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PHYTOPLANKTON OF THE BLACK WARRIOR RIVER, ALABAMA

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ABSTRACT

Most floristic and community ecology reports of freshwater algae are based only on preserved or fresh samples. In the present study, the phytoplankton of The Black Warrior river near Tuscaloosa, receiving domestic sewage and industrial wastes, was investigate- from cultured as well as natural and preserved samples. Over 380 species and varieties of algae, including some rarely reported forms, were identified. The results of Sedgwich-Rafter and diatom proportional analyses showed that a) phytoplankton density ranged from 117-488 individuals/ml.; b) among the common groups, Chlorococcales were numerically dominant, followed by the Pennales, Chrysophyceae, Centrales and Cryptomonadaceae; c) out of 36 genera of Bacillariophyceae listed, 4 genera were abundant and constant in occurrence. Some difficulties of identification and limitations of enumeration are briefly discussed. Present data confirm the presence of a resident phytoplankton and provide useful data for current research on the taxonomy, ecology and possible pesticide degradation ability of the algae.

INTRODUCTION

The Warrior River, which has its source in North Alabama, and following its union with the Tombigbee, flows into the Gulf of Mexico at Mobile. It is impounded at Tuscaloosa by the Oliver Lock and Dam to form the Oliver Pool. Sewage from the City of Northport, after primary treatment, and effluents from several industries including a paper mill, a chemical plant, and a coke plant are discharged into the Oliver Pool. Composition and rates of discharge are available in a thesis by McClure (1968).

During the spring of 1971, thirty six algal isolates were obtained in axenic cultures by standard bacteriological methods from a station at Bennett's Marina about 500 meters upstream of the dam. These algae were studied for their possible ability to degrade pesticides. The algae are considered to be planktonic, but there are no published studies of the Warrior flora on which to base this conclusion. Further, most studies of phytoplankton populations have involved observations only of preserved materials. We felt that we might get a better picture of the algae actually present during a period of several months if we combined three methods: 1) Observations on freshly collected smaples, 2) Observation of cultured samples, and 3) Observations of preserved samples. Organisms consistently observed by two or more methods and represented in samples from different sites and at different sites and at different times should be those which are consistently present and representative of the 'normal' population. In this sense only do we refer to resident plankton.

MATERIALS AND METHODS

Samples for our studies were taken at about three week intervals beginning in May and extending through August of 1973. The collecting stations at Tuscaloosa were chosen for ready accessibility, comparable environmental conditions, and availability of boat or barge for convenient collection of offshore plankton. Station number one was located 1.126 km (0.7 miles) upstream from Oliver Lock and Dam at the Corps of Engineers Workshop, and station two was approximately 1.287 km (0.8 miles) further upstream at Rose Towers, Tuscaloosa.

Eight to twelve liter samples were obtained for phytoplankton by pushing polyethylene containers 20-30 cm beneath the water surface before allowing them to fill. A stock solution of thimerosal-iodine (Williams, 1964) was added to the samples immediately to preserve them for later study. Unfortunately certain delicate genera such as Gonyostomum, Merotrichia, and Synura, disintegrated with the preservative. Untreated aliquots were retained for observations of living material, and small samples (0.5 L) were taken in sterile glass containers for culture work.

Periphyton growing on the sides of boats or on fallen wood were scraped into vials. Bottom mud also was obtained from the shore in the vicinity of the stations for a look at the benthic forms which might contribute to the plankton. Taxa appearing only in these collections are indicated in the tables.

Samples collected aseptically were dilution plated using three media: Bold's inorganic salt medium (Deason & Bold, 1960) BG-11 (Stanier et al., 1971), and FW-1 medium (Lewin, 1966). Other aliquots of these samples were added to liquid media, and all cultures were incubated in constant light of approximately 300 ft. c. at a temperature of 25 degrees C. The use of three media made possible the growth of a considerable variety of algae. All cultures were surveyed for algal taxa and no taxa were reported unless they were observed at least twice. Observations of the algae in culture facilitated identification of algae in the fresh and preserved samples.

The plankton of the field-preserved samples were allowed to settle out for a minimum of 2 weeks in graduated cylinders, most of the supernatant carefully withdrawn by pipette, and the remaining contents washed into smaller cylinders. This procedure was repeated. The final concentrate for each composite sample was collected in 10 ml graduated cylinders, and the level was adjusted with distilled water when necessary so that the ratio of concentrate to original raw samples was 1:1000. Quantitative analyses for phytoplankton were accomplished using 1.0 ml of the above concentrate. These analyses were largely based on methods of the Analytical Quality Control Laboratory (Weber, 1966). Useful hints also were obtained from "Standard Methods" (American Public Health Association, 1965). For the phytoplankton analysis, 1 ml concentrate was made up to 50 ml with distilled water and 1 ml aliquots were used to fill a standard Sedgwick-Rafter counting cell. Two strips were counted at a magnification of 210 X. Data were recorded on separate bench sheets for major groups and for the genera. The results were reported as numbers of individuals/ml of raw material.

Permanent hyrax mounts for Diatom Proportional Analysis were prepared by the incineration method (Williams, 1962; Weber, 1966). Diatoms were counted at a magnification of 970 X using a binocular compound microscope containing a Whipple micrometer grid and a calibrated linear scale. The random strip counts were made until 200 cells were encountered or the scanning time reached 3 hours. Data was recorded on a bench sheet and the results reported in percentages for the four most abundant genera. The permanent slides also were used to identify the diatom species.

RESULTS AND DISCUSSION

Over 380 species or varieties of algae representing several Divisions were observed in our samples and cultures (Table VI). The Sedgwick-Rafter analysis (Table III) shows that pennate diatoms were second in abundance only to the *Chlorococcales* as indicated by total counts for the period of study. *Chrysophycean* algae were next in abundance, followed by centric diatoms and *Cryptophyta*. Total numbers of algae per ml of water increased as the season progressed, but only the *Chlorococcales* and *Zygnematales* showed a steady increase in numbers with time. During the period of study, water level (gauge height) remained relatively constant while the flow rate gradually decreased. The mean discharge rate in cubic feet per second was 13,550 for May, 9,639 for June, 8,585 for July and 4,465 for August.[3] Surface water temperatures for the four collecting dates (both stations), were respectively 23°C, 27°C, 29°C, and 29°C. The pH of the river was approximately 6.4 throughout the study.

The dominant genera, as indicated by the total Sedgwick-Rafter counts for the period of study (Table IV), were *Synedra* (including

Nitzschia), Kephyrion (including Kephyriopsis and Chrysococcus), Ankistrodesmus, and Cryptomonas. Only Cryptomonas increased steadily in numbers with time. Chlorella, although obviously numerous in fresh samples, was not listed because of the difficulty of identifying it at low magnification. Chlorococcum-like algae also were impossible to identify at low magnification particularly in preserved material. Several other genera listed may include closely related forms due to the identifications made at low magnification: Navicula may include Pinnularia, Oscillatoria may include Lyngbya and Phormidium, and Peridinium may include Glenodinium.

Our culture studies supplemented observations of raw and preserved samples. Algae which we were able to culture were much easier to recognize in the samples after we had studied them at leisure. In cultures, with or without enrichment media, certain flagellates such as Anthophysa vegetans, Paraphysomonas vestita, Spumella vivipara, Collodictyon triciliatum, Furcilia lobosa, Ochromonas sp., Chrysochromulina sp. and Entosiphon spp. developed in profusion and facilitated their identification. These and many other species which would have been overlooked in the samples were revealed by the cultures as shown in Table II indicating that 20 species appeared only in the cultures. Finally, we were able to identify in the cultures the same morphological entities isolated during 1971, including species of Chlorella, Scenedesmus, Golenkiniopsis, Carteria, Ankistrodesmus, Actinastrum, and Nitzschia. Unfortunately, time did not permit reisolation of all strains for physiological comparisons with our 1971 isolates. However, if our contention that these strains are essentially resident plankton is valid, then we should be able to reisolate the strains if time permits and if conditions in the river are not too greatly altered.

Our culture studies also confirmed the tendency of planktonic forms to be morphologically variable under different environmental conditions as reported by Trainor (1969) and others. Colonies from the samples ascribable to Tettrallantos and Nephrochlamys turned out to be Kirchneriella in culture. Scenedesmus spp. produced forms resembling Chodatella and Ourococcus. Actinastrum displayed a variety of forms resembling Tetradesmus, Didymogenes, Marthea, and Coccomyxa; an untrained observer might well have reported the occurrence of these genera.

Because our samples were large, and effectively made larger by the use of the culture technique, the identification of a large number of species in a more or less polluted river is not too surprising. Species abundance which is necessary for evaluating species diversity, was not determined because of the difficulty of determining species at Sedgwick-Rafter magnifications. When there are relatively few preserved cells, identification of most species is a difficult proposition even using a magnification of 1000 X. It is probably useful to look at the diatom proportional analysis

(Table V) to get a better idea of the diversity-abundance relationship. It is observed that almost 80% of the population consists of four genera of the 36 listed in Table I. *Synedra* (33%) and *Nitzschia* (3.8%) were most abundant among the pennate diatoms and the genera *Cyclotella* (23.4%) and *Melosira* (18%) among the centric diatoms. Of the 123 species of diatoms listed in Table I four species were the most abundant as indicated by bench data collected during the proportional analysis: *Synedra acus*, *S. ulna*, *Cyclotella stelligera*, and *Melosira distans*. A comparison of Tables III and IV shows that *Synedra* accounted for about 73% of the living *Pennales* and *Ankistrodesmus* for about 62% on 30 May 1973 at Station 1. Data for calculation of a species diversity index (Patten, 1962) are not available, but it appears that species diversity is low, indicating eutrophication (Williams, 1964). Eutrophication is also suggested by the dominance of the bacteria and organic detritus feeders *Keratella*, *Codonella*, and *Tintinnidium* among the zooplankton, and although no water blooms were observed during our study, the density of the phytoplankton (117-488 individuals/ml) indicates that the river is eutrophic.

Although species identification was facilitated, and additional species were found using the culture method, the costs in time exceeded the benefits in a study of this type.

TABLE I

Taxon	Station 1	Station 2
Division Cyanophyta		
Chroococcus rufescens (Kuetz.) Naegeli	N	
Merismopedia glauca (Ehr.) Naegeli		N
Merismopedia sp.	N	NC
Microcystis flos-aquae (Wittr.) Kuetzing		N
Microcystis sp.	NC	N
Oscillatoria amonena Gomont		N
Oscillatoria sp. 1	NCB	NC
Oscillatoria sp. 2	NCB	C
Beggiatoa sp.		N
Lyngbya epiphytica Hieronymus	P	
Lyngbya subtilis W. West	P	
Lyngbya sp.	CP	C
Phormidium sp.	C	NC
Microcoleus sp.	NCB	
Anabaena sp.	NCB	NCP
Anabaena spiroides Klebahn	N	
Aphanizomenon flos-aquae (Linn.) Ralfe	C	
Nostoc sp.	CB	C
Scytonema sp.		C
Calothrix sp.		C
Division Cryptophyta		
Chroomonas sp.	NC	
Cryptochrysis sp.		NC
Chilomonas paramaecium Ehrenberg	C	NB
Cryptomonas erosa Ehrenberg	CB	NCP
Cryptomonas obovata Skuja	NCB	NCB
Cryptomonas reflexa (Marsson) Skuja	N	
Cryptomonas sp. 1	NCB	NCB
Cryptomonas sp. 2	N	NCB
Cyathomonas truncata (Fres.) Fisch	NCB	NC
Division Chloromonadophyta		
Gonyostomum depressum Lemmermann	N	
Gonyostomum semen Diesing	N	NC
Merotrichia sp.	N	
Division Pyrrhophyta		
Glenodonium palustre Zachariasi		NP
Glenodinium spp.	N	NC
Peridinium inconspicuum Lemmermann	N	
Peridinium wisconsinense Eddy	N	N
Peridinium spp.	N	NP
Ceratium hirundinella (Muell.) Shrank	N	N

Taxon	1	2
Division Bacillariophyta		
Melosira ambiqua (Grun.) O. F. Mueller	N	N
Melosira distans (Ehr.) Kuetzing	N	N
Melosira granulata (Ehr.) Ralfs	N	NC
Melosira herzogii Lemm	NC	N
Melosira italica (Ehr.) Kuetzing	NC	N
Melosira varians C. A. Agardh	NCP	NCP
Cyclotella atomus Hustedt.	N	N
Cyclotella antiqua Wm. Smith	N	N
Cyclotella bodanica Eulenstein	N	N
Cyclotella meneghiniana Kuetzing	NC	NC
Cyclotella stelligera (Cleve et Grun.) van Heurck	N	NC
Cyclotella pseudostelligera Hustedt.	N	N
Cyclotella glomerata Bachmann	N	N
Stephanodiscus sp.		N
Attheya zachariasi Brunthaler	N	N
Rhizosolenia eriensis H. L. Smith	NC	N
Rhizosolenia sp.	NC	N
Chaetoceros sp.	N	
Asterionella formosa Hass. var. *formosa* Patrick et Reimer	N	N
Diatoma vulgare Bory var. *vulgare* Patrick et Reimer	N	
Fragilaria brevistriata Grun. var. *brevistriata* Patrick et Reimer		N
Fragilaria capucina (Desm.) var. *capucina* Patrick et Reimer	N	N
Fragilaria construens (Ehr.) Grun. var. *construens* Patrick et Reimer	N	
Fragilaria crotonensis Kitton var. *crotonensis* Patrick et Reimer	NCB	NC
Fragilaria vaucheriae (Kuetz.) Peters var. *vaucheriae* Patrick et Reimer	NCB	NP
Fragilaria spp.	N	N
Synedra acus Kuetz. var. *acus* Patrick et Reimer	N	NP
Synedra rumpens Kuetz. var *rumpens* Patrick et Reimer		NP
Synedra rumpens var. *meneghiniana* Grunow		N
Synedra ulna (Nitz.) Ehr. var. *ulna* Patrick et Reimer	NC	NCP
Synedra spp.	NC	N
Tabellaria fenestrata (Lyng.) Kuetz. var *fenestrata* Patrick et Reimer	N	NP
Tabellaria flocculosa (Roth) Kuetz. var. *flocculosa* Patrick et Reimer	N	NP
Meridion circulare (Grev.) C. A. Ag. var. *circulare* Patrick et Reimer		N
Eunotia curvata (Kuetz.) Lagerst. var. *curvata* Patrick et Reimer		N
Eunotia incisa W. Sm. ex Greg. var. *incisa* Patrick et Reimer	N	
Eunotia pectinalis (O. F. Muell.) Rabh. var. *pectinalis* Patrick et Reimer	N	NP

Taxon	1	2
Eunotia pectinalis var. undulata (Ralfs) Rabenhorst		N
Eunotia spp.	N	NP
Achnanthes clevei Grun. var. clevei Patrick et Reimer	N	
Achnanthes exigua Grun. var. exigua Patrick et Reimer	N	
Achananthes lanceolata (Breb.) Grunow var. dubia Grunow	N	N
Achnanthes lanceolata var. omissa Reimer		N
Achnanthes linearis (W. Sm.) Grun. var. linearis Patrick et Reimer		N
Achnanthes minutissima Kuetzing var. minutissima Patrick et Reimer	NC	NBP
Achnanthes sp.		N
Cocconeis fluviatilis Wallace var. fluviatilis Patrick et Reimer	N	
Cocconeis sp.	N	N
Amphipleura pellucida Kuetz var. pellucida Patrick et Reimer	P	NP
Anomoeoneis vitrea (Grun.) Ross var. vitrea Patrick et Reimer		
Caloneis bacillum (Grun.) Cleve	N	
Capartogramma crucicula (Grun. ex Cl.) Ross var. crucicula Patrick et Reimer	N	N
Diploneis puella (Schum.) Cl. var. puella Patrick et Reimer	N	
Diploneis sp.	N	N
Frustulia rhomboides var. capitata (A. Mayer) Patrick		N
Frustulia rhomboides var. crassinervia (Breg. ex W. Sm.) Ross		NP
Frustulia rhomboides (Ehr.) DeToni var. rhomboides Patrick et Reimer	N	NP
Frustulia rhomboides var. saxonica (Rabh.) De Toni		N
Frustulia vulgaris (Thwaites) De T. var. vulgaris Patrick et Reimer	N	N
Frustulia weinholdii Hust. var. weinholdii Patrick et Reimer		N
Gyrosigma nodiferum (Grun.) Reim. var. nodiferum Patrick et Reimer		N
Gyrosigma spencerii (Quek.) Griff. et Henfr. var. spencerii Patrick et Reimer	N	NCP
Gyrosigma sp.		
Navicula atomus (Kuetz.) Grun. var. atomus Patrick et Reiner		N
Navicula crucicula (W. Sm.) Donk. var. crucicula Patrick et Reiner	N	N
Navicula exigua (Greg. ex. Grun.) var. capitata Patrick et Reiner	N	
Navicula gottlandica Grun. var gottlandica Patrick et Reiner	N	N
Navicula gregaria Donk. var. gregaria Patrick et Reiner	N	
Navicula heufleri (Grun.) var. leptocephala (Breb. ex Grun.) Patrick	N	

Taxon	1	2
Navicula mobiliensis Boyer var. minor Patrick		N
Navicula mutica Kuetz. var. mutica Patrick et Reimer	N	
Navicula mutica var. tropica Hustedt	N	N
Navicula notha Wall. var. notha Patrick et Reimer		N
Navicula pupula Kuetz. var. capitata Skvortzov et Meyer	N	
Navicula pupula Kuetz. var. pupula Patrick et Reimer	N	
Navicula pupula Kuetz. var. rectangularis (Greg.) Grunow		N
Navicula pygmaea (Kuetz.) var. pygmaea Patrick et Reimer	N	
Navicula radiosa Kuetz. var. tenella (Breb. et Kuetz.) Grunow	N	
Navicula rhynchocephala var. germainii (Wall.) Patrick	N	N
Navicula viridula (Kuetz.) var. rostellata Patrick et Reimer	N	
Navicula spp.	NB	BP
Neidium affine (Ehr.) Pfitz. var. affine Patrick et Reimer	N	
Neidium affine var. ceylonicum (Skv.) Reimer	N	N
Neidium bisulcatum (Lagerst.) Cl. var. bisulcatum Patrick et Reimer		N
Pinnularia appendiculata (Ag.) Cl. var. appendiculata Patrick et Reimer		N
Pinnularia biceps Greg. var. biceps Patrick et Reimer	N	
Pinnularia borealis Ehr. var. rectangularis Carlson		N
Pinnularia braunii (Grun.) Cl. var. amphicephala (A. Mayer) Hustedt		N
Pinnularia brebissonii (Kuetz.) Rabh. var. brebissonii Patrick et Reimer	N	
Pinnularia microstauron (Ehr.) Cl. var. microstauron Patrick et Reimer	N	
Pinnularia obscura Krasske var. obscura Patrick et Reimer	N	
Pinnularia subcapitata Greg. var. subcapitata Patrick et Reimer		N
Pinnularia substomatophora Hust. var. substomatophora Patrick et Reimer		N
Pinnularia viridis (Nitz.) Ehr. var. viridis Patrick et Reimer	N	
Pinnularia spp.	N	NCP
Stauroneis anceps Ehr. var. anceps Patrick et Reimer	N	
Stauroneis sp.	N	N
Gomphonema acuminatum Ehrenberg	N	N
Gomphonema acuminatum var. coronata (Ehr.) Cleve		N
Gomphonema angustatum (Kuetz.) Grunow	N	CP
Gomphonema sp.	N	N
Amphora sp.	N	N
Cymbella gracilis (Rabh.) Cleve	N	N

Taxon	1	2
Cymbella tumida (Breb.) van Heurck	NP	NP
Cymbella turgida Gregory	P	NP
Cymbella ventricosa Kuetzing	NP	NP
Cymbella sp.	N	N
Denticula elegans Kuetzing	N	N
Denticula sp.		N
Epithemia ocellata (Ehr.) Kuetzing	N	
Epithemia sp.	N	N
Rhophalodia gibba (Ehr.) O. F. Mueller	N	N
Bacillaria paradoxa Gmelin	N	P
Hantzschia amphioxys (Ehr.) Grunow	N	N
Nitzschia acicularis W. Smith	NC	NC
Nitzschia amphibia Grunow	N	N
Nitzschia closterium (Ehr.) W. Smith	N	N
Nitzschia filiformis (W. Smith) Hustedt	NC	NP
Nitzschia holsatica Hustedt		N
Nitzschia longissima (Breb.) Ralfs	N	N
Nitzschia lorenziana Grunow	N	NP
Nitzschia palea (Kuetz.) W. Smith	NC	CBP
Nitzschia sigma (Kuetz.) W. Smith		N
Nitzschia sinuata var. *tabellaria* Grunow	N	
Nitzschia tryblionella Hantzsch	N	N
Nitzschia spp.	N	N
Surirella elegans Ehrenberg		N
Surirella didyma Kuetzing		NB
Surirella linearis W. Smith	N	N
Surirella tenuissima Hustedt	N	
Surirella spp.	N	NB
Division *Chrysophyta*		
Chrysamoeba sp.	NC	
Lagynion scherfelii Pascher		N
Kephyrion cupuliforme Conrad	N	N
Kephyrion cyclindricum (Lack.) Conrad	N	N
Kephyrion doliolum Conrad	N	N
Kephyrion rubri-claustri Conrad		
Kephyrion spp.	N	N
Codonodendron sp.	N	
Chrysococcus porifer Lemmermann	N	N
Chrysococcus rufescens Klebs	N	N
Chrysococcus spp.	N	N
Ochromonas sp. 1	C	CP
Ochromonas sp. 2	NC	NCB
Paraphysomonas vestita (Stokes) De Saedeleer	NC	NC
Spumella vivipara	NC	
Chrysochromulina sp.	NC	
Anthophysa steinii Senn		N
Anthophysa vegetans (O. F. M.) Stein	N	NP
Dinobryon bavaricum Imhof	N	N
Dinobryon cylindricum Imhof		N

Taxon	1	2
Dinobryon divergens Imhof	N	N
Pseudokephyrion ellipsoideum (Pasch.) Schm.		N
Pseudokephyrion spp.	N	N
Mallomonas acaroides Perty		N
Mallomonas tonsurata Teiling		N
Mallomonas spp.	N	N
Synura uvella Ehrenberg	NCP	N
Codosiga sp. 1	NP	N
Codosiga sp. 2	P	
Salpingoeca sp.	N	N
Division *Xanthophyta*		
Botrydiopsis sp.	N	
Chlorocloster sp.	N	N
Leuvenia natans Gardner	NC	
Chlorobotrys sp.	C	
Gloeobotrys sp.	NC	C
Characiopsis sp.		P
Centritractus belanophorus Lemmermann		N
Ophiocytium bicuspidatum (Borge) Lemmermann	N	N
Ophiocytium parvulum (Perty) A. Braun	N	N
Heterothrix sp.	NC	NC
Botrydium granulatum (L.) Greville	C	
Division *Euglenophyta*		
Euglena acus Ehrenberg	NCB	
Euglena ehrenbergii Klebs	N	
Euglena oxyuris Schmarda		N
Euglena pisciformis Klebs	NCB	NC
Euglena viridis Ehrenberg		
Euglena spp.	N	N
Lepocinclis fusiformis (Carter) Lemmermann	NC	
Lepocinclis ovum (Ehrenb.) Lemmermann	NC	N
Lepocinclis steinii Lemmermann	NC	N
Phacus agilis Skuja	N	N
Phacus longicauda (Ehrenb.) Dujardin	N	
Phacus orbicularis Huebner		N
Phacus oscillans Klebs	N	
Phacus tortus (Lemm.) Skvortzow	N	
Phacus sp.	N	N
Trachelomonas bernardinensis W. Vischer em. Deflandre	N	
Trachelomonas granulata Swirenko	N	N
Trachelomonas hispida (Perty) Stein	N	N
Trachelomonas oblonga Lemmermann	N	N
Trachelomonas obovata Stokes em. Deflandre	N	
Trachelomonas similis Stokes	N	
Trachelomonas superba (Swir.) Deflandre	N	N
Trachelomonas volvocinopsis Swirenko	N	N
Trachelomonas spp.	N	N
Strombomonas giradiana (Playf.) Deflandre	N	N

Taxon	1	2
Strombomonas sp.		N
Menoidium pellucidum Perty	N	
Notosolenus apocamptus Stokes		C
Notosolenus obliquus Stokes		NP
Notosolenus orbicularis Stokes		N
Anisonema acinus Dujardin	NC	NC
Anisonema sp. 1		NC
Entosiphon obliquum Klebs	N	N
Entosiphon ovatum Stokes	N	NP
Entosiphon sulcatum (Duj.) Stein	N	NC
Entosiphon sp. 1	N	P
Petalomonas sp.	C	NC
Heteronema cryptocercum Skuja	N	
Peranema furcatum Skvortzow		NC
Peranema trichophorum (E.) Stein	C	NCP
Peranema sp.	NC	P
Division Chlorophyta		
Collodictyon triciliatum Carter	NC	NC
Furcilia lobosa Stokes	NC	NC
Furcilia trifurca Pascher	C	
Carteria sp. 1	N	N
Carteria sp. 2		N
Carteria sp. 3		N
Chlamydomonas sp. 1	CB	NC
Chlamydomonas sp. 2	C	NC
Chlamydomonas sp. 3	C	C
Chlamydomonas sp. 4		B
Chlamydomonas sp. 5	C	
Sphaerellopsis sp. 1	C	C
Dysmorphococcus variabilis Takeda	NC	NCB
Coccomonas sp.	N	N
Gonium pectorale Mueller	C	NC
Pandorina morum Bory	N	NCB
Eudorina elegans Ehrenberg	NC	NV
Pedinomonas rotundata Korshikov	NC	N
Nephroselmis sp.	N	
Characium sp.		P
Chlorococcum sp.	C	NC
Schroederia setigera Lemmermann	NC	NC
Tetraedron gracile (Reinch) Hansgirg	N	
Tetraedron regulare Kuetzing		C
Sphaerocystis schroeteri Chodat	NB	NC
Ankistrodesmus convolutus var. minutus (Naeg.)		
Ankistrodesmus falcatus (Corda) Ralfs	NCB	NC
Ankistrodesmus falcatus var. stipitatus (Chorda) Lemmermann	C	
Ankistrodesmus sp. 1	NCB	NC
Ankistrodesmus sp. 2	NCB	N
Ankistrodesmus sp. 3	NC	C

Taxon	1	2
Chlorella sp.	NCB	C
Chodatella ciliate (Lagerh.) Chodat	N	N
Chodatella quadriseta Lemmermann	NC	
Chodatella subsalsa Lemmermann	N	
Closteriopsis longissima Lemmermann	NB	N
Franceia droescheri (Lemm.) G. M. Smith	N	N
Franceia ovalis (France) Lemmermann	N	N
Kirchneriella contorta (Schmidle) Bohlin	NC	NC
Kirchneriella lunaris (Kirch.) Moebius	NC	NC
Kirchneriella obesa (W. West) Schmidle	NC	NC
Kirchneriella obesa var. major (Bernard) G. M. Smith	N	N
Kirchneriella subsolitaria G. S. West	N	N
Nephrocytium sp.		NC
Oocystis borgei Snow		N
Oocystis parva West et West	N	C
Oocystis sp.	N	NC
Quadrigula sp.		N
Rayssiella hemisphaerica Edelstein et Prescott	N	
Selenastrum bibraianum Reinch	NC	NC
Selenastrum westii G. M. Smith	NC	C
Selenastrum sp. 1	C	
Treubaria crassispina G. M. Smith	N	N
Eutetramorus globosus Walton		N
Radiococcus sp.		N
Errerella bornhemiensis Conrad	N	N
Golenkiniopsis solitaria Korshikov	NC	C
Micractinium pusillum Fresenius	NCB	NC
Micractinium quadrisetum (Lemm.) G. M. Smith	NC	
Dictyosphaerium ehrenbergianum Naegeli	NC	N
Dictyosphaerium pulchellum Wood	NCBP	NCP
Quadricoccus verrucosus Fott	NC	
Westella botrydioides (W. West) de Wildeman	NC	NC
Actinastrum hantzschii Lagerheim	NCB	NC
Coelastrum cambricum Archer	NC	NC
Coelastrum microporum Naegeli	NCB	NC
Coelastrum reticulatum (Dang.) Senn	C	NCP
Coelastrum sphaericum Naegeli	N	C
Nautococcus sp.	C	C
Coronastrum aestivale Thompson		C
Crucigenia apiculata (Lemm.) Schmidle	NC	NC
Crucigenia fenestrata Schmidle	NC	N
Crucigenia quadrata Morren		N
Crucigenia tetrapedia (Kirch.) West et West	N	NC
Scenedesmus abundans (Kirch.) Chodat	NC	NC
Scenedesmus acuminatus (Lagerh.) Chodat	N	N
Scenedesmus armatus (Chod.) G. M. Smith	NC	NC
Scenedesmus arcuatus Lemmermann	C	NC
Scenedesmus bernadii G. M. Smith		N
Scenedesmus bijuga (Turp.) Lagerheim	NC	C
Scenedesmus brasiliensis Bohlin	N	C

Taxon	1	2
Scenedesmus denticulatus Lagerheim		N
Scenedesmus dimorphus (Turp.) Brebisson	NC	NC
Scenedesmus longus Meyen	C	C
Scenedesmus opoliensis p. Richter	C	C
Scenedesmus obliquus (Turp.) Kuetzing	C	
Scenedesmus quadricauda (Turp.) Brebisson	NC	
Scenedesmus serratus (Corda) Bohlin	NC	N
Scenedesmus smithii Teiling	NC	NC
Scenedesmus sp.	C	
Tetrallantos lagerheimii Teiling	NC	N
Tetrastrum heteracanthum (Nordst.) Chodat	N	N
Pediastrum duplex Meyen	NC	NC
Pediastrum duplex var. gracilimum West et West	N	NC
Pediastrum duplex var. rotundatum Lucks		N
Pediastrum tetras (Ehrenb.) Ralfs	N	NC
Pediastrum tetras var. tetraodon (Corda) Ralfs		N
Dactylothece sp.	C	C
Dispora sp.	NC	
Elakatothrix sp.	N	N
Ulothrix fimbriata Bold	NC	
Ulothrix sp. 1	N	P
Ulothrix sp. 2	C	NCP
Ulothrix sp. 3	N	N
Microthamnion strictissimum Rabenhorst	N	
Stigeoclonium sp.	CB	P
Aphanochaete repens A. Braun		P
Oedogonium sp. 1	P	CP
Oedogonium sp. 2	P	P
Rhizoclonium sp.		P
Mougeotia sp.		P
Spirogyra sp. 1	C	P
Spirogyra sp. 2		P
Spirogyra sp. 3		NP
Cylindrocystis brebissonii Meneghini	N	
Closterium gracile Brebisson	NC	NCBP
Closterium moniliferum (Bory) Ehrenberg		NCP
Closterium sp. 1	NC	N
Closterium sp. 2	N	N
Cosmarium phaseolus Brebisson	N	
Cosmarium sp. 1		N
Cosmarium sp. 2		N
Cosmarium sp. 3		B
Cosmarium sp. 4		NP
Euastrum denticulatum (Kirch.) Gay	N	N
Euastrum sp. 1	C	NC
Euastrum sp. 2		N
Pleurotaenium ehrenbergii (Breb.) Debary	N	N
Pleurotaenium sp. 1		NBP
Staurastrum arachne Ralfs		NC
Staurastrum chaetoceros (Schroed.) G. M. Smith	N	N

Taxon	1	2
Staurastrum corniculatum Lundell		N
Staurastrum depressiceps Scott et Groenblad		N
Staurastrum megacanthum Lundell	N	N
Staurastrum paradoxum Meyen	NC	N
Staurastrum sp. 1	C	N
Staurastrum sp. 2	N	
Spondylosium planum (Wolle) West et West	N	N
Teilingia granulata (Roy et Biss.) Bourrelly	N	NC

TABLE II

Division	Totals	Chlorophyta	Euglenophyta	Xanthophyta	Chrysophyta	Bacillariophyta	Pyrrhophyta	Chloromonadophyta	Cryptophyta	Cyanophyta
Genera	164	66	13	10	16	36	3	2	5	13
Species	381	137	43	11	30	122	6	3	9	20
NB	35	15	2	-	1	7	-	-	5	5
B	1	1	-	-	-	-	-	-	-	-
NP	49	11	4	-	5	25	2	-	1	1
P	8	6	-	1	1	-	-	-	-	-
C	20	15	1	1	-	-	-	-	-	3
N	203	43	25	5	20	98	3	2	1	6
CC	127	67	12	3	7	19	1	1	8	9
Photosynthetic Flagellate spp.	84	18	27	-	22	-	6	3	8	-
Non-photosynthetic Flagellate spp.	29	3	16	-	8	-	-	-	2	-
Total Flagellates	113	21	43	-	30	-	6	3	10	-

TABLE III

Date	30-5-73		22-6-73		16-7-73		6-8-73	
Station	1	2	1	2	1	2	1	2
Group:								
Cyanophyta, coccoid	-	0.6	1.9	-	1.2	-	2.5	6.2
Cyanophyta, filamentous	2.5	1.9	0.6	0.6	5.6	4.3	9.3	29.1
Cryptophyta	4.3	7.4	8.7	16.1	20.5	8.1	26.0	29.1
Pyrrhophyta	5.6	1.9	3.6	9.3	9.9	1.2	18.0	18.0
Bacillariophyta								
Centrales, live	5.0	12.4	6.8	4.3	19.8	13.0	13.0	21.7
Centrales, dead	4.3	5.6	2.5	3.1	4.3	2.5	-	2.5
Pennales, live	37.8	46.5	15.5	14.9	109.1	85.6	26.0	32.2
Pennales, dead	8.1	7.4	2.5	6.2	11.2	5.0	2.5	3.7
Chrysophyta	9.3	3.7	22.3	43.4	55.2	23.6	47.1	71.9
Euglenophyta	1.9	2.5	3.7	3.1	4.3	3.1	1.9	5.0
Chlorophyta								
Volvocales	1.9	2.5	10.5	6.2	12.8	6.9	16.7	9.3
Chlorococcales	31.6	45.9	42.2	64.5	75.0	59.5	115.9	244.9
Ulotrichales	-	-	-	0.6	0.6	-	-	-
Zygnematales	-	0.6	0.6	-	0.6	1.9	3.1	5.6
Unidentified cells	3.1	5.5	2.5	4.9	1.8	7.4	4.3	6.2
Unidentified filaments	1.2	5.0	0.6	1.9	5.6	1.2	0.6	2.5
Total individuals per milliliter	117	149	125	179	338	223	287	488

TABLE IV

Date	30-5-73		22-6-73		16-7-73		6-8-73	
Station	1	2	1	2	1	2	1	2
Genus:								
Ankistrodesmus	19.7	24.2	5.6	9.9	24.2	13.0	40.3	26.0
Asterionella	-	-	-	-	1.2	1.2	-	-
Attheya	-	-	-	-	-	-	-	0.6
Chlamydomonas	-	0.6	1.9	3.7	2.5	-	2.5	1.2
Closterium	-	-	-	-	-	0.6	0.6	0.6
Coccomonas	0.6	0.6	6.2	3.2	3.7	3.7	8.1	6.8
Coelastrum	-	-	-	-	-	-	6.2	10.5
Cryptomonas	5.6	3.1	8.1	16.1	19.0	8.1	24.8	26.7
Dictyosphaerium	-	-	-	-	-	-	1.2	2.5
Dinobryon	-	0.6	3.1	3.7	49.6	-	1.2	0.6
Dysmorphococcus	-	1.2	-	0.6	1.2	3.1	2.5	1.4
Euglena	0.6	0.6	-	0.6	1.2	1.2	-	1.2
Kephyrion	2.5	2.5	18.0	49.2	48.2	17.4	39.1	57.6
Kirchneriella	-	-	-	-	-	-	-	1.2
Lepocinclis	-	-	1.2	-	-	0.6	-	0.6
Mallomonas	3.1	2.5	1.9	2.5	3.7	3.7	7.4	11.8
Merismopedia	-	-	1.2	-	1.9	-	2.5	5.0
Navicula	3.7	7.5	5.6	4.3	5.0	3.7	3.1	1.9
Oscillatoria	-	-	0.6	0.6	4.3	3.1	24.8	26.7
Peridinium	3.1	0.6	-	0.6	4.3	3.1	24.8	26.7
Phacus	-	0.6	-	-	-	-	0.6	0.6
Rhizosolenia	-	-	-	-	-	-	1.2	5.0
Scenedesmus	6.8	4.3	3.1	1.9	0.6	3.1	2.5	7.4
Staurastrum	-	-	0.6	-	0.6	0.6	1.9	0.6
Synedra	27.8	34.5	12.4	9.9	35.5	91.3	39.1	40.3
Trachelomonas	0.6	0.6	2.7	2.5	3.1	0.6	1.2	1.4
Totals/ml	74.1	94.0	72.2	109.3	210.0	158.0	235.6	264.9

TABLE V

Date	30-5-73		22-6-73		16-7-73		6-8-73	
Station	1	2	1	2	1	2	1	2
Genus:								
Cyclotella	6	35(31)	79(76)	32	46(45)	40(39)	41(36)	33(31)
Melosira	25(13)	65(36)	80(42)	48(27)	52(28)	34(18)	46(31)	54(34)
Rhizosolenia	-	-	-	-	-	-	-	-
Stephanodiscus	-	2	-	-	-	-	-	-
Unidentified Centrales	1	5	2	4(2)	15(9)	3(2)	2	-
Achnanthes	1	6	11	7	1	3	4	17
Amphipleura	-	-	1	-	-	-	-	-
Amphora	-	-	-	-	-	-	1	-
Asterionella	-	1	6(1)	-	3(1)	4(2)	3(1)	12(3)
Cocconeis	-	-	1	-	-	-	-	-
Cymbella	1	2	3	1	2	2	1	2
Denticula	-	-	-	-	-	-	-	1
Diatoma	-	-	1	-	-	-	-	-
Diploneis	-	-	-	-	1	-	-	-
Eunotia	1	3	1	-	1	-	-	-
Fragilaria	3(2)	11(6)	6	7	5(3)	3(2)	3(2)	3
Frustulia	-	-	-	1	2	1	-	-
Gomphonema	1	-	1	2	5	3	-	2
Gyrosigma	-	-	-	-	-	-	-	1
Hantzschia	-	-	1	-	2	-	-	-
Navicula	2	5	9	3	3	3	5	6
Neidium	-	-	-	1	1	-	-	1
Nitzschia	2	9	14	7	4	3	6	10
Surirella	-	1	-	-	-	-	-	1
Synedra	2	11	35	16	102	159	112 (102)	92(90)
Unidentified Pennales	6(5)	7	8	4(2)	12(9)	10(8)	6	11

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FOOTNOTES

1. Present address: Department of Botany, University of Malaya, Kuala Lumpur, Malaysia.

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3. Courtesy of U.S. Geological Survey.

TABLE LEGENDS

TABLE I. Identified species of phytoplankton from raw, cultured, and preserved samples. N = phytoplankton from raw or preserved samples, C = from cultures, B = Benthic samples, P = periphyton.

TABLE II. Summary of distribution based on Table I. NB = Number of species in both plankton and benthos, B = Benthos only, NP = species in both plankton and periphyton, P = Periphyton only, N = Plankton from raw and preserved samples, C = from culture only, CC = from culture and natural collections. Species excluding varieties and forms.

TABLE III. Phytoplankton Analysis of Main Groups of Algae in Individuals per Millilter of Raw Sample.

TABLE IV. Phytoplankton Analysis of Main Genera of Algae in Individuals per Milliliter of Raw Sample.

TABLE V. Proportional Analysis of Diatom Genera in Number of Cells per Permanent Hyrax Slide Mount. Numbers of Individuals are Given in Brackets.

NOTES ON NEW AND NOTEWORTHY PLANTS. CIII

Harold N. Moldenke

CLERODENDRUM FLORIBUNDUM var. ANGUSTIFOLIUM Moldenke, var. nov.

Haec varietas a forma typica speciei foliis minoribus laminis anguste ellipticis plerumque ca. 4--7 cm. longis 1--3 cm. latis ad apicem acuminatis ad basin acutis vel subacuminatis recedit.

This variety differs from the typical form of the species in is leaf-blades being narrowly elliptic, mostly ca. 4--7 cm. long and 1--3 cm. wide, acuminate at the apex and acute or subacuminate at the base.

The type of this variety was collected by Cyril Tenison White (no. 8675) at Tarrens Creek, North Queensland, Australia, on March 19, 1933, and is deposited in the B. A. Krukoff Herbarium at the New York Botanical Garden. The collector notes that it is a fairly common shrub in rocky places, the flower white and faintly scented.

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ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXXIII

Harold N. Moldenke

LACHNOCAULON ECILIATUM Small

Additional bibliography: Moldenke, Phytologia 36: 497. 1977.

Additional citations: FLORIDA: Highlands Co.: Brass 14545 (W--2065050). Lake Co.: Biltmore Herb. 15001d (N). Putnam Co.: R. M. Harper 7 (N). Walton Co.: Curtiss 3022 (W--45319--isotype, W--936874--isotype).

LACHNOCAULON EKMANNII Ruhl.

Additional & emended bibliography: León, Fl. Cuba, imp. 1, 1: 284 & 426. 1946; Moldenke, Phytologia 33: 21. 1976.

Additional citations: CUBA: Pinar del Río: Shafer 11011 (W--718184).

LACHNOCAULON ENGLERI Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 21 (1976), 35: 111 (1977), and 36: 29. 1977.

Brass describes this plant as having brown flower-heads or "heads appearing gray (dark brown under a microscope)" and found it "plentiful in crowded tufts on sandy and mucky shores of lake" and "very abundant on damp lake shores, bright-green somewhat fleshy tufts 5--10 cm. tall". It has been collected in flower and fruit in February and April by recent collectors.

A small fragment (two scapes) of this species appearing on the Herb. Chapman s.n. [St. Andrew's Bay] collection, cited below, appears to have been mounted accidentally on a sheet of C. Mohr s.n. [Aug. 18, 1879] from Mobile County, Alabama (which is L. beyrichianum) in the United States National Herbarium. I do not consider the presence of this fragmentary material on the Mohr sheet as evidence of the occurrence of L. engleri in Alabama.

The Brass 14545, distributed as L. engleri, actually is L. eciliatum Small, while O'Neill 7785 is the type collection of L. engleri f. abludens Moldenke, Shafer 11011 is L. ekmannii Ruhl., and Curtiss 5911 is L. minus (Chapm.) Small. O'Neill 7785 & 7785a are mixtures of typical L. engleri and its f. abludens, which obviously grow in close proximity.

Additional citations: FLORIDA: Bay Co.: Herb. Chapman s.n. [St. Andrew's Bay] (W—957074). Highlands Co.: Brass 14660 (W—2065107), 15066 (W—2065323). Lake Co.: Nash 1184 (W—936871—isotype). Martin Co.: R. Kral 18235 (W—2470383), 20386 (W—2470384). Orange Co.: O'Neill s.n. [Lake Ola, July 2, 1929] (W—1488704). Volusia Co.: R. Kral 18426 (W—2470303). Walton Co.: R. Kral 17746 (W—2470437).

LACHNOCAULON ENGLERI f. ABLUDENS Moldenke, Phytologia 35: 111. 1977.

Bibliography: Moldenke, Phytologia 35: 111 (1977) and 36: 29. 1977.

Citations: FLORIDA: Pasco Co.: O'Neill 7785 in part (I—isotype, N—isotype, W—1790170—type).

LACHNOCAULON FLORIDANUM Small

Additional bibliography: Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3 [Bot. Lab. Univ. S. Fla. Contrib. 73:] 38 & 165. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 262 & 944. 1976; Moldenke, Phytologia 35: 14. 1976.

Lakela and her associates (1976) reduce this species to synonymy under L. anceps (Walt.) Morong, but its superficial habital resemblance is much more like L. minus (Chapm.) Small.

Additional citations: FLORIDA: Lake Co.: Nash 1981 (W—252418—isotype).

LACHNOCAULON GLABRUM Körn.

Additional bibliography: Moldenke, Phytologia 29: 287. 1974; Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3 [Bot. Lab. Univ. S. Fla. Contrib. 73:] 38 & 165. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 262 & 944. 1976; Moldenke, Phytologia 36: 57. 1977.

Lakela and her associates (1976) regard this taxon as conspecific with L. anceps (Walt.) Morong, but in this I do not agree.

Material of L. glabrum has been misidentified and distributed in some herbaria as L. anceps (Walt.) Morong. On the other hand, the Garber 37, s.n. [Tampa, Sept. 1877], & s.n. [Levy Co., Nov. 1877], distributed as L. glabrum, actually are Eriocaulon ravenelii Chapm., Mohr s.n. [Aug. 18, 1879] is Lachnocaulon beyrichianum Sporleder, Curtiss 3022 is the type collection of L. eciliatum Small, Nash 1981 is the type collection of L. floridanum Small, and Curtiss 6911 is L. minus (Chapm.) Small. R. Kral 20418 appears to be a mixture of L. glabrum and L. beyrichianum — the collector notes that the two species were growing together.

Additional citations: FLORIDA: Charlotte Co.: R. Kral 18048 (W—2470365). Lee Co.: Francis 60 (W—1036538); Harshberger s.n. [Ft. Myers, June 5th, 1912] (W—692008); A. S. Hitchcock 374 (W—387407); R. Kral 18012 (W—2470339); J. P. Standley 33 (W—569490); P. C. Standley 52589 (W—1308788). Martin Co.: R. Kral 18288 (W—2470366). Saint Lucie Co.: R. Kral 20424 (W—2470296).

LACHNOCAULON MINUS (Chapm.) Small

Additional bibliography: Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3 [Bot. Lab. Univ. S. Fla. Contrib. 73:] 39 & 165. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 260, 262, & 944. 1976; Moldenke, Phytologia 35: 14 (1976) and 36: 29. 1977.

Lakela and her associates (1976) include L. eciliatum Small in the synonymy of L. minus.

Material of L. minus has sometimes been misidentified and distributed in some herbaria as L. anceps (Walt.) Morong and as Syngonanthus flavidulus (Michx.) Ruhl. On the other hand, the Arsène 12142 & 12315, M. A. Chase 3153, and Drushel 10141, distributed as L. minus, actually are L. anceps and House 2685 is L. anceps f. glabrescens Moldenke.

Additional citations: NORTH CAROLINA: Brunswick Co.: Bradley & Stevenson 3306 (W—2499743); Godfrey & Fox 49472 (W—2006817). New Hanover Co.: Godfrey Pl. Exsicc. Gray. 926 (W—1823367). Onslow Co.: J. Kohlmeyer 2034 (Hm); R. Kral 22472 (W—2470439). SOUTH CAROLINA: Georgetown Co.: R. Kral 19018 (W—2470438). GEORGIA: Baker Co.: Thorne 5066 (W—2005959). Lowndes Co.: R. M. Harper 1607 (W—431915). FLORIDA: Bay Co.: R. Kral 15637 (W—2470376). Highlands Co.: Webster 4179 (Mi, W—2067703). Lake Co.: Nash 148 (W—223264, W—936870), 1295 (W—223174), 1855 (W—252419). Leon Co.: Godfrey 62896 (W—2433164); Kral & Godfrey s.n. [15 Aug. 1962] (W—2470385). Madison Co.: Drushel 9642 (W—1688941). Orange Co.: Meislahn 158a (W—511436); Murrill 710 (W—1928530); Wilbur & Webster 2645 (W—2132022). Pasco Co.: O'Neill 7785 in part (W—1790169), 7786 in part (W—1790171). Putnam Co.: Godfrey & Reinert 61106 (W—2385134). Seminole Co.: R. Kral 20457 (W—2470420). Volusia Co.: R. Kral 18427 (W—2470387). Wakulla Co.: E. S. Ford 4644 (W—2230971). Walton Co.: Curtiss 5911 (W—314427); R. Kral 17747 (W—2470386). ALABAMA: Mobile Co.: Mohr s.n. [April 20, 1868] (W--784499).

LEIOTHRIX Ruhl.

Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 37 & [69]. 1975; Follmann-Schrag, Excerpt. Bot. A.26: 513. 1976; Moldenke & Sm. in Reitz, Fl. Ilus. Catar. I Erio: 5, 62, 63, 72--75, 94, 98, & 100--102, pl. 8, fig. 20--26. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23]--27, fig. 1 & 8, & [105]--111, fig. 1--16. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61]--72, fig. 3--15. 1976; Moldenke, Phytologia 35: 15--16, 124, & 129 (1976), 35: 310, 333, 347, 424, 427, 432, & 509 (1977), and 36: 34, 49, & 74. 1977.

LEIOTHRIX ANGUSTIFOLIA (Körn.) Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 95. 1972.

Davidse and his associates found this plant growing "on [a] cliff among mosses in spray of waterfall", at 850 m. altitude, flowering and fruiting in April.

Additional citations: BRAZIL: Bahia: Davidse, Ramamoorthy, & Vital 11954 (Z).

LEIOTHRIX ARECHAVALETAE (Körn.) Ruhl.

Additional bibliography: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23], 24, & 27. 1976; Moldenke, Phytologia 35: 15 (1976) and 35: 427. 1977.

Monteiro-Scanavacca and her associates (1976) report that there is no vegetative reproduction from the apex of the inflorescence in this species and cite Herter 95663.

LEIOTHRIX ARGYRODERMA var. BREVIPES Moldenke

Additional bibliography: Moldenke, Phytologia 29: 288. 1974.

Castellanos encountered this plant at 2350 m. altitude, in flower and fruit in December.

Additional citations: BRAZIL: Rio de Janeiro: A. Castellanos 25664 [Herb. FEEMA 4346] (Z).

LEIOTHRIX ARRECTA Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 96--97. 1972; Cárdenas de Guevara, Act. Bot. Venez. 10: 37. 1975.

LEIOTHRIX CURVIFOLIA (Bong.) Ruhl.

Additional bibliography: Monteiro-Scanavacca & Mazzoni, Bol. Mus. Univ. S. Paulo 4: 23, 24, 26, & 27, fig. 8. 1976; Moldenke, Phytologia 35: 15 (1976) and 35: 333 & 347. 1977.

Additional illustrations: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 26, fig 8. 1976.

Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the apex of the inflorescence in this species and cite Monteiro-Scanavacca 4892 from Minas Gerais, Brazil.

LEIOTHRIX CURVIFOLIA var. MICROPHYLLA Alv. Silv.
Additional bibliography: Moldenke, Phytologia 35: 15. 1976.
Eiten & Eiten 11012 is a mixture of this variety and Paepalanthus archeri Moldenke. It was collected in a natural open rocky campo at 1250 m. altitude, flowering and fruiting in March.
Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 11012 in part (W--2799677).

LEIOTHRIX CURVIFOLIA var. PLANTAGO (Mart.) Ruhl.
Additional synonymy: Leiothrix plantago Monteiro-Scanavacca, Mazzoni, & Giulietta, Bol. Bot. Univ. S. Paulo 4: [61], 62, & 66. 1976.
Additional bibliography: Moldenke, Phytologia 29: 288. 1974; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61], 62, 66, & 67, fig. 3. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]. 1976; Moldenke, Phytologia 35: 333. 1977.
Illustrations: Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 67, fig. 3. 1976.
Monteiro-Scanavacca and her associates (1976) report that there is vegetative reproduction from the apex of the inflorescence in this variety complete with leaves, stem, and adventitious roots. They cite Semir 4132 from Minas Gerais, Brazil.

LEIOTHRIX CUSCUTOIDES Alv. Silv.
Additional bibliography: Moldenke, Phytologia 33: 22. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61], 62, 66, & 67, fig. 4 & 5. 1976.
Additional illustrations: Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. S. Paulo 4: 67, fig. 4 & 5. 1976.
Monteiro-Scanavacca and her associates (1976) assert that this species often reproduces vegetatively from the apex of the inflorescence, forming complete plants with leaves, stem, and adventitious roots, citing Giulietti 4919 from Minas Gerais, Brazil.

LEIOTHRIX DIELSII Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 15 & 129 (1976) and 36: 74. 1977.
Strang found this plant growing in wet turf, flowering in August.
Additional citations: BRAZIL: Guanabara: Strang 677 [Herb. FEEMA 5041] (Ld).

LEIOTHRIX ECHINOCEPHALA Ruhl.
Additional bibliography: Moldenke, Phytologia 26: 44 (1973) and 33: 198. 1976.

LEIOTHRIX FLAVESCENS (Bong.) Ruhl.
Additional synonymy: Leiothrix flavecens (Bong.) Ruhl. apud Cárdenas de Guevara, Act. Bot. Venez. 10: 37, sphalm. 1975. Eriocaulon

elongatum "St. Hil. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 99, in syn. 1976. Paepalanthus brevifolius "Körn. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 100, in syn. 1976. Paepalanthus elongatus "Mart. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 101, in syn. 1976. Paepalanthus falcatus "Mart. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 101, in syn. 1976. Paepalanthus petrophilus "Mart. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, in syn. 1976. Paepalanthus xyrioides "Mart. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, in syn. 1976. Paepalanthus xyridoides var. brevifolius "Mart. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, in syn. 1976. Paepalanthus xyrioides var. brevifolius "Schreb. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, in syn. 1976. Paepalanthus xyrioides "St. Hil. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, in syn. 1976. Euriocaulon falcatum Mart. ex Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 73, sphalm. 1976.

Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 37. 1975; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 62, 63, 73--75, & 98--102, pl. 8, fig. 20--26. 1976; Moldenke, Phytologia 33: 22 (1976) and 35: 424 & 427. 1977.

Additional illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 63, pl. 8, fig. 20--26. 1976.

Dombrowski reports this plant "frequente em banhado", flowering and fruiting in December. Castellanos encountered it in brejo (sedge meadow) and refers to the flower-heads as "white". Vernacular names reported for the species are "capim-manso", "capipoatinga-amarela", "gravatá-manso", and "sempre-viva-do-campo". In southern Brazil is period of anthesis is said to be December and January.

Additional citations: BRAZIL: Minas Gerais: A. Castellanos 24182 (Pf); Monteiro de S. s.n. [19.XII.1971] (Ld). Paraná: Dombrowski 6763 (Ld); Hatschbach 35772 (Ac).

LEIOTHRIX FLAVESCENS var. ALPINA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 131 (1973) and 29: 388. 1974.

LEIOTHRIX FLUITANS (Mart.) Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 289. 1974; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]-111, fig. 1--16. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61], 68, & 69, fig. 8--11. 1976.

Additional illustrations: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 109--111, fig. 1--16. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 69, fig. 8--11. 1976.

Monteiro-Scanavacca and her associates (1976) have studied the inflorescence apex of this species in detail and report that it shows vegetative reproduction by means of sprouting originated by the meristematic cells of the axis of the mature inflorescence after the production of all the flowers; tunica-corpus organization is present in both immature and mature meristems. The reproduction results in complete plantlets with leaves, stems, and adventitious roots. They cite Semir 4082 from Minas Gerais, Brazil.

LEIOTHRIX FULGIDA Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 16 (1976) and 36: 74. 1977.

LEIOTHRIX GRAMINEA (Bong.) Ruhl.
Additional bibliography: Moldenke, Phytologia 25: 132 (1973), 29: 390 (1974), and 35: 124. 1976.

LEIOTHRIX HIRSUTA (Wikstr.) Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 16. 1976.
Recent collectors have encountered this plant on sandy river margins and in colonies with Xyris "em alagando, porte areto, acinzentado, capítulos jovens amarelados", flowering in July, and both flowering and fruiting in January and October.
Additional citations: BRAZIL: Bahia: Hatschbach 39704 (Ld). Guanabara: Castellanos & Strang 10 [Herb. FEEMQ 4678] (Ld), s.n. [Herb. Cent. Pesq. Florest. 6647] (Fe); Lanna Sobrinho 1577 [Herb. FEEMA 5743] (Ld).

LEIOTHRIX LUXURIANS (Körn.) Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 16. 1976.
The Eitens have encountered this plant in "natural open rocky campo, campo rupestre vegetation", at 1250 m. altitude, in fruit in March, and distributed it as Paepalanthus sp.
Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 11022 (W--2799681).

LEIOTHRIX MUCRONATA (Bong.) Ruhl.
Additional bibliography: Moldenke, Phytologia 29: 291 (1974) and 33: 136. 1976.

LEIOTHRIX NUBIGENA (Kunth) Ruhl.
Additional bibliography: Moldenke, Phytologia 29: 291. 1974; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 72 & 100. 1976.
This species has been designated the official lectotype of the genus.

LEIOTHRIX PROPINQUA (Körn.) Ruhl.
Additional bibliography: Moldenke, Phytologia 25: 135. 1973; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61]--64, 70, & 71, fig. 15. 1976.

Additional illustrations: Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 71, fig. 15. 1976.

Monteiro-Scanavacca and her associates (1976) assert that this species reproduces vegetatively from the apex of the inflorescence with complete plantlets being formed, each with leaves, stem, and adventitious roots. They cite Giulietti 5400 from Minas Gerais, Brazil.

LEIOTHRIX RUFULA (A. St.-Hil.) Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 24 (1976) and 36: 34 & 49. 1977.

LEIOTHRIX RUFULA var. BREVIPES Moldenke, Phytologia 36: 49. 1977.

Bibliography: Moldenke, Phytologia 36: 34 & 49. 1977.

Citations: BRAZIL: Rio de Janeiro: A. Castellanos 25666 [Herb. FEEMA 4341] (Z—type).

LEIOTHRIX SCHLECHTENDALII (Körn.) Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 136. 1973.

Hatschbach encountered this plant in "solo arenoso junta afloramentos de arenito" and "topo de morro no solo arenoso da matinha da encosta do morro", flowering and fruiting in January.

Additional citations: BRAZIL: Bahia: Hatschbach 39614 (Ld), 39694 (Z).

LEIOTHRIX SCLEROPHYLLA Alv. Silv.

Additional bibliography: Moldenke, Phytologia 33: 24. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23]--27, fig. 1. 1976.

Illustrations: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 24, fig. 1. 1976.

Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the apex of the inflorescence in this species. They cite Monteiro-Scanavacca 4895 from Minas Gerais, Brazil.

LEIOTHRIX SPIRALIS (Bong.) Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 137 (1973) and 29: 390. 1974.

LEIOTHRIX TURBINATA Gleason

Additional bibliography: Moldenke, Phytologia 26: 186. 1973; Cárdenas de Guevara, Act. Bot. Venez. 10: 37. 1975.

LEIOTHRIX UMBRATILIS Moldenke

Additional bibliography: Moldenke, Phytologia 25: 137—138 (1973), 32: 47 (1975), and 34: 256. 1976.

LEIOTHRIX UMBRATILIS var. BREVIPES Moldenke

Additional bibliography: Moldenke, Phytologia 33: 24 (1976) and 34: 256. 1976.

LEIOTHRIX VIVIPARA (Bong.) Ruhl.

Additional bibliography: Moldenke, Phytologia 35: 16. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]. 1976; Monteuro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61], 62, 70, & 71, fig. 12—14. 1976.

Additional illustrations: Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 71, fig. 12—14. 1976.

Monteiro-Scanavacca and her associates (1976) report that this species reproduces vegetatively from the apex of the inflorescence, producing complete plantlets with leaves, stem, and adventitious roots. They cite Monteiro-Scanavacca 4901 from Minas Gerais, Brazil.

MESANTHEMUM Körn.

Additional bibliography: Engl., Syllab. Pflanzenfam., ed. 3, 92 (1903), ed. 5, 94 (1907), and ed. 6, 99. 1909; Gilg in Engl., Syllab. Pflanzenfam., ed. 7, 138 (1912), ed. 8, 140 (1919), and ed. 9 & 10, 152. 1924; Diels in Engl., Syllab. Pflanzenfam., ed. 11, 154. 1936; Follmann-Schrag, Excerpt. Bot. A.26: 512. 1976; Moldenke, Phytologia 35: 16—17 (1976), 35: 303, 308, 421, 422, & 510 (1977), and 36: 470 & 507. 1977.

MESANTHEMUM BENNAE Jacques-Félix

Additional bibliography: Moldenke, Phytologia 25: 139 & 140. 1973.

MESANTHEMUM PRESCOTTIANUM (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 35: 17 (1976) and 35: 303. 1977.

MESANTHEMUM RADICANS (Benth.) Körn.

Additional bibliography: Moldenke, Phytologia 35: 17 (1976), 35: 421 & 422 (1977), and 36: 470. 1977.

In a letter to me from Robert Wingfield, dated April 19, 1977, he lists as representing this species on Mafia island: Batty 1443 (at "DSM" and in the East African Herbarium at Nairobi) and Greenway 5393 (at Kew and in the East African Herbarium), the latter described by Greenway in 1938 as "not quite typical of the species".

Material of M. radicans has been misidentified and distributed in some herbaria as Eriocaulon sp.

Additional citations: LIBERIA: J. Kohlmeyer 2358 [Herb. Hamann 1243] (Hm).

MESANTHEMUM RUTENBERGIANUM Körn.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89 & 90. 1975; Moldenke, Phytologia 35: 17. 1976.

MOLDENKEANTHUS P. Morat

Additional bibliography: Moldenke, Phytologia 35: 17—18 (1976) and 35: 510. 1977.

PAEPALANTHUS Mart.

Additional synonymy: Dupatia Griseb. ex Moldenke, Phytologia 36: 42, in syn. 1977.

Additional & emended bibliography: Sweet, Hort. Brit., ed. 2, 597 (1830) and ed. 3, 719. 1839; Engl., Syllab. Pflanzenfam., ed. 2, 86 (1898), ed. 3, 92 (1903), ed. 5, 94 (1907), and ed. 6, 99. 1909; Gilg in Engl., Syllab. Pflanzenfam., ed. 7, 136 & 139, fig. 140 (1912) and ed. 8, 140 & 141, fig. 140. 1919; Fedde in Just, Bot. Jahresber. 45 (1): 517 & 549. 1923; Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 20. 1923; Gilg in Engl., Syllab. Pflanzenfam., ed. 9 & 10, 152, fig. 144. 1924; Diels in Engl., Syllab. Pflanzenfam.. ed. 11, 154 & 155, fig. 158. 1936; León, Fl. Cuba, imp. 1, 1: 279, 281--283, & 428, fig. 113. 1946; Cárdenas de Guevara, Act. Bot. Venez. 10: 36--38 & [69]. 1976; Anon, Biol. Abstr. 61: AC1.667. 1976; Follmann-Schrag, Excerpt. Bot. A.26: 513. 1976; Hocking, Excerpt. Bot. A.28: 259. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 4, 41--73, 89, 84, & 98--102, pl. 6--8. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23]--27, fig. 3--7, & [105]. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61], 62, 66, & 67, fig. 1 & 2. 1976; Moldenke, Phytologia 34: 485 (1976), 35: 14 & 18--36 (1976), 35: 111--131, 252--264, 277--285, 288--291, 293, 295, 304, 305, 308--310, 312, 315, 317, 318, 321, 332, 333, 336, 338--340, 346, 347, 350, 354, 359, 421--423, 425--427, 429, 431, 432, 436, 440--445, 447, 448, 451--455, 457, 508, & 510 (1977), and 36: 30--32, 35, 40, 42, 45, 49--51, 56, 65, 68, 69, 72--76, 78--82, 84, 85, 482, 504, & 508. 1977.

The Eiten & Eiten 11022, distributed as Paepalanthus sp., actually is Leiothrix luxurians (Körn.) Ruhl., while Bogner 1166 is Eriocaulon majusculum Ruhl.

PAEPALANTHUS ACANTHOPHYLLUS Ruhl.

Additional bibliography: Moldenke, Phytologia 35: 18 (1976) and 35: 258 & 284. 1977.

PAEPALANTHUS ACUMINATUS Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 144--145 (1973) and 30: 122. 1975.

PAEPALANTHUS ACUTALIS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 187 & 200. 1973.

PAEPALANTHUS ACUTIPILUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 29: 294 (1974) and 35: 252. 1977.

PAEPALANTHUS AEQUALIS (Vell.) J. F. Macbr.

Additional bibliography: Moldenke, Phytologia 33: 28 (1976) and 35: 255. 1977.

PAEPALANTHUS ALBO-TOMENTOSUS Herzog

Additional bibliography: Moldenke, Phytologia 29: 295 (1974) and 30: 31. 1974.

Davidse and his associates have encountered this plant on sandy soil in low scrub forest, at 910 m. altitude, and describes the flowers as "white" in April.

Additional citations: BRAZIL: Bahia: Davidse, Ramamoorthy, & Vital 11860 (Z).

PAEPALANTHUS ALBO-VAGINATUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 35: 18--19. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 62--65, & 100, pl. 8, fig. 1--7. 1976.

Additional illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 63, pl. 8, fig. 1--7. 1976.

Dombrowski asserts that this species is rather frequent in wet swamps. Vernacular names recorded for it are the usual "capim-manso", "capipoatinga", "gravatá-manso", and "sempre-viva-do-campo".

Additional citations: BRAZIL: Paraná: Dombrowski 6452 (Ld), 6624 (Ld).

PAEPALANTHUS ALBO-VILLOSUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 187 (1973) and 35: 130 & 451. 1977.

PAEPALANTHUS ALPINUS Körn.

Additional bibliography: Moldenke, Phytologia 33: 28. 1976.

The Cuatrecasas 28252, distributed as P. alpinus, actually represents P. columbiensis Ruhl.

Additional citations: COLOMBIA: Department undetermined: Schwabe s.n. [II.1973] (Hm).

PAEPALANTHUS ALSINOIDES C. Wright

Additional & emended bibliography: Fedde & Schust in Just, Bot. Jahresber. 45 (1): 20. 1923; León, Fl. Cuba, imp. 1, 1: 283 & 428. 1946; Moldenke, Phytologia 35: 19 & 28 (1976) and 36: 42 & 45. 1977.

PAEPALANTHUS ALSINOIDES var. MINIMUS Jennings

Additional & emended bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 20. 1923; León, Fl. Cuba, imp. 1, 1: 283 & 428. 1946; Moldenke, Phytologia 35: 19. 1976.

PAEPALANTHUS AMOENUS (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 35: 19 (1976) and 35: 258, 261, & 284. 1977.

PAEPALANTHUS APPLANATUS Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 296 (1974), 30: 120 (1975), and 33: 191 & 192. 1976.

PAEPALANTHUS ARCHERI Moldenke
Additional bibliography: Moldenke, Phytologia 25: 148. 1973.
The Eitens have found this plant growing in a natural open rocky campo with "campo rupestre" vegetation, at 120 m. altitude, in saturated soil, flowering in March. Their no. 11012 is a mixture with Leiothrix curvifolia var. microphylla Alv. Silv.
Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 11012 in part (W--2799677).

PAEPALANTHUS ARETIOIDES Ruhl.
Additional bibliography: Moldenke, Phytologia 25: 148 (1973), 29: 485 (1974), and 33: 150. 1976.

PAEPALANTHUS ARGILLICOLA Alv. Silv.
Additional bibliography: Moldenke, Phytologia 35: 20 (1976) and 36: 35. 1977.

PAEPALANTHUS ARGYROLINON Körn.
Additional bibliography: Moldenke, Phytologia 25: 149 (1973) and 26: 230. 1973.

PAEPALANTHUS BABYLONIENSIS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 26: 136 (1973) and 35: 252. 1977.

PAEPALANTHUS BAHIENSIS (Bong.) Kunth
Additional bibliography: Moldenke, Phytologia 29: 297 (1974) and 35: 333. 1977.

PAEPALANTHUS BALANSAE Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 30 & 142. 1976.

PAEPALANTHUS BARBIGER Alv. Silv.
Additional bibliography: Moldenke, phytologia 33: 31. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23], 24, & 26. 1976.
Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the inflorescence apex in this species, citing Monteiro-Scanavacca 4893 from Minas Gerais, Brazil.

PAEPALANTHUS BARBULATUS Herzog
Additional bibliography: Moldenke, Phytologia 33: 31 (1976) and 35: 257. 1977.

PAEPALANTHUS BARREIRENSIS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 26: 136 (1973) and 29: 485. 1974.

PAEPALANTHUS BIFIDUS (Schrad.) Kunth.
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez.

10: 36 & 37. 1975; Moldenke, Phytologia 35: 20 (1976), 35: 346, 347, 359, & 457 (1977), and 36: 56. 1977.

The Lasseign 21169 collection, cited below, is a mixture with P. fasciculatus f. sphaerocephalus Herzog.

Additional citations: FRENCH GUIANA: Aubréville 226 (W--2546896). BRAZIL: Amazônas: Lasseign 21169 in part (N); Prance & Lleras 23719 (Ld, N).

PAEPALANTHUS BIFIDUS f. FRUSTUS Moldenke

Additional bibliography: Moldenke, Phytologia 29: 298--299 (1974) and 31: 382, 397, 398, & 404. 1975.

PAEPALANTHUS BIFRONS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 35: 21 (1976) and 35: 284. 1977.

PAEPALANTHUS BLEPHAROPHORUS (Bong.) Kunth

Additional bibliography: Moldenke, Phytologia 29: 300 & 484 (1974) and 30: 49 & 342. 1975.

PAEPALANTHUS BOMBACINUS Alv. Silv.

Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 37. 1975; Moldenke, Phytologia 35: 21. 1976.

PAEPALANTHUS BONGARDI Kunth

Additional bibliography: Moldenke, Phytologia 33: 32, 35, 41, & 275. 1976.

PAEPALANTHUS BRACHYPHYLLUS Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 153--154 (1973) and 30: 83. 1975.

PAEPALANTHUS BRACHYPUS (Bong.) Kunth

Additional bibliography: Moldenke, Phytologia 29: 300 & 492 (1974) and 35: 333. 1977.

PAEPALANTHUS BRASILIENSIS (Mart.) Mart.

Additional bibliography: Moldenke, Phytologia 29: 300 (1974), 30: 274 (1975), 33: 131 & 191 (1976), and 35: 284. 1977.

PAEPALANTHUS BRITTONI Moldenke

Additional & emended bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 20. 1923; León, Fl. Cuba, imp. 1, 1: 282, 283, & 428, fig. 113. 1946; Moldenke, Phytologia 35: 21 & 30. 1976.

Emended illustrations: León, Fl. Cuba, imp. 1, 1: 282, fig. 113. 1946.

PAEPALANTHUS BROMELIOIDES Alv. Silv.

Additional bibliography: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23], 24, & 26, fig. 5 & 7. 1976; Moldenke, Phytologia 33: 32 & 130 (1976) and 35: 263. 1977.

Additional illustrations: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 26, fig. 5 & 6. 1976.

The Eitens report finding this plant forming "acaulescent clumps" with white flower-heads, along roadsides through a natural rocky campo with "campo rupestre" vegetation, at 1000 m. altitude, flowering in March. Their material was misidentified and distributed as P. vellozioides Körn.

Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the inflorescence apex in this species, citing Monteiro-Scanavacca 4902 from Minas Gerais, Brazil.

Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 10922 (W--2799675, W--2799676).

PAEPALANTHUS BRUNNESCENS Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 158 (1973) and 33: 133. 1976.

PAEPALANTHUS BRUNNEUS Moldenke

Additional bibliography: Moldenke, Phytologia 29: 301. 1974.

Hamann found this plant growing in association with Thurnia sphaerocephala, flowering and fruiting in January.

Additional citations: VENEZUELA: Bolívar: Hamann 2897 (Hm), 2898 (Hm).

PAEPALANTHUS BRYOIDES (Riedel) Kunth

Additional synonymy: Paepalanthus bryoides "(Riedel ex Bong.) Kunth" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 55. 1976.

Additional bibliography: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 44, 55--56, 98, & 101, pl. 6, fig. 26--30. 1976; Moldenke, Phytologia 35: 21 (1976) and 35: 263 & 289. 1977.

Additional illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 44, pl. 6, fig. 26--30. 1976.

Vernacular names recorded for this species are the usual "capim-manso", "capipoatinga-de-musgo", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower in Santa Catarina from November to March.

PAEPALANTHUS BULBOSUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 138 (1973) and 29: 491. 1974.

PAEPALANTHUS CABRALENSIS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 138 & 249 (1973) and 33: 272. 1976.

PAEPALANTHUS CACHAMBUENSIS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 138 (1973) and 29: 390. 1974.

PAEPALANTHUS CACUMINIS Ruhl.
Additional bibliography: Moldenke, Phytologia 25: 162--163 (1973), 30: 111 (1975), and 35: 263 & 279. 1977.

PAEPALANTHUS CAESPITITIUS Mart.
Additional bibliography: Moldenke, Phytologia 29: 301 (1974) and 33: 51. 1976.

PAEPALANTHUS CALDENSIS Malme
Additional synonymy: Paepalanthus dusenii "Ruhl. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 101, in syn. 1976. Paepalanthus tortilis var. albidus "Ruhl. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, in syn. 1976.
Additional bibliography: Moldenke, Phytologia 35: 21. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 44, 51—54, 101, & 102, pl. 6, fig. 21--25. 1976.
Additional illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 44, pl. 6, fig. 21—25. 1976.
Vernacular names recorded for this species are "capim-manso", "capipoatinga-de-caldas", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower from October to April, but predominantly in December and January.
Additional citations: BRAZIL: Santa Catarina: Smith, Klein, & Hatschbach 15695 (W—2653315).

PAEPALANTHUS CALVUS Körn.
Additional bibliography: Moldenke, Phytologia 33: 33 (1976) and 35: 130. 1977.

PAEPALANTHUS CAMPTOPHYLLUS Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 33 (1976) and 35: 252. 1977.

PAEPALANTHUS CAPANEMAE Alv. Silv.
Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 20. 1923; Moldenke, Phytologia 35: 22. 1976.
Additional citations: BRAZIL: Goiás: Hatschbach, Anderson, Barneby, & Gates 36337 (N); Irwin, Grear, Souza, & Reis dos Santos 12614 (N).

PAEPALANTHUS CAPAROËNSIS Ruhl.
Additional bibliography: Moldenke, Phytologia 26: 147 (1973) and 29: 484. 1974.

PAEPALANTHUS CAPILLACEUS Klotzsch
Additional bibliography: Moldenke, Phytologia 33: 34. 1976.
Tillett and his associates refer to this plant as "dominant on sandstone in flowing water of river in large beds, the shorter plants from drier, more exposed positions, leaves lustrous, medium to light slightly olive-green, peduncles white, phyllaries

dark-brown, flowers white" and found it in flower in January and February.

Additional citations: VENEZUELA: Amazonas: Tillett, Ferrigni, & Zorrilla F. 751-82 (N).

PAEPALANTHUS CAPILLACEUS var. PROLIFERUS Gleason

Additional bibliography: Moldenke, Phytologia 33: 34. 1976.

Murça Pires encountered this plant in flower and fruit in February.

Additional citations: BRAZIL: Amazônas: Murça Pires 100 [Herb. IPEAN 15080] (Ld).

PAEPALANTHUS CAPILLARIS (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 26: 190--191 (1973) and 30: 325. 1975.

PAEPALANTHUS CAPILLIFOLIUS Moldenke

Additional synonymy: Paepalanthus filifolius Moldenke, Phytologis 36: 45, in syn. 1977.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 259. 1976; Moldenke, Phytologia 33: 34 (1976), 34: 277 (1976), and 36: 35 & 45. 1977.

Additional citations: BRAZIL: Minas Gerais: Hatschbach, Anderson, Barneby, & Gates 36456 (N--isotype).

PAEPALANTHUS CAPITO Körn.

Additional bibliography: Moldenke, Phytologia 29: 303--304 (1974), 31: 404 (1975), and 33: 134. 1976.

The Anderson, Stieber, & Kirkbride "3556" cited by me in a previous installment of these notes is a typographic error for no. 35568.

PAEPALANTHUS CARDONAE Moldenke

Additional bibliography: Moldenke, Phytologia 29: 304 (1974) and 35: 120. 1977.

PAEPALANTHUS CATHARINAE Ruhl.

Additional synonymy: Paepalanthus catharinae var. catharinae [Ruhl.] apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 46. 1976.

Additional bibliography: Moldenke, Phytologia 35: 22. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 44--49, & 101, pl. 6, fig. 6--13. 1976.

Illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 44, pl. 6, fig. 6--13. 1976.

Vernacular names recorded for this species are "capim-manso", "capipoatinga-catarinense", "gravatá-manso", and "sempre-viva-do-campo" and it is said to bloom from September to February in Santa Catarina.

PAEPALANTHUS CATHARINAE var. HATSCHBACHI (Moldenke) Moldenke & Smith

Additional synonymy: Paepalanthus catharinae var. hatschbachii (Moldenke) Moldenke apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 48, sphalm. 1976.

Additional bibliography: Moldenke, Phytologia 29: 304. 1974; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 45, 48—49, & 101. 1976.

Vernacular names recorded for this plant are "capim-manso", "capipoatinga-de-hatschbach", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower from October to February in Santa Catarina.

PAEPALANTHUS CEARAENSIS Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 304 (1974), 30: 35 & 37 (1975), and 35: 281. 1977.

PAEPALANTHUS CHIQUITENSIS Herzog

Additional bibliography: Moldenke, Phytologia 33: 34—35, 190, & 192 (1976) and 35: 117. 1976.

Cárdenas describes this plant as 60 cm. tall, with white flowers, and encountered it at the edge of an arroyo, at 900 m. altitude, flowering in May.

Additional citations: BOLIVIA: Chiquitos: M. Cárdenas 6255 (N).

PAEPALANTHUS CHRYSOLEPIS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 200 (1973) and 33: 152. 1976.

PAEPALANTHUS CHRYSOPHORUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 33: 32, 35, & 41 (1976) and 35: 252. 1977.

PAEPALANTHUS CILIATUS (Bong.) Kunth

Additional bibliography: Moldenke, Phytologia 29: 305 (1974), 30: 274 & 275 (1975), 33: 131, 151, & 191 (1976), 35: 284 & 333 (1977), and 36: 35. 1977.

Martins has encountered this plant in sandy soil, flowering in September.

Additional citations: BRAZIL: Guanabara: Martins 405 [Herb. FEEMA 6326] (Z).

PAEPALANTHUS CIPOENSIS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 228. 1973.

The Eitens have found this plant growing on a natural open rocky campo with "campo rupestre" vegetation, at 1250 m. altitude, flowering and fruiting in March.

Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 11030 (W—2799678).

PAEPALANTHUS CLAUSSENIANUS Körn.
Additional bibliography: Moldenke, Phytologia 35: 22 (1976) and 35: 284. 1977.

PAEPALANTHUS COLOIDES Ruhl.
Additional bibliography: Moldenke, Phytologia 26: 230--231 (1973), 29: 312 (1974), and 35: 422. 1977.

PAEPALANTHUS COLUMBIENSIS Ruhl.
Additional bibliography: Moldenke, Phytologia 30: 22 (1976) and 36: 45. 1977.
Cuatrecasas describes this species as "acaulirossula, hoja crassa, verde clara, flores blancas" and found it in fruit in November. Luteyn and his associates encountered it "in páramo vegetation with Espeletia and Puya", at 3260 m. altitude, flowering in January.
Additional citations: COLOMBIA: Cundinamarca: Cuatrecasas 28252 (W--2581339A, W--2581340A); Luteyn, Dumont, & Lebrón-Luteyn 4720 (N).

PAEPALANTHUS COMANS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 33: 36 (1976) and 35: 283. 1977.
The Eitens have encountered this apecies in natural open rocky campos with "campo rupestre" vegetation, at 1250 m. altitude, flowering and fruiting in March. Material has been misidentified and distributed in some herbaria as P. mirabilis Alv. Silv.
Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 11027 (W--2799680).

PAEPALANTHUS CONDUPLICATUS Körn.
Additional bibliography: Moldenke, Phytologia 29: 306 (1974) and 30: 258. 1975.

PAEPALANTHUS CONVEXUS Gleason
Additional bibliography: Moldenke, Phytologia 26: 237 (1973), 29: 483 (1974), and 35: 277. 1977.

PAEPALANTHUS CONVEXUS var. STRIGOSUS Moldenke, Phytologia 35: 277. 1977.
Bibliography: Moldenke, Phytologia 35: 277. 1977.
Citations: BRAZIL: Amazônas: Murça Pires 21 [Herb. IPEAN 14998] (Z--type).

PAEPALANTHUS CORDATUS Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 36--37 & 191 (1976) and 35: 258. 1977.

PAEPALANTHUS CORYMBOIDES Ruhl.
Additional bibliography: Moldenke, Phytologia 26: 239 (1973), 30: 110 (1975), and 35: 279. 1977.

PAEPALANTHUS CORYMBOSUS (Bong.) Kunth
Additional bibliography: Moldenke, Phytologia 29: 301 & 306 (1974), 30: 40, 78, & 111 (1975), and 33: 48, 130, & 201. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 99. 1976; Moldenke, Phytologia 35: 263 & 279. 1977.

PAEPALANTHUS COSTARICENSIS Moldenke
Additional bibliography: Moldenke, Phytologia 35: 23 & 24 (1976) and 36: 30. 1977.
Additional citations: COSTA RICA: Province undetermined: Horlich s.n. [Bogner 1138] (Mu).

PAEPALANTHUS CRASSICAULIS Körn.
Additional bibliography: Moldenke, Phytologia 33: 37. 1976.
López & Sagástegui have encountered this plant on escarpment slopes, a rather typical habitat.
Additional citations: PERU: Amazonas: Hegewald s.n. [Herb. Hamann 3014] (Hm). Cajamarca: López & Sagástegui 5347 (Ld).

PAEPALANTHUS CRATERIFORMIS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 33: 37. 1976.
Additional citations: BRAZIL: Goiás: Hatschbach, Anderson, Barneby, & Gates 36349 (N).

PAEPALANTHUS CRISTATUS Moldenke
Additional bibliography: Moldenke, Phytologia 33: 37 & 273 (1976) and 35: 304. 1977.

PAEPALANTHUS CRYOCEPHALUS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 33: 37--38 (1976) and 35: 117. 1977.

PAEPALANTHUS CUMBRICOLA Moldenke
Additional bibliography: Moldenke, Phytologia 33: 38 (1976) and 35: 304. 1977.

PAEPALANTHUS DENSIFOLIUS Alv. Silv.
Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 20. 1923; Moldenke, Phytologia 33: 38 (1976) and 35: 34. 1976.

PAEPALANTHUS DENUDATUS Körn.
Additional bibliography: Moldenke, Phytologia 26: 249—250 (1973), 29: 314 (1974), 30: 99 (1975), and 33: 131 & 191. 1976.

PAEPALANTHUS DIANTHOIDES Mart.
Additional bibliography: Moldenke, Phytologia 26: 251—252 (1973) and 30: 125. 1975.

PAEPALANTHUS DICHOTOMUS Klotzsch
Additional bibliography: Moldenke, Phytologia 29: 307, 483, &

488. 1974.

PAEPALANTHUS DIFFISSUS Moldenke
Additional bibliography: Moldenke, Phytologia 30: 73 (1975) and 31: 382. 1975.

PAEPALANTHUS DIFFUSUS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 26: 254--255 (1973) and 30: 329. 1975.

PAEPALANTHUS DIPLOBETOR Ruhl.
Additional bibliography: Moldenke, Phytologia 26: 255--256 (1973) and 35: 283. 1977.

PAEPALANTHUS DUBIUS Körn.
Additional bibliography: Moldenke, Phytologia 29: 308 (1974) and 30: 39 & 60. 1975.

PAEPALANTHUS DUIDAE Gleason
Additional bibliography: Moldenke, Phytologia 29: 308 (1974) and 31: 404. 1975.

PAEPALANTHUS ELATUS (Bong.) Körn.
Additional bibliography: Moldenke, Phytologia 26: 471--473 (1973) and 30: 60. 1975.

PAEPALANTHUS ELONGATULUS Ruhl.
Additional bibliography: Moldenke, Phytologia 26: 473 (1973) and 35: 255. 1977.

PAEPALANTHUS ELONGATUS (Bong.) Körn.
Additional bibliography: Moldenke, Phytologia 35: 23--24 (1976), 35: 451 (1977), and 36: 35. 1977.

PAEPALANTHUS ELONGATUS var. ANGUSTIFOLIUS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 33: 39. 1976.
Additional citations: BRAZIL: Goiás: Hatschbach, Anderson, Barneby, & Gates 36394 (N).

PAEPALANTHUS ELONGATUS f. GRAMINIFOLIUS Herzog
Additional bibliography: Moldenke, Phytologia 35: 24 (1976), 35: 451 (1977), and 36: 35. 1977.
Monteiro has encountered this plant on quartzite, at 1400--1440 m. altitude, and describes it as having "flores muito brancas, lanosas, sépalos castanhos con franjas brancas, concavas; folhas pilosas, base de folhas lanosa, pedúnculo floral muito longo e piloso".
Additional citations: BRAZIL: Minas Gerais: Monteiro S. 230 [Vianna 391; Herb. Dept. Conserv. Ambient. 8080] (Z), s.n. [Herb. Centro. Pesq. Florest. 7670] (Fe).

PAEPALANTHUS ENSIFOLIUS (H.B.K.) Kunth

Additional bibliography: Moldenke, Phytologia 35: 23 & 24. 1976.

Holm-Nielsen and his associates have encountered this plant "in humid scrub between dry scrub" in regions of "dry low scrub vegetation, more humid in small hollows and valleys", dominant in areas of dry scrub 1—3 m. tall which are very wet in spring, and on humid grass slopes, at altitudes of 2725—2950 m., flowering and fruiting in April and May. López-Palacios found it in wet soil at 2900 m. altitude, flowering in December.

Additional citations: ECUADOR: Azuay: Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 4800 (N), 5071 (N). Loja: Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 3664 (N); López-Palacios 4151 (Ld).

PAEPALANTHUS ERECTIFOLIUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 35: 24 (1976) and 36: 35. 1977.

Ribeiro refers to the inflorescence-heads of this species as white when fresh, but they certainly blacken very conspicuously in drying! He encountered it in sandy soil on "campo cerrado". Material has been misidentified and distributed in some herbaria as P. claussenianus Körn., a very similar species whose inflorescence-heads apparently do not blacken in drying.

Additional citations: BRAZIL: Rondonia: Ribeiro 1069 [Herb. IPEAN 149759] (Ld).

PAEPALANTHUS ERIOCAULOIDES Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 40 & 198. 1976.

PAEPALANTHUS ERIOPHAEUS Ruhl.

Additional bibliography: Moldenke, Phytologia 26: 483--484 (1973), 29: 484 & 491 (1974), and 30: 103, 266, & 342. 1975.

PAEPALANTHUS EXIGUUS (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 29: 310—312 & 489 (1974), 30: 37, 43, & 86 (1975), 33: 198 (1976), and 36: 74. 1977.

PAEPALANTHUS FALCIFOLIUS Körn.

Additional bibliography: Gilg in Engl., Syllab. Pflanzenfam., ed. 7, 139, fig. 140 (1912), ed. 8, 141, fig. 140 (1919), and ed. 9 & 10, 152, fig. 144. 1924; Diels in Engl., Syllab. Pflanzenfam., ed. 11, 155, fig. 158. 1936; Moldenke, Phytologia 33: 40, 131, 145, 191, & 272. 1976.

Additional illustrations: Gilg in Engl., Syllab. Pflanzenfam., ed. 7, 139, fig. 140 (1912), ed. 8, 141, fig. 140 (1919), and ed. 9 & 10, 152, fig. 144. 1924; Diels in Engl., Syllab. Pflanzenfam., ed. 11, 155, fig. 158. 1936.

PAEPALANTHUS FASCICULATUS (Rottb.) Kunth

Additional bibliography: Moldenke, Phytologia 35: 24 & 125

(1976), 35: 289 (1977), and 36: 75. 1977.

Material of this species has been misidentified and distributed in some herbaria as P. myocephalus (Mart.) Körn., a taxon of very similar aspect. Ribeiro describes P. fasciculatus as a "planta resteira, flor marron".

Additional citations: GUYANA: Goodland & Maycock 452 (N, W--2548122). BRAZIL: Amazônas: Prance, Berg, Bisby, Steward, Monteiro, & Ramos 17921 (N); Ribeiro 15302 [729] (W--2787919).

PAEPALANTHUS FASCICULATUS f. SPHAEROCEPHALUS Herzog

Additional bibliography: Moldenke, Phytologia 35: 25 (1976) and 36: 75. 1977.

Gentry refers to this plant as a "tiny herb [with] whitish inflorescence" and found it growing "in campina-like formation on sand". Lasseign 21169 is a mixture with P. bifidus (Schrad.) Kunth.

Additional citations: BRAZIL: Amazônas: A. Gentry 13391 (Ld); Lasseign 21169 in part (N); Murça Pires & Marinho 15693 [Herb. IPEAN 146606] (Ld); Nascimento, Murça Pires, & Coradin 61 [Herb. IPEAN 148173] (Ld).

PAEPALANTHUS FASCICULIFER Alv. Silv.

Additional bibliography: Moldenke, Phytologia 29: 324--325 & 482 (1974) and 32: 335. 1975; Anon., Biol. Abstr. 61: AC1.667. 1976; Hocking, Excerpt. Bot. A.28: 259. 1976.

PAEPALANTHUS FASICULIFER var. CAPILLIFOLIUS Moldenke

Additional bibliography: Moldenke, Phytologia 35: 25. 1975; Anon., Biol. Abstr. 61: AC1.667. 1976; Hocking, Excerpt. Bot. A. 28: 259. 1976.

PAEPALANTHUS FILOSUS Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 326 (1974), 30: 340 (1975), and 36: 281. 1977.

PAEPALANTHUS FLACCIDUS (Bong.) Kunth

Additional bibliography: Moldenke, Phytologia 35: 25 (1976) and 35: 252 & 359. 1977.

PAEPALANTHUS FLAVORUTILUS Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 330 (1974) and 30: 54. 1975.

PAEPALANTHUS FORMOSUS Moldenke

Additional bibliography: Moldenke, Phytologia 35: 25 (1976) and 36: 35. 1977.

Additional citations: BRAZIL: Mato Grosso: Prance, Lleras, & Coêlho 19206 (N).

PAEPALANTHUS FRATERNUS N. E. Br.

Additional bibliography: Moldenke, Phytologia 33: 41--42 & 133

(1976) and 35: 310. 1977.

PAEPALANTHUS FREYREYSII (Billb.) Körn.
Additional bibliography: Moldenke, Phytologia 29: 388—390 (1974), 30: 264 (1975), and 35: 124. 1977.

PAEPALANTHUS FUSCUS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 29: 392—393 & 477. 1974.

PAEPALANTHUS GARDNERIANUS Walp.
Additional bibliography: Moldenke, Phytologia 29: 393—394 (1974), 30: 83 (1975), and 33: 140. 1976.

PAEPALANTHUS GENICULATUS (Bong.) Kunth
Additional bibliography: Moldenke, Phytologia 29: 477—478 & 481 (1974) and 30: 114 & 115. 1975.

The Eitens have found this plant growing in fine light-gray sand with some humus content on open hillsides on which there were also areas of small stones and gravel, at 1200 m. altitude, flowering in November.

Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 6793 (N).

PAEPALANTHUS GLABRIFOLIUS Ruhl.
Additional bibliography: Moldenke, Phytologia 29: 479—480 & 485 (1974), 30: 51 (1975), and 36: 35. 1977.

Castellanos has found this plant in flower in September.

Additional citations: BRAZIL: Guanabara: A. Castellanos 25643 [Herb. FEEMA 4319] (Z).

PAEPALANTHUS GLAZIOVII Ruhl.
Additional bibliography: Moldenke, Phytologia 29: 482—483 (1974) and 33: 140. 1976.

PAEPALANTHUS GLEASONII Moldenke
Additional bibliography: Moldenke, Phytologia 29: 483 (1974) and 33: 132. 1976.

PAEPALANTHUS GNEISSICOLA Alv. Silv.
Additional bibliography: Moldenke, Phytologia 29: 484. 1974.

Strang has encountered this plant in flower in April.

Additional citations: BRAZIL: Minas Gerais: Strang 369 [Herb. FEEMA 1308] (Pf, Z).

PAEPALANTHUS GOMESII Alv. Silv.
Additional bibliography: Moldenke, Phytologia 29: 484. 1974.

The Macedo 2792 distributed in some herbaria as P. gomesii and so cited by me in 1974 actually seems to represent P. plantagineus (Bong.) Körn instead.

PAEPALANTHUS GUARAIENSIS Moldenke, Phytologia 35: 49--51. 1977.
Bibliography: Moldenke, Phytologia 35: 35 & 49--51. 1977.
Illustrations: Moldenke, Phytologia 36: 50. 1977.
Citations: BRAZIL: Goiás: Hatschbach & Kummrow 38508 (Z--type).

PAEPALANTHUS HENRIQUEI Alv. Silv. & Ruhl.
Additional synonymy: Eriocaulon henriquei Reitz apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 43 & 99, in syn. 1976. Paepalanthus henriquei "Alv. Silv. & Ruhl. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 101, in syn. 1976.
Additional bibliography: Moldenke, Phytologia 29: 491--492 (1974) and 30: 48 & 103. 1975; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 41--45, 99, & 101, pl. 6, fig. 1--6. 1976.
Illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 44, pl. 6, fig. 1--5. 1976.
Vernacular names reported for this species are "capim-manso", "capipoatinga-de-henrique", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower in Santa Catarina in January.

PAEPALANTHUS HILAIREI Körn.
Additional bibliography: Moldenke, Phytologia 33: 42, 131, 188, & 191 (1976) and 34: 258. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23], 24, & 27. 1976.
Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the inflorescence apex in this species, citing Monteiro-Scanavacca 4304 from Minas Gerais, Brazil.

PAEPALANTHUS HILAIREI var. MAXIMILIANI Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 42 & 131 (1976) and 34: 258. 1976.

PAEPALANTHUS HILAIREI var. PIAUHYENSIS Ruhl.
Additional bibliography: Moldenke, Phytologia 29: 495 & 499--500. 1974.

PAEPALANTHUS HILAIREI var. POHLIANUS Moldenke
Additional bibliography: Moldenke, Phytologia 29: 495 & 500. 1974.

PAEPALANTHUS HISPIDISSIMUS Herzog
Additional bibliography: Moldenke, Phytologia 33: 42--43 (1976) and 35: 255. 1977.

PAEPALANTHUS HYDRA Ruhl.
Synonymy: Paepalanthus hydra "Ruhl. in Engl." apud Hocking, Excerpt. Bot. A.26: 90. 1975.
Additional bibliography: Moldenke, Phytologia 35: 26 (1976) and 35: 263 & 279. 1977.

PAEPALANTHUS INTERMEDIUS Körn.
Additional bibliography: Moldenke, Phytologia 33: 43 & 275. 1976.

PAEPALANTHUS ITAMBEENSIS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 30: 21 (1975) and 33: 183. 1976.

PAEPALANTHUS ITATIAIENSIS Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 26. 1976.
Additional citations: BRAZIL: Minas Gerais: Bogner 1157 (Mu, Z—photo). Rio de Janeiro: Carauta 928 [Herb. FEEMA 7425] (Ld).

PAEPALANTHUS ITHYPHYLLUS (Mart.) Mart.
Additional bibliography: Moldenke, Phytologia 30: 22--24, 103, & 275 (1975), 33: 191 (1976), and 35: 118. 1977.

PAEPALANTHUS JAUENSIS Moldenke
Additional bibliography: Moldenke, Phytologia 35: 27. 1976.
Additional citations: MOUNTED ILLUSTRATIONS: Mem. N. Y. Bot. Gard. 23: 851, fig. 5. 1972 (N—photo).

PAEPALANTHUS KARSTENII Ruhl.
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 38. 1975; Anon., Biol. Abstr. 61: AC1.667. 1976; Moldenke, Phytologia 35: 27. 1976.

PAEPALANTHUS KARSTENII var. SUBSESSILIS (Moldenke) Moldenke
Additional bibliography: Moldenke, Phytologia 4: 205 (1953) and 35: 27. 1976; Anon., Biol. Abstr. 61: AC1.667. 1976.
Additional citations: VENEZUELA: Mérida: Hamann 2888 (Hm), 2889 (Hm).

PAEPALANTHUS KILLIPII Moldenke
Additional bibliography: Moldenke, Phytologia 30: 29--30 & 117 (1975) and 33: 148. 1976.
Additional citations: VENEZUELA: Bolívar: Steyermark, Dunsterville, & Dunsterville 92619 (W—2584522).

PAEPALANTHUS LAMARCKII Kunth
Additional & emended bibliography: Sweet, Hort. Brit., ed. 2, 597. 1830; Loud., Hort. Brit., ed. 2, 719. 1832; Sweet, Hort. Brit., ed. 3, 719. 1839; León, Fl. Cuba, imp. 1, 1: 283 & 428. 1946; Moldenke, Phytologia 35: 19 & 27—28 (1976), 35: 125, 281, 338, & 359 (1977), and 36: 40, 65, & 75. 1977.
Goodland has encountered this species in "grassland with scattered trees, Curatella, Byrsonima, Trachypogon, and Fimbristylis dominant".
Both Sweet (1830) and Loudon (1832) list this species as grown in British gardens, introduced from Guyana in 1825, doubtless in a greenhouse as a specimen plant. They refer to it as the "fascicled

pipewort".

The Aubréville 226, distributed as P. lamarckii, actually is P. bifidus (Schrad.) Kunth.

Additional citations: GUYANA: Goodland 609 (N, W--2548121). BRAZIL: Pará: Pinheiro & Carvalho 429 (Ld). MOUNTED ILLUSTRATIONS: Meikle & Baldwin, Am. Journ. Bot. 29: 48 & 50. 1952 (W); Kunth, Enum. Pl. descrip. (W).

PAEPALANTHUS LANCEOLATUS Körn.

Additional bibliography: Moldenke, Phytologia 35: 28 (1976) and 35: 255, 263, & 279. 1977.

PAEPALANTHUS LANGSDORFFII (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 30: 40--42 (1975) and 31: 404. 1975.

PAEPALANTHUS LANGSDORFFII var. CARACENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 30: 41--42 (1975) and 31: 404. 1975.

PAEPALANTHUS LAXIFOLIUS Körn.

Additional bibliography: Moldenke, Phytologia 30: 42--43 & 111 (1975) and 35: 263 & 279. 1977.

PAEPALANTHUS LEISERINGII Ruhl.

Additional synonymy: Paepalanthus leiseringii var. leiseringii [Ruhl.] apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 69. 1976.

Additional bibliography: Moldenke, Phytologia 30: 43--44. 1975; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 62, 63, 69--72, & 101, pl. 8, fig. 13--19. 1976.

Vernacular names recorded for this plant are "capim-manso", "capipoatinga-de-leisering", "gravatá-manso", and "sempre-viva-do campo" and it is said to flower in April in Santa Catarina.

PAEPALANTHUS LEISERINGII var. KLEINII Moldenke & Smith

Additional bibliography: Moldenke, Phytologia 30: 44. 1975; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 62, 63, 70--72, & 101, pl. 8, fig. 13--19. 1976.

Illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 63, pl. 8, fig. 13--19. 1976.

Vernacular names reported for this plant are the expected "capim-manso", "capipoatinga-de-klein", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower in December in Santa Catarina.

PAEPALANTHUS LEUCOBLEPHARUS Körn.

Additional bibliography: Moldenke, Phytologia 30: 16, 44--45, & 54 (1975) and 35: 257. 1977.

PAEPALANTHUS LEUCOCEPHALUS Ruhl.
Additional bibliography: Moldenke, Phytologia 30: 45—46 (1975) and 33: 147. 1976.

PAEPALANTHUS LEUCOCYANEUS Tutin
Additional bibliography: Moldenke, Phytologia 30: 37 & 46—47 (1975) and 35: 120. 1977.

PAEPALANTHUS LODICULOIDES Moldenke
Additional bibliography: Anon., Biol. Abstr. 61: AC1.667. 1976; Moldenke, Phytologia 33: 48—50 (1976) and 34: 256. 1976.

PAEPALANTHUS LODICULOIDES var. FLOCCOSUS Moldenke
Additional bibliography: Anon., Biol. Abstr. 61: AC1.667. 1976; Moldenke, Phytologia 35: 28. 1976.

PAEPALANTHUS LONGICAULIS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 30: 51—52 (1975) and 31: 404. 1975.

PAEPALANTHUS LONGICAULIS var. GLABER Moldenke
Additional bibliography: Moldenke, Phytologia 30: 52 (1975) and 31: 404. 1975.

PAEPALANTHUS LUNDII Körn.
Additional bibliography: Moldenke, Phytologia 33: 49 & 184 (1976) and 35: 255. 1977.

PAEPALANTHUS LÜTZELBURGII Herzog
Additional bibliography: Moldenke, Phytologia 30: 45 & 54 (1975) and 35: 257. 1977.
Hatschbach has found this plant growing "na matinha de solo arenoso, sombria, do topo de morro", flowering and fruiting in January.
Additional citations: BRAZIL: Bahia: Hatschbach 39618 (Z).

PAEPALANTHUS MACROCEPHALUS (Bong.) Körn.
Additional bibliography: Moldenke, Phytologia 30: 56—59, 323, & 341 (1975) and 33: 149. 1976.

PAEPALANTHUS MACRORRHIZUS (Bong.) Kunth
Additional bibliography: Moldenke, Phytologia 30: 59—61, 122, & 269. 1975.

PAEPALANTHUS MANICATUS var. PULVINATUS Herzog
Additional bibliography: Moldenke, Phytologia 30: 75—76 (1975) and 33: 35. 1976.

PAEPALANTHUS MARTIANUS Körn.
Additional bibliography: Moldenke, Phytologia 30: 76—77 (1975) and 33: 191. 1976.

PAEPALANTHUS MELALEUCUS (Bong.) Kunth
Additional bibliography: Moldenke, Phytolcgia 30: 77--78 & 111 (1975), 33: 130 (1976), and 35: 262, 263, & 279. 1977.

PAEPALANTHUS MESETICOLA Moldenke & Steyermark
Additional bibliography: Moldenke, Phytologia 35: 28 (1976) and 36: 32. 1977.

PAEPALANTHUS MEXIAE Moldenke
Additional bibliography: Moldenke, Phytologia 33: 51 (1976) and 35: 257. 1977.

PAEPALANTHUS MICROCAULON Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 51 (1976) and 34: 259. 1976.
Additional citations: BRAZIL: Minas Gerais: Hatschbach, Anderson, Barneby, & Gates 36567 (N).

PAEPALANTHUS MYOCEPHALUS (Mart.) Körn.
Additional bibliography: Moldenke, Phytologia 33: 51 & 52 (1976) and 35: 125. 1977.
The Ribeiro 15302, distributed as P. myocephalus, actually is P. fasciculatus (Rottb.) Kunth.

PAEPALANTHUS OCHROCEPHALUS Körn.
Additional bibliography: Moldenke, Phytologia 30: 100--101 (1975) and 33: 191. 1976.
Recent collectors have encountered this plant in wet sandy restinga, flowering in January.
Additional citations: BRAZIL: Bahia: Lanna 754 [A. Castellanos 25504; Herb. FEEMA 5791] (Z).

PAEPALANTHUS OXYPHYLLUS Körn.
Additional bibliography: Moldenke, Phytologia 33: 53. 1976.
Additional citations: BRAZIL: Goiás: Hatschbach, Anderson, Barneby, & Gates 36373 (N).

PAEPALANTHUS OYAPOCKENSIS Herzog
Additional bibliography: Moldenke, Phytologia 30: 106--107 (1975), 33: 134 (1976), 35: 34 (1976), 35: 112 & 359 (1977) and 36: 65. 1977.

PAEPALANTHUS PAULINUS Ruhl.
Additional bibliography: Moldenke, Phytologia 30: 112. 1975; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23]--25 & 27, fig. 3. 1976.
Illustrations: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 25, fig. 3. 1976.
Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the apex of the inflorescence in this species, citing Monteiro-Scanavacca 4296 from Minas Gerais,

Brazil.

PAEPALANTHUS PERPLEXANS Moldenke
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 38. 1975; Moldenke, Phytologia 30: 116—117. 1975.

PAEPALANTHUS PERPUSILLUS Kunth
Additional bibliography: Moldenke, Phytologia 30: 113 & 117—119 (1975) and 35: 124. 1977.

PAEPALANTHUS PHAEOCEPHALUS Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 54 & 192. 1976.
Additional citations: BRAZIL: Goiás: Hatschbach, Anderson, Barneby, & Gates 36363 (N).

PAEPALANTHUS PHELPSAE Moldenke
Synonymy: Paepalanthus phlepsae Moldenke, Phytologia 36: 45, in syn. 1977.
Additional bibliography: Moldenke, Phytologia 30: 121 (1975) and 36: 45. 1977.
Additional citations: MOUNTED ILLUSTRATIONS: Mem. N. Y. Bot. Gard. 23: 853, fig. 6. 1972 (N—photo).

PAEPALANTHUS PILOSUS (H.B.K.) Kunth
Additional bibliography: Moldenke, Phytologia 35: 29 (1976) and 35: 350 & 354. 1977.
Additional citations: COLOMBIA: Antioquia: Barkley & Saldarriaga 43018 (Ac, Bm).

PAEPALANTHUS PLANIFOLIUS (Bong.) Körn.
Additional synonymy: Eriocaulon iridifolium (Kunth) Steud. apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 67 & 99, in syn. 1976. Eriocaulon monticola (Mart.) Steud. apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 67 & 99, in syn. 1967. Eriocaulon vaginans "ex Ruhl." apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 100, in syn. 1976. Paepalanthus planifolius var. planifolius [(Bong.) Körn.] apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 66. 1976.
Additional bibliography: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 62, 63, 66—68, & 98--102, pl. 8, fig. 8—15. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23]—27, fig. 4 & 7. 1976; Moldenke, Phytologia 35: 29 (1976) and 35: 259. 1977.
Additional illustrations: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 25 & 26, fig. 4 & 7. 1976.
Eiten has encountered this species in open marshy ground with scattered low shrubs and low tree-ferns, periodically burned, flowering and fruiting in October. Vernacular names recorded for it are the usual "capim-manso", "capipoatinga", "gravatá-manso",

and "sempre-viva-do-campo" and it is said to flower throughout the year in Santa Catarina.

Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the inflorescence apex in this species, citing Monteiro-Scanavacca 4895 from Minas Gerais, Brazil.

Additional citations: BRAZIL: Amazônas: Merxmüller s.n. [1968] (Hm). Minas Gerais: Strang 1070 [Castellanos 26653; Herb. Brad. 60456] (Ld), 25410 [Herb. FEEMA 4218] (Ld). São Paulo: G. Eiten 6384 (N).

PAEPALANTHUS PLANIFOLIUS var. GLOBULIFER (Alv.) Silv. Moldenke & Smith

Additional bibliography: Moldenke, Phytologia 30: 256--258 & 260--262. 1975; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 62, 63, 66--68, & 102, pl. 8, fig. 8--12. 1976.

Additional illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 63, pl. 8, fig. 8--15. 1976.

Vernacular names reported for this plant are "capim-manso", "capipoatinga-de-bola", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower in October and November in Santa Catarina.

PAEPALANTHUS PLANIFOLIUS var. PUBERULUS (Körn.) Ruhl.

Additional bibliography: Moldenke, Phytologia 30: 256 & 259--262. 1975.

PAEPALANTHUS PLANTAGINEUS (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 35: 29 & 34. 1976.

The Macedo collection, cited below, was previously inaccurately cited by me as P. gomesii Alv. Silv., a taxon of similar general appearance. It was collected in flower in December.

Additional citations: BRAZIL: Minas Gerais: Macedo 2792 (N, S).

PAEPALANTHUS PLUMIPES Alv. Silv.

Additional bibliography: Moldenke, Phytologia 33: 56, 132, & 191. 1976.

PAEPALANTHUS POLYANTHUS (Bong.) Kunth

Additional synonymy: Paepalanthus polyanthus f. polyanthus [(Bong.) Kunth] apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 57. 1976.

Additional bibliography: Moldenke, Phytologia 35: 23 & 29--30. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 57--62, 98, 100, & 102, pl. 7. 1976.

Additional illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 59, pl. 7. 1976.

The Eitens have encountered this species in natural open rocky campo with "campo rupestre" vegetation, growing in rock clefts in outcropping rock on the open campo, at 1250 m. altitude, flowering in March, the flower-heads described as "white". Other recent collectors have found it growing on quartzite. Vernacular names recorded for it are "capim-manso", "capipoatinga-de-mil-flores", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower from December to April in Santa Catarina.

Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 11038 (W--2799679); Hatschbach, Anderson, Barneby, & Gates 36426 (N, N); Monteiro de S. 243 [Vianna 404; Herb. FEEMA 8093] (Ld).

PAEPALANTHUS POLYANTHUS f. VILLOSUS (Beauverd) Moldenke & Smith

Additional synonymy: Paepalanthus polyanthus var. villoseus apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, sphalm. 1976.

Additional bibliography: Moldenke, Phytologia 33: 56. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 57, 61--62, & 102. 1976.

Vernacular names recorded for this plant are, as for the typical form, "capim-manso", "capipoatinga-de-mil-flores", "gravatá-manso", and "sempre-viva-do campo" and it is said to flower in January and February in Santa Catarina.

PAEPALANTHUS POLYTRICHOIDES Kunth

Additional bibliography: Moldenke, Phytologia 35: 30 (1976), 35: 112, 117, & 338 (1977), and 36: 35 & 84. 1977.

Additional citations: BRAZIL: Rondonia: Cordeiro 865 [Herb. IPEAN 152404] (Ld).

PAEPALANTHUS POLYTRICHOIDES f. VILLOSUS Moldenke

Additional bibliography: Moldenke, Phytologia 30: 318 & 320 (1975) and 35: 117. 1977.

PAEPALANTHUS PUNGENS Griseb.

Additional & emended bibliography: León, Fl. Cuba, imp. 1, 1: 283 & 428. 1946; Moldenke, Phytologia 35: 21 & 30. 1976.

PAEPALANTHUS PUNGENS var. BREVIFOLIUS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 57 (1976) and 34: 254. 1976.

PAEPALANTHUS RAMOSUS (Wikstr.) Kunth

Additional bibliography: Moldenke, Phytologia 35: 30--31. 1976.

Moreira found this plant in full anthesis in May.

Additional citations: BRAZIL: Guanabara: Moreira 77 [Herb. FEEMA 6645] (Pf).

PAEPALANTHUS RAMOSUS var. AFFINIS (Bong.) Ruhl.

Additional bibliography: Moldenke, Phytologia 35: 31. 1976.

Additional citations: BRAZIL: Rio de Janeiro: Pabst 7350 [Herb. Brad. 25323] (N).

PAEPALANTHUS REGALIS Mart.
Additional bibliography: Moldenke, Phytologia 30: 335--336 (1975) and 33: 274. 1976.

PAEPALANTHUS REPENS (Lam.) Körn.
Additional bibliography: Anon., Biol. Abstr. 61: AC1.667. 1976; Moldenke, Phytologia 35: 31 (1976) and 36: 81. 1977.

PAEPALANTHUS RETUSUS C. Wright
Additional & emended bibliography: León, Fl. Cuba, imp. 1, 1: 283 & 428. 1946; Moldenke, Phytologia 36: 31. 1976.

PAEPALANTHUS RIPARIUS Moldenke
Additional & emended bibliography: León, Fl. Cuba, imp. 1, 1: 283 & 428. 1946; Moldenke, Phytologia 33: 131--132. 1976.

PAEPALANTHUS SAXICOLA Körn.
Additional bibliography: Moldenke, Phytologia 33: 136--139 (1976), 35: 111, 119, 336, & 431 (1977), and 36: 35. 1977.

PAEPALANTHUS SAXICOLA var. PILOSUS Moldenke, Phytologia 35: 111. 1977.
Bibliography: Moldenke, Phytologia 35: 111 (1977) and 36: 35. 1977.
Citations: BRAZIL: Goiás: Hatschbach 36832 (Z--type).

PAEPALANTHUS SCIRPEUS Mart.
Additional bibliography: Moldenke, Phytologia 35: 31. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [6], 62, 66, & 67, fig. 1 & 2. 1976.
Illustrations: Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 67, fig. 1 & 2. 1976.
Monteiro-Scanavacca and her associates (1976) report that this species reproduces vegetatively from the apex of the inflorescence, producing complete plantlets with leaves, stem, and adventitious roots, citing Damásio s.n. [June 1908] from Minas Gerais, Brazil.

PAEPALANTHUS SENAEANUS Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 32 (1976) and 35: 333. 1977.
The Eiten & Eiten 11027, distributed as P. mirabilis Alv. Silv., actually is P. comans Alv. Silv.

PAEPALANTHUS SESLERIOIDES Griseb.
Additional synonymy: Dupatia seslerioides Griseb. ex Moldenke, Phytologia 36: 42, in syn. 1977.
Additional & emended bibliography: León, Fl. Cuba, imp. 1, 1: 281 & 428. 1946; Moldenke, Phytologia 34: 485 (1976), 35: 32--33 (1976), and 36: 31 & 42. 1977; Moldenke, Biol. Abstr. 63: 2452.

1977.

PAEPALANTHUS SESLERIOIDES var. CARABIAE Moldenke
Additional bibliography: Moldenke, Phytologia 34: 485 (1976), 35: 32 (1976), and 36: 31. 1977; Moldenke, Biol. Abstr. 63: 2452. 1977.

PAEPALANTHUS SESLERIOIDES var. WILSONII Moldenke
Additional bibliography: Moldenke, Phytologia 34: 485 (1976), 35: 33 (1976), and 36: 31. 1977; Moldenke, Biol. Abstr. 63: 2452. 1977.

PAEPALANTHUS SINGULARIUS Moldenke
Additional bibliography: Moldenke, Phytologia 33: 188. 1976.
Campbell and his associates describe this plant as herbaceous, to 5 cm. tall, the "old flower-heads brown", and found it growing on "campina in sun on white sand", fruiting in June.
Additional citations: BRAZIL: Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22542 (Z).

PAEPALANTHUS SPECIOSUS (Bong.) Körn.
Additional bibliography: Moldenke, Phytologia 33: 189--198 (1976), 34: 276 & 395 (1976), 35: 24, 30, & 33 (1976), and 35: 258, 284, 421, & 422. 1977.

PAEPALANTHUS SPECIOSUS var. ANGUSTIFOLIUS Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 192--194 & 196. 1976.
Hatschbach has encountered this plant, flowering in July, on a "campo cerrado solo rochoso encosta de morro".
Additional citations: BRAZIL: Goiás: Hatschbach 38775 (Ld).

PAEPALANTHUS STEYERMARKII Moldenke
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 37. 1975; Moldenke, Phytologia 35: 33. 1976.

PAEPALANTHUS STUEBELIANUS Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 274--275. 1976.
Additional citations: PERU: Amazonas: Hegewald s.n. [Herb. Hamann 3013] (Hm).

PAEPALANTHUS SUBTILIS Miq.
Additional bibliography: Moldenke, Phytologia 35: 112--114, 309, 310, 322, & 333 (1977) and 36: 65 & 74. 1977.
The Donselaar & Donselaar 359, distributed as P. subtilis, actually is Syngonanthus simplex (Miq.) Ruhl.

PAEPALANTHUS TESSMANNII Moldenke
Additional bibliography: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 42, 44, 49--51, 100, & 102, pl. 6, fig. 14--20.

1976; Moldenke, Phytologia 35: 121. 1977.

Illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 44, pl. 6, fig. 14--20. 1976.

Dombrowski has encountered this species in wet campos and swamps, where she reports it frequent, and in brejo (sedge meadow) where she reports it abundant. She found it in flower in November and December and in fruit in December.

Vernacular names for the species are "capim-manso", "capipoatinga-de-tessmann", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower from November to January in Santa Catarina.

Additional citations: BRAZIL: Paraná: Dombrowski 5441 (Ld), 5552 (Ld), 5571 (Ld), 5616 (Ld), 5845 (Ld).

PAEPALANTHUS TORTILIS (Bong.) Mart.

Additional bibliography: Moldenke, Phytologia 35: 122--127 & 281 (1977) and 36: 35, 51, 74, & 75. 1977.

The Martius 551, distributed as typical P. tortilis and so cited by me in 1976, is now regarded as the type collection of var. glaberrimus Mart. & Moldenke.

Additional citations: BRAZIL: Bahia: Lanna Sobrinho 763 [A. Castellanos 25513; Herb. FEEMA 6035; Herb. Cent. Pesq. Florest. 5718] (Ld, Pf).

PAEPALANTHUS TORTILIS var. GLABERRIMUS Mart. & Moldenke ex Moldenke, Phytologia 36: 51. 1977.

Synonymy: Eriocaulon tortile var. glabra Mart. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959. Eriocaulon tortile var. glabra, subsimplex Mart. ex Moldenke, Phytologia 25: 239, in syn. 1973. Eriocaulon tortile var. glaberrimum Mart., in herb.

Bibliography: Moldenke, Phytologia 36: 35 & 51. 1977.

Strang has found this plant growing in wet turf, flowering and fruiting in August. The variety has previously been confused with and regarded as identical to the typical form of the species, but it seems to me now to be sufficiently distinct to merit nomenclatural recognition, as Martius originally suggested. The synonymy of the species needs to be restudied to determine which names actually belong to the present variety.

Citations: BRAZIL: Guanabara: Strang 678 [Herb. Cent. Pesq. Florest. 5040] (Pf). Rio de Janeiro: Martius 551 (B--isotype, B--isotype, Br--isotype, C--type, E--isotype, Mu--isotype, S--isotype, Z--isotype).

PAEPALANTHUS TORTILIS var. MINOR Moldenke

Additional bibliography: Moldenke, Phytologia 35: 126--127 (1977) and 36: 35. 1977.

PAEPALANTHUS VENUSTUS Moldenke, Mem. N. Y. Bot. Gard. 9: 281--282. 1957 [not P. venustus Alv. Silv., sphalm. 1928].

Additional bibliography: Moldenke, Phytologia 35: 264. 1977.

PHILODICE Mart.
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 38 & [69]. 1975; Moldenke, Phytologia 35: 286--292, 304, 309, & 510 (1977) and 36: 508. 1977.

PHILODICE HOFFMANNSEGGII Mart.
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 38. 1975; Moldenke, Phytologia 35: 287, 289--292, & 304. 1977.

RONDONANTHUS Herzog
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 38 & [69]. 1975; Moldenke, Phytologia 34: 509 (1976) and 35: 292--295 & 511. 1977.

RONDONANTHUS MICROPETALUS Moldenke
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 38. 1975; Moldenke, Phytologia 35: 293--294. 1977.

RONDONANTHUS RORAIMAE (Oliv.) Herzog
Additional synonymy: Rondonanthus roraime (Oliv.) Herzog apud Cárdenas de Guevara, Act. Bot. Venez. 10: 38, sphalm. 1975.
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 38. 1975; Moldenke, Phytologia 35: 294--295. 1977.

SYNGONANTHUS Ruhl.
Additional synonymy: Svngonanthus Ruhl. ex Alv. Silv., Fl. Mont. 1: 396, sphalm. 1928. Mutia Mart. ex Moldenke, Résumé Suppl. 1: 19, in syn. 1959.
Additional & emended bibliography: Engl., Syllab. Pflanzenfam., ed. 3, 92 (1903), ed. 5, 94 (1907), and ed. 6, 99. 1909; Gilg in Engl., Syllab. Pflanzenfam., ed. 7, 138 (1912), ed. 8, 140 (1919), and ed. 9 & 10, 152. 1924; Diels in Engl., Syllab. Pflanzenfam., ed. 11, 154. 1936; León, Fl. Cuba, imp. 1, 1: 379, 283--284, 435, & 436. 1946; Moldenke, Mem. N. Y. Bot. Gard. 9: 175. 1955; Cárdenas de Guevara, Act. Bot. Venez. 10: 36, 38--39, & [69]. 1975; J. A. Steyerm., Act. Bot. Venez. 10: 225, 226, & 232. 1975; Hocking, Excerpt. Bot. A.28: 259. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 5, 62, 63, 76--94, & 99--103. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23]--27, fig. 2. 1976; Moldenke, Phytologia 35: 288, 295--322, 332--364, 420--458, & 511 (1977) and 36: 32, 35, 36, 40, 42, 45, 47, 54--85, 116, 470, 487, 493, 506, 510, & 511. 1977.

SYNGONANTHUS ANDROSACEUS (Griseb.) Ruhl.
Additional & emended bibliography: León, Fl. Cuba, imp. 1, 1: 283 & 435. 1946; Moldenke, Phytologia 35: 306 & 312--313. 1977.

SYNGONANTHUS ANOMALUS (Körn.) Ruhl.
Additional bibliography: Cárdenas de Guevara, Act. Bot. Venez. 10: 36 & 39. 1975; Moldenke, Phytologia 35: 307, 315--317, 341, 345, & 356. 1977.

Additional citations: BRAZIL: Amazônas: Prance, Berg, Bisby, Stewart, Monteiro, & Ramos 17814 (N).

SYNGONANTHUS ANTHEMIFLORUS (Bong.) Ruhl.

Additional bibliography: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23]--25 & 27, fig. 2. 1976; Moldenke, Phytologia 35: 303, 317--320, 339, 435, 438, 439, & 456 (1977) and 36: 63. 1977.

Additional illustrations: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 25, fig. 2, 1976.

Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the inflorescence apex in this species, citing Giulietti 4063 from Minas Gerais, Brazil.

Additional citations: BRAZIL: Minas Gerais: Hatschbach, Anderson, Barneby, & Gates 36442 (N).

SYNGONANTHUS ARTHROTRICHUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 35: 334--335 & 450. 1977.

SYNGONANTHUS BAHIENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 35: 337. 1977.

Additional citations: BRAZIL: Bahia: Davidse, Ramamoorthy, & Vital 11932 (Ld).

SYNGONANTHUS BALDWINI Moldenke

Additional bibliography: Moldenke, Phytologia 35: 337 (1977) and 36: 35. 1977.

SYNGONANTHUS BARBATUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 35: 337 & 446. 1977.

SYNGONANTHUS BELLUS Moldenke

Additional bibliography: Moldenke, Phytologia 35: 338 (1977) and 36: 84. 1977.

SYNGONANTHUS BIFORMIS (N. E. Br.) Gleason

Additional bibliography: Moldenke, Phytologia 35: 339--341 (1977) and 36: 63, 64, 72, & 74. 1977.

SYNGONANTHUS BISUMBELLATUS (Steud.) Ruhl.

Additional bibliography: Moldenke, Phytologia 35: 342--344 (1977) and 36: 35. 1977.

SYNGONANTHUS CANDIDUS var. BAHIENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 35: 349. 1977.

Hatschbach has found this plant growing in "solo arenoso junto a corrego" and "a afloramentos de arenito", flowering and fruiting in January.

Additional citations: BRAZIL: Bahia: Hatschbach 39568 (Ld). 39700 (Ld).

SYNGONANTHUS CAULESCENS (Poir.) Ruhl.

Additional synonymy: Eriocaulon surinamense "Miq. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 100, in syn. 1976. Paepalanthus caulescens (Bong.) Kunth apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 90, in syn. 1976. Paepalanthus caulescens var. humilis Kunth apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 89, in syn. 1976. Paepalanthus caulescens var. parvifolius Kunth apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 89, in syn. 1976. Paepalanthus splendens "Mart. ex Körn." apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 102, in syn. 1976. Syngonanthus clavescens "Ruhl. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilustr. Catar. I Erio: 103, in syn. sphalm. 1976. Syngonanthus caulescens "(Pois.) Ruhl. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 103, in syn. 1976. Syngonanthus caulescens var. caulescens [(Poir.) Ruhl.] apud Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 89. 1976.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 259. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 77, 84, 88--94, & 98--103, pl. 9, fig. 10—22. 1976; Moldenke, Phytologia 35: 420--423 & 453 (1977) and 36: 33, 35, & 64—66. 1977.

Additional illustrations: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 85, pl. 9, fig. 10—22. 1976.

Hatschbach has found this plant growing in "brejo borda da chapada". Vernacular names reported for it are "capim-manso", "capipoatinga-açu", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower from October to February in Santa Catarina, Brazil.

Additional citations: BRAZIL: Bahia: Hatschbach 39413 (Ld). Mato Grosso: Prance, Lleras, & Coêlho 19232 (N).

SYNGONANTHUS CAULESCENS var. ANGUSTIFOLIUS Moldenke

Additional bibliography: Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erio: 89, 92--93, & 103. 1976; Moldenke, Phytologia 35: 420 (1977) and 36: 33 & 35. 1977.

Vernacular names recorded for this variety are identical to those for the typical form of the species listed above.

SYNGONANTHUS CAULESCENS var. DISCRETIFOLIUS Moldenke

Additional bibliography: Moldenke, Phytologia 35: 364 (1977) and 36: 35. 1977.

SYNGONANTHUS CAULESCENS f. LONGIPES Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 259. 1976; Moldenke, Phytologia 35: 421. 1977.

[to be continued]

A NEW SPECIES OF GALACTIA (FABACEAE) IN THE SOUTHEASTERN UNITED STATES

Wilbur H. Duncan[1]

Abstract: Galactia minor Duncan (FABACEAE) of the Southeastern United States is described as a new species and compared with the similar G. regularis (L.) BSP.

Certain aspects of the variation in Galactia regularis (L.) BSP. sensu Fernald (1950), Gleason and Cronquist (1963), Wilbur (1963), and Radford et al (1964) have bothered me for many years. Sporadic field and herbarium studies have led me to the conclusion that one segment deserves separate specific rank. It is described below.

GALACTIA MINOR Duncan, sp. nov.

Herba perennis. Caule prostrati, plerumque geniculati, ferentes pilos adpressos antrorsos 0.05-0.25 mm longos; internodia circiter longitudo longissimae foliolae. Folia composita, 18-38 mm longa; foliola 3, elliptica, retusa vel rarenter apiculata, integra, grandissimum 6-14 mm latum et 14-28 mm longum, ferens pilos adpressos antrorsos, Inflorescentiae axillares, 15-40 mm longae et circiter aequae vel breviores quam folia. Flores 1-3(4), 10-17 mm longi. Calyx 6.5-10 mm longus. Legumen 30-42 mm longum, 4-5 mm latum, ferens pilos adpressos antrorsos. Semina (5)6-8.

TYPE: UNITED STATES: Long County, Georgia: Sandhills adjacent to Altamaha River bottom sw of Ludowici, 2 Aug. 1953, Wilbur H. Duncan 16993 (HOLOTYPE, GA 99594).

Perennial herb. Stems prostrate, usually slightly geniculate, rarely twining at the tips, bearing appressed antrorse hairs 0.05-0.25 mm long; internodes about as long as longest leaflet of the adjacent nodes. Leaves compound, 18-38 mm long; leaflets 3, narrowly elliptic to elliptic, retuse or rarely apiculate, entire, largest 6-14 mm wide and 14-28 mm long, bearing small antrorse hairs. Inflorescences axillary, 15-40 mm long and about the length or shorter than the subtending leaves, bearing 1-3(4) flowers from 11-17 mm long. Calyx 6.5-10 mm long. Legume 30-42 mm long, 4-5 mm wide, bearing appressed antrorse hairs. Maximum number of seeds (5)6-8 per legume.

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A selection of other representative G. minor specimens follows to represent the species more widely. Duplicates of these are likely to be in other herbaria. --- Duncan 4001, 28 Aug. 1941, Irwin Co., Ga. Sandhill area just E of Alapaha R., W of Ocilla (GA 49857). -- Thorne 5742, 30 July 1947, Baker Co., Ga. Sandy bank of Flint R. near its junction with Ichawanochaway Creek (GA 37546). -- Cronquist 5514, 18 July 1948, Taylor Co., Ga. Among scattered scrub oak in sandhills 3 mi N of Butler (GA 29354). -- Webster and Wilbur 3574, 25 July 1950, Escambia Co., Fla. Dry oak woods on sandy soil 11 miles W of Pensacola (GA 94657). -- Faircloth 2798, 20 Aug. 1965, Thomas Co., Ga. Floodplain and banks on E side of Ochlocknee R., 5.5 mi SW of Coolidge (NCU 395212). -- Godfrey 71886, 31 Aug. 1972, Liberty Co., Fla. Frequent in longleaf pine-turkey oak, upland ridge, Torreya State Park (FLAS 113724).

DISTRIBUTION: Sandhills, scrub oak pinelands, dry sandy pinelands, fine sandy soils of se Miss, s Ala, nw Fla, Coastal Plain of Ga, inner Coastal Plain of and sw SC, and se Coastal Plain of NC. Absent from Atlantic coastal counties.

Galactia minor is different from the other segments of G. regularis as follows: --

Internodes only a little longer than to much shorter than the largest leaflet of the adjacent nodes, stems often geniculate and rarely twining, hairs on the stem always antrorse and 0.05-0.25 mm long, largest leaflets 14-28 mm long, longest inflorescences little if any longer than to shorter than the subtending leaves. Flowers 1-3(4) - G. minor

Several to most internodes (especially those toward the base) much longer than the largest leaflet of the adjacent nodes, stems not geniculate and occasionally twining, hairs on stems occasionally antrorse but more often retrorse and 0.1-0.8 mm long, largest leaflets 25-50 mm long, longest inflorescences longer than to sometimes more than twice as long as or rarely about as long as leaves, flowers 4-many - G. regularis

I have no strong opinion concerning how to treat those plants of "G. regularis" with antrorse hairs -- as another species, as a variety or part of G. minor, or as being allied with G. regularis. I know of others currently interested in this subject and leave this decision for them to make. It is interesting that Small (1933) reserved the name G. regularis for those individuals having minutely retrorse-pubescent stems. However, none of the other species he includes can be the antrorse-haired G. minor described here.

G. minor might also be confused with G. floridana T. & G. var. microphylla Chapman but the type specimen (labeled:- Herb. Chapm --Galactia floridana T. & G. var. microphylla -- Florida -- Southern Flora) at the New York Botanical Garden has longer and spreading hairs and the leaflets are mostly apiculate. Also a specimen in the Gray Herbarium presumed to be one of Chapman's from Florida [labeled:- Galactia microphylla, Sp. n. (sine fl. et fr)], although with retuse leaflets, has spreading to somewhat retrorse hairs to 0.6 mm long on the stems. Furthermore, neither of these specimens has geniculate stems. This microphylla material seems more closely allied to G. floridana (Chapman, 1889).

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Flora of the Southern United States. Ivison, Blakeman, & Company. NY. [Copyright 1883] 698p.

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Radford, A.E. et al. 1964.
Manual of the Vascular Flora of the Carolinas. University of North Carolina Press. Chapel Hill. 1183p.

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BOOK REVIEWS

Alma L. Moldenke

"ART FORMS FROM PLANT LIFE" by William M. Harlow, xvi & 121 pp., illus. with 122 photographs, Revised & Expanded Edition by Dover Publications, Inc., New York, N. Y. 10014. 1976. $4.00 oversize, paperbound.

The basis for this beautiful addition to the Dover Pictorial Archives Series is "Patterns of Life: The Unseen World of Plants" published in 1966 by Harper & Row, Inc. "The pictures on the following pages not only reveal beauty of structure but in many cases show how plants respond or adapt to their environment, not only during the life-time of the individual plant but also over millions of years." Plant patterns (enlarged, internal) "may provide students, designers and others with new and exciting departures for creative expression".

I would like to see a classroom size set of this book available in all lower schools and summer outdoor programs.

It also makes a pleasurable inexpensive gift.

"JOHN BURROUGHS' SLABSIDES" by Elizabeth Burroughs Kelley, xi & 112 pp., illus., provately published at Moran Publishing Co., Rhinebeck, N. Y. 12572 for the author, West Park, N. Y. 12493. 1974. $5.75 paperback.

"Slabsides. a National Historic Landmark since 1968, is a rustic cabin in the hills of the Hudson Valley near West Park, New York, now owned and maintained by the John Burroughs Memorial Association with headquarters in the American Museum of Natural History in New York City. It was build by the naturalist-author, used by him for over a score of years for observing nature intimately, writing and showing this simple type of life to all kinds of visitors from school children, Vassar students, Dr. Barrus (his biographer) to Teddy Roosevelt. Many of these folks have returned again and again to this "mecca", often introducing younger generation to its charm. Some will even recognize themselves and friends among the thirty-odd photographs reproduced in this splendid book. It more than replaces the long out-of-print 1931 "Slabsides Book of John Burroughs" written as a tribute by his son Julian and some of his many friends.

"AUDUBON THE NATURALIST: A History of his Life and Time" in two volumes by Francis Hobart Herrick, Vol. I, lxxiv & 451 pp., illus; Vol. II, xxi & 500 pp., illus., Reprinting of 1968 Replication Edition by Dover Publications, Inc., New York, N. Y. 10014. 1975. $4.00 each volume, paperbound.

This fine study is an unabridged and unrevised republication of the second edition as published by D. Appleton - Century Company in 1938. It covers all phases of his life with careful documentation which routs that Dauphin story, pays great tribute to Lucy Blakewell for her sterling qualities of mind and heart as his wife and mother to the family, his unsuccessful business endeavors, his travels throughout the United States, Labrador, England and France for the purpose of capturing wildlife with gun, pencil and paintbrush, his signing up subscribers, his dealing with engravers and printers, and his meeting with ornithophiles of the day. Although Jean Jacques Fougère Audubon died in 1851, aged only 66 years, reading these thousand pages of his great and gifted endeavors makes me feel that he lived several years in each calendar one for most of his adult life.

There are over one hundred interesting illustrations, appendices showing important original documents, lists of subscribers to "The Birds of America" and an annotated bibliography for this definitive biography.

"1001 QUESTIONS ANSWERED ABOUT INSECTS" by Alexander B. Klots & Elsie B. Klots, xii & 260 pp., illus., Facsimile Edition by Dover Publications, New York, N. Y. 10014. 1977. $4.75 in Canada, $4.00 in U.S.A., paperbound.

This book is an unabridged and unaltered republication of the work first published by Dodd, Mead & Co, in 1961. So many question-answer books in the general educational field have been so bewilderingly unorganized and weighted with trivia, but this Klots' study is really a beautifully organized and fascinatingly presented survey of the insect world covering arthropod and insect characteristics, origins, classification, distribution, structures, functions, development, senses, and behavioral relationships to plants, fungi, man and other animals.

There are 31 of Alexander Klots' famous black/white photographs and even more finely drawn illustrations made by Elsie B. Klots and Su Zan Swain. A detailed index supplements as a cross-reference among these queries and their replies, keeping the text itself uncluttered.

"671. What is the largest insect proboscis known? A Sphinx Moth in Madagascar has an 11-inch proboscis.....Before it was known to exist the great naturalist Alfred Russel Wallace predicted that such a moth would be found, since a Madagascan orchid has a corolla 11 inches deep. Twelve years later that moth was discovered."

"KNOWING THE OUTDOORS IN THE DARK" by Vinson Brown, 191 pp., illus., Stackpole Books, Inc., Harrisburg, Pennsylvania 17105. 1972. $6.95.

Vinny Brown has been known directly or indirectly to thousands upon thousands of counselors and teachers responsible for the nature study programs in camps, schools and today's ecology centers. After explaining needful safety precautions and equipment, he explains how folks readying themselves for nature on the night shift can sharpen their senses of general awareness, direction, smell, hearing, touch and sight in the darkened world, and ultimately develop a feeling of kinship with all life.

The text describes, pictures and gives the geographic distribution in the U.S.A. of our nocturnal vertebrates, invertebrates and fungi. The author shows how various plants and roosting birds can be identified in silhouette against all but a black sky and explains how daytime reconnoitering in an area can help in map construction and use, as well as in the selection of vantage points for the nighttime watch.

On p. 155 the scientific name of the creosote bush is misspelled, but that fact would not be visible at night unless artificially or naturally illuminated.

"SNAKES OF THE WORLD: Their Ways and Means of Living" by Hampton Wildman Parker, 191 pp., illus., Facsimile Edition by Dover Publications, Inc., New York, N. Y. 10014. 1977. $3.00 paperbound.

This unabridged replication of "Snakes" (the 1963 title) is for sale only in the U.S.A. by special arrangement with the original publishers, Robert Hale Ltd. of London. The author of this really modern survey of snakes was formerly head of the Department of Zoology at the Natural History Museum in London. It makes excellent informative reading for anyone interested in these reptiles as well as for students of ecology, adaptive evolution, etc. The illustrations do not include those used and reused so much in American texts. Much of the book's obviously great accuracy and interest is presented without the use of highly specialized technical language. This makes the book more accessible to many more readers.

"ADVENTURES WITH A MICROSCOPE" by Richard Headstrom, xxiv & 232 pp., illus., Facsimile Edition by Dover Publications, New York, N. Y. 10014. $3.25 in Canada, $2.75 in U.S.A., paperbound.

This is an unabridged replication of the author's work that was first published in 1941 by J. B. Lippincott Co. as one of his hobby books on natural science for young people and the amateur adult.

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CONTENTS

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Price of the number $3; per volume, $9.75 in advance or $10.50 after close of the volume; 75 cents extra to all foreign addresses; 512 pages constitute a volume; claims to numbers lost in the mail must be made immediately after receipt of the next number.

New Species of *Stenospermation* (Araceae) from the Cordillera de Cutucú

Michael Madison*

The Cordillera de Cutucú is an isolated fragment of the eastern cordillera of the Andes in Ecuador, separated from adjacent ranges by the deep valleys of the Río Upano and Río Santiago. Its isolated position has contributed to a high level of endemism, and a recent general collection of flowering plants from the Cutucú is proving to include about 15% new species. In the course of identifying the aroids in this collection I have come across two species of *Stenospermation* Schott previously undescribed.

Stenospermation is predominantly Andean, with 19 of its 39 species reported from Ecuador. The plants are sparsely branched epiphytes, usually comprising two or three stems up to 1 m long bearing thickly coriaceous leaves and terminal inflorescences. Evolutionary specialization as true epiphytes is a major feature distinguishing *Stenospermation* from the related genera *Monstera* Adans. and *Rhodospatha* Poepp., which are vining hemi-epiphytes with terrestrial germination. In *Stenospermation* the tiny seeds are dispersed by birds to the branches of trees, and the entire life cycle is passed epiphytically.

The first of the new species here described is secondarily terrestrial, and forms a component of the bizarre vegetation at the summit of the Cutucú. This consists of extensive meadows of bright red sphagnum in which a scattering of angiosperms, principally cyclanths, orchids, and bromeliads, is to be found. However, the dominant angiosperm is *Stenospermation arborescens*, a giant (for the genus) herb standing 3 m tall, usually solitary but sometimes forming clumps of half a dozen plants. The weird aspect of these megaphyllous monocaul herbs, seen through a wind-blown fog, is reminiscent of the *Espeletia* paramos further north, and makes an unforgettable impression.

Stenospermation arborescens Madison, sp.nov.

Herba terrestris magna arborescens, ad 3 m alta. Caudex teres, viridis, 4-8 cm crassus, internodiis 1.5-3 cm longis. Petiolus 60 cm longus, vagina 10 cm infra laminae basin desinente instructus. Lamina valde coriacea, elliptica, 50-60 cm longa, 20-25 cm lata, base rotundata vel obtusa, apice obtusa. Pedunculus carnosus, teres, 1.5-2 cm crassus, 60-80 cm longus, erectus. Spatha ignota. Spadix 1-1.5 cm stipitatus, cylindricus, albus, 14-18 cm longus, ovariis pluriovulatis.

*The Marie Selby Botanical Gardens, 800 S. Palm, Sarasota, Fla. 33577

TYPE: Ecuador, Prov. Morona-Santiago, Cordillera de Cutucú, along a trail from Logroño to Yaupi in the general region 2°46'S x 78°06'W, summit, elev. 2000 m, Nov. 1976, Madison, Bush & Davis 3589 (Holotype SEL, isotype US)

Stenospermation arborescens is most closely related to *S. crassifolium* Engler, an epiphytic species from eastern Peru distinguished by its much slenderer peduncle and shorter stipe, and by the leaf sheath nearly reaching the lamina, rather than ending 10 cm below the lamina base as in *S. arborescens*.

The second new species of *Stenospermation* from the Cutucú is much more typical of the genus, being a diminutive epiphyte inhabiting cloud forest at 1800 m elevation.

Stenospermation zeacarpium Madison, sp. nov.

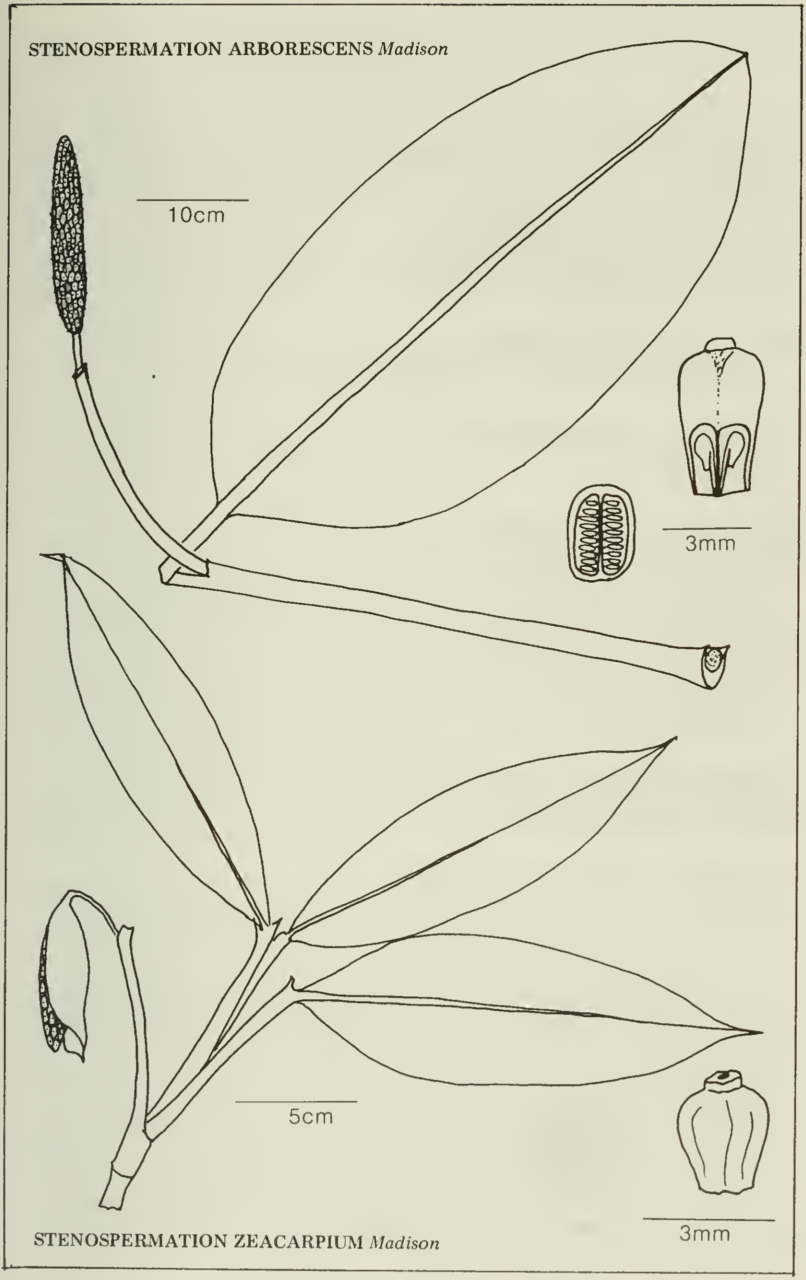
Herba terrestris vel epiphytica, ad 0.5 m alta. Caudex viridis, cylindricus, 5-8 mm crassus, internodiis 1-2 cm longis. Petiolus 5-6 cm longus, ad basem laminae late vaginatus; lamina subcoriacea, ovata vel anguste elliptica, base cuneata, apice atenuato, 13-18 cm longa, 4-6 cm lata. Pedunculus gracilis, teres, 1 mm crassus, 10 cm longus; spatha subviridis, globosa, persistens, 5-6 cm longa, ambitu 4-5 cm. Spadix fructifer nutans, 5-6 mm stipitatus, conicus, 5 cm longus, base 1.5 cm crassa, ad apicem angustatus. Baccae 4-5 mm longae, 5-8 seminales; semina claviformi, 3 mm longa.

TYPE: Ecuador, Prov. Morona-Santiago, Cordillera de Cutucú, along a trail from Logroño to Yaupi in the general region of 2°46'S x 78°06'W, cloud forest, elev. 1800 m, Nov. 1976, Madison, Bush & Davis 3430 (Holotype SEL, isotype US)

ETYMOLOGY: Latin *Zeacarpium*, 'Zea-fruited,' referring to the resemblance of the tapered spike of fruits, with its enveloping green bract, to an ear of maize.

The persistence of the short, globose spathe to time of fruit maturity readily distinguishes *Stenospermation zeacarpium* from the other species of the genus, in which the spathe is deciduous after anthesis. The strongly tapered conical spadix, 1.5 cm thick at the base narrowing to 0.5 cm at the apex, is also a diagnostic feature. *Stenospermation zeacarpium* appears to be most closely related to *S. angosturense* Engler, which also occurs in the Cutucú, but at lower elevations (1200 m). *Stenospermation angosturense* is distinguished from *S. zeacarpium* by its broader leaves and peduncles only half as long

In addition to the three species already mentioned, *Stenospermation adsimile* Sodiro, with distinctive bright yellow fruits, occurs in the Cutucú at elevations of 1700-2000 m.


STENOSPERMATION ARBORESCENS Madison
10cm
3mm
5cm
3mm
STENOSPERMATION ZEACARPIUM Madison

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXXIV

Harold N. Moldenke

SYNGONANTHUS CIRCINNATUS (Bong.) Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 429--430 & 443. 1977.

SYNGONANTHUS COMPACTUS Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 431 (1977) and 36: 33. 1977.

SYNGONANTHUS DECORUS Moldenke
Additional bibliography: Hocking, Excerpt. Bot. A.28: 259. 1976; Moldenke, Phytologia 35: 435. 1977.

SYNGONANTHUS DENSIFOLIUS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 35: 438--440 & 456, 1977.

SYNGONANTHUS DENSUS (Körn.) Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 440--441 (1977) and 36: 35. 1977.
Additional citations: BRAZIL: Amazônas: Prance, Berg, Bisby, Steward, Monteiro, & Ramos 17932 (N).

SYNGONANTHUS DROUETII L. B. Sm.
Additional bibliography: Moldenke, Phytologia 35: 441--442 (1977) and 36: 45. 1977.

SYNGONANTHUS ELEGANS (Bong.) Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 444--448 (1977) and 36: 76. 1977.

SYNGONANTHUS ELEGANS var. ELANATUS Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 445--448. 1977.
The Glaziou 20013 cited by Ruhland as a cotype of this variety is the type collection of S. elegantulus var. glaziovii Moldenke. The Glaziou 16398 and Duarte 7569 [Herb. Brad. 27315], also previously cited by me as S. elegans var. elanatus, seem better placed as S. elegantulus var. glaziovii.

SYNGONANTHUS ELEGANTULUS Ruhl.
Additional bibliography: Moldenke, Phytologia 35: 446--449 & 456 (1977) and 36: 35. 1977.
Monteiro has encountered this plant growing on quartzite.
Additional citations: BRAZIL: Minas Gerais: Monteiro de S. 235 [Vianna 396; Herb. FEEMA 8085] (Ld), s.n. [Herb. FEEMA 6716]

(Ld).

SYNGONANTHUS ELEGANTULUS var. GLAZIOVII Moldenke, Phytologia 36: 35, June 18 (1977) & 36: 116. June 23. 1977.

Bibliography: Moldenke, Phytologia 36: 35 & 116. 1977.

Material of this variety has mistakenly been distributed in some herbaria as Paepalanthus elegans Kunth, Syngonanthus elegans var. elanatus Ruhl., S. niveus Ruhl., or (in the case of Glaziou 16398) as Paepalanthus sp. nov.; Glaziou 20013 was regarded by Ruhland (1903) as a cotype of his S. elegans var. elanatus; both Glaziou collections were cited by me in a previousinstallment of these notes as S. elegans var. elanatus, a taxon which they closely resemble.

Citations: BRAZIL: Minas Gerais: Glaziou 16398 (N), 20013 (Br—isotype, C—type); Monteiro de S. s.n. [19.XII.1971] (Z).

SYNGONANTHUS FERTILIS (Körn.) Ruhl.

Additional bibliography: Moldenke, Phytologia 35: 452—453 (1977) and 36: 35. 1977.

SYNGONANTHUS FISCHERIANUS (Bong.) Ruhl.

Additional synonymy: Eriocaulon nardifolium "Kunth ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilus. Catar. I Erio: 99, in syn. 1976. Paepalanthus vaginatus "Mart. ex Moldenke" apud Moldenke & Sm. in Reitz, Fl. Ilus. Catar. I Erio: 102, in syn. 1976.

Additional bibliography: Moldenke & Sm. in Reitz, Fl. Ilus. Catar. I Erio: 62, 63, 77, 80—83, & 98—103, pl. 8, fig. 32—39. 1976; Moldenke, Phytologia 35: 454—456 (1977) and 36: 56 & 78—80. 1977.

Illustrations: Moldenke & Sm. in Reitz, Fl. Ilus. Catar. I Erio: 63, pl. 8, fig. 32—39. 1976.

Vernacular names reported for this species are "capim-manso", "capipoatinga-de-fischer", "gravatá-manso", and "sempre-viva-do-campo" and it is said to flower in December and January in southern Brazil.

SYNGONANTHUS FLAVIDULUS (Michx.) Ruhl.

Additional bibliography: Moldenke, Phytologia 36: 54—60, 487, & 493 (1977) and 37: 24. 1977.

SYNGONANTHUS FUSCESCENS Ruhl.

Additional bibliography: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [23], 24, & 26. 1976; Moldenke, Phytologia 36: 61—62. 1977.

Monteiro-Scanavacca & Mazzoni (1976) report that there is no vegetative reproduction from the apex of the inflorescence in this species, citing Monteiro-Scanavacca 4302 from Minas Gerais, Brazil.

SYNGONANTHUS GLANDULOSUS Gleason

Additional bibliography: Moldenke, Phytologia 36: 35, 36, 63—

66, 74, & 76. 1977.

SYNGONANTHUS GRACILIS var KOERNICKEANUS Ruhl.

Additional bibliography: Moldenke, Phytologia 36: 72, 73, 75, & 83—85. 1977.

Ruhland (1903) describes this variety as "Differt foliis semper recurvato-caespitosis vel subrosulatis, nigro-olivaceis vel olivaceo-glaucescentibus, appresso-puberulis, serius glabriusculis, plerumque fere 2 cm longis; vaginis arctissimis, folia adaequantibus vel superantibus, patentissime glanduloso-puberulis, dein calvis, plus minus perspicue costato-striatis; pedunculis 3 costatis, saepe tortis, subaequaliter puberulis, 7—22 cm altis; bracteis involucrantibus naviculari-imbricatis, exterioribus brevioribus, rotundato-obtusis, interioribus obovatis vel oblongo-obovatis, acutiusculis vel obtusiusculis, flores includentibus, omnibus glabris et nitide aureo-stramineis." He cites the following Brazilian specimens: Bahia: Salzmann s.n., Sellow 626. Goiás: Burchell 6917. Maranhão: Schwacke 686. Minas Gerais: Sena s.n. [Herb. Schwacke 12827]. Rio de Janeiro: Riedel 557, Sellow s.n. São Paulo: Riedel 2304.

Körnicke's Paepalanthus gracilis var. β subvar. α is based on Luschnath s.n. [inter Macagé et Campos], Riedel 557 in part, Sellow s.n. [Rio de Janeiro] & s.n. [inter Vittoria et Bahia], and Weddell 552.

The Limnoxeranthemum pubescens Salzm., cited by Ruhland (1903) in the synonymy of Syngonanthus gracilis var. koernickeanus, is actually more correctly placed in that of S. gracilis var. hirtellus (Steud.) Ruhl., which see.

Recent collectors refer to S. gracilis var. koernickeanus as having "stems and leaves greenish-sericeous", with "crowded multiple rosettes of grass-green subcoriaceous leaves", the basal rosettes often nearly buried in sand, the sheaths brown, the bracts pale-yellow, and the flower-heads white. They have found it growing in savanna forests, in sandy places on savannas, in moist places, wet valleys, moist meadows, and white-sand grassland, in rich wet soil bordering springs on llanos, and along seepage in wet savannas, at altitudes of 100—1400 meters, flowering in January, May, June, August, September, October, and December, fruiting in August and October. Koyama & Oldenburger found it growing in association with S. glandulosus, Philodice hoffmannseggii, Diplacrum africanum, Bacopa monierioides, Centunculus pentander, Polygala paludosa, Utricularia adpressa, and Eleocharis nana. Kramer & Van Donselaar (1968) include it in what they call a Syngonantho-Hyridion alliance in Surinam, where they assert that it is "Not rare in open savannas and open woods".

Schulz & Poveda encountered S. gracilis var. koernickeanus in "el 'morichal abierto' - pastizal inundado a la temporada húmeda, con matos de Mauritia minor en las depreciones, horizonte superficie del suelo rico en mater orgánico, con Panicum laxum, Paspalum spp., Xyris savanensis, Sauvagesia erecta, Polygala timtoutou, etc."

The Paepalanthus brizoides Kunth, referred to in the synonymy of this taxon, is in part probably also a synonym of S. gracilis var. subinflatus Ruhl. according to Ruhland (1903). The material comprising Pabst 4612, cited below, is very immature.

The Angely (1972) work cited in the bibliography is often cited as "1970", the title-page date, but was not actually published until 1972.

Lindeman & Görts-van Rijn (1968) cite from Surinam: Hostmann 1066, Huk 61, Kramer & Hekking 2241, 2928, & 3081, Lanjouw 434, Lanjouw & Lindeman 860, Lindeman 128, 244, 307, 3013, 4228, & 4229, and Van Donselaar 738. Hostmann 1066, however, is a mixture with S. simplex (Miq.) Ruhl., of which it is the type collection and which I regard as a separate taxon. Lanjouw & Lindeman 860 is a mixture with typical S. gracilis (Bong.) Ruhl.

Silveira (1928) cites Silveira 516 from Diamantina, Minas Gerais, Brazil, collected in 1908.

Material of this variety has been misidentified and distributed in some herbaria under the designations Paepalanthus oxycnemis Mart., P. gracilis var. b subvar. β Körn., P. gracilis var. α Körn., Syngonanthus gracilis (Bong.) Ruhl., and S. gracilis var. setaceus Ruhl.

Additional citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 18093 (Z). Vichada: F. J. Hermann 11054 (N, W—1906224). VENEZUELA: Bolívar: Pannier & Schwabe 1777 (Ve); J. A. Steyermark 89686 (Mi, N); Steyermark, Dunsterville, & Dunsterville 104231 (Ft); Steyermark & Nilsson 456 (Mi), 638 (Mi, N). Guárico: Guyon 112 (P); Schulz & Poveda 232 (Ut—320389). GUYANA: C. D. K. Cook 133 (K, S); Goodland & Persaud 1097 (Ld, W—2546170); Irwin 500 (W—2212838); Tutin 619 (Ut—39599A, W—1743628). SURINAM: Donselaar 3621 (Ut—320400); Hostmann 633 (Ut—411), 1066 in part (Ut—411); Hulk 61 (Ut—31952); Lanjouw 434 (Ut—44053A); Lanjouw & Lindeman 128 (Ut—17892B), 244 (Ut—17896B), 860 in part (N, Ut—1789aB), 3013 (Ut—17891B), 3307 (Ut—17890B); Van Donselaar 738 (Ut—93607B). FRENCH GUIANA: Hoock 872 (P), s.n. [11 Aout 1962] (P). BRAZIL: Amapá: W. A. Egler 1427 [Herb. Mus. Goeldi 24583] (Mi), 1444 [Herb. Mus. Goeldi 24599] (Mi). Bahia: Belém 1682 (Ac); A. P. Duarte 6079 [Herb. Brad. 15444] (Lw); Sellow 626 (B—cotype). Maranhão: Murça Pires & Black 2198 (N). Pará: Froés 29358 (Z); Murça Pires & Silva 4263 (N); Sick s.n. [Pabst 4612] (Bd). Rio de Janeiro: L. Riedel 557 (B—cotype, B—cotype, B—cotype, Mu—cotype, Ut—404—cotype), 2305 (Ut—402); Segadas-Vianna, Dau, Ormond, Machline, & Lorêdo 943 (Ja); Sellow s.n. [inter Rio Janeiro et Campos, 1815] (B). Rondônia: Black & Cordeiro 52-14785 (Z). São Paulo: L. Riedel 2304 (B—cotype, Mu—cotype, Ut—403—cotype), s.n. [Batataes] (B). State undetermined: Herb. A. Gray s.n. (T).

SYNGONANTHUS GRACILIS var. LATIFOLIUS Moldenke, Phytologia 21: 418. 1971.

Bibliography: Moldenke, Phytologia 21: 418. 1971; Moldenke, Fifth Summ. 2: 962 & 968. 1971; Moldenke, Biol. Abstr. 53: 5252. 1972.

This variety differs from the typical form of the species and from all other described varieties of it in having its basal leaves very numerous, closely appressed to the ground, and uniformly about 2 mm. wide at the midpoint.

Citations: BRAZIL: Mato Grosso: Irwin, Grear, Souza, & Reis dos Santos 16349 (N—type).

SYNGONANTHUS GRACILIS var. LUETZELBURGII Herzog, Estud. Bot. Nordest. Bras. 3 [Insp. Fed. Obras Secc. Publ. 57]: 149 & 151. 1923.

Bibliography: Herzog, Estud. Bot. Nordest. Bras. 3 [Insp. Fed. Obras Secc. Publ. 57]: 149 & 151. 1923; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 107 & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 962. 1971; Moldenke, Phytologia 31: 386. 1975.

This variety is obviously based on Lützelburg 283 from Vao do Faria, in southern Piauí, Brazil, where it is said to be typical of the "carrasco" formation, deposited in the Munich herbarium where it was photographed by Macbride as his type photograph number 18744. Macbride's photograph shows only the upper two of the three plants on the type sheet. The label avers that the locality of collection is in Bahia, but the Gray Herbarium's index cards refer it to Piauí and also claim that the original publication is a nomen nudum. Herzog, however, provides this formal description on the type sheet: "differt bracteis involucrantibus subacutis, pedunculis numerosissimis brevibus".

Citations: BRAZIL: Piauí [or Bahia?]: Lützelburg 283 [Macbride photos 18744] (Mu—type, N—photo of type, Z—photo of type).

SYNGONANTHUS GRACILIS var. PALLIDUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 240 [as "pallida"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946.

Synonymy: Syngonanthus gracilis var. pallida Ruhl. in Engl., Pflanzenreich 13 (4-30): 250. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 250 & 293. 1903; Herzog in Fedde, Repert. Spec. Nov. 29: 212. 1931; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Alph. List Cit. 4: 1076. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65, 92, & 213. 1949; Moldenke, Phytologia 4: 319. 1953; Moldenke, Résumé 73, 107, 352, & 492. 1959; Moldenke, Résumé Suppl. 1: 6. 1959; Moldenke, Fifth Summ. 1: 127 & 174

(1971) and 2: 637 & 962. 1971; Moldenke, Phytologia 36: 83. 1977.

This variety is based on Passarge & Selwyn 258 from "Venezuela: Gebiet des unteren Orinoko, sumpfige Wiesen am Sipao, Monte oscuro" and M. Guedes 603 from "Brasilianisches Guyana: am Rio Maracá". Ruhland (1903) describes it as "Differt foliis e basi vix vel non dilatata paullisper elongato-linearibus, subarrecto-caespitosis, 1—3-nerviis, acutiusculis, pilis brevissimis, appressis leviter puberulis, mox glabriusculis, ad 8 cm [probably a typographic error for "mm."] longis; vaginis erectis, arctis, pallide viridi-flavidulis, profunde striato-costatis, pilis sparsis, patentibus, eglandulosis, pubescenti-hirtis; pedunculis erectis, nitide stramineis, profunde 3 costatis, subrobustis, apicem versus pilis arrecto-patentibus, glanduliferis pubescentibus, 14—16 cm longis; bracteis involucrantibus pallide albo-spadiceis, obovatis, acutis, capitulum 4,5—5 mm latum perspicue includentibus." He comments that "Habitu quam antecedens [var. subinflatus Ruhl.] robustior." Herzog (1931) thinks that it may be identical with var. amazonicus Ruhl. It has been collected in anthesis in August, November, and December.

Additional citations: VENEZUELA: Bolívar: J. A. Steyermark 90387 (Z). BRAZIL: Piauí: Wachsmund s.n. (B).

SYNGONANTHUS GRACILIS f. PROLIFER Moldenke, Phytologia 22: 6. 1971.

Bibliography: Moldenke, Fifth Summ. 1: 174 (1971) and 2: 962. 1971; Moldenke, Phytologia 22: 6. 1971; Hocking, Excerpt. Bot. A.21: 30. 1972; Moldenke, Biol. Abstr. 54: 6295. 1972; Moldenke, Phytologia 31: 386. 1975.

This form differs from the typical form of the species in having its flower-heads distinctly proliferous, each producing from 3 to many linear leaf-like growths to 5 mm. in length. Anderson found it growing in open woods on rocky slopes and along streams, in wet mossy mats on rocks by streams, and similar places, at 1150 m. altitude, flowering and fruiting in April.

Citations: BRAZIL: Minas Gerais: W. R. Anderson 8873 (N); G. Gardner 5281 (N—type).

SYNGONANTHUS GRACILIS var. PULCHER Alv. Silv., Fl. Mont. 1: 347 [as "pulchra"]. 1928; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946.

Synonymy: Syngonanthus gracilis var. pulchra Alv. Silv., Fl. Mont. 1: 347. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 347 & 418. 1928; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 107, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 637 & 962. 1971.

This variety is based on A. Silveira 716 from "In campis inter Serrinha et Itacambira", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. On page

418 of his work (1928) Silveira gives Itacambira as the type locality. He describes the variety as "Foliis supra appresso-pubescentia, subtus glabra, 6—12 mm longa, 0.5 mm medio lata. Pedunculi numerosi, filiformes virides, dense pilis glanduliferis obsiti, 3—8 cm alti, 3-costati, non vel paullo torti vaginae oblique fissae ut pedunculos pubescentes 6—10 mm elatae. Capitula 2 mm lata, pallide albo-flavida. Bracteae involucrantes obovatae rotundato-obtusae, flores claudentes." Thus far it is known only from the original collection.

SYNGONANTHUS GRACILIS var. RECURVIFOLIUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 252 [as "recurvifolia"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 16 & 58. 1946.

Synonymy: Syngonanthus gracilis var. recurvifolia Ruhl. in Engl., Pflanzenreich 13 (4-30): 252. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 252 & 293. 1903; Herzog in Fedde, Repert. Spec. Nov. 29: 212. 1931; Moldenke, Known, Geogr. Distrib. Erioc. 6, 18, & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65, 92, & 213. 1949; Moldenke, Résumé 73, 107, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 127 & 174 (1971) and 2: 637 & 963. 1971; Moldenke, Phytologia 36: 79 & 83. 1977.

This variety is based on Passarge & Selwyn 81 from "Gebiet des unteren Orinoko, Savanne bei S. Lucia, auf abgebranntem Grasland" in Venezuela and W. Schwacke 4084 from "Amazonasgebiet; Cachoeira grande am Rio Negro bei Manáos" in Brazil, both deposited in the Berlin herbarium. Ruhland (1903) describes the variety as "Differt foliis brevissimis, recurvato-rosulatis, angustissime linearibus, obtusiusculis, atro-olivaceis, appresso-puberulis, mox calvescentibus, modo 5—6 mm longis; vaginis folia multiplo superantibus, arctissimis, lamina appressa, apice obtusiuscula praeditis, torto-striatulis, brunneolis, persistenter patentihirtellis, 2 cm longis; pedunculis gracillimis, 3 costatis, valde tortis, splendido subolivaceo-flavidis usque 14 cm altis; capitulis parvis, apertis, vix 2 mm latis, plerumque opacis; bracteis involucrantibus concavis, ovatis, imbricatis, rotundato-obtusis, flores vix adaequantibus, non vel vix nitidulis."

It has been collected in anthesis in December. Material has been misidentified and distributed in some herbaria under the designation Paepalanthus hirtellus var. β Körn.

Citations: BRAZIL: State undetermined: J. E. Pohl s.n. [Brasilia] (Mu).

SYNGONANTHUS GRACILIS var. SETACEUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 252 [as "setacea"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946.

Synonymy: Paepalanthus oxycnemis Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 461, in syn. 1863. Paepalanthus gracilis var. ρ subvar. β Körn. in Mart., Fl. Bras. 3 (1): 461—463. 1863. Paepalanthus gracilis var. b. subvar. β Körn. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 252, in syn. 1903. Paepalanthus gracilis var. b var. β Körn. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 290, in syn. 1903. Syngonanthus gracilis var. setacea Ruhl. in Engl., Pflanzenreich 13 (4-30): 252. 1903. Syngonanthus gracilis setacea Ruhl. ex Moldenke, Résumé Suppl. 12: 12, in syn. 1965.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 461--463. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Ruhl. in Engl., Pflanzenreich 13 (4-30): 252, 290, & 293. 1903; Alv. Silv., Fl. Mont. 1: 418. 1928; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 18, 49, 52, & 58. 1946; Moldenke, Phytologia 2: 492. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 319. 1953; Moldenke, Résumé 107, 325, 327, 352, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 12: 5 & 12. 1965; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 583, 587, 637, & 963. 1971; Moldenke, Phytologia 34: 276 (1976) and 36: 73, 75, & 78. 1977.

This variety is based on Martius 557 from Campos, Rio de Janeiro, and Glaziou 14359 from Cabo Frio in the same state, deposited in the Berlin herbarium. Ruhland (1903) describes it as "Differt foliis arrecto-caespitosis, setaceo-linearibus, longiusculis, acutangulis, obtusiusculis, juventute pilis brevibus aspersis, mox glabriusculis, in sicco atro-olivaceis vel spadiceo-brunneis, 2--2,5 cm longis; vaginis folia vix adaequantibus, arctis, subtiliter striatis, pilis glanduliferis patenti-puberulis; pedunculis erectis, gracillimis, tortis, 3 costatis, sparse glandulifero-puberulis, circ. 14 cm altis; capitulis subglobosis, semi-apertis, demum circ. 3 mm latis; bracteis involucrantibus flores perspicue superantibus, interioribus acutiusculis, omnibus obovatis, glabris, nitide stramineo-flavidis, concavis."

Körnicke's Paepalanthus gracilis var. β subvar. β is based on Luschnath s.n. [Campos Bravos] and Riedel 557 in part [inter Macahé et Campos].

Recent collectors have encountered this plant in "bare spots in shrubby restinga", flowering in September. Silveira (1928) cites A. Silveira 603 from Bahia, collected in 1912.

Additional citations: BRAZIL: Guanabara: B. Lutz 602 (Ja--24576, Ja--113694, Ja, W--1593789). Rio de Janeiro: Segadas-Vianna, Dau, Ormond, Machline, & Lorêdo 943 (Z). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

SYNGONANTHUS GRACILIS var. SUBINFLATUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 250 [as "subinflata"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946.

Synonymy: Paepalanthus brizoides Kunth, Enum. Pl. 3: 534, in part. 1841. Paepalanthus gracilis var. α subvar. α Körn. in

Mart., Fl. Bras. 3 (1): 460—463. 1863. Paepalanthus gracilis var. a subvar. α Körn. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 250 & 290, in syn. 1903. Paepalanthus gracilis var. a var. α Körn. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 290, in syn. 1903. Syngonanthus gracilis var. subinflata Ruhl. in Engl., Pflanzenreich 13 (4-30): 250. 1903.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 460—463. 1863; Ruhl. in Engl., Pflanzenreich 13 (4-30): 250, 290, & 293. 1903; Moldenke, Known Geogr. Distrib. Erioc. 18, 49, & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 107, 325, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 583, 637, & 963. 1971; Moldenke, Phytologia 34: 275 & 276 (1976) and 36: 73 & 83. 1977.

This variety is based on A. Silveira 865 from "an feuchten Stellen in der Serra do Lenheiro", Minas Gerais, Brazil, deposited in the Berlin herbarium. Ruhland (1903) describes it as "Differt bracteis involucrantibus spadiceo-brunneis, rotundato-obtusis, glabris, capitulum perspicue superantibus et subincludentibus; pedunculis perspicue 3 costatis, stramineo-flavidis, pilis arrecto-patentibus, eglandulosis, praesertim apice subdense et persistenter pilosis, ad 11 cm longis; vaginis laxiusculis, virescentibus, striatis, pilis squarroso-patentibus, glanduliferis hirtis, 3 cm longis; foliis valde repressis, fere rosulatis, viridibus, obtusiusculis, levissime puberulis, 6—7 mm longis." Thus far it is known only from the original collection which was collected in anthesis in April.

Körnicke's Paepalanthus gracilis var. α subvar. α was based by him on Salzmann s.n. from Bahia (but he cited another Salzmann s.n. from Bahia under his P. gracilis var. c).

Ruhland (1903) cites Eriocaulon brizoides Kunth, Enum. Pl. 3: 534 (1841) as questionably belonging [in part?] in the synonymy of this variety, but he also regards it as questionably [in part] var. koernickeanus Ruhl. In previous publications I have regarded it as in part typical S. gracilis, but this seems to be incorrect. For some reason unknown to me he dates Kunth's work "1840".

SYNGONANTHUS GRACILIS var. TENUISSIMUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 250 [as "tenuissima"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946.

Synonymy: Syngonanthus gracilis var. tenuissima Ruhl. in Engl., Pflanzenreich 13 (4-30): 250. 1903. Syngonanthus gracilis tenuissima Ruhl. ex Moldenke, Résumé Suppl. 12: 12, in syn.. 1965.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 250 & 293. 1903; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 319. 1953; Moldenke, Résumé 107, 352, & 492. 1959; Moldenke, Résumé Suppl. 12: 12. 1965; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 637 & 963. 1971; Moldenke, Phytologia 29: 211 (1974), 30: 37 (1975), 31: 386 (1975), and 36:

83. 1977.

This variety is based on Regnell III.1266 and III.1801 from Caldas, Minas Gerais, Brazil, deposited in the Berlin herbarium. Ruhland (1903) describes it as "Differt foliis plus minus erecto-distantibus, caespitosis, e basi dilatata setaceo-linearibus, obtusiusculis, raro subrecurvatis, pilis brevibus irregulariter subappressis, puberulis, 3—4 mm longis; pedunculis 10--12 cm longis; vaginis folia longe superantibus, ut folia pilosis; pedunculis primo intuitu teretibus, costulis vix vel non conspicuis, tenuissimis, stramineo-flavidis, apicem versus interdum sparse puberulis; bracteis involucrantibus obovatis, pallide aureis, plerumque perspicue acutiusculis, capitulum includentibus."

Recent collectors have encountered this plant on moist campos, flowering in May, July, and August. Material has been misidentified and distributed in some herbaria as S. gracilis var. recurvifolia Ruhl. Lützelburg 20687 is a mixture with Eriocaulon neglectum Ruhl. and Paepalanthus lamarckii Kunth.

Additional citations: BRAZIL: Amazônas: Lützelburg 20687 in part (Mu). Minas Gerais: Lützelburg 20938 (Mu, Z); Regnell III. 1266 [1/1848] (W—200757—cotype, Z--cotype), III.1266 [5/4/1870] (W--936258—cotype).

SYNGONANTHUS GRAO-MOGOLENSIS Alv. Silv., Fl. Mont. 1: 342—343, pl. 216. 1928.

Synonymy: Syngonanthus grão-mogolensis Alv. Silv., Fl. Mont. pl. 216. 1928. Syngonanthus grao-nogolensis Alv. Silv. ex Moldenke, Résumé Suppl. 18: 14, in syn. 1969.

Bibliography: Alv. Silv., Fl. Mont. 1: 342—343 & 418, pl. 216. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Phytologia 2: 493 & 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 107, 352, & 492. 1959; Moldenke, Résumé Suppl. 18: 14. 1969; Moldenke, Phytologia 20: 80. 1970; Anon., Biol. Abstr. 52 (3): B.A. S.I.C. S.228. 1971; Moldenke, Biol. Abstr. 52: 1316. 1971; Moldenke, Excerpt. Bot. A.18: 445. 1971; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 637 & 963. 1971; Moldenke, Phytologia 34: 277. 1976.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 216. 1928.

This species is based on A. Silveira 842 from "In campis arenosis humidisque secus margines fluminis Iracambirussu, prope Grão Mogol", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium.

Citations: BRAZIL: Pará: Castro Soares s.n. [Herb. Rio Jan. 86788] (N).

SYNGONANTHUS GRAO-MOGOLENSIS var. DETONSUS Moldenke, Phytologia 20: 80 [as "grão-mogolensis"]. 1970.

Synonymy: Syngonanthus grão-mogolensis var. detonsus Moldenke, Phytologia 20: 80. 1970.

Bibliography: Moldenke, Phytologia 20: 80. 1970; Anon. Biol. Abstr. 52 (3): B.A.S.I.C. S.228. 1971; Moldenke, Biol. Abstr. 52: 1316. 1971; Moldenke, Excerpt. Bot. A.18: 445. 1971; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 637 & 963. 1971; Moldenke, Phytologia 34: 277. 1976.

Citations: BRAZIL: Minas Gerais: Irwin, Reis dos Santos, Souza, & Fonseca 23354 (N--isotype, Z--type).

SYNGONANTHUS GUIANENSIS Moldenke, Phytologia 2: 352 & 381, nom. nud. 1947; in Maguire & al., Bull. Torrey Bot. Club 75: 201--302. 1948.

Bibliography: Moldenke, Phytologia 2: 352 & 381. 1947; Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 201—202. 1948; Moldenke, Alph. List Cit. 3: 701. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 67 & 213. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 76, 419, & 492. 1959; Moldenke, Fifth Summ. 1: 131 (1971) and 2: 778 & 963. 1971.

This species is based on Maguire & Fanshawe 23236 from the Kaieteur Savanna, Guyana, collected on May 4, 1944, and deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe it as a locally frequent, annual, short-stemmed herb with canescent leaves. Superfically it greatly resembles Blastocaulon rupestre (G. Gardn.) Ruhl. of Minas Gerais, Brazil.

Citations: GUYANA: Maguire & Fanshawe 23182 (N), 23236 (N--type).

SYNGONANTHUS HABROPHYUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 274. 1903.

Synonymy: Syngonanthus habrophyllus Ruhl. ex Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 242. 1956. Paepalanthus habrophyus Ruhl. ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959. Syngonanthus habraphys Ruhl. ex Moldenke, Résumé Suppl. 12: 12, in syn. 1965.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 274, & 293. 1903; Ruhl., Verh. Bot. Ver. Brand. 48: 130. 1907; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 418, 1928; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Phytologia 2: 493. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 320. 1953; Mendes Magalhães, Anais V. Reun. Anual Soc. Bot. Bras. 242—243. 1956; Moldenke, Résumé 107 & 492. 1959; Moldenke, Résumé Suppl. 1: 20. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Résumé Suppl. 3: 35 (1962) and 12: 12. 1965; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 584, 637, & 963. 1971.

This species is based on Glaziou 6449 from dry sand near the sea at Restinga de Tijuca, Rio de Janeiro, Brazil, deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10687. Recent collectors have found it growing on bare ground of shrubby restinga between shrubs and trees, forming colonies, and ascending from about sealevel to 1200 m. altitude, flowering from January to September, and fruiting in February and July. Silveira (1928) cites A. Silveira 541 from the Serra de Ibitipoca, Minas Gerais, collected in 1895. Ruhland (1903) asserts that the species is related to S. ulei Ruhl.

The Segadas-Vianna, Dau, Ormond, Machline, & Lorêdo I.940, distributed as S. habrophyus, actually is S. nitidus (Bong.) Ruhl., while Mexia 5734 is S. niveus var. rosulatus (Körn.) Moldenke and Brade 11004 and Mello Barreto 4794 [Herb. Jard. Bot. Belo Horiz. 17534] are S. pauper Ruhl.

Additional citations: BRAZIL: Minas Gerais: Héringer & Castellanos 6173 (B); Mello Barreto 25853 (N); Segadas-Vianna 6007 (Sm). Rio de Janeiro: Glaziou 6449 [Macbride photos 10687] (B—type, N—isotype, N—photo of type, W—photo of type, Z—isotype); Segadas-Vianna, Dau, Ormond, Machline, & Larêdo 149 (Ja), 374 (Sm).

SYNGONANTHUS HARLEYI Moldenke, Phytologia 31: 489—491. 1975.

Bibliography: Moldenke, Phytologia 31: 386 & 489—491. 1975; Anon., Biol. Abstr. 61: AC1.718. 1976.

Illustrations: Moldenke, Phytologia 31: 491. 1975.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16662 (Z—type).

SYNGONANTHUS HATSCHBACHII Moldenke (in press)

Citations: BRAZIL: Bahia: Hatschbach 39668 (Z—type).

SYNGONANTHUS HELMINTHORRHIZUS (Mart.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 261. 1903.

Synonymy: Eriocaulon umbellatum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1831 [not E. umbellatum Humb., 1826, nor Humb. & Bonpl., 1817, nor H.B.K., 1817, nor Humb. & Kunth, 1852, nor Kunth, 1841 & 1852, nor Lam., 1789]. Paepalanthus helminthorrhizus Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 443—444, pl. 60, fig. 4. 1863. Paepalanthus helminthorrhizus var. α Körn. in Mart., Fl. Bras. 3 (1): 443—444. 1863. Paepalanthus helminthorrhizus var. β Körn. in Mart., Fl. Bras. 3 (1): 443—444. 1863. Paepalanthus (Andraspidopsis) helminthorrhizus Körn. in Mart., Fl. Bras. 3 (1): pl. 60, fig. 4. 1863. Dupatya helminthorhiza (Mart.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya helminthorhiza Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145, in syn. 1902. Dupatya helminthorrhiza Kuntze apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 261, in syn. 1903. Syngonanthus helminthorrhizus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus helminthorrhizus "(Martius) ex Koernicke Ruhland in Engler" apud Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1162. 1972.

Bibliography: Bong., Ess. Monog. Erioc. 3. 1831; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1831; Körn. in Mart., Fl. Bras. 3 (1): 443—444, 451, 502, & 507, pl. 60, fig. 4. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 3, 246, 261, 264, 287, 290, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 418. 1928; Stapf, Ind. Lond. 4: 518. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Alph. List Cit. 1: 56, 303, & 304. 1946; Moldenke, Known Geogr. Distrib. Erioc. 18, 30, 41, 49, & 58. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Alph. List Cit. 3: 951 (1949) and 4: 1301 & 1304. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 320. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 107, 117, 280, 293, 325, 351, 352, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Résumé Suppl. 3: 35. 1962; Hocking, Excerpt. Bot. A.9: 290. 1965; Moldenke, Biol. Abstr. 46: 3616. 1965; Moldenke, Résumé Suppl. 18: 9. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 158. 1969; Moldenke, Fifth Summ. 1: 174, 187, & 481 (1971) and 2: 515, 584, 636, 637, & 963. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1162 & Ind. 20 & 28. 1972; Moldenke, Phytologia 23: 418 (1972), 28: 463 (1974), 31: 408 (1975), and 34: 276. 1976.

Illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 60, fig. 4. 1863.

This species is apparently based on an unnumbered Riedel collection from swampy places along the Rio Pardo, Mato Grosso, Brazil, deposited in the Leningrad herbarium, the type of Eriocaulon umbellatum Bong. (1831). Körnicke (1863), in adopting Martius' cheironymous name, Paepalanthus helminthorrhizus, for this species, apparently used it as a substitute for Bongard's earlier name since the latter was a later homonym of the Eriocaulon umbellatum of Lamarck as well as of that of H.B.K. It would appear to me, therefore, that the type of Bongard's name remains the type also of Körnicke's name and of his Paepalanthus helminthorrhizus var. β, the typical variety, although G. Gardner 5264 and J. E. Pohl 3302 have in the past been regarded as cotypes of the latter variety, for which he cites these collections and an unnumbered Riedel collection from the Berlin herbarium. This Riedel collection is ascribed by Ruhland (1903) to Rio Grande do Sul, but K. Emrich, in a letter to me dated January 30, 1950, asserts that it is from Mato Grosso since Riedel never collected in Rio Grande do Sul.

Körnicke's original description of his var. α is: "foliis caulinis pilis brevibus arrectis puberulis vel pubescentibus demum calvis" and cites for it "in Brasilia orientali: Sellow; in prov. Goyazensi: Pohl; e. gr. in paludosis prope Aracoara: Riedel n. 2202." His var. β is described by him as "foliis caulinis pilis patentibus vel patentissime longioribus pubescentibus vel hirsutis. Er. umbellatum Bong., nec Lam. nex HBKth. in paludibus ad ripas Rio Pardo prov. Rio Grande do Sul: Riedel; in prov. Minarum: Gardner n. 5264; in prov. Goyazensi inter praedia Alegras et Trinidade: Pohl n. 3302."

Recent collectors describe S. helminthorrhizus as an herb, with its inflorescences 85—100 cm. tall, bearing "gray-green" heads. They have found it growing in brejo, swamps, and marshes, in low wet ground in cerrado on hills, and in gallery margins in areas of gallery forest and adjacent wet campo, at altitudes of 975—1300 meters, flowering and fruiting from July to October (also in flower in May). Silveira (1928) cites A. Silveira 423 from Itapetininga, São Paulo, collected in 1887.

The Eriocaulon umbellatum, referred to in the synonymy above, is a synonym of Syngonanthus umbellatus (Lam.) Ruhl., while that of Humboldt, Bonpland, & Kunth is in the synonymy of what we now know as S. humboldtii (Kunth) Ruhl.

The Angely (1972) work cited in the bibliography above is often listed as "1970", but was not actually published until 1972.

Ruhland (1903) cites the following collections for S. helminthorrhizus: Goiás: Glaziou 22313, J. E. Pohl 3302. Minas Gerais: G. Gardner 5264. Mato Grosso: L. Riedel s.n. São Paulo: Burchell 5206, Löfgren 156, L. Riedel 2202, Sellow 5470. He comments that "Specimina a cl. Glaziou sub n. 22313 collecta foliis caulinis longissimis, perrobustius a ceteris abhorrent".

The S. glandulosus Herzog, sometimes regarded as a synonym of the typical form of S. helminthorrhizus, is actually a synonym of its var. glandulosus Moldenke, which see.

Material of S. helminthorrhizus has been misidentified and distributed in some herbaria as S. glandulosus Herzog and as Paepalanthus sp.

Additional & emended citations: BRAZIL: Distrito Federal: Irwin, Grear, Souza, & Reis dos Santos 18162 (Ld, N, W—2759030); Irwin, Souza, & Reis dos Santos 8870 (N, W—2759029, Z). Goiás: Hatschbach 34593 (Ld); Macedo 1903 (S, S, S), 3341 (S, S); J. E. Pohl 3302 [N. Y. Bot. Gard. Type Photo New Ser. 8836] (Mu, Mu, Mu, N—photo, Z—photo); Ule 235 (P). Mato Grosso: Archer & Gehrt 185 [Herb. Inst. Bot. S. Paulo 36369] (W—1740840); Hatschbach 24559 (Ac, N, S, W—2706888), 32346 (Ld); Rombouts s.n. [Solos 241; Herb. Inst. Agron. S. Paulo 2752] (W—1459657). Minas Gerais: G. Gardner 5264 [Macbride photos 10688] (N, N—photo, W—photo); Hatschbach

27376 (Ft, S). São Paulo: Löfgren 156 (P); L. Riedel 2202 (B, M, N—photo, S, Ut—405, Z—photo); Sellow 5470 (B). PARAGUAY: Hassler 11427 (Ca—929865, Mi, N, V—13030, W—2055485). MOUNTED ILLUSTRATIONS: Körn. in Mart., Fl. Bras. 3 (1): pl. 60, fig. 4 (B, N, Z), n. 187 (B); drawings by Körnicke (B).

SYNGONANTHUS HELMINTHORRHIZUS var. GLANDULOSUS Moldenke, Phytologia 10: 489. 1964.

Synonymy: Syngonanthus glandulosus Herzog ex Moldenke, Résumé 351, in syn. 1959. Syngonanthus glandulosa Herzog ex Moldenke, Résumé 351, in syn. 1959 [not S. glandulosus Gleason, 1929].

Bibliography: Moldenke, Résumé 351. 1959; Moldenke, Phytologia 10: 489. 1964; Moldenke, Résumé Suppl. 11: 5. 1964; J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl., issue 246. 1965; Hocking, Excerpt. Bot. A.9: 290. 1965; Moldenke, Biol. Abstr. 46: 3616. 1965; Schubert, Assoc. Trop. Biol. Bull. 5: 68. 1965; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 636 & 963. 1971; Moldenke, Phytologia 31: 408. 1975.

Herzog's S. glandulosus apparently is based on Brade 6585 from the Horto Oswaldo Cruz at Butantan, São Paulo, Brazil, was collected there in September, 1921, and is deposited in the Munich herbarium where it was photographed by Macbride as his type photograph number 18743; it is inscribed "Syngonanthus glandulosus Herzog n. sp. ad interim". My variety, on the contrary, is based on Héringer 1340/534 from the mata at Horto de Guará, Brasilia, in the Distrito Federal, collected on May 17, 1961, and deposited in my personal herbarium.

Irwin and his associates refer to this variety as a rosette herb, the inflorescences to 1 m. tall, and the heads whitish. They encountered it in gallery forests at 1100 m. altitude, in flower and fruit in September.

Citations: BRAZIL: Distrito Federal: Héringer 8340/534 (Z—type); Irwin, Souza, & Reis dos Santos 8105 (N, N); Prance & Silva 59041 (N, S). São Paulo: Brade 6585 [Macbride photos 18743] (Mu, N, N—photo, W—photo).

xSYNGONANTHUS HESSII Moldenke, Phytologia 5: 341. 1956.

Synonymy: Syngonanthus angolensis H. Hess x S. poggeanus Ruhl. ex H. Hess, Bericht. Schweitz. Bot. Gesell. 65: 195. 1955. "x (S. angolensis x S. poggeanus) H. Hess" apud Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1955, p. 30. 1956. Syngonanthus angolensis x poggeanus H. Hess apud Moldenke, Phytologia 5: 341, in syn. 1956.

Bibliography: H. Hess, Bericht. Schweitz. Bot. Gesell. 65: 195 & 198, fig. 5. 1955; Moldenke, Phytologia 5: 341. 1956; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1955, p. 30 (1956) and 1956, p. 28. 1957; Moldenke, Résumé 147, 351, & 492. 1959; G. Taylor, Ind. Kew. Suppl. 13: 132. 1966; Moldenke, Fifth Summ. 1: 244 (1971) and 2: 635 & 963. 1971; Moldenke, Phytologia 34: 278 (1976) and 35: 314. 1977.

Illustrations: H. Hess, Bericht. Schweitz. Bot. Gesell. 65: 198, fig. 5. 1955.

Hess (1955) describes this natural hybrid as follows: "Folia aequalia illis parentium, glabra vel adpresso-pilosa vel pilis glanduliferis patentibus puberula. Vaginae plus minusve glanduloso-pilosae, saepe subglabrae. Culmi intermedii, 0,2—1 mm longi, capitula versus praesertim dense pilosi, sed saepe glaberrimi (culmo rotundo, non striato). Capitula subaequalia illis S. angolensis. Bracteae involucrantes albae vel flavescentes vel dilute fuscae. Sepala ♀ floris 2,3—2,7 mm longa, dorsaliter et ventraliter sparse usque dense pilosa, saepe glaberrima. Sepala ♂ floris intermedia, basi flavescentia usque albida. Pubescentia similis illi S. angolensis, plerumque parcior. Plantae normaliter fertiles."

He comments further that "Die Blätter sind von gleicher Form und Grösse wie die der Eltern; sie sind kahl, angedrückt behaart oder auch abstehend drüsenhaarig. Die Scheiden sind ± dicht mit abstehenden Drüsenhaaren besetzt, oft fast kahl. An den Halmen gibt es alle Übergänge zwischen dicht drüsenhaarigen und fast kahlen Exemplaren; dabei schwankt auch die Länge der Drüsenhaaren zwischen 0,2—1 mm. Die obersten Zentimeter unter den Blütenkopf sind bei Syngonanthus Poggeanus und S. Wahlbergii besonders dicht mit Drüsen- und Spitzhaaren besetzt. An den Nastarden ist dies auch zu beobachten, doch ist dieser Teil oft auch vollständig kahl. Die Blütenköpfe sind ungefähr gleich gross wie bei S. angolensis. Die Hüllbrakteen sind weiss, gelblich oder hellbraun. Die Sepalen der ♀ Blüten sind 2,3—2,7 mm lang, dorsal un ventral zerstreut bis dicht behaart, oft auch ganz kahl. Die Sepalen der ♂ Blüten sind in der Grösse ebenfalls intermediär, am Grunde gelblich bis weiss. Die Behaarung ist wie bei S. angolensis, jedoch meist spärlich. Die Pflanzen sind normal fertil."

He bases the hybrid on H. Hess 52/615, 52/2089, 52/2107, & 58/2113 from Bié, Angola, at 1100—1360 m. altitude, flowering in February and June. Its habitat is "Mit denen von Syngonanthus angolensis übereinstimmend und mit diesen gemeinsam vorkommend". Variations, he says, "Ergeben sich aus der Bastardnatur und sind in der Diagnose rücksichtigt". Its distribution is "Angola: Im Baixo Cubango und an den Seitenflüssen des Rio Cubango, am Rio Cuatir und am Rio Quiriri". Interestingly, he asserts that "Der einer Elter, Syngonanthus Poggeanus, findet sich nicht unter dem gesammelten Material aud Angola. Der locus classicus dieser Art liegt aber nördlich des Baixo Cubango." This admission that only one of the putative parenal species occurs with the hybrid is remarkable. If this situation is widespread in this family, it is most probable that many such hybrids will be discovered among the "variant" specimens now assigned tentatively to so many taxa in the group in the New World.

As far as we know, this hybrid is represented in herbaria only by the original collections.

SYNGONANTHUS HETEROPEPLOIDES Herzog in Fedde, Repert. Spec. Nov. 29: 211--212, pl. 120. 1931.

Bibliography: Herzog in Fedde, Repert. Spec. Nov. 29: 211--212, pl. 120, fig. k--m. 1931; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Alph. List Cit. 3: 975. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65, 92, & 213. 1949; Moldenke, Phytologia 4: 320. 1953; Moldenke in J. A. Steyerm., Fieldiana Bot. 28: 824. 1957; Moldenke, Résumé 69, 73, 107, & 492. 1959; Moldenke, Résumé Suppl. 4: 4. 1962; J. A. Steyerm., Act. Bot. Venez. 1: 247. 1966; Moldenke, Résumé Suppl. 16: 5. 1968; Moldenke, Fifth Summ. 1: 120, 127, & 174 (1971) and 2: 963. 1971; Moldenke, Phytologia 33: 138. 1976.

Illustrations: Herzog in Fedde, Repert. Spec. Nov. 29: pl. 120, fig. k--m. 1931.

This species is based on Lützelburg 21991 from on sand at Manaos, Amazônas, Brazil, deposited in the Munich herbarium; an isotype, also in the Munich herbarium, was photogarphed there by Macbride as his type photograph number 18745. Herzog (1931) says of this species: "Diese Art steht durch den Bau der ♀ Blüten das Fehlen der Bracteae stipantes und manche andere Züge dem S. heteropeplus nahe unterscheidet sich aber die ganz kahlen Kelchblätter der ♂ und ♀ Blüten ferner durch den Zuschnitt der Sepalen, die bei S. heteropeplus wesentlich schmäler und fast röhrig zugespitzt sind, die Petalen die bei unserer neuen Art deutlich schmäler und viel schwächer behaart sind, und schliesslich durch die perinteren Grössemunterschiede obwohl zwischen ♂ und ♀ Blüten, wie auch zwischen Sepalen und Petalen der ♀ Blüte."

Recent collectors have encountered this plant in moist open sandy areas and in wet ground along streams at the base of Mauritia palms, at 100--200 m. altitude, in flower in July, September, and October. Wurdack and his associates found it locally frequent on savannas.

The Schultes & Cabrera 17564, distributed as S. heteropeploides, actually represents, instead, S. huberi Ruhl., while Schultes, Baker, & Cabrera 17987 and Schultes & Cabrera 17586 are Paepalanthus saxicola var. conicus Moldenke.

Additional citations: VENEZUELA: Amazonas: Maguire, Wurdack, & Keith 41807 (N); Maguire, Wurdack, & Maguire 41630 (N, S); Wurdack & Adderley 43707 (N, S). BRAZIL: Amazônas: Lützelburg 21991 [Macbride photos 18745] (Mu--type, N--photo of isotype, W--photo of isotype, Z--isotype).

SYNGONANTHUS HETEROPEPLUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 248. 1903.

Synonymy: Paepalanthus heteropeplus Körn. in Miq., Ann. Mus. Lugd. Bat. 3: 238. 1867.

Bibliography: Körn. in Miq., Ann. Mus. Lugd. Bat. 3: 238. 1867;

Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Ruhl. in Engl., Pflanzenreich 13 (4-30): 244, 248, 290, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Herzog in Fedde, Repert. Spec. Nov. 29: 210—211. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 7, 49, & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 68 & 213. 1949; Moldenke, Résumé 78, 325, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 134 (1971) and 2: 584 & 963. 1971.

This species is based on Mélinon 338 from French Guiana, deposited in the herbarium of the Muséum National d'Histoire Naturelle in Paris and is thus far known only from the original collection. Ruhland (1903) says of it "Species sepali floris ♀ discum longe superante valde insignis esse dicitur. Ego eam non vidi."

The Lützelburg 20800, 20875, & 21035a, distributed as S. heteropeplus, actually are S. simplex var. appendiculifer Ruhl.

SYNGONANTHUS HETEROPHYLLUS Alv. Silv., Fl. Mont. 1: 369—370, pl. 234. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 369—370 & 418, pl. 234. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 107 & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 963. 1971; Moldenke, Phytologia 35: 348. 1977.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 234. 1928.

This species is based on A. Silveira 548 from "In campis arenosis prope Itacambira", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. In his text Silveira (1928) refers to "Tabula CCXXXV" as illustrating this species, but the illustration itself is labeled "TABULA CCXXXIV" — plate 235 actually depicts S. angustifolius Alv. Silv. He says of S. heterophyllus: "Species a S. elegans (Bong.) Ruhl. cauli hypogeo paullo elongato, capitulis minoribus et bracteis involucrantibus pallidioribus differt".

SYNGONANTHUS HETEROTRICHUS Alv. Silv., Fl. Serr. min. 73, pl. 29. 1908.

Bibliography: Alv. Silv., Fl. Serr. Min. 73, pl. 29. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 5. 1924; Alv. Silv., Fl. Mont. 1: 311—313, pl. 197, 198, & 209. 1928; Stapf, Ind. Lond. 6: 248. 1931; A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Alph. List Cit. 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 320. 1953; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 963. 1971; Moldenke, Phytologia 35: 425. 1977.

Illustrations: Alv. Silv., Fl. Serr. Min. pl. 29. 1908; Alv. Silv., Fl. Mont. 1: pl. 197, 198, & 209. 1928.

This species is based on A. Silveira 379 from "In cacumine montis, Morro do Breu, campis uliginosis, et aliis locis uvidis in Serra do Cipó", Minas Gerais, Brazil, collected in April, 1905, and deposited in the Silveira herbarium. Thus far it is known only from the original collection. It apparently bears a striking superficial resemblance to S. chapadensis Alv. Silv.

Citations: BRAZIL: Minas Gerais: A. Silveira 379 [Herb. Marie-Victorin 12437] (B--isotype, Z--isotype, Z--photo of isotype).

SYNGONANTHUS HIRTELLUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 252. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 244, 252, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 963. 1971.

This species is based on Glaziou 15514 from Itacolumy, near Ouro Preto, Minas Gerais, Brazil, flowering in June, and deposited in the Berlin herbarium. It is thus far known only from the original collection and Ruhland (1903) notes that the "Species cum S. gracili peraffinis". He distinguishes the two as follows:

1. "Folia anguste vel setaceo-linearia, glabra vel pilosula; bracteae involucrantes apice rotundato-obtusae".S. gracilis.
1a. "Folia plana, latiuscule linearia, hirtella; bracteae involucrantes acutiusculae"....................S. hirtellus.

SYNGONANTHUS HONDURENSIS Moldenke, Phytologia 1: 344--345. 1939.

Bibliography: Moldenke, Phytologia 1: 344--345. 1939; Moldenke, Carnegie Inst. Wash. Publ. 522: 146. 1940; Moldenke, Known Geogr. Distrib. Erioc. 4 & 58. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 224. 1947; Moldenke, Alph. List Cit. 3: 777. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 37 & 213. 1949; Standl. & Steyerm., Fieldiana Bot. 24: 378 & 379. 1958; Moldenke, Résumé 43 & 492. 1959; Moldenke, Fifth Summ. 1: 82 (1971) and 2: 963. 1971; Moldenke, Phytologia 35: 306. 1977.

Citations: BELIZE: O'Neill 8543 (I--isotype, Mi--type, N--isotype).

SYNGONANTHUS HUBERI Ruhl. in Engl., Pflanzenreich 13 (4-30): 266. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 264, 266, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 418. 1928; Gleason, Bull. Torrey Bot. Club 58: 327. 1931; Moldenke, Alph. List Cit. 1: 132. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5, 18, & 58. 1946; Moldenke, Phytologia 2:

493. 1948; Moldenke, Alph. List Cit. 3: 945 (1949) and 4: 1005 & 1075. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61, 92, 95, & 213. 1949; Moldenke, Phytologia 4: 320—321. 1953; Cuatrecas., Revist. Acad. Colomb. Cienc. 10: 254. 1958; Moldenke, Résumé 69, 76, 108, 112, & 492. 1959; Hocking, Excerpt. Bot. A.4: 284. 1962; Moldenke, Phytologia 19: 43. 1969; Moldenke, Fifth Summ. 1: 120, 131, 174, & 180 (1971) and 2: 963. 1971; Moldenke, Phytologia 23: 417 (1972), 33: 480 (1976), 34: 259 (1976), 35: 292, 317, & 346 (1977), and 36: 65, 66, & 470. 1977.

This species is based on J. Huber 173, collected in June, 1896, at "Rio Arary, in lichtem Camposwald auf Sand", on Marajo island in the mouth of the Amazon river, Brazil, deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10689. Ruhland (1903) cites only the one collection and says that the species "cum S. philodicoidi valde affinis foliis latioribus, bracteis involucrantibus et flores stipantibus glabris, appendicibus styli nullus ab illo differt".

Recent collectors refer to S. huberi as a herbaceous aquatic plant, to 15 cm. tall, with white inflorescences and flowers, and have found it growing in and under water, in open sandy swamps, in dense forests, on sandy savannas with a quartzite base, and in rapids, at altitudes of 200—500 meters, flowering from January to March and June to November, and fruiting from January to March as well as in July and August. Ramos reports encountering it in a "forest on high river banks, flowering just above water level". Agostini refers to it as "hierba en lecho de quebrada seca". Goodland found it growing along with Philodice hoffmannseggii Mart. and Eriocaulon guyanense Körn. in a "marsh with open hog-wallowed impeded drainage by mottled clay pan, about 6 inch top and 6 inch light gray sand, in grassland with scattered trees, the dominant being Curatella, Byrsonima, Trachypogon, and Fimbristylis". Cowan & Soderstrom call it a "locally common herb in boggy patches atop rocks in constant mist from falls". Campbell and his associates collected it "in cracks of exposed rock in debris".

Silveira (1928) cites Huber 436 from Marajo island. The species in many respects greatly resembles S. anomalus (Körn.) Ruhl. and S. macrocaulon Ruhl. Material has been misidentified and distributed in some herbaria as those species as well as Eriocaulon sp., S. glandulosus Gleason, S. glandulosus var. epapillosus Moldenke, Podostemaceae, and even Potamogetonaceae. On the other hand, the Egler & Murça Pires 47724, Murça Pires & Cavalcante 52413, Schultes, Baker, & Cabrera 18442, and A. C. Smith 2112, distributed as S. huberi, actually are S. macrocaulon Ruhl. The Ratter, Santos, Souza, & Ferreira R.1723, cited below, is a mixture with the type of f. viviparus Moldenke.

Additional citations: COLOMBIA: Meta: Killip 34259 (N, S). Vaupés: I. Cabrera 19702 (Ss); Schultes & Cabrera 13109 (Ss, W—2171099), 13192 (Ss), 14412 (Ss, W—2171416), 17240 (Ss), 19702 (N). VENEZUELA: Bolívar: Agostini 264 (N); Hamann 2895 (Hm).

GUYANA: Cowan & Soderstrom 2154 (Fg, N); Goodland 302 in part (Ld, W--2546172). BRAZIL: Amazônas: Prance, Maas, Atchley, Steward, Woolcott, Coêlho, Monteiro, Pinheiro, & Ramos 14426 (Ld); G. H. H. Tate 123 (N). Mato Grosso: Ratter, Santos, Souza, & Ferreira R. 1723 in part (Z). Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22433 (Ld); Lützelburg 23182 (Mu). MARAJO ISLAND: Huber 173 [Macbride photos] (B--type, N--photo of type, W--photo of type).

SYNGONANTHUS HUBERI f. VIVIPARUS Moldenke, Phytologia 33: 480. 1976.

Bibliography: Moldenke, Phytologia 33: 480 (1974), 34: 259 (1976), and 36: 66. 1977.

Material of this taxon has been misidentified and distributed in some herbaria as S. glandulosus var. epapillosus Moldenke.

The type collection is a mixture with typical S. huberi Ruhl.

Citations: BRAZIL: Mato Grosso: Ratter, Santos, Souza, & Ferreira R.1723 in part (N--type).

SYNGONANTHUS HUMBERTI Moldenke, Phytologia 3: 424--425. 1951.

Bibliography: Moldenke, Phytologia 3: 424--425 (1951) and 4: 321. 1953; Moldenke in Humbert, Fl. Madag. 36: 30, 31, & 36--37, fig. 18--24. 1955; Moldenke, Résumé 156 & 492. 1959; G. Taylor, Ind. Kew. Suppl. 12: 138. 1959; Moldenke, Fifth Summ. 1: 262 (1971) and 2: 963. 1971.

Illustrations: Moldenke in Humbert, Fl. Madag. 36: 31, fig. 18--24. 1955.

Additional citations: MADAGASCAR: Humbert 3487 (N--photo of type, Z--photo of type).

SYNGONANTHUS HUMBOLDTII (Kunth) Ruhl. in Engl., Pflanzenreich 13 (4-30): 262--263. 1903.

Synonymy: Eriocaulon umbellatum H.B.K., Nov. Gen. & Sp. Pl., ed. quart., 1: 252. 1816 [not E. umbellatum Bong., 1831, nor Lam., 1789]. Eriocaulon umbellatum Humb. & Bonpl. apud Roem. & Schult. in L., Syst. Veg., ed. 15 nova, 2: 867--868. 1817. Paepalanthus humboldtii Kunth, Enum. Pl. 3: 535. 1841. Eriocaulon umbellatum Humb. & Kunth ex Kunth, Enum. Pl. 3: 535 & 614, in syn. 1841. Eriocaulon humboldtii Kunth ex D. Dietr., Syn. Pl. 5: 263. 1852 [not E. humboldtii Kunth, 1841]. Eriocaulon bonplandianum Steud., Syn. Pl. Glum. 2: [Cyp.] 275. 1855. Dupatya humboldtii (Kunth) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya humboldtii Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus humboldtii Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus humboldtii (Knuth) Ruhl. apud Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20, sphalm. 1939. Syngonanthus humboldtii Rupr. ex Moldenke, Résumé Suppl. 1: 23, in syn. 1959.

Bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. quart., 1: 252-253 (1816) and ed. folio, 1: 201. 1816; Roem. & Schult. in L., Syst. Veg., ed. 15 nova, 2: 867—868. 1817; Kunth, Enum. Pl. 3: 535 & 625. 1841; Klotzsch in Schomb., Faun. & Fl. Brit.-Guian. 1116. 1848; D. Dietr., Syn. Pl. 5: 263. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 275, 333, & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 279, 447—448, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 & 879 (1893) and imp. 1, 2: 402. 1894; Barnhart, Bull. Torrey Bot. Club 29: 585—598. 1902; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 246, 262—263, 284, 287, 290, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939; Moldenke in Gleason & Killip, Brittonia 3: 159. 1939; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 & 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5, 6, 30, 33, 41, 49, & 58. 1946; Moldenke, Alph. List Cit. 1: 92 & 132 (1946), 2: 557 (1948), 3: 975 (1949), and 4: 985. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61, 65, & 213. 1949; Moldenke, Phytologia 4: 321. 1953; Cuatrecas., Revist. Acad. Colomb. Cienc. 10: 255. 1958; Moldenke, Résumé 69, 73, 280, 286, 293, 325, & 492. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé Suppl. 1: 23. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 & 879 (1960) and imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 4: 5 (1962) and 18: 12. 1969; Oberwinkler, Pterid. & Sperm. Venez. 8 & 52. 1970; Moldenke, Fifth Summ. 1: 120, 127, & 481 (1971) and 2: 494, 503, 515, 584, 637, & 963. 1971; Moldenke, Phytologia 23: 418 (1972) and 25: 244. 1973; J. A. Steyerm., Biotropica 6: 10. 1974; J. A. Steyerm., Act. Bot. Venez. 10: 226 & 232. 1975; Moldenke, Phytologia 34: 257 & 277 (1976), 35: 343, 452, & 453 (1977), and 36: 35 & 65. 1977.

This species is based on a Humboldt & Bonpland collection [Herb. Willdenow 2375] from "In ripa Orinocensi, prope Maypures et rupem Aricagua, locis calidis", Amazonas, Venezuela, deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10664. Kunth's Paepalanthus humboldtii (1841) is obviously only a new name for Bongard's homonymous Eriocaulon umbellatum (1831) and therefore has the same type; in fact, the Humboldt & Bonpland collection is the only one cited by Kunth. The Eriocaulon humboldtii Kunth (1841) to which Dietrich (1852) refers H.B.K.'s E. umbellatum, is a very different taxon, being a valid species of Eriocaulon based on an entirely different type. The E. umbellatum of Bongard is a synonym of Syngonanthus helminthorrhizus (Mart.) Ruhl., while the E. umbellatum of Lamarck is now known as Syngonanthus umbellatus (Lam.) Ruhl.

Ruhland (1903) cites for Syngonanthus humboldtii only the original Humboldt & Bonpland collection. According to the late Dr. J. H. Barnhart (1902) the publication of this species in both the quarto and the folio editions of the H.B.K. work was in 1816, not "1815" as sometimes cited.

Recent collectors have found this species growing on savannas and riverbanks. Oldenburger and his associates found it "locally common in transition of fine white sand to moist fine sand with clay". Wurdack & Monachino found it "abundant in morichal", while Davidse reports it from on "savannas with scattered trees, including Curatella, and with many large outcroppings of dark-colored boulders" and describe it as "moss-like plants with large umbels of globose inflorescences of white flowers". It has been collected in anthesis in February, May, June, and October and in fruit in February and October, at altitudes of 90—1000 meters.

Garcia Barriga & Jaramillo Mejia 17119 is a mixture with var. glandulosus Gleason and a species of Burmannia. Material of typical S. humboldtii has been misidentified and distributed in some herbaria as var. glandulosus Gleason and as S. fertilis (Körn.) Ruhl. On the other hand, the Hertel & Oberwinkler 15225, Vareschi & Foldats 4576, and Vareschi & Magdefrau 6957, distributed as typical S. humboldtii, actually represent var. glandulosus Gleason, while Vareschi & Magdefrau 6612 is S. bisumbellatus (Steud.) Ruhl.

Additional citations: COLOMBIA: Vaupés: Garcia Barriga & Jaramillo Mejia 17119 in part (N); Humbert & Schultes 27320 (P); Schultes & Cabrera 19918b (W—2113118). VENEZUELA: Amazonas: G. Davidse 2752 (Ld); Humboldt & Bonpland s.n. [Herb. Willdenow 2375; Macbride photos 10664] (N—photo of type, W—photo of type); Vareschi & Magdefrau 6614b (Ve—42516). Apuré: Ramia 1628 (Ve—42810). Bolívar: Agostini 256 (N, Z), 348 (Lw, N); Cardona Puig 2849 (W—2195051); Hamann 2900 (Hm), 2901 (Hm); López-Palacios 3072 (Ld); Schacht s.n. [Canaima, Januar 1973] (Mu); Vareschi s.n. [Herb. Hamann 2899] (Hm); Vareschi & Foldats 4629 (N); Wurdack & Monachino 39948 (Mu, N). State undetermined: Mayeul-Grisol s.n. [7 avril 1921] (B). SURINAM: Oldenburger, Norde, & Schulz ON.558 (N). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B).

SYNGONANTHUS HUMBOLDTII var. ELONGATUS Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101. 1953.

Bibliography: Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101. 1953; Moldenke, Phytologia 4: 321. 1953; Moldenke, Résumé 73 & 492. 1959; Moldenke, Fifth Summ. 1: 127 & 963. 1971.

This variety differs from the typical form of the species in having its branches 30—50 cm. long, with 14—21 whorls of leaves, many of the upper whorls producing 1, 2, or more secondary branches. Thus far, it is known only from the original collection, Maguire, Cowan, & Wurdack 30558, from a savanna at 125 m. altitude in the Cerro Yapacana on the Río Orinoco, Amazonas, Venezuela, deposited in the Britton Herbarium at the New York Botanical Garden.

SYNGONANTHUS HUMBOLDTII var. GLANDULOSUS Gleason, Bull. Torrey Bot. Club 58: 327. 1931.

Synonymy: Syngonanthus humboldtii var. glandulousus Gleason ex Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101, sphalm. 1953.

Bibliography: Gleason, Bull. Torrey Bot. Club 58: 327. 1931; Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939; Moldenke in Gleason & Killip, Brittonia 3: 159. 1939; Moldenke, Alph. List Cit. 1: 92. 1946; Moldenke, Known Geogr. Distrib. Erioc. 6. 1946; Moldenke, Alph. List Cit. 2: 557 (1948), 3: 975 (1949), and 4: 985. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65 & 213. 1949; Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101. 1953; Moldenke, Phytologia 4: 321. 1953; Moldenke, Résumé 69, 73, & 492. 1959; Moldenke, Fifth Summ. 1: 120 & 129 (1971) and 2: 963. 1971; Moldenke, Phytologia 23: 418. 1972; J. A. Steyerm., Biotropica 6: 10. 1974; J. A. Steyerm., Act. Bot. Venez. 10: 226 & 232. 1975; Moldenke, Phytologia 34: 277 (1976) and 36: 35 & 65. 1977.

This variety differs from the typical form of the species in having the peduncles softly glandular-villous, the stems elongated, very slender, glabrous or puberulent at the summit, the leaves fascioled, very narrowly linear, lanate at the base, and the peduncles elongate and numerous.

The variety is based on G. H. H. Tate 315 from moist parts of the Grand Savanna, Esmeralda, Amazonas, Venezuela, deposited in the Britton Herbarium at the New York Botanical Garden. Gleason (1931) adds that "The basal leaves are 15—25 mm. long and 3 to 4 times as long as the cauline" ones. The statement made in my 1953 publication that Tate 1308 is the type collection of this variety is erroneous.

Recent collectors have found the plant growing on savannas and morichal, campo cerrado, lowland savannas, quartzite savannas, along the banks of streams, in wet places and waterholes, in moist soil pockets, the moist parts of savannas, periodically flooded savannas on sand, on savannas over igneous rock, and in white sand generally, at altitudes of 15—1300 meters, flowering from September to January, March, April, June, and July, and in fruit in March, April, June, July, September, and November. Maguire and his associates report it as "infrequent" or "a common annual of damp sandy places on savannas", "locally frequent", "abundant on sabanitas", and "a dominant savanna herb common on wet savannas". Collectors describe the heads as white or ashy-gray and the flowers themselves as whitish.

Foldats 3536 bears a striking resemblance to S. fertilis (Körn.) Ruhl., an obviously closely related species. Material of S. humboldtii var. glandulosus has been widely misidentified and distributed in herbaria as the typical form of S. humboldtii (Kunth) Ruhl. On the other hand, the Wurdack & Monachino 39948, distributed as var. glandulosus, actually seems to represent the typical form. Cordeiro 31 is a mixture with S. glandulosus Gleason.

Additional citations: COLOMBIA: Vaupés: García Barriga & Jaramillo Mejia 17119 in part (W—2569463A); Schultes, Baker, & Cabrera 18230 (Ss), 18534 (Ss, W—2172194). VENEZUELA: Amazonas: Foldats 3536 (N); Holt & Gehriger 234 [Herb. Leonard 7662] (B, W—1471944); Maguire, Wurdack, & Bunting 36389 (N); Maguire, Wurdack, & Maguire 41658 (N, S); J. A. Steyermark 105144 (Ac); Steyermark & Bunting 102661 (Ft); G.H. H. Tate 315 (N—type). Bolívar: Hamann 2902 (Hm), 2903 (Hm), 2904 (Hm); Hertel & Oberwinkler 16225 (Mu); Killip 37355 (Ve); Koyama & Agostini 7273 (N, N, N, S), 7351 (N, N, S), 7516 (N, N, N), 7528 (N, N, N); B. Maguire 33698 (N), 33699 (N); Schacht s.n. [Canaima, Januar 1937] (Mu); J. A. Steyermark 75264 (Z), 94182 (Lw, Mu, N); Steyermark & Wurdack 21 (Mu, N); Vareschi & Foldats 4576 (Ve—40470); Vareschi & Magdefrau 6957 (Ve—42506); Wurdack & Monachino 39948 (S, S). Guárico: Tamayo 3998 (W—2195276). BRAZIL: Amazônas: Prance, Maas, Woolcott, Monteiro, & Ramos 16185 (Ld, Mu, N, W—2759068). Mato Grosso: Cordeiro 31 in part (Ld). Rondônia: Ribeiro 1103 [Herb. IPEAN 149794] (Ld).

SYNGONANTHUS HUMBOLDTII var. MACROCEPHALUS Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101. 1953.

Bibliography: Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101. 1953; Moldenke, Phytologia 4: 321—322. 1953; Moldenke, Résumé 73 & 492. 1959; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 963. 1971.

This variety differs from the typical form of the species in having the flower-heads 7—9 mm. wide and the peduncles rather densely whitish-pilose, the hairs irregularly appressed, often twisted, not gland-tipped. It is based on Maguire & Politi 27649 from "in depressions in rocks" on the southeast slopes of North Mountain, Cerro Sipapo (Paraque), Amazonas, Venezuela, at an altitude of 5000—6000 feet, collected on December 12, 1948, and deposited in the Britton Herbarium at the New York Botanical Garden.

SYNGONANTHUS HUMBOLDTII var. ORINOCENSIS Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 102. 1953.

Bibliography: Moldenke in Maguire & al., Mem. N. Y. Bot. Gard. 8: 102. 1953; Moldenke, Phytologia 4: 322. 1953; Moldenke, Résumé 73 & 492. 1959; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 963. 1971.

This variety differs from var. glandulosus Gleason in being stouter in stature, with the basal leaves 3—8 cm. long and those of the cauline whorls to 2.3 cm. long.

It is based on B. Maguire 29340 from "under thickets on moist white sand about borders of small 'laja', Río Temi, one hour below Yavita, Río Stabapo", on the Río Orinoco, Amazonas, Venezuela, collected on October 20, 1950, and deposited in the Britton Herbarium at the New York Botanical Garden. Thus far it is known only from the original collection.

xSYNGONANTHUS HYBRIDUS Moldenke, Phytologia 5: 341. 1956.

Syninymy: "[Syngonanthus angolensis H. Hess x S. wahlbergii (Wikstr.) Ruhl.]" H. Hess, Bericht. Schweitz. Bot. Gesell. 65: 197, fig. 6. 1955. Syngonanthus angolensis x wahlbergii H. Hess ex Moldenke, Phytologia 5: 341, in syn. 1956. x(S. angolensis x S. wahlbergii) H. Hess apud Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1955: 30. 1956.

Bibliography: H. Hess, Bericht. Schweitz. Bot. Gesell. 65: 197, fig. 6. 1955; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1955: 30. 1956; Moldenke, Phytologia 5: 341. 1956; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1956: 28. 1957; Moldenke, Résumé 147, 351, & 492. 1959; G. Taylor, Ind. Kew. Suppl. 13: 132. 1966; Moldenke, Fifth Summ. 1: 244 (1971) and 2: 635 & 963. 1971; Moldenke, Phytologia 34: 278 (1976) and 35: 314. 1977.

Illustrations: H. Hess, Bericht. Schweitz. Bot. Gesell. 65: fig. 6. 1955.

This hybrid is based on H. Hess 52/2147 from "Am Rio Quangue, 5 km westlich der Mission Galangue", at 1450 m. altitude, northeast Huila, Angola, collected on July 6, 1952, and H. Hess 52/2085 from "Am Rio Cuatir, 30 km östlich Vila Serpa Pinto (Menongue)", at 1360 m. altitude, Bié, Angola, collected on June 27, 1952.

Hess describes this natural hybrid as follows: "Folia similia illis S. Wahlbergii. Culmi intermedii, 2—15; pilis glanduliferis, brevibus, paucis. Capitula flavescentia usque fusca. Sepala ♀ floris 1,8 mm longa, flavescentia vel fusca, medio dorsaliter et ventraliter sparse usque dense pilosa. Sepala ♂ floris circ. aequilonga, pubescentia intermedia. Plantae normaliter fertiles.

"Die Blätter gleichen denen von Syngonanthus Wahlbergii. Die Halme sind in der Höhe intermediär, ihre Zahl schwankt zwischen 2 und 15. Die Drüsenhaare sind kurz und stehen nicht dicht. Die Blütenköpfe sind gelblich bis braun. Die Sepalen der ♀ Blüten sind um 1,8 mm lang, gelblich oder braun, im mittleren Drittel dorsal und ventral zerstreut bis dicht behaart. Die Sepalen der ♂ Blüten sind etwa gleich so lang und weisen dieselbe intermediär Behaarung auf. Die Pflanzen sind normal fertil." He further notes: "Standorte: Mit denjenigen von Syngonanthus angolensis übereinstimmend und von dieser Art begleitet. Varianten: Ergeben sich aus Bastardnatur und sind in der Diagnose berücksichtigt. Verbreitung: Angola: Im Nord-Osten der Provinz Huila und an einem Nebenfluss des Rio Cubango, am Rio Cuatir, in der Provinz Bié."

This hybrid has been collected in anthesis in June and July, at altitudes of 1360—1450 m. Thus far it is known only from the original collections. The Devred 1872, Welwitsch 2454, and H. Wild 1551 [S. Rhodes. Govt. Herb. 16096], distributed as xS. hybridus, actually are S. ngoweensis H. Lecomte.

SYNGONANTHUS HYGROTRICHUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 246—247. 1903.

Synonymy: Paepalanthus hygrotrichus Ruhl. ex Moldenke, Résumé Suppl. 1: 21, in syn. 1959.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 18, 243, 246, & 293. 1903; Pilger in Engl. & Prantl, Nat. Pflanzenfam. Ergänz. 2, Nachtr. 3 zu 2: 41. 1908; Prain, Ind. Kew. Suppl. 3: 175. 1908; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 56. 1930; Castell. in Descole, Gen. & Sp. Pl. Argent. 3: 76 & 104. 1945; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 322. 1953; Moldenke, Résumé 108 & 492. 1959; Moldenke, Résumé Suppl. 1: 21. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 72. 1960; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 584 & 963. 1971; Moldenke, Phytologia 35: 305. 1977.

This species is based on three collections from Minas Gerais, Brazil, deposited in the Berlin herbarium where the first of them was photographed by Macbride as his type photograph number 10690: (1) Glaziou 19998 from "dans l'eau des rapides, sur le rocher" at Biribiry near Diamantina, flowering in March; (2) W. Schwacke 8479 from "more Podostemonacearum ad rupas cataract.", Biribiry, in March 1892; and (3) Sena s.n. [Herb. Schwacke 14553] from the Serra do Cipó, flowering in June. Ruhland (1903) comments that the "Caulis basi ± foliis denudatus ibique in sicco rigidus, flavo-brunneus, circ. 1 mm crassus, vel paullo crassior, ± angulosus est".

It is perhaps worth mentioning here that Stapf in the Index Londinensis (1931) dates the Pilger reference (1908) as "1906", but on what evidence I do not know.

Thus far this species is known only from the original collections.

Additional citations: BRAZIL: Minas Gerais: Glaziou 19998 [Macbride photos 10690] (B--cotype, N--photo of cotype, W--1124166--cotype, W--photo of cotype).

SYNGONANTHUS IMBRICATUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 279. 1903.

Synonymy: Paepalanthus imbricatus Körn. in Mart., Fl. Bras. 3 (1): 430. 1863. Dupatya imbricata (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya imbricata Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus imbricatus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 299, 430, 431, & 508. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 276, 279, 290, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 18, 30, 49, & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213.

1949; Moldenke, Phytologia 4: 322. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 108, 280, 325, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 148. 1969; Moldenke, Fifth Summ. 1: 174 & 481 (1971) and 2: 584 & 963. 1971; Moldenke, Phytologia 35: 321 & 443. 1977.

This species appears to be based on an unnumbered Blanchet collection from "mont de sable blanc", Bahia, Brazil, deposited as no. 270497 in the Reichenbach herbarium at Vienna; an isotype in the Munich herbarium was photographed there by Macbride as his type photograph number 18746.

Additional citations: BRAZIL: Bahia: Blanchet s.n. [Macbride photos 18746] (Mu--isotype, W--photo of isotype).

SYNGONANTHUS INSULARIS Moldenke, N. Am. Fl. 19: 45. 1937.

Bibliography: Moldenke, N. Am. Fl. 19: 43 & 45. 1937; Moldenke, Phytologia 1: 345. 1939; Alain, Contrib. Ocas. Mus. Hist. Nat. Coleg. La Salle 7: 47. 1946; León, Fl. Cuba, imp. 1, 1: 283 & 435. 1946; Moldenke, Alph. List Cit. 1: 64, 92, & 186. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5 & 58. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 224. 1947; Moldenke, Alph. List Cit. 2: 648 (1948) and 4: 1259. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 45 & 213. 1949; Moldenke, Phytologia 4: 322. 1953; Moldenke, Résumé 53, 54, & 492. 1959; Moldenke, Fifth Summ. 1: 98 & 99 (1971) and 2: 963. 1971; León & Alain, Fl. Cuba, imp. 2, 1: 283 & 435. 1974.

The type of this species is Britton, Britton, & Wilson 14162 from in white sand in the vicinity of Los Indios, Isla de Pinos, Cuba, collected on February 13, 1916, and deposited in the Britton Herbarium at the New York Botanical Garden. The species has been collected in white sand, in moist places on savannas, often in dense clumps on white-sand savannas, flowering in February and December, in fruit in December. Material has been misidentified and distributed in some herbaria as S. lagopodioides (Griseb.) Ruhl.

Additional citations: CUBA: Oriente: Carabia 3731a (Ok). ISLA DE PINOS: Ekman 12095 (B, Ut--23744A), 12522 (B, Ba); Killip 42853 (Le), 43684 (N, S), 44564 (N, Z), 45613 (Mu, N, N, Sm); León & Seifriz 17521 (Mv).

SYNGONANTHUS INUNDATUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 267. 1903.

Synonymy: Paepalanthus inundatus Körn. in Mart., Fl. Bras. 3 (1): 468—469. 1863. Dupatya inundata (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Paepalanthus nundatus Körn. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402, sphalm. 1894. Dupatya inundata Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus inundatus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 468—469 & 507.

1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 264, 267, 269, 290, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 18, 30, 49, & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92, 210, 213, & 214. 1949; Moldenke, Phytologia 4: 322. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 99, 108, 280, 487, & 492. 1959; Moldenke, Résumé Suppl. 1: 6, 21, & 25. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 12: 12. 1965; Moldenke, Fifth Summ. 1: 174 & 482 (1971) and 2: 584, 587, 637, & 963. 1971; Moldenke, Phytologia 35: 452. 1977.

This species is based on L. Riedel 2745 from flowing water at Chapadão de São Marcos, Goiás, Brazil, flowering in August, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10691. The species bears strong habital resemblance to S. appressus (Körn.) Ruhl. and S. ferrensis Alv. Silv. Ruhland (1903) cites only the original collection. He mistakenly cites the original publication of Dupatya inundata to page "74" of Kuntze's work (1891) instead of to page 746. In his index (p. 290) he mistakenly lists the species as valid in the genus Paepalanthus.

Additional citations: BRAZIL: Goiás: L. Riedel 2745 [Macbride photos 10691] (B--type, M--isotype, Mu--isotype, N--photo of type, Ut--406--isotype, W--photo of type).

SYNGONANTHUS ITAMBEENSIS Alv. Silv., Fl. Mont. 1: 334--335, pl. 211. 1928.

Synonymy: Syngonanthus itambeënsis Alv. Silv. apud A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938.

Bibliography: Alv. Silv., Fl. Mont. 1: 334--335 & 418, pl. 211. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 963. 1971; Moldenke, Phytologia 34: 277. 1976.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 211. 1928.

This species is based on A. Silveira 657 from "In campis arenosis prope Itambé do Serro", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. Silveira (1928) comments that the "Species distinctissima ob capitula magna et bracteae involucrantes pulchre bicolores. A S. anthemidifloro (Bong.) Ruhl. indumento foliorum facile distinguitur". On page 418 of his work he cites the type locality as "Serra de Itambé". Thus far the species is known only from the original collection.

SYNGONANTHUS KUHLMANNII Moldenke, Phytologia 3: 277—278. 1950.

Bibliography: Moldenke, Phytologia 3: 277—278 (1950) and 4: 322. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 108 & 492. 1959; Moldenke, Résumé Suppl. 1: 6 (1959), 8: 2 (1964), and 16: 6. 1968; Hocking, Excerpt. Bot. A.13: 506. 1968; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 963. 1971; Moldenke, Phytologia 35: 441. 1977.

The Prance, Pena, Forero, Ramos, & Monteiro 4790, distributed as S. kuhlmannii, actually is, in part, f. viviparus Moldenke, and in part [4790a] S. densus (Körn.) Ruhl., while Murça Pires, Silva, & Souza 9627 is S. nitens var. hirtulus Ruhl.

Additional citations: BRAZIL: Pará: Sick 702 [Herb. Brad. 4619] (Bd).

SYNGONANTHUS KUHLMANNII f. VIVIPARUS Moldenke, Phytologia 15: 462. 1968.

Bibliography: Hocking, Excerpt. Bot. A.13: 506. 1968; Moldenke, Biol. Abstr. 49: 3245. 1968; Moldenke, Phytologia 15: 462. 1968; Moldenke, Résumé Suppl. 16: 6. 1968; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 963. 1971.

Citations: BRAZIL: Amazônas: Prance, Pena, Forero, Ramos, & Monteiro 4790a (N--isotype, Z--type).

SYNGONANTHUS LAGOPODIOIDES (Griseb.) Ruhl. in Urb., Symb. Antil. 1: 489. 1900.

Additional synonymy: Syngonanthus lagopodioides Ruhl. apud Thiselt.-Dyer, Ind. Kew. Suppl. 2: 180. 1904.

Bibliography: Griseb., Cat. Pl. Cub. 225. 1866; Sauv., Anal. Acad. Sci. Habana 8: 50. 1871; Sauv., Fl. Cub. 165. 1871; Gomez de la Maza, Not. Bot. Sist. 49 & 110. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Ruhl. in Urb., Symb. Antill. 1: 487 & 489. 1900; Ruhl. in Engl., Pflanzenreich 13 (4-30): 245, 257, & 293. 1903; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 180. 1904; Moldenke, N. Am. Fl. 19: 43—45. 1937; Moldenke, Phytologia 1: 345. 1939; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; León, Fl. Cuba, imp. 1, 1: 283 & 435. 1946; Moldenke, Alph. List Cit. 1: 24, 63, 64, 66, 91, 92, 412, & 470. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5, 50, & 58. 1946; Moldenke, Alph. List Cit. 2: 646 & 648--651 (1948), 3: 868, 929, & 930 (1949), and 4: 1094, 1144, & 1304. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 45, 46, & 213. 1949; Moldenke, Phytologia 2: 381 (1951) and 4: 322—323. 1953; Moldenke, Résumé 53, 54, 326, 352, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Phytologia 18: 92 & 243. 1969; Moldenke, Fifth Summ. 1: 98 & 99 (1971) and 2: 585, 637, & 963. 1971; León & Alain, Fl. Cuba, imp. 2, 1: 283 & 435. 1974; Moldenke, Phytologia 33: 184 (1976) and 35: 306 & 313. 1977.

This species is based on C. Wright 3237 from sandy pinewoods in Pinar del Río, Cuba.

[to be continued]

BOOK REVIEWS

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"LIMU: AN ETHNOBOTANICAL STUDY OF SOME EDIBLE HAWAIIAN SEA-WEEDS" by Isabella Aiona Abbott and Eleanor Horswill Williamson, ii + 22 pp., 15 figs., 1 pl., 1 tab. Ed. 2. Pacific Tropical Botanical Garden, Lawai, Kauai, Hawaii 96765. 1974. $1.16.

The folk usage of 12 of the most common marine Algae used by the natives of Hawaii is recorded here. Included are the common venacular names used by the Hawaiians, the special meanings conveyed by the different names, and the practical uses of these "limu" (algae growing in the water or in damp places).

GMH

"A DICTIONARY OF BIOLOGY" by M. Abercrombie, C. J. Hickman, and M. L. Johnson, 311 pp., 10 figs. Sixth edition. Penguin Books, Inc., Baltimore, MD 21207. 1973(1974). $1.95.

Many botanical terms are included in this compact reference book.

GMH

"ACCUMULATIVE VETERINARY INDEX" quarterly supplement to Jan. through Sept. 1966. (Vol. 3) No. 3, 51 pp. Index Incorporated, 6905 Garriston St., Arvada, Colo. Sept. 1966. $2.00.

This index consists of two parts: a subject index, in which the subject is followed by the author(s), journal reference, volume number, pages, and year. The author index covers the same papers, the only difference being in the transposition of author and subject. The subject index is made of course with the leading entity for indexing use, such as Patella, Piroplasmosis, Parasites, Canine, Heartworm.

GMH

"CLINICAL PHARMACOLOGY (DILLING)" by Stanley Alstead, J. Gordon MacArthur, and Thomas J. Thomson, xii + 760 pp., 16 tabs. 22nd ed. Williams & Wilkins Co., Baltimore, Md. 21202. 1969. $7.25.

This is a volume known to and used by many in the medical and pharmaceutical fields, particularly those living in the

Commonwealth, such countries as Canada. It represents a standard text for class use and is not intended for reference use; a bibliography appearing on page 734-6; represents all of the references given and these are quite general ones, viz., standard textbooks of experimental pharmacology, therapy, and materia medica, with several standard references, such as the pharmacopeias and publications dealing with the art of prescribing. The last two chapters (30-1) take up the elements of pharmacy/dispensing and chemical nomenclature while chapter 29 gives important information on prescribing. The rest of the volume is devoted to the usage of medicinals in medical practice. There are chapters on vitamins, antibiotics, anticoagulants, and so on. The index seems quite thorough. This is a good standard didcactic text and should furnish the beginner with a sound foundation in the science.

GMH

"BIOLOGY DATA BOOK" compiled and edited by Philip L. Altman and Dorothy S. Dittmer, second edition, Volumes I, II, III. Vol. I: xix + pp. 1-606; 1972. Vol. II: xxi + pp. 607-1432; 1973. Vol. III: xix + 1433-2123; 1974. 281 tabs. 13 appendices. Federation of American Societies for Experimental Biology (FASEB), 9650 Rockville Pike, Bethesda, MD 20014. 1972-4. $40.00 per volume; $100.00 for the set of 3.

This set of large volumes encompasses a great deal of the basic information requisite to thorough studies in the field of biology. The botanist, zoologist, physiologist, biochemist, and many other professionals in the general field of biology will find many answers and a great saving of time in reference book searching by using these books. The previous edition of the Biology Data Book appeared in 1964 in a single volume format of 630 pages. The increased size of this edition reflects the broadening of scope and the increasing depth of coverage of subject matters. Each volume is an independent unit with its own index and its own listing of equated scientific and common plant and animal names. The index in volume III is not cumulative (Numbers cited in the indexes are of tables not pages.) Volume I covers genetics, cytology, reproduction, development, and growth, together with chemical data and a survey of materials and methods. Volume II has data on biological regulators and toxins, environmental and survival data, parasitism (plants on plants, plants on animals, animals on animals, animals on plants), and sensory and neuro-biology. Volume III bears sections on nutrition, digestion, excretion; metabolism; respiration; circulation; and the blood and other body fluids. A large part of this volume is based on three separate volumes published between 1961 and 1971: Blood and other Body Fluids; Metabolism; Respiration and Circulation. Environmental Biology (1966) and Growth, including Reproduction and Morphological Development (1962) were other special handbooks of FASEB. The texts of all of these handbooks are composed of tables with subjoined explanatory statements and bibliographic citations keyed to the data. The data in the tables were assembled by research scientists, the review integration, and selection, and the final editing were done by others--a total of more than 3000 scientists participating in this grand effort. A list of the many participants is presented in the early part of each volume. As in the first edition, each datum is adjacent to a number which corresponds to a literature reference: in this way, all data are reliably documented. Some idea of the depth of coverage of this work may be gleaned from the total number of reference citations--a total of over 18,000. Many of the features of edition one have been carried over (after strict inspection) to the present edition but as might be expected there has been some curtailing; for instance the table on properties of resins of the earlier edition was deleted. Libraries and individuals who have copies of the 1964 edition and of the separate handbooks might be well advised to hold them for supplementing a search of data. It seemed to me of interest to know the relative representation of plants and animals in this handbook. A count showed that 495 pages were devoted to plants of all categories while 1628 pages concerned members of the animal kingdom. In some places the coverage is somewhat thin; thus chromosome numbers are given for only representative plant species--viz., for 128 nonvascular plant taxa and for 132 vascular plants. Actually several thousand such counts are in the record but as a practical thing, there was no point in duplicating the specialized publications in which such numbers can be found. Such data as these are relatively easy to locate whereas this data book presents data as a rule which must be dug out of the literature with the expenditure of much time and energy. To a biological scientist the value of these volumes must be many times the list price--in fact their value is really inestimable. Every science and medical library should certainly not be without the Biology Data Books.

GMH

"THE GENUS ANADENANTHERA IN AMERINDIAN CULTURES" by Siri von Reis Altschul, v + 96 pp., 4 figs., 1 tab., 7 maps, Botanical Museum, Harvard Univ., Cambridge, Mass. (hard cover).

Following a brief taxonomic description of Anadenanthera with its two known species, A. peregrina (L.) Spegazzini and A. colubrina (Vell.) Brenan, there is a detailed treatment of the congnomens, uses, and traditions of one or other species in the various cultures of the American Indians, a culture being defined as that of one or more tribes. 46 cultures are considered, distributed among 15 "culture areas" (Caribbean;

Caqueta; Orinoco; Savanna; Guiana; Amazon; Peruvian; Montaña; Juruá-Purús; Pará; Bolivian; Chilean; Chaco; and Eastern Lowland). Various ethnobotanical uses are described but especially the use as an hallucinogenic snuff. Methods of preparation and administration, cultural significance, and other points are detailed. A "cross-cultural chart" is used to indicate the relationship of these various cultures as it applies to hallucinogenic use. A phytochemical and pharmacological review, bibliography, and tables of names from "all sources" and from herbarium specimes complete the volume.

GMH

"THERAPIE DER ARTERIELLEN HYPERTONIE, ERFOLGE, MÖGLICHKEITEN, METHODEN" by O. H. Arnold, (Klinikum Essen der Ruhruniversität), Experimentelle Medizin, Pathologie und Klinik. Herausgegeben von R. Hegglin, F. Leuthardt, R. Schoen, H. Schwiegk, A. Studer, H. U. Zollinger. Band 30; 26 Tab., 2 Abb., VIII, 202 Seiten, 1970; Springer-Verlag, Berlin-Heidelberg-New York. Gebunden DM 39.-; c.US $17.00.

There is no gainsaying the importance of the subject taken up in this volume. Aterial hypertonia or hypertension because so often a death cause is definitely the single greatest enemy of mankind, the very chief of devils! Included importantly here are arteriosclerosis of the heart and the vascular diseases of the brain. The most important facet, that of therapy, is the chief subject of this text. The following sections of the text can be recognized: (1) History of modern therapy in high blood pressure; (2) influence of blood pressure reduction on the prognosis of various diseases; (3) the objectives and indications, also the contra-indications, in the reduction of hypertension; (4) surgical therapy; (5) the chemotherapy of hypertension (the chief part of the text, with 89 pages or nearly half of the volume); (6) general measures to control hypertension, including the diet, life regimen, psychotherapy, etc. This is followed by 41 pages of literary references, with 950 references, composing ca. 20% of the volume. Then the 10 page index furnishes a good key to the text. The literature list in alphabetical sequence serves in place of an author index. Of most interest perhaps is the chapter on medicinal therapy, which takes up the various compounds used, in the following order: Rauwolfia alkaloids derived from Rauwolfia serpentina Bentham (not Bentheim as given) which acts by removal of noradrenalin from the storage granules; alpha-methyldopa, which acts by substituting noradrenalin in the storage granules by a "false transmitter", viz., alpha-methylnoradrenalin; clonidin which apparently acts by a central action on the medullary centers, reducing the peripheral arterial resistance, hence lowering blood pressure; adrenergic neuron blocking agents, such as guanethidine, bethanidine, etc., which substitute guanethidine for noradrenalin in the storage granules; hydralazines, which act directly on the smooth muscles of the arterioles, somewhat like the nitrites, but weaker; the adrenergic β-receptor blocking agents (or beta-sympatholytics); and the less used and obsolete medicaments, such as reduced ergot alkaloids (e.g., dihydroergocristine); the adrenergic α-receptor blocking agent (or alpha-sympatholytics). Also importantly discussed here (19 pages!) are the effects of mineral and water metabolism, with emphasis on the natriuretics.

GMH

"PONDEROSA PINE BIBLIOGRAPHY II" 1966-1970 by Elvera A. Axelton, iv + 63 pp., USDA For. Serv. Gen. Techn. Rept. INT-12 (Ogden, Utah). 1974.

A listing of 732 reference citations (with cross indexing following) supplements the original list (USDA For. Serv. Res. Paper INT-40; 1967), concerning the important tree, Pinus ponderosa Laws. Aditional references to theses, etc., are given on pages 59-63.

GMH

"LEAF ANATOMY AND SYSTEMATICS OF NEW WORLD VELLOZIACEAE" by E. S. Ayensu, vi + 125 pp., 52 pls., 24 figs., Smithsonian Contributions to Bot. No. 15. 1974. $2.20.

106 species of Vellozia and Barbacenia were studied with the object of using important characteristics in aiding in classification. Cross sections of the leaf showed the sclerenchyma-mesophyll patterns. Besides the light microscope, the SEM* was also used to examine both the epidermal surfaces as well as internal structures. Details of structure of stomata, furrows in cuticle, and types of trichomes (including coalescent trichomes) were noted for the first time. Light and SEM micrographs are presented as an aid in the identification of species.

GMH

"THE BIOGENESIS OF STARCH GRANULES IN HIGHER PLANTS" by N. P. Badenhuizen, viii + 121 pp., 34 figs, Appleton-Century-Crofts, 440 Park Ave. So., New York 10016. 1969. $6.45.

The value of electron microscopy is exhibited in this text, as its numerous and revealing photographs show. The importance of such high magnifications to a study of structures active in the synthesis of starch--the amyloplasts--is readily apparent. The text is divided into two parts: the general and the special. In the general part, the plastids are described

*Scanning Electron Microscope

as to their structure and function, with a chapter on the starch synthesizing enzymes and on the origin and reproduction of the amyloplasts. In the special part, the biogenesis of special starches is detailed. Two types of starch grain are recognized: the cereal starches showing the so-called A-diagram crystalline pattern as recorded in the X-ray spectrum; and the tuber starches which have the B-diagram. A chapter is devoted to each of these groups: the A-starches including maize, wheat, rye, rice, barley, and tapioca, while the B-starches have the Irish potato, Pellionia daveauana (of the nettle family), the leaf-starches (as in tobacco and coffee leaves), the high-amylose corn (maize) starches, and the starches of the pea or bean family (Leguminosae). Follow the "Summary and conclusions" and the Index. Phytochemists, plant physiologists, biochemists, and plant histologists will find the book of interest.

GMH

"SYRUP PRODUCTION FROM CANYON MAPLE", by P. A. Barker and D. K. Salunkhe, 4 pp. (s. p.), Utah Sci. Mar. 1974.

Acer grandidentatum was called "sugar maple" by the early Mormons, who confused the tree with the similar A. saccharum. However, there seems to be no definite proof of the use of the Utah maple tree in the production of maple sugar or syrup, even though this was recommended in 1847 by the early L.D.S. leaders. Syrup was prepared by boiling the sap (with yields of 6 to 8 gallons/tree) and it was shown to be quite similar to that from A. saccharum. The sugar content of the sap was about 2%, somewhat less than that of the sugar maple (2.5%).

GMH

"THE PLANTAINS OF CANADA" by I. J. Bassett, 47 pp., 17 maps, 17 pls, Canada Dept. Agr., Res. Branch, Monograph No. 7. 1973. (Gratis)

In this monograph, 16 species of Plantago and one of Littorella (L. americana Fern.) are described, figured, and mapped. One species is taken up on each double spread of pages, with figures on one side, text on the other. Included are synonymy, vernacular names, description, hybridizability, pollen grain characters, similar taxa, chromosome numbers, and miscellaneous discussion.

GMH

"NEMATOSPORACEAE (HEMIASCOMYCETIDAE): taxonomy, pathogenicity, distribution, and vector relations" by L. R. Batra, viii + 71 pp., U.S.D.A., Agr. Res. Serv. Tech. Bull. 1469. 1973. $1.00.

Review of an important group of destructive phytopathogens found in the warmer parts of the world. At times they have made it impossible to grow cotton. Attacked are citrus, pecans, soybeans, and tomatoes. Discussed are those of economic importance belonging to genera Eremothecium, Ashbya, Nematospora, and Metschnikowia.

GMH

"LEHRBUCH DER ANGEWANDTEN BOTANIK" by Walter Baumeister and Gerhart Reichart, ed. 1, XVI + 490 pp., 188 figs., 68 tabs., Gustav Fischer Verlag, Stuttgart, BRD. 1969. Cloth bound, DM. 68,-.

Baumeister and Reichart have collaborated to produce a volume rich in information and having many different uses. Thus, it is of value in orienting plant scientists on the many ways in which plants can be utilized, particularly the cultivated plants. There is first a review of the chief cultivated plants (including starch, sugar, fodder, beverage, drug, spice, fiber, lumber, and other economic species). The section on drug plants and spices is of particular interest (pp. 24-30). Then follow chapters on the morphology of cultivated plants; anatomy; food requirements (minerals, humus, air), development; production of substances by cultivated plants; the diseases and infestations of these; applied plant sociology; and finally a chapter on the teaching and research institutions devoted to applied botany, including agriculture and forestry. This chapter includes lists of such institutions. There is a bibliography at the end of each chapter and a terminal subject (but no author) index. This work presents a scientific discussion of the various topics, including the chemical. The book is printed on a smooth finish paper, is strongly but attractively bound, and is of the same format as various other texts on botany of the same publisher - such as Strasburger, Moebius, and others. Dr. Baumeister is a "Professor in ordinary" for applied botany at the University of Muenster in Westfalen and Dr. Reichart is the Curator of the Botanical Institute at the same institution. An important feature in the second chapter are the tables of statistics indicating production, usage, etc., of economic plant products; these are at first sight not as recent as one would wish (ex., 1960, 1964); however anyone who has endeavored to get the "latest figures" will realize how difficult this often is, dependent as it is on the collection, classification, calculation, and recording of great numbers of data. Sometimes these production figures are quite overwhelming: for instance, a world production (in 1964 per FAO) of 1,060,000 tons of tea. The relative importance of some products is well shown by such figures. Thus (a debated question) which is the most popular fatty oil? The figures show, from the world production standpoint, cotton seed oil is most outstanding, with (1964) 21,200,000 tons produced annually in the entire world, the next nearest being sunflower seed oil (6,400,000 tons). In the USA, cotton seed oil production was also highest with 5,600,000 tons (1964), the next in size being linseed oil with 800,000 tons. This gives a clue to why persons allergic to cottonseed oil generally avoid products containing "vegetable oil," since these so often give them a reaction.

GMH

"PETER KALM'S TRAVELS IN NORTH AMERICA" by A. B. Benson, editor 2 volumes, v. 1: xix + 401 pp., 1 map, 16 pls. v. 2: v + pp. 402-797, 3 pls., 1 map. 1966. $5.00.

Reprint of 1937 edition with additional materials; this is based on Forster's English translation but with many additions and changes.

GMH

"CHEMICAL AND BIOLOGICAL ASPECTS OF STEROID CONJUGATION" by Seymour Bernstein and Samuel Solomon, xiii, 529 pp., 11 figs., many tabs. Springer-Verlag-New York. 1970. $28.00. Obtainable from Springer-Verlag-New York, Inc. 175 Fifth Ave., New York 10010.

The process whereby steroids unite by conjugation or condensation with glucuronic acid or sulfuric acid (etc.) to form steroid conjugates has long been known to represent a final stage of metabolism and often useful in detoxication. However it has not generally been known that these conjugates represent intermediates of biochemical significance and of therapeutic or clinical importance. Seymour is also the co-author of a work (1968) on the physical properties of steroid conjugates, tabulating the sulfates and glucuronides of 147 steroid compounds. The same publisher (Springer) has also published (1965) an Atlas of steroid spectra. The three volumes are of course complementary to the subject. This work with its nine U.S. contributors, and seven Canadian contributors (also one each from Sweden and Australia) is practically a joint US - Canadian contribution in the field. (Both editors (Bernstein, American; Solomon, Canadian) are also contributors). The text is made up of nine chapters, each with one to four authors, which are listed on both the book and chapter tables of contents; the author and subjects included in the text are fully covered in the terminal author and subject indexes, which seem fully comprehensive. The sequence followed chapter by chapter is from the theoretical or chemical to the biochemical to the physiological to the pharmacological and clinical application, a quite logical order of subject matter. Following a very brief preface and note on nomenclature, the first chapter deals with synthesis and characterization of the various conjugate compounds (glucuronides; sulfates; double conjugates, with SO_3 attached at one side of the sterane molecule at C-3 and the glycuronide etc. attached on ring D usually at C-17 at the other side of the sterane molecule). Then follow chapters on the enzymic aspects of steroid conjugation, the hydrolysis of the conjugates, and the isolation of same. The biochemistry of 3 β-hydroxy-Δ^5-steroids is dealt with next, this group including many very important metabolic and therapeutic compounds, such as cholesterol, pregnenolone, androstenediol, and by derivation such important hormones as testosterone, progesterone, estradiol, and others. Formation, metabolism, and transport of estrogen conjugates furnishes the subject of the next chapter and isolation and metabolism of natural steroid conjugates from natural sources the one following. The last two chapters are more pragmatic and hence of greater interest to the biological scientist whereas the earlier chapters are primarily of interest to the physical scientist (chemist). Chapter 8 deals with the biological properties of the estrogen conjugates (the most popular and widely used estrogen products today are the estrogen conjugates, of which there are on the American market five well known brands, used wherever female hormone therapy is requisite, such as in the menopausal syndrome). The final chapter on the clinical aspects of steroid conjugates wraps up the practical applications with discussions on aldosterone, the C_{19} (ex-androsterone) and C_{21} (ex-cortisone) endocrines, the estrogens, and the progestins. Each chapter has a multitude of references. The book is of outstanding importance in endocrinology.

GMH

"THE NUCLEUS OF A LIBRARY: A STUDY OF THE BOOK COLLECTION OF THE UNIVERSITY OF MICHIGAN" by Russell E. Bidlack, x, 106 pp., Univ. Mich., Dept. Library Sci., Ann Arbor, Mich. Dept. Library Sci. No. 6.

This is a study in 7 chapters of the beginnings of the great library of the U. of Michigan with feature studies of the personalities involved in its acquisition in the years 1837-45. Now ranking fifth among all university libraries, its beginnings were humble enough with 242 volumes of government documents in 1837. It was the Asa Gray Collection of 3,401 volumes purchased by this botanist in Europe and received at Ann Arbor in 1840 that really started a proper collection of books.

GMH

"HONOLULU BOTANIC GARDENS INVENTORY 1972" by L. E. Bishop, 293 pp., 11 pls., 1 map, Friends of Foster Garden Press, Honolulu, Hawaii. 1973. $20.00.

The history of the seven botanical gardens on the island of Oahu (Hawaii) is recounted. Two of these are still in the developmental stage. General information is given on these gardens, and this is followed by an inventory of plants of the 5 gardens by binomial name. The genera are arranged alphabetically within the families, which are in turn arranged alphabetically under four headings: Pteridophyta, Gymnospermae, Dictoyledonae, and Monocotyledonae. The inventory gives the following data after the botanical name: accession number (usually indicating date by year), geographic source (where known), and which garden/gardens have the growing plant. There is a terminal index of family names. The active Gardens are: Foster Botanic Garden; Koko Crater B. G., Lo'i Kalo B. G., Sandy Beach B. G., and Wahiawa B.G. Some plants are shown as in "Nursery."

GMH

"THE PLANT KINGDOM" (Foundations of Modern Biology Series), by Harold C. Bold. (ed. 1 (1960): XIII, 114 pp., 91 figs., 2 tabs. ($3.75)) ed. 4: (1977): X, 310 pp., 233 figs., 2 tabs. Prentice-Hall, Inc., Publishers, Englewood Cliffs, N.J. 1977. $7.95.

To quote from the dust jacket (ed. 1), "The Plant Kingdom is a compact, interesting introduction to the many fascinating varieties of plants that support all life in the world, from algae through the flowering plants. The author stresses the fact that the diversity of plants is more apparent than real and through comparison of structure and reproduction, he shows their basic biological similarities." These sentences aptly summarize the basic content of this text, which is (for the United States) refreshingly brief and compact. The author again introduces his new grouping for the plant kingdom, originally published in 1956 and again in 1957 (Morphology of Plants; cf. EBA 3: 40; 1961). This classification scheme resembles considerably that of Tippo (1942), and of course represents a strong break with the old traditional classification of Plantae into four phyla. The following chapters will be found: (1) Unity and diversity of plants; (2) Algae; (3) Bacteria; (4) Slime molds; (5) Fungi; (6) Mosses and liverworts; (7) organization of vascular plants; (8) Vascular Cryptogams (seedless plants) I - psilotophytes, club and spike "mosses", arthrophytes; and (9) ferns; (10) gymnosperms; (11) angiosperms; (12) Conclusions and Summary. There are only 23 references, all books. This is not a complete treatment but apparently includes all material important in an undergraduate course in botany as viewed from the taxonomic standpoint.

GMH

"AETHERISCHE OELE" by K. Bournot and H. Weber, in von Wiesner, Julius: Die Rohstoffe des Pflanzenreichs. Ed. 5. Lieferung 7. VIII, 175 pp., 7 figs., Verlag von J. Cramer, Lehre. 1968. DM. 60-.

The general part occupies about one sixth of the volume, the balance being the special part; following a few pages of botanical explanations, the various essential oils are presented monographically from Angelica root oil to cypress oil, arranged in the alphabetical order of the German language names. There are 90 oils or oil groups taken up, in this case "groups" representing a closely knit group of plants, for instance, spruce oil is subdivided among 5 coniferous tree oils, from species of Picea, Abies, and Pinus. Under each oil ordinarily are taken up the following data: origin; history of use; production methods; commerce and statistics; properties (constants); constituents; testing and adulteration; and uses. The text is brief but compact and dependable. The introductory part goes into the chemistry, biochemistry, and physics of formation and storage, methods of preparation, etc. Under "Krauseminzoel" (p. 79) no mention is made of Mentha cardiaca, which is official along with M. spicata in the National Formulary (US), and now represents the major source of American spearmint oil. The constituent responsible for the characteristic aroma of spearmint oil is not named: carvenyl acetate. 178 references. Subject index; author index.

GMH

"CONE-BEARING TREES OF THE PACIFIC COAST" by N. A. Bowers, lxi, 169 pp., 70 pls., 6 figs., 3 maps, (ed. 4), Pacific Books, Box 558, Palo Alto, Calif. 1965 (received 1968). $4.95.

This volume has much introductory information, including tree-ring analysis, tree groups, needle key, elevation key, geographical key, etc., followed by the systematic portion of the text which includes 56 species, covering the following genera: Chamaecyparis, Libocedrus, Thuja, Cupressus, Abies, Tsuga, Pseudotsuga, Juniperus, Larix, Pinus, Picea, Sequoia, Torreya, and Taxus. Description of the tree and its parts, distribution, vernacular names, and general data are accompanied by special keying information, including elevation range, foliage, and geographical range. The figures show drawings of foliage and cones, with photographs of the tree and of its bark. Glossary and index. A large specimen of Taxodium mucronatum near Oaxaca, Mexico, which has been claimed to be 10,000 years old is in actuality only about 500 years old (p. xxix).

GMH

"BRITISH PHARMACEUTICAL CODEX 1968" xxxvii, 1513 pp., 2 figs., many tabs, Published by the Pharmaceutical Press, 17 Bloomsbury Square, London WC1. $19.50. £7.

This is the 9th edition of an official compendium of Great Britain which was first published in 1907. While the external format has been very similar in the last few editions, the contents of course are very thoroughly revised, with deletions, additions, and corrections galore. While BPC is published by the Pharmaceutical Society of Great Britain, a private organization, it has full legal acceptance in Great Britain, in the Commonwealth countries, and in several other countries. It is published simultaneously with the other official compendium, the British Pharmacopoeia (BP). The Codex Revision Committee is working together with committees from several other European countries to publish a European Pharmacopoeia, and it is planned to adopt the standards of that work in the compilation of the BP and BPC. The composition of BPC 1968 is as follows (number of pages after title): Introductory material (37); drugs and pharmaceutical adjuvants (900); immunological products (biologicals in the USA) (50); human blood and preparations (14); surgical ligatures and sutures (14); surgical dressings (46); formulary (302); 28 appendices (103); index (81). The chief portion of the book is the largest section with its monographs on various drugs, compounds, and pharmaceuticals; next to it in importance is the formulary, with its detailed information on the formulation of many pharmaceuticals, arranged in alphabetical order, thus, creams, elixirs, injections, mixtures, ointments, solutions, tablets, etc.

Many crude drugs are here including many not in the American compendia, thus, colophony, colchicum corm, quillaja, arrowroot, catechu, myrrh, hamamelis, gentian, quassia, ergot, sterculia gum, henbane, stramomium, ispaghula, fig, black currant, mastic, ginger, rhubarb (also in the BP), senega, senna fruit, male fern, cocillana, aconite, gelsemium, lobelia, and citronella oil, among others. As usual the monographs are superior to those of the USP, NF, and BP in having useful and reliable information on the pharmacology and therapy of the various drugs. There are 2 separate pamphlets accompanying the volume (these would best have been incorporated in the book): (1) "Names of Substances" (20 pp.), giving the proprietary names and additional generic names for many entities; (2) "Classified index to Part I Monographs" (13 pp.) (on pink paper), which gives the therapeutic or pharmaceutical classification for all the various monographed materials.

GMH

"TREES OF NORTH AMERICA: A FIELD GUIDE TO THE MAJOR NATIVE AND INTRODUCED SPECIES NORTH OF MEXICO" by C. Frank Brockman, 380 pp., hundreds of col. figs., and maps, Golden Press, 850 Third Ave., New York 10022. 1968. ($7.33). (Price to schools and libraries, $5.50). (Limpbound edn., $3.95).

This is one of 3 books in the publisher's Field Identification Guide Series, the others dealing with birds and sea-shells. Indeed such books are very productive in the accelerating movement of man from city to country, hopefully to the eventual reduction of pollution in both areas. With this volume, a person of ordinary intelligence and education should be able to identify practically all of the more than 730 species of trees found in 76 families which are described and figured. There are enough aids to the understanding of botanical terms (with illustrations) to permit a seriously interested person able to find his way around in the manual without difficulty. There is a crude key to families, some taking up of phytogeography, and a terminal index. For the price this tree guide is hard to beat.

GMH

"AN INTRODUCTION TO THE LIMESTONE SINKHOLES OF NORTHEASTERN MICHIGAN" by P. M. Brown, ii, 28 pp., 7 maps, 1 fig., Pamphlet, Jesse Besser Museum, Alpena, Mich. 1973.

This is a preliminary survey of title geological phenomena. There is an estimated total of 200 sink holes in this area, ranging up to 260 feet deep, representing cave-ins of superficial limestone caverns. This survey of the karst areas of Alpen and Presque Ile Counties (townships 31, 32, 33) discusses some of the plants and fossils found in these locations. A list of 24 ferns and 47 flowering plants (both species and genera) indicates that the sink holes are habitats for some rare ferns (also mosses) and a haven for some higher plants.

GMH

"HOW TO FIND OUT IN PHARMACY: A GUIDE TO SOURCES OF PHARMACEUTICAL INFORMATION" by Alice L. Brunn, (How to Find Out Series), ix + 130 pp., 14 figs., Pergamon Press, Inc., Maxwell House, Fairview Park, Elmsford, New York 10523. 1969. $4.75 Hard Cover; $2.95 soft cover.

This excellent guide, primarily aimed at undergraduate students but no doubt also of use to graduate students in pharmacy, is intended to uncover the chief literature sources of the United States, Canada, Great Britain, and Ireland, and to cover the literature in the English language primarily. There are chapters as follows: overview of field; periodicals and index and abstract services; law, welfare, marketing, physical pharmacy, drug adulteration; pharmacology and therapeutics; crude drugs, practical pharmacy, pharmacodynamics, and toxicology. One appendix lists the applicable libraries of the U.S. and Canada; another those of the United Kingdom and Eire. Finally, an index. In the serials list (p. 19), an important omission is the Journal of Pharmaceutical Sciences. Also, there are no lists of special field serials, such as pharmacognosy (Planta Medica, etc.). Pharm. Abstracts (p. 21) closed with v. 10 (1969) and has not as yet been revived (as was hoped). An abstract journal covering pharmacognosy could have been named: Excerpta Botanica Sectio A. This inexpensive book is to be highly recommended as a reference for all pharmacy students and could also well serve as a most practical classroom text in courses in pharmacy literature, pharmacy orientation, courses in bibliography, etc.

GMH

"INHIBITORS, TOOLS IN CELL RESEARCH" Editors: Th. Buecher and H. Sies, x + 415 pp., 151 figs., tabs, Springer-Verlag New York Inc., 175 Fifth Ave., New York 10010. 1969. Cloth. $14.90.

The text represents the scientific content disseminated at the twentieth Colloquium of the Society for Biological Chemistry, held at Mosbach/Baden on the 14th to 16th of April, 1969, sometimes briefly called the "20th Mossbach Colloquium." The entire contents are in the English language except for one contribution of 3 pages in German. The participants whose presentations appear here came from Germany, Switzerland, France, the United States, England, Spain, the Netherlands, and Poland. The last named country, represented by Z. Kaniuga (Warsaw), was apparently overlooked by the editors who in the Preface regretted "that no contributors from Eastern Europe were able to participate." The Editors are associated with the Institute for Physiological Chemistry and Physical Chemistry at the University of Munich. There are five sections in the book, dealing in turn with DNA-dependent processes, protein synthesis, supramolecular structure, respiratory chain, and cytoplasmic compartmentation, followed by an appendix in which the chemical structures of the various inhibitors mentioned in the text are shown. Each section is made up of several chapters, separately authored, regularly followed by a bibliography and sometimes by a transcript of the discussion, which includes queries, answers, and comments of various interested persons. There is no index. In using inhibitors in various biochemical reactions involving cellular materials, much has been learned of cellular sub-units: their functions and interactions have been in many instances elucidated. The proper application of inhibitors to biological problems is discussed. The mechanisms of action have been described in a number of cases where understood. Some of the inhibitors which are taken up are antibiotics (for instance, the penicillins, puromycin, nigericin, the mitomycins, mithramycin, and so on); others are germicides (for example, the acridines, Congo red, etc.); some are insecticides (as rotenone); at least one, amobarbital, is an hypnotic; and several are of miscellaneous type (thus rhein, colchicine, alkylating agents, etc.) This book will appeal to a wide variety of scientific specialists, biochemists, microbiologists, molecular biologists, pharmacologists, cytogeneticists, and biophysicists, among others.

GMH

"HANDBUCH DER PFLANZENKRANKHEITEN" (Begr. v. Paul Sorauer) by D. Buhl, H. Boerner and H. Schmidt, Band I. Die nicht-parisitaeren Krankheiten. 3. Lfg. Ed. 7. XI 299 pp., 75 figs., 6 tabs. Verlag Paul Parey, Berlin 61. 1968. DM. 116,--.

This volume is one of 24 volumes comprising the 6 volumes of the Handbuch, and is concerned with wounds, the antagonistic effects of higher plants (allelopathic phenomenon), and injuries to cultivated plants from plant protective and plant treatment agents. The text is well printed with attractive graphic aids, such as photographs and graphs, and has a terminal subject index. A large part of the volume consists of bibliography.

GMH

"MORPHOLOGICAL AND ANATOMICAL CONSIDERATIONS OF THE GRASS SUBFAMILY BAMBUSOIDEAE BASED ON THE NEW GENUS MACLUROLYRA" by C. E. Calderon and T. R. Soderstrom, iii, 55 pp., 24 figs., Smithsonian Contr. Bot. No. 11. 1973.

Maclurolyra tecta gen. et sp. nov. grows in Panama. Epidermis and leaf anatomy, seedlings, inflorescence morphology, floral structure, and cytology indicate this as a member of tribe *Olyreae* of subfamily *Bambusoideae*. The "bambusoid" type of leaf anatomy is described with comments on the vascular bundle sheaths in *Gramineae* and chloroplast structure and photosynthetic pathways as new criteria for grass taxonomy. With a basic number x=11 (chromosomes), it is regarded phylogenetically as one of the least advanced genera of its tribe. (Most bamboos are tetraploids, with 2n = 48). It is probable that bamboos derived from herbaceous ancestors, or they arose as polyploids from diploid herbaceous progenitors. Most herbaceous bambusoid grasses are diploid and flower throughout the year, while most bamboos are tetraploid and flower only once in many years. An appendix gives the genera comprising the *Bambusoideae*, designating those which are true bamboos and those which are herbaceous bambusoid grasses.

GMH

"THE SEA AROUND US" by Rachel L. Carson (1907-1964). (Ed. 2). XVIII + 257 pp., 3 figs., 16 pls., 4 maps (including end sheets), Oxford University Press, New York. 1961. $5.00.

This very popular book sold copies in the millions and was translated into at least 28 foreign languages. This revision of the first (1951) edition is mostly a revision made in the form of notes in the Appendix (pp. 211-222) keyed to points in the text. The Preface (pp. VII-XIII) is also new. This work although now essentially 25 years old is just about as fascinating as ever and can be read with a great deal of interest. Part I, Mother Sea, deals with the history, variety, magnitude, and wonder of the oceans. Part II, The Restless Sea, expounds on the various factors (wind, sun, earth rotation, tides, etc.) which mold the ocean and the surrounding land. Part III, Man and the Sea about him, speaks of the value to man in various ways of the oceans and seas: moderation of climate, economic benefits, and so on, Man's efforts at navigation from the earliest times are recounted. This book is truly timeless and should be of as much interest a century now as it is at the present time.

GMH

"BACKGROUND TO MIGRAINE. THIRD MIGRAINE SYMPOSIUM: 24-25 April, 1969" by A. L. Cochrane, editor, X + 186 pp., 65 figs., 28 tabs, Springer-Verlag New York, Inc. (Sponsored by the Migraine Trust) 1970. $7.40.

Participation in this Symposium held at the National Hospital in Longon WC1 was very broadly international with active participation from many countries, including Denmark and Austria. For the 18 chapters (most with the recorded discussion following) there are 36 contributors or authors. The book is done entirely in English as in previous numbers. This symposium differed from earlier ones in including a larger proportion of scientific research reports. Fortunately, the text has been kept readable and interesting for the average physician or related health professional and for the knowledgeable and serious layman. Some chapters show titles which would attract one to read them in whole or in part: psychiatric aspects of headache; role of tyramine in migraine; migraine families and their EEG's; epidemiology of migraine in Denmark; migraine and serotonin; headache as related to oral contraception pills; the many varieties of migraine; steroidal hormones and vascular reactivity (related to etiology of migraine); dietary migraine; migraine cured by treatment of Conn's syndrome (aldosteronism); interaction of ergot and xanthine alkaloids; headache after administration of reserpine in migranous patients; and (the last chapter not the first as might have been expected) definition of migraine.

GMH

"THE BOLETI OF NORTH CAROLINA" by W. C. Coker and Alma Holland Beers, VIII + 97, 67 pls. (7 in color), Dover Publications, Inc., New York. 1974 (1943). $3.50.

This is an unabridged republication of a book, the original title of which (1943) was "The Boletaceae of North Carolina." Included are taxa of Boletus, Boletinus, and Strobilomyces. The new taxa included are of course now part of the total literature of mycology.

GMH

"DRUG TOPICS RED BOOK" by W. Cousins, Editor. 1968. 71st Year: 552 pp., plus 46 pp. = 598 pp.; 9¼ x 12 in.; card cover; 1967. $15.00 (including main volume and 2 supplements). Cumulative Supplement #1: 48 + 4 pp. = 52 pp.; 1968; same size as mainwork. Topics Publishing Co., Inc., 330 W. 34th St., New York, NY 10001. $10.00

In this large compilation, which is of vital importance to the retail or wholesale pharmacist, there is a real "world of information." Product listing and prices, with a list of manufacturers and their addresses, sometimes with manufacturers' catalogs, and with many descriptive texts are contained in the main part of the volume. Interspersed among the numbered pages are 21 unnumbered or separately numbered advertising inserts or catalogs; also the inside front cover and both sides of the back cover bear manufacturers' announcements. Two cumulative supplements appear in January and May. There is much useful information pages 4-17 and 546, 548, with such data as names of pharmaceutical associations, pharmaceutical state board secretaries' names and addresses, reference book list for the drug store, etc.

GMH

"MACROLICHENS OF DENMARK, FINLAND, NORWAY, AND SWEDEN" by E. Dahl and H. Krog, 185 pp., 62 figs., Universitetsforlaget, Oslo, Norway. 1973. Hard Cover. US $10.00.

Textual matter is given on the morphology, distribution, and chemistry of lichens, followed by analytical keys to 45 genera and ca. 400 species of lichens. There are also sections on the classification of the group, synonyms (equating of synonyms or invalid names to the accepted epithets), a glossary, literature collation, etc. While the book is understandable to the serious layman, at the same time it is accurate and comprehensive enough to attract the professional botanist. The largest proportion of the work is that occupied by the annotated key, which includes brief descriptions and figures of the various taxa. The book should be an excellent guide to the identity of this interesting group of plants and no doubt would also be applicable to many of the lichens of other parts of the world since these plants are so widely distributed. The book is attractively and strongly manufactured.

GMH

"PRODROMUS OF GALEATELLA AND NEOWIMMERIA" by O. and Isa Degener, Pamphlet, 1-13; 1974. Published by authors (P.O. Box 154; Volcano, Hawaii 96785).

Nine transfers are made from Lobelia to these two genera established by the authors (Flora Haw., 1962, 1963). Thus, Galeatella longibracteata comb. nov. (Lobelia gaudichaudii var. longibracteata Rock, 1913). Other transfers had been made in earlier publications.

GMH

"THE FAT-SOLUBLE VITAMINS" edited by H. F. DeLuca and J. W. Suttie, xviii + 531 pp., many figs. and tabs., The University of Wisconsin Press, Madison, Wisc. 53701. 1970. $15.00.

In this volume, 31 papers by 49 contributors, among them the two editors, contribute to our knowledge of vitamins A, D, E, and K, which are now so important in the practice of medicine. (An additional 3 papers (A,B,C) were contributed later.) These papers were presented in 1969 at a Symposium honoring the late Harry Steenbok (1886-1967) and which was held at the University of Wisconsin. The first introductory paper is an analysis of the place in science held by Dr. Steenbok who is best known for his discovery of the preparation of vitamin D by irradiation of ergosterol. The research papers are in four groups: first vitamin D, with 13 papers, then vitamin A with 8, vitamin E with 6, and vitamin K with 6 papers. The emphasis in the various papers is on the biochemistry and therapeutics of these vitamins. The chapter on the clinical aspects of vitamin D (E. R. Yendt et al.) was found particularly interesting and informative as a review of the results both of vitamin D deficiency and excessive dosage. The initial chapter by Hector DeLuca covers interesting new studies which indicate that vitamin D_3 is not directly metabolized by the mammalian body but is first converted into 25-hydroxycholecalciferol (25-HCC), which exerts the vitamin D effect much more rapidly. Other workers have made the attempt to use this special compound in treating patients who are refractory to the effects of vitamin D, thus in sarcoidosis, some cases of hypoparathyroidism, etc. If it can be produced economically, one day 25-HCC may be the drug of choice in rickets and other vitamin D-deficient diseases. A chapter on the metabolic functions of Vitamin A (G. Wolf and L. DeLuca) conveys the surprising information that this vitamin should be regarded as more of a hormone than a vitamin "in the classical sense of a coenzyme" since it is secreted into the bloodstream and influences the behavior of tissues and organs at distant points. Two chapters explore the effect of vitamin A deficiency in the germ-free rat: one chapter is by U. S. Army investigators, the other by National Institutes of Health personnel. There are many other important matters disclosed in this volume, which well deserves to stand on the shelves of physicians, biochemists, and pharmacologists.

GMH

"CARTE ECOLOGIQUE DU NEPAL" by J. F. Dobremez and C. Jest. I. Région Annapurna-Dhaulagiri, 1/250.000. Notes et Documents de la RCP 253: 147-190. (Univ. de Grenoble). II. Région Jiri-Thodung 1/50,000. ibid. 9-24. (Also Note ethnologique sur la région de Jiri). III. Région Kathmandu-Everest 1/250,000. Documents de Cartographie Ecologique 11: 17-32; 1973. IV. Région Terai Central. 1/250,000. ibid. 12: 1-16; 1973.

Each large colored map is accompanied by the text of which the pages were cited. These ecological maps cover about one-half of Nepal and in III show 46 types of vegetation and 10 vegetation belts in the central part of Nepal.

GMH

"BIBLIOGRAPHIE DU NEPAL" by J. F. Dobremez, F. Vigny and L. H. J. Williams, Vol. 3 Sciences Naturelles. Tome 2. Botanique., Centre Nat. Rech. Scient., Paris VII. 126 pp., 9 figs., 4 pls., Editions du CNRS. 15 quai Anatole France, Paris, Fra. 1972 (1973).

Annotated citations are given to the literature, followed by an analytical review with cross indexes based on geographical areas, plant groups, cytology, palynology, etc. A list of herbaria and botanical gardens containing Nepalese plants follows, along with a list of plant collectors in Nepal and alphabetic indexes of anonymous articles, authors, and serials represented in the bibliography.

"DRUG INFORMATION SOURCES" [A World List] Anonymous. American Journal of Pharmacy 136: 52-70, 152-64, 257-67; 1964. 137: 35-40, 69-81; 1965.

This is a compilation of books which deal with the drugs, pharmaceuticals, and specialties (proprietaries) of the various countries of the world, including the United States, International, Argentine, Australia, Austria, Belgium; Brazil, Bulgaria, Canada, Cuba, Denmark, France, Germany; Great Britain, Greece, Hong Kong, India; Israel, Italy, Japan, Latin America; Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Scandinavia, Spain, Sweden, Switzerland, United Arab Republic, USSR, and Yugoslavia. Besides the citation of the work, there is a paragraph of description and criticism about it. The list was compiled by the Drug Information Sources Committee (Chairman, Anne McCann) of the Pharmaceutical Section, Science-Technology Division, Special Libraries Association.

GMH

"FACING REALITY: PHILOSOPHICAL ADVENTURES BY A BRAIN SCIENTIST" by J. C. Eccles. (Heidelberg Science Library, vol. 13). xi + 199 pp., 36 figs., Springer-Verlag New York, Inc., 175 Fifth Ave., New York 10010. 1970. Soft cover. $6.20.

In this book, we have a combination of philosophy, psychology, psychiatry, neurology, theology, anthropology, biology, communication sciences, and the various social sciences and liberal arts. There is something for everyone, or almost everyone, apparently. The author, Professor Sir John C. Eccles, lectures at the State University of New York in Buffalo (formerly called the University of Buffalo) in the department of Physiology of the medical school. His outlook on life is that of the true humanist as may be gleaned from the following passage in the preface: "After the radiance and optimism of the first few years of this century, European civilization has been overwhelmed by a succession of disasters with only brief respites...I look with forboding at the future of our European civilization. . . my whole effort has been directed positively in the attempt to build upon the magnificent heritage of our civilization with its rationality and its beauty. My hope is that I may restore to my fellow men a sense of the wonder and mystery of their own personal existence on this beautiful planet that is ours. . . (and) with the courage to adventure wisely in achieving a new illumination in the last decades of this turbulent century."

GMH

"ILLUSTRATED GUIDE TO THE SEAWEEDS AND SEA GRASSES IN THE VICINITY OF PORT ARANSAS, TEXAS" by Peter Edwards, iv + 131 pp., 225 figs. (including 9 in color), University of Texas Press, POB 7819, Austin, Texas 1976. $6.95.

This is a reprint of a supplement to Contributions in Marine Science vol. 15 (1970), which renders it available in convenient form to the taxonomist, field collector, and others. Also, several important additions have been made, resulting in a total of 97 taxa of Algae in 56 genera, along with 5 species of Phanerogamae (Angiospermae; Monocotyledoneae). There are both generic and species keys, with descriptions of all taxa and with collecting information. The photographs are well done, both macro and micro views of the various plants being included. The price of the book is returned from the illustrations alone. The copy reviewed is in a water-shedding card cover and sturdy enough for most usage. Port Aransas is well down the Texas coast, about fifty miles from Mexico.

GMH

"ERZEUGUNG VON KRANKHEITSZUSTAENDEN DURCH DAS EXPERIMENT" (Experimental production of pathological conditions), Part 8, "Stuetz- und Hartgewebe" (Supportive and solid tissues), by six authors; Editor Oskar Eichler. Handbuch der experimentellen Pharmakologie vol. XVI/8: XI + 270 pp., 56 figs. Springer-Verlag Berlin (etc.): 1969. Bound DM 98,- (US $43).

This volume, all in the German language, consists of four articles, the first on diseases or disorders of the teeth (by H. D. Cremer and W. Buettner), the second on those of the skeleton (by Hans Gebauer); the third on skeletal deformities induced by irradiation (by W. Seelentag and O. Kistner); and the last on those disorders of the joints (by P. Stern). There are accompanying comprehensive listings of the literature and a subject and an author index. Dr. Stern is from Jugoslavia, all the others live in Germany. As usual, very fine black and white photographs and clear-cut diagrams illuminate the pages. The first chapter has sections dealing with the experimental production of caries (cavities) in experimental animals, the objective being to determine the factors which determine this pathological development (diet, genetic factors, microorganisms, etc.). Experiments are reported using human teeth in vitro, attempting to simulate conditions in the human oral cavity. Also reviewed are experimental studies of erosion of enamel, depigmentation, etc. A review of the parameters affecting tooth disorders includes discussion of the importance of various minerals and elements, vitamins, endocrines, and irradiation. The eventual benefits to human health are obvious.

GMH

"ZANDER: HANDWOERTERBUCH DER PFLANZENNAMEN" by F. Encke, G. Bucheim and S. Seybold, Ed. 10, 744 pp., Verlag Eugen Ulmer, Stuttgart. 1972 (recd. 1973). DM. 42.--(linen).

This very useful reference book contains synopses of many genera (chief part of book), German and some foreign vernacular names for plants, many specific names with their meaning, and brief biographies of many botanists.

GMH

"BRADYKININ, KALLIDIN, AND KALLIKREIN" E. G. Erdös and A. F. Wilde (Technical Editor). Handbook of Experimental Pharmacology, Heffter-Heubner, New Series, Edited by O. Eichler, A. Farah, H. Herken, and A. D. Welch. Vol. XXV: XIX + 768 pages, 117 figs., many tabs., Springer-Verlag: Berlin - New York - Heidelberg. 1970. Cloth DM. 248,--. US $68.20.

The latest part of this great work ("Heffter-Heubner") covers an area of expanding research with great thoroughness and detail. The first chapter traces the discovery of two of the three agents named in the book's title, and is authored by one of the men engaged in this early pioneering work - Dr. Eugen Werle (Univ. of Munich). This chapter like all the remainder of this large volume is in the English language. Kallikrein was discovered in the urine as a substance causing blood pressure decrease; Frey (1926) made the discovery - hence the "F substance;" Kraut (1928) called the "serum inactivator" something in the blood serum which inactivated kallikrein. Kallikrein was isolated from the pancreas by Kraut (1930) (Werle, 1934). Kallikreinogen, inactive precursor, was discovered in 1937 (Werle), being later called prekallikrein. Another inhibitor occurring only in bovine organs was discovered in 1930; this was not the same as the serum inactivator. Kallidin (Werle, 1936) was discovered as a second component of urine, which lowered blood pressure but also contracted the intestine. Kallidin-inactivating enzymes were also demonstrated. Kallikrein was discovered to be an enzyme ca. 1940. The story of bradykinin, a potent vasodilator which however acted slowly (hence the name), is told in chapter 2. It was discovered in 1949 in the plasma by Rocha e Silva in Brazil. This chapter is written by D. F. Elliott (London), who did much of the research on bradykinin. This impressive tome has 40 contributors (including the Editor), who is at the University of Oklahoma, and who has done valuable work with the kinins and kininases, kinin being of course the generic term used for these various endogenous peptides which act on blood vessels, smooth muscles, nerve endings, etc. The authorship of the volume is international in scope, with 18 Americans, 7 Germans, 5 British, 3 Brazilians and 3 Japanese represented, along with 1 author each from Belgium, Canada, Italy, and Czechoslovakia. (Minor error on page 5: between line 6 and 7 the meaning would have been clearer by adding "shown to"). There are numerous references following each subdivision within the chapter rather than solely at the ends of chapters. 9 chapters, an appendix, and author and subject indexes compose the volume.

GMH

"FLORA DE S. TOME E PRINCIPE. ALANGIACEAE" - Jardim e Museu Agricola do Ultramar, Ministerio do Ultramar, Lisboa. by J. do Espirito Santo, 4 pp.; 1973.

Descriptions of *Alangium chinense* (Lour.) Harms, the sole species of the sole genus of the family represented. Geographical distribution is given.

Also *Aquifoliaceae*. 4 pp.; 1973.

Description of the family with its sole representative here, *Ilex mitis* (L.) Radlk.

GMH

"ETMER-LUNDT: DEUTSCHE SEUCHENGESETZE"; Sammlung des gesamten Bundesseuchenrechts. Verlag R. S. Schulz, Percha am Starnberger See, Berger Str. 8,10; also Muenchen. Looseleaf; 1396 pp. 1969. Price DM.59.- approx. $26.00.

This collection of the German Federal laws concerning infectious diseases has been published to replace the work entitled: Seyffertitz/Thomaschewski: "Bundes-Seuchengesetz; Sammlung des Seuchrenrechts. (Bundes-Seuchengesetz)" (last supplement issued 9 Nov. '68). The compilers are Dr. F. Etmer, Vice-president (retired) of the national social laws division and Dr. P. V. Lundt, managing Director and Professor at the Federal Health Office. The contents include the laws relating to animal infections, meat inspections, food law specifications, etc. Both compilers are outstanding experts in these subjects. The laws are numbered from 1 to 880, and two indexes are provided at the front of the volume to facilitate the sections of interest. One index is a systematic enumeration by order of numbers, the other is an alphabetic arrangement; a condensation of this latter index is set in the inner covers of the volume, using abbreviated forms.

Thus AffenEinfVO may be translated as Affen-Einfuhr-Verordnung (Importation of apes regulation). Law No. 1, which with its supplement covers many pages, is entitled the "law for the prevention and control of contagious diseases in man", and concerns many diseases, such as (taken at random) ornithosis, salmonella infections, scarlatina, and toxoplasmosis. Law 2 (KrErreg) deals with notices concerning directions or rules regarding infectious agents, i.e., shipping, mailing, etc. The "milk law" is No. 650. The numbers are not consecutive. Thus, under the heading of "foods and condiments; requirements," there will be found Laws no. 201, 205, 207, 211, 216, 217, 219, 221, 222, 223, 227, 228, 230, and 232, and following the last number a gap up to 250 (child welfare). Obviously this is to permit expansion and the introduction of new laws to cover new situations or products, the same object in using the loose-leaf binding. A law is often followed by an executive order, thus for instance Item No. 133 is a law for the professional practice of medicine "without (medical school) diploma," including presumably such medical arts as chiropractic, naturopathy, etc.; this is followed by Item No. 134, an executive order for administration of this law. In addition to the statutory provisions, many legal decisions are referred to, so that apparently precedents are regularly used in administering justice ("the unwritten law").

GMH

"THE CHEMISTRY OF THE ANTIBIOTICS USED IN MEDICINE" by R. M. Evans, X + 226 pp., many figs. and tabs. 1515 cm. X 19.6 cm., Pergamon Press, Oxford, New York. 1965 (1969). $8.50.

The stiff board covers of this volume are decorated with illustrations, back and front, of Petri dish ("plate") cultures prepared from soil samples and on the front cover there is imposed the structural formula of fusidic acid, one of the more recent antibiotics, first isolated in 1962. It is a steroid closely related to cholesterol and lanosterol, and illustrates the fact of the wide variety of structural types to be found among the antibiotics, including those derived from amino acids, those from sugars, those from acetate or propionate units, and so on. This small volume includes good background information but is specially concerned with the chemistry of these compounds, except for the last chapter and the two appendices. These deal with the mode and sites of action of antibiotics, their use in clinical practice, and those with antitumor activity (respectively). This book can be recommended for college courses in which the antibiotics are studied, especially in such courses as "natural products chemistry." With the hundreds of reference citations at the ends of the various chapters, the book will be doubly effective as a learning and reference tool.

GMH

"CARBON MONOXIDE IN ORGANIC SYNTHESIS" by Jürgen Falbe. Translated from the German by Charles R. Adams, ix, 219 pp., 21 illus. including 1 col. pl., 69 tabs, Springer-Verlag New York, Inc., 175 Fifth Ave., New York NY 10010. Title #101653. 1970. Cloth. $16.00.

This volume represents a revised and updated translation of "Synthesen mit Kohlenmonoxyd" by Falbe, published in 1967 as Volume 10 of "Organische Chemie in Einzeldarstellungen". Besides a table of contents in the front of the book there is a subject index at the end but no author index. The text is composed of four chapters, each dealing with a separate type of synthesis using carbon monoxide (CO): (1) Hydroformylation reaction, also called the oxo-reaction or the Roelen reaction (because developed by Roelen in 1938 at the Ruhrchemie AG., where Falbe is also associated); in this reaction, aldehydes and ketones are formed by the interaction of CO and H_2. (2) Metal carbonyl-catalyzed carboxylation reaction, also called the Roeppe reaction because developed by W.R. in 1938 at the Badische Anilin-u. Soda-fabrik: in this process, $Ni(CO)_4$ and other metallic carbonyls (Co, Fe, Pd, etc.) aid the reaction of CO with unsaturated compounds (ex. acetylene) and with nucleophilic compounds (i.e., those able to donate or share electrons) (ex. H_2O, alcohols, etc.) to produce carboxy acids (such as acetic acid). (3) Carbonylation with acid catalysts, developed mostly by Koch, (hence called the Koch reaction): a 2-stage process involving an olefin combining with CO and H_2O in the presence of an acid catalyst, at relatively moderate temperature and pressure to form a complex, which in the second stage is hydrolyzed to form a carboxylic acid, such as propionic acid. (4) Ring closure with CO: unsaturated compounds with at least 4 or 5 membered chain reacting with CO to form a 5 or 6 membered ring compound. On page 2, line 6 from bottom, Cios is misspelled for Bios: there are two papers in the serial called Bios referred to in the bibliography.

GMH

"ORGANISCHE CHEMIE: by Gabor Fodor. Vol 2. 939 pp. (pp. 828-1766) plus 6 pp. of col. pls. (42 pls.) (pl. 63-104), 58 tabs. - Vol. 3. "Literatur und Register.", 229 pp. (pp. 1767-1995). - VEB Deutscher Verlag der Wissenschaften, Berlin (DDR). 1965. Bound (v.1,2); flexible cloth (v. 3). 3 vols. for MDN 152,- US $38.00.

The first volume of this detailed work on organic chemistry has previously been **reviewed** (Quart. J. Crude Drug Res. 9: 1490-1; 1969). The author of this comprehensive work is Director of the Research Laboratory for Stereochemistry of the Hungarian Academy of Sciences in Budapest. He is well known for his numerous publications and many guest lectures both inside and outside of Hungary. This comprehensive work is based on an Hungarian edition, which was enlarged and brought up to date by the author. Despite the enormous growth in the number of organic compounds of both natural and synthetic origin, the new findings in the area of reaction mechanisms and the steric basis of these, and the uninterrupted flow of discoveries of ever new transformations, the quintessence of all this older and newer knowledge has been put together from a clear and uniform outlook. By showing basic principles and guide-lines, the development of theoretical organic chemistry is greatly simplified; the general and essential principles have been selected to obtain the utmost simplification of the organic type reactions. Whereas volume I dealt with the hydrocarbons (both aliphatic and aromatic) and their halogen and hydroxy derivatives and the organic compounds of sulfur, nitrogen, phosphorus, etc., in the present volume, four large chapters have been included, dealing respectively with the oxo-compounds (aldehydes, ketones, etc.); the carboxylic acids and derivatives; the aromatic heterocycles and derivatives; and the steroids. As in volume 1, a series of Stuart-Briegleb atomic (molecular) models is appended at the end of the volume to better show true steric relationships of the atoms in a molecule. The 3rd volume is composed of four lists: literature citations, Nos. 1-2607; biographical data for outstanding chemists; author index; and subject index. This valuable work is intended for advanced chemistry students specializing in the field of organic chemistry; however, it is of inestimable value for all professional chemists.

GMH

"THE GROWTH OF PLANTS" by G. E. Fogg (Ed. 2). 302 pp., 54 figs., 24 pls., 1 tab., Penguin Books, Inc., Baltimore, MD. 1975. (paperback) $3.95.

This small volume lays the foundations for a study of plant growth, a basic process which supports the life of man and all other animals as well as the lives of many parasitic plant species. It seems likely that this dependence of man will continue indefinitely into the future. With the earth's exploding populations, it seems essential that we learn all we can about the way plants grow so that we can better utilize them in the vast efforts at food production that lie ahead for the human race. The alternative is the spectre of vast starvation and death for millions - the cruelest death of all, it is said. The machinery of photosynthesis - that all important process for production of plant substances - is reviewed, and other essential processes, such as respiration, are gone over. Transport (translocation) of materials in the plant, correlation of growth with formation of plant organs, adjustments of growth to the environment, circadian and other rhythms, and other important matters are included in this important text.

GMH

"GADDUM"S PHARMACOLOGY" Revised by A. S. V. Burgen and J. F. Mitchell. Ed. 6, VII + 235 pp., many figs. and tabs., 1 frontispiece (portrait of Sir John Gaddum), Oxford Univ. Press, 200 Madison Ave., New York 10016; also Toronto and London. 1968. (paper) $8.00.

At first sight, one wonders if one is getting "his money's worth" from this little book. However, after a careful study, it becomes clear that for its wealth of clear and useful information and its organization the book is a bargain. Sir John's work has been well received since the original edition of 1940, and the new edition has been reworked to maximum effectiveness. There is considerable graphic material, such as figures, diagrams, formulas, graphs, etc., division into reasonably short sections, and at the end of each of the 19 chapters "Further reading." The general arrangement follows the following plan: introductory, central nervous system agents, peripheral nervous system, autonomic nervous systems, smooth muscle, circulation, body temperature control, alimentary tract, vitamins, blood, endocrines, urinary system, chemotherapy, and a final chapter on "quantitative and human pharmacology." At the end of the text are sections of general reference books and journals, units of measurement, quantitative data for aqueous solutions, an index of chemical rings, and the index. It should be considered as a text for any introductory course in pharmacology. It has a large advantage in providing a relatively small book which will look readable to the student who is so often overcome by the formidable size and weight of the college textbook.

GMH

"THE ENDOGONACEAE IN THE PACIFIC NORTHWEST" by J. W. Gerdemann and J. M. Trappe, VII + 76 pp., Mycologia Memoir No. 5. 1974.

As a result of these studies, the large and heterogeneous gen. *Endogone* has been split into four genera, viz., *Endogone* Link, *Glomus* Tul. et Tul., *Modicella* Kanouse, and *Gigaspora* gen. nov., with *G. gilmorei* sp. nov., *G. calospora* (Nicol. et Gerd.) comb. nov. (Endogone c.), *G. gigantoa* (Nicol. et Gerd.) comb. nov. (E. g.), and *G. coralloidea* Trappe, Gerdemann, et Ho sp. nov. An extralimital sp., *G. heterogama* (Nicol. et Gerd.) comb. nov. (E. h.) from Illinois is also brought into the gen. Seven genera are represented in the title area (c. California no. to Alaska and east to Idaho; most studies were made in Oregon). Also recognized for the family is *Acaulospora* gen. nov. with as type sp. *A. laevis* sp. nov. and *A. elegans* sp. nov. Also 8 species nov. and several new combinations are described for the genera *Glomus*, *Sclerocystis*, and *Endogone*.

GMH

"MAMMALIAN REPRODUCTION" edited by H. Gibian and E. J. Plotz, vi + 470 pp., 224 figs., 81 tabs, 21st Colloquium of the Society for Biological Chemistry (Gesellschaft fuer Biologische Chemie), 9-11 April, 1970, in Mosbach/Baden (Germany), Springer-Verlag New York. 1970. $18.70.

The contents of this cloth-bound, hard-back book consist of the introduction and terminal summary and the 20 chapters which lie between. All is in the English language ("the Latin of the scientific world") except for a part of the Introduction (which is translated in a footnote). There are 33 authors including the Editor, Dr. Heinz Gibian, who is responsible for both introduction and summary. (Both editors wrote the brief Preface.) These include 9 United States individuals or groups, 7 German, 3 individuals from Great Britain, and one individual from France. The discussions following each presentation have not been published in this volume since this would have unduly delayed appearance of the volume. Since sexual reproduction is of primary importance to man (and to any other mammalian species), sometimes transcending food, shelter, or even life itself in priorities, the subject of this conference is of the utmost interest. Most papers deal with the various phases of reproduction in the lower animals, so often much more convenient and at times representing more objective subjects for study. Thus the pages are replete with references to dogs, monkeys, apes, rats, and rabbits. (Especially rabbits). Title samplings (in essence) include a general review of the subject; importance of hormones in sex differentiation _in utero_; hypothalamus luteinizing hormone (LH)-releasing hormone; the identity of the LH and follicle-stimulating hormone (FSH); pituitary regulation of sexual functions; cybernetics of mammalian reproduction; androgen biogenesis; female sex hormones biosynthesis; the life history of sperm from ejaculation to syngamy; the biochemistry of seminal plasma; ovum transport; ovum metabolism between conception and nidation (deposit on uterine wall); immunology of reproduction; genetics of early development; role of uterus in regulating ovarian periodicity; hormonal effects on socio-sexual behavior of dogs. Something for everyone in the biological fields! The book is well printed, the text in clear simple English (except for the technical terms), and the information important in the advancement of the various scientific disciplines.

GMH

"A REVISION OF B. E. DAHLGREN'S INDEX OF AMERICAN PALMS" by S. F. Glassman, vi + 294 pp., 2 tabs., Phanerogamarum Monographiae Tomus VI. 1972 (1973). DM. 120,--.

An amended listing of American palm species is given based on the work of Dahlgren (Field Mus. Nat. Hist. Bot. 14: 1-456; 1936), which was the first compilation of the taxonomic and nomenclatural information on New World Palmae. The present annotated listing includes 76 genera and 1167 species considered to be "good" (valid). This is fewer species than appeared in the original work; the reason is that Dahlgren included many pre-Linnaean names. In this listing, the correct names are given in bold face type and the incorrect names in ordinary type face. The addenda include references (229-264), geographic distribution by country (native species not cultivated, unless known only in cultivated form), census of New World palms by genus and by country (288-9), and additions and corrections (291-4). Excluded from this listing are fossil palm names and vernacular names. Greater ease of use would have been possible by running the generic names as a title at the head of each page - or else if an index had been prepared.

GMH

"MEDICAL PHARMACOLOGY: PRINCIPLES AND CONCEPTS" by Andres Goth, M.D., Ed. 3, xi, 668 pp., 66 figs., mostly graphs, 23 tabs., The C. V. Mosby Company, St. Louis, Missouri. 1966. $12.50.

Nowadays, most textbooks grow with each edition, sometimes from relatively slender volumes to thick rather unwieldy tomes, one might even say overpowering to the poor student. In the present volume, one finds a pleasant contrast: The author, who is Professor of Pharmacology at The University of Texas Southwestern Medical School, at Dallas, states in the Preface:

> ... a textbook for students and physicians, as opposed to a reference book, does not have to be lengthy if it includes adequate references to the experimental literature and to recent review articles. In fact, there is a danger that a textbook with too many details may obscure for the student or practitioner what is really exciting about the disciplines: the underlying ideas, their development, and their importance in current medical thinking.

The author apparently means what he says since he has succeeded very well in condensing the essence of the subject matter of the field within 635 uncrowded pages of text. Not only that, but the pages are enlivened with useful graphs, figures, and formulas, and there has even been an effort to make the pages more colorful by using blue colored chapter and section headings and coloring the tables so that they stand out from the text quite emphatically. This seems a good idea to underline the importance of tables, since most students give them scarcely a glance. The author makes a serious error of fact on page 634, when he states that inclusion of drugs in the "National Formulary" may be based on extent of use, and suggesting for this reason that the physician should limit his use of drugs to those in the U.S. Pharmacopeia and New Drugs (A.M.A.). The section on quinine (p. 601) should be updated.

GMH

"HACKH'S CHEMICAL DICTIONARY" (American and British usage), containing the words generally used in chemistry, and many of the terms used in the related sciences of physics, astrophysics, mineralogy, pharmacy, agriculture, biology, medicine, engineering, etc., based on recent chemical literature, by Julius Grant. Ed. 4, completely revised, XI + 738 pp., tabs., figs. (s.n.), McGraw-Hill Book Company, 330 W. 42nd St., New York 10036. 1969. $31.50.

This large compilation is obviously more comprehensive than its preceding edition, with an estimated 80,000 definitions (approx.). From studying over the contents, it was found that many different kinds of information are to be had from the single alphabetical sequence contained. These include besides chemical names of compounds, generic names for medicinals (such as acetophenetidine), proprietary trademarked names (such as Phenacetin (not capitalized)), synonyms (for instance, blue salt), therapeutic terms (as emetic), plant common names (like potato), plant group names (such as Compositae), some small plant units (as the generic name Solanum), biographic information (such as Ira Remsen), abbreviations (for example D.C. for direct current), animal common names (e.g., whale), apparatus and equipment names (such as interferometer, boss), pharmaceutical preparation types (f.i., lotion), classes of compounds (for an example, loretinates), crude drug common names (ex., thoroughwort), names of reagents (as Thoulet's reagent), elements (as thulium), commercial terms (as stumpage), various phenomena (as scattering), scientific disciplines (such as metallography, metallurgy), chemical redicals (as heptyl), and others. Interspersed in the text are many space-saving tables and figures, such as petroleum reserves of various parts of the world, leading insecticides (3 pages), and graphic formulas for many compounds, such as menadione. With such an enormous and proliferating vocabulary as is found in the chemistry field, it is no wonder that there are omissions. Here are several found: carvenyl acetate - conformation - towsack - simethicone - ergoline - absorbance and absorbancy - Ci. (for Curie) - tris- heteropolysaccharides and homopolysaccharides - scalant - catecholamines - glucanase - glucan (polyglucoside) - glycans (polysaccharides) - glycoside (besides the one meaning given) - heteroside - ose, oside - HLB (for hydrophilic-lipophilic balance) - tartar emetic (SbK tartrate) - UL (ultra linear) - glycokinin - homosekikaic acid (in lichens) - crambe oil - amine alkaloids - pectose (should have been equated to protopectin) - betalains (natural dyes) - thyronine - extinction (for absorbance). The definition for prostaglandin is incomplete. The 3 components of ergotoxine are not indicated. Glucokinin is not an equivalent name for insulin. In the alkaloid table, aconitine, etc. are wrongly indicated as of unknown constitution. This is truly a great mine of information!

GMH

"GENETICS OF FLOWERING PLANTS" by Verne Grant, xiv + 1-514, 61 figs., 4 tabs., Columbia University Press, New York and London. 1975. $20.00.

The strategy of this important and unique book is a developing one from the simpler to the more complex: beginning with the genes proceeding to gene systems thence to linkage systems and finally to genetic systems. This is the only work covering this field published since Sansome and Philip's "Recent Advances in Plant Genetics" (ed. 2, 1939). The subject has been largely dropped from texts in genetics, which are now more concerned with animal genetics, etc. This book is actually an extension from an earlier work of the author: "Architecture of the Germplasm" (1964). In the earlier part of the book dealing with gene action and the development of the organism, features are discussed which are common to both plants and animals, thus, the relations of genotype and phenotype. Mendelian genes as originally conceived were not thought of as being present in the chromosomes, in fact the location was unknown except that they were in the gametes. Hence a distinction is made between this theoretical entity of Mendel and the modern rather concrete gene located along the length of the chromosome. The text has been made as simple as would be possible for such a complicated subject matter, however the chief difficulty with this as with so many other fields of science lies in the vocabulary. It occurs to this reviewer that a glossary would have been of much value in this work. Even though many definitions can be found by using the subject index (there are also author and organism indexes), quite a number of words could not be found by this means: thus, allele, dedifferentiation, clone, introgression, dominant and recessive, and allopolyploids were not present in the index. The depth and breadth of the coverage may be gaged by the very large bibliography (35 pages) at the back of the book (instead of at the ends of the various chapters). Libraries of botany and genetics should surely have this volume.

GMH

"CHEMOSTYSTEMATICS IN THE CLASSIFICATION OF CULTIVARS" by W. F. Grant, pp. 293-302, Chemistry in botanical classification, Proc. 25th Nobel Symposium, 1973. Stockholm (Ed. G. Bendz and J. Santesson). 1974.

Various cultivars often cannot be properly distinguished by morphological descriptions alone. Biochemical technics such as paper and thin-layer chromatography, electrophoresis, and serology offer better means of distinction of such plants. This is illustrated in the case of *Manihot esculenta* Crantz, of which more than 900 cultivars are known. Two-dimensional thin-layer chromatography was successfully used to distinguish the pattern of secondary phenolic compounds of the leaf, comparisons being made of differences in 55 fluorescent spots by a cluster analysis computer program in which the cultivars were grouped by different S values. By using chromatography and spectrophotometry, flavonoids have been identified as glycosides of quercetin and luteolin and the cinnamic acids as chlorogenic acid, esters of p-coumaric, caffeic, ferulic, and sinapic acids, and glycosides of caffeic and ferulic acids.

GMH

"ANATOMY, DESCFIPTIVR AND SURGICAL" by Henry Gray, F. R. S. 1260 pp., 780 figs., Running Press, 38 S. 19th St., Philadelphia, Pa. 19103. 1977 (1901). $8.95.

This paperback reprinting of Gray's classical Anatomy is based on the 1901 edition. The number of this edition is not stated; the first edition appeared in 1858, 43 years before. The latest (1973) edition is the 29th; hence, if the editions have been spaced fairly regularly, this might represent the 11th edition or thereabouts. The work represents a photographic reproduction, the only changes being seen in the first four pages - the title page and "Introduction". The illstrations are said to be of interest to art students, although it is difficult to understand why the older editions are of more interest artistically than the newer. The work is of course of primary interest to the student of human anatomy and is very much more economical to purchase than a later edition ordinarily would be. (The book is available directly from the Press.)

GMH

"INTERNATIONAL AND METRIC UNITS OF MEASUREMENT" by Marvin H. Green, Ed. 2. iii + 118 pp., 54 tabs., Chemical Publishing Co. Inc., 200 Park Ave. S., New York 10003. 1973. $12.50.

The various units are taken up by chapter in alphabetic order: angular measure, area, atomic energy units, density and concentration, electrical units, energy, flow (rates), force, length, magnetic units, mass, power, pressure, time, velocity, and volume. These chapters are followed by references and two appendices, one giving systems of units in use, the other a comparison of international and U. S. customary units. It is apparent to anyone that such a book will be a useful reference to engineers, chemists, physicists, manufacturers, and college students. The book is thoroughly indexed. (One omission noted: nanometer (nanon) (one-billionth of a meter; 10^{-9} mm.)).

GMH

"DETECTION OF PURITY OF BREWERS' YEAST CULTURES AND OF VARIATIONS IN THE PROPORTIONS OF BIOS TYPES" by S. R. Green and P. J. Sullivan, Wallerstein Lab. Commun. 25: 271-9, 6 tabs., 1 fig. (Wallerstein Advances in Beer Quality, Part II) (French and Spanish summaries). 1962.

Bios types (i.e., types of yeasts reacting significantly to quantities of the bios group of compounds in the culture medium, i.e., inositol, biotin, pantothenic acid, thiamine, and pyridoxine) can be detected even when present in very small amounts in pitching yeast and in yeast crops by agar plating with various medium formulas. The method is so sensitive that a single yeast cell of one bios type can be distinguished (detected) among 100,000 or even more yeast cells of another bios type. This plating technic can also be used to indicate relative proportions of bios types. This procedure is of much importance in the practical operation of brewing.

GMH

"EXPERIMENTAL AND CLINICAL EFFECTS OF L-ASPARAGINASE" by E. Grundmann and H. F. Oettgen (Editors), Recent Results in Cancer Research (RRCR) Vol. 33: Xi + 354 pp., 190 figs., 144 tabs., cloth, Springer-Verlag Berlin, Heidelberg, New York. 1970. DM 58,--; US $16.00.

In this volume are reproduced the papers presented at an "International Symposium on the Experimental and Clinical Effects of L-Asparaginase" held at Wuppertal-Elberfeld (BRD) in 1969. The editors, Doctors Grundmann (of Farbenfabrik Bayer) and Oettgen (of the Sloan Kettering Institute for Cancer Research) are also co-authors of articles in the volume. Based on observations of Clementi (1922) and the pioneering work of two Americans, J. G. Kidd (New York Hospital, Cornell Medical Center, NYC) and J. D. Broome (New York University) the development of an effective anti-malignancy agent of natural origin is recounted and many indications of its medical value are brought together. The preparation of this enzyme from cultures of the microorganism *Escherichia coli* (the well known colon bacillus or colibacillus), has rendered the product relatively cheap and available for medical use. This volume presents a study of the product from all standpoints: there are chapters on the importance of asparagine (which is hydrolyzed by the enzyme) to the cancer cell; methods of manufacture; the pharmacokinetics (absorption, distribution, and clearance of asparaginase from the animal body); experimental studies on mice, dogs, cats, and cows; toxicological information; the problems of resistance of the cancer cell to the enzyme; and the last large section on the clinical effects and the unwanted side effects. Some chapters in the latter section seem to cover the same ground, thus there are three chapters with the identical title: "Clinical experience with asparaginase." However, it will be noted that they cover different patients, with somewhat different treatment, etc. The book is entirely in the English language. There is no list of the authors as is usually given in such a work. There are no indexes except the table of contents in front. This is an important book in a field of increasing importance for human beings.

GMH

"PLANT CELL BIOLOGY: AN ULTRASTRUCTURAL APPROACH" by Brian E. S. Gunning and Martin W. Steer. ii + 1-7 + 184-282pp., 49 pls., 1 fig., Crane, Russak & Company, Inc., 347 Madison Ave., New York 10017. 1975. $8.95.

The foregoing book (with card covers) represents a portion of another work, "Ultrastructure and the Biology of Plant Cells," published by Edward Arnold (Publishers) (England) in 1975. This accounts for the unusual pagination. The total of 108 large pages bears approximately 200 microphotographs (transmission electronic, scanning electronic, light microscope) or diagrams, since each plate bears from one to seven figures. The figures represent a variety of specific examples of structure and function in plant cells. Thus, among others, one may observe in excellent detail such structures as the following: plasma membranes, xylem and phloem elements, wax and cuticle, sieve plates and pores, glandular trichomes, pollen grains, transfer cells, plasmodesmata, endodermis, Caspary strip, vacuoles, nucleolus, endoplasmic reticulum, mitochondria, Golgi apparatus, plastids of various types, microtubules and microfilaments, stages of cell division, etc. Each plate faces a page of clearly phrased text, with marginal references to pages in the mother text. The purpose of the book primarily is to make available these excellent unsurpassed illustrations of the cell. It has accomplished this objective in praiseworthy manner.

GMH

RESIDUE REVIEWS. VOLUME 5. Special volume on "INSTRUMENTATION FOR THE DETECTION AND DETERMINATION OF PESTICIDES AND THEIR RESIDUES IN FOODS" by Francis A. Gunther (Editor), Los Angeles meetings of the American Chemical Society, Apr. 1963, VIII, 176 pp., 8 vo., Springer-Verlag, Heidelberger Platz 3, 1 Berlin 31 (Wilmersdorf), Germany. 1964. DM. 26.--.

This entire volume has been printed in the English language with the exception of chapter summaries in French and German. The content represents the text of all of the papers presented at a Symposium as indicated in the title, which was held on 1 April, 1963, during the course of the 144th National Meeting of the American Chemical Society (31 March-5 April, 1963). Following a brief Foreword by the Chairman and Chairman-Elect of the Pesticides Subdivision of the Division of Agricultural and Food Chemistry of the A. C. S. (who sponsored the symposium), the following subjects were discussed in serial order, each of the 12 papers representing a contribution 7 to 28 pp. in length (average 14 pp.): Analysis of pesticide residues and food control; gas chromatography with an electron absorption detector; electron absorption chromatography for quantitative determination of pesticide residues; selective detection and identification of pesticide residues; microcoulometric titrating systems for detecting pesticide residues in gas chromatography; flame ionization and electron capture detectors for gas chromatographic evaluation of herbicide residues (comparison);

polarography in detection and determination of pesticides and their residues; polarography for determining organic feed medicaments; fluorescence analysis for pesticide residues; infra-red and ultra-violet spectrophotometry for determining residues; automatic wet chemical analysis applied to pesticide residues; determination of pesticide residues by neutron-activation analysis. The great advances in analytical instrumentation become apparent to anyone who reads over the text of this volume. Index.

GMH

"WILDLIFE OF YELLOWSTONE AND GRAND TETON NATIONAL PARKS" by Bryan Harry and Willard E. Dilley, 66 pp., 75 col. pls., 11 figs. The Wheelwright Press, 975 S. West Temple, Salt Lake City, Utah 84101. 1972. $1.50.

Most of this attractive book deals with mammals; however, several fishes, reptiles, and amphibians are also included. Strikingly attractive color photos are included, one for each description; all are good to excellent in quality. This would be a useful and convenient companion to the visitor to these parks.

GMH

"BIRDS OF UTAH" by C. Lynn Hayward, Clarence Cottam, Angus M. Woodbury, and Herbert H. Frost. Great Basin Naturalist Memoirs No. 1: iv + 229 pp., 65 figs., 1 map. Brigham Young University, Provo, Utah. 1976. $10.00.

The introduction discusses historical matters, the bird populations of Utah, physiography and climate of Utah, and the various bird habitats of the state. The systematic part follows. There is no count or census of species; at a rough estimate, there are ca. 500 birds in this compilation. For each species, the status is discussed (i.e., relative abundance, seasons when present, nesting dates, etc.) and records are given of the bird for Utah. Many of the photographs are in color, others in black and white. As would be expected, there is a great variety of bird life in Utah, including such species as the California Gull which played such an important part in the early days of the Mormon settlement.

GMH

"THE PSYCHOLOGY AND BEHAVIOUR OF ANIMALS IN ZOOS AND CIRCUSES" by H. Hediger, vii + 166 pp., 30 photos., Dover Publications, Inc., New York. 1968 (1955). $2.00.

A translation of "Skizzen zu einer Tierpsychologie im Zoo und im Zirkus" was published in 1955 in England and this is a reprint of the same in unabridged form. The reprinting so faithfully adheres to the original that the English spelling of "behavior" in the title has been retained. The text is fascinating, revealing as it does the almost human type of consciousness found among mammals and even among various of the lower vertebrates, such as serpents. The daily life of the animal, its various crises (such as birth), relations of mother and infant, the psychology of animals in the circus (lions, etc.), and many other topics will be found of extraordinary interest.

GMH

"STRUCTURE AND BONDING" editors: P. Hemmerich, C. K. Jorgensen, J. B. Neilands, Sir Ronald S. Nyholm, D. Reinen, and R. J. P. Williams, Volume 7: iii, 154 pp., 45 illus., 27 tabs, Springer-Verlag New York, Inc., 175 Fifth Ave., New York 10010; Heidelberg; Berlin. 1970. Soft cover $10.50.

For this volume, there are 6 authors, one of them German (BRD) the remaining from England. The first of the four articles included is by D. W. Smith and R. J. P. Williams and is devoted to the "spectra of ferric haems and haemoproteins". It is the only review in this volume having an important direct bearing on the biological area - physiology and biochemistry, the others being concerned with transition metal complexes and compounds, and the ions of spinel, garnet, and other complex structures. In the first article, the absorption spectra are discussed of the porphyrin ring (porphin) and of the various porphyrins and metalloporphyrins. The porphyrin ring is regarded as representing a large aromatic ring of 18 atoms, made up of four connected pyrrole rings. Substituents are attached to the C atoms of the pyrroles (including methyl, ethyl, acetic acid, etc.) in derivatives occurring naturally. Metalloporphyrins also occur in nature, the chief one being the iron complex called Protoporphyrin IX: this represents a protein-bonded iron porphyrin. Important ligands (complexing groups) includes peroxidase, catalase, and various cytochromes. This elaborate discussion of the spectral properties of the group is documented with 138 references.

GMH

"WILDFLOWERS OF THE MONTEREY AREA, CALIFORNIA" by Beatrice F. Howitt 52 pp., 65 col. pls., 1 fig., 1 map, The Wheelwright Press, 975 S. West Temple, Salt Lake City, Utah. 1965. $1.50.

Excellent kodachrome illustrations and interesting and useful texts covering 63 plant entities found in the central coastal area of California are furnished. This is a very useful little guide for the person interested in the beautiful flowering plants of the south Pacific coast of the United States.

GMH

"ABBREVIATIONS OF BASIC MEDICAL PHYSIOLOGY" 4th edition, Talmage Gordeon Hiebert, XI, 320 pp., several tabs. and figs., Sigma Press, Publishers, 2140 K St. N.W., Washington, D.C. 1962. $5.50 (paperback); $7.50 (cloth).

The title of this volume is misleading as it is not an alphabetical compilation of abbreviations but rather a review of the salient features of human physiology, with only occasional mention of abbreviations, and these are usually placed in parentheses after the words for which they are used. A foreward (foreword) states that the book is not intended as a textbook but only as a review. There are chapters on neuromuscular physiology, circulation and respiration, metabolism and nutrition, kidney and electrolyte function, and endocrines and reproduction. Index. The book would be very useful as a review before examination, the state board, and so on.

GMH

"PENTOSES AND PENTITOLS". International Symposium on Metabolism, Physiology, and Clinical Use of Pentoses and Pentitols. Hakone, Japan, 27/29 Aug. 1967. Edited by B. L. Horecker, K. Lang, Y. Takagi, 254 figs., and many tabs., VII, 408 pp., 8vo., Springer-Verlag, Berlin, Heidelberg, New York. 1969. Cloth DM 68.--. US $18.70.

The papers presented at this Symposium are arranged into 3 series in the order of sessions: Session I: Metabolism; Session II: Physiology; Session III: Clinical Use. A listing of participants at the end of the volume (there is no index) shows the presence of mostly Japanese nationals, however also West Germans, Americans (USA), two Englishmen, and one Swede. The opening and closing remarks were presented by Konrad Lang (Univ. of Mainz) who was one of the editors. This volume underlines the importance of 5-carbon sugars, the pentoses, and their reduction products, the pentitols or 5-carbon sugar alcohols. Important among the pentoses is ribose and desoxyribose, the latter now known to play a very important role in the form of the nucleotides in furnishing means for the synthesis of specific proteins which is manifested most importantly in the precise reproduction of genes. Of chief interest in this symposium was xylitol: with the exception of one, all of the papers in the second session were devoted to consideration of this polyol, whereas in the third session all but two papers were concerned (as indicated by the titles) with xylitol. Unlike sorbitol, which acts only as a substrate, xylitol has active physiological effects on the organism; it is an active unit in the glucuronic acid/xylulose metabolic cycle. It appears to have considerable value in therapy, especially in treating metabolic disturbances, such as diabetes mellitus, and also in serious conditions of shock following trauma with hemorrhage or after major surgical intervention. When administered to diabetics, there was no rise in blood sugar levels; also it is incorporated into glycogen in the liver and muscle in the same way as glucose. Xylitol increases the production and secretion into the blood stream of corticosteroids. There are indications of other endocrinological activity. Some fields in which clinical trials have been made with indications of success and value are: pediatry; diabetics; surgery; liver diseases; endocrinology; anaesthesiology; and the emergency ward. We will no doubt be hearing more from the clinical students about xylitol.

GMH

Pierre Huard and Ming Wong: "CHINESE MEDICINE" (Translated from the French by Bernard Fielding), Covers plus 256 pp., 19 col. figs., 47 black & white figs., 1 map, World University Library, McGraw-Hill Book Co., New York, Toronto. 1968. $2.45.

In this broad account of a very large subject, both the ancient and the modern schools of medicine are described. Five chapters deal successively with the evolution of Chinese medicine from the earliest written records of half a millenium before the Christian era up to modern times; the Chinese medicine compared with that of other Asiatic countries; medicine in China and Europe compared from the 17th to the 20th Centuries; western or modern medicine as practiced in modern China; and the practice of traditional (or ancient) medicine in modern China. Besides the appended section on bibliography and sources, a Chinese chronology will be found useful. In view of the recent wide interest in acupuncture arising since news reports have been received from China, this book will supply some information on this technic, also regarding moxas, the procedure in which a burning material is left on the skin. The section on massage (pp. 221-3) and on coitus reservatus will also be of interest. A very interesting book.

GMH

"GRUNDZUEGE DER PFLANZENANATOMIE: VERSUCH EINER ZEITEGEMAESSEN NEUDARSTELLUNG" by Bruno Huber, XII + 243 pp., 199 figs., 3 tabs., Springer-Verlag Berlin, Heidelberg. 1961. Cloth bound DM 48,--.

The "Bases of Plant Anatomy" ("Search for a modern novel presentation") was written by Professor Huber of the University of Munich. The text follows a progressive order of subject matter, starting with a consideration of the various kinds of technical equipment provided for enhancing microscopic examination of plant tissues. After this, a discussion of cytology follows, with consideration of the cytoplasm, nucleus, plastids, and non-living cell constituents. The next part takes up the anatomy of the vegetative organs - in the order: Thallophyta; Psilophyta (fossil primitive Pteridophyta); Spermatophyta; primary axis structure; secondary structure (shoot and root) (secondary cortex;

wood and bark medullary rays; axis thickening); leaf. The last part of the text deals with the anatomy of the reproductive organs: gametes; sporophylls (flowers); special apparatus of the phanerogam flowers (display structures, such as petals, nectaries, etc; the anatomy of pollination and fertilization in Phanerogamae; embryology; and the seed and fruit. The book is well printed with excellent figures of the various plant parts, many references for further study, and adequate author and subject indices. This should be an excellent text for classes in plant anatomy.

GMH

"HANDBUCH DER EXPERIMENTELLEN PHARMAKOLOGIE", Handbook of Experimental Pharmacology. Heffter/Heubner. New Series. Band XXII/2: Die Gestagene, Teil 2 Herausgegeben von K. Junkmann. Springer-Verlag, Berlin, Heidelberg, New York, xii + 1334 pp., 226 figs., many tabs. 1969. Octavo. Bound. US $140; DM 320,--.

The huge size of this volume, the second of a set of two parts, reflects the importance of the subject - the gestagens, also referred to as progestogens, or progestins. The first part, published in 1968, has fewer pages than the second one but actually more pages of text since the second part contains the general indexes for both parts and these are of immense size (author index 224 pp., subject index 186 pp.). (Hence, over 30% of part 2 consists of indexes). The first part was concerned with the chemistry of the gestagens, their metabolisation, absorption, distribution, and elimination, action on the metabolism, side effects, relationship of chemical constitution to pharmacology, therapeutic use, and use in contraceptives. Part 2 deals with the action of the gestagens on the morphology and functions of the human genital tract and that of the other mammals, naturally with particular attention being paid to the processes of conception and reproduction. There are only three chapters in this part, each with many subdivisions, following the eight chapters of the first part. Chapter IX written by eight men concerns the actions of various gestagens on the morphology and function of the genitalia of different animal groups, including the mammals, other vertebrates (non-mammalian), molluscs, and insects; the effect of gestagens on the milk glands; the effect on the sexual and other behavior of animals; and the synthesis, activity, and breakdown of the gestagens as observed in tissues under the electronic microscope. Chapter X deals with the physiological role of progesterone in humans and in other vertebrates (2 authors). Chapter XI is concerned with the share of progesterone in the control of incretory and generative ovarian functions, including progesterone formation in and secretion by the corpus luteum and the placenta (1 author). The last chapter deals with the use of gestagens in veterinary medicine and in the care of animals, written by Dr. W. Joechle of Syntex Research (California), who also wrote part of Chapter X. All the other authors are German and the text is entirely in the German language. Without question, this is the definitive work (both parts) on the subject of the gestagens, and will be of much interest to specialists in endocrinology, gynecology, and internal medicine and veterinary medicine, but should also interest biochemists, pharmacologists, physiologists, anatomists, pathologists, and those interested in animal breeding.

GMH

"SEED TO CIVILIZATION: THE STORY OF MAN'S FOOD" by Charles B. Heiser, Jr., xii + 243 pp. 83 figs., 1 tab, W. H. Freeman and Co., 660 Market St., San Francisco, CA 94104. 1973. $7.50.

With this book, the author has taken up the beginnings of agriculture, and in that context has described most interestingly the various plants and animals which have been and are used as food by man. Besides the past, the author has considered the present situation with regards to these foods and has had the courage to look into and predict the future for such products. In eleven chapters, Heiser has considered such major topics as the grasses ("staff of live"), meats ("luxury food"), the legumes (peas and beans) ("poor man's meat"), the starchy staples (the common and sweet potato, manioc, breadfruit, banana, yams), the coconut tree ("man's most useful tree"), and miscellaneous foods, beverages, and spices (garden vegetables, nuts, beverages, etc.). The book is chuck-full of important and often surprising information. It is quite concentrated and will occupy the student many hours of close application. There are abundant references for each chapter grouped at the end of the volume. This book is highly recommended. One error was noted: (p. 36) in speaking of vitamin B_{12}, it was mentioned that only animals can supply this necessary food element. Although the vitamin is obtained by man principally from animal foods, it is now believed that all of the vitamin originates through synthesis by various microorganisms, mostly bacteria. Thus, one of the chief commercial sources is Streptomyces species, as a by-product in the manufacture of antibiotics--the tetracyclines, streptomycin, etc. (see Drill's "Pharmacology in Medicine", ed. 4, p. 1063; 1971). The author, Prof. Heiser, (Indiana University) is an outstanding botanist; previously he has published "Nightshades, the paradoxical plants" (Solanaceae) and has recently had a volume on Sunflowers published.

GMH

"THE BIOLOGY AND CHEMISTRY OF THE UMBELLIFERAE" edited by V. H. Heywood, x + 438 pp., 62 figs., 33 pls., 59 tabs., Academic Press, London, New York. 1971. $26.00

The texts of 22 papers by 26 authors at an international symposium on title subject held at the University of Reading (England) are recorded in these pages. Among them is a paper on "The use of serological data in a comparison of tribes in the _Apioideae_", authored by J. L. Pickering and D. E. Fairbrothers. Five serological groupings could be recognized, corresponding to the tribes _Scandiceae_, _Coriandreae_, _Ammineae_, _Peucedaneae_, and _Dauceae_. Serological data supported the division of _Peucedaneae_ into three sub-tribes: _Angelicinae_, _Ferulinae_, and _Tordyliinae_.

GMH

"PHARMACOGNOSY OF INDIAN ACONITES, LONG PEPPER (_Piper longum_) AND GADUCHI (_Tinospora_ spp.)" by Har Sharn Jit Singh, (H. S. Puri) IV, 194 pp., 40 pls., 42 tabs, Thesis for Ph.D., Panjab Univ., Chandigarh, India.

Besides the general discussions, there are detailed descriptions of many tissues (microscopic) and organs (morphologic) of these drugs, popular in India. Described are 14 _Aconitum_ species, 3 _Piper_ species, and two _Tinospora_ species. (_T. cordifolia_, _T. malabarica_.)

GMH

"ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS", Volume 3 by R. F. Johnston, P. W. Frank, and C. D. Michener (Editors) ix + 520 pp., 59 figs., 25 tabs. 1972.

This volume includes 16 chapters having 21 authors in all. About half of the titles are of general type and half specific. In the chapters dealing with ecology, there are approximately twice as many of specific type as of general. At the end of each chapter there is a rather complete bibliography and at the end of the volume there are both author and subject indexes. Chapters of particular interest include the following (with authors) Mineral cycling: some basic concepts and their application in a tropical rain forest (C. F. Jordan and J. R. Kline); Niche theory (J. H. Vandermeer); Community interactions on marine rocky intertidal shores (J. H. Connell); the carbon balance of plants (H. A. Mooney); and Cladistic methodology: a discussion of the theoretical bases for the induction of evolutionary history (F. G. Estabrook). This is a very useful and time-saving work where the objective is to master the advances of an area over a period of the past several years. There are at the end cumulative indexes of volumes 1-3 (authors and chapter titles).

GMH

"SYSTEMATIK DER PFLANZEN: PROGRAMMIERTES STUDIENMATERIAL ZUR WIEDERHOLUNG UND UEBUNG" by Klaus Klopfer. 156 pp., many figs. (unnumbered). VEB Gustav Fischer Verlag, Jena, DDR. 1974. 7.80 M.

This paper-backed volume is intended to be used to gain a rapid learning attainment in the field of plant systematics.

There are 12 chapters and 120 sectional units. The chapters are concerned (respectively) with general information; Bacteria; blue algae; Algae; Fungi; lichens; mosses; ferns; Gymnospermae; general characteristics of Angiospermae; Dicotyledoneae and Monocotyledoneae. In using this programmed study guide, the student is given an exercise or questions, then referred to a specific textbook for study, then called upon for the answer or answers, and finally this is checked against the correct answer (located on a different page to strengthen the learning process). This book should serve as a means of quickly absorbing the subject matter.

GMH

"THE ROLE OF CHROMOSOMES IN CANCER BIOLOGY" by Peo C. Koller Recent Results in Cancer Research (RRCR) Vol. 38: XII + 122 pp., 42 figs., 35 tabs., Springer-Verlag Berlin-Heidelberg - New York. 1972. $15.30.

The first chapter is a general treatment of the known structural and functional properties of chromosomes and discusses the importance of the genes with their informational load of DNA molecules. Chapter 2 tells how anomalies of chromosomes, either in their number or in their structure, will affect the development of the organism bearing them. Abortions, still births, and early death of infants are known often to depend upon chromosome defects, a matter confirmed by postmortal examinations of the fetus or infant. In addition to alterations in the chromosome or chromosomes which occur in the gamete before fertilization, other times changes appear in the zygote or fetus developing from normal chromosomes (or apparently so): this is referred to as "chromosomal mosaicism." In the third chapter, mitotic changes are discussed as these occur in tumors. Neoplastic tissues commonly show altered chromosome configurations and these differing patterns can be used in diagnosis. There is evidence that such chromosomal irregularities are causative to the accelerated tissue growth and other properties of tumors. In Chapter 4, entitled "Malignant cell populations and the stemline concept," it is demonstrated that cell populations are heterogeneous as to chromosomal constitution and the amount of deviation from the normal diploid state varies for the individual tumor. The "stemline" which represents the major numerical component of the cell population is flexible in tumors and may vary with time and environmental conditions. Chapter 5 takes up chromosomal and functional differences found in malignant cell populations: mutations produce cell variations and mutations can be identified by changes in the chromosomes. The 7th chapter deals with induced primary tumors in animals. Such tumors are of two chief types: those with diploid chromosome makeup, and those in which the cells show a great number of chromosome variations which deviate from the diploid state. The differences in tumor cells from a cytological standpoint include chromosome number, chromosome changes, frequency of cells with differing chromosome numbers, and marker chromosomes. The next two chapters take up chromosome aneuploidy existing in human malignancies of two types: (1) effusions (where peritoneal and/or pleural ascitic (tumor) fluids are available and convenient for the study of free-floating cancer cells; and (2) solid tumors. Chapters 9 to 13 are concerned with fuller details on chromosome properties, in cancerous and pre-cancerous states and how these altered states of chromosomes may predispose to cancer, and with the relation of chromosomes to viral oncogenesis. The final chapter takes up chromosome changes during cancer treatment. The author is Professor Emeritus of Cytogenetics at the University of London.

GMH

"PLANTS AND ANIMALS OF THE PACIFIC NORTHWEST: an illustrated guide to the natural history of western Oregon, Washington, and British Columbia" by Eugene N. Kozloff, ix + 264 pp., 123 figs., 321 col. figs. in 48 col. pls., 1 map, University of Washington Press, Seattle, Wash. 98105. 1976. $17.50.

In this book, nearly all divisions of the plant and animal kingdoms seem to be included. A wide coverage is clearly indicated by the color photos appearing on the front and back dust covers, since they show four monocot and four dicot flowering plants, a gymnosperm, a fungus, two lichens, an annelid, three molluscs, an amphibitan, and a reptile. The text is well written and informative and combined with the excellent color pictures and line drawings should permit effective understanding of the plants and animals and the ability to identify them in the wild. The first chapter is introductory with something of the geography of the area and a discussion of scientific vs. vernacular names, precautions for avoiding extirpation of the organisms, and so on. In chapter 2, the organisms which might be expected in a coniferous forest are taken up in a regular order: (1) coniferous trees; (2) angiosperm trees, shrubs, vines, and wild flowers (herbs) (mostly dicots), (3) ferns, fungi, lichens, mosses, liverworts, etc., (4) the invertebrate animals, and (5) the vertebrates. (In this section 67 pages are devoted to plants, only 5 to animals.) A similar treatment is applied in the third chapter, covering oak woods, rocky slopes, and brushy (=bushy) areas. (The entire chapter of 71 pages is devoted to plants.) In Chapter 4, dealing with wet places, all 29 pages are given over to plants. Back yards, vacant lots, and roadsides are taken up in chapter 5, which is about equally divided between plants (13 pp) and animals (9 pp). Chapter 6 in 37 pages deals only with vertebrate animals. To sum up, 180 pages deal with plants, 51 with animals. Altogether ca. 450 plant and animal species are dealt with, with 446 species illustrated. A glossary, reference list, and index complete what must be one of the most useful and attractive semi-popular works on the living things of the Pacific Northwest. Individuals, societies, and libraries should all consider the purchase of this very worthwhile text.

GMH

"THE BIOCHEMISTRY OF GREEN PLANTS" by D. W. Krogmann, xiv + 239 pp., 101 figs., 11 tabs., Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. 1973. Paper $6.95. Cloth $11.95.

This volume is one of seven in the "Foundations of Modern Biochemistry" Series, being ranked among the "Special Topics" group. The work is not intended as a basic text in biochemistry but rather as a secondary more specialized sub-field, that dealing with photosynthesis in its various facets - the physical angle, photophosporylation, photoregulation, photochemistry, hexose breakdown, phytohormones, electron transport, etc. Not all areas of primary metabolism are covered and no effort at all is made in the area of the secondary metabolites. A few important references occur at the end of most chapters, while at the end of the book is a section of numerous references keyed to definite statements in the text. This book should furnish a good learning tool.

GMH

"CURRENT DIAGNOSIS AND TREATMENT" by Marchs A. Krupp, Milton J. Chatton et al., 12th edition, xii + 996 pp., 28 figs., many tabs., Lange Medical Publications, Los Altos, Calif. 1973.

With the exception of one author from Oregon, all 36 medical authors of this work are active in California, the two major authors being associated with the School of Medicine at Stanford University. There are 31 chapters, each concerned with the disorders of some organ or system of the body or with some type of infectious disease, with the exception of the last six chapters which are entitled: "Anti-infective chemotherapeutic and antibiotic agents," "Disorders due to physical agents," "Poisons," "Medical genetics," " Malignant disorders," and "Immunologic disorders." The single Appendix takes up various constants, normal values, modes of resuscitation, etc. The format for various organs or systems of organs follows a logical development, viz., essentials of diagnosis; general considerations; clinical findings; differential diagnosis; complications; treatment (medical; surgical); prognosis; and references. An excellent index terminates the volume. In many respects the book is reminiscent of Merck's Manual, which also is very useful, but with CDT there are two important advantages - the larger page size (with 2 columns) and larger textual content, so that much more can be included. Hence, quite a number of diseases and disorders are included that are not found in Merck. Also, CDT is published annually while Merck comes out at intervals of several years. Thus, CDT can easily be kept up-to-date and corrected, hence is more timely. This frequent revision no doubt also accounts for the flexible plastic cover of CDT, which is certainly protective enough for a year (actually it will last for several years anyhow). A further advantage over Merck of this medical treatise is the section of literature references given at the end of each disease entity (etc.); these are selected from the book and journal literature and are current. That the work has been well received is manifest from the fact of its publication in seven languages, including two from behind the "iron Curtain." This volume is unreservedly recommended for students and practitioners of medicine and the para-medical sciences.

GMH

"THE PEYOTE CULT" by W. La Barre, enlarged edition (Ed. 5), xvii + 262 pp., 2 pls., 1 map, 7 figs., Shocken Books, 200 Madison Ave., New York 10016. 1969 (reprinted 1971) (received 1973). $2.45.

This edition differs from earlier ones in incorporating new materials, viz., "Twenty years of Peyote studies" and "The last five years of peyote studies." There is a new introduction by the author. Appendices; bibliography; index.

GMH

"A CATALOGUE OF PLANTS AND SHELLS, FOUND IN THE VICINITY OF MILWAUKEE, ON THE EAST SIDE OF LAKE MICHIGAN" by L. A. Lapham, 14 pp, Facsimile of booklet originally published in Milwaukee, Wisc. in 1836. Bot. Club of Wisconsin (Available from Walter E. Scott, 1721 Hickory Drive, Madison, Wisc. 53705). 1976. $5.00.

An unannotated listing of plant and mollusc species, this is the first publication of scientific type in Wisconsin and may be west of Lake Michigan and north of St. Louis. (Limited edition).

GMH

"EDIBLE GUMS AND RELATED SUBSTANCES" by A. A. Lawrence, xii + 340 pp., 9 figs., 9 tabs, Noyes Data Corporation, Park Ridge, N.J. 07656. 1974. $36.00

Detailed descriptive information is given on U. S. patents since 1962 which relate to various edible gums (tragacanth, guar gum, carob gum, acacia, carageenans, alginates, agar, Furcellaria extract, pectins, tamarind polysaccharides, etc.) also to related substances starch, cellulose derivatives, fermentation gums, etc.).

GMH

"ÉNUMERATION DES PLANTES VASCULAIRES DU SÉNÉGAL" par J. P. Lebrun, 209 pp., 6 pls., 1 map. Institut d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 10, rue Pierre Curie, 94700 Masons Alfort (Valde Marne), France. Étude Botanique No. 2. 1973. Gratis.

The list of taxa composing the large body of this work is preceded by an introductory descriptive section and a history of botanical exploration in Senegal (1506-date) and is followed by a bibliography. 2086 species (in 858 genera and 165 families) are reported, of which 188 species are not present in J. Berhaut, "Flore du Sénégal," ed. 2 (1967), the definitive floral manual for the area. Also listed separately are 212 taxa of non-spontaneous (i.e., introduced) species. (Berhaut had shown grosso-modo 300 species in this category). These listings represent a kind of union catalog of collections of various persons from 1966 to 1972. These most recent studies have added 80 species to the flora, including 10 which are of special interest and are discussed in the introduction. Endemism is considered rather weak in Senegal properly so-called, however in the non-mountainous furthermost western part of the country, it is considerable, with such species as Jatropha chevalieri and Tephrosia berhautiana. The elaborate bibliography should be very useful to students of the African flora.

GMH

"THREE CENTURIES OF MICROBIOLOGY" by H. A. Lechavalier and M. Solotorovsky, viii + 536 pp., 1 fig., Dover Publications, Inc., New York 10014. 1974. $5.00.

Unabridged republication of work originally published in 1965. Mycology is included.

GMH

"DICIONARIO PORTUGUÊS-UMBUNDU" by G. Le Guennec and J. F. Valente, XLVII + 691 pp., Inst. Invest. Cient. de Angola, Luanda. 1972 (publ. 1973, recd. 1974).

A general dictionary of the Umbundu language of Angola, including plant names. The introductory portion includes considerable on the phonetics and morphology of the Umbundu language.

GMH

"DAS ULTRAKURZNARKOTICUM METHOHEXITAL (The ultra short narcotic Methohexital)" by Charlotte Lehmann, X + 188 pp., 55 figs., 32 tabs. (Anaesthesiology and Resuscitation, Vol. 57). Springer-Verlag Berlin, Heidelberg, New York. 1972. flexible cloth, $8.80.

In this report of the International Methohexital Symposium held in December of 1970 at Frankfurt am Main, West Germany, the ultrashort narcotic Methohexital was examined from many different standpoints. This product is official in the U. S. National Formulary as the Sodium salt; it is also called variously Brevital, Brietal, Methohexitone, and by other names. An unusual feature of the symposium is the fact that out of 24 authors, at least nine are women, including one who is also the editor. The content includes 20 chapters together with introductory and closing statements and two "discussions." Four papers are in English, the others in German, but there are summaries in both German and English. Methohexital is one of ca. a dozen short-acting narcotics developed over the past three decades; these belong mostly to three classes: the barbiturates (incl. Methohexital), the thiobarbiturates, and the eugenol derivatives. Not much has been published about Methohexital in the German language and this publication is hoped to correct this lacuna. Since its introduction in 1956, about 50 million anesthesias have been carried out with Methohexital. In this limp cover book, there are chapters on the pharmacology of Methohexital, cardiac effects noted during narcosis (uresthesia) with this agent, comparisons with Thiopental, etc. The second section deals with clinical studies, including a statistical study of 60,000 cases, comparison of narcosis (anesthesia) with inhalants, injections, and infusions, sodium methohexital as an anesthetic induction and maintenance agent, trends in dental anesthesia, use in electroshock treatment, etc.

GMH

"PHARMACOLOGICAL FACTS AND FIGURES" (Heidelberg Science Library Vol. 9) by F. Lembeck and K. F. Sewing, viii + 114 pp., many tabs. and figs., Springer-Verlag New York, Inc., 175 Fifth Ave., New York 10010. 1969. Soft Cover $3.00.

With its many formulas, diagrams, tabulations, schemes, graphs, and so on, this is a kind of pioneering effort in the way of texts, it would seem. The usual textbook consists of the text primarily, with a more or less modest number of graphs, tables, diagrams, etc. Here the emphasis is reversed and it would appear that this constitutes in some ways a better teaching medium from both the standpoint of speed of transmission of information and that of stronger retention in the memory. It does not of course take the place of the detailed textbook, but it will certainly ensure the understanding of the student. Perhaps a useful manner of learning such a subject matter would be as review following the study of the textbook. It would seem that this would lead to a better understanding; the summary text would serve to confirm and emphasize ideas which had already been communicated to the learner through the classroom and the regular textbooks. The subject matter includes drugs affecting the autonomic, peripheral, and central nervous systems, cardiovascular system, kidney, blood, digestion, also the various hormones, chemotherapeutic agents, and a final section "Miscellaneous," which includes metallic poisoning, vitamins, emergency drugs, biologicals, drug metabolism, and statistics.

GMH

"FLORA DA GUINÉ PORTUGUESA. CAESALPINACEAE" by Maria Cândida Liberato, 47 pp., Jardim e Museu Agrícola do Ultramar. Ministério do Ultramar, (Lisboa). 1973.

Descriptions of the family (Leguminosae-Caesalpinoideae) with 18 genera, and numerous species which have been collected in Portuguese Guinea, with keys. There are no novelties. Descriptions are given of genera, keys and descriptions of some species with synonymy, habitats, ecology, geographic distribution, and vernacular names.

GMH

"FLORA DE SÃO TOMÉ E PRINCIPE. MIMOSACEAE" by Maria Cândida 29 pp., Jardim Agrícola do Ultramar, Ministério do Liberato, Ultramar, Lisbon. 1973.

Descriptions of familiy (Leguminosae-Minosoideae), 11 genera, and 18 species found in Sao Tomé and Principe, Portuguese island colonies off the west coast of Africa. There are no novelties.

Distribution and herbarium data are given.

GMH

"ARBOLES COMUNES DE LA PROVINCIA DE ESMERALDAS [Ecuador]. by E. L. Little and R. G. Dixon, Estudio de Preinversion para el desarrollo forestal del noroccidente. Ecuador. Informe Final, Tomo IV. (FAO, UNO. Roma.) FAO/SF: 76/ECA 13. xii, 536 pp., 220 figs., 2 maps, 1 tab. 1969 (recd. 1973).

Descriptions of 230 of the commonest and most important trees with notes on distribution, characteristics, type of wood, common names, botanical synonyms, uses, etc. Diagnostic key and introductory essay are included.

GMH

"THE CARNIVOROUS PLANTS" by Francis Ernest Lloyd, xvi + 352 pp., 547 figs., Dover Publications, Inc., 180 Varick St., New York 10014. 1976 (1942). $4.50.

A book such as this one is timeless and so a reprinting is of special value since it is not reproducing outdated materials. The author spent a long life time in studying the various carnivorous species of plants and has collected here his findings. Lloyd must have been a particularly versatile person as the hundreds of excellent drawings are from his pen. Fourteen chapters cover the various plants discussed, usually with only one genus or even a single species per chapter (exceptions are chapters XI, XII, and XIII. Among the better known plant entities taken up are Sarracenia (the pitcher plants), Nepenthes (Indian and Chinese pitcher plants), Pinguicula (the butter-worts), Drosera (the sundews), and Dionaea muscipula (the Venus' fly trap). Altogether about 450 plant species are discussed in greater or lesser detail. This book is an unabridged republication of the original work published 34 years before.

GMH

"GUIDE DES COULEURS NATURELLES (Natural color guide) (De coloribus naturalium)" par Marcel V. Locquin, 2 pp., 12 color charts, cover, Published by the author, 89 Saint Clément, 89100 Sens, France. 1975.

This portfolio of color data is identified as a part of "De Taxia Fungorum," with the citation "Observationes et Disputationes Mycologicae, 1 - 1975 - 2." The printed colors are compared directly with the plant or other object preferably by using a piece of white or neutral gray paper with a window cut out the same size as the color rectangle. Observations should always be made in the natural light of a luminous white sky, never using direct sunlight nor artificial light. Fluorescent tubes even if marked "daylight" are especially to be advised against because of the green mercury rays they emit. Every color is designated by two names: the generic name, such as brown, yellow, etc., and its specific name or code. The generic names are printed in Latin on the plates (the French and English equivalents are indicated on the instruction sheet). The specific codes are obtained by combining three signs: the capital letter denoting the plate (each of the 12 plates has two letters, one above and one below, dividing the plate into equal halves), the figure denoting the line, and the small letter indicating the column. For instance Flavus A8h (or Yellow A8h). The code number may be replaced by a name, which may not be as exact an identification but is easier to remember. There are 33 genera, including for instance, white, garnet, buff; each is identified with a color code--thus (resp.) W,PN,YN. A listing of names and abbreviations is given in the order of the spectrum. This color code seems to be a very practical one and would seem to have advantages over others that have been proposed in the past.

GMH

"BIOLOGICAL RHYTHMS IN HUMAN AND ANIMAL PHYSIOLOGY" by Gay Gaer Luce, viii + 183 pp. Dover Publications, Inc., New York. 1971. $2.50.

This volume represents an unabridged unaltered republication of the U. S. Public Health Service Publication No. 2088 ("Biological Rhythms in Psychiatry and Medicine" (1970). Although based on findings in various scientific fields, this book has been written in a simple and interesting manner and will therefore have an appeal for the layman as well as for scientific persons in various disciplines. The diurnal rhythms of the body (now referred to as circadian rhythms) are chiefly discussed. Other rhythms concern monthly changes up to annual occurrences and even beyond. The many references for each of the twelve chapters are grouped together at the end of the volume. There is a good table of contents but no detailed alphabetized index, such as is usually placed at the end of a volume.

GMH

"FLORA OF TAYLOR COUNTY, TEXAS" by W. F. Mahler, IX + 247 pp., 358 figs., 3 maps, SMU Bookstore, Southern Methodist University, Dallas, TX 75275. 1973. $7.25.

Both Pteridophyta and Spermatophyta found in this County of central Texas are treated, with elaborate keys and descriptions of the various taxa. The descriptions are quite detailed for a county flora; the drawings are functional, that is mostly the sketches of plant parts that would be made as memoranda by a botanist studying an herbarium specimen and important to the classification of the specimen. Unfortunately there is no census of taxa, however a total of 668 taxa (species and below) is indicated, which contrasts favorably with the total of 540 in Tolstead and Cory for the same county (Field and Lab. 1946). This manual represents a revision of the author's "Keys to the Embryophyta of Taylor County, Texas" (1966), revision of which was delayed unavoidably. The keys were the first to be published for any county in the State and apparently this is the first county flora for the state also. It represents a good practical field/herbarium manual which should be well worth the price of $7.25 for anyone working in the southern U.S. flora.

GMH

"ONE THOUSAND AMERICAN FUNGI. HOW TO SELECT AND COOK THE EDIBLE..." by C. McIlvaine and R. K. MacAdam, xxxvii, 729 pp., 182 pls., Revised ed. Something Else Press, Inc., West Glover, Vt. 1973. $6.50.

This is a reprinting of the edition of 1902, representing the second republication in the same year by two different

American publishers, both selling for the same price. The second edition was selected in place of the first (1900) because it is better. Some plates in the original were in color and have been reproduced here in black and white since there was no dependable value in the original colors used. This continues to be an excellent book for both the layman and the botanist. Descriptions and illustrations are useful. The large size (29 x 21 cm.) and weight of this volume makes it more useful for identification of fungal materials in the home or laboratory.

GMH

"BACTERIAL PLASMIDS: CONJUGATION, COLICINOGENY, AND TRANSMISSIBLE DRUG-RESISTANCE" by G. G. Meynell, xiii + 164 pp., 27 figs., 8 tabs., MIT Press, Cambridge, Mass. 1973. $14.95.

As accessory chromosome, the plastid (one type of plasmid), plays a multiple role inside and outside of the bacterial cell, thus as F or sex factors, as bacterial phages, as colicin (toxic proteins) factors, and, most recently discovered, as the R factors (which develop resistance to drugs, including the tetracyclines, chloramphenicol, kanamycin, sulfonamides, etc.) The latter function is highly significant in medicinal practice, thus explaining the development of resistant Staphylococci. The plasmids are parallel in functioning to the DNA of some viruses and of mitochondria. A large number of references (672!) is given.

GMH

"CHEMICAL PUBLICATIONS: THEIR NATURE AND USE" Ed. 4 by M. G. Mellon, XI + 324 pp., 4 figs., McGraw-Hill Book Company, a division of McGraw-Hill, Inc., 330 West 42nd St., New York 10036. 1965. $9.50.

The stated purpose of this volume is (1) to give examples of the kind of questions which prompt library searching by chemists; (2) to describe and discuss the various kinds of publications which will furnish answers; and (3) to furnish practical library problems to give students an opportunity of using the chief publications in chemistry. To accomplish these purposes, the student will find chapters on the following subjects: (1) introduction and general outline, with information on the history of chemical literature, and a classification of various kinds of publications; (2) primary sources: periodicals ("journals"); (3) institutional publications; (4) patent literature; (5) miscellaneous primary sources; (6) secondary sources: periodicals and serials; (7) bibliographies; (8) reference works; (9) monographs and textbooks; (10) tertiary sources - guides and directories; (11) the process of making a search in the chemical literature; and (12) various library problems. This last constitutes a large part of the book with

78 pages. Terminal index. One of the many excellent features of this book is the list of periodicals in chapter 2. In this, the titles are classified into journals of general science, this in turn subdivided by country (from Argentina to the United States); then chemical journals by chronological order of establishment (from Chemisches Journal, 1778, to Pure and Applied Chemistry, 1960) (only the important journals are included); then the specialized journals are taken up, such as those of analytical chemistry, etc.

In using this book, the student must appreciate that only important journals, books, etc., are taken up, a great majority of less important items not being even mentioned. This is as it should be in a beginning guide.

Journal titles are not always given in extenso, thus for instance, Chemiker-Zeitung, 1877- (p. 30) was actually titled originally Allgemeine Chemiker-Zeitung. (No mention is made of Deutsche Chemiker-Zeitung, 1886-). Cognizance seems not to have been taken of such types of annual publications as "Annual Review of Biochemistry" (1938-date). Some reference book titles which were omitted include: Allen's Commercial Organic Analysis (rather old); New Drugs (AMA); New Dental Therapeutics (ADA); Gildemeister and Hoffman - The Volatile Oils; Heilbron's Dictionary of organic compounds. It would seem better to list many reference books by their titles rather than by their author or editor; for instance, "Physician's Desk Reference" rather than in order by the name of the editor, H. Bull.

GMH

"FLORA BOREALI-AMERICANA" by André Michaux In two volumes:
Vol. 1: xlvi xii 330 pp., 29 pls.; 1974 (1803).
Vol. 2: (vi) 340 pp., 22 pls.; 1974 (1803).
Hafner Press, 866 Third Ave., New York 10022. Classica Botanica Americana - Vol. 3. Price $37.50 (by subscription), $42.50.

The full title of this, the first book published on the North American flora, is (translated): "North American flora, presenting the characters of plants which were collected and determined in North America by Andreas Michaux, member of the French Institute of Scientists and also of the Society of Agriculture of Carolina. Ornamented with 51 copper plates. First volume/Second volume. With figures by Charles Crapelet. Published at Paris and Argenteuil in the house of Levrault Brothers. In the 11th year of the Revolution - 1803." This book was published one year after the death of its author in Madagascar, which he had been visiting since the previous fall after leaving the Baudin expedition at Mauritius. There is very little here about the life of Andre Michaux: more would have been of interest. The Preface to the Flora was written in

Latin by his son, François André Michaux; a translation is given. This is the only part of the book which would be difficult for the average botanist: the systematic part with descriptions is relatively simple for the taxonomist since the Latin descriptive terms are closely similar to or identical with the terms used today in botany. This work is a valuable contribution in furnishing a basis for names and descriptions of many North American plants.

GMH

"PHARMACY STATE BOARD QUESTIONS AND ANSWERS 1968 (Mill)." by Ralph J. Mill, 120 pp., (unpaginated), several figs., 8 1/2 x 11 in., Clark and Wilson Co., Box 3, General Post Office, Detroit, Mich. 48232. 1967. $4.00 (Flexible card cover).

Questions and answers are presented in 2-column format in this off-set publication. The following subjects of the pharmaceutical curriculum are given: chemistry (99 questions) materia medica, pharmacology, etc. (includes pharmacognosy) (121 questions), calculations (141 questions), Jurisprudence (25 questions), pharmacy (proper) (75 questions), dispensing pharmacy (102 questions). A total of 563 questions (with answers). This book is intended apparently to help the student who is preparing to take the state board in pharmacy; on the 4th page are some suggestions for one with this in mind. The typography is clear, the information (from samplings) accurate, and this would seem to be a "cram" which could be recommended to review the various subject matters. The last two pages gives a review of some of the cautions which should be taken by one working in the dispensing room of a pharmacy.

GMH

"MUSHROOMS OF NORTH AMERICA" by O. K. Miller, Jr., 360 pp. 292 col. pls., 108 figs. (b & w); s.d., E. P. Dutton & Co., Inc., New York. [1974] $17.95.

This splendid book bears descriptions of 422 mushroom species in considerable detail, with less detailed information on an additional 258, a grand total of 680 species. The most excellent, clear and realistic colored photographs mark the book as outstanding for the field collector and will serve in many cases to definitely pinpoint the identity of the fungus. However, a conscientious collector will also carefully read the quite elaborate printed descriptions, particularly if he has any notion of attempting to include the particular plant in his supper. There are many additional features to the book: keys, both large and small; a pictorial key to the major groups so that a person can promptly learn to which of the 15 chief subdivisions of the text he may refer; much information on the edibility and what is also important the palatibility of the various groups and the various individual mushrooms; a miniature (6 pp.) cook book for mycophagists is featured. A series of labeled drawings constitutes a pictured glossary followed by an alphabetic printed glossary, with definitions keyed to the sketches. There is an index but no bibliography. (For convenience, a transparent inch-millimeter rule is enclosed in the book.) For the reasonable price of $17.95, the book is a most excellent book purchase to make.

GMH

"ECOLOGICAL FACTORS OF IMPORTANCE TO COLUMNEA TAXONOMY" by B. Morley, Chap. 13 in HEYWOOD, V. (Ed.) - Taxonomy and Ecology., pp. 265-281, Academic Press, New York. 1973.

Members of sect. Columnea of Jamaica are generally problem-free taxonomically speaking when growing as epiphytes; however, in habitats disturbed by man, taxonomic problems are rife. However, in Central America members of sect. Collandra, both epiphytic and terrestrial species, give rise to taxonomic problems. Corolla morphology is discussed as related to pollination ecology and crossability.

GMH

"TRAVELER IN A VANISHED LANDSCAPE: the life and times of David Douglas, botanical explorer" by W. Morwood, xii + 244 pp., 26 figs., 7 maps, Clarkson N. Potter, Publisher, New York. 1973. $7.95.

We have in this biography a fascinating account of an eminent traveler, botanist, collector, writer, and adventurer, who discovered many of the plants of western America (USA, Canada) and whose life was cut off in full bloom (aet. 35). He lived (1799-1834) at a time when the national alignment of the western part of North America was still unsettled, when Russians were colonizing parts of California and the Britishers were active in what is now Washington and Oregon as well as the area now called British Columbia (Canada). The circumstances of discovery of many of the western plants is told in detail. There is an excellent bibliography. The text is embellished with many figures of the plants Douglas discovered. The index is good.

GMH

"A MONOGRAPH OF CHALARA AND ALLIED GENERA" by T. R. Nag-Raj and W. B. Kendrick, 1-200, 61 figs., Wilfred Laurier University Press, Waterloo, Ontario, Canada. 1975. (recd. 1977).

An original objective of preparing a monograph on Chalara and closely related fungi expanded into a study of various dimorphic Deuteromycetes with Chalara-like phialides (Thielaviopis, Chalaropsis, Stilbochalara, Hughesiella, Fusichalara), next to include Chaetochalara and Sporoschisma, genera with Chalara-like phialides but with characteristic ancillary sterile structures. Lastly, several other genera with phialides having somewhat cylindrical collarettes and deep-seated conidiogenous loci were studied: Bloxamia, Endosporostilbe, Excioconidium, Ascoconidium, Sporendocladia. Three genera, Endoconidium, Columnophora, and Milowia, were researched because their descriptions indicated the possibility that they had features similar to those of the next preceding genera. Thus, 16 genera were considered, of which five were reduced to synonymy, one to the status of nomen dubium (Milowia); to the remaining ten genera was added gen. Fusichalara Hughes et Nag Raj (1973). 30 new species are described, including 27 new species of Chalara as well as Chaetochalara ramosa sp. nov. (Tanzania; similar to C. cladii Sutton et Pirozynski); C. setosa (Harkn.) comb. nov. (Chalara s.); Bloxamia nilagirica (Subram) comb. nov. (Endosporostilbe n.); Calycellina carolinenis sp. nov. (New Zealand, USA); and Hyaloscypha cladii sp. nov. (United Kingdom). There are also three new combinations in Chalara. The book is well printed and bound and is an economic purchase at only $9.00. Dr. Nag Raj is from India and Professor Kendrick from England; both are now active in fungal research in Canada.

GMH

"BIOSYNTHESIS OF CYANOGENIC GLUCOSIDES IN CASSAVA (MANIHOT species)" by F. Nartey. In "Chronic cassava toxicity; proceedings of an interdisciplinary workshop, London, England, 29-30 Jan. 1973." 73-87, Internat. Devt. Res. Centre Monograph IDRC-010e. 1974.

Cyanogenic substances could not be detected in seeds of sweet cassava cultivars whereas low levels of these were found in seeds of bitter cultivars. However, both types synthesized high levels of cyanogens during germination and growth. Linamarin accounted for 93% while lotaustralin accounted for only 7% of total cyanogenic glucosides. Linamarase which hydrolyzes both glycosides was identified in seedlings and leaves of both sweet and bitter types. During growth of seedlings, the concentration of cyanogenic glucosides increased and then fluctuated without release of HCN; it was shown that HCN released intracellularly from the glycosides was rapidly incorporated into asparagine and later into metabolic pools involved with respiration and protein and carbohydrate metabolism. Large amounts of fat and protein bodies were found in seed tissues (all cells).

GMH

"THE NATURALISTS' DIRECTORY, INTERNATIONAL" (Founded 1878)., Anonymous, Ed. 41: 182 pp., PCL Publications, Inc., P. O. Box 583, S. Orange, N. J. 07079. 1972.

Furnishes lists of individuals, museums, societies, associations, periodicals, etc., active in the biological fields, including botany. A very useful guide!

GMH

"BOTANY" by Michael Neushul, xviii + 532 pp., 303 figs., 19 tabs. 32 col. plates, Hamilton Publishing Company, Sta. Barbara, Calif. 1974.

The general order of this attractive text is as follows: (1) General view of classification, the cell, genetics, and physiology. (2) Taxonomy of the lower plants. (3) Taxonomy of the higher plants. (4) Plant development and growth, ecology, and the environment. The text proper is followed by four appendices: the chief food plants; units; references; and glossary. There is a useful index. The author, on the staff of the University of California at Santa Barbara, has prepared this book as a text for undergraduate botany. It would of course be very useful to the self study of the subject or as a review for a graduate student or whoever. As so commonly done nowadays, the book is printed in the format of an album, with the binding on the narrow side of the page and with three columns to the page. There are many excellent diagrams and photos, which are so useful in stimulating and maintaining interest in the subject matter. The classification scheme followed employs 24 divisions (equivalent of phyla) arranged in two subkingdoms, Procaryota and Eucaryota. The glossary is rather detailed and therefore of special value. The bibliography is not very comprehensive and includes only books, no papers. However, it should be adequate. If the student reads the text carefully he will not have much time left over for consulting many references. It can be said without challenge that botany in this book has been presented as an up-to-date and most important discipline of study, at the same time without the rather repulsive qualities found in some of the older texts.

GMH

"A TROPICAL RAIN FOREST: a study of irradiation and ecology at El Verde, Puerto Rico" by H. T. Odum and R. F. Pigeon, (Eds.). Office of Inform. Serv., U. S. Atomic Energy Commission, Washington, D. C. 1970-3.

This consists of 3 volumes: Book 1: Sections A-C: xxiii, 497 pp.; Book 2: Sects. D-F: xi, 586 pp.; 1970; Book 3: Sects. G-I: xi, 594 pp.; 1970 (reprinted 1973). Price not stated. Section headings; A: The rain forest project; B: The rain forest at El Verde. C: The radiation experiment; D: Plants and the effects of radiation; E: Animals and the effect of radiation; F: Microorganisms and the effects of radiation; G: Cytological studies within the irradiated forest; H: Mineral cycling and soils; I: Forest metabolism and energy flows. The same index appears in each volume (index to all volumes). Some chapters in Section B are abstracted.

GMH

"PAECH AND TRACEY'S MODERN METHODS OF PLANT ANALYSIS" (Moderne Methoden der Pflanzenanalyse). Editors: H. F. Linskens and M. V. Tracey. Volume VI. Co-Edited by B. D. Sanwal. XXIV + 512 pp., 8°, cloth bound, 89 figs., Springer-Verlag, Heidelberger Platz 3, 1 Berlin 31 (Wilmersdorf), Germany. 1963. DM. 98,--.

As in the previous volumes of this outstanding series on plant chemistry, this represents the collaborative and directed efforts of several outstanding authorities, in this case 23 individuals, including the three editors named in the citation. Volume VI is concerned with silicon compounds, sulfhydryl groups, phosphatides and glycolipides, acetylene compounds, chromones, orchinol, humulones, lupulones and other hop constituents, lichen compounds, kinetin and kinetin-like compounds, gibberellins, plant toxins (phytotoxins), plant agglutinins (phytagglutinins), bacterial cell wall compounds, and general consideration of enzymes. (Volume VII will be devoted entirely to the study of enzymes.) The first four volumes of this work appeared in 1955-6 and this was a more or less complete coverage of the subject of plant analysis. However, advances came so rapidly in many areas that it was decided to furnish three additional volumes, vol. V (1962) being a revision of vol. I (analytical methods in general), vol. VI (1963) revising material in volumes II, III, and IV, and vol. VII (1963), which is concerned with Enzymology, special emphasis being given to individual groups of enzymes. (See QJCDR 5:697-8:1965). Volume VI includes 16 contributions in the German language (W. Heinen; Ulrich Beiss; F. Bohlmann and W. Sucrow; M. Hesse and H. Schmid; Richard Braun; Ruediger Knapp; Josef Tobiska; F. Zilliken and R. Lambert; H. F. Linskens; Ed. Hofmann; G. Pfleiderer) and 10 in the English language (Herbert Stern; J. R. Hudson; S. Shibata; Carlos O. Miller; L. V. Tracey; B. D. Sanwal; Hans G. Boman; Fay Bendall; Walter Bjork). This volume is remarkable for the wide distribution of locations of the various authors. Thus, contributions are from Germany with 6 authors, the Netherlands 4, the USA 3, Great Britain, Sweden, and Switzerland with 2 each, and Canada, Japan, Australia, and the Czechoslovakian Socialist Republic with 1 each. The section in this volume dealing with enzymes, constituting nearly half of the contents, is devoted to general considerations - including general characteristics, detection of the presence of enzymic activity, general methods of preparation and purification, inhibition and activation of enzymes, quantitative determination, and enzymic determination of metabolites. The older nomenclature for enzymes has been retained because the report recommending newer names did not appear until shortly before the volume went to press. However, the recommendations are incorporated at the end of volume VII. This volume matches earlier volumes of the series with thorough and accurate citations of the literature at the end of each chapter and with both German and English indices at the end of the volume. GMH

"HOW TO KNOW WILD FRUITS: A GUIDE TO PLANTS WHEN NOT IN FLOWER BY MEANS OF FRUIT AND LEAF" by Maude Gridley Peterson, lxvi + 340 pp., 80 figs., 1 tab., Dover Publications, Inc., New York. 1973 (1905). $3.00.

Unaltered rep ublication of the original (1905) edition, with the addition of a table of changes in nomenclature (E. S. Harrar). This is an excellent lay guide.

GMH

"CALLAWAY GARDENS - the unending season" by Caleb Pirtle III and Gerald Crawford, vi + 90 pp., many col. pls. (s.n.), Southern Living Books, P. O. Box 2643, Birmingham, AL 35202. 1973. $5.95.

This very attractive volume tells the story of one of the great institutions of the southern United States, the Callaway Gardens of Harris County, Georgia. Opened in May, 1952, the 2500 acres of verdant beauty attract many thousands of visitors annually. The primary attraction is the plant life of the area, which has been embellished with many attractive plantings. Birds and other animals abound. However, water sports, meetings, holidaying, and picnicking can be enjoyed; there is an ancient cabin, and even a chapel on the grounds. However, it is the beauty of the plant life so well shown in the book that is the great attraction.

GMH

"THE DATE PALM" by P. Popenoe, (edited by H. Field), xii + 247 pp., Field Research Projects, Coconut Grove, Miami, Fla. 1973.

This useful publication covers the literature quite thoroughly up to 1924, which was the date of completion of the manuscript. There are many data on the history, cultivation, uses, etc., of Phoenix dactylifera L., together with a great deal of information on the varieties (pp. 145-237). Appendices are devoted to a description of the plant and the chemistry of the ripening date [fruit].

GMH

"FLORA NEOTROPICA, MONOGR. No. 1 : CARYOCARACEAE" by G. T. Prance and Marlene Freitas da Silva, pp. 1-77, 23 figs., 1 tab., 2 portr. 1973. $8.50.

This is the first monograph on the family published since 1886 (L. Wittmack). Two genera occur in the Neotropics: Caryocar (15 species) and Anthodiscus (8 species). Novelties include Caryocar brasiliense subspecies intermedium (Wittmack) stat. nov. (C. i.), C. glabrum subspecies parviflorum (A. C. Smith) stat. nov. (C. p.), and C. g. subspecies album subspecies nov. (Guyana). An introductory section reviews and discusses the history of the family, pollen grains, anatomy and morphology, blastogeny (germination of seedlings), and pollination biology. It is concluded that the family belongs among the Theales and may be most closely related to the Theaceae. Besides many maps of distribution, and several indices, there are biographical sketches and portraits of both authors at the end of the monograph.

GMH

"DESSIDIALES. PART 1. SACCORDERMAE, MESOTAENIACEAE. by G. W. Prescott, Hannah T. Croasdale and W. C. Vinyard, North American Flora II: 7: 1-84. 1972 (1973).

Descriptions of eight genera with many species are included. New are: Netrium minus, N. digitus var. rectum f. minus, also var. scottii.

GMH

"THIRD DICTIONARY OF ACRONYMS AND ABBREVIATIONS: MORE ABBREVIATIONS IN MANAGEMENT, TECHNOLOGY AND INFORMATION SCIENCE" by Eric Pugh, A.L.A., 208 pp., Linnet Books, Shoe String Press, Inc., P. O. Box 4327, Hamden, Conn. 06514. 1977. $12.00.

This book follows the same plan as Pugh's first volume titled "A dictionary of acronyms and abbreviations" 2nd ed., (1970) (see review ibid. 31(1): 33-4; 1975). The "Second Dictionary" appeared in 1974. A study of the coverage in the third volume shows considerable variety. Many of the abbreviations/acronyms are for organizations, such as BNB for the British National Bibliography. A large number of abbreviations pertain to chemistry or biochemistry, as for example, LC (liquid-crystal), TPE (trypsin-protein esterase); the medical sciences are represented by many examples, as RCM (red cell mass). About 5,000 new terms are introduced here, giving a total for the 3 volumes of ca. 25,000. Some items which could not be found in either I or III are: GET (Greenwich English Time), SIM (Scientific Instrument Module); OPS (Oxygen Purge System); U (uracil); FU (fluorouracil); PCP (Phenyl Cyclohexyl Piperidine = phenyl cyclidine) (Peace Pill); MPS (Member of the Pharmaceutical Society) (MPSGB, MPSNI (Northern Ireland), etc.); LRCP (Licentiate of the Royal College of Physicians); SEC (Security and Exchange Commission); PR (Public Relations); TPP (Triphenyl Phosphate); TU (Tuberculin Units); PMR (Proton Magnetic Resonance); MEq (millequivalent); WARFARIN (Wisconsin Alumni Research Foundation Anti Rat plus common ending IN); NYSTATIN (New York State Institute Dept. Health); TV (Television); PA (Public Address); R/V (Research Vessel); GS (General Schedule); FDC (First Day Covers); RDA (Recognized Daily Allowance); cf. (compare); VPC (=?); CMT (Cancer Multistage Therapy); LB (Liebermann-

Burkhart (test)); RRL (Regional Record Librarian); TMS (Time of Flight Mass Spectrometry); AMSOC (American Miscellaneous Society); UDP (Uridine 5'-Diphosphate); UTP (Uridine 5'-Triphosphate); CD (Communicable Diseases Certificate of Deposit); D & C (Dilatation and Curettage). As in the previous editions, there is a useful subject index in the back, which lists all abbreviations (by number) under various headings.

GMH

"ANALOGUES OF NUCLEIC ACID COMPONENTS: Mechanisms of action" by P. Roy-Burman, XI + 111 pp., 41 figs., Recent Results in Cancer Research (RRCR) No. 25, Springer-Verlag Berlin - Heidelberg - New York. 1970. $7.70.

The interest in analogs of nucleic acids results indirectly from the successful use of sulfa drugs in combatting bacterial infection. Sulfanilamide is a structural analog of PABA which is essential for the living bacterial cell, being requisite for the synthesis of folic acid. By competitive means, sulfanilamide interferes with the use of PABA and the bacterial cells starve to death. In the higher animals, requirements of fatty acids are obtained from the food and do not need to be synthesized; consequently, medication of the animal with PABA does not interfere with the manufacture of FA in the animal body and such medication can be safely given. In the combatting of cancer it is hoped that something similar might eventually be done - starving the cancer cells to death by feeding them a defective raw food material. The nucleic acids contain purines and pyrimidines and are importantly represented in DNA and RNA so important to life; they are also present in cancer cells and enable them to reproduce efficiently and only too rapidly. Studies of their competitive analogs began with Hitchings in 1950. The volume is mostly made up of chapters on purines, pyrimidines, and nucleoside antibiotics. Approx. 400 references. Subject index and bibliography.

GMH

"PHARMACEUTICS - GALENICAL PHARMACY" by Erik Sandell (Ed. 1), VII + 364 pp., 147 figs., 7 tabs., Almqvist & Wiksell, Box 62, Stockholm 1, Sweden. 1968. US $8.00; Sw.kr. 40.00.

The order of general topics in this translation of the Swedish text, "Galenisk Farmaci," can be summarized as follows: history of pharmacy (1 chapter), literature (1 chapter), processes (15 chapters), and preparations (34 chapters). The 52 chapters are unnumbered. Many galenical classes are taken up, including syrups, mixtures, "drops" (eye drops plus), tablets, injections, "extractives" (extracts, fluidextracts, tinctures, wines, infusions, decoctions, spirits, electuaries), etc. There are many references which occur in the midst of the textual matter and not as usually at the ends of the chapters or at the end of the book. The purpose of the volume was to supply a basic course in the school of pharmacy with sufficient information of a more advanced type to provide a starting point for research studies. Throughout the text, questions or imperative statements enclosed within frames suggest typical pharmacy board or college examinations, for which the book might well serve as a preparation. Preparations are shown by Latin title, a practice abandoned in the United States but still retained in most countries.

GMH

"DAS AMP-SYSTEM. MANUAL ZUR DOKUMENTATION PSYCHIATRISCHER BEFUNDE," edited by Ch. Scharfetter, 88 pp., Springer-Verlag Berlin - New York. 1971. DM. 3.50. US $1.10.

The Arbeitsgemeinschaft fuer Methodik und Dokumentation in der Psychiatrie (AMP) is represented by psychiatric clinics in leading cities of Switzerland, Germany, and Austria. The six data forms for use in computer recording and calculations are reproduced: general anamnesis; disorder anamnesis; psychiatric findings; somatic findings; medication (30 day period); and therapy. These sections are discussed in detail. Bibliography; index.

GMH

"DIE ERNAEHRUNG DES MENSCHEN UEBER 50 JAHRE" by Dr. med. Otto Schmid, 56 pages, 24 tables, brochure, Paracelsus-Verlag, Neckarstr.121, Stuttgart, Germany. 1962. DM 4.80.

This hard paper booklet on the nutritional requirements of older people has the subtitle (translated) "A generally understandable adviser for the maintenance of health and efficiency through proper nourishment". Following introductory remarks emphasizing the importance of the subject matter, there are sections on food and its constituent parts--fats, proteins, carbohydrates, vitamins, trace elements, salts or mineral substances, water, and flavorings. The energy requirements of the body, the physiology of nutrition, relationship of nutrition to the maintenance of efficiency, ideal weights for various heights and ages of men and women, nutritional defects and what they may do to various organs, number and composition of meals, "fasting days" (Entschlackungstage), and beverages are taken up with what may be called reasonable detail. One of the most useful features of this booklet is the table 12 pages long giving the elementary, food class, and vitamin content of many foods, also the classification as acidic or basic food and the degree of same. This volume is written in simple understandable language and would undoubtedly be a most valuable guide to the aging lay person.

GMH

"DIE RINDE - DAS GESICHT DES BAUMES" by Alfred Schwankl, 100 pp., 156 figures, bound in wood veneer from makore wood (Dumoria Heckeli), a West African product, Franckh'sche Verlagshandlung (Kosmos-Verlag), Stuttgart. 1953. DM. 8.50.

This splendid little book, one of a series of guides to natural products, published by the Franckh Press, is designed to show by word and illustration how important bark is to a tree, and incidentally to other organisms, primarily man. With this book, one could no doubt in Europe identify a majority of the trees with a fairly good accuracy, and what makes such a guide so useful, one can use the book even during the winter season when characteristic leaves, flowers, and fruit are lacking, as they usually then are. The species descriptive part of the text is preceded by a general introductory chapter and followed by a concluding chapter on the tissue divisions of the bark and their economic applications. The last few pages of the book are a combination index-glossary. "The Bark, the Face of the Tree" has been written with care and with accuracy. One may wonder if "Kirschbaum" (Prunus avium) on page 55 might better have been designated "Wilde" or "Wilde Süsse Kirsche" to distinguish it from other cultivated cherries. "Betulin" on page 80 is confusing as it has been applied to several products of the birch tree. On page 86, the assimilation stream from the tree crown to the root is mentioned, but not the reverse flow of early spring. However, these are minor, and the book can well be recommended as a guide to tree barks, of interest to botanist, pharmacognosist, and layman alike.

GMH

"PLANT LIFE THROUGH THE AGES - A GEOLOGICAL AND BOTANICAL RETROSPECT " by A. C. Seward, xvi + 603 pp., Hafner Publishing Co., London and New York. 1933 (1966).

Facsimile replication of second edition.

GMH

"WILD FLOWERS OF YELLOWSTONE AND GRAND TETON NATIONAL PARKS" by Richard J. Shaw, iv + 64 pp., 92 col. pls., 1 fig.; 1972. "TREES AND FLOWERING SHRUBS OF YELLOWSTONE AND GRAND TETON NATIONAL PARKS" by Richard J. Shaw, 52 pp., 73 col. pls; 1964. The Wheelwright Press, 975 S. West Temple, Salt Lake City, Utah 84101. $1.50 each.

Both of these attractive little books should be useful companions for a visitor to these great national parks - a visitor that is who is interested in learning more about the trees, shrubs, and herbs of these delightful areas. For each plant entity, common and scientific names are given, with important other information and a realistic picture of each plant. The descriptions have just the right balance of scientific fact and human interest (such as the uses made of the plant) to give maximum effectiveness.

GMH

"AN INTRODUCTION TO THE BOTANICAL TYPE SPECIMEN REGISTER" by S. G. Shetler, vi + 186 pp., 3 figs.; frontispiece, Smithsonian Contr. Bot. No. 12. 1973. $2.85.

In Part I (pp. 1-25), a description is given of a computer-based system for the storage and retrieval of information about type specimens. Concept, purpose, and scope are detailed and the operational procedures are outlined. Modes of using and contributing to this data bank are proposed. Up to 30 Sept., 1972, over 13,000 plant specimens representing more than 10,000 taxa have been registered. Part 2 (pp. 26-186) is made up of a catalog of over 1,000 specimens representing over 600 taxa of Carex (Cyperaceae), deposited in 10 major American herbaria. The catalog is cross-indexed five ways: by author, publication date, collector, country, and herbarium. The preparation and editing of the catalog is summarized in an introduction. This Carex catalog is the first installment of the Type Register to be published and is intended to serve as an example of others to follow.

GMH

"INTERNATIONAL INDEX OF CURRENT RESEARCH PROJECTS IN PLANT SYSTEMATICS. NO. 7." by S. G. Shetler and R. W. Read (Editors), i-xxii, 1-120, Flora North America Rept. 71. 1973.

This brochure represents a catalog of programs (nos. 1-3524)(pp. 1-64) classified into subject and including publications in progress or the name of the project. A geographical index appears on pp. 65-78, a geological index (79-81), a methodological index (ex. ecologic, cytogenetic, etc.) (82-84), and an index of the specialists with their addresses (85-117). This is a very useful compilation, international in scope, and one of the most complete ever published without question. It covers all fields of plant taxonomy. A descriptive introduction tells of the collapse of the FNA project as a result of lack of funding. It is hoped that the project, for which this is a tentative final report, will be continued at a later time.

GMH

"AN INTRODUCTION TO THE ECOLOGY OF THE ILLINOIS ORCHIDACEAE" by C. J. Sheviak, xiii + 89 pp., 20 maps, 1 col. pl., Ill. Sta. Mus, Sci. Papers XIV. 1974.

In this monograph, 46 taxa are recognized as found in Illinois, four taxa are provisionally recognized, and six taxa are excluded (after having previously been reported for the state by various workers). Keys, distribution information, and maps are presented, along with detailed discussions. Relationships to the environment are given chief stress - the effect on plant distribution and numbers of the soil, other plants, climate (moisture, insolation), and human-originated disturbance is especially thoroughly examined. In this state, elevational differences are of minor importance. For each taxon, the record of anthesis is given, where this is known. The work culminating in this publication occupied the author during the period 1957 to the time shortly before publication.

GMH

"WILD MUSHROOM RECIPES" by Pauline Shiosaki (Editor) (Puget Sound Mycological Society), xi + 178 pp., Pacific Search Books, 715 Harrison St., Seattle, Wash. 98109. (Ed. 2). 1973. $6.95.

More than 200 recipes are given utilizing 22 species of edible mushrooms found in the Pacific Northwest and neighboring parts of North America; these include Agaricus, Russula, and Sparassis species. Care and handling, precooking, preservation, canning, etc., are also covered. The first edition was entitled "Oft Told Mushroom Recipes"; 1969.

GMH

"FIRST SYMPOSIUM ON RECENT AND FOSSIL MARINE DIATOMS, BREMERHAVEN, September 21-26, 1970" by R. Simonsen (Editor), viii + 294 pp., 50 pls. with 218 figs., 7 tabs., 32 text figs., J. Cramer, Lehre. Nova Hedwigia, Beihefte, Heft Nr. 39. 1972. DM. 150.--.

This volume contains 15 articles (all but one (German) in English) concerning many facets of diatomology, taxonomy, life histories, paleobotany, morphology, ecology, study technics, etc.

GMH

"ANGIOSPERM EVOLUTION AND THE RELATIONSHIP OF THE FLORAS OF AFRICA AND AMERICA" by A. C. Smith, Chapter of Meggers, Betty J.: Tropical forest ecosystems in Africa and South America: a comparative review, pp. 49-61, Smithsonian Inst. Press, Washington, D.C. 1973.

The similarities of the Angiosperm floras of the tropical forests of Africa and America are largely superficial representing independent evolutions of allochthonous elements. This opposes the hypothesis of origins of floras from a shared continental area. Similar environmental conditions have no doubt produced parallel developments of structure and differentiation.

GMH

"THE NORTH AMERICAN SPECIES OF PSATHYRELLA" by A. H. Smith, iii + 635 pp., 867 figs., 95 pls., Memoirs N. Y. Bot. Garden 24. 1972.

In this monograph on Psathyrella (Agaricaceae), the initial section deals with various methods of classification, study technics, microscopic features, phytogeography and ecology, relationship to other genera, and evolutionary development. In the systematic portion, 414 species are recognized, including 252 species nov. with Smith as sole author, 14 species nov. having Smith and others as authors, 18 var. nov., 1 forma nov., 56 comb. nov.; also 1 sub gen. nov., 1 ser. nov., 3 sect, nov., and 9 subsect. nov. In addition, there are 6 nom. nov., and 1 stat. nov., along with P. subgen. Panaeolina (Maire) comb. et stat. nov. (Paneolina as gen.); and P. ellenae A. H. Smith var. yubaensis Thiers et A. H. Smith var. nov. Among species nov. with 2 or 3 authors are: P. albescens Hesler et A. H. Smith; P. sequoiae Thiers et A. H. Smith; P. solheimii McKnight et A.H.S.; P. utahensis McKn. et A.H.S.; P. pseudoparadoxa V. Wells et A.H.S.; P. wapintaensis P. Kempton et A.H.S.; P. volumbiana Harrison et A.H.S.; P. rugoradiata Hesler et A.H.S.; and P. katmaiensis Wells, Kempton, et A.H.S.

GMH

"PROF. GEORGE WINSTON SMITH: MEDICINES FOR THE UNION ARMY" VII + 120 pp., 8 figs., 7 appendices, 1 index, American Institute of the History of Pharmacy, Univ. Wisc., Madison, Wisconsin. 1962. Paper bound; $2.75 postpaid.

This historical account of the medical supplies prepared for and used by the Union Army in the Civil War (1861-5) supplements presentations by other recent authors on the medicines used in the Revolutionary War and in the Confederate Army. Professor Smith has been a professor of history at the University of New Mexico since 1949 and is a professional historian and not a pharmacist as were the authors of the other two works cited (Franke, Griffenhagen). Nonetheless he has presented a story here which does not seem to be lacking in scientific and professional accuracy as it concerns pharmacy and medicine. Chapter I deals with the medical purveying system in use at that time, II discusses the beginnings of the laboratories (one at Philadelphia, Penna., the other at Astoria, New York), III considers the operation of the Astoria Laboratory, and IV that of the Philadelphia one. The last chapter entitled "The Balance Sheet" is a summing up of the total operations of these laboratories and other segments of medical supply, and tells about the liquidation of stocks, equipment, etc., at the terminus of the tragic War of Confederation. Under Notes and References which follows are included an enormous number of references and minor annotations of the text of the five preceding chapters. The appendices include inventories of the U. S. Army Supply Table, of the Autenrieth Medicine Wagon, and of the U. S. Army Pannier put up by E. R. Squibb and Company. Appendices B, C, D, and E represent an innovation, since these are not published in extenso but are procurable on microfilm from the American Institute of the History of Pharmacy at a charge of $3.00. These include detailed data on price fluctuations, inventories of medicines produced, and a proposal for the manufacture of quinine sulfate (transcript of manuscript from J. M. Maisch to A. K. Smith, 1863).

GMH

"GUIDE TO THE LITERATURE OF THE LIFE SCIENCES" by R. C. Smith and W. M. Reid, Ed. 8, vi + 166 pp., Burgess Publishing Co., Minneapolis, Minn. 1972.

Included are the mechanics of library and book classifications, bibliographies, abstract journals, primary research journals, taxonomic literature, literature searches, and the preparation of a scientific paper. There are numerous lists and a complete index.

GMH

"NUMERICAL TAXONOMY: THE PRINCIPLES AND PRACTICE OF NUMERICAL CLASSIFICATION" by P. H. A. Sneath and R. R. Sokal, xv + 573 pp., 81 figs., 9 tabs, W. H. Freeman and Co., San Francisco. 1973. $19.50.

Apparently this work represents an enlargement of the previous text by Sokal and Sneath: "Principles of numerical taxonomy." (EBA 9: 125-6) This is a more elaborate treatment of a science which has shown prodigious growth in the last few years. An enumeration of the headings of the twelve chapters will give a fairly good nature of the book's contents: The aims and principles of numerical taxonomy, taxonomic principles, taxonomic evidence, the estimation of taxonomic resemblance, taxonomic structure, the study of phylogeny, population phenetics, identification and discrimination, implications for nomenclature, a critical examination of numerical taxonomy, numerical taxonomy in fields other than biological systematics, and the future of systematics. In addition, there are two data-rich appendixes and an enormous bibliography with 60 pages and ca. 1500 references, an author index that includes the names in the bibliography and a comprehensive subject index. The book is well made and may be very serviceable as a class text. It should stand as the definitive work in this important modern field. Sneath teaches at the University of Leicester (England), Sokal at The State University of New York (Stony Brook).

GMH

"UEBERLEBENS- UND WIEDERBELEBUNGSZEIT DES HERZENS" (Survival and resuscitation (or reanimation) time of the heart) by P. G. Spieckermann, Anaesthesiology and Resusciation. Vol. 66, ix + 116 pp., 32 figs., Springer-Verlag Berlin, Heidelberg, New York. 1973. DM 38,--, c. $US 16.00.

This volume is published in the German language; however, there is a one and half page summary in English, as well of course as many of the references. An unusually large portion (nearly 21%) of this brochure is made up of the bibliography or tabulation of references. There are chapters on functional disturbances due to oxygen deficiency, the energy requirements of the myocardium (heart muscle), chief possibilities for conservation of organ function and for reducing the myocardial energy requirements, methodology, energy-rich phosphates in the myocardium during aerobiosis and anaerobiosis, tolerance to ischemia of the normothermal dog heart dependent on the type of narcosis and the pre-ischemic hemodynamic stress, the adenine nucleotides and their decomposition products in the ischemic myocardium, energy metabolism in the ischemic myocardium, the metabolism during the post-ischemic recovery; morphological changes during oxygen lack and its relations to the content of the tissue in energy-rich phosphate compounds; functional disturbances of the heart muscle during oxygen deficiency, and its biochemical and structural correlates; biochemical findings on cardiac standstill with cardioplegin (a commercial article containing Mg aspartate, procaine, and sorbitol). It was determined that the duration of the survival and of the reanimation time of the heart is determined by the basal level of high energy phosphates (ATP) before the onset of ischemia and by the velocity of breakdown of such compounds during ischemia. Both of these factors are dependent on the energy requirements of the myocardium before and during anoxia. The energy requirements of the heart muscle also determines the rate of resynthesis of high energy phosphates during the post-ischemic period. The anesthesia chosen modifies the duration of the reanimation period. Myocardial tolerance to ischemia decreases in the following order: Halothane, neuorleptanalgesia, choloralose-urethane, ether, $CHCl_3$, penthrane, pentobarbital, and ketamine.

GMH

"THIN-LAYER CHROMATOGRAPHY: a laboratory handbook" by Egon Stahl (Editor), Edition 2, XXIV + 1041 pp. 8vo., 220 tabs., (including 2 folded in), 241 figs., 3 pls. (color), Translation by M. R. F. Ashworth, Springer-Verlag Berlin, Heidelberg, New York. 1969. Cloth DM 128,--; US $56.00.

It is quite logical that the man chiefly responsible for initial developments in thin layer technology should be the editor and principal author of this work. There are in addition 24 other authors who have collaborated in the preparation of the text, among others H. Gaenshirt, H. Jork, and F. Šantavý. Both German editions were translated into English editions: the first German edition appeared in 1962, the English edition in 1965--the second German edition came out in 1967, its translation in 1969. Comparing the English editions, one will note an enormous increase in size, with 569 pages in the first edition, 1066 in the second. The texts have been very thoroughly revised. The first edition had only 7 authors. While the book is titled a laboratory handbook (or manual), it actually is a textbook as well as a reference book in the discipline. The text explores the many advances recently made in this field, including preparative thin layer chromatography (TLC); gradient, transfer, and coupling procedures; direct quantitative determinations, new isotope technics, etc. There seems to be considerable material in the first edition which was not retained in the later one. Hence, one might be well advised to keep both editions for reference purposes. A considerable effort has been made in this volume to condense and systematize the enormous amount of information provided. There are 28 chapters (A to Z, with TF (F for Farben, colors); TN (N for Nahrstoffen, foods), and TS (S for Synthetika, synthetic substances)), lumped into two great divisions, the General Section (Chapters A to I) and the Special Section (Chaps. J to Z). There is a single bibliography at the end of Chapter I to cover the General Section, whereas each chapter of the Special Section except Chapter Z has its own bibliography. Chapter Z is devoted to the matter of spray reagents and includes a detailed and annotated listing of 266 of these, with composition, application, and literature citations. Reference throughout the volume is made to the various reagents with identification by number. An additional useful feature is listing of compounds or compound classes in alphabetic order with the reagent or reagents indicated as of service for their detection. Another useful feature is a conversion table for converting R_f into R_m (= log $\frac{1}{R_f} - 1$)) values and vice versa. (Error in one example shown: R_f 65.4 = -0.280 not -0.277 as shown). A useful table of equivalent terms in English, German, and French is given, also a list of manufacturers and suppliers of chemicals and equipment. The author and subject indexes follow. This work is an invaluable one for pharmacognosy, analytical chemistry, biochemistry, phytochemistry, and organic chemistry, and is truly the "Bible" of TLC. (Some confusion may be found in the use of the terms Molybdophosphoric Acid and Tungstophosphoric Acid, where Phosphomolybdic Acid and Phosophotungstic Acid are generally used (USA)).

GMH

"FLORA OF GUATEMALA" by P. C. Standley and L. O. Williams, Fieldiana: Botany 24, Part IX, Nos. 3 and 4: v, 237-418, 50 figs., Field Museum of Nat. Hist., Roosevelt Road, Chicago, Ill. 60605 . 1973. $7.25.

This brochure covers the families Labiatae and Scrophulariaceae, the text being roughly equal for each. Descriptions and distribution data are chiefly featured. There are no novelties. An index at the end shows 107 families covered in Part IX.

GMH

"BACTERIAL METABOLISM" by (Miss) Marjory Stephenson, xiv + 398 pp., many figs. & tabs., MIT Press, Mass. Institute of Technology, Cambridge, Mass. (Paperback Series No. 50). 1966. $2.95.

The present volume is a reprint, apparently unchanged, of the edition of 1949 (manuscript completed 1947; the author died in 1948), but in spite of its being effectively 19 years old, yet it represents a valuable reference volume on the subject with 62 pages of references, many rich tables, a detailed index, and a condensed and well written text. Miss Stephenson of Cambridge was herself a productive research worker, who among other achievements developed the "washed cells" technic for obtaining bacterial enzymes. Some chapter headings will give a better idea of the book: Fermentation; the metabolism of nucleic acid and its derivatives; enzyme variation and adaptation.

GMH

"KANSAS WILD FLOWERS" by Wm. C. Stevens, Ed. 2, ix + 461 pp., 771 text figs., 1 col. frontispiece, Univ. Kansas Press, Lawrence, Kans. 1961. $8.00.

Professor Stevens died in 1955 at the age of 94 years. He contributed much to botany (author of "Plant Anatomy") and to the botanical knowledge of Kansas, where he lived for nearly all of his long life. In this compilation, ca. 500 species are taken up, constituting the chief part of the flora and representing plants mostly found widely distributed in the mid-Western states. The book is far from dry and uninteresting since the author makes frequent allusion to the country side and to the herbal use of the various plant species by both aborigines and the early settlers. For nearly all the taxa covered there is a photograph in the field or taken against a grid of squares, ordinarily measuring an inch (2.5 cm.) across. For each plant entity there are ordinarily given the syllabic accentuation, the meaning of the Latin name, common names, anthesis, habitat, and a description. Besides the main systematic portion of the text, arranged in the Englerian order, and covering 418 pages, there is an introductory part including a key to the families, and at the end an adequate glossary and index.

GMH

"THE PENICILLIN GROUP OF DRUGS" by Gordon T. Stewart, xii + 212 pp., 17 tabs., 11 figs., Elsevier Publishing Company New York. 1965. $10.00.

The last two decades have seen an enormous increase in the volume of literature on the penicillin group of drugs. Gordon T. Stewart, being a medical doctor, has tried to elaborate more on the pharmacological aspects of penicillin. The book under review can be considered more appropriately as an historical rather than a medicinal chemistry book, as it illustrates the examples without much description.

It is divided into sixteen chapters. The first three chapters are devoted to the historical development of penicillin and the next three chapters deal with acid-stable penicillin in which the author is mainly concerned with the uses of penicillin. The chemistry and structure-activity relationships are very poorly dealt with. The remaining chapters are concerned with the pharmacology and toxicity of various forms of penicillin. The mode of action is very inadequately covered. The last chapter deals with the cephalosporins.

The author has tried to discuss structure-activity relationships but the conclusions are historical. On the over-all basis, the book may be useful for medical students but not for medicinal chemists.

Man M. Kochhar, Associate Professor of Pharmaceutical Chemistry, Auburn, Alabama

"COMMON WILD FLOWERS OF THE GRAND CANYON" by John W. Stockert and Joanne W. Stockert, 52 pp., 75 col. pls, The Wheelwright Press, 975 S. West Temple, Salt Lake City, Utah 84101. 1970. $1.50.

This card-cover spiral-bound booklet will furnish answers to the many question which a keen-minded person visiting the Canyon will ask. The fine Kodachromes alone are worth the price of the book but in addition, an accompanying text is furnished with much worth-while information.

GMH

"THE PLANTS OF SOUTHERN NEW JERSEY" by W. Stone, 946 pp., 131 pls., 1 map, Quaterman Publications Inc., Lawrence, Mass. 01885. 1973 (1911). $25.00.

Unabridged republication of a title published in 1911, with the addition of a foreword by Elizabeth W. Woodford. 1401 species are included, with keys, habitat and geographical distribution data, phenology, and discussions.

GMH

"LAYMAN'S MEDICAL DICTIONARY" by Harry Swarts, M. D., Ed. 2 ("enlarged"), XIV + 322 pp., paper bound, many figs. and tabs., Frederick Ungar Publishing Co., 131 East 23rd Street, New York 10, N.Y. 1963. $1.75.

In this attractively printed volume, the important medical, anatomical, surgical, and psychiatric terms which are so important when applied by the physician to the layman's own person or to others close to him have been clearly explained in simple words. For the non-medico this should prove a very interesting book. Not only the practitioner, but also the medical writer who writes for the newspaper or the popular magazines frequently uses terms which are not too clear to a typical layman. To this could also be added radio and television program speakers, and who will forbid the layman from reading the technical literature itself? With all of the library facilities now available in many countries, there is nothing to prohibit the use of medical works and journals by even the least technically versed individual. At first "blush", the reviewer had the impression that this was a dictionary of common medical terms, lay terminology, translated into technical verbage. Many slang expressions of the medical professions as well as of the man on the street are not always clear and it seems to this particular reviewer that such a compendium would be of real merit for both the layman and practitioner.

GMH

"FROM SINGLE CELLS TO PLANTS" by E. Thomas and M. R. Davey, XV + 172 pp., 60 figs., 7 tabs, Springer-Verlag New York, Inc., New York 10010. (Wykeham Publns., London, England). 1975.

This review covers the history and development of plant tissue cultures but with sufficient detailed technical information that it can serve as a laboratory manual in the subject. Materials and methods are described in considerable detail. The term "plant tissue culture" is applied to the culture of both plant organs and plant cells. Space is given to details on the isolation and behavior of protoplasts of higher plants, and the culture of haploid reproductive cells (microspores). The appendices furnish the formulas for various culture solutions. It is now possible by the use of careful and appropriate culturing to grow plants from certain single isolated cells, which possess the property of totipotency (the ability within the individual cell of recreating by division the entire organism). Tissue cultures work was pioneered by W. J. Robbins (USA, 1922) and W. Kotte (Germany). 1 page of references. Future possibilities from this work are explored.

GMH

"ENTOMOLOGY: CATALOG OF INSTRUCTIONAL MATERIALS" by Vernon J. Tipton, editor. (Center for Health and Environmental Studies, Brigham Young Univ., Provo, UT 84602). (IX +) 1-262; 353-441; c. 1977 (undated). Price unstated.

This package consists of loose-leaf sheets presenting much practical information relating to the study and teaching of entomology. To provide better separation of the sections, colored sheets (5 colors) have been used. Part I relates to written materials and includes first a lengthy bibliography relating to all phases of entomology, and including a list of publishers (55 pages). Booklets, illustrations, offprints, and pamphlets are next listed (44 pages). Laboratory guides, equipment for collection, etc., sources of live insects, and publishers are next detailed. (20 pages). Then journals (including zoological, abstracting, and popular science) are listed. Part II: Multimedia materials described include motion picture films (8, 16 mm), film strips, transparencies, cassettes, recordings, etc. (120 pages). (The gap of 90 pages is unexplained; possibly this is left for additions). Part III is a "gazetteer of educational programs which may have application for teachers of entomology." It presents pertinent details on seminars, courses, workshops, and other programs throughout the USA (28 pages). Part IV: Regulatory entomology, programs to control insect pests, pesticide legislation, etc., with bibliography (26 pages); "From Darwin to Shakespeare," Part V, is made up entirely of quotations running from the Ancients up to the current period, all concerning insects and their relatives and entomology as a professional and scientific field (32 pages). Part V, Addendum, lists additional references (3 pages). This large compilation should be of much service to teachers and students of entomology, and to entomologists, if there are any such, for Oliver Wendell Holmes said: "No man can be truly called an entomologist....the subject is too vast for any single human intelligence to grasp."

GMH

"WINTER BOTANY" by William Trelease, xlii + 306 pp., 1110 figs., Dover Publications, Inc., 180 Varick St., New York 10014. 1967 (1931). $2.00.

This unaltered unabridged republication of the third edition of Trelease's book serves as a useful identification guide for native trees and shrubs of the northern United States. However, many of the plants covered occur further south and in other parts of the USA. This "Winter Botany" follows and was complementary to the author's "Plant Materials" (1917) which was a kind of Summer Manual (or Summer Botany, to match the present title). Conifers have been excluded because they are identifiable by the summer key. A total of ca. 1100 taxa are covered (in ca. 328 genera and 94 families). The author points out that it is often easier and even (for the layman) more accurate to identify by the winter characters. The order of contents is: Keys; systematic coverage of individual species (one species per page); references; glossary; index. For the individual species, the names, a generic description fit for the winter months, discussion, figures (twig or branch; bud scars; other markings), and citation of species (sometimes with a key) are given. This book is sturdy enough to be a good field manual, as no doubt it was intended.

GMH

"LIFE IN AND AROUND THE SALT MARSHES: A HANDBOOK OF PLANT AND ANIMAL LIFE IN AND AROUND THE TEMPERATE ATLANTIC COASTAL MARSHES" by M. J. Ursin, xvii + 110 pp., 20 col. pls., ca. 800 figs. and maps, Thomas Y. Crowell Co., 660 Fifth Ave., NYC 10019. 1973 (1972) (spring).

Plants are covered on pages 5-44, animals on pp. 45-99. Following are the glossary, literature references, and index. All major groups of plants are covered from the diatoms to the seed plants. This should be useful in the field.

GMH

"A DICTIONARY OF SCIENCE" by E. B. Uvarov and D. R. Chapman, revised by Alan Isaacs. Ed. 4, 443 pp., 47 figs., 11 tabs. Penguin Books, Inc., 7110 Ambassador Road, Baltimore, MD 21207. US $2.50.

As noted in a review of the third edition (Acta Phytotherapeutica 18: 16; 1971), the emphasis in this dictonary is on the physical sciences (chemistry, physics, chemical engineering, etc.) which is reasonable since its companion volume by Penguin is "A dictionary of biology." The definition for "pharmacognosy" is inappropriate: it is not the science of drugs (since "drugs" is too broad a term). Better would it be to say "the science of products of natural origin used in medicine and pharmacy." Terms which might have been defined: sitosterol; madder; expeller; flavones; Tris; alkanols; TLC (thin layer chromatography); dimethyl formamide (DMF); rheogram; protophilic; enamine. All in all, this is an excellent dictionary - especially considering the small size of the book, which puts limitations on content.

GMH

"CHEMICAL MUTAGENESIS IN MAMMALS AND MAN" edited by F. Vogel and G. Roehrborn, XIV + 520 pp., 95 figs., 108 tabs., Springer-Verlag New York - Heidelberg - Berlin. 1970. Cloth bound. $34.10.

Herewith are presented the many reports issuing from a Symposium on mutation research held at Mainz in October, 1969. There has been a great lag in interest concerning the potentially dangerous substances of the environment and this symposium was conducted as one way to catch up. A careful reading will convince one that much was accomplished at this meeting of specialists. The objective was to establish whether there was or was not evidence of mutational changes resulting in the lower animals as a direct or indirect result of environmental active substances. Special interest was shown in experimental *in vivo* work with mammals since these animals represent the special group of organisms to which *Homo sapiens* belongs. Many graphic presentations appear in these pages with numerous diagrams, photographs, including those made with the microscope, and of most interest, those which show the configurations of the chromosomes. Bibliographies appear at the ends of the chapters; some of these are quite detailed and possibly exhaustive. Thus, there are 1097 references at the end of Chapter 3. This is a volume of vital interest to biologist, chemist, physician, toxicologist, and environmentalist.

GMH

"NATIVE VEGETATION OF NEBRASKA" by J. E. Weaver, v + 186 pp., 151 figs., 1 tab., University of Nebraska Press, Lincoln, Nebraska 68508. 1965. $7.95.

This work by the late Professor Weaver (1884-1966) is important because the author was so knowledgeable about the characteristic plants and ecology of Nebraska. This was his 16th book and he was the author of more than 100 articles all or practically all devoted to this subject. Born in the adjoining state of Iowa, Weaver got his B.S. at Nebraska and spent nearly all of his professional life at the University of Nebraska (1914-52). Following a general introductory chapter, there are chapters on the forests (deciduous and flood-plain forests), lakes and other wet lands, grasses of the lowlands and uplands, forbs (non-grass-like herbaceous plants) of the lowlands and uplands, soils, plant growth of various areas (transition to the Great Plains and Loess Hills; Great Plains; Sand hills; Evergreen Forests; and the Northwest) with a final chapter on the cultivated crops of grassland soils. (Cf. EBA 11: 276-7; 1967).

GMH

"THE PYRENOMYYCETOUS FUNGI" by Lewis E. Wehmeyer. Mycologia Memoir No. 6. vii + 1-250, 1 portr. J. Cramer, Lehre, Germany. 1975. DM 80,-- (c $33.00) (Members of Mycological Society of America: $20.00).

This excellent work of Wehmeyer (1897-1971), published posthumously, carries at the beginning of the text a biographical sketch with bibliography (1924-66) written by the Editor. The work is valuable in presenting Wehmeyer's matured views on the state and relationships of the Ascomycetes and its various subdivisions including the Pyrenomycetes, an area in which he labored for a large portion of his life. Formerly, the Pyrenomycetes was a formal taxonomic group, a class under the Ascomycetes (kind of a super-class), commonly called the "flask fungi" to distinguish them from a parallel class, the "cup fungi" (Discomycetes). (Sometimes, Ascomycetes was a subclass under Euascomycetes or subclass Euascomycetidae. The classification of Fungi at least at the higher levels is of course a very confused mess, and there seem to be as many schemes of classification as there are mycologists). Currently, however, the Pyrenomycetes are considered as an extra-taxonomic group and are so treated in this volume. Pages 1-17 are used for a general discussion of the Ascomycetes while pages 18-25 are devoted to the non-pyrenomycetous Ascomycetes: one might wonder if a better title had not been "The Ascomycetes with special emphasis on the Pyrenomycetous groups." There are numerous keys interspersed throughout the textual matter describing the various groups. A large bibliography (21 pp.) is very helpful. Unfortunately there are no figures. The line drawings which had been intended for use with the text were incomplete and could not be used. Possibly these will be published separately. A glossary of technical mycological terms might have been in order, as there is a wealth of designations used in the book which are not to the say the least unusually common, such as ascostroma, archicarp, subiculum, hypostroma, erumpent, etc. These are not covered in the Index either. In this book, the families and genera are covered quite thoroughly with an occasional mention of an important species. The scattering of families and genera of these Fungi and the multiplication of orders confused and dismayed me in consideration of the principles of mycology taught me in 1930-1 until it became clear from the text that not long after that time (Nannfeldt (1932)), a change in the whole concept of classification was introduced. In the earlier period (up to ca. 1932), the ascocarp, ascus, and ascospores were used as the basis of classification, after that a change to developmental characteristics came about in which Luttrell, von Arx, Miller, and others participated. Wehmeyer has attempted to combine and modify their systems into his own general system of classification of the group. No doubt, other systems will be proposed and his system will be displaced. Nothing is permanent in this world of change except the fact of change itself. Some errors noted in the index: Chaetomium p. 119 (not 113) (p 238); Halotheles, should be Hyalotheles (p. 242).

GMH

"ANGLO-AMERICAN AND GERMAN ABBREVIATIONS IN SCIENCE AND TECHNOLOGY" Ed. 1: Part 1: A-E, by Peter Wennrich, vii + 607 pp., R. R. Bowker Company, New York; Verlag Dokumentation, Publishers, Muenchen. 1977. $24.00.

This is the most ambitious, that is the largest, compilation of abbreviations that this reviewer has seen. It is particularly voluminous when one considers that it covers terms only in science and technology and does not cover various fields with an extraordinary large number of abbreviations, such as political science, social science, engineering, armed forces, and so forth. It represents the first of three volumes and when completed this should be a very much consulted part of any library. Increasingly, abbreviations and acronmyms are being used and it is one of the minor problems of research to be able to identify many of these that are now in use. Sometimes authors define an abbreviation in the first usage in a book or article, but often they forget this courtesy and the reader is left to try and dig out the meaning - whether from the context, his background knowledge of the subject, or from reference books. Too often, the reference books do not include the abbreviation sought. This has been for myself a constant source of difficulty in reading. The abbreviations here assembled were obtained by careful reading of the columns of 800 scientific journals; also from the schedules supplied by various national standards organizations, such as DIN (Deutsche Industrie Normen). There are roughly in the 3 volumes, 150,000 abbreviations, of which more than 2/3 are English-American in origin. A strict alphabetic sequence is used: there will be an index of sources in vol. 3. It is important to know the context of the abbreviation; for instance, there are 49 entries for "DL" ("dl"), all the way from deciliter to lethal dose. Some abbreviations not noted are: CMT: cancer multistage therapy; CC (control check; column chromatography); CVA (cardio-vascular accident); DP (direct photometry); Ad. (Adeps); Ad. Lan. (Adeps Lanae); BC (back cross); DTA (direct thermal analysis).

GMH

"CUMULATIVE LIST OF PROPOSED INTERNATIONAL NONPROPRIETARY NAMES FOR PHARMACEUTICAL SUBSTANCES" Cumulative List No. 3 (1971). 189 pp. World Health Organization, Geneva, Switzerland. 1971. $6.00. (Available from many sales services, such as N. J. Martinus Nijhoff's Boekhandel, The Hague, Netherlands).

In this volume, we have a cumulation of lists no. 1 to 25 (1963-71), originally published in the "Chronicle of the World

Health Organization" (WHO), later in the "WHO Chronicle." The alphabetic listing is by the proposed international non-proprietary name (Latin and English), a reference number in parentheses indicating the list where originally published, followed by the chemical name or description and the molecular formula. This covers more than half the book, being followed by Annex 1, stating the procedure for selection of these names and giving a list of standardized suffixes, prefixes, and infixes denoting chemical or pharmacological properties. Annex 2, a listing of molecular formulas in the form of an index to the names completes the volume. This index follows the letter and number order in strict sequence.

GMH

"WORLD HEALTH ORGANIZATION (WHO). WORLD DIRECTORY OF SCHOOLS OF PHARMACY", 301 pp. many tabs., 11 annexes, English and French editions. Available from Columbia University Press, 2860 Broadway, New York 10027. 1963. 1966 (date of publication). $6.75.

This useful volume incorporates the important facts about pharmacy education in 81 countries of the world (representing approximately half of the total number of nations). Also conveniently available here is information on the requirements for practicing pharmacy in the various countries covered. The annexes are especially rich in statistical data on the practice of pharmacy, the number of pharmacists, and such relationships as number of persons in the population per pharmacist, also the numbers of pharmacy schools. The data cover a total world population figure of 2,455,661,000 people, with a total in the world of 472 schools of pharmacy, 597,418 pharmacists, a total graduating group in pharmacy of 19,113 (incomplete), and with a ratio averaging one pharmacist per 4,100 heads of population. Summaries are given also for Africa, America (both N. & S.), Asia, Europe, the USSR, and Oceania. This volume is one of a series covering medicine, dentistry, veterinary medicine, etc.

GMH

"BRITANNICA YEARBOOK OF SCIENCE AND THE FUTURE, 1970" by Richard G. Young, Editor, pp. 1-448, ca. 200 col. pls., several maps, hundreds of black and white figs., Encyclopaedia Britannica, Inc., 425 N. Michigan Ave., Chicago, Ill. 60611. 1969. $12.50.

Essentially, this yearbook, the second to appear, consists of two major portions - the main portion consisting of a review of science for the year 1 July, 1968 to 30 June, 1969, with 50 authors (pp. 98-177; 242-305; 372-399;) and the series of 18 feature articles each with a byline of an outstanding individual, including two Nobel Prize winners (Joshua Lederberg and Max F. Perutz). The book has been written for the layman and it would seem to be successful from the clearly written relatively simple text and the many full page cover color plates which are included. The book starts out with a "pictorial essay" on the application of natural (organic) forms to human enterprises in art, architecture, and engineering. It continues with an article on the brain and recent researches on its "mystery." Following is a dissertation on the "game theory" or the necessity in human affairs, personal and communal, of conflict as a way of life. Follows an interesting account of archeological digging in central California (Calico Mountains) in an effort to prove that man was present and culturally active in North America as long ago as 50,000 years. (Previously, findings indicated a probable existence going back 20,000 years in this continent.) Following this is an interesting and thoughtful account of human genetics and how mankind may hope eventually to improve the breed of human beings with benefits for all. The series of outstanding articles continues in the midst of the review series with a timely article on moon travel and moon landings. Then an exciting review of what has been found indicating the presence of living things in other parts of the solar system. Another article deals with the "urban society" and the prospects of "superagglomeration" of pccple in the big cities of the future. The piece on "Nature on the rampage" tells of earthquakes, hurricanes, and other natural catastrophes. Other articles deal with sleep and dreams; physical science in the Soviet Union; Freud and psychiatry; the effects of malnutrition on children's mentality; and the validity of the racial separation of humans and others. The last essay deals with the possible guidance of human affairs by science (a program long advocated by the technocrats). A thorough terminal index covers both the 1969 and 1970 volumes. This is a good book for both the living room and the library.

GMH

"DICTIONARY OF CULTIVATED PLANTS AND THEIR CENTRES OF DIVERSITY, EXCLUDING ORNAMENTALS, FOREST TREES AND LOWER PLANTS" by A. C. Zeven and P. M. Zhukovsky, 219 pp., figs., maps, tabs. (s.n.) Centre for Agricultural Publishing and Documentation, Wageningen, Netherlands (Available in USA: ISBS, Inc., PO Box 555, Forest Grove, Ore. 97116). 1975. $21.50.

The cultivated plants are distributed in this dictionary according to their "centres of diversity" (or "megacentres"), twelve being recognized, as follows: 1) Chinese-Japanese, 2) Indochinese-Indonesian, 3) Australian, 4) Hindustani, 5) Central Asian, 6) Near Eastern 7) Mediterranean, 8) African, 9) European-Siberian, 10) South American, 11) Central American and Mexican, 12) North American. A chapter is devoted to each center, with the flora of each arranged alphabetically by families (and alphabetization of genera and species within each family). Maps are plentifully used to show the range of cultivation or growth of a species or of a group of species. The individual paragraph describes the plant entity as to a common name or names, chromosome number, distribution, uses, etc. About 2300 species in 167 families are included. A history of concepts in this field and general explanations, precedes the 12 systematic chapters. At the end of the book are the references and an index of genera and species. Included among the plants are those used for food, beverages, fiber, medicine, chemical manufacture, etc. Among the cultivated plants are some which are regarded in the USA at least as weeds, such as Taraxacum officinale, Chenopodium album (cultivated in Neolithic times), Sida rhombifolia (tea weed, iron weed, wire weed). Some of these are now cultivated in Europe; pigweed furnishes an excellent kind of spinach greens (U.S.A., Canada); dandelion is good for salads. The book is of handy size, clearly printed and adequately bound. The text could have been improved using the services of an individual more fully familiar with the English language. The slips are minor yet uncomfortable to a language purist. In the first chapter, repeated mention is made of a "sedentary" way of life, where "settled" would have been preferable. On page 10 occur the words "sedentism" and "live" (for life). From several examples, it was obvious that the botanical nomenclature has been updated; for instance, black-eyed peas is equated to Vigna unguiculata (the older V. sinensis is cross-referenced), velvet beans to Mucuna deeringianum (rather than Stizolobium deeringianum). This valuable reference book grew out of a paper and small book (1970) written by Professor Zhukovsky which had only 700 plant species. A collaboration to prepare a larger volume was sought by the Dutch co-author, Dr. Zeven. The format is somewhat unusual for a "dictionary" since there are twelve sequences of alphabetization in contrast with a single alphabetization seen in the usual dictionary.

GMH

"PROCEEDINGS OF THE SECOND MIDWEST PRAIRIE CONFERENCE, Madison, Wisconsin, Sept. 18-20, 1970" by J. H. Zimmerman (Leader) 232 pp., Available from JHZ, 1207 Seminole Hwy., Madison, Wisconsin 53710. $6.00, postpaid.

History, surveys, ecology, management, restoration, uses, pollution, etc., of prairies.

GMH

"Annuelles et légumes, résultats des cultures d'essai, 1976" by Pierre Bourque and Émile Jacqmain. 253 pp., 21 figs. Jardin Botanique de Montréal, Québec, Canada. 1977. Gratis.

This annual publication gives descriptive lists of plants grown in the Jardin Botanique at Montreal, giving many characteristics of the plants, such as flower color, dimension, plant height, beginning and termination of flowering, etc. Included are annuals, (such as *Gomphrena globosa* cv. 'Buddy') and "légumes" (vegetables)(such as celery, *Apium graveolens* var. *dulce* cv. 'Calmario'). At the end is a list of firms who supplied the seeds; included are houses in Canada, USA, Japan, France, Belgium, Switzerland, and the Netherlands.

CORRECTION FOR PHYTOLOGIA 34 (1): 134; 1976

Androgens II and antiandrogens.

Add: Handbuch der experimentellen Pharmakologie, Heffter-Heubner, New Series, v. XXXV/2.

Addition to previous citation:

Phytologia - vol. 27: p. 199; 1973 (top of page). "An illustrated flora of the northern United States and Canada" was authored by N. L. Britton and A. Brown.

Acknowledgement

This and the five previous publications of book reviews (Phytologia 27 (3): 180-208; 1973. - 29(5): 395-445; 1975 - 30(6): 488-504; 1975; 31(1): 30-61; 1975; - 34(1): 95-142; 1976) were supported by a Faculty Grant-in-Aid (No. 73-57) of Misc. Grants Fund 2775-17-5240 (Auburn University, Auburn, AL), for which the reviewer is grateful.

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Price of this number, $2.50; per volume, $9.75 in advance or $10.50 after close of the volume; 75 cents extra to all foreign addresses; 512 pages constitute a volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number.

TAXONOMY OF *SELINOCARPUS* AND *AMMOCODON* (NYCTAGINACEAE)

Beverly Ann Fowler and B. L. Turner

The University of Texas, Austin, Texas 78712

Selinocarpus is primarily a North American desert genus belonging to the Nyctaginaceae. It is a relatively rare taxon, most of the species being confined to local outcrops of gypsum ($CaSO_4$). The species are perennial herbs or shrubs with unusually attractive yellow or white tubular flowers. The genus was proposed by Asa Gray, in 1853, in a paper dealing with the plants of the family Nyctaginaceae collected by Charles Wright during his explorations of western Texas, southern New Mexico and Arizona, and northeastern Mexico. The name *Selinocarpus* was chosen to emphasize the likeness between the fruits of the new genus and those of the genus *Selinum* (Umbelliferae). Two species were described, *S. diffusus* and *S. chenopodioides*. There is no indication that the genus was based primarily upon either species; consequently, the first *S. diffusus*, may be taken as the type. Since its original description, the genus has increased in size to include nine species. One of the original species, *S. chenopodioides*, has been segregated as the sole member of the genus *Ammocodon*, discussed in a separate section of this paper.

ECOLOGY

Selinocarpus is restricted primarily to the arid and semiarid regions of the southwestern United States and northern Mexico, the one exception to this being *S. somalensis* which has been described from Somaliland in Africa.

As indicated, most of the species are gypsophiles. In fact, six of the eight North American species seem confined to gypseous soils: *S. lanceolatus*, *S. purpusianus*, *S. palmeri*, *S. diffusus*, *S. parvifolius*, and *S. undulatus*.

Selinocarpus angustifolius shows no marked soil preference. I. M. Johnston (1944) reported observing this species on basalt, volcanic tuff, igneous intrusives, limestone, caliche, and gypsum. The one common feature of these varied habitats is a preference for dry, well-drained sites. The species is tolerant to gypsum in at least limited quantities, however, and occasionally is found on predominantly gypsum soils. The closely related species, *S. undulatus*, is found more frequently on gypsum than *S. angustifolius*, though it presumably also grows on a variety of soils.

Selinocarpus nevadensis is known only from the basin region around Clark County, Nevada. Soil preference, if any, is not known, although one collection is reportedly from calcareous soil.

No information is available as to the habitat or soil preferences of S. somalensis, which is known only from the type collection, but the area in which it occurs is described as desert with gypseous soils being plentiful (Horwood, 1976).

POLLINATION

The outcrossing flowers of all species of Selinocarpus, except perhaps those of S. angustifolius and S. undulatus, are probably pollinated by moths. Some of the characteristics of phalaenophilous species cited by Faegri and van der Pijl (1966) are (1) nocturnal anthesis, (2) strong perfume at night, (3) mostly white or faint colored, (4) deeply dissected lobes, (5) blossoms horizontal or pendant, rim absent or bent back, (6) anthers versatile, (7) nectar deeply hidden in a long tube, narrower than in bird blossoms, and (8) nectar guides generally absent, guidance by contour of blossom.

The flowers of all species of Selinocarpus open at dusk and close by mid-morning at the latest. (1) The nocturnal requirement of phalaenophilous species is thus fulfilled. (2) Personal observations as well as label data on specimens indicate that, when open, these flowers are fragrant. (3) All species, except S. angustifolius, are white, yellow, pale green, or pale pink. (4) The perianth is typically lobed, although not deeply so. (5) The flowers of all species are horizontal, vertical or rarely pendant, with very little rim, thus best adapted to a hovering pollinator such as a moth. (6) The anthers are versatile. (7) The nectar is located at the base of an elongate funnelform perianth which is from 10--15 mm. broad. The exception to this is the shorter perianth (10--15 mm. long, 6--8 mm. wide) of S. angustifolius and S. undulatus. (8) No nectar guides are present but the flowers are contoured so as to guide the proboscis to the nectaries.

The flowers, therefore, exhibit most of the generally accepted characteristics of phalaenophilous species. We have observed repeated hawkmoth visitations after sundown in at least one population of S. purpusianus at Cuatro Cienegas, Mexico. No other pollinator seems to fulfill the requirements of the genus.

The shorter flower of S. angustifolius and S. undulatus, though not well adapted to hawkmoths, may be pollinated by some other species of moths. These flowers, though shorter, are still nocturnal and appear to be adapted to hovering pollinators such as moths.

GENERIC RELATIONS

The most recent revision of the Nyctaginaceae was that of Heimerl (1934). In this classification, as well as that of Standley (1918), Selinocarpus was placed in the subtribe Boerhaaviinae (=subtribe Nyctaginae) of the tribe Mirabileae (=Nyctageae). Nowicke (1970) has recently reviewed the pollen morphology of this tribe, an approach which has been very helpful in delineation of the higher categories within the family. In general, her work corroborates that of Heimerl. In our work we have found nothing to doubt their placement of the genus.

Ammocodon is undoubtedly the genus most closely related to Selinocarpus. It is easily distinguished by its campanulate flowers clustered in umbelliform cymes.

ACKNOWLEDGEMENTS

This paper is an abbreviated version of a Masters Thesis (Fowler, 1972) prepared at the University of Texas, Austin, by the senior author under the guidance of the junior author. We wish to acknowledge the field assistance of Dr. A. M. Powell and the numerous helpful suggestions of Dr. Richard Spellenberg, who has been an avid student of this difficult family. Material from the following institutions (abbreviations after Lanjouw and Stafleu, 1964) was borrowed for study: ARIZ, F, FI, GH, LL, MEXU, MO, NY, OKL, OKLA, POM, RENO, RSA, SMU, TAES, TEX, TTC, UC, UNM, US, UT, UTC. Distributional maps were prepared from these collections and full citations can be found in the bound Masters Thesis on file in the library, University of Texas, Austin.

TAXONOMIC TREATMENT

Selinocarpus A. Gray

Selinocarpus A. Gray, Am. J. Sci. 15: 262. 1853.

Perennial herbs or low shrubs, erect or decumbent; stems relatively unbranched to much-branched. Leaves simple, opposite, pubescent or glabrate, those of a pair more or less unequal, sessile or petiolate, blades usually thick and succulent, entire or undulate. Flowers perfect, pseudo-axillary or solitary to geminate in the leaf axils, sessile or short pedicellate, often cleistogamous, each subtended by 1 to 4 narrow bracts. Perianth tubular-funnelform, the tube elongate or rarely short, not constricted above the ovary, rather abruptly expanded into a broad, shallowly 5-lobed limb, the lobes plicate. Stamens usually 5, or more rarely 4--8; filaments filiform, short connate at the base, adherent to the perianth tube basally; anthers didymous, exserted, opening longitudinally. Pollen grains spheroidal (70-134μ in diameter), pantoporate (18--45 pores), the pores 2.5--5.0 in diameter, the pore plate spinulose, sparsely tubiferous and spinulose, the spinules 2--4 long. Ovary oblong, style filiform, exserted; stigma peltate often with revolute margins, smooth. Anthocarp compressed, the body truncate to subtruncate, broadly 5-winged, the hyaline wings, not veined. Seed narrowly oblong to elliptical, light brown, the testa adherent to the pericarp; farinaceous endosperm; radicle elongate, descending.

Type species: *Selinocarpus diffusus* A. Gray.

KEY TO SPECIES

1. Perianth 10-15 mm. long; leaves distinctly petiolate, the petiole to 4 mm. long.
    2. Leaf blades linear to linear-lanceolate, margins entire and flat.................... 4. *S. angustifolius*
    2. Leaf blades oblong to elliptical, margins undulate .... 5. *S. undulatus*
1. Perianth 17-45 mm. long.
    3. Leaves petiolate, the lower ones often long-petiolate; blades ovate or orbicular.
        4. Perianth 17-22 mm. long....... 9. *S. somalensis*
        4. Perianth 30-45 mm. long.
            5. Upper leaves much reduced, bract-like; fruit 9-10 mm. long .... 6. *S. parvifolius*
            5. Upper leaves not reduced; fruit 6-7 mm. long.
                6. Perianth limb ca. 15 mm. broad; leaves ovate to elliptical, often drying brownish-green .... 7. *S. diffusus*
                6. Perianth limb less than 10 mm. broad; leaves mostly rhomboid to broadly ovate, often drying yellowish-green .... 8. *S. nevadensis*
    3. Leaves sessile or subsessile, the petioles sometimes 1-3 mm. long; blades linear to broadly ovate or orbicular.
        7. Leaf blades more than 4 mm. wide .... 1. *S. lanceolatus*
        7. Leaf blades less than 4 mm. wide.
            8. Leaf blades linear, 10-40 mm. long; scarcely glandular-puberulent or glabrous; perianth pink .... 2. *S. palmeri*
            8. Leaf blades narrowly spatulate-oblong, 4-20 mm. long .... 3. *S. purpusianus*

1. Selinocarpus lanceolatus Wooton

Selinocarpus lanceolatus Wooton, Bull. Torr. Bot. Club 25: 304. 1898. HOLOTYPE (US!): U.S.A. New Mexico. Dona Ana Co. Co. Just S of the White Sands, 26 Aug 1897. Wooton 389 (Isotypes: GH! MO! NY! POM! UC! US!).

Perennial herb or half-shrub, to 3 dm. tall; stems erect or decumbent from a woody base, diffusely branched, densely leafy, covered throughout with minute, appressed, flattened, white hairs, or glabrate in age; leaves opposite, subsessile, with petioles to 3 mm. long; leaf blades thick, succulent, lanceolate to elliptical (rarely orbicular), 12--40 mm. long, 4--35 mm. wide, the apex acute or attenuate, the base obtuse, or, less often, cordate, the margins entire and flat; flowers solitary in leaf axils, subsessile, subtended by 2--3, subulate bracts, 1.5--4.0 mm. long; perianth elongate-funnelform, 30-45 mm. long, the tube slender, 10-20 mm. wide at the 5-lobed limb, ca calyx yellow; stamens 5--8, slightly exserted; anthocarp 6--9 mm. long, with 5 membranous wings, 2--4 mm. wide. Occasional cleistogamous flowers also occur.

DISTRIBUTION: North-central New Mexico southward into North-central Mexico. It is found almost exclusively on gypsum outcrops (Map. 1).

This species is easily distinguished from all other species of Selinocarpus by its dark bluish-green lanceolate leaves.

KEY TO VARIETIES

1. Leaves narrowly ovate-oblong (rarely broadly ovate in southern Hudspeth Co., Texas), 4--15(25) mm. wide; stems mostly wiry and reclined, rarely strictly erect; limb of corolla ca. 10 mm. wide; plants of the United States ... . 1.a. var. lanceolatus
1. Leaves ovate to orbicular to reniform, 15--35 mm. wide; stems stout and stiffly erect; limb of corolla 10--15 mm. wide; plants of Mexico .... 1.b. var. megaphyllus

1.a. Selinocarpus lanceolatus Wooton var. lanceolatus. Fig. 1
This is by far the more heavily collected variety of the species, being found, so far as is known, in the United States (Map 1), var. megaphyllus being confined to Mexico. However, plants from a single populational site in trans-Pecos Texas approach the var. megaphyllus and these are discussed in more detail below.

1.b. Selinocarpus lanceolatus var. megaphyllus Fowler & Turner, var. nov. Fig. 2
HOLOTYPE(LL): MEXICO. Chihuahua. Jurassic gypsum ca. 15 mi. SW of Estacion Moreon on Rio Conchos Lake Road, Sierra de la Monillas, 25 May 1971. Powell 2105. (Isotype: TEX!).

FIG. 1_ S. lanceolatus var. lanceolatus

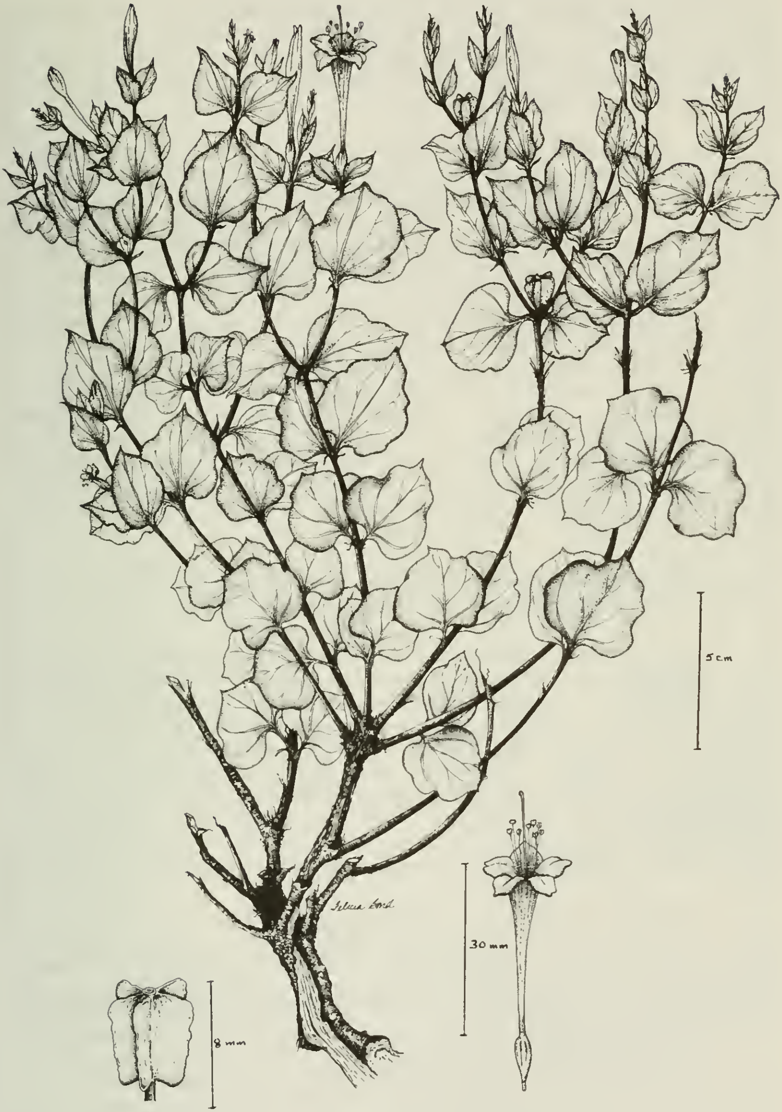


FIG. 2 – S. lanceolatus var. megaphyllus

Frutex erectus, omnino ornatus pilis minutis adpressis complanatis albis; folia sessilia vel subsessilia, ovata vel reniformia, 10--30 mm. longa, 15--35 mm. lata, subcoriacea, ad marginem integra, ad apicem saepe mucronata; perianthium elongato-infundibuliforme, 35--45 mm. longum, 15--20 mm. latum, sulphureum; stamina 5--8; anthocarpium 6--9 mm. longa, alis 5 membranaceis 3--4 mm. latis.

Erect, brittle stemmed shrub, to 5 dm. high, older branches gnarled with yellowish wood and grayish bark, new shoots and leaves glaucous, pubescent with abundant, minute (0.2 mm. long), appressed, flattened, white hairs, becoming glabrous with age; leaves subcoriaceous, margins entire, sessile to subcoriaceous, margins entire, sessile to subsessile (petiole to 1 mm. long); lower leaves reniform to orbicular, the apex often mucronate, the base often cordate, 20--30 mm. long, 25--35 mm. wide; uppermost leaves ovate to elliptical, 10--20 mm. long, 15--20 mm. wide; flowers solitary, or rarely paired in the leaf axils, sessile, or on pedicels ca. 1 mm. long, subtended like, lanceolate, decussate bracts, 3--4 mm. long, 1--2 mm. wide; perianth elongate-funnelform, 35--45 mm. long, 15--20 mm. wide at the 5-lobed limb, calyx yellow, with external pubescence like the stem and leaves; stamens 5--8, slightly exserted; anthocarp 6--9 mm. long, with 5 membranous wings, 3--4 mm. wide. Occasional cleistogamous flowers also occur.

DISTRIBUTION: Known only from the region of the type collection north of Aldama, Chihuahua, Mexico (Map 1).

This variety is relatively easily distinguished from the var. lancolatus by its mostly sessile, ovate to reniform leaves, and slightly erect stems. Both varieties may have sessile to short-petiolate, broad leaves (lanceolate in the latter and ovate to reniform in the former), and are glaucous with a pubescence of minute, appressed, flattened, white hairs. In var. megaphyllus the stamens vary from 5 to 8 in number; in var. lanceolatus there are either 5 or 6. In addition, the floral parts of var. megaphyllus have a tendency to be larger than those of var. lanceolatus although there is considerable overlap.

Three collections of var. lanceolatus from near Finley, Hudspeth County, Texas (Waterfall 5028, 5790 and 5828, GH, MO, NY) have leaves that approach those of var. megaphyllus. These were placed by Fowler (1972) in the latter taxon. However, the junior author believes that the populations concerned belong to the var. lanceolatus since recent collections in the Finlay area by Spellenberg and Syvertsen (3744, LL) suggest that, in habit and floral size, these populations are perhaps best referred to the var. lanceolatus, although the leaves are admittedly larger, approaching those of var. megaphyllus. Recent collections of the latter from Mexico also show considerable

Map 1. Distribution of Selinocarpus lanceolatus var. lanceolatus (closed circle); var. megaphyllus (triangle); S. purpusianus (open circle); S. palmeri (star).

Fig. 3 _ S. palmeri (after Hemsl., Pl. 70_1882) variation in leaf size and shape, but general habital and floral features hold. Because of the "approach" noted in the Finlay populations we treat the taxa as but regional varieties of a single species. However, if the floral size and colors prove diagnostic for the two taxa (larger and varying towards white in var. megaphyllus and smaller and varying towards yellow in var. lanceolatus) and if these attract quite different pollinators, they might yet prove to be "good" biological species.

2. Selinocarpus palmeri Hemsl. Fig. 3

Selinocarpus palmeri Hemsl., Biol. Centr. Am. Bot. 3:6. 1882. TYPE: MEXICO. Coahuila. San Lorenzo de Laguna, May 1880. Palmer 1118 (Holotype: K. Isotypes: F! GH! US!).

Dichotomously branched shrub, branches slender, ascending; old shoots and leaves glabrous to sparsely, glandular-puberulent, new shoots and leaves glaucous, pubescent with sessile, resinous glands; leaves subcoriaceous, sessile, linear, 9--33 mm. long, 1.0--1.5 mm. wide, the margins entire, apex acute; flowers solitary in the leaf axils, sessile, or on pedicels 0.2--1.0 mm. long, subtended by 2--3, lanceolate-linear bracts, 3--4 mm. long, 1--2 mm. wide; perianth elongate-funnelform, 36--49 mm. long, ca 15 mm. wide at the 5-lobed limb, calyx reported to be bright pink with a whitish base (Palmer 1118, GH) externally, obscurely glandular-puberulent, like the older stems and leaves; stamens 5--6, exserted ca. 10 mm., with the stigma extending ca. 2 mm. beyond; anthocarp 5--7 mm. long, with 5 membranous wings, 3--4 mm. wide.

DISTRIBUTION: Known only from the type locality of San Lorenzo de Laguna, Mexico. (Map 1).

This species is readily distinguished from all other members of the genus by its lack of pubescence, sessile resinous glands, and by its long, sessile, linear leaves.

3. Selinocarpus purpusianus Heimerl.

Selinocarpus purpusianus Heimerl, Oesterr. Bot. Zeits. 63: 353. 1913. HOLOTYPE(US!): MEXICO. Coahuila. Sierra del Rey, Jun 1910. Purpus 4505. (Isotypes: F! GH! UC!).

Intricately and dichotomously branched shrub, to 2 feet tall, leaves and stems densely pubescent with glandular, sessile or stalked, trichomes and often minute, appressed, flattened white hairs, becoming glabrate with age; leaves entire, thick, fleshy, sessile, linear-lanceolate to subspatulate, 6--20 mm. long, 1.5--4.0 mm. wide; flowers solitary in the leaf axils, sessile, or on pedicels 1--3mm. long, subtended by 2, lanceolate

FIG. 4_ S. purpusianus var. purpusianus

bracts, 2--5 mm. long; perianth elongate-funnelform, 30-40 mm. long, ca. 15 mm. wide at the 5-lobed limb; calyx cream-colored or yellow, with an external pubescence like that of leaves and stems; stamens 5 or 6 (rarely 4), slightly exserted; anthocarp 7.5--9.0 mm. long, with 5 membranous wings, 3--4 mm. wide. Occasional cleistogamous flowers also occur.

DISTRIBUTION: Region of Laguna del Rey in western Coahuila, Mexico, eastward to the Coahuila-Luevo Leon border area. (Map 1) It is apparently confined to well-drained gypsum ridges and dunes.

KEY TO VARIETIES

1. Plants glandular-hirtellous with a few appressed white trichomes often present; perianth bright yellow .... 3a. var. purpusianus
1. Plants pubescent with appressed white trichomes and with a few glandular trichomes often present; perianth cream-colored to white .... 3b. var. marshii

3a. Selinocarpus purpusianus var. purpusianus. Fig. 4

Var. purpusianus is usually readily distinguished from var. marshii, as well as from all other species of Selinocarpus, by its sessile, linear to subspatulate, leaves and yellow flowers. Specimens, often in populational form, intermediate to the var. marshii occur, however, and the following may be cited: COAHUILA. 40 km on Monclova-Piedras Negras Hwy 57, 24 Apr 1971, Richardson 1433 (TEX); 1 mi S of Estacion Hermanas, 4 Apr 1970, Turner 6012 (TEX). 100 km marker on Hwy 53 from Monterrey to Monclova, 1 May 1971, Fowler 4 (TEX); 101 km marker on Hwy 53 from Monterrey to Monclova, 1 May 1971, Fowler 5 (TEX).

3b. Selinocarpus purpusianus Heimerl var. marshii (I. M. Johnston) Fowler & Turner, comb. nov. Fig. 5

Selinocarpus marshii I. M. Johnston, Jour. Arn. Arb. 25: 162. 1944. HOLOTYPE (GH): MEXICO. Coahuila. Hermanas, about 40 km NE of Monclova, 20 Apr 1939. Marsh 1579. (Isotypes: F! TEX!).

Known only from several collections about the type locality (Fig. 2), where it occurs on dry gypsum ridges with a number of other gypsophilous endemics.

The variety differs from var. purpusianus in both perianth color and pubescence. The calyx of var. marshii is cream-colored or whitish as opposed to yellow. Pubescence differences are chiefly quantitative, var. marshii having fewer glandular-trichomes in proportion to the number of appressed, flattened, white hairs. In fact, some specimens of var. marshii do not possess glandular trichomes but may possess a few sessile, resinous glands.

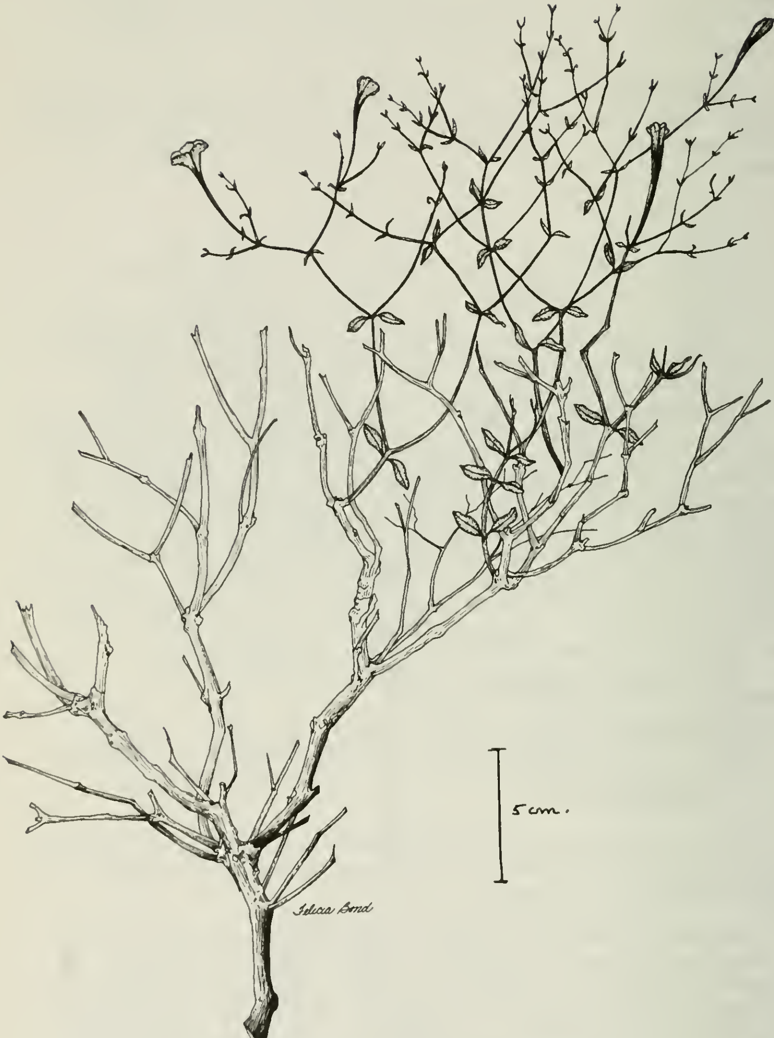


FIG. 5_ S. purpusianus var. marshii

I. M. Johnston recognized this taxon as a species, emphasizing that it differed from S. purpusianus primarily by its pubescence: S. marshii having only appressed, flattened, white trichomes and S. purpusianus having mainly glandular trichomes. These differences are substantial when extreme individuals of the group are studied. However, several intermediate specimens (Fowler 4, 5; Richardson 1433; Turner 6012; all at TEX) have been observed. We have been unable to find additional characters which might be used to distinguish between the taxa, and since the characters concerned are trivial, and often vary in the same population (except for perianth color), we have treated them as varieties. Such treatment emphasizes the undoubtedly close relationship of the two taxa.

4. Selinocarpus angustifolius Torr. Fig. 6

Selinocarpus angustifolius Torr., Bot. Mex. Bound. 170. 1859. LECTOTYPE (NY!): MEXICO. Chihuahua. Presidio del Norte (Ojinaga), July 1852. Parry s.n. (Possible isotypes: GH! NY! US!).

Perennial woody herb or low shrub, stems erect, 0.3--1.3 m. tall, much-branched from the base, glandular-puberulent, and with numerous curved, flattened, white trichomes with a conical base and T-shaped trichomes, glabrate in age; leaves with petioles to 3 mm. long, or occasionally sessile; leaf blades linear, oblong-linear to lanceolate-linear, 5--27 mm. long, 1--4 mm. wide, the margins entire and flat, often with some purple coloration, acute to rounded and apiculate at the apex, thick, fleshy, pubescent like the stem, the white trichomes often concentrated on adaxial surfaces, along the margins and veins; flowers solitary, or more rarely paired, in the leaf axils, on pedicels 1--3 mm. long, subtended by 1--3, minute, subulate bracts; perianth funnelform, 10--15 mm. long, 6--8 mm. wide at the 5-lobed limb; calyx brown, orange, or dark-greenish-yellow, with an external pubescence like the stem and leaves; stamens 5, slightly exserted; anthocarp 5--7 mm. long, the 5 membranous wings, 1.5--2.5 mm. wide, dull yellow to purple. Cleistogamous flowers often occur.

DISTRIBUTION: Trans-Pecos Texas in Presidio County and central Brewster County southward to the northern part of the state of Durango, Mexico (Map 2). It is usually found growing in dry, well-drained, rocky habitats. It apparently shows no strong preference for particular soil types, having been reported as growing on basalt, volvanic tuff, igneous intrusives, limestone, caliche, and gypsum.

This species is readily distinguished from all other species of Selinocarpus by its linear, petiolate leaves with entire margins and its short (ca. 15 mm. long) perianth.

FIG. 6_ S. angustifolius

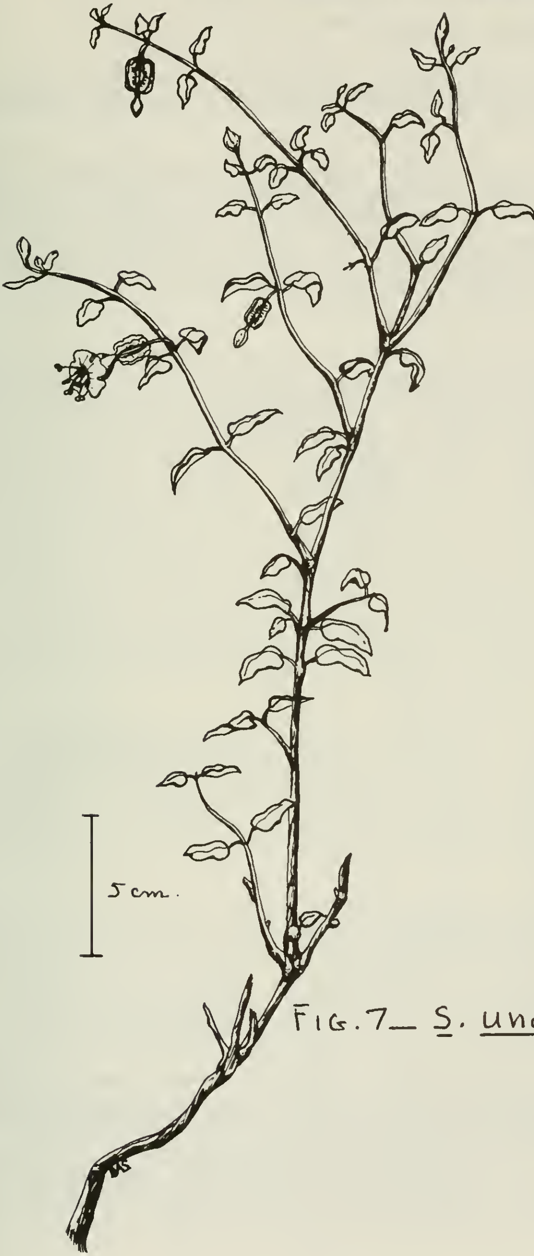


FIG. 7— S. undulatus

5. Selinocarpus undulatus Fowler & Turner, sp. nov. Fig. 7

HOLOTYPE (GH): MEXICO. Coahuila. 4 mi W of Cuatro Cienegas, mouth of canyon, 24-26 Aug 1938. I. M. Johnston 7159.

Herba perennis vel frutex humilis omnino pubescens; trichomata glandulifera vel arcuata complanata alba base conica vel T-formia; petioli 1--4 mm. longi; laminae oblongae vel ovatae, 4--14 mm. longae, 2--6 mm. latae, ad marginem undulatae; perianthium infundibuliforme, 10--15 mm. longum, 4--5 mm. latum, cinnamomeum; stamina 5; anthocarpium 5--6 mm. longum, alis 5 membranaceis 1--2 mm. latis.

Perennial woody herb or low shrub, stems erect, much-branched from the base, glandular-puberulent, and with numerous curved, flattened, white trichomes with a conical base, and T-shaped trichomes, glabrate in age; leaves with petioles 1--4 mm. long; leaf blades broadly oblong or elliptical or ovate, 4--14 mm. long, 2--6 mm. wide, the margins undulate, obtuse to apiculate at the apex, obtuse to truncate at the base, thick, fleshy, pubescent with white trichomes, these often concentrated on adaxial surfaces or margins and veins; flowers solitary in the leaf axils, on pedicels 1--3 mm. long, subtended by a minute, subulate bract; perianth funnelform, 10--15 mm. long, 4--5 mm. wide at the 5-lobed limb; calyx burnt orange, externally glandular-puberulent; stamens 5, slightly exserted; anthocarp 5--6 mm. long, the 5 membranous wings 1--2 mm. across. Cleistogamous flowers often occur.

DISTRIBUTION: Restricted to an area in southwestern Coahuila, Mexico, extending eastward from Parras to Saltillo and northward to just west of Cuatro Cienegas (Map 2). Soil preferences of this species are not known; however, the localities of the specimens examined indicate that it grows on or near gypsum over most of its range.

Selinocarpus undulatus is most readily distinguished by its short, funnelform perianth, and broadly oblong to elliptical or ovate petiolate leaves with undulate margins. It is most closely related to S. angustifolius. These two species have shorter perianths than those of other Selinocarpus species. They also possess unusual "T-shaped" trichomes, not found in other species of the genus. They differ mainly in leaf morphology: S. undulatus having broader leaves with undulate margins, and S. angustifolius having linear leaves with non-undulate margins. They also differ in their floral pubescence, S. undulatus having almost solely glandular-trichomes while S. angustifolius possesses both glandular and non-glandular, small, white trichomes. Nevertheless, because of their similar morphologies it might seem appropriate to treat these as only

Map 2. Distribution of Selinocarpus angustifolius (closed circle) and S. undulatus (open circle).

Fig. 8 _ S parvifolius

varietally distinct. However, in regions where the two taxa occur together or overlap (e.g., in the Cuatro Cienegas and Parras regions), they both appear quite distinct. In fact, collections of the two species from the area of sympatry are as distinct as those from the more remote geographical areas, intergrades having not been found.

ADDITIONAL SPECIMENS EXAMINED: MEXICO: COAHUILA: Mesillas, near Saltillo, 23 Sep 1848, Gregg 535 (GH, MO); 39 km E of Saltillo, along the Saltillo-Monterrey Hwy, 26 Jul 1971, Pilz & Strother 704 (TEX); 12 mi W of Saltillo, 26 Jul 1971, Pilz & Strother 705 (TEX); Parras, Apr 1905, Purpus s.n. (UC); Parras, Aug 1910, Purpus 4687 (UC); 13 mi W of Saltillo, 23 Oct 1963, Ripley & Barneby 13280 (NY); Cerro N of Saltillo, 27 Aug 1968, Ripley 14978 (NY); 4 mi W of Cuatro Cienegas, 26 Aug 1938, Shreve 8458 (ARIZ, US); 14 mi E of Paila, 6 Sep 1940, Shreve & Tinkham 9900 (ARIZ, GH).

6. Selinocarpus parvifolius (Torr.) Standl. Fig. 8

Selinocarpus parvifolius (Torr.) Standl., Contr. U.S. Nat. Herb. 12: 388. 1909.

Selinocarpus diffusus Gray var. parvifolius Torr., Bot. Mex. Bound. 168. 1859. TYPE: TEXAS. Canons of the Rio Grande or Presidio del Norte, 1852. Mex. Bound. Sur. (Bigelow, Parry et al.) s.n. (Lectotype: GH! possible isotypes: GH! NY! US!).

Dichotomously branched shrub, to 6 dm. high; most plant parts pubescent with glandular trichomes and flattened, appressed white trichomes with clear, conical, multicellular bases (the younger parts often more densely so); leaves decreasing markedly in size towards the inflorescence, margins undulate, petiole 1--8 mm. long, ovate, or rarely rhomboid, the apex usually acute, the base obtuse; lower leaves, 9--21 mm. long, 4--12 mm. wide; upper leaves 1--7 mm. long, 1--4 mm. wide; flowers solitary in the leaf axils or terminal, on pedicels 1--3 mm. long, subtended by 2--3, lanceolate bracts, 2--3 mm. long, 1.5 mm. wide; perianth elongate-funnelform, 34-52 mm. long, up to 15 mm. wide at the 5-lobed limb, usually greenish-yellow; stamens 5, equal in length to the calyx; anthocarp 8--10 mm. long, the striate body finely glandular puperulent, the 5 membranous wings, pale yellow to beige, 2--4 mm. wide. Cleistogamous flowers also occur.

DISTRIBUTION: Trans-Pecos region of Texas and adjacent Mexico (Map 3). It appears to be confined to the gypseous, Upper Cretaceous, shales and clays of this region.

FIG. 9 – S. diffusus

Selinocarpus parvifolius is easily distinguished by its ovate leaves which decrease markedly in size toward the inflorescence. It is probably most closely related to S. diffusus. This resemblance was first noticed by Torrey in his original description of the former as a variety of S. diffusus. The pubescence of these two species is very similar and both have broad, petiolate leaves. These characters serve to place S. diffusus, S. parvifolius, S. nevadensis, and possibly S. somalensis in a somewhat natural group. Of these, S. diffusus appears to be the most generalized form from which the others were presumably derived.

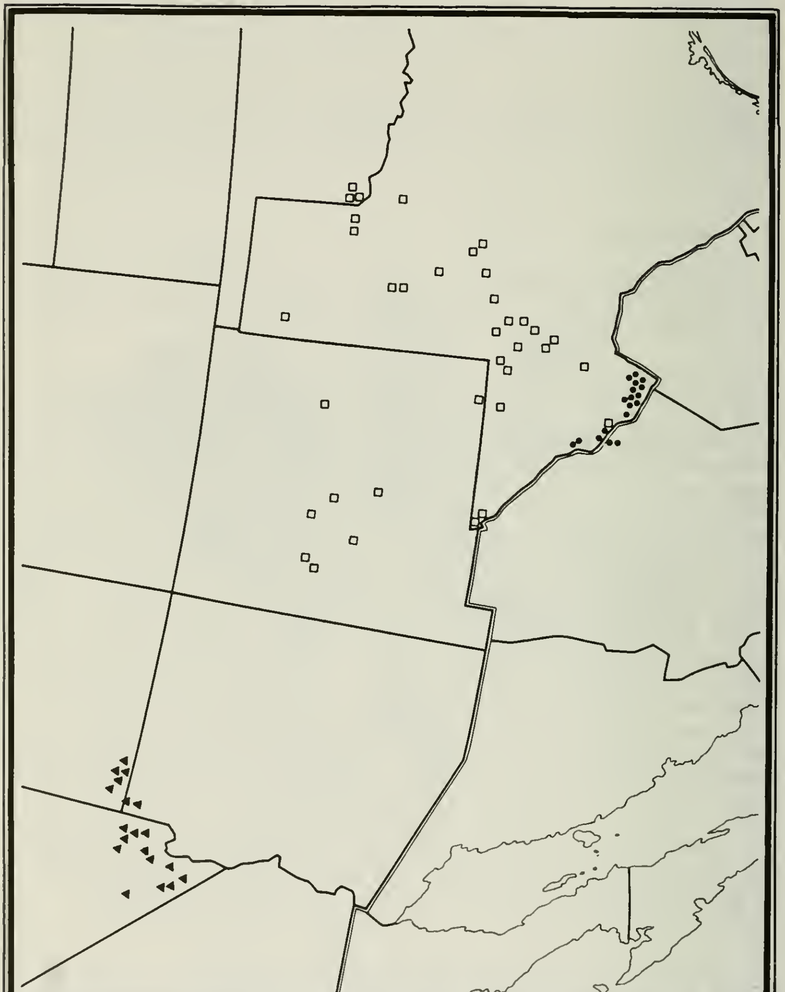
7. Selinocarpus diffusus A. Gray Fig. 9

Selinocarpus diffusus A. Gray, Am. J. Sci. 15: 262. 1853. LECTOTYPE (GH!): U.S.A. Texas. Pecos Co., 1851 or 1852. Wright 1708, in part. Isotypes: NY! UC!).

Erect or decumbent perennial herbs, or half-shrubs, from stout woody roots, stems 1--3 dm. tall or long, much-branched from the base and also above, very leafy; branches and leaves covered with brown, translucent, conical trichomes, with the terminal cell modified into an enlarged, flattened, white, opaque or a clear to brownish, spheroidal cell, or absent, and with short, appressed, flattened, white trichomes, often glabrate with age; leaves with petioles 3--20 mm. long; leaf blades thick, fleshy, ovate to ovate-oblong, 10--30 mm. long, 4--17 mm. wide, the apex obtuse to acute, the base obtuse to truncate, the margins usually undulate; flowers solitary, or less often paired in the leaf axils, on pedicels ca. 1 mm. long, subtended by 2--3, linear-subulate bracts, 0.5--5.0 mm. long; perianth elongate-funnelform, 35--48 mm. long, ca. 15 mm. wide at the 5-lobed limb; calyx green-white to greenish-yellow, or white with green stripes, externally pubescent; stamens 5, or more rarely 4, slightly exserted; style exserted, to 7 mm. beyond the stamens; anthocarp 5--7 mm. long, the body puberulent, the 5-wings, 1.0--2.0 mm. wide. Cleistogamous flowers often occur.

DISTRIBUTION: Southwestern Oklahoma through north-central and western Texas into eastern and central New Mexico (Map 3). It is most commonly found on dry clay or sandy loam which contain gypsum.

Gray combined Wright's field numbers 357, 380, and 528 into Wright 1708, the type collection for this species, and generalized the locality to "rocky hills and valleys from the Pecos to the Limpio". All three of the collections are from Pecos County, Texas. Number 357 is from the valley of the Pecos near the hills 5 Jun 1851; 380, from the stony hills at Comanche Springs, 7 Jun 1851; and 528, also from the stony hills at Comanche Springs 29 June 1852. One specimen from the Gray Herbarium has been



Map 3. Distribution of Selinocarpus parvifolius (circles), diffusus (squares), and nevadensis (triangles).

chosen to serve as a lectotype.

The species is readily distinguished from other members of the genus, except S. nevadensis, by its distinctly petiolate leaves and elongate perianth. Its more narrow, undulate leaves and broader, less delicate perianth serve to distinguish it from the closely related S. nevadensis.

8. Selinocarpus nevadensis (Standl.) Fowler & Turner, comb. nov.

Selinocarpus diffusus Gray subsp. nevadensis Standl., Contr. U.S. Nat. Herb. 12: 388. 1909. HOLOTYPE (US): U.S.A. Nevada. Lincoln Co.: Overton, May 1891. Bailey 1932.

Erect, decumbent, or prostrate, perennial herbs, or half-shrubs from stout woody roots, much-branched from the base and also above, the branches slender, very leafy; branches and leaves covered with short, appressed, flattened, white trichomes, sparsely glandular-puberulent, and with larger whitish, translucent trichomes with, or without, an enlarged, flattened, white, opaque terminal cell, often glabrate in age; leaves with petioles 3--20 mm. long, often exceeding that of the blades; leaf blades thick, fleshy, ovate, oval to orbicular, 10--26 mm. long, 6--19 mm. wide, the apex broadly obtuse to more rarely acute, often mucronate, the base rounded or truncate, the margins entire and smooth; flowers solitary, or less often paired in the leaf axils, on pedicels 1--3 mm. long, subtended by 2--3, linear-subulate bracts, 0.5--5.0 mm. long; perianth elongate-funnelform, 30--40 mm. long, the tube very slender, ca. 10 mm. wide at the 5-lobed limb; calyx greenish-white, externally glandular-hirtellous with short, appressed, flattened, white trichomes also present; stamens 5, or rarely 4, slightly exserted; style exserted ca. 4--6 mm. beyond the stamens; anthocarp 5--7 mm. long, with 5 wings, 1.5--2.0 mm. wide. Flowers often all cleistogamous.

DISTRIBUTION: Restricted to a small area encompassing Clark County, Nevada, Washington County, Utah, and the northwestern tip of Mohave County, Arizona (Map 3). Herbarium label data indicate that populations are usually found in dry rocky areas with good drainage such as hills, washes, and disturbed roadsides. One collection (Preece & Turner 2562, SMU) was reportedly from calcareous soil.

The species is readily distinguished from its closest relative, S. diffusus, by its broader, more obtuse, leaves with flat margins. In addition, the leaves of S. nevadensis are often a brighter yellowish-green when dried, and the perianth is more slender and delicate.

Standley (1909) described this taxon as a subspecies of S. diffusus. At that time he noted the ease with which the two taxa could be distinguished and postulated that they were probably good species, but that the differences were difficult to define. After examining a more extensive collection of these plants, we find that the differences Standley noted, as outlined above, hold true and, in conjunction with their allopatry, constitute sufficient reasons for their recognition as species.

Selinocarpus nevadensis and S. diffusus possibly had a common origin from a widespread, ancestral species. Perhaps changing climatic conditions caused the extinction of the main mass of this ancestral population, leaving a relatively small isolated colony in the area currently occupied by S. nevadensis. The more southern element of this ancestral taxon presumably gave rise to S. diffusus.

Finally, it should be noted that A. Nelson apparently anticipated elevation of this taxon to specific rank, having annotated at least a few collections with the combination made here.

9. Selinocarpus somalensis Chiov. Fig. 10

Selinocarpus somalensis Chiov., Flora Somala: 284. 1929. HOLOTYPE (FI!): SOMALILAND. Costa dei Migiurtini, dintorni di Biaddo, June 1924. Puccioni & Stefanini 814 (901).

Low, hemispherical, much-branched, shrub, internodes, 6--12 mm. long, new shoots and leaves glaucous, pubescent with flattened, appressed, white trichomes with clear, conical bases, becoming glabrate with age; leaves with petioles 4--10 mm. long; leaf blades ovate to obpandurate, 6.5--12.0 mm. long, 6--11 mm. wide, the apex obtuse to apiculate, the base oblique to attenuate, the margins entire; flowers solitary in the leaf axils, on pedicels ca. 2 mm. long, subtended by 2, opposite, linear bracts, ca. 3 mm. long, 0.5 mm. wide; perianth funnelform, 20--22 mm. long, ca. 7 mm. wide at the 5-lobed limb; stamens 5, slightly exserted, filaments purplish; style purplish, exserted ca. 4 mm. beyond the stamens; anthocarp 7 mm. long, with 5 membranous wings, ca 1 mm. wide.

DISTRIBUTION: The species is known only from the type collection from Somaliland, Africa, the sole collection of any species of Selinocarpus outside of the southwestern United States or northern Mexico. No information is available from either the herbarium label or the original description with regard to habitat, but the area concerned is largely desert with extensive outcrops of gypsum (Horwood, 1976).

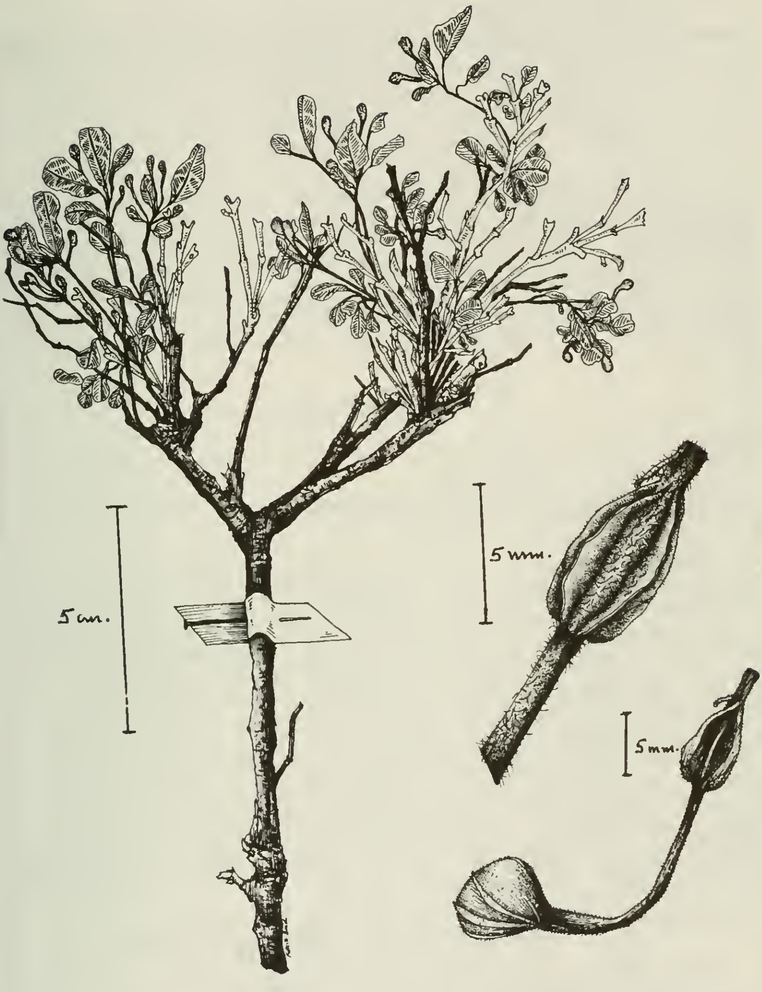


FIG. 10 — S. somalensis (Holotype)

The disjunct distribution of S. somalensis is quite remarkable and we are unable to find a plausible explanation for its existence. It is possible that the species only superficially resembles Selinocarpus, this being a case of convergent evolution. However, Heimerl (1934) believed it to be a member of the genus. Upon examining a fragment of the holotype, we also agree that the species belongs to Selinocarpus and is most closely related to S. diffusus. However, new evidence is needed to resolve the issue, and it will be interesting to see what a chemical study of the group might suggest.

The only reasonable explanation of the disjunction of Selinocarpus somalensis is one of recent introduction from the southwestern United States or northern Mexico. This is, however, laden with problems. Rapid differentiation must be incorporated into any such hypothesis, if, indeed, the species belongs to Selinocarpus, for S. somalensis is quite distinct at the species level. Many other speculations are possible but none is satisfactory.

AMMOCODON Standl.

Ammocodon Standl., Jour. Wash. Acad. Sci. 6: 629-631. 1916.

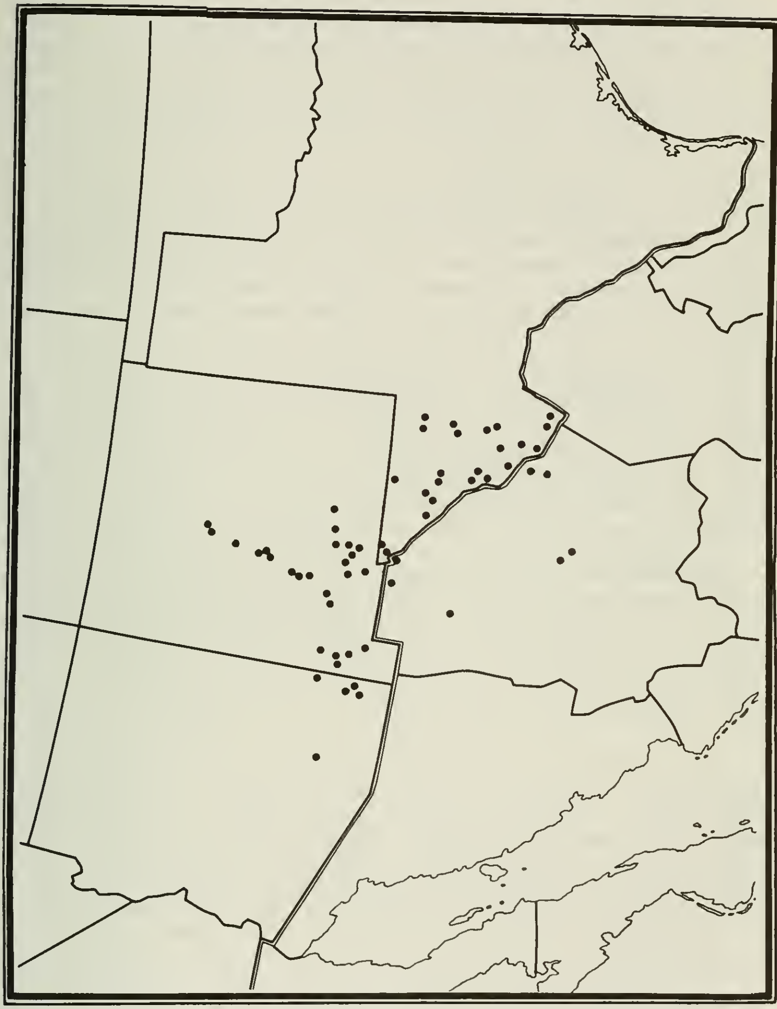
Selinocarpus Gray sect. Breviflora Heimerl, Oesterr. Bot. Zeitschr. 63: 354-355. 1913.

Perennial herbs, stems much-branched, pubescent. Leaves simple, opposite, pubescent, or glabrous with age, those of a pair often unequal. Flowers perfect, umbellate, the umbellules in open cymes, often cleistogamous, each flower subtended by a minute, subulate bract, or a second small bract rarely also present. Perianth campanulate, constricted above the ovary, shallowly 5-lobed, the lobes plicate. Stamens 2, or rarely 3; filaments filiform, short connate at the base, free from the perianth; anthers didymous, exserted, opening longitudinally. Ovary oblong; style filiform, exserted; stigma peltate, smooth. Anthocarp compressed, broadly 5-winged, the hyaline wings not veined. Seed with the testa adherent to the pericarp; embryo conduplicate, the cotyledons enclosing the farinaceous endosperm; radicle elongate, descending.

Type species: Selinocarpus chenopodioides A. Gray

1. Ammocodon chenopodioides (A. Gray) Standl.

Ammocodon chenopodioides (A. Gray) Standl., J. Wash. Acad. Sci. 6: 629-631.



Map 4. Distribution of *Ammocodon chenopodioides*.

Selinocarpus chenopodioides A. Gray, Am. J. Sci. 15: 262. 1853. TYPE: Left hand specimen on sheet labeled "Wright 1707" at GH, 1851 or 1852. Wright 1707 in part. (Lectotype: GH! Isotype: NY!).

Erect or decumbent perennial herb, from a fleshy, fusiform rootstock, 1.5--3.0 dm. tall; stems dichotomously much-branched, the branches rather stout, densely covered with short, appressed inflated, white hairs when young, glabrate in age. Leaves with petioles 5--45 mm. long, those of a pair often unequal; the blades ovate-oval to ovate-oblong, or rarely deltoid or suborbicular, fleshy thickened, 1.5--5.0 cm. long, 6--40 mm. wide, rounded to subcordate at the base, broadly rounded to acute at the apex, often abruptly apiculate, flat or crispate, paler beneath, pubescent like the stems when young, becoming glabrate, the veins usually conspicuous beneath, broad and white, or occasionally with pale purple color. Flowers umbellate, the umbellules in open cymes, few- or many-flowered, each flower subtended by a minute, subulate bract, or a second small bract rarely also present; flowers often cleistogamous, on slender pedicels, 1--4 mm. long. Perianth pink to lavender, campanulate, 4--5 mm. long, and just as broad or broader, sparsely puberulent outside, constricted above the ovary, shallowly 5-lobed, the lobes plicate. Stamens 2, or rarely 3, exserted. Ovary narrowly oblong; anthocarp 5 mm. long, the 5 wings 2 mm. broad; the body sulcate between the wings, sparsely puberulent. Seed oblong; cylindric, 2.5 mm. long, pale brown, lustrous.

DISTRIBUTION: Occurs from western Texas through southern New Mexico to southeastern Arizona, and southward into Chihuahua (Map 4). Field observations and herbarium label data show this species to be found most often in loose sandy soils. Ecological information from other herbarium labels indicate a range of habitats suitable for its growth, including limestone, calcareous bluffs, sandy clay, igneous outwashes, and gypseous-clay soils.

Gray combined Wright's field numbers 89, 172, and 525 into Wright 1707, the type collection for the species, and generalized the locality to "valleys from Providence Creek to the Rio Grande." Number 89 is from the stony hills between Santa Barbara and the Coppermines, New Mexico, 30 July, 1851; 172, from the hills towards Lake Santa Maria, northwest Chihuahua; 525, from the valleys from Deadman's Pass to the Wells, Texas, 17 June, 1851. One specimen from the Gray Herbarium has been chosen to serve as a lectotype.

This species was originally described as belonging to the genus Selinocarpus. Heimerl (1913) emphasized the differences between S. chenopodioides and the other members of the genus by dividing the genus into two sections: sect. Breviflora, containing only S. chenopodioides, and sect. Tubiflora, containing the remainder of the species. Standley (1916) raised the sect. Breviflora to generic rank, naming the group Ammocodon, a position which he reaffirmed in his treatment of the Nyctaginaceae for the North American Flora (Standley, 1918). Heimerl (1934) reasserted his feeling that these differences be recognized at the infrageneric level. Tidestrom & Kittell (1941) and Johnston (1944) followed Heimerl in treating the species within Selinocarpus. However, more recent treatments of this group have recognized the species as belonging to Ammocodon (Kearney & Peebles, 1960; Reed, 1968; Lundell, 1969; and Correll & Johnston, 1970).

Based on field observations and study of herbarium material, we also treat this species as being the sole member of the genus Ammocodon. The two genera, however, are undoubtedly closely related, the 5-winged fruit found in both surely having a common origin. The floral differences, however, are considerable, this constituting the primary reason for its segregation as a genus.

The perianth of Ammocodon is campanulate and conspicuously constricted above the ovary, while that of Selinocarpus is tubular-funnelform and not constricted above the ovary. In Ammocodon the stamens are 2 or rarely 3, their filaments free from the perianth, whereas in Selinocarpus the stamens are usually 5 (with 4 to 8 less common) and their filaments are adherent to the perianth tube. Furthermore, the flowers of A. chenopodioides are aggregated into many-flowered, umbelliform cymes, each flower subtended by one, or rarely 2, bracts, in contrast to the solitary to geminate flowers in the leaf axils, subtended by 2 to 4, or very rarely one, bract, as found in the various species of Selinocarpus.

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NEONOTONIA, A NEW GENERIC NAME TO INCLUDE *GLYCINE WIGHTII* (ARNOTT) VERDCOURT (LEGUMINOSAE, PAPILIONOIDEAE)

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Abstract.--Recent evidence indicates that *Glycine wightii* (Arnott) Verdcourt must be generically removed from the remaining species of the genus. Because there is no valid generic name to accept this transfer, the new generic name *Neonotonia* is proposed.

Since Hermann's (1962) revision of the genus *Glycine* Willdenow gen. consv., evidence from morphology, cytology, and biochemistry indicates that the common and widespread *G. wightii* (Arnott) Verdcourt [*G. javanica* auct. mult. non Linnaeus, and *G. petitiana* (A. Richard) Schweinfurth] should not be maintained in the same genus with the cultivated soybean *G. max* (Linnaeus) Merrill and other wild species, among which is found the type of the genus, *G. clandestina* Wendland. Full justification for the generic separation will come in a later paper, but the new generic name *Neonotonia* is here proposed to accept the necessary transfer of *G. wightii*.

As suggested by Arnott (1834), *Neonotonia* is closely related to *Shuteria* Arnott. Table I will serve to distinguish these and associated genera. It is probable that *Glycine* sp. A. (Verdcourt, 1971) is congeneric with *Neonotonia wightii*: both taxa have 22 (44 in some *N. wightii*) large somatic chromosomes and canavanine in seeds. *Pueraria collettii* Prain [*P. siamica* Craib], *P. stricta* Kurz, *P. brachycarpa* Kurz, and *P. bella* Prain may possibly be referred to *Neonotonia* when they are better known.

Arnott (1834) first described *G. wightii* as the sole species of a new genus *Notonia*. Noticing, however, that de Candolle (1833) had already used *Notonia* for a genus of Compositae, Arnott substituted the name *Johnia* in the addendum of the text. *Johnia* Arnott is preoccupied by *Johnia* Roxburgh (1832), now considered a synonym of *Salacia* (Hippocrateaceae). Meyer (1836) independently described the genus *Bujacia*, which included only two species: *B. anonychia* [*G. wightii*] and *B. gampsonychia* [*Teramnus labialis* (Linnaeus) Sprengel]. The generic description of *Bujacia* specifies alternately aborted anthers, which could refer only to *Teramnus* and would definitely exclude *G. wightii*. *Bujacia* must therefore be

TABLE I

ATTRIBUTES OF *NEONOTONIA* AND ASSOCIATED GENERA

Genus	Attribute[a] 1	2	3	4	5	6	7	8	9
Ophrestia H.M.L. Forbes	2(3?)	D(U)	20	-	10	-	+-	P	G(P)
Teramnus P. Brown	2+	D(U)	28(20?)	-	5	-	-	G(P)	P(G?)
Glycine Willdenow	1	D	40,80	-	10	-	-	G	P-G
Teyleria Backer	3	D	unknown	unknown	10	+	-	G	P
Shuteria Arnott	1-3(5?)	U	unknown	+	10	-	-	G	G
Neonotonia Lackey	3+	U	22,44	+	10	-	-	G	P

[a]Attributes, 1 = Number of flowers per node of the inflorescence. 2 = Upper calyx lobes United or Distinct. 3 = Somatic chromosome number. (Lackey, 1977a). 4 = Canavanine present (+) or absent (-) from seeds (Lackey, 1977b). 5 = Number of fertile anthers per flower. 6 = Stems strongly four-angled with dense brown hairs on the angles (+) or not strongly angled and without prominent hairs on the angles (-). 7 = Seeds arillate (+) or without an aril (-) (although sometimes with a papery remain of the funiculus, definition of aril follows Polhill (1976)). 8 = Petals Pubescent or Glabrous. 9 = Inside of calyx teeth Pubescent or Glabrous.

lectotypified by *B. gampsonychia*. As a result there is no valid generic name to accept a transfer of *G. wightii*. The following names are therefore proposed.

Neonotonia Lackey, nom. nov. *Notonia* Arnott in Wight and Walker-Arnott, Prod. Fl. Ind. Or. 207 (1834)--Generitypus: *Notonia wightii* Arnott loc. cit. ≡ Neonotonia wightii (Arnott) Lackey, comb. nov.--non *Notonia* de Candolle in Guillemin, Arch. Bot. 2:518 (1833)--*Johnia* Arnott, op. cit. 449 (1834); non *Johnia* Roxburgh, Fl. Ind. 1:168 (1832).

Bujacia E. Meyer, Comm. Pl. Afr. Aust. 127 (1836) pro parte.--Lectogeneritypus: *B. gampsonychia* E. Meyer, loc. cit. = Teramnus labialis (Linnaeus f.) Sprengel.

Glycine sect. *Javanicae* sensu Harms in Engler, Pflanzenw. Afr. 3(1):654 (1915) pro parte.

Glycine subgen. *Glycine* sensu Hermann, USDA Tech. Bull. 1268: 24 (1962).

Glycine subgen. *Bracteata* Verdcourt, Taxon 15:34 (1966)--Sp. typica: *G. wightii* (Arnott) Verdcourt, loc. cit. ≡ Neonotonia wightii (Arnott) Lackey.

For fuller synonomy see Verdcourt (1971) and Hermann (1962).

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NEW SPECIES OF ACANTHACEAE FROM COLOMBIA

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During the course of routine identifications of Acanthaceae from South America, I have found three undescribed species of the genera Dicliptera and Habracanthus.

1. DICLIPTERA CUNDINAMARCANA Wasshausen, sp. nov.

Suffrutescens, caulibus erectis vel ascendentibus, subhexagonis, glabris vel parce hirtellis; lamina foliorum ovata, subacuta vel subacuminata, utrinque glabra, costa et venis lateralibus plus minusve puberulis; cymae axillares pleurumque 6-partitae; bracteae cymas subtendentes rudimentariae; bracteae cymulas subtendentes aliquanto magnae, bractea inferior aliquanto minor quam superior, ambae late ovatae, obtusae, virides vel subpurpureae maculatae glabrae vel parce puberulae; bracteae intimae parvae, ovatae, parce hirtellae; calycis segmenta anguste triangularia, pilis glanduliferis et eglanduliferis intermixtis; corolla subpurpurea, bilabiata, labio superiore ovato, obtuso, labio inferiore anguste obovato, apice minute trilobato.

Small shrub about 1 m high; stems erect or ascending, subhexagonal, glabrous or sparingly and inconspicuously puberulous; leaf blades ovate, 5.5-9.5 cm long and 2.5-4.2 cm wide, subacute or if subacuminate, the tip itself obtuse, narrowed at base, drying dark olive green, rather firm, entire, undulate, both surfaces glabrous except costa and basal portions of lateral veins (5 or 6 pairs), these sparingly to rather densely puberulous with recurved hairs, the cystoliths numerous but inconspicuous, whitish; petioles rather slender, 1.5-2.5 cm long, channelled, puberulous with curved hairs; cymes mostly 6-parted, the peduncles below the node 1 cm long, hexagonal, hirtellous, above node, 1.7-2.3 cm long, hexagonal and narrowly winged, hirtellous, the bracts borne at the node of the peduncle rudimentary, 0.5 mm long, the larger cymule bract 1.5-1.8 cm long and 2-2.5 cm wide, the smaller 1.4 cm long and 1.6-1.8 cm wide, both broadly ovate, obtuse, truncate at base, firm; greenish or spotted dark purplish red, glabrous or sparingly puberulous, the costa and lateral nerves rather inconspicuous, the veinlets coarsely reticulated, rather obscure unless viewed with a lens; innermost bracts ovate, about 1.25 mm long and 0.5 mm wide, acute to subacute, sparingly hirtellous; calyx 6 mm long, puberulous with a mixture of glandular and eglandular hairs, the segments narrowly triangular, 3.5 mm long and 1 mm wide at base, acute; corolla purplish or rose-colored marked with white longitudinal lines, finely pubescent, 2.2-2.4 cm long, the upper lip ovate, 11 mm long and 5 mm wide, obtuse, the lower lip 12 mm long and 4 mm wide, 3-lobed at tip, the lobes broadly ovate, rounded, 0.5 mm long; anther cells superposed, 1.5 mm long and 0.8 mm broad; filaments flattened, sparingly hirtellous; capsules ovoid, 11 mm long, 5 mm wide, 1.5 mm thick, flattened, obtusish at tip, minutely puberulous, the retinacula usually bilobed, 1 mm long; seeds suborbicular, flattened, 3-3.5 mm in diameter, 1.5 mm thick, dark brown, roughened by minute retrorse prickles.

Type. L. Uribe U. 4903 (holotype US, isotype COL), Colombia, Cundinamarca: Lagunaverde, municipio de Zipacón, very abundant near lake, 1,800 m alt, 1 Aug 1964.

Distribution. Known only from the type locality.

Dicliptera cundinamarcana superficially resembles D. columbiana Leonard. In D. columbiana though, the cymes are only 2-3-parted, the cymule bracts to 17 mm wide, and the corolla is about 17 mm long.

2. HABRACANTHUS CLEEFII Wasshausen, sp. nov.

Suffrutex, caulibus erectis vel ascendentibus, subquadrangularibus, puberulis; lamina foliorum lanceolato-ovata, subobtusa vel breviter acuminata, supra hirtella, subtus pilis rigidis subadpressis, praecipue in costa et venis positis; paniculae longae, graciles, ramis infirmis ramosis, ramis ultimis racemosis, racemis laxis floribus paucis; pedunculi hirtelli; pedicelli brevissimi, hirtelli; rami infirmi paniculae foliis ovatis suffulti; rami ultimi et flores bracteis linearibus; bracteolae nullae; calycis segmenta dorso dense hirtella, corolla rubra, apice viridi-flavido, glabra, tubo basi angusto, abrupte dilatato, valide ventricoso, in fauce leviter angustato, labio superiore oblongo-ovato, erecto, subobtuso, labio inferiore leviter patulo, trilobato, lobis ovatis, rotundatis; stamina exserta.

Suffrutescent herb probably to 1 m high; stems erect or ascending, slender, subquadrangular, puberulous, the hairs upwardly ascending, curved, septate (the septa brown), internodes of the stems to 6.5 cm long; leaf blades lance-ovate, 1.8-3 cm long and 0.7-1.1 cm wide, subobtuse to short-acuminate with a blunt tip, narrowed at base, rather firm, entire, the upper surface hirtellous, the hairs mostly curved, ascending, rigid, the hairs of the lower surface confined chiefly to costa and lateral veins, rigid, subappressed, straight or slightly curved, the venation of both leaf surfaces moderately conspicuous, the cystoliths obscure; petioles slender, 5-10 mm long, hirtellous; panicles slender, 16-30 cm long and 3-6 cm broad, the lowermost branches paniculate, the upper branches racemose; the flowers in each raceme few (usually 2-5 or 6), or the flowers in or near the tip of the panicle solitary; peduncles slender, 1.4-2.5 cm long, subquadrangular, hirtellous, the hairs similar to those of the stems; pedicels short, not exceeding 2 mm in length, hirtellous, the medial and lowermost branches of the panicle subtended by leaves, these progressively smaller toward tip of the inflorescence, uppermost branches subtended by bracts, these linear, 3-4 mm long and 0.5 mm wide, acute, sparingly hirtellous; bracts subtending the flowers similar but somewhat smaller; bractlets none; calyx deeply segmented, the segments 5, linear-lanceolate, 6-7 mm long, 0.75 mm wide near base, subacute at tip, densely hirtellous dorsally, and ciliate, the hairs rigid, an occasional gland-tipped, the inner surface of segments glabrous; corolla dark red, yellowish-green distally, 15-17 mm long, glabrous, the tube 2 mm broad at base, enlarged to 3 mm at 1.5 mm above base, thence abruptly enlarged to 8 mm at middle and again narrowed to 5 mm at mouth, somewhat ventricose, curved at tip, the upper lip oblong-ovate, erect, 4.5 mm long, 2.5 mm wide, subobtuse, the tip itself retuse, the lower lip slightly spreading, 5 mm long, 8 mm wide, 3-lobed, the lobes ovate, 3 mm long, 3 mm wide, rounded; stamens exserted 6-10 mm beyond mouth of corolla tube and inserted at its base, glabrous; anthers 4 mm long, 1.5 mm broad, oblong and slightly curved; style slightly exceeding stamens, glabrous; capsules clavate, glabrous, 12 mm long, 3.5 mm thick; seeds brown, ovoid, oblique at base, 2.5 mm long, 1.6 mm broad, muricate.

Type. A. Cleef 7859 (holotype US, isotypes COL, U), Colombia, Meta: Cerro Nevado del Sumpaz, Quebrada El Buque, 3,350 m alt, 14 Jan 1973.

Distribution. Known only from the type locality.

Habracanthus cleefii is not nearly allied to the other species. It superficially resembles H. charien from Colombia's Cerro Negro, however, this species is unique in its small rose corollas with narrow tube, small throat, subequal lips and in its short, barely exserted stamens.

3. HABRACANTHUS SANCTAE-MARTAE Wasshausen, sp. nov.

Suffrutex, caulibus subteretibus, aliquando parce puberulis vel deorsum glabratis; lamina foliorum oblongo-ovata vel oblongo-elliptica, breviter acuminata, basi cuneata, utrinque glabra vel parce puberula; paniculae terminales et laterales, ramis 1-vel 2-furcatis, semi-helicoideis, rhachibus et pedicellis dense hirtellis; calycis segmenta anguste linearia; corolla rubescens vel violacea, glabra, labio superiore lineari, apice obtuso, recurvato, labio inferiore patulo, obovato, apice 3-lobato, lobis brevibus, rotundatis; stamina exserta.

Shrub 0.5-1 m high; stems subterete, rather sparingly puberulous or the lower portions glabrate; leaf blades oblong-ovate to oblong-elliptic, 5-12 cm long and 2-3.2 cm wide, short-acuminate, cuneate at base, thin, entire or undulate, both surfaces glabrous or sparingly puberulous except costa and lateral veins, these more densely puberulous, cystoliths scarcely prominent; petioles slender, 0.5-1.5 cm long, puberulous; flowers borne in terminal and axillary rather dense panicles 12-21 cm long and 4-7 cm broad, the branches of the panicles few-flowered, once-or twice-forked, subhelicoid, the lowermost branches subtended by typical stem leaves, the uppermost branches and the flowers subtended by linear bracts 3-4 mm long; calyx 9-11 mm long, deeply segmented, segments narrowly linear, 0.75 mm wide near base, rather sparingly hirsute, the longer hairs sometimes glandular; corolla wine- to violaceous-red, glabrous, 20-25 mm long, the upper lip about 1 cm long and 2 mm wide, the tip obtuse, recurved, the lower lip spreading, obovate, 1 cm long and 5-6 mm wide, 3-lobed at tip, the lobes 1 mm long, 1 mm wide, rounded; stamens exserted about 1 cm beyond the mouth of the corolla, glabrous, the anthers linear, about 4 mm long and 0.75 mm broad, rounded at both ends; capsule clavate, 14 mm long, 3-4 mm broad, glabrous; seed suborbicular, oblique at base, 2 mm long, 1.75 mm wide, brownish, muricate.

Type. Cuatrecasas & Romero 24718 (holotype US, isotype COL), Colombia, Magdalena: Sierra Nevada de Santa Marta, SE slopes: Hoya del Río Donachuí: Cancurúa, 2,400-2,650 m alt, 11 Oct 1959.

Distribution. In Colombia, in the department of Magdalena at elevations between 2,400-2,800 meters.

COLOMBIA. MAGDALENA: Sierra de Perijá, E of Manaure: Quebrada de Floridablanca, 2,700-2,800 m alt, 11 Nov 1959, Cuatrecasas & Romero 25225 (paratypes COL, US).

Habracanthus sanctae-martae is perhaps nearest in relationship to H. callianthus Leonard, but differs markedly in the subterete stem, the glandular calyx segments, and the obovate, 5-6 mm wide lower corolla lip.

Fig. 1. Habracanthus cleefii Wassh.: A, habit, x $\frac{1}{2}$; B, bracts and calyx, x 3; C, corolla, x $1\frac{1}{2}$; D, corolla expanded, x $1\frac{1}{2}$.

Fig. 2. Dicliptera cundinamarcana Wassh.: A, habit, x $\frac{1}{2}$; B, cymule bract and calyx, x 3; C, corolla, x 3; D, corolla expanded, x 3.

Fig. 3. Habracanthus sanctae-martae Wassh.: A, habit, x $\frac{1}{2}$; B, bracts and calyx, x 3; C, corolla, x 3; D, corolla expanded, x 3.

PRELIMINARY TAXONOMIC STUDIES IN THE PALM GENUS *SCHEELEA* KARSTEN*

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The genus *Scheelea* was originally established by Karsten (1857) in which he described four species and transferred three others from *Attalea* and *Maximiliana*. In 1861 and 1866, Karsten also published illustrations of the species he described. During the next several decades, other taxa of *Scheelea* were described or transferred from other genera (mainly *Attalea*) to *Scheelea* by Barbosa Rodrigues (1891, 1894, 1898, 1899, 1903, 1907), Hooker (1897), Beccari (1916), Burret (1929, 1934, 1940), Bailey (1933, 1947), Bartlett (1935), and Dugand (1959).

Undoubtedly, the most comprehensive study of *Scheelea* was done by Burret (1929). In the same article he also treated the genera *Attalea*, *Orbignya* and *Maximiliana*. Besides describing 13 new species of *Scheelea* and transferring 8 others to the genus from *Attalea* and *Maximiliana*, he divided *Scheelea* into two sections, *Synalphocaryum* Burret and *Dialphocaryum* Burret. In the first section (characterized by having very large endocarp fibers distributed in dense clusters, and 1-5 closely arranged female flowers on each androgynous rachilla) Burret includes 23 species, and in section *Dialphocaryum* (differentiated by having endocarp fibers about one-half as small and distributed in smaller clusters, and 5-many loosely arranged female flowers per androgynous rachilla) 15 taxa are listed. Burret also constructed a partial key to the species within the first section, and a more or less complete key to those in the second section. In the same article, Burret emphasized the pitfalls involved in undertaking a comprehensive study of *Scheelea* because a number of the taxa are based on incomplete descriptions as well as inadequate herbarium material.

Wessels Boer (1965, 1972) treated all species of *Scheelea*, as well as other closely related genera (*Attalea*, *Orbignya*, *Maximiliana*, *Parascheelea* and *Markleya*), as part of the genus *Attalea*, *sensu lata*. Glassman (1977a, 1977b) published preliminary studies of the first two genera; and all six genera in the *Attalea* complex were discussed and differentiated in Glassman (1977a).

As previously mentioned for *Attalea* and *Orbignya* in Glassman (1977a, 1977b), preparation of this study was very difficult because type specimens are frequently fragmentary or non-existent, very few additional collections have been made for each species, and because descriptive and illustrative information is often inadequate.

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The following is a description of the genus Scheelea: tall trees (several taxa up to 30m. or more) mostly with relatively smooth trunks and inconspicuous leaf scars, or lacking trunks (acaulescent or nearly so); leaves usually very long (averaging 5-10 m.), pinnately compound, leaf base conspicuous, petiole frequently short, sometimes absent, with fibrous margins; middle pinnae single in several taxa, but more commonly clustered; plants monoecious (occasional plants with only functional male flowers or only functional female flowers), flowers unisexual, both male and androgynous spathes woody and deeply sulcate, usually terminating in a fairly long umbo; androgynous spadices usually with many branches (rachillae), each branch with few to several (to as many as 20) female flowers along basal part forming triads with two male flowers, the terminal part becoming slender, bearing only male flowers which are frequently sterile; female flowers 2.0-3.5 cm. long, subtended by two bracts, with 3 subequal or equal convex imbricate sepals and 3 similar petals, pistil with a well developed staminodial ring surrounding the ovary, carpels 3-several, fused, stigmas 3-6, style short or absent; male spadices many branched, male flowers usually spirally arranged around rachillae, sometimes on one side of the rachillae; male flowers 5-19 mm. long, with 3 very short sepals and 3 much longer fleshy, plano-convex or terete petals, stamens always 6, included in the petals, anthers straight; fruits 4-10 cm. long, mostly ovoid, 1-5 seeded, exocarp fibrous, mesocarp usually pulpy and fibrous, endocarp stony, usually more than twice as thick as exocarp and mesocarp combined, usually dotted with clusters of fibers, persistant perianth and staminodial ring enlarged in fruit; seeds conforming to size and shape of locules, endosperm homogeneous.

A total of 47 taxa have been described or transferred under the name Scheelea. Of this number, I am presently recognizing 28 "good" species of Scheelea (includes 11 synonyms); and the remaining eight taxa have been relegated to species dubiae or species incertae.

The following key, based on specimens examined plus descriptions and illustrations, encompasses 27 species of Scheelea. Unfortunately, S. tessmannii could not be included because of lack of leaf material. The reader should keep in mind, however, that this key is based on preliminary studies, and hopefully a more satisfactory revised treatment will be presented in the future.

Subsequent to the key, the group of "good" species as well as the doubtful or uncertain species, are arranged alphabetically with the author and original place of publication. Sometimes, other pertinent articles are listed, as well. Complete citations of most of these plus other articles mentioned in the text are listed under LITERATURE CITED at the end. Pertinent synonyms are also included. The type of each species, when known, is listed and is followed by a list of cited specimens examined by the present author. Holotypes, isotypes, and lectotypes are specifically listed as such; however, when its status is uncertain it is merely called "type". For each specimen, collector's name and collecting number is followed by a symbol of the herbarium where the collection is deposited. Abbreviations of herbaria used here are those listed in "Index Herbariorum" by Holmgren and Keuken (1974).

Key to Species of Scheelea

1. Middle pinnae not clustered

 2. Male flowers 9-14 mm long

  3. Middle pinnae 3-4 cm wide, about 90 cm long, fruits 6-7 cm long........... *S. kewensis*

  3. Middle pinnae 4-6 cm wide

   4. Mature fruits yellow, 4-5.2 cm x 2.8 cm, male flowers 10-14 mm long, middle pinnae about 150 cm long, 5-6 cm wide............-.........*S. butyracea*

   4. Mature fruits yellowish, finally becoming orange, 6.0-7.5 cm x 3.2-4.5 cm, male flowers 9-12 mm long, middle pinnae 75-100 cm long and 4-5 cm wide.................... S. *magdalenica*

 2. Male flowers 14-20 mm long

   5. Mature fruits 5-6 cm long and 2-3 cm in diam, one-seeded

    6. Rachis of leaf about 3.5 m long, male flowers 15-20 mm long........ *S. preussii*

    6. Rachis of leaf 6-9 m long, male flowers 13-16 mm long

     7. Rachis of leaf 7-9 m long, petiole about 120 cm long, 16-19 female flowers per androgynous rachilla....... *S. rostrata*

     7. Rachis of leaf about 6 m long, petiole 30-60 cm long, 12-14 female flowers per androgynous rachilla................. *S. zonensis*

5. Mature fruits 6-9 cm. long and 4-5 cm. in diam., 1-3 seeded

8. Male flowers 13-15 mm long, middle pinnae 100-120 cm long, 5-10 female flowers per androgynous rachilla.................... *S. macrocarpa*

8. Male flowers 13-19 mm long, middle pinnae 100-160 cm long. 10-20 female flowers per androgynous rachilla.................... *S. osmantha*

1. Middle pinnae in clusters of 2-5

9. Plants acaulescent, middle pinnae 40-98 cm long and 2.8-5 cm wide

10. Male flowers 5-8 mm long, mostly arranged on one side of the rachilla

11. Middle pinnae about 2.8 cm wide and 40 cm long......................... *S. parviflora*

11. Middle pinnae 4.5-5 cm wide and 90 cm. long.

12. Rachis of leaf 9-10 m long, male flowers 5-6 mm long...... *S. weberbaueri*

12. Rachis of leaf 5.3 m long, male flowers about 8 mm long... *S. anisitsiana*

10. Male flowers 9-13 mm long, mostly spirally arranged around rachilla

13. Rachillae of male spadix about 18 cm long, rachis of leaf about 4 m long, branched part of androgynous spadix 21-38 cm long.................... *S. attaleoides*

13. Rachillae of male spadix about 9 cm long, rachis of leaf about 5.6 m long, branched part of androgynous spadix 30-50 cm long .... *S. lauromuelleriana*

9. Plants with trunks 3-45 m tall, middle pinnae 60-150 cm long and 2-6.5 cm wide

14. Male flowers 6-10 mm long

15. Middle pinnae 3-4 cm wide, 60-90 cm long

16. Male flowers spirally arranged around rachilla.............................. S. princeps

16. Male flowers arranged on one side of rachilla

17. Middle pinnae about 4 cm wide and 70 cm long, each androgynous rachilla with about 8 female flowers...... S. phalerata

17. Middle pinnae about 3 cm and 90 cm long, each androgynous rachilla with 1-2 female flowers......... S. microspadix

15. Middle pinnae 4-6 cm wide and 100-150 cm long

18. Male flowers arranged on one side of the rachilla, middle pinnae about 6 cm wide and 100-150 cm long................. S. amylacea

18. Male flowers spirally arranged around rachilla, middle pinnae 4-5 cm wide and 100-125 cm long

19. Rachillae of male spadix 7-10 cm long, rachillae of androgynous spadix with one female flower, trees 10-15 m tall............................ S. huebneri

19. Rachillae of male spadix 10-14 cm long, rachillae of androgynous spadix with 2-4 female flowers, tree up to 3m tall............................ S. leandroana

14. Male flowers 11-18 mm long

20. Mature fruits 9-10 cm long, 3-4 seeded

21. Rachillae of male spadix 17-34 cm. long, trees about 12 m tall.......... S. bassleriana

21. Rachillae of male spadix 10-13 cm long, trees 3-4 m tall............... S. cephalotes

20. Mature fruits 4-7 cm long, 1-3 seeded

22. Rachillae of male spadix 10-25 cm long, middle pinnae 60-90 cm long

23. Rachillae of male spadix about 10 cm long, fruits 4-4.5 cm long, middle pinnae 2.2 cm wide.................................. S. macrolepis

23. Rachillae of male spadix 14-25 cm long, fruits 5-7 cm long, middle pinnae 4-5 cm wide

24. Rachis of leaf 4.5-7.5 m long, middle pinnae about 90 cm long, fruit 2-3 seeded............................ S. excelsa

24. Rachis of leaf 2.5-3 m long, middle pinnae about 60 cm long, fruit one seeded............................ S. insignis

22. Rachillae of male spadix 25-40, middle pinnae 100-140 cm long

25. Middle pinnae 100-140 cm long, 5.0-6.5 cm wide, male flowers 12-18 mm long

26. Middle pinnae about 5 cm wide, mature fruits 4-6 cm. long and 2.0-2.7 cm in diam .... S. liebmannii

26. Middle pinnae 6.0-6.5 cm wide, mature fruits 6.3-6.6 cm long and 2.8-3.4 cm in diam .... S. lundellii

25. Middle pinnae about 100 cm long and 4.5 cm wide, male flowers 11-14 mm long... S. maracaibensis

SCHEELEA Karsten, Linnaea 28: 264. 1857. ATTALEA sect. Pseudo-Scheelea Drude, 1881; MAXIMILIANA sect. Scheelea Drude, 1887; ATTALEA subgen. Scheelea Drude, 1887; ENGLEROPHOENIX Kuntze, 1891 (in part).
Type species: S. attaleoides Karsten.

Alphabetical List of Species

S. amylacea Barb. Rodr., Pl. Nov. Cult. Jard. Bot. Rio de Janeiro 1: 17, t. 5A, t. 6. 1891; t. 45B, 1903. Lectotype: Brazil, native origin not indicated, cult. in Jard. Bot. Rio de Jan. no. 151 (Glaziou 17340-P). c.f. Burret 1929, p. 663.

Specimens examined: Brazil, cult. Jard. Bot. Rio de Jan., Glaziou 16484 (P); Glaziou 17340 (P, lectotype; BR, C, isolectotypes); Dahlgren & Millar s.n. (F-611598, 611601); H. A. Johnstone 1838, 1840, 1842 (B). Doubtful: Brazil, Jard. Bot. Lagoa de Freitas, Glaziou 16486 (BR, MO, P); Glaziou 16489 (P).

Vernacular names: Anajá, Catolé.
Distribution: known only from cultivation.

Barbosa Rodrigues (1891, 1903) did not cite any specimens, but only listed the number of a tree growing in the botanical garden. In his Index of American Palms, Glassman (1972) mentioned t. 5A and t. 6 as the type for this species, however since Burret (1929) cited Glaziou 17340 in his detailed study of Scheelea it is more appropriate that this specimen be chosen as the lectotype of S. amylacea.

Apparently, S. amylacea is distinct because it is one of several species of Scheelea with male flowers arranged on one side of the male rachillae (also characteristic of S. microspadix, S. parviflora, S. phalerata and S. weberbaueri) rather than being spirally arranged around the rachillae.

S. anisitziana Barb. Rodr., Palm. Matogross. 63, t. 20. 1898 ("anizitziana"); t. 47B. 1903.
Lectotype: Brazil, MatoGrosso, and cult. Assuncion, Paraguay (t. 20, 1898).
Vernacular names: none recorded.
Distribution: Reported from MatoGrosso in Brazil.

Barbosa Rodrigues (1898) cited number 223 as the type, but this specimen has not been located. Hence, the selection of t. 20 as the lectotype.

Burret (1929) says that this species resembles S. phalerata, especially in the description of the petiole.

Even though the description is incomplete (no fruits or androgynous spadix) and no specimens have been seen, a distinct species seems to be indicated. It is hoped that collections of Scheelea made in Mato Grosso and Goias during the summer of 1976 by the present author will be useful in clarifying the limits of S. anisitziana as well as other poorly known species (S. microspadix and S. phalerata) described from these two states.

S. attaleoides Karsten, Linnaea 28: 265, 1857; t. 67. 1861; Dugand Caldasia 7: 145-146, 1955.
Lectotype: New Granada (Colombia), Prov. Bogota, Llano de San Martin, 300 m., "Yagua", 1851-1857 (J. Triana 731-P).

Specimens examined: Colombia, Prov. Bogota, Llano de San Martin, J. Triana 731 (P, lectotype): Intendencia del Meta, 20 km. S.E. of Villavicencio, 500 m, dense forest, Killip 34270 (COL, US); Meta, Monte de Rio Meta, Puerto Lopez, alt. 200 m., F. J. Hermann 11208-1/2 (COL, US); Intendencia del Meta, Llanos orientalis, entre Villavicencio y el Rio Ocoa, 450 m. alt., Dugand & Jaramillo 2915 (COL).
Doubtful: Colombia, Los Llanos, Rio Meta, Umapo,

Cuatrecasas 3654 (COL); Selva del Caño Popore (Apaporis-Vaupes), 240 m. alt., Cuatrecasas 7101 (COL).
Vernacular name: Jagua
Distribution: Colombia, principally in the province of Meta.

Karsten cited no specimens in either of his articles, but gave the following information for the type locality: "Vallis orinocensis margines pede andium Bogotensium, alt. 400 m." According to Dugand (1955), the above includes the Intendencia del Meta, on the foot of the eastern Andes and the Llanos that were previously called "San Martin", and the banks of the Alto Meta and it affluents called "Rio Negro". In 1972, I listed t. 67 of Karsten as the type of this species. At the time I was not aware of the existence of Triana 731 (P), especially since Dugand did not cite it. This specimen was collected within the general area of the type locality, probably during or close to the same time period when Karsten visited the area in 1853. Therefore it seems appropriate to choose Triana 731 as the lectotype instead of t. 67. The collection consists of leaf parts (including middle pinnae), and parts of a male spadix with male flowers and an androgynous spadix with female flowers.

As previously mentioned, S. attaleoides is the first taxon described by Karsten in Scheelea, and hence is the type species of the genus.

S. bassleriana Burret, Notizbl. 10: 655. 1929.
Holotype: Peru (Dept. Loreto), Middle Ucayali, Yarina Cocha, alt. 155 m., in flood free highland (G. Tessmann 5490-B).
?S. brachyclada Burret, Notizbl. 10: 680. 1929.
Lectotype: Peru (Dept. Loreto), Lower Itaya, Soledad, flood-free high forest, alt. 110m. (G. Tessmann 5237-F); c.f. Glassman 1972, p. 202.
?S. stenorhyncha Burret, Notizbl. 10: 675. 1929.
Lectotype: Peru, Dept. Loreto, flood free high forest on lower Itaya near Soledad (Tessmann 5256-F).

Specimens examined: Peru, Loreto, Rio Ucayali, Yarina Cocha, G. Tessmann 5490 (B, holotype of S. bassleriana; NY, US, isotypes); Lower Itaya, Soledad, G. Tessmann 5237 (F, lectotype of S. brachyclada; NY, isolectotype); Tessmann 5256 (F, lectotype of S. stenorhyncha). Doubtful: Peru, Yarina Cocha, G. Tessmann 5439a (NY).
Vernacular names: Chebon (S. bassleriana), Shapaja (S. brachyclada, S. stenorhyncha)
Distribution: Peru, mainly in Dept. of Loreto.

The holotype of S. bassleriana only consists of a mature fruit, whereas the isotypes comprise leaf material and packets of male flowers.

At present, I am not certain if S. brachyclada is actually synonymous with S. bassleriana. The holotype from (B) was probably destroyed, while isotypes from (F) and (NY) and a photo from (G) consist only of androgynous rachillae with both female and male flowers. For this species Burret (1929) also cited in the same article Tessmann 5493, Peru, Middle Ucayali, Yarina Cocha, alt. 155 m., flood-free high forest. The above specimen, consisting of male rachillae with flowers and a water color of the fruit, was probably destroyed at Berlin because I have not been able to locate it. Because of inadequate collections and the incomplete description (e.g. size of trunk, size of leaf and size of pinnae not described), I considered placing S. brachyclada in species dubia; but I surmised that it may be the same as S. bassleriana since Tessmann 5493 was collected in the same locality as the holotype (Tessmann 5490) of the latter taxon.

In spite of the fact that S. stenorhyncha is poorly known (no description of leaves, female flowers or male and female spadices) I am including it here in synonymy because it has the same locality as S. brachyclada. The holotype from (B) was apparently destroyed, hence the selection of Tessmann 5256 (F) as lectotype.

Scheelea bassleriana is one of four species of Scheelea I am recognizing from Peru. It is distinct from S. weberbaueri in the larger male flowers (12-17 mm rather than 5-6 mm) and from S. tessmannii by the shorter male rachillae; however, it seems to be most closely related to S. cephalotes, differing mainly in dimensions of various plant parts.

S. butyracea (Mutis ex L. f.) Karsten ex Wendl., in Kerch. Palm. 241, 256. 1878; Dugand, Caldasia 1: 24-29. 1941.
Cocos butyracea Mutis ex L. f., Suppl. plant. 454. 1781.
Type: Colombia, (Dept.of Tolima) near the mines of Ibague (observed by D. Mutis, but no specimens cited).
?S. regia Karsten, Linnaea 28: 266. 1857; Fl. Colomb. 2: t. 176, fig. 1-6. 1866.
Lectotype: Colombia, in warm valleys of Rio Magdalena and Cauca, up to 1,000 m. alt. (t. 176, fig. 1-6. 1866).
?S. humboldtiana (Spruce) Burret, Notizbl. 10: 658. 1929; Dugand, Caldasia 7: 147. 1955. Attalea humboldtiana Spruce, Journ. Linn. Soc. 11: 163. 1871.
Holotype: Venezuela, on the Orinoco above the waterfall, and Colombia, Rio Cassiquiare, above the mouth of Vasiva Lake (Spruce 43-K).
S. dryanderae Burret, Notizbl. 11: 1049. 1934.
Holotype: Colombia, Dept. Valle del Cauca, ebene bei Cali (Frau E. Dryander 12-B).

Specimens examined: Colombia, Dept. Cundinamarca, near Melgar, alt. 1,500 ft., M. B. Foster & R. Foster 1891

(A, COL); Nocaima, Hacienda Tobia, H. Garcia-Berriga 10674 (COL); Dept. Valle, cañon ebene bei Cali, Frau E. Dryander 12 (B, holotype of S. dryanderae); Cali, E. Dryander s.n. (COL); Zarzal, E. Dryander s.n. (B); Caicedonia, alt. 1,300 m., J. M. Duque-Jaramillo 4588 (COL). Doubtful specimens: Lower banks of Casiquiare & Orinoco, "Palma Yagua", R. Spruce 43 (K, holotype of Attalea humboldtiana; F, isotype). Colombia, Rio Hacha, 1844, J. Linden 1641 (P); without locality. E. Perez Arbelaez 10226 (COL); Dept. Caldas, La Dorada, Rafael Vanegas 1 (COL); Comisaria del Putumayo, selva hygrofila del Rio Putumayo, Puerto Ospina, J. Cuatrecasas 10858 (COL): Comisaria del Caqueta, between Florencia & Venecia, sabanas, J. Cuatrecasas 8945 (COL). Venezuela, Cumana, 1833, Bonpland s.n. (P); Territ. Amazonas, Isla Raton, disturbed mesophytic forest, Wessels Boer 1912 (U).
Vernacular names: Palma de Vino, Palma de Cuesco, Palma Real, Palma de Puerco, Corozo de Puerco, Marano, Corozo de Marrano, Palma dulce (Colombia).
Distribution: Colombia, especially in the departments of Tolima, Cundinamarca, Caldas and Valle; and Venezuela?

No specimens were cited by Mutis in his original publication nor could any specimens be found relating to his description of Cocos butyracea.

According to Dugand (1941), Burret (1929) included in S. butyracea another species of Scheelea growing in the Caribbean region of Colombia (Sierra Nevada de Santa Marta, Dept. of Magdalena). Burret cited Schultze 707 which was the basis for the description of a new, distinct species, S. magdalenica Dugand in 1959.

Dugand (1941) further stated that the type locality of S. butyracea is actually in the Dept. of Tolima, in the Alto Magdalena region closer to the Pacific coast. Today, this palm is rather scarce near Ibague itself, but is common in the lower Llanos of Tolima between Rios Cuello and Magdalena. It is also found in neighboring foothills of the Cordillera Central, Dept. of Cundinamarca, up to 1,300 m., in regions of Guaduas, La Esperanza, El Colegio and Melgar. Humboldt and Bonpland (H.B.K. 1816, p. 301) also observed this species in Melgar as well as other localities in Tolima and Cundinamarca. Dugand distinguishes S. butyracea from the Caribbean Scheelea (S. magdalenica) primarily by the fruits being yellow at maturity, smaller (5.2 x 2.8 cm) and with a perianth about 2.2 cm long; rather than larger (5.2-7.5 x 2.8-4.8 cm), yellow-orange or orange-red fruits with a perianth 3 cm long. He suggests that comparisons should be made with living plants because the color of mature fruits are important, distinct and constant characters.

In La Dorada (Dept. of Caldas), S. butyracea in called "palma real", the same as in certain parts of Cundinamarca. Dugand said this was significant in explaining the identity of S. butyracea with S. regia because in a trip to Cartago, in the Valle del Cauca, he was told that the "palma real" of that region was no different than S. butyracea of Tolima. Even though the type locality of S. regia is rather general (valleys of Magdalena and Cauca), Karsten did visit La Dorada and Guaduas where he saw this palm and he possibly received specimens from Cartago through Triana, as well. The fruits of S. regia are described by Karsten as yellow and small (4 cm.) which is further evidence that both species are conspecific. Unfortunately, no specimens were cited by Karsten in either article, nor could any be found; hence an illustration was chosen as the lectotype for S. regia . If indeed, S. butyracea and S. regia are synonymous, then the latter becomes the correct name because of an earlier publication date (1857 vs. 1878).

Karsten (1857) described S. excelsa as growing with S. regia in the same localities (warm valleys of Rio Magdalena and Cauca, up to 1,000 m. alt). In visits to Alto Magdalena and Valle del Cauca, Dugand (1941) stated that he observed only one species of Scheelea, namely S. butyracea. It is probable that in his trip from Rio Magdalena to Baranquilla, Karsten made collections of S. excelsa either in the middle or lower (Bajo Magdalena) part of this region. No specimens are available to verify this assumption, however. Nevertheless, Dugand observed (but did not collect) a palm in the middle Magdalena region (between Honda and El Banco) which is distinct from the one in Alto Magdalena (S. butyracea) and from the Scheelea in the Caribbean coastal region (S. magdalenica). Karsten's description of S. excelsa is incomplete, but the pinnae are clustered (which distinguish it from the other two species) and the fruits are about 6.5 cm x 2.5 cm (estimated from the illustration) and appear to be immature. Until more collections are made from the middle Magdalena region and until the type locality of S. excelsa can be more precisely fixed, the status of this species will remain doubtful.

When Burret described S. dryanderae ("Palma de Puerco") from Valle del Cauca, he had no clear view of S. butyracea (Dugand, 1941). Fruits sent by Frau Dryander to Dugand from the type locality were identical to those of S. butyracea; hence S. dryanderae was reduced to synonymy.

Wessels Boer (1972) transferred S. butyracea to the genus Attalea, but this combination is invalid because the basionym, Cocos butyracea, was not cited (article 33, 1961 of International Code of Botanical Nomenclature - see Stafleu et al. 1972).

In his unpublished manuscript on Venezuelan palms, Wessels Boer includes S. humboldtiana as a synonym of S. butyracea. The holotype (Spruce 43) of Attalea humboldtiana from Kew comprises only leaf material. Fruits were also collected, but apparently they have since been lost or misplaced. In his original article, Spruce emphasized the vertical rather than the normally horizontal arrangement of pinnae along the rachis (pinnae at right angles to the rachis). Dugand (1955) mentions photographs taken by Leopold Richter of abundant stands of this palm along the margins of the Bajo Guaviare and Orinoco rivers which demonstrate this characteristic. Later, Dugand said that S. humboldtiana is native to Venezuela, but not Colombia (see Moore, 1971). I have not seen any authentic specimens determined as S. humboldtiana other than leaf material (male flowers were not described by Spruce), therefore the status of this species is uncertain. Wessels Boer 1912 (U), cited above, from the Amazonas region of Venezuela,appears to be close to S. butyracea, but further study is necessary. The vertical arrangement of pinnae may be significant in delimiting S. humboldtiana as a separate species, but until I can examine more complete collections,I am tenatively keeping it in synonymy under S. butyracea.

Distributional data in Venezuela for S. humboldtiana is listed in FAO (Claassen et al., 1949), as follows: in upper Orinoco valley and its tributaries from Caura River to its tributaries in the state of Amazonas. Braun (1968) also lists the following localities for this species: region of Maypures, Upper Orinoco, Rio Casiquiare and Rio Negro (Amazon territory). Since neither author cites specimens, I can't be certain of the accuracy of this information.

S. cephalotes (Poeppig ex Mart.) Karsten, Linnaea 28: 269. 1857; Dahlgren pl. 371. 1959. Attalea cephalotesPoeppig ex Mart., Palmet. Orbign. 119. 1844; Mart., t. 169. 1845. Lectotype: Peru, Maynas Alto, Tocache (Poeppig 2000-W destroyed; M); c.f. Dahlgren 1959, pl. 371.

Specimens examined: Peru, Maynas Alto, Tocache, Poeppig 2000 (M, lectotype; BR). Doubtful . Peru, 1909-1914, A. Weberbauer 6762 (F).
Vernacular name: Shapaja
Distribution: recorded from Peru

No specimens were cited by Poeppig in the original publication, but Dahlgren's plate 371 of Poeppig 2000 from Vienna established it as the lectotype. Since most of the specimens deposited in the Vienna herbarium were destroyed during World War II, a duplicate specimen from Munich was chosen as the new lectotype.

This species seems to be most closely related to S. bassleriana from Peru mainly because both taxa have clustered pinnae and large fruits (about 10 cm long). The principal differences are in dimensions of the tree, pinnae and male rachillae. Unfortunately, only specimens from the type collection of S.

cephalotes have been seen, hence a careful comparison with the "better known" S. bassleriana is not practical at the present time.

S. excelsa Karsten, Linnaea 28: 267. 1857; Fl. Colomb. 2: t. 176, fig. 10-11. 1866; Dugand, Caldasia 3: 24-29. 1941.
Lectotype: Colombia, warm valleys of Magdalena and Cauca, up to 1,000 m. alt. (t. 176, fig. 10-11).

Specimens examined: Doubtful. Colombia, Dept. Bolivar, vic. of Estrella, Caño Papayal, pastureland and secondary forest, H. M. Curran 354 (US). Venezuela, Est. Barinas, near Barrancas, Bosque Experimental El Caimital, secondary forest, Wessels Boer 1990 (U); Schulz & Rodriguez 416, 417, 420, 423, 432, 433 (U).
Vernacular names: Palma de vino
Distribution: Colombia, mainly in the middle Magdalena region (fide Dugand); and Venezuela?, in estado Barinas.

No specimens were cited by Karsten in his original articles, nor could any specimens be found that could definitely be attributed to this taxon; hence the selection of Karsten's illustration as the lectotype. Problems concerning the type locality of S. excelsa was previously discussed under S. butyracea.

The above cited specimens from Utrecht were originally determined as S. butyracea by Wessels Boer, but collections with leaves (e.g. Wessels Boer 1990) have clustered middle pinnae like S. excelsa and the male flowers are 6-8 mm long. In Curran 354 (det. by Dugand) the male flowers are 14-16 mm. long, but contain no leaf material. Karsten described the male flowers as being about 5-10 mm. long. Both of the above specimens are within the graphical range of S. excelsa designated by Dugand, probably including the extension of the middle Magdalena region into Barinas in Venezuela.

As previously mentioned (under S. butyracea where S. excelsa was discussed in detail), more collections are necessary from various parts of these regions before the morphological limits and a more precise area for the type locality can be established.

S. huebneri Burret, Notizbl. 10: 633. 1929.
Holotype: Brazil (Amazonas), Rio Purus, Manaos (Huebner 23a-B).

Specimens examined: Brazil (see holotype above). Cultivated, Brazil, Hort. Rio de Janeiro, Capt. Johnstone 1846 (B). Doubtful. Brazil, Mato Grosso, region Machado, Yutaurassa, Krukoff 1615 (F-620747).
Vernacular name: Urucuri
Distribution: Brazil, in state of Amazonas.

Burret (1929) reported the distribution of this palm as Amazon region, lower Rio Purus in Igarapé and in Igapó (alluvial forest). The fruit is edible and also used for smoking rubber. Burret also mentioned two photos in connection with the cited specimen, but these were not found. Another photo of trees in their natural habitat taken by George Huebner in Manaos, 1935, is deposited in the herbarium at the Field Museum (#460079).

Scheelea huebneri appears to be a distinct species, but more collections are necessary to determine its range of variation and morphological limits.

S. insignis (Mart.) Karsten, Linnaea 28: 269. 1857; Dahlgren 1959, pl. 372-373. Maximiliana insignis Mart., Hist. Nat. Palm. 2: 133, t. 94. 1826. Attalea insignis (Mart.) Drude, Engl. & Prantl, Nat. Pflanzenf. 2: 80. 1887. Englerophoenix insignis (Mart.) Kuntze, Rev. Gen. Plant. 3: 322. 1898. Lectotype: Brazil, Japura, Rio Negro (Martius s.n. - M). c.f. Dahlgren 1959, pl. 372.

Specimens examined: Brazil, Japura, Rio Negro (see lectotype above); Brazil, Prov. Rio Negro, Martius s.n. (M); Amazonia, Basin of Rio Purus, Terr. of Acre, mouth of Rio Macauhan, Krukoff 5572, 5622 (A, NY). Doubtful. Brazil, Amazonia, Rio Purus, Terr. Acre, Krukoff 5618 (A, NY); Brazil, Cult. Jard. Bot. Rio, Dahlgren s.n. (F-611600); Java, Cult. Hort. Buitenzorg, Capt. H. A. Johnstone 1573, 1577a (B); Brazil, Cult. Bot. Gart. Mus. Goeldi, H. A. Johnstone 1093 (B).

In his original article, Martius (1826) stated the type localities as follows: "in horrendis sylvis ad Cataractus Cupatenses et Araracoara fluminis Japura, in ripa fluviorum Messai et dos Enganos in confinis Regni Quitensis et Provinciae Lusitanicae, quae de flumine nigro". Since no specimens were cited in any of Martius' articles (1826, 1845, 1853), a lectotype was chosen from one of Martius' specimens originally illustrated by Dahlgren (1959, pl. 372). This specimen (Martius s.n., Japura, Rio Negro) was chosen over the other collection (Martius s.n., Rio Negro) because the label is apparently in Martius' handwriting, whereas in the other collection someone else wrote the label.

Too few collections of S. insignis have been made to carefully determine its relationships, but it appears to be most closely related to S. excelsa from Colombia and Venezuela, which is itself a poorly known species.

S. Kewensis Hooker, Curtis' Bot. Mag. 123: t. 7552-7553. 1897. Lectotype: Cult. Kew Gardens, origin unknown (t. 7552-7553. 1897).

Specimens examined: Doubtful. Cultivated, Bot. Gardens Singapore, June 1933, C. X. Furtado s.n. (B); June 25, 1929, Nus s.n. [det. C. X. Furtado] (BH).
Vernacular names: none recorded
Distribution: Known only from cultivation.

No specimens were cited by Hooker nor could any be found which were collected in Kew Gardens; hence the selection of above illustrations as the lectotype.

This species is frequently known under the cultivation name of *Attalea spinosa* Meyen which actually has no botanical standing (*nomen nudum*). In fact, both specimens cited above were identified as such.

Scheelea kewensis seems to be a distinct taxon, but I have not examined enough material to make careful comparisons with other species. It would also be helpful to know where it came from originally.

S. lauromuelleriana Barb. Rodr., Contrib. Jard. Bot. Rio de Jan. 4: 108, t. 25. 1907.
Lectotype: Brazil, cult. Jard. Bot. Rio de Janeiro, 1926, (Dahlgren s.n., F-611607).

Specimens examined: Brazil (see lectotype above). Doubtful. Brazil (probably Jard. Bot. Rio de Janeiro), Dahlgren s.n. (F-404661).
Vernacular name: Baguaçu.
Distribution: Origin said to be from Minas Gerais, but now only known from cultivation.

No specimens were cited by Barbosa Rodrigues and hence t. 25 was originally chosen as lectotype by Glassman (1972). In 1892, the Jardim Botanico in Rio received for planting from Mr. J. C. Abreu, three young palms which came from the sertão in the state of Minas Gerais (locality not indicated). Between 1906 and 1907 these plants produced flowers and fruits. The specimens cited above are the only ones I have been able to locate with the label *Scheelea lauromuelleriana*. Dahlgren s. n. (F-611607) most probably was collected from one of the three original trees on which Barbosa Rodrigues based his description and illustrations. Hence, it is appropriate to select this collection as the lectotype instead of t. 25.

This species appears to be most closely related to *S. attaleoides* from Colombia because both taxa are acaulescent and have clustered pinnae. Further study is necessary, however, to determine its exact relationships.

S. leandroana Barb. Rodr., Plant. Nov. Cult. Jard. Bot. Rio de Janeiro 1: 19, t. 7, t. 8B, 1891; t. 44. 1903. Lectotype: Brazil, Cult. Jard. Bot. Rio de Jan., 1926 (Dahlgren s. n., F-61140).

Specimens examined: Brazil (see lectotype above), Doubtful: Brazil, Cult. Jard. Bot. Rio de Jan., 1926, Dahlgren s. n. (F-611617), (F-611597); Dahlgren & Millar s. n. (F-611651); cult. Rio de Janeiro, Sete (Lake) Pontes, Nov. 1, 1890, Glaziou 18587 (F,K,P).
Vernacular name: none recorded
Distribution: only known from cultivation.

No specimens were cited by Barbosa Rodrigues (1891,1903), but he mentioned number 453 (probably the tree number) and "country unknown". Originally, t. 7,8 B was chosen as the lectotype (Glassman 1972); however, Dahlgren s. n. (F-61140) is being selected istead because it is the only specimen I have seen labelled Scheelea leandroana and probably was collected from the original tree. All other specimens cited above were either undetermined or identified with other species names.

This taxon seems to be close to S. huebneri, but more specimens of both taxa should be examined before their exact affinities can be determined. Punt & Wessels Boer (1965) cited a specimen, H. A. Johnstone 1845 (B), which was identified as a hybrid between S. leandroana and S. huebneri. I have seen this particular specimen, but could not corroborate the determination because of insufficient material available for study.

S. liebmannii Becc., L'Agric. Colon. 10: 617. 1916; Miranda, 349-368, 1945; Hernandez X, 43. 1947; 18. 1949; Dahlgren pl. 374-375. 1959. (Described as new name for Cocos regia Liebm. because of existence of Scheelea regia Karsten, 1857). Cocos regia Liebm. ex. Mart., Hist. Nat. Palm. 3: 323. 1853.
Lectotype: Mexico, Dept. Vera Cruz, Xicaltepec, pr. Rio Nautla, 1841, Liebmann 6560 (C). c.f. Dahlgren 1959, pl. 374.

Specimens examined: Mexico (see lectotype cited above); Prov. (state) Vera Cruz, Monte Mistan, 1845, Galeotti 4977 (BR); banks of Arroyo, San Miguel outside Juanita, H.E. Moore 8056 (BH); betw. Tierra Blance & Tres Valles, on road to Tlacotalpan, H.E. Moore & M. Cetto 6229 (BH); state of Oaxaca, wet wooded land on Isthmus road beyond Mathias Romero, 40 mi from Empalme Balboa, H. E. Moore & R. Brossard 6353A (BH); around Ubero & Almoloya, common in rough pasture or in clearings, L. Williams 9636 (F).

Vernacular names: Palma real (fide Galeotti), Coyol Largo (fide H. E. Moore)
Distribution: Native to Mexico in the states of Vera Cruz,

Oaxaca, Chipas, Tabasco, and Campeche (fide Hernandez X, 1949)

No specimens were cited in Liebmann (ex Martius, 1853) or Beccari (1916), therefore a lectotype was chosen. Dahlgren (1959) illustrated two photos (pl. 374-375) or specimens from (C) labelled Cocos regia or Scheelea liebmannii. Plate 375 has no collecting data and no. 6560? is written above the annotation label in a handwriting different from that below. The specimen was determined by Beccari, in 1916, in which the names S. liebmannii and Cocos regia were apparently inscribed on the annotation label by Beccari himself. No other information appears on this sheet which I have been unable to locate. I have chosen the other specimen (from plate 374) as the lectotype because information on the label seems to have been written by Liebmann and identified by him as well. Beccari probably did not see this specimen because it was not annotated by him.

In his article describing S. liebmannii as a new name, Beccari (1916) gave the following distributional information attributed to Liebmann: forests of eastern Mexico up to an altitude of 2500 ft., frequent in Antigua, Tolome, San Carlos and Colipa.

Miranda (1945) gave a detailed description of this palm, and Hernandez X (1949) presented a key to three species of Scheelea found in Mexico, based mainly on dimensions of fruit (also includes S. preussii and S. lundellii). Scheelea liebmannii differs from S. preussii (which also occurs in Guatemala) mainly in having clustered rather than non clustered middle pinnae; but it seems to be very closely related to S. lundellii (also found in Guatemala) and may even be conspecific with this taxon. Further study is necessary, however, before such a decision can be definitely made.

S. lundellii Bartlett, Carn. Inst. Wash. Publ. no. 461: 45, pl. 1-5. 1935; Standley & Steyermark p. 290, 1958.
Holotype: Guatemala, Dept. Peten, Monte Polol (Lundell 3752 - MICH).

Specimens examined: Guatemala, Dept. Peten, Monte Polol, C. L. Lundell 3752 (MICH, holotype; GH, US, isotypes); Dept. Alta Verapaz, betw. Candelaria & Samanzana, Steyermark 45718a (F).

Vernacular names: Kantutz, Corozo.
Distribution: Native to Guatemala, but also reported from Mexico by Hernandez X (1949).

According to Standley & Steyermark (1958), S. lundellii grows in the same forests in Peten as Orbignya cohune which it resembles very closely in appearance.

Judging from the small number of collections, S. lundellii does not appear to be common because Guatemala has been well botanized by a number of collectors over the last 30 years. As previously mentioned, however, this species may be synonymous with S. liebmannii from Mexico which seems to have a wider distribution.

S. macrocarpa Karsten, Linnaea 28: 268. 1857; t. 176, fig. 12-15. 1866.
Lectotype: Venezuela, Rios Tuy and Jaracuy, sine loc. (Karsten s.n. - LE, not seen); c. f. Wessels Boer (unpublished ms.).
?S. passargei Burret, Notizbl. 10: 671. 1929.
Holotype: Venezuelan Guiana, without definite locality (Passarge s.n. - B).

Specimens examined: Venezuela, Est. Bolivar, near El Palmar, tropical rain forest, Wessels Boer 2105 (U); Est. Cojedes, along road from Tinaco to Valencia, pastures, alt. 500 m., Wessels Boer 2106 (U). Venezuelan Guiana, Passarge s. n. (B, holotype of S. passargei).

Vernacular names: Coroba (fide Claassen et al., 1949), Yagua, Corozo (fide Braun, 1968).
Distribution: Venezuela

In Glassman (1972) t. 176, fig 12-15 was listed as the type of S. macrocarpa. Wessels Boer (unpublished ms. on Venezuelan palms), however, cited a specimen collected by Karsten (consisting of a single fruit) as the lectotype. Wessels Boer (1972) transferred this species to the genus Attalea, but the combination is invalid because no basionym was listed in this article.

The description of S. passargei is based only on the fruit and the holotype itself consists only of a fruit as well. Wessels Boer (unpublished ms.) placed this species in synonymy under S. macrocarpa, but at present there does not seem to be enough evidence to make this judgement.

Scheelea macrocarpa is listed in Claassen et. al. (1949) and illustrated (fig. 19-21). It is called "Coroba" in Venezuela, and there are extensive stands (about six million trees) south of Lake Maracaibo and along the railroad and Zulia River near the Colombian border. Braun (1968) also lists S. macrocarpa from Rio Tui and Barlovento (state of Miranda) and is known as "Yagua" or "Corozo" in Venezuela. Since no specimens were cited in either one of these articles, I can't be certain if the identity of this species is correct.

S. macrolepis Burret, Notizbl. 10: 688. 1929.
Holotype: Venezuelan Guiana, Yopal (Passarge 774 - B, destroyed).

Specimens examined: Venezuela, Est. Bolivar, El Tigre Cerca de Rio Cuchivero, Middle Orinoco, Llewelyn Williams 13315 (F-617690).

Vernacular names: Coroba
Distribution: Venezuela

Wessels Boer (unpublished ms.) also cites the same collection above from (US) and (VEN) and Tamayo 3418 (VEN), from savannas of Cuchivero, which I have not examined. In 1972 he transferred this species to the genus Attalea, but the combination is invalid for lack of a basionym.

The FAO article (Claassen et. al., 1949) gives the following distributional data for S. macrolepis: along Orinoco River and its tributaries and common from Puruy near mouth of Caura River and beyond Caicara on the Orinoco. This palm grows in dense pure stands called "Corobales" in dry sandy soils at the edge of tropical forests bordering savannas or
Caura and Cuchivero valleys an estimated 900,000 trees of this species occur. Since no specimens were cited in the FAO article,I cannot be certain all of the above information actually pertains to S. macrolepis.

S. magdalenica Dugand, Mutisia 26: 1. 1959.
Holotype: Colombia, Dept. Magdalena, Santa Marta, near Tucurinca (A. Schultze 707 - B, destroyed).
Lectotype: Colombia, Santa Marta (H.H. Smith 2639 - GH).
S. butyracea sensu Burret, Notizbl. 10: 685. 1929; not Cocos butyracea Mutis ex L. f., Suppl. 454. 1781.

Specimens examined: Colombia, Santa Marta, H.H. Smith 2639 (GH, lectotype: F, NY, P, US); Guajaro Lagoon, Dugand 558 (F); Dept. Magdalena, entre Pivijay and Medialuna, Najar 4A (COL); entre los puentas de la quebrada de Orihueca y del rio Sevilla, R. Romero - Castanedo 8225 (COL).

Vernacular names: Palma de vino, Curua, Corua.
Distribution: Colombia, in northern part of the valley of the Rio Magdalena, almost to the shore of the Carribean sea, in the departments of Atlantico, Bolivar and Magdalena.

Since the holotype was presumably destroyed in Berlin, one of the paratypes (collected near the type locality) cited by Dugand was chosen as the lectotype.

Dugand (1959) distinguishes S. magdalenica from S. butyracea by having a fruit about twice as large (6-7.5 X 3-4.5 cm vs. 4-5 X 3 cm) and becoming orange rather than yellow at maturity; and from S. excelsa by having single rather than clustered pinnae. Dugand (1941) discusses in detail the distinction between geographical ranges of the three Colombian species listed above, and also first mentioned the misapplication of S. butyracea by Burret from the species later described by Dugand as S. magdalenica.

Dugand (1959) says S. magdalenica used to be common in the region between Sabanalarga and Guajaro, and from there to Los Pendales to the West; and Puerto Giraldo and Suan to the east, in Dept. Atlantico, but tens of thousands of trees have been destroyed, and currently remain isolated in small groups. The greatest concentration of this palm was found in Magdalena between Medialuna and Pivijay, on the highway from Fundacion to Salamina; however these stands of trees are being cut down and burned, and the area converted to pasture.

S. maracaibensis (Mart.) Burret, Notizbl. 10: 676. 1929.
Attalea maracaibensis Mart., Palmet. Orbign. 124, 1844; t. 167, fig. 3. 1845; Wessels Boer, 1972.
Holotype: Venezuela, Maracaibo (Plée s.n. - P, destroyed?)

Specimens examined: Venezuela, est. Zulia, near Santa Barbara del Zulia, in pastures, Wessels Boer 2007 (U); est. Zulia, Perija, near Mission Los Angeles del Tucuco, forest at base of mountains, Wessels Boer 2463 (U).

Vernacular name: Palma de Agua
Distribution: Western Venezuela, common and locally abundant in the lower hot, humid lands encircling Lake Maracaibo and in the foothills of the mountains that surround the lake, up to 1000 m (fide Wessels Boer).

The holotype (Plee s.n. - P) was probably destroyed because neither Wessels Boer nor myself have seen this specimen.

Dugand (1941) said that S. maracaibensis (originally described by Martius solely on its fruit) seems to be close to S. butyracea from the coast of Colombia (later differentiated as S. magdalenica) because both species have small fruits and because of their geographical proximity.

According to Wessels Boer (unpublished ms.), Dugand (1959) refers plants in the vicinity of La Fria, est. Tachira (Venezuela) to S. macrocarpa without much evidence, and probably incorrectly. Nevertheless, he said that S. magdalenica appears to be identical to S. maracaibensis because he was unable to detect any major differences between the two taxa.

S. microspadix Burret, Notizbl. 15: 104. 1940.
Holotype: Brazil, Mato Grosso, without definite locality (W. Hopp 3010 - B).

Specimens examined: Brazil, Mato Grosso (see holotype above). Doubtful. Mato Grosso, Jacobina #1, O. Kuntze s.n. (BH), Guacuril #2, O. Kuntze s.n. (BH).

Vernacular name: Acuri
Distribution: Brazil, in state of Mato Grosso.

Apparently, part of the holotype from (B) was destroyed because a photograph of another specimen bearing fruits and male flowers (Hopp 3010) was attached to the collection cited above (consisting of parts of a petiole, leaf rachis, spathe, female spadix and parts of a leaf; but no fruits or male flowers).

According to Burret (1940), S. microspadix belongs to the section of Scheelea called Synalphocaryum. Bundle fibers in the endocarp are conspicuous, pinnae are irregular, fruit is almost completely round (broadly rounded at base and apex) and perianth is low, and male flowers are on one side of the rachilla. Burret also distinguishes the species from S. phalerata, S. quadrisperma, S. parviflora, S. amylacea and S. leandroana by having completely rounded rather than beaked fruits.

Scheelea microspadix seems to be most closely related to S. phalerata because both species have clustered pinnae and male flowers on one side of the rachillae; but they differ mainly in having 1-2 female flowers rather than about 8 female flowers per androgynous rachilla, respectively.

S. osmantha Barb. Rodr., Pl. Nov. Cult. Jard. Bot. Rio de Jan. 4: 24. 1894; t. 4B, 1896; t. 43. 1903.
Lectotype: Cult. Jard. Bot. Rio de Janeiro (Glaziou 16487 - MO).
S. urbaniana Burret, Notizbl. 10: 672. 1929; 14: 476-477. 1937.
Holotype: Tobago, Easterfield (Broadway 4015 - B, destroyed).
Lectotype: Tobago, Easterfield (Broadway 4015 - F).
S. curvifrons Bailey, Gentes Herb. 7: 443, fig. 206, 209-210. 1947.
Holotype: Trinidad, Leasehold Reservation, St. Patrick (L. H. Bailey 124-BH).
S. excelsa of Barb. Rodr., Pl. Nov. Cult. Jard. Bot. Rio de Jan. 1: 30, t. 9, fig. A1-8. 1891; not Karsten, 1857.

Specimens examined: Trinidad, Leasehold Reservation, Saint Patrick, L. H. Bailey 124 (BH, holotype of S. curvifrons); Horseshoe Reservation, Forest Reserve, Wessels Boer 1660 (U); Trinidad, cultivated, Lapeyhouse Cemetary, Broadway 8922 (F). Tobago, Easterfield, Broadway 4015 (F, lectotype of S. urbaniana; G); Mason Hall, Broadway 4744 (F, G, GH, NY, P, US). Venezuela, Est. Sucre, Penins. de Paria, near Yaguarapara, secondary forest, Wessels Boer 1837 (U). Cultivated. Surinam, Wessels Boer 1339 (U). Brazil, Jard. Bot. Rio de Janeiro, Glaziou 16487 (MO, lectotype of S. osmantha; BR, F, P); Dahlgren & Millar s.n. (F-611598).

Doubtful. British Guiana, Georgetown Bot. Garden, Dahlgren & Millar s.n. (F-610614, 610615, 610816).
Vernacular names: Trash palm (Trinidad).
Distribution: Native to Trinidad and Tobago; and Venezuela, in semi-dry deciduous forests (fide Wessels Boer, unpubl. ms.).

Known in cultivation from the following botanical gardens: Trinidad, Georgetown, Rio de Janeiro, Peradeniya, Buitenzorg and Surinam.

Barbosa Rodrigues (1891) originally described this taxon under *S. excelsa*, but could not use this binomial because it was preempted in 1857 by Karsten. In 1894, however, he changed the name to *S. osmantha* and at the same time added a description of the fruit. No specimens were cited by Barbosa Rodrigues here, but he listed no. 104 which may refer to the number of a tree growing in the Jardim Botanico in Rio. Label on specimen of Glaziou 16487 (MO) is inscribed "could be from type tree", but no. 104 is not on the sheet. Even though I am not certain if this specimen actually came from the tree based on the original descriptions, I am designating it as the lectotype. Previously, I had designated t. 4B, 1896 (Glassman, 1972) as the type because I was unaware of the existence of Glaziou 16487 at the time.

Burret (1937) first mentioned that *S. osmantha* was native to both Trinidad and Tobago (and placed *S. urbaniana* in synonymy) however, it is still uncertain where the original cultivated trees came from since Barbosa Rodrigues made no mention of it in any of his articles. From Trinidad Burret cited a specimen (which I could not locate) collected by "A. C. Langlois, Pt. a Pierre, Ferres Hill, Phoenix Park area, California Hill forest, area 3 mi. sq., were very common until area was cleared for sugar planting". Wessels Boer (unpubl. ms.) was apparently the first one to include both *S. urbaniana* and *S. curvifrons* as synonyms under *S. osmantha*.

S. parviflora (Barb. Rodr.) Barb. Rodr., Sert. Palm. Bras. 1: 53, t. 45A. 1903. *Attalea parviflora* Barb. Rodr., Bull. Herb. Boiss. ser. 2, 3: 625. 1903.
Holotype: Paraguay, Concepcion (Hassler 7165 - G).
?*S. quadrisperma* Barb. Rodr., Palm. Nov. Parag. 23, t.6. 1899; t. 46A, 1903.
Lectotype: Paraguay, ripas Arroyo Y-aka in Pule-cus, near Santa Maria de la Sierra and in ripas Rio Apa (t. 6, 1899.). c.f. Glassman, p. 205, 1972.
?*S. quadrisulcata* Barb. Rodr., Contr. Jard. Bot. Rio de Jan. 4: 107, t. 22B. 1907.
Lectotype: Paraguay, near Villa Concepcion (t. 22B, 1907).

Specimens examined: Paraguay (see holotype of *S. parviflora* above).

Hassler 7165 is one of the few type specimens that can be attributed to a species described by Barbosa Rodrigues. In most cases, no specimens were cited and the handful that were listed have been destroyed.

No specimens were cited for *S. quadrisperma* by the above author, hence the selection of t. 6 as the type. Burret (1929) lists Glaziou 22268 as probably belonging to the above species, but he also cited it under *S. phalerata* (see following species). Burret also surmised that *S. quadrisperma* was perhaps identical to *S. phalerata*.

For *Scheelea quadrisulcata*, Barbosa Rodrigues (1907) stated that Dr. E. Hassler discovered this species in 1903 near Villa Concepcion, Paraguay,and subsequently sent him collections of this palm along with other specimens. Unfortunately, no specimens pertaining to this taxon have been found to date. Therefore, the above illustration (t.22B) was chosen as the lectotype.

This taxon needs further study because differences between it and other species collected in Paraguay have not been resolved.

Scheelea phalerata (Mart. ex Sprengel) Burret, Notizbl. 10: 669. 1929. *Attalea phalerata* Mart. ex Sprengel, Syst. Veg. 2: 624. 1825; Mart. t. 169, fig. 5, 1845; Drude t. 101, fig. 2. 1881.

Type: Brazil, Goias, exact locality not indicated (no specimens cited).

S. princeps var. *Corumbaensis* Barb. Rodr., Palm. Mattogross. 66, t. 21A. 1898; *S. corumbaensis* (Barb. Rodr.) Barb. Rodr., Sert. Palm. Bras. 1: 54, t. 47A, 1903.

Lectotype: Brazil, Mato Grosso, Corumbá (t. 21A, 1898).

Specimens examined: Brazil, central, Salinas, 1844, Weddell 2030 (P); Goias, near Morinhos, 1894, Glaziou 22268 (BR, P). Paraguay, between Rio Apa and Rio Aquidiban, Centurion, 1908, K. Fiebrig 4037 (GH).

Vernacular names: Acuri, Guacuri, Guriry, Cabeçudo (Brazil).
Distribution: Brazil, in states of Goias and Mato Grosso; and Paraguay.

No specimens were cited by Martius in either article, nor could any be found at (BR),(M) or (P) which were annotated by him. Burret (1929), however, cited a specimen (Martius, non vidi) as follows: Goias, in pure stands, Vao do Paranan, "Cabeçudo". Apparently, some one sent the above information to Burret because he did not see this specimen. A continued search should be made for this specimen, but it probably has been lost or destroyed.

Barbosa Rodrigues (1898) cited B.R. 218 for *S. princeps* var.

corumbaensis, but this specimen was apparently destroyed. Therefore, t. 21A was chosen as its lectotype.

Burret (1929) cited both Glaziou 22268 and Fiebrig 4037. He also said that S. phalerata was probably identical to or related to S. anisitziana from Mato Grosso, and S. quadrisperma and S. parviflora from Paraguay. Even though key characters have been used to separate the above species, further study is necessary to completely differentiate them.

S. preussii Burret, Notizbl. 10: 678. 1929; Hernandez X., 145-152. 1945; Standley & Steyermark, fig. 50. 1958.
Holotype: Guatemala, Pacific side, very common (Preuss s.n. - B).

Specimens examined: Guatemala (see holotype above); Dept. San Marcos, Palmetto flats, 1-2 mi no. of Ocos, Steyermark 37869 (F); Dept. Suchitepequez, So. of Alotenango Farm, 7 mi So. of Tiquisate, along road, Steyermark 47732 (F); Dept. Retalhuleu, mixed forest betw. Retalhuleu and Nueva Linda, Standley 87258, 87277, 87289, 87314 (F); Dept. Retalhuleu, vic. of Las Delicias, So. of Retalhuleu, abundant on plains, tree left where land was cleared, Standley 92369 (F). Doubtful. Nicaragua, Dept. Bluefields, Bluefields, L.E. Long 154 (F).
Vernacular names: Coquito, Corozo.
Distribution: abundant in plains along Pacific side of Guatemala; and Mexico, in state of Chiapas (fide Hernandez X.).

Scheelea preussii is one of five species of Scheelea described (and recognized by me) from Central America. It is readily distinguished from S. liebmannii from Mexico and S. lundellii from Guatemala by having pinnae arranged singly rather than in clusters; however, S. preussii seems to be closely related to both S. rostrata from Costa Rica and S. zonensis from Panama. In fact, all three may be conspecific, but more careful study is necessary before such a decision can be made.

S. princeps (Mart.) Karsten, Linnaea 28: 269. 1857; Barbosa Rodrigues, p. 65. 1898; t. 47C, 1903. Attalea princeps Mart., Palmet. Orbign. 113, t. 4, fig. 3, t. 31B, 1844.
Type: Bolivia, prov. Moxos and Chiquitos, in large groups in humid forests (D'Orbigny 16-P, destroyed?).
Lectotype: Martius, t. 31B, 1844.

Vernacular name: Motacú.
Distribution: Bolivia

Even though I have not seen any authentic specimens of this taxon, the description is adequate to maintain it as a separate entity, for the present time. Very few species of Scheelea have been reported or collected from Bolivia, so comparisons should be made with taxa found in Mato Grosso, Brazil, which is the adjacent state to the east of Bolivia.

S. rostrata (Oersted) Burret, Notizbl. 10: 688. 1929; N.W. Uhl & H. E. Moore, Principes 17: fig. 7B. 1973. Attalea rostrata Oersted, Vidensk. Meddel. Kjoeb. 1858: 50. 1859. Type: Costa Rica, west coast near Puntarenas (no specimens cited).

Specimens examined: Costa Rica, Puntarenas, abundant in open pasture near Puerto Cortez, H. E. Moore 6540 (BH); Prov. Puntarenas, Cabo Blanco Nature Reserve, So. tip of Nicoya Penins., secondary vegetation, W. C. Burger & R. L. Liesner 6696 (F).

Vernacular name: Corozo
Distribution: Northwestern Costa Rica and adjacent Nicaragua, primarily in bottom land and hillside forests.

In 1977a, I considered this taxon as a species incerta under Attalea because male flowers were not known at the time Burret transferred it to Scheelea. When my article was written, however, I was not aware of the existence of the complete collections (cited above) from the general area of the type locality. Uhl & Moore (1973) cited Moore 6540 in an article on "Protection of pollen and ovules in palms".

As previously mentioned, S. rostrata is most closely related to S. preussii and S. zonensis.

Janzen (1971) studied five separate populations of S. rostrata in northwestern Costa Rica with relation to damage of fruits by rodents and Bruchid beetles. He gave the following information on these locations: 1. Barranca site - on hills and bottomlands 5-8 miles northwest of Puntarenas, area extensively cleared for cultivation, but with 1000-2000 estimated trees. 2. Taboga site - river bottoms along Rio Higueron on Finca Taboga, south of Canas, Guanacaste province, about 200 individuals confined to a narrow strip of forest remaining along the river and the contigious palm forest of about 10 acres. 3. Colorado site - pastures along the creek network about halfway between Barranca and Toboga sites, only 13 trees remaining of undoubtedly a much larger population. 4. Esparta site - at least 1000 palms scattered among hillside pastures and clumped in some creek bottoms 3-6 miles northeast of Esparta, Puntarenas province. 5. Penas Blancas site - separated from the Toboga site by 90 miles of forest with a very severe dry season, extends along Pan American highway from Costa Rican - Nicaraguan border to 10 miles south and extends north into Nicaragua for an unknown distance along river draining into Lake Nicaragua; probably less than 200 individuals, but this population may extend eastward and thus be continuous with a large population on the Atlantic Coastal plain.

S. tessmannii Burret, Notizbl. 10: 682. 1929.
Holotype: Peru, Upper Amazon, Iquitos, in flooded or dry highlands (Tessmann 5085-B).

Specimens examined: Peru, Iquitos, Tessmann 5085 (B, holotype; NY, isotype); Peru, Iquitos, Tessmann 5088 (NY).

Vernacular name: Chapaja
Distribution: Peru, Iquitos

The holotype (B) consists of a piece of wood and part of a spathe, whereas the isotype (NY) comprises female rachillae and female flowers. I considered calling this a species dubia because no leaves were described or collected until I discovered Tessmann 5088 (NY) which was not cited by Burret nor determined to species. This specimen matches Burret's description of S. tessmannii in the unusually long male rachillae (42-46 cm) with male flowers 16-17 mm long and spirally arranged around the rachilla.

Scheelea tessmannii is probably most closely related to S. bassleriana, differing mainly in the length of the male rachillae (42-46 cm v s. 17-34 cm).

Unfortunately, I could not include S. tessmannii in the key to species of Scheelea because of lack of leaf material.

S. weberbaueri Burret, Notizbl. 10: 659. **1929.**

Holotype: Peru, Dept. Junin, Prov. Tarma, La Merced by Chanchamayo - Tal, in forests (Weberbauer 1848-B).

Specimens examined: Peru, Dept. Junin (see holotype above); Dept. Junin, along Rio Perene, near Hacienda Colonia Perene, forest, E. P. Killip & A. C. Smith 25141 (F, NY, US).

Vernacular name: Shapaja
Distribution: Peru, Dept. of Junin

Holotype consists of fruit only; the remaining specimens of this collection were probably destroyed. Killip & Smith 25141 was determined by Burret.

Scheelea werberbaueri seems to be a distinct species with its relatively short male flowers (5-6 mm) arranged on one side of the rachilla, short male rachillae (9 cm) and rather large fruits (8 cm x 3-4 cm). As previously mentioned, it is one of four species of Scheelea being recognized from Peru.

S. zonensis Bailey, Gentes Herb. 3: 37, figs. 20-23. 1933.
Lectotype: Panama, Barro Colorado island, Canal Zone

(L.H. & E.Z. Bailey 1-BH).

Specimens examined: Panama, Barro Colorado Island, Bailey & Bailey 1 (BH, lectotype); Barro Colorado Island, Snyder Molino Trail 10, T. Croat 4600 (F); Canal Zone, forest north of Golf Club at summit, T. Croat 16649 (F).

No specimens were cited by Bailey, hence the selection of the above specimen as lectotype.

As previously mentioned, S. zonensis seems to be closely related to S. preussii from Guatemala and S. rostrata from Costa Rica and may even be conspecific with both of them.

Species Incertae et Dubiae

S. blepharopus (Mart.) Burret, Notizbl. 10: 674. 1929.
Attalea blepharopus Mart., Palmet. Orbign. 116, t. 5, fig. 2, t. 31C. 1844; Hist. Nat. Palm. 3: t. 167. 1845.
Type: Bolivia, prov. Yuracares, by Molito (D'Orbigny 34-P, destroyed?).

Burret (1929) transferred this species to Scheelea without explanation, but probably because male flowers were described as fleshy by Martius (1844). Male flowers illustrated by Martius (t. 167), however, appears to have flattened petals. Since no specimens have been seen which can be attributed to this taxon and since the description is inadequate to even designate the genus, it should be deemed a species dubia.

S. costaricensis Burret, Notizbl. 10: 684. 1929.
Type: Costa Rica (C. Hoffman s.n. - B, destroyed).

The description of this palm was based on fruits only and has no record of a specific type locality. Burret said that the fruit of this species is similar to S. excelsa from Colombia.

Because of the incredibly inadequate information available, S. costaricensis unquestionably belongs in the category of species dubia.

S. cubensis Burret, Notizbl. 10: 671. 1929.
Holotype: Cuba (Gundlach s.n. - B).
Specimens cited: see holotype above.

The situation here is similar to S. costaricensis in that the description was based on fruits only and there is no known type locality. Burret noted the similarity of the fruit of S. cubensis with S. princeps Mart.

In his flora of Cuba, Leon (1946) offered no new information except that Gundlach probably did not collect the fruit himself because he had no knowledge of where it came from. Rather than speculate as to the identity and type locality of S. cubensis, I prefer to give it the obvious designation of species dubia.

S. goeldiana (Huber) Burret, Notizbl. 10: 658. 1929. Attalea goeldiana Huber, Bull. Herb. Boiss. ser. 2, 6: 268. 1906.
Type: Brazil, Rio Acre (no specimens cited)

Huber's description contains very little information for identification of this palm; no illustrations were included and no specimens were cited, nor could any be found. Therefore, S. goeldiana has been placed in species dubia (Glassman, 1977a).

S. gomphococca (Mart.) Burret, Notizbl. 10: 666. 1929. Attalea gomphococca Mart., Hist. Nat. Palm. 3: 301, t. 167, fig. 6. 1845.
Lectotype: Central America (t. 167, fig. 6). c.f. Glassman 1972, p. 24.

No specimens were cited by Martius (1845), hence a lectotype was chosen from his illustration of the fruit. Unfortunately, this name is based only on a description and illustration of the fruit and furthermore is without a precise type locality. Therefore, S. gomphococca is unquestionably a species dubia (see Glassman, 1977a).

S. martiana Burret, Notizbl. 10: 661. 1929.
Type: Published as new name for Attalea excelsa because a Scheelea excelsa Karsten, 1857 already existed.
Attalea excelsa Mart. ex Sprengel, Syst. Veg. 2: 624. 1825; Mart., t. 96, fig. III, 1-2. 1826; t. 169, fig. 3. 1845.
Type: Brazil, Maranhão and Pará (no specimens cited).

Specimens examined: Doubtful. Brazil, Pará, Tapajos, Bôa Vista, lowland, Capucho 516 (F).

Vernacular name: Urucuri

Burret (1929) transferred this taxon to Scheelea based on presence of fiber clusters in endocarp of the fruit (since male flowers were neither described nor illustrated by Martius). This is a questionable distinction because many species of Attalea and Orbignya also have fiber clusters in the endocarp. According to Burret, S. martiana is closely related to S. huebneri from the Amazon region, but it differs in having a shorter elliptical fruit with a shorter perianth.

Since this species is based largely on a delineation of the fruit (and almost no other information), and since no authentic collections have been seen which can be definitely attributed to it, I am compelled to relegate S. martiana to species dubia.

S. tetrasticha (Drude) Burret, Notizbl, 10: 667. 1929; Dahlgren, pl. 376. 1959. Maximiliana tetrasticha Drude, Mart. Fl. Bras. 3: 455. 1881. Englerophoenix tetrasticha (Drude) Barb. Rodr., Sert. Palm. Bras. 1: 76. 1903.
Holotype: Brazil, forests on Rio Tocantins and Rio Araguaya (Weddell 2331-P).

Specimens examined: Brazil, border of Rio Tocantins, 1844, Weddell 2331 (P, holotype; F, isotype).

Vernacular name: Anaja.

The type material consists of leaf parts (pinnae are clustered, but are not from the middle) and a packet of male flowers (7 mm long). This species is very poorly described, (no spadices or female flowers) and the type specimens are inadequate to distinguish it as a separate entity. Until more material can be collected from the type locality, I am considering S. tetrasticha as a species dubia.

S. wallisii (Huber) Burret, Notizbl. 10: 657. 1929; Notizbl. 11: 1048. 1934. Attalea wallisii Huber, Bull. Herb. Boiss. Ser. 2, 6: 267. 1906.
Type: Brazil, Amazonas, Rio Purus (no specimens cited).
Lectotype: Brazil, Rio Purus, mundung des Rio Acre (leg. A. Ducke, com. G. Huebner 163-B).

Specimens examined: Brazil (see lectotype above); Rio Purus, Rio Acre, leg. Lako com. Huebner s.n. (B).

Vernacular name: Jacy

Huber's description is mainly a comparison of characters with Attalea (Scheelea) humboldtiana which it most closely resembles. Burret (1929) probably transferred this species to Scheelea because of its resemblance to S. humboldtiana, but male flowers were not known. In 1934, Burret described S. wallisii in detail and cited the above specimen chosen here as lectotype (Huebner 163-B). In none of the articles, however, are male and female flowers described. The specimens cited above consist of parts of a female spathe and spadix (but no flowers), part of a leaf and an immature fruit. Since S. wallisii is incompletely known, I am compelled to relegate it to species dubia.

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(An additional manuscript with descriptions and synonymy of the taxa mentioned above was prepared by Wessels Boer, but never published.).

NEW SPECIES OF NEUROLAENA (Asteraceae-Heliantheae)

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In connection with a forthcoming taxonomic study of the genus Neurolaena, I find it expedient to publish the following new species. The proposed treatment will contain 10 species: a widespread, weedy taxon, N. lobata; 5, fairly local species endemic to southern Mexico; and 4 species endemic to Central America, one of which extends into Chiapas, Mexico.

Neurolaena balsana B. L. Turner, sp. nov. - N. lobata affinis et aliquantum similis sed capitulis majoribus, foliis magis grosse pubescentibus, hispidis, anguste lanceolatis ut videtur integris vel tantum denticulatis, floribus majoribus, achaeniis majoribus copiose glandularibus.

Holotype (GH): MEXICO. Guerrero: "Sierra Madre," 1000 m., 9 Feb. 1899. E. Langlassé 843. Isotype (MICH).

Neurolaena fulva B. L. Turner, sp. nov. - N. lobata affinis et fortiter similis sed foliis lanceolatis minute crenatis vel denticulatis (nunquam grosseserratis lobatisve), ramis capitulescentiae et foliis subtus fulvotomentosis, capitulis brevipedicellatis, capitulescentiis paniculiformibus conferte corymbosis, rotundatis, multiaggregatis, phyllariis fere glabris 1-3-nervatis flavescentibus subchartaceis.

Holotype (DS): MEXICO. Chiapas: Lago of Monte Bello, 5100 ft., 25 mi. E of La Trinitaria, municipio of La Trinitaria. 13 Apr. 1965, D.E. Breedlove 9678. Isotypes (F,MICH).

Neurolaena oaxacana B. L. Turner, sp. nov. - N. cobanensis Greenm. affinis et valde similis sed foliis latioribus saepe 3-lobatis grosseserratis, involucris minoribus conspicuae hemisphaericis, floribus numerosioribus, disci floribus et achaeniis minoribus.

Holotype (ENCB): MEXICO. Oaxaca: "moist deciduous woods with tree ferns" 46.9 m. N of Ixtlán de Juarez on road to Tuxtepec, 1700 m., 15 May 1970, M. Denton 1691. Isotype (MICH, 2 sheets).

Neurolaena venturana B. L. Turner, sp. nov. - N. macrophylla Greenm. affinis et valde similis sed foliis subtus conspicue glandulario-pubescentibus glandulis atomiferis, petiolis prominente alatis; capitulescentis et venis majoribus subtus pilis fuscis crispatis multicellulosis 4-8-septatis, achaeniis glabris.

Holotype (MICH): MEXICO. Veracruz: La Calavera, municipio de Atzalan, "orilla de arroyo," 1100 m., 2 Apr. 1970, F. Ventura A. 801. Isotypes (DS,MEXU).

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXXV

Harold N. Moldenke

SYNGONANTHUS LAGOPODIOIDES (Griseb.) Ruhl.

Additional bibliography: Moldenke, Phytologia 37: 95 & 97. 1977.

Ruhland (1903) cites only the type collection and says that the "Species habitu S. gracili similis". Recent collectors have encountered it in sandy places and on white-sand savannas, flowering in May and November (in addition to the months previously reported in this series of notes) and fruiting in May.

The Ekman 12522, distributed as S. lagopodioides, actually is S. insularis Moldenke.

Additional citations: CUBA: Pinar del Río: Carabia 741 (N), 746 (N); Ekman 10823 (Ca—491270), 11035a (B, Ba, Ut—23745A), 11061 (Ca—491269); León 15421 (W—2286773); León & Marie-Victorin 19613 (Mv); Marie-Victorin 58317 (Vi, Vi). ISLA DE PINOS: Ekman 11973 (Ca—491268); Killip 42600 (Le), 42672 (Le, S), 42830 (Le), 42855 (Le), 42856 (Gg—401112, Le, Mu), 42860 (W), 42861 (Le), 43033 (Le), 44064 (Mi), 44545 (N, Z), 44565 (Ss), 44578 (Ss), 45171 (Sm), 45172 (B, Mu, Sm), 45392a (Sm), 45508 (Sm), 45562 (Sm), 45584 (Sm); León 6049 (Um—10065); C. V. Morton 10024 (W—2350701).

SYNGONANTHUS LANATUS Moldenke, Résumé 108 & 492, nom. nud. 1959; Bol. Mus. Para. Emil. Goeldi, ser. 2, Bot. 3: 3—4. 1960.

Bibliography: Moldenke, Résumé 108 & 492. 1959; Moldenke, Bol. Mus. Para. Emil. Goeldi, ser. 2, Bot. 3: 3—4. 1960; Hocking, Excerpt. Bot. A.4: 284. 1962; Moldenke, Biol. Abstr. 37: 2453. 1962; Dau, Excerpt. Bot. A.7: 520. 1964; Moldenke, Résumé Suppl. 8: 2 (1964) and 11: 4. 1964; G. Taylor, Ind. Kew. Suppl. 13: 132. 1966; Moldenke, Résumé Suppl. 16: 5 & 6. 1968; Moldenke, Fifth Summ. 1: 127 & 174 (1971) and 2: 963. 1971; Anon., Ind. Bot. Guay. High. 25. 1972; Moldenke in Steyerm., Maguire, & al., Mem. N. Y. Bot. Gard. 23: 854. 1972.

This species is based on Murça Pires, Black, Wurdack, & Silva 6199 from Serra do Cachimbo, Pará, Brazil, at an altitude of 425 m., collected on December 14, 1956, and deposited in the Britton Herbarium at the New York Botanical Garden. The plant has much the aspect of a Leiothrix. Recent collectors describe it as "multicespitose in dense clumps", the leaves spreading, flat, grayish-green or blue-green, and the heads whitish or creamy-white, and have found it growing at 425--2100 m. altitude, flowering in March and May, and fruiting in May, October, and December. Irwin and his associates report it "locally common among grasses on wet campo".

Citations: VENEZUELA: Bolívar: J. A. Steyermark 97968 (Ld), 107221 (Ld). BRAZIL: Distrito Federal: Murça Pires, Silva, & Souza 9355 (Z). Goiás: Irwin & Soderstrom 7267 (Ld, N, W—2759028).

Pará: Murça Pires, Black, Wurdack, & Silva 6077 (N), 6199 (N—type).

SYNGONANTHUS LANATUS var. ALPINUS Moldenke, Résumé Suppl. 11: 4, nom. nud. 1964; Act. Bot. Venez. 2: 153. 1967.

Bibliography: Moldenke, Résumé Suppl. 11: 4. 1964; Moldenke, Act. Bot. Venez. 2: 153. 1967; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 963. 1971.

Citations: VENEZUELA: Bolívar: J. A. Steyermark 93931 (N—isotype, Z—type).

SYNGONANTHUS LANCEOLATUS Alv. Silv., Fl. Mont. 1: 386—387, pl. 246. 1928.

Synonymy: Syngonanthus lanceolotus Alv. Silv., Fl. Mont. 1: 418, sphalm. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 386—387 & 418, pl. 246, 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 637 & 963. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 246. 1928.

This species is based on A. Silveira 843 from "In campis argillosis humidisque in Serra da Moeda, prope Lagoa Grande", Minas Gerais, Brazil, collected in August, 1926, and deposited in the Silveira herbarium. Silveira (1928) says of it "Species ob bracteas involucrantes lanceolatas ab omnibus Eulepidis differt". In his text he refers to "Tabula CCXLVII" as illustrating the species, but the actual plate is labeled "TABULA CCXLVI" — plate 247 illustrates S. rufipes Alv. Silv. Syngonanthus lanceolatus is thus far known only from the original collection.

SYNGONANTHUS LARICIFOLIUS (G. Gardn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 257—258. 1903.

Synonymy: Paepalanthus laricifolius G. Gardn. in Hook. f., Icon. Pl. 6 [ser. 2, 2]: vi & viii, pl. 524. 1843. Paepalanthus caricifolius G. Gardn. apud Walp., Ann. Bot. Syst. 1: 889—890. 1849. Eriocaulon caricifolium Steud., Syn. Pl. Glum. 2: [Cyp.] 281 & 333. 1855. Paepalanthus leucophaeus Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 441, in syn. 1863. Dupatya laricifolia (G. Gardn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya laricifolia Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Eriocaulon laricifolium Steud. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 257, in syn. 1903. Syngonanthus laricifolius Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: G. Gardn. in Hook. f., Icon. Pl. 6 [ser. 2, 2]: vi & viii, pl. 524. 1843; Walp., Ann. Bot. Syst. 1: 889—890.

1849; Steud., Syn. Pl. Glum. 2: [Cyp.] 281 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 283, 284, 440, 441, 451, 501, & 507, pl. 57, fig. 3. 1863; Bent. & Hook. f., Gen. Pl. 3 (2): 1023. 1883; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 24. 1888; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 (1893) and imp. 1, 2: 401 & 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 245, 257—258, 286, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 418. 1928; Stapf, Ind. Lond. 4: 518. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 (1946) and imp. 2, 2: 401 & 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 7, 18, 30, 36, 50, & 58. 1946; Moldenke, Phytologia 2: 378. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 323. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 108, 280, 286, 289, 326, 352, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 (1960) and imp. 3, 2: 401 & 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 72. 1960; Moldenke, Fifth Summ. 1: 174 & 482 (1971) and 2: 496, 504, 579, 585, & 963. 1971; Moldenke, Phytologia 35: 319, 320, & 339. 1977.

Illustrations: G. Gardn. in Hook. f., Icon. Pl. 6 [ser. 2, 2]: pl. 524. 1843; Körn. in Mart., Fl. Bras. 3 (1): pl. 57, fig. 3. 1863.

This species is based on G. Gardner 5262 from elevated sandy campos on mountain tracts to the north of the Diamond District, Minas Gerais, Brazil, collected in July, 1840, and deposited in the Kew herbarium. Paepalanthus leucophaeus is based on an unnumbered Martius collection from "an höher gelegenen, trockenen Stellen am Flusse Juquitinhonha oder Belmonte", Minas Gerais, collected in May, 1818, and deposited in the Munich herbarium. Ruhland (1903) cites only these two collections. He comments that this "Species cum sequente [S. anthemiflorus (Bong.) Ruhl.] bracteis involucrantibus as subgenus Eulepidem spectat". In his key he separates these two very similar taxa as follows:

1. Leaves densely and persistently pilose; sheaths densely long-pubescent.. . . . . S. laricifolius.

1a. Leaves puberulent above, calvescent beneath; sheaths glabrate . . . . S. anthemiflorus.

However, in his description of S. anthemiflorus he does not describe the sheaths as glabrous.

Syngonanthus laricifolius has been collected in anthesis in May and July. Silveira (1928) cites A. Silveira 521, also from the Diamantina region, collected in 1908.

Curiously, Jackson (1893) lists both a Paepalanthus caricifolius and a P. laricifolius as published by Gardner "in Hook. Ic. Pl. t. 524" and both as accepted valid species! Gardner's plate, however, plainly has the specific epithet spelled "laricifolius".

The Archer & Mello Barreto 4930 [Herb. Jard. Bot. Belo Horiz. 17512 in part] and Glaziou 19981, distributed as S. laricifolius, actually seem to represent S. anthemiflorus (Bong.) Ruhl., while Mello Barreto 9494 [Herb. Jard. Bot. Belo Horiz. 24811 in part] is S. bicolor Alv. Silv. and Mello Barreto 8927 [Herb. Jard. Bot. Belo Horiz. 25930] is S. plumosus Alv. Silv.

Additional citations: BRAZIL: Minas Gerais: G. Gardner 5262 (B--isotype, N--isotype); Martius s.n. [ad fluv. Jaquetinhonha, Maio 1818] (B, Mu, N--photo, Z--photo); J. E. Pohl s.n. (Mu). MOUNTED ILLUSTRATIONS: Körn. in Mart., Fl. Bras. 3 (1): pl. 57, fig. 3. 1863 (B, N, Z); drawings by Körnicke (B).

SYNGONANTHUS LARICIFOLIUS var. LONGIFOLIUS Alv. Silv., Fl. Mont. 1: 340 [as "longifolia"]. 1928.

Synonymy: Syngonanthus laricifolius var. longifolia Alv. Silv., Fl. Mont. 1: 340. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 340 & 418. 1928; Moldenke, Known Geogr. Distrib. Erioc. 18 & 58. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 174 (1971) and 2: 637 & 963. 1971.

This variety differs from the typical form of the species in the "Folia caulina usque 8 cm longa et erecta" and is based on A. Silveira 841 from "In campis arenosis inter Serrinha et Itacambira", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. On page 418 of his work (1928) Silveira cites the type locality as just "Serrinha". As of now this taxon is known only from the original collection.

SYNGONANTHUS LEONII Moldenke, Boissiera 7: 3--4. 1943.

Bibliography: Moldenke, Boissiera 7: 3--4. 1943; León, Fl. Cuba, imp. 1, 1: 284 & 436. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5 & 59. 1946; Moldenke, Alph. List Cit. 2: 650. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 45 & 213. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Phytologia 4: 323. 1953; Moldenke, Résumé 53 & 492. 1959; Moldenke, Fifth Summ. 1: 98 (1971) and 2: 963. 1971; León & Alain, Fl. Cuba, imp. 2, 1: 284 & 436. 1974.

This species is based on León & Alain 19491 from the banks of a lagoon at La Máquina, near La Coloma, Pinar del Río, Cuba, collected on November 28, 1940, and deposited in the Britton Herbarium at the New York Botanical Garden. Thus far it is known only from the original collections cited in my 1953 work.

SYNGONANTHUS LEPRIEURI (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 266--267 [as "leprieurii"]. 1903.

Synonymy: Paepalanthus leprieuri Körn. in Miq., Ann. Mus. Lugd.-bat. 3: 239. 1861. Syngonanthus leprieurii (Körn.) Ruhl.

in Engl., Pflanzenreich 13 (4-30): 266. 1903. Paepalanthus leprieurii Körn. ex Moldenke, Known Geogr. Distrib. Erioc. 50, in syn. 1946.

Bibliography: Körn. in Miq., Ann. Mus. Lugd.-bat. 3: 239. 1861; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Ruhl. in Engl., Pflanzenreich 13 (4-30): 264, 266—267, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 7, 50, & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 68 & 213. 1949; Moldenke, Résumé 78, 326, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 134 (1971) and 2: 585 & 963. 1971; Moldenke, Phytologia 34: 257, 259, 276, & 277. 1976.

This species is based on an unnumbered Leprieur collection from Cayenne, French Guiana, in the Paris herbarium, possibly the Leprieur 557 photographed at the United States National Herbarium in Washington. Ruhland (1903) cites only the original collection which he apparently did not himself see. Steyermark found what appears to be this species in wet sand on a flat area bordering a dwarf forest, at 1200 meters altitude, in fruit in December.

Citations: VENEZUELA: Bolívar: J. A. Steyermark 111277 (Z). FRENCH GUIANA: Leprieur 557 [U. S. Nat. Herb. photo 5885] (N—photo). BRAZIL: Pará: Spruce 557 (P, Z).

SYNGONANTHUS LINEARIS Ruhl. in Engl., Pflanzenreich 13 (4-30): 272. 1903.

Synonymy: Paepalanthus linearis Ruhl. ex Moldenke, Résumé Suppl. 1: 21, in syn. 1959.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 272, & 293. 1903; Prain, Ind. Kew Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 418. 1928; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 323. 1953; Moldenke, Résumé 108 & 492. 1959; Moldenke, Résumé Suppl. 1: 21. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 72. 1960; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 585 & 963. 1971; Moldenke, Phytologia 24: 454—455. 1972.

This species is based on H. de Magalhães 1367 from the Serra de Ibitipoca, Minas Gerais, Brazil, collected in June, 1896, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10692. Ruhland (1903) says that the "Species foliis et bracteis involucrantibus pro disco brevibus insignis". Silveira (1928) cites A. Silveira 22, also from the Serra de Ibitipoca and also collected in 1896.

Additional citations: BRAZIL: Minas Gerais: Magalhães 1367 [Macbride photos 10692] (B—type, N—photo of type, W—photo of type, Z—isotype).

SYNGONANTHUS LLANORUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 265—266. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 264—266 & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 357. 1928; Moldenke, Known Geogr. Distrib. Erioc. 5, 6, & 59. 1946; Moldenke, Alph. List Cit. 2: 634 (1948) and 4: 1079. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61, 65, & 213. 1949; Moldenke, Phytologia 4: 323—324. 1953; Moldenke, Résumé 69, 73, & 492. 1959; Moldenke, Résumé Suppl. 2: 4 (1960) and 12: 11. 1965; Lasser, Act. Bot. Venez. 4: 35. 1969; Moldenke, Phytologia 18: 105. 1969; Moldenke, Fifth Summ. 1: 120 & 127 (1971) and 2: 585 & 963. 1971; Moldenke, Phytologia 36: 74. 1977.

This species is based on Karsten s.n. from the "Llanos von Villavicencio", Meta, and Schlim 193 from Ocana "1200 m...blühend im Oktober", Norte de Santander, Colombia, the former deposited in the Vienna herbarium and the latter in the Berlin herbarium. Ruhland (1903) comments that the "Species habitu S. eriophyllo simillima, sed jam foliorum indumento, bracteis involucrantibus acutis, consistentia petalorum floris ♂ etc. diversa". Syngonanthus eriophyllus is regarded by me as conspecific with S. gracilis (Bong.) Ruhl. Syngonanthus llanorum is said by Silveira (1928) to be related to S. pauciflorus Alv. Silv. and S. planus Ruhl.

Pennell 1430 was distributed as and cited by me in 1953 as S. llanorum, but seems actually to represent Eriocaulon guyanense Körn. in spite of the fact that E. P. Killip asserts that he compared it with the "type" of S. llanorum in Berlin and found that it matched well and is from the "type locality". I have also seen the Berlin cotype and find that it is not at all similar to Pennell's plant!

Additional & emended citations: COLOMBIA: Meta: Karsten s.n. [Villavicencio; Macbride photos 29992] (B—cotype, N—photo of cotype, W—photo of cotype).

SYNGONANTHUS LONGIPES Gleason, Bull. Torrey Bot. Club 56: 15—16. 1929.

Bibliography: Gleason, Bull. Torrey Bot. Club 56: 15—16. 1929; A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933; Fedde & Schust. in Just, Bot. Jahresber. 57 (2): 16. 1937; Moldenke in Gleason & Killip, Brittonia 3: 159. 1939; Moldenke, Alph. List Cit. 1: 92. 1946; Moldenke, Known Geogr. Distrib. Erioc. 6 & 59. 1946; Moldenke, Phytologia 2: 352. 1947; Moldenke, Alph. List Cit. 2: 352 (1948), 3: 976 (1949), and 4: 985. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65, 67, & 213. 1949; Moldenke, Mem. N. Y. Bot. Gard. 8: 102. 1953; Moldenke, Phytologia 4: 324. 1953; Moldenke in J. A. Steyerm., Fieldiana Bot. 28: 826. 1957; Moldenke, Résumé 69, 73, 76, 108, & 492. 1959; J. A. Steyerm., Act. Bot. Venez. 1: 41 & 247. 1966; Moldenke, Résumé Suppl. 17: 3. 1968; Oberwinkler, Pterid. & Sperm. Venez. 9 & 52. 1970; Moldenke, Fifth Summ. 1: 120, 127, 131, & 195 (1971) and 2: 963. 1971; Moldenke, Phytologia 31: 386 (1975) and 34: 257. 1976; Anon., Biol. Abstr. 61: AC1.718. 1976; Moldenke, Phytologia 35: 307 (1977) and 36: 35 & 470. 1977.

This species is based on Appun 1199 from the Roraima district of Guyana, deposited in the herbarium of the Royal Botanic Gardens at Kew. Gleason (1929) cites, in addition, ImThurn 33 and Schomburgk 1060. The type was originally identified as Paepalanthus schomburgkii Klotzsch by Oliver, but, according to Gleason, "The descriptions of P. Schomburgkii do not agree with this plant in many important respects, nor do they cite any collection number". In his unpublished Flora of British Guiana Gleason describes S. longipes as having the "Basal leaves densely cespitose, firm or rigid, linear, 6--9 cm. long, 3--6 mm. wide, glabrous, obtuse; umbel single, its stalk glabrous, terete, 2--3 dm. long; subtending leaves resembling the cauline, acute; peduncles 4--14, 2--4 dm. long, glabrous; sheaths obliquely cleft, the lamina acute; heads subglobose, 4--6 mm. wide; bracts rotund to obovate, glabrous, rounded at the summit." He cites only Appun 1199, ImThurn 33, and Schomburgk 1060 and regards the species as endemic to Guyana. In his key he distinguishes it from S. umbellatus (Lam.) Ruhl. as follows:

1. Leaves subtending the umbels about 1 mm. wide; bracts acuminate . . . . S. umbellatus.

1a. Leaves subtending the umbels 3--5 mm. wide; bracts obtuse or subacute .S. longipes.

Recent collectors describe this plant as a cespitose herb, 40--100 cm. tall, growing in large clumps, the leaves in basal rosettes, the inflorescences to 35 cm. tall, the heads white or dull-white, and the flowers themselves white. They have found it growing on campos and wet campos, savannas and the margins of savannas, in moist sand, in partly inundated grassy and sandy campos and adjacent forests, and "in water-holes by morichal", at altitudes of 125--1250 meters, flowering from September to April and in July, fruiting in February, March, and November.

Wurdack & Adderley refer to it as "locally frequent in moist grassy areas"; Steyermark found it in swamps on savannas bordering forests; Steyermark & Wurdack call it "locally frequent on moist savannas"; Oldenburger and his associates encountered it "in 'kawfutu' valley with 'hog-wallow' relief, associated with Cuphea gracilis, Eriochrysis cayennensis, and Melochia villosa"; and Maguire and his associates report it "frequent on burnt savannas", "occasional on savanitas", an "abundant perennial herb in marshy areas", and "annuals to 1 m. tall occasional on little wet savannas".

López-Palacios describes the plant as having "las hojas aparecen en un verticilo ca. a 20 cm. sobre el nivel del suelo", while Ruiz-Terán & López-Palacios say "Hierba rosulada, estolonifera. Estolones desiguales, rosulados a su vez en el ápice. Roseta principal: 10 cm. de alto. Rosetas laterales: 5--6 cm. de alto. Escapos hasta de 35 cm. Capítulos hemisféricos, 5--6 mm. de diámetro. Flores blanquecinas. Hojas algo espinascentes en el ápice; alt. 800--1250 m. [in Venezuela], orilla de la carretera." They report the common name, "aribái-panáru-kusí".

The ImThurn 33 specimen in the United States National Herbarium is incorrectly inscribed as having been collected by E. Jenman in 1884--1885.

Material of this species has been misidentified and distributed in some herbaria as Eriocaulon sp. or as Paepalanthus schomburgkii Klotzsch.

Additional citations: COLOMBIA: Vaupés: Maguire, Wurdack, & Keith 41862 (N); Schultes, Baker, & Cabrera 18448 (Ss); Schultes & Cabrera 14239 (Ss), 18360 (Re, W--21272131, Z), 18448 (W--2172191). VENEZUELA: Amazonas: Ule 8552 [Herb. Mus. Goeldi 13614] (Bs, K); Wurdack & Adderley 43714 (N, S). Bolívar: Bernardi 2625 (N); Cardona 220 (Ve--18498, W--1693626); Hamann 2893 (Hm), 2894 (Hm); Hertel & Oberwinkler 15297 (Mu); Koyama & Agostini 7245 (N, N, N); López-Palacios 3022 (Ld); B. Maguire 33230 (N); Pannier & Schwabe s.n. [Auyantepui] (Ve); Ruiz-Terán & López-Palacios 11224 (Mi); J. A. Steyermark 75275 (Ss), 94183 (Lw, Ut); Steyermark & Wurdack 25 (N); Vareschi & Foldats 4741 (Ve--40479), 4754 (N). GUYANA: Im-Thurn 33 (W--303488); Maguire & Fanshawe 32240 (N), 32626 (N). SURINAM: Oldenburger, Norda, & Schulz 446 (Ld). BRAZIL: Amazônas: Murça Pires 26 [Herb. IPEAN 15003] (Ld). Goiás: Irwin, Maxwell, & Wasshausen 19220 (Ld, N, N). Pará: W. R. Anderson 11013 (Ld, N); Ducke 11326 (Gl), 11329 (Gl), 11954 (Bs), 14886 (Bs); W. A. Egler 383 (Bs); Egler & Raimundo s.n. [W. A. Egler 1288; Herb. Mus. Goeldi 24335] (Bm); Murça Pires, Black, Wurdack, & Silva 6086 (N). Rondônia: Prance, Forero, Coêlho, Ramos, & Farias 5764 (Ac, Mu, N); Prance, Rodrigues, Ramos, & Farias 8575 (Ld, Mu, N).

SYNGONANTHUS LONGIPES var. PILOSUS Moldenke, Phytologia 31: 27--28. 1975.

Bibliography: Moldenke, Phytologia 31: 27--28 & 386. 1975; Anon., Biol. Abstr. 61: AC1.718. 1976.

Citations: BRAZIL: Mato Grosso: Hatschbach & Kummrow 35034 (Z--type).

SYNGONANTHUS LUNDELLIANUS Moldenke, Phytologia 1: 345--346. 1939.

Synonymy: Eriocaulon lundellianus Moldenke, Phytologia 4: 324, in syn. 1963.

Bibliography: Moldenke, Phytologia 1: 345--346. 1939; Moldenke, Carnegie Inst. Wash. Publ. 522: 144 & 146--147. 1940; Moldenke, Known Geogr. Distrib. Erioc. 4 & 58. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 224. 1947; Moldenke, Alph. List Cit. 3: 777. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 37 & 213. 1949; Moldenke, Phytologia 4: 324. 1953; Standl. & Steyerm., Fieldiana Bot. 24: 378 & 379. 1958; Moldenke, Résumé 43, 290, & 492. 1959; Moldenke, Fifth Summ. 1: 82 (1971) and 2: 505 & 963. 1971; Moldenke, Phytologia 35: 306. 1977.

Hunt reports this species "common on damper pine ridges", at 1500 feet altitude, flowering in March.

Additional citations: BELIZE: Hunt 427 (W).

SYNGONANTHUS MACROCAULON Ruhl. in Engl., Pflanzenreich 13 (4-30): 269—270, fig. 39. 1903.

Synonymy: Syngonanthus anomalus f. glabriusculus Herzog in Fedde, Repert. Spec. Nov. 29: 213, hyponym. 1931. Syngonanthus anomalus f. natans Herzog in Fedde, Repert. Spec. Nov. 29: 214, hyponym. 1931. Syngonanthus anomalus f. natans glabripes Herzog ex Moldenke, Phytologia 31: 407, in syn. 1975.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 2, 18, 269—270, & 293, fig. 39. 1903; Pilger in Engl. & Prantl, Nat. Pflanzenfam. Ergänz. 2, Nachtr. 3 zu 2: 41. 1908; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 418. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 57. 1930; Herzog in Fedde, Repert. Spec. Nov. 29: 213 & 214. 1931; Stapf, Ind. Lond. 6: 248. 1931; Moldenke, Known Geogr. Distrib. Erioc. 5, 18, & 59. 1946; Moldenke, Phytologia 2: 373. 1947; Moldenke, Alph. List Cit. 2: 609 (1948) and 4: 1165. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61, 70, 92, & 213. 1949; Moldenke, Phytologia 4: 324. 1953; Moldenke, Résumé 69, 80, 108, & 492. 1959; Moldenke, Résumé Suppl. 1: 5. 1959; Lindeman & Görts-van Rijn in Pulle & Lanjouw, Fl. Surin. [Meded. Konink. Inst. Trop. 30, Afd. Trop. Prod. 11]: 335 & 337—338. 1968; Moldenke, Fifth Summ. 1: 120, 133, 137, & 175 (1971) and 2: 963. 1971; Moldenke, Phytologia 31: 386 & 407 (1975), 34: 256 (1976), 35: 307 & 316 (1977), 36: 64 (1977), and 37: 87. 1977.

Illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 270, fig. 39. 1903.

This species is based on two collections: (1) Huber 1149 from "bei Cunani in einem Waldsumpf", Pará, Brazil, flowering in October, deposited in the Goeldi Museum herbarium at Belém, and (2) Karsten s.n. from "Villa Vicencio, Llano de S. Martin", Meta, Colombia, deposited in the Vienna herbarium. Ruhland (1903) comments that the "Specimina in Columbia collecta multo brasiliensibus graciliora, in icone nostra illustrata".

Syngonanthus anomalus f. natans is based on Lützelburg 22147 and 23299b in the Munich herbarium, but the latter proves on close examination to represent typical S. anomalus (Körn.) Ruhl., so 22147 should be taken as the lectotype of f. natans; f. glabriusculus and f. natans glabripes are both based on Lützelburg 23008 in the same Munich herbarium.

Recent collectors describe the heads of S. macrocaulon as white. They have found it growing on sandy banks and rooted among rocks in running water, at altitudes of 700—800 feet, in flower in July, August, October, and November, and in fruit in August and November. Egler & Murça Pires refer to it as "locally common", while Murça Pires & Cavalcante report it a common submerged herb in running water.

For some reason not known to me Stapf (1931) cites the Pilger (1908) work as published in "1906". Silveira (1928) cites A. Silveira 440 from Cunani, Pará, Brazil, collected in 1895. Lindeman

& Görts-van Rijn (1968) cite B.W.7113 from Surinam.

Material of S. macrocaulon has been misidentified and distributed in some herbaria as S. gracilis (Bong.) Ruhl., S. huberi Ruhl., and Tonina fluviatilis Aubl. On the other hand, the Killip 34259, distributed as S. macrocaulon, seems better placed as repsenting S. huberi.

Additional citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 18442 (W--2172188, W--2198901, Z). GUYANA: A. C. Smith 2112 (N). SURINAM: Stahel 521 (Ut--44044A). BRAZIL: Amapa: Egler & Murça Pires 47724 (N); Murça Pires & Cavalcante 52413 (N). Amazônas: Lützelburg 22147 [N. Y. Bot. Gard. Type Photo Neg. N.S. 8843] (Mu, N--photo, Z--photo). Pará: Huber 1149 (B--cotype); Lützelburg 23008 [N. Y. Bot. Gard. Type Photo Neg. N.S. 8842] (Mu, N--photo, Z--photo); Murça Pires & Silva 4206 (N).

SYNGONANTHUS MACROLEPIS Alv. Silv., Fl. Serr. Min. 72, pl. 28. 1908.

Bibliography: Alv. Silv., Fl. Serr. Min. 72, pl. 28. 1908; Fedde & Schust in Just, Bot. Jahresber. 46 (2): 5. 1924; Alv. Silv., Fl. Mont. 1: 309--311 & 419, pl. 196 & 196a. 1928; Stapf, Ind. Lond. 6: 248. 1931; A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

Illustrations: Alv. Silv., Fl. Serr. Min. pl. 28. 1908; Alv. Silv., Fl. Mont. 1: pl. 196 & 196a. 1928.

The type of this species was collected by Álvaro da Silveira (no. 378) "In campis uvidis prope Capão Redondo in Serra do Cipó", Minas Gerais, Brazil, in April, 1905, and is deposited in the Silveira herbarium. Silveira (1908) notes that the "Magnitudo bractearum involucrantium capitulorum hujus speciei forsan maxima in genero Syngonantho. Ob eos characteres species valde distincta". Thus far it is known only from the original collection.

Citations: BRAZIL: Minas Gerais: A. Silveira 378 (B--isotype, Z--isotype).

SYNGONANTHUS MARGINATUS Alv. Silv., Fl. Mont. 1: 336--337, pl. 212. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 336--337 & 419, pl. 212. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 324. 1953; Moldenke, Résumé 108 & 492. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 72. 1960; Moldenke, Fifth Summ. 1:

175 (1971) and 2: 964. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 212. 1928.

This species is based on A. Silveira 542 from "In campis arenosis prope Bandeirinhas, Serra do Cipó", Minas Gerais, Brazil, collected in April, 1909, and deposited in the Silveira herbarium. Silveira (1928) says of it: "Ab affine S. heterotricho Alv. Silv. indumento foliorum et colore atque forma bractearum praecipue differt". More recent collectors describe it as an herb to 25 cm. tall, with light-gray heads, and have found it growing on wet campo slopes in an area of high campo slopes, outcrops, and creek margins, at 1400 m. altitude, flowering in February.

Additional citations: BRAZIL: Minas Gerais: Héringer & Castellanos 6101 (Z); Irwin, Maxwell, & Wasshausen 20262 (Ld, N).

SYNGONANTHUS MENDESII Moldenke, Phytologia 3: 312—313. 1950.

Bibliography: Moldenke, Phytologia 3: 312—313. 1950; Moldenke, Phytologia 4: 324. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Mendes Magalhães, Anais V Reun. Anual. Soc. Bot. Bras. 293 & 303. 1956; Moldenke, Résumé 108 & 492. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 72. 1960; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

SYNGONANTHUS MICROCEPHALUS Alv. Silv., Fl. Mont. 1: 378—379, pl. 240. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 378—379 & 419, pl. 240. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 240. 1928.

This species is based on A. Silveira 644 from "In locis siccis arenosisque in Serra do Cabral", Minas Gerais, Brazil, collected in November, 1917, and deposited in the Silveira herbarium. In his text Silveira (1928) refers to "Tabula CCXLI" as illustrative of this species, but the actual plate is labeled "TABULA CCXL" — plate 241 illustrates S. pterophyllus Alv. Silv.

Thus far S. microcephalus is known only from the original collection.

SYNGONANTHUS MICROPUS Alv. Silv., Fl. Mont. 1: 314—315, pl. 199. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 314—315 & 419, pl. 199. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964.

1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1163 & Ind. 28. 1972.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 199. 1928.

This species is based on an Edwall collection from São Paulo, Brazil: "In campis humidis prope Campo Grande, ad Alto da Serra do Cubatão, S. Paulo, Oct. 1892: Gustavo Edwall; n. 1.911 in herb. da Comm. Geog. de S. Paulo; n. 6.630 in herb. do Jardim Bot do Rio de Jan.; n. 419 in herb. Silveira". Thus far it is known only from the original collection. The Angely (1972) reference to it is often dated "1970", the title-page date, but the portion of the work concerned here was not actually published until 1972.

SYNGONANTHUS MINUTIFOLIUS Alv. Silv., Fl. Mont. 1: 351—352, pl. 218. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 351—352 & 419, pl. 218. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 218. 1928.

This species is based on A. Silveira 790 from "In campis arenosis inter Diamantina et Serro", Minas Gerais, Brazil, collected in June, 1925, and deposited in the Silveira herbarium. On page 419 of his text Silveira (1928) gives "Milho Verde" as the type locality. Thus far the species is known only from the original collection.

SYNGONANTHUS MINUTULUS (Steud.) Moldenke, Known Geogr. Distrib. Erioc. 18 & 37, hyponym. 1946; Phytologia 2: 142. 1946.

Synonymy: Eriocaulon pusillum Bong., Mém. Acad. Imp. Dci. St. Pétersb., ser. 6, 1: 634. 1831 [not E. pusillum R. Br., 1810, nor Poepp., 1863, nor Willd., 1841]. Eriocaulon minutulum Steud., Syn. Pl. Glum. 2: [Cyp.] 270. 1855. Paepalanthus pusillus (Bong.) Körn. in Mart., Fl. Bras. 3 (1): 459. 1863. Paepalanthus pusillus Körn. in Mart., Fl. Bras. 3 (1): 459. 1863. Dupatya pusilla (Bong.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya pusilla Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus pusillus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 634. 1831; Bong., Ess. Monog. Erioc. 34. 1831; Bong., Mém. Acad. Imp. Sci. St. Péters., ser. 6, 5: 15, pl. 29. 1839; Steud., Nom. Bot., ed. 2, 1: 585 & 586. 1840; Kunth, Enum. Pl. 3: 577—578 & 614. 1841; D. Dietr., Syn. Pl. 5: 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 270 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 459, 463, 507, & 508. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878 & 879 (1893) and imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 245, 254--255, 286, 287, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 420. 1928; Stapf, Ind. Lond. 3: 91. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 878 & 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 18, 19, 31, 37, 39, & 59. 1946; Moldenke, Phytologia 2: 142 (1946) and 2: 381. 1947; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 324--325. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 108, 281, 290, 291, 327, 352, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 878 & 879 (1960) and imp. 3, 3: 402. 1960; Moldenke, Phytologia 18: 303, 304, & 428. 1969; Moldenke, Fifth Summ. 1: 175 & 485 (1971) and 2: 506, 509, 589, 638, & 964. 1971; Moldenke, Phytologia 30: 118. 1975.

Illustrations: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 5: pl. 29. 1839.

This species is based on an unnumbered L. Riedel collection from the Serra da Lapa, Minas Gerais, Brazil, flowering in November, probably deposited in the Leningrad herbarium. Ruhland (1903) cites this and also Schwacke 8492 from the same state and deposited in the Berlin herbarium. The species has been found in anthesis in March and November.

The original description by Bongard is "acaule; foliis caespitosis vaginis brevioribus linearibus subcanaliculatis curvatis; pedunculis pubescentibus; vaginis laxiusculis....Habitat in Brasilia." Körnicke (1863) comments "Inter affines minimus, bracteis involucrantibus cuneiformibus rigidulis saturate brunneis insignis", citing only the type collection. Silveira (1928) cites A. Silveira 519 from Diamantina.

The Eriocaulon pusillum R. Br., referred to in the synonymy above, is a valid Australian species, while E. pusillum of Poeppig is a synonym of Paepalanthus perpusillus Kunth and that of Willdenow is Eriocaulon microcephalum H.B.K.

Additional citations: BRAZIL: Minas Gerais: Mello Barreto 1046 [Brade 14479; Herb. Jard. Bot. Rio Jan. 28458] (B); Schwacke 8492 (B, B, Z). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

SYNGONANTHUS MULTICAULIS Alv. Silv., Fl. Mont. 1: 380--382, pl. 242. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 380--382 & 419, pl. 242. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 242. 1928.

This species is based on A. Silveira 656 from "In campis siccis inter Serro et Datas, in serra Geral", Minas Gerais, Brazil, collected in June, 1925, and deposited in the Silveira herbarium. On page 419 of his work Silveira (1928) cites "Serro" as the type locality. Also, in his text he refers to "Tabula CCXLIII" as illustrating this species, but theplate is actually the one labeled "TABULA CCXLII" — plate 243 represents S. barbatus Alv. Silv.

Syngonanthus multicaulis is thus far known only from the original collection. Silveira (1928) comments that the "Species a S. pterophylla valde proxima, sed caule hypogeo folioso et foliis pagina superiore pilosis praecipue differt".

SYNGONANTHUS MULTICAULIS var. GLAUCUS Alv. Silv., Fl. Mont. 1: 382 [as "glauca"]. 1928.

Synonymy: Syngonanthus multicaulis var. glauca Alv. Silv., Fl. Mont. 1: 382. 1928. Syngonanthus multicaulis var. glaucescens Alv. Silv. ex Moldenke, Known Geogr. Distrib. Erioc. 59, sphalm. 1946.

Bibliography: Alv. Silv., Fl. Mont. 1: 382 & 419. 1928; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 637 & 964. 1971.

This variety is based on A. Silveira 752 from "In campis siccis arenosisque inter Serro et Datas, in Serra Geral", Minas Gerais, Brazil, collected in June, 1925, and deposited in the Silveira Herbarium. It is know thus far only from the original collection. On page 419 of his work Silveira (1928) gives "Serro" as the actual tyoe locality.

SYNGONANTHUS MULTIPES Alv. Silv., Fl. Mont. 1: 824—826 ["326"], pl. 206. 1928.

Synonymy: Syngonanthus multiceps Alv. Silv. ex Wangerin in Just, Bot. Jahresber. 57 (1): 478, sphalm. 1937.

Bibliography: Alv. Silv., Fl. Mont. 1: 824—826 ["326"] & 419, pl. 206. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 206. 1928.

The type of this species was collected by Álvaro da Silveira "In pratis arenosis in Serra do Cabral", Minas Gerais, Brazil, in May, 1910, and is deposited in the Silveira herbarium. In his original description Silveira (1928) cites "n. 5" as the number of the type collection, but on page 419 of the same work he cites it as "n. 576" -- probably this latter number is meant as a correction of a typographic error on the earlier page. He comments that the species "A S. flavicepite Alv. Silv. cum quo magnem affinitatem habet, capitulis obconicis (non hemisphaericis et basi non applanatis) et colore capitulorum facile distinguitur."

Thus far S. multipes is known only from the original collection.

SYNGONANTHUS NANUS Moldenke, Phytologia 3: 175--176. 1949.

Synonymy: Syngonanthus mamus Moldenke ex Angely, Fl. Paran. 10: 12, sphalm. 1957. Syngonanthus mamus Moldenke, Résumé 352, in syn. 1959.

Bibliography: Moldenke, Phytologia 3: 175--176 (1949) and 4: 325. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Angely, Fl. Paran. 10: 12 & 15 (1957) and 12: 9. 1958; Moldenke, Résumé 108, 352, & 492. 1959; Angely, Fl. Paran. 16: 77 (1960) and 17: 24. 1961; Moldenke, Résumé Suppl. 3: 35. 1962; Angely, Fl. Anal. Paran. 201. 1965; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 637 & 964. 1971.

Although the type specimen of this taxon is inscribed "Ceccatto 118" and it was so cited by me in my 1949 and 1953 works, Angely (1957) cites it as "Gastão Nascimento no. 118.....in herbário do (ex Mus. Par.) hoje Ins. Hist. Nat. no. 3230, Sec. Agr. do Paraná". The species is thus far known only from the original collection.

SYNGONANTHUS NGOWEENSIS H. Lecomte, Bull. Soc. Bot. France 55: 596. 1909.

Bibliography: H. Lecomte, Bull. Soc. Bot. France 55: 595--597. 1909; Prain, Ind. Kew. Suppl. 4, imp. 1, 231. 1913; H. Hess, Bericht. Schweits. Bot. Gesell. 65: 192. 1955; Prain, Ind. Kew. Suppl. 4, imp. 2, 231. 1958; Moldenke, Résumé 140 & 492. 1959; Moldenke, Résumé Suppl. 4: 6 & 7 (1962) and 16: 8. 1968; Moldenke, Fifth Summ. 1: 217 & 233 (1971) and 2: 964. 1971; Lewalle, Bull. Jard. Nat. Belg. 42 [Trav. Univ. Off. Bujumb. Fac. Sci. C.20]: [237]. 1972; Lewalle, Boissiera 24: 88. 1975; Moldenke, Phytologia 31: 388 (1975) and 37: 93. 1977.

This species appears to be based on Lecomte s.n. and Dybowski 117 from Fernand-Vaz, N'Gowe, Guinea. The Lewalle (1909) paper is sometimes cited as "1908" since it was presented at the November 13, 1908, session of the Society, but apparently it was not actually published until 1909 (as attested by the "Index Kewensis").

Recent collectors have encountered this plant in swamps and on damp rock ledges, at 1950 m. altitude, flowering in January, April, and May, and fruiting in January and April. They describe it as 5--10 cm. tall, the leaves in rosettes, the peduncles 10--15 cm. tall, and the flowers white. Lewalle notes that he found it "en tapis sur plusieurs areas".

For Hess' detailed comparisons and discussion of differences between this species as S. poggeanus Ruhl., see under the latter species in this series of notes.

Material has been misidentified and distributed in some herbaria as Paepalanthus wahlbergia Körn., xS. hybridus Moldenke, and S. wahlbergii (Wikstr.) Ruhl. On the other hand, the Lewalle 5938, distributed as S. ngoweensis, actually is S. wahlbergii (Wikstr.) Ruhl.

Citations: GUINEA: Pitot s.n. [29.IV.1949] (An, An, Ld). ZAIRE: Devred 1872 (Mu). BURUNDI: Lewalle 2681 (Ac, Gz), 3939 (Ld), 5855 (Ac, Ld, Ws, Z). ANGOLA: Huila: Welwitsch 2454 (Mu). RHODESIA: H. Wild 1551 [Govt. Herb. Rhodes. 16096] (N).

SYNGONANTHUS NIGER Alv. Silv., Fl. Mont. 1: 331--333. 1928.

Synonymy: Syngonanthus nigrescens Alv. Silv., Fl. Mont. 1: 419, hyponym. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 331--333 & 419. 1928; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Moldenke, Known Geogr. Distrib. Erioc. 18 & 59. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 637 & 964. 1971.

This species is based on A. Silveira 583 from "In campis prope Lagoão et secus margines rivuli Pedra Pintada, in serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. Syngonanthus nigrescens is based on the same type and apparently is merely a substitute or alternative name. Silveira (1928) comments that the "Species capitulis nigrescentibus ab omnibus usque adhuc cognitis facile distinguenda". Thus far it is known only from the original collection.

SYNGONANTHUS NIGRO-ALBUS Alv. Silv., Fl. Mont. 1: 350--351, pl. 222. 1928.

Synonymy: Syngonanthus nigroalbus A. Silveira ex Worsdell, Ind. Lond. Suppl. 2: 426. 1941.

Bibliography: Alv. Silv., Fl. Mont. 1: 350--351, pl. 222. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971; Moldenke, Phytologia 34: 278. 1976.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 222. 1928.

This species is based on A. Silveira 791 from "In campis, locis humosis humidisque, prope Milho Verde", Minas Gerais, Brazil, collected in June, 1925, and deposited in the Silveira herbarium. Thus far the species is known only from the original collection.

SYNGONANTHUS NITENS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 254. 1903.

Synonymy: Eriocaulon nitens Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1831. Paepalanthus nitens (Bong.) Kunth, Enum. Pl. 3: 531. 1841; Malme, Bih. Svensk. Vet.-Akad. Handl. 27 (3), no. 11: 31. 1901. Eriocaulon nitens Kunth ex Steud., Syn. Pl. Glum. 2: [Cyp.] 280--281 & 334. 1855. Paepalanthus nitens Kunth ex Körn. in Mart., Fl. Bras. 3 (1): 279. 1863. Paepalanthus lamprocephalus Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 456 & 457. 1863. Paepalanthus nitens var. α Körn. in Mart., Fl. Bras. 3 (1): 456—458. 1863. Psilocephalus nitens Kunth ex V. A. Pouls., Vidensk. Meddel. Natur. For. Kjøbenh. 40 [ser. 4, 9]: 343. 1888. Dupatya nitens (Bong.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya nitens Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus nitens Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Paepalanthus lamprocephalum Mart. ex Moldenke, Phytologia 4: 326, in syn. 1953. Stachytarpheta nitens Hocking, Excerpt. Bot. A.23: 292, sphalm. 1974.

Bibliography: Bong., Ess. Monog. Erioc. 33. 1831; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 531, 578, 613, & 625. 1841; D. Dietr., Syn. Pl. 5: 262. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 280—281 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 279, 309, 456—458, & 507. 1863; Körn. in Warm., Vidensk. Meddel. Nat. Foren. Kjöbenh. 23: 315. 1871; V. A. Pouls., Vidensk. Meddel. Naturh. For. Kjøbenh. 40 [ser. 4, 9]: 343. 1888; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Malme, Bih. Svensk Vet.-Akad. Handl. 27 (3), no. 11: 31. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 244, 251, 254, 286, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 419. 1928; Herzog in Fedde, Repert. Spec. Nov. 29: 212. 1931; Malme, Phanerog. 3: 10. 1933; J. F. Macbr., Field Mus. Publ. Bot. 13 (363): 491 & 492. 1936; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 19, 30, 34, 37, 38, 50, 51, 57, & 59. 1946; Moldenke, Phytologia 2: 493 & 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 325. 1953; Angely, Fl. Paran. 10: 15. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 108, 117, 281, 290, 326, 341, & 492. 1959; Moldenke, Résumé Suppl. 1: 6. 1959; Soukup, Biota 2: 302. 1959; Angely, Fl. Paran. 16: 77. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 72. 1960; Angely, Fl. Paran. 17: 24. 1961; Eiten in Ferré, Simpos. Sôbre Cerrado 194. 1962; Moldenke, Résumé Suppl. 3: 14 (1962), 11: 5 (1964), and 12: 12. 1965; Angely, Fl. Anal. Paran., ed. 1, 202. 1965; Moldenke, Résumé Suppl. 17: 9. 1968; Moldenke, Phytologia 17: 489 & 490. 1968; Moldenke, Résumé Suppl. 18: 5 & 14. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 148, 149, 159, 161, 170, 174, 175, 184—

187, & 189. 1969; Moldenke, Phytologia 20: 94 & 95. 1970; Moldenke, Fifth Summ. 1: 175, 187, & 483 (1971) and 2: 507, 585, 587, 614, 637, & 964. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1163, map 1784, & Ind. 20 & 28. 1972; Anon., Biol. Abstr. 56 (1): B.A.S.I.C. S.254. 1973; Moldenke, Biol. Abstr. 56: 69. 1973; Moldenke, Phytologia 25: 223 & 230. 1973; Hocking, Excerpt. Bot. A.23: 292. 1974; Moldenke, Phytologia 28: 440 & 463 (1974), 29: 495 (1975), 30: 74, 264, & 330 (1975), 31: 382, 386, 387, 405, & 408 (1975), 34: 258—260, 276, & 278 (1976), 35: 336 (1977), and 36: 66, 72, 75, 76, 78, & 81. 1977.

This typical form of the species is apparently based on L. Riedel 295 from Minas Gerais, Brazil, and deposited in the Leningrad herbarium. Bongard's original (1831) description is "acaule: foliis radicalibus caespitosis vaginis brevioribus linearibus acutis subpilosis; pedunculis caespitosis glabris; vaginis pilosis. Habitat in paludosis arenosis exsiccatis probe os Prados. Floret Junio." The plate 55 which he cites seems never to have been published and probably exists only in the Leningrad herbarium or library.

Körnicke (1863) describes his var. α as having "vaginis patentissimo-pilosis;pedunculis rufidulis", giving Paepalanthus nitens Kunth, P. lamprocephalus Mart. (Martius 895 type), Eriocaulon nitens Bong., and E. maximiliani Mart. (Martius 891 type) as synonyms, and citing Weddell 2039, 2384, & 2442 from Goiás, Weddell 3340 & 3385 from Mato Grosso, Clausen 97 & s.n., Martius 891, 895, & s.n., Sellow s.n., and Stephan s.n. from Minas Gerais, Gardner 2748b, 2964, & 2965 from Piaui, and Riedel 2305 from São Paulo. In his 1871 work he adds Lund s.n. [Batataés, Junio] & s.n. [Franca, Julio] and Warming s.n. [Lagoa Santa]. It should be pointed out that I regard the Eriocaulon maximiliani Mart., which he cites as a synonym, as in part a synonym of S. nitens var. filiformis (Bong.) Ruhl. and in part Paepalanthus hilairei Körn. I regard Weddell 2442, 3340, & 3385 as S. nitens var. erectus Ruhl.

Ruhland (1903) seems to regard S. nitens var. filiformis as the typical form of the species, placing Paepalanthus nitens var. α Körn. and P. lamprocephalus Mart. in its synonymy, but it is not entirely clear to me that this is really his intention.

Macbride (1936) affirms that S. nitens is related to S. gracilis (Bong.), but that in S. gracilis the inflorescence-heads are small, only 3--5 mm. in diameter, while in S. nitens they are 5—8.5 mm. thick. In general this is true. He cites Weberbauer 4328 from Amazonas, Peru, determined by Ruhland, but I have thus far seen no material of this species from Peru. Ruhland, by the way, distinguishes the two species differently: for S. gracilis he says "Bracteae involucrantes capitulus paullo vel duplo superantes idque claudentes", while for S. nitens "Bracteae involucrantes flores aequantes vel eis breviores".

Recent collectors describe S. nitens as growing in cerrado, campo cerrado, marshes, Sphagnum moors, swamps, grassy campos, and marshes in gallery forests, on lake shores, and between tussocks in "pantanal" (wet grassland), at altitudes of 500—2000 m., and have found it in anthesis in January and from May to October and in fruit in May and from August to October.

Malme (1901) cites Regnell III.1802 and Mosén 762 & 763 from Minas Gerais. Kunth (1841) cites Sellow s.n. from "Brasilia meridionalis, prope Barbacena" and comments "An planta vere dioeca? Suppetit frustulum hujus speciei (?) in summitate Serra do S. Antonio lectum vaginis glabratis". Silveira (1928) cites A. Silveira 737 from Lago do Ferro, Minas Gerais, collected in 1924.

It should be mentioned that the Malme (1901) work cited in the bibliography above is sometimes listed as having been published in "1903", but apparently incorrectly so. The Angely (1972) work is often cited as "1970", the title-page date, but was not actually published until 1972.

Clausen 203 is a mixture with Leiothrix curvifolia var. glabrescens Ruhl., while Philcox, Pereira, & Bertoldo 3431 is a mixture with Syngonanthus glandulosus var. epapillosus Moldenke.

Material of typical S. nitens has been misidentified and distributed in some herbaria under the names Eriocaulon maximiliani Schrad., Eriocaulon sp., Syngonanthus gracilis (Bong.) Ruhl., and S. nitens var. filiformis (Bong.) Ruhl. On the other hand, the G. Gardner 2965 and Reitz & Klein 17497, distributed as and in the former case cited by me (1953) as typical S. nitens, are actually better regarded as var. filiformis (Bong.) Ruhl., Argent, Ramos, Richards, & Souza 6462, Hassler 9430, Hatschbach 3191, Herb. Jard. Bot. Belo Horiz. 34293, F. C. Hoehne 6591, Lützelburg 1433, Martius s.n. [ad fluv. S. Franc. prope Salgado, 1818], Mendes Magalhães 416, Riedel 2305, and Stephan s.n. [Congonhas do Campo, 1843] are var. hirtulus Ruhl., Brade 6591, Hatschbach 156, Irwin & Soderstrom 5229, 5824, & 5981, Krieger 1004, and Lützelburg 1519 are var. koernickei Ruhl., and Macedo 3353, Maguire, Murça Pires, Maguire, & Silva 56230 & 56459, and Swallen 9611 are f. pilosus Moldenke.

Additional & emended citations: BRAZIL: Distrito Federal: Andrade 390 [Emmerich 382] (Bd—15508); Héringer 8485/679m (Lw); Sucre 800 (Ac, Ld). Goiás: Andrade 487 [Emmerich 479] (Bd—15505); Héringer 8485 [Herb. Brad. 23116] (Lw); Lützelburg 536 (Mu), 624 (Mu). Mato Grosso: Goldsmith 52 (K), 52a (L); Hatschbach 24344 (Ac), 24615 (Ld, S), 32422 (Ld); Nienstedt 123 (Ac); Philcox, Fereira, & Bertoldo 3431 in part (K); Richards R.475 (Ac, N). Minas Gerais: Andrade 976 [Emmerich 937] (Bd—16656); Arlé s.n. [Carmo do Rio Claro] (Bd—10941); P. Clausen 97 (B), 203 in part (P); Hatschbach 27283 (Ft, S); Martius

895 (B, M); Mosén 763 (P); L. Riedel 295 (B—isotype, Ut—408—isotype), 1032 (B), s.n. [Prope Batataes] (B); Sellow 94 [4955] (B), 272 (B), C.272 (B). Paraná: Hatschbach 19963 (Z); Lindeman & Haas 3067 (Ld); Smith, Klein, & Hatschbach 14787 (W—2451598). Piauí: G. Gardner 2748 bis (W--1440336), 2964 (N, W—936277, W--1066759). São Paulo: Black 51-10978 (Z); Löfgren 150 (P); L. Riedel 1305 (Ut—407). State undetermined: Martius 897 (Mu), s. n. [Prope fluv. Fermozo in confinis prov. Minarum et Bahiensis] (Mu). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B, B).

SYNGONANTHUS NITENS var. ERECTUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 354 [as "erecta"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946.

Synonymy: Syngonanthus nitens var. erecta Ruhl. in Engl., Pflanzenreich 13 (4-30): 254. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 254 & 293. 1903; Malme, Phanerog. 3: 10. 1933; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 325. 1953; Moldenke, Résumé 108, 352, & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 637 & 964, 1971.

Ruhland (1903) describes this variety as "Differt foliis densissime rosulatis, apice recurvatis, latiuscule linearibus, glaberrimis, obtusis, crassis, saepius glaucescenti-viridibus, 1,2—1,3 cm longis, medio 1,5 mm latis; vaginis arctis, costato-striatis, non tortis, pilis patentissimis, glanduliferis, breviter hirtis; pedunculis valde erectis, robustis, nitide stramineis." He bases it on Glaziou 22307 from on campos at Serra Bourada, Goiás, Brazil, and Burchell 7483 from between the city of Goiás and Cavalcante in the same state, both deposited in the Berlin herbarium.

Hatschbach has encountered this plant on "campo umido, borda da chapada". It has been found in anthesis in July and August, in fruit in July.

Additional citations: BRAZIL: Goiás: Glaziou 22307 (Mi—cotype, W—1112539—cotype); Hatschbach 38781 (Z).

SYNGONANTHUS NITENS var. FILIFORMIS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 254. 1903.

Synonymy: Eriocaulon filiforme Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 634. 1831. Paepalanthus nitens var. γ Körn. in Mart., Fl. Bras. 3 (1): 456--457. 1863. Eriocaulon maximiliani Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 457, in syn., in part. 1863 [not E. maximiliani Bong., 1831, nor Schrad., 1824, nor (Schrad.) Bong., 1841]. Eriocaulon filiformis Bong. ex Moldenke, N. Am. Fl. 19 (1): 22, sphalm. 1937 [not E. filiformis Raf., 1832].

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 634. 1831; Bong., Ess. Monog. Erioc. 33--34. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 577--578 & 613. 1841; D. Dietr., Syn. Pl. 5: 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 280 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 456--457. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 195, 254, 285, 286, & 293. 1903; Moldenke, N. Am. Fl. 19 (1): 22. 1937; Moldenke, Phytologia 1: 312. 1939; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 878. 1946; Moldenke, Known Geogr. Distrib. Erioc. 19, 34, 37, 50, 51, 57, & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 325--326. 1953; Moldenke, Résumé 108, 117, 288--290, 326, 351, & 492. 1959; Moldenke, Résumé Suppl. 1: 6. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 878. 1960; Renné, Levant. Herb. Inst. Agron. Minas 72. 1960; Moldenke, Résumé Suppl. 12: 12 (1965) and 17: 9. 1968; Moldenke, Phytologia 20: 95. 1970; Moldenke, Fifth Summ. 1: 175 & 187 (1971) and 2: 500, 504, 505, 587, 636, 638, & 964. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1163 & Ind. 28. 1972; Moldenke, Phytologia 29: 495 (1975) and 30: 330. 1975.

Bongard's original (1831) description of this taxon is "acaule; foliis vaginis brevioribus, confertis patenti-diffusis lanceolatis apice pubescentibus; pedunculis longissimis filiformibus spiraliter tortis glabris; vaginis pilosis. Tab. LIII. Habitat in paludibus Serra da Lapa. Floret Novembri. Obs. Variat pedunculis vix pollicem excedentibus". It is based on L. Riedel 1032 in the Leningrad herbarium. The plate 53, cited by Bongard, apparently never was actually published and probably exists only in the Leningrad library or herbarium.

Körnicke (1863) describes his Paepalanthus nitens var. γ as having "vaginis glabris vel sparse patentissimo-pilosis; pedunculis gracillimis", citing Riedel 1032 and Sellow s.n. from Minas Gerais.

Ruhland (1903) says of the variety: "Differt vaginis patenti-puberulis, dein glabriusculis; foliis supra sparsissime pilosulis", citing G. Gardner 2965 from Pernambuco and A. Silveira s.n. [Herb. Comm. Geogr. & Geol. 2335] and Ule 3158 from Minas Gerais, and commenting that it occurs "ferner in Matto Grosso, São Paulo und Goyaz".

Recent collectors describe the plant as having its leaves small, shorter than the sheaths, pubescent to glabrous, the peduncles weak. They have found it growing in damp places, marshes, wet campos, and "brejo" (sedge meadow), at 900 m. altitude, flowering from August to December, and fruiting in October and December. Hatschbach encountered it in "brejo, borda da chapada, solo arenoso".

The Eriocaulon filiformis Raf., referred to in the synonymy above, is a synonym of E. compressum Lam., while E. maximiliani Bong. is a synonym of Paepalanthus hilairei Körn. and the homonym credited to Schrader and to "(Schrad.) Bong." belongs in the synonymy of P. ramosus (Wikstr.) Kunth. Eriocaulon maximiliani Mart. is in part Syngonanthus nitens var. filiformis and in part Paepalanthus hilairei. Jackson (1893) reduces it to the synonymy of typical S. nitens.

It should perhaps be stated here again that the Angely (1972) work cited in the bibliography above is sometimes cited as "1970", the title-page date, but was not actually published until 1972.

Material of S. nitens var. filiformis has been misidentified and distributed in some herbaria under the designations Paepalanthus nitens Kunth, P. nitens var. α Körn., Syngonanthus nitens (Bong.) Ruhl., and S. nitens var. koernickei Ruhl. In fact, the G. Gardner 2965, cited below, was erroneously cited by me in 1953 as typical S. nitens.

On the other hand, the Hatschbach 19963, distributed as S. nitens var. filiformis, is typical S. nitens (Bong.) Ruhl., while Martius s.n. [Prope Contendas et in Serra do S. Antonio, Jul. 1818] and s.n. [Ad fluv. S. Franc. prope Salgado, 1818] are var. hirtulus Ruhl. and Sellow C.271 is var. koernickei Ruhl.

Additional citations: BRAZIL: Goiás: Hatschbach 39024 (Ld); Macedo 3353 (S); Smith & Macedo 4693 (W--2248221). Minas Gerais: L. Riedel 1032 [N. Y. Bot. Gard. Type Photos N.S. 8833] (Mu--isotype, N--photo of isotype, Ut--409--isotype, Z--photo of isotype). Paraná: Hatschbach 8488 (Z); Reitz & Klein 17497 (Ac, N). Piauí: G. Gardner 2965 (B, N, W--936279). State undetermined: Löfgren 1108 (P). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

SYNGONANTHUS NITENS var. HIRTULUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 254 [as "hirtula"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946.

Synonymy: Syngonanthus nitens var. hirtula Ruhl. in Engl., Pflanzenreich 13 (4-30): 254. 1903. Paepalanthus strictissimus Mart. ex Moldenke, Phytologia 31: 405, in syn. 1975.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 254 & 293. 1903; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 326. 1953; Moldenke, Résumé 108, 352, & 492. 1959; Eiten in Ferré, Simpos. Sôbre Cerrado 194. 1962; Moldenke, Résumé Suppl. 3: 14 (1962), 11: 5 (1964), and 18: 5. 1969; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 637 & 964. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1163 & Ind. 28. 1972; Moldenke, Phytologia 28: 440 (1974), 30: 264 (1975), 31: 386, 387, & 405 (1975), and 36: 75. 1977.

Ruhland (1903) describes this taxon as "Differt a varietate praecedenti (cui proxima) [var. erectus Ruhl.] foliis non recurvis, diffuso-rarius rosulato-caespitosis, supra pilis brevibus patentibus, rigidulis puberulis; pilis vaginarum plerumque eglandulosis; pedunculis gracillimis", citing Glaziou 22304 from

"Cassú bei Uberaba, auf Campos" and Glaziou 22306 from "Abbade, bei Meia Ponte, auf Campos", Goiás, Brazil, as cotypes, deposited in the Berlin herbarium. Macbride photographed a duplicate of Glaziou 22304 in the Copenhagen herbarium as his type photograph number 22290. Eiten (1962) cites Eiten & Eiten 2350.

Recent collectors describe the inflorescence-heads of this plant as "gray-white". They have found it growing in sandy soil, at the margins of corrego, in brejo (sedge meadow), on slight slopes of river plains, in the water of swamps, and between tussocks on wet pantanal grassland, at altitudes of 700—1000 m., flowering in April and from June to October, and fruiting from August to October. Irwin and his associates report it "locally common, forming dense stands among grasses in cerrado"; Mimura says that it is an "erva, capítulo 7 mm. de diâm., pétalas branco-argênteas.....Terrena brejoso e aberto". Hatschbach 3191 is very immature.

The cheironymous name, Paepalanthus strictissimus, is apparently based on Martius s.n. [Cachoeira do Campo, April] in the Munich herbarium.

The Angely (1972) work cited in the bibliography above is sometimes cited as "1970", the title-page date, but was not actually issued until two years later.

Material of this variety has been misidentified and distributed in some herbaria under the designations, Paepalanthus nitens var. α Körn., Syngonanthus gracilis Ruhl., S. kuhlmannii Moldenke, S. nitens Ruhl., and S. nitens var. filiformis (Bong.) Ruhl.

Additional citations: BRAZIL: Distrito Federal: Irwin & Soderstrom 5981 (Ac, N); Murça Pires, Silva, & Souza 9627 (Ld, Z). Goiás: Glaziou 22304 [Macbride photos 22290] (N—photo of cotype, W--photo of cotype); Hatschbach 34590 (Ld); Lützelburg 1433 (Mu). Mato Grosso: Argent, Ramos, Richards, & Souza 6462 (Ld, N); Hatschbach 32343 (Ld). Minas Gerais: Andrade 1011 [Emmerich 972] (Bd--16654); Hatschbach 30186 (Ld); Héringer 8540/734 (Z); Martius s.n. [Prope Contendas et in Serra do S. Antonio, Jul. 1818] (Mu), s.n. [Ad fluv. S. Franc. prope Salgado, 1818] (Mu), s.n. [Cachoeira do Campo, April] (Mu); Mendes Magalhães 416 [Herb. Jard. Bot. Belo Horiz. 34293] (N); Stephan s.n. [Congonhas do Campo, 1843] (N). Paraná: Hatschbach 3191 (Z). São Paulo: Eiten & Eiten 2350 (N); F. C. Hoehne 6591 (N); Mimura 497 (N, W—2555594); L. Riedel 2305 (B, B, Mu). PARAGUAY: Hassler 9430 (Bl—83479, Ca—930106, N, V—7008).

SYNGONANTHUS NITENS var. KOERNICKEI Ruhl. in Engl., Pflanzenreich 13 (4-30): 254. 1903.

Synonymy: Paepalanthus nitens var. β Körn. in Mart., Fl. Bras. 36 (1): 457 & 458. 1863. Syngonanthus nitens var. koernickeana Ruhl. ex Alv. Silv., Fl. Mont. 1: 419. 1928. Syngonanthus nitens var. köernickei Ruhl. ex Angely, Fl. Anal. Paran., ed. 1, 202, sphalm. 1965.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 456—458. 1863; Ruhl. in Engl., Pflanzenreich 13 (4-30): 254 & 293. 1903; Alv. Silv., Fl. Mont. 1: 419. 1928; Moldenke, Known Geogr. Distrib. Erioc. 19, 51, & 59. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 326. 1953; Angely, Fl. Paran. 10: 15. 1957; Moldenke, Résumé 108, 117, 326, 352, & 492. 1959; Angely, Fl. Paran. 16: 77 (1960) and 17: 24. 1961; Angely, Fl. Anal. Paran., ed. 1, 202. 1965; Moldenke, Résumé Suppl. 18: 14. 1969; Moldenke, Fifth Summ. 1: 175 & 187 (1971) and 2: 587, 637, 964, & 968. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 1163 & Ind. 28. 1972. [to be continued]

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NOTES ON NEW AND NOTEWORTHY PLANTS. CIV

Harold N. Moldenke

SYNGONANTHUS TENUIS var. MINOR Moldenke, var. nov.

Haec varietas a forma typica speciei statura humilior pedunculis 4—8 cm. altis capitulis minoribus recedit.

This variety differs from the typical form of the species in its lower stature, the peduncles only 4—8 cm. long, and the smaller heads.

The type of the form was collected by Julian A. Steyermark, G. C. K. Dunsterville, and E. Dunsterville (no. 113217) at "cumbre de Cerro Guaiquinima, Salto del Río Szczerbanari (Río Carapo), 1—2 km. río arriba del Salto Szczerbanari, lat. 5°44'4" N., long. 63°31'8" W., parte central del cerro", at 750 m. altitude, Bolívar, Venezuela, between January 20 and 25, 1977, and is deposited in my personal herbarium.

VERBENA RIGIDA f. ALBA (Trivetts) Moldenke, stat. nov.

Verbena venosa alba Trivetts, Cat. Suppl. 1933 Novelty List 6. 1933.

VERBENA RIGIDA f. LILACINA (Benary & Bodger) Moldenke, stat. nov.

Verbena venosa lilacina Benard & Bodger ex Harrow, Journ. Roy. Hort. Soc. 61: 401. 1935.

VITEX PEDUNCULARIS f. juv. ROXBURGHIANA (C. B. Clarke) Moldenke, stat. nov.

Vitex peduncularis var. _roxburghiana_ C. B. Clarke in Hook. f., Fl. Brit. India 4: 587. 1885.

Alma L. Moldenke

"THOMAS JOHNSON: Botanical Journeys in Kent and Hampstead" edited by J. S. L. Gilmour, ix & 147 pp., illus., The Hunt Botanical Library, Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213. 1972. $39.50.

This gem is "A Facsimile reprint with Introduction and Translation of his Iter Plantarum 1629 [and] Descriptio Itineris Plantarum 1632", the third in the Hunt Facsimile Series. There seem to be only two copies of the former and five copies of the latter extant. They record "the first separate accounts of botanical journeys in Britain and as such merit a place of honour in the bibliography of British botany."

This appreciative study not only reproduces the original Latin texts followed by their English translations by Canon Raven, but also adds present day scientific names in brackets after the pre-Linnean ones listed, bibliography of these works, appendices with additions and corrections and maps (1) of southeast England showing the County of Kent and the contiguous Borough of Hampstead, (2) fold-out of North Kent (1596) showing the routes in red and blue arrows of Johnson's journeys with a comparable modern map in matching position below, and (3) fold-out of Hampstead 1746 with Johnson's route marked in red and an adjacent matching modern map of Hampstead. The index includes over 700 names of a few animals, lower plants and mainly of the higher plants.

The publication certainly serves as a model par excellence for other publishers planning facsimile reproductions of other worthwhile works of limited access. It is beautifully prepared.

"BIOENERGETIK BEI PFLANZEN" by Wolfgang Wiessner, 224 pp., illus., card of abbreviations & symbols, & 6 fold-in charts, Veb. Gustav Fischer Verlag, Jena 69, Germany or D.D.R. 1975. 31 DM. paperbound.

In this "Bausteine der Modernen Physiologie" series, this is an excellent text covering biochemistry and biophysics with emphasis on energy transport and release. Much involves all forms of life; some because of the unique photosynthetic process involves only green plants and photosynthetic bacteria.

To benefit from this fine study a reading knowledge of straightforwardly expressed German, some basic biology and some chemistry are needed. The diagrams used in the text are particularly good and diffent from those repeatedly used in U.S.A. texts. The six fold-in charts can be removed and used side by side with various pertinent pages of the text. Libraries may have problems keeping these assorted parts together with the main body of the text.

"ENDANGERED PLANT SPECIES OF THE WORLD AND THEIR ENDANGERED HABITATS: A Selected Bibliography" compiled by C. R. Long & M. A. Miasek, 17 pp., for the Council of Planning Librarians, P. O. Box 229, Monticello, Illinois 61856. 1977. $1.50 paperbound.

This Exchange Bibliography No. 1299 has been prepared by the director and a research librarian of the New York Botanical Garden Library happily "to document world-wide efforts to list endangered plant species and their special habitats" so that interested (or to be interested) members of the public may have ready access to well over 200 scientifically prepared articles and books that could lead in saving these treasures in our earthly environment.

This publication should prove a time-saving and/or information boon to librarians and teachers in school and public libraries.

It is curious to note that Reveal's two papers on this subject in PHYTOLOGIA (1976, 1977) are not included, nor any of the scores of papers by Degener, a modern "voice crying in the wilderness" of Hawaii!

"HANDBOOK OF THE BIRDS OF INDIA AND PAKISTAN — Together with Those of Nepal, Sikkim, Bhutan and Ceylon", Volume 7, by Sálim Ali & S. Dillon Ripley, 236 pp., illus., Oxford University Press, London W.1, Bombay, & New York, N. Y. 10016. 1972 [1973]. $17.50.

This Volume 7 presents in Order Passeriformes, Family Muscicapidae, the subfamilies of Babblers, Flycatchers and Monarch Flycatchers with synopsis numbers 1272—1470 and fine color plates 73—83 illustrating 117 forms

After keys to species and subspecies the text provides concisely for each bird nomenclatural synonymy, common name(s), distribution along with maps, habits, breeding, nest, diet, voice and/or calls, size, migration, appearance, food, and museum diagnosis.

This fine publication is sponsored by the Bombay Natural History Society.

"FLORA OF WEST PAKISTAN No. 55 BRASSICACEAE" by S. M. H. Jafri, i & 309 pp., illus., Department of Botany, University of Karachi and Stewart Herbarium, Gordon College, Rawalpindi, Pakistan. 1973 [1974].

Even though this large, mainly herbaceous crucifer family with ca. 350 genera and with ca. 3,000 species is predominantly temperate and boreal in distribution, 92 genera and ca. 250 species are reported from the districts of Pakistan. This number includes 5 genera and 14 species known from cultivation only for their oil-producing seeds. Taxonomically the author tends to follow O. E. Schulz in Engler & Prantl, but sees the need for a "revaluation of tribes and subtribes and above all generic concepts in certain cases". There are 5 full-page tables illustrating the fruits in each of 5 tribes and 36 full-page figures with drawings of a few specimens on each.

"HOW TO GROW ANNUALS" by Ann Roe Robbins, Revised Edition, viii & 297 pp., illus., Dover Publications, Inc., New York, N. Y. 10014. 1977. $3.50 paperbound.

The progenitor of this helpful, completely revised work was published under the same title in 1949 by the Macmillan Company. The author still maintains her happy enthusiasm for the successful cultivation of annual garden flowers. Of at least 150 prospects she has chosen 25, discussing for each its history, description, classification, recommended cultivars and hybrids, culture, planting and cultivation. Each is illustrated by L. J. Robbins. The family name for Verbena, one of the chosen genera, is misspelled.

An annotated list of additional annual flowers is given. Spring and fall frost zone lines are given on U.S.A. maps. An appendix lists annuals classified by color, by special habitats, for fragrance, according to size, as climbers, etc.

The first edition was very good; this one is even better.

"LILLY ON DOLPHINS: Humans of the Sea" by John Cunningham Lilly, xviii & 500 pp., illus. with 40 plates. Anchor Press of Doubleday, Garden City, New York 11530. 1975. $3.50 paperbound.

This book is a combination and republication of three books — "Man and Dolphin" 1961, "The Dolphin in History" 1962-3 and "The Mind of the Dolphin" 1967 — and two scientific papers — "Communication with Extraterrestrial Intelligence" 1966 and "Reprogramming of the Sonic Output of the Dolphin: Sonic Burst Count Matching" 1968. There is also a new introduction.

The author reports the detailed studies on "interspecies" human-dolphin and dolphin-human education planned by the author's Communication Research Institute. The photographs, the responses and the interpretations of them are all very interesting. Dr. Lilly and his followers believe that within a few years "the human species will establish communication with another species; nonhuman, alien, possibly extraterrestrial, more probably marine; but definitely highly intelligent, perhaps even intellectual.... If and when interspecies contact is made, it may be used as a force for peace or as further aid to warfare."

"WEEDS AND PLANTS INTRODUCED INTO THE UNITED STATES: A Bibliography" compiled by Fred Strum, 11 pp., unnumbered, New York Botanical Garden & its Cary Arboretum, Bronx Park, New York, N. Y. 10458. 1975. 50 ¢ paperbound.

"This bibliography consists primarily of citations for 'weeds' that were introduced into the United States by the colonial settlers, other persons and by accident. The word 'weed' is also used here to mean herbs and other plants that were originally cultivated in gardens, but escaped and spread indiscriminately."

Some 73 sources of information are listed under (A) Journal and magazine articles, (B) Yearbooks, and (C) Books first for weeds and then for other introduced vegetation. Public, school, and garden librarians could find that this compilation offers easy access to answers to often asked questions. They should not be "turned off" by the unbotanical expression "weeds and plants" in the title and the misspelled word in the very first line.

"NITROGEN FIXATION IN BACTERIA AND HIGHER PLANTS" by Richard C. Burns & Ralph W. F. Hardy, x & 189 pp., illus., Springer-Verlag, Heidelberg, Berlin, & New York, N. Y. 10010. 1975. $25.80.

This useful survey of the development of research on N_2-fixation is published as Volume 21 in the Molecular Biology, Biochemistry and Biophysics Series.

"The term diazotroph is introduced here and defined as any N_2-fixing organism or symbiotic association". Part I of three chapters describes and classifies these diazotrophs including 18-41 genera of bacteria and 23 genera of blue-green algae, free-living or even in loose associative symbioses in phylloplane or in rhizophere. It also treats the diazotrophs involved in obligatory symbioses in alder-type root nodules reportec from 110 species in 14 genera and in legume-type root nodules reported from well over a thousand species in about 700 genera. These legume root nodule symbioses with Rhizobium are generally regarded as the most recent evolutionary development of N_2-fixation and the most intimate because neither nitrogenase nor leghemoglobin (a heme protein unique to legume nodules, red colored, probably O_2 carrying) can be synthesized by the symbionts independently.

Part II of five chapters presents and evaluates the recent biochemical and biophysical experiments. There are some particularly interesting diagrams. The bibliography consists of 752 references. The family name for the legumes is misspelled. The plural forms, rhizobia and clostridia, are capitalized and italicized as generic names. In this paragraph what is mentioned in the first three sentences is significantly important, but that in the latter two is just minutia.

"TROPICAL GRAZING LANDS: Communities and Constituent Species" by Robert Orr Whyte, xii & 220 pp., illus., Dr. W. Junk b.v., Publishers, The Hague. 1974. Dutch Guilders 40, paperbound.

This book, limited to the intertropical zones, is basic in its approach to vegetational ecology as a global science with practical application restricted to specific biological and socio-economic habitats. Its chapters deal with the evolution of grass covers and replacing them, assessing resources, succession, ecological management, adding legumes to sward (which is so much easier to do in temperate areas) for soil crop enrichment, other vegetation, genetic evolution and resources. A very detailed bibliography, arranged by chapter topics, is given, as well as some fine charts, tables and maps.

"A REVISED HANDBOOK TO THE FLORA OF CEYLON" Volume One, Part Two: Moraceae by E. J. H. Corner, pp. 111—165, illus., Dipterocarpaceae by P. S. Ashton, 166—196. University of Sri Lanka, Peradeniya, Sri Lanka. 1977. Paperbound.

This study is being published serially as family manuscripts and printing arrangements are readied under the editorship of Prof. M. D. Dassanayake of the University. For the Moraceae Dr. Corner treats 8 genera with 33 species including 5 endemics and one genus and species introduced. Because of the great variability, as in Ficus, the author (1962) treats taxonomic divisions broadly. In the Dipterocarpaceae Dr. Asshton records "45 species in Ceylon, all but one endemic; confined mainly to the wet zone."

I wonder about the lasting quality of the paper upon which these studies are printed.

"FLORA OF ECUADOR — ONAGRACEAE" by Philip A. Munz, 46 pp., Opera Botanica Ser. B No. 3, edited by Gunnar Harling & Bengt Sparre, Distributed by C. W. K. Gleerup, Lund, Sweden. 1974. Sw.Kr. 35 paperbound.

This Flora of Ecuador project is sponsored by the Swedish Natural Science Research Council. In this country, exclusive of the Galapagos Islands, the evening-primrose family is represented by the following described and keyed 4 genera: Epilobium with 3 species, Fuchsia with 19 species, Ludwigia with 15 species, and Oenothera with 7 species. Under Fuchsia hybrida Hort. ex Vilmorin it is stated that "many strains of garden fuchsias, in a wide variety of colours and which arealmost universally hybrid.... are said by Bailey (Hortus, 264. 1930) to be probably of hybrid derivation from forms of F. magellanica and F. fulgens."

This study is very carefully prepared and presented. The printing and paper are both of first quality.

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HELP

Save the Dwindling Endemic Flora of the Hawaiian Islands at Least as Herbarium Specimens for Museums of the World

Otto Degener

Though this disturbing article was submitted to a local periodical for publication February 27, 1977, it was returned as unsuitable for printing July 26. Disappointed, I here submit it for the more international readers of Phytologia. As an addendum, I wish to mention a release received July 21 from the State of Hawaii's Department of Land and Natural Resources.

Our older executives and legislators, usually the product of schools concentrating on the Three Rs and ignoring the teaching of Biology, hardly realize that the intelligent World about us is horrified by our bull-in-the-china-shop attitude toward the outstanding biological treasures Nature has provided for us. These are an ever increasingly important magnet for attracting wealthy tourists and scientists to our shores. So I was not surprised when I received a request dated February 10, 1977 from E.H. Rapoport, Fundacion Bariloehe, Rio de Negro, Argentina for information about the present status of our native flora and the name, date of introduction and extent of each of our exotic plants - especially our pernicious weeds. Though the task is impossible because of its enormity, I am mailing him with this, my present report, articles by Honolulu Star-Bulletin Conservation Editor Whitten appearing 8/22/68 and 2/21/77 concerning Clidemia hirta (L.) D. Don or Koster's Curse, a member of the Melastomataceae.

The late Dr. Harold Lyon, a botanist by training and an efficient Director of the Hawaiian Sugar Planters' Experiment Station in Honolulu, was a powerful man with a strong, persuasive personality. He was convinced that our uplands should become a thick tangle of plants to increase by fog drip and rainfall water for irrigating the lowland sugarcane fields. Employees of the Station, such as Fred Hadden, were instructed that wherever they might travel, to bring seeds and other propagules back to the Islands. He was particularly interested in banyans and strangler figs of all kinds, the late Dave Fullaway concentrating on their study and becoming an expert on the peculiar wasps effecting their pollination. Dr. Lyon favored these figs, he told me to my horror, because the plants had no timber value and hence jungles consisting of them would never succumb to the lumberman's ax but catch water undisturbed for ever. Many of such plants were grown in the Station's nursery in Wahiawa, Island of Oahu, now a State Botanical Garden.

One of the exotics in Wahiawa was Clidemia hirta, carefully grown in tins under the supervision of Forester George McEldowney and staff. Being interested solely in endemic plants and the animals that depend on them for food and shelter, I feebly protested in the late '40s the planting of the Clidemia seedlings in the Pupukea-Kahuku area of Oahu where I was spending so many days gleaning its endemic riches for permanent preservation in the museums of the World. My unheeded protest was countered by Lyon's remark that the species was particularly promising as, similar to lantana, its seeds would be widely disseminated by birds like the dove and mynah.

I had collected this tropical American shrub of the Melastome Family while Botanist of the Anne Archbold Expedition to Fiji in 1940, my voucher specimen being preserved in Harvard's Arnold Arboretum. It had become such a pernicious weed in Fiji that it was known there as Koster's (not Coster's) Curse, in memory of the reckless wretch who had foolishly introduced it. It was not only a costly weed in pastures, plantations and gardens; but a scourge in the forest by crowding out and exterminating - and that means for ever - the endemic flora. It is briefly illustrated in Hosaka & Thistle's "Noxious Plants of Hawaiian Ranges" in 1954; listed by Degener & Degener in their leaflet of plants to be studied along the Poamaho Trail of Oahu, Aug. 27, 1961 by members of the Tenth Pacific Science Congress; and figured in color by Merlin in his "Hawaiian Forest Plants" in 1976.

Though influential in the spread of Clidemia hirta on Oahu, It is patently unjust to blame Dr. Lyon for the introduction of this noxious weed to the Islands. Had he done so, he certainly would have mentioned the fact in his meticulously kept file of introduced exotics long housed in the Station Library on Keeaumoku Street, Honolulu. Though search for this valuable file at the Lyon Arboretum was futile, I was delighted to learn that retired Forester L.W. Bryan of Kailua-Kona, Island of Hawaii, owns a partial copy that he had made of it a score years ago. His perusal for me of it shows no mention of any Clidemia.That it should have been mentioned in the lost portion is pure conjecture.

Even though insects have been introduced for biological control, such as a moth caterpillar that skeletonizes the leaves, the scourge, disseminated mainly by birds and feral pigs, is spreading to some of the other islands presumably by the vector man on hiking boots and camping gear.

For additional Clidemia information, including sixty references, consult L.L. Wester & H.B. Wood, Dept. Geography, Univ. Hawaii.

Though harmful to Hawaiian Biology with his continuous introduction of some of the most vigorous and harmful weeds from the far corners of the World to help rush our endemic biota to extinction, Dr. Lyon was an efficient, conscientious "sugar" executive, a position for which he was employed; and one of the great benefactors to local horticulture. He not only introduced many plants of great interest and beauty to our gardens and condominium lanai; but established andor materially helped Foster Botanical Garden, Wahiawa Botanical Garden, and the University of Hawaii's Lyon Arboretum, all on the Island of Oahu where tourists eager to see the real Hawaii presently congregate.

But why do we not learn from experience? Recently I read in the local newspaper that a would-be benefactor, apparently a restaurateur and not a botanist, is introducing a Hebe (incorrectly identified in the article) to the Islands because it is so aggressive that it will cover the junk piles, discarded cars and waste places about Honolulu with greenery. This "Down Under" exotic may be a two-edged sword as it may likewise smother with greenery our ornamentals, garden hedges, papaya trees, plantations and ultimately our hard-pressed endemics. Instead of opening up another Pandora's box of expensive problems, should not Beach's Blunder be extirpated before it reseeds itself and emulates Koster's Curse? Federal Law wisely discourages the introduction of exotics - was the Law innocently ignored?

The frightening result of more recently fallaceous thinking of a few individuals endangers the sanctity of our two National Parks, truly Cities of Refuge for endemics peculiar to large areas of the Islands of Hawaii and Maui. They maintain that exotic weeds now fill niches that always have been empty of natives. Even were this true, such weed patches would be foci for the continuous infection of unspoiled primeval surrounding regions. Exotics, for the most part free of the fungi and insects that plague and control their spread in their native home, compete for lebensraum at the expense of endemics having endemic fungi and insects feeding upon them.

Although the release from the State's Department of Land and Natural Resources mentioned above maintains that a forest products industry could "provide some 800 jobs in rural areas and a net cash flow to landowners in the State of $4 million annually," it ignores the costly effect on the lucrative tourist industry; the biological research programs supported by lucrative grants-in-aid; and, in a Biblical sense people can understand, the Sin of exterminating God's endemic Creations unique to the Hawaiian Islands.

Reading further, we learn that "A target of 200,000 acres, equivalent to 10 percent of Hawaii's forest lands, may ultimately be a part of our industrial forest resource base." This approaches the area of Molokai and Niihau combined! The present craze appears to be for "queensland maple, toona, and some eucalyptus." I have noted that pines are likewise favored particularly in the Kona District of Hawaii. Even a lay person knows that a planting of Eucalyptus and Pinus, with their fallen, resinous leaves and needles, produces a surrounding area devoid of a healthy understory of duff producing water-holding underbrush harboring endemic birds and other endemic animals. Today, a casual hour's flight by helicopter above 5,000 feet ground level will disclose numerous, extensive bulldozed and clear-cut areas in midst of the remnant native forests where specific endemics were flourishing in small circumscribed ecological niches. Trees even now are being harvested as "Wood chips for pulp or fuel," and thus sold to countries in the Orient via foreign bottoms - we now lack a merchant marine - which wisely prefer to sacrifice our forests to their own. What ferocious, uneducated Islanders we must be in contrast to refined, intelligent Mainlanders who went so far - too far I believe - to hold up the construction along the St. John River of the one and three tenths billion ($1,300,000,000) Dickey-Lincoln hydroelectric project because the last known station of the Furbush lousewort, an endangered Maine snapdragon, was in jeopardy!

With the imminent decline of the sugarcane and pineapple plantations, there is room for a lumber industry on abandoned "sugar" and "pine" lands at lower elevations. This is especially convincing since August 1977 when local newspapers admonished us to reduce our water usage voluntarily 10% or it shall become mandatory. I find no logic for wiping out our remaining superb native watershed forests with their endemic biota as has been done, for example, on the privately owned, once-fascinating Island of Lanai by bulldozing parallel strips through it and planting rows of exotic Pinus! Expressed differently, it is replacement of a verdant, biologically almost unknown forest that is far more valuable intellectually than the entire surface of moon and mars with a monotonous stand of "weed trees" with no more interest to Man than how many boardfeet or tons of woodchips they will produce in 30-60 years.

The above complaint is like futile howling in the wilderness. We should be realistic and learn from History: Just as drunken orgies during Prohibition Days were not ended by the Volstead Act, so am I convinced conservation laws and regulations will not prevent the imminent extermination of most Hawaiian endemics by exotic weeds and misplaced industries. This annihilation being inevitable by illicit or legal means, botanists - and zoologists should emulate them - of the World should at least preserve Hawaiian specimens NOW to add to museum collections where they can be studied by appreciative future generations.

In summary, I implore colleagues to come,

HELP
SAVE THE DWINDLING ENDEMIC FLORA OF THE HAWAIIAN ISLANDS
AT LEAST AS HERBARIUM SPECIMENS FOR MUSEUMS OF THE WORLD

NEW SPECIES OF MALVACEAE FROM MEXICO AND BRAZIL

Paul A. Fryxell
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The ongoing activities of plant collectors continue to bring to light previously unrecognized and undescribed species, especially from tropical regions, and these discoveries continue to enlarge our understanding of the flora of these regions. Twelve new species in six genera of the Malvaceae are described below and are related to other members of their respective genera.

1. Abutilon pinkavae Fryxell, sp. nov.

Abutilon caulibus gracilibus erectis, saepe sine pilis stellatis; laminis foliorum parvis (2-4 cm longis), concoloribus; corollis aurantiacis et stigmatibus marroninis; mericarpiis intus parce stellato-pubescentibus, apice spinescentibus (non tantummodo acuminatis), 2-spermis ut videtur.

Erect or spreading, branched subshrub, 0.5 m tall. Stems green when young becoming straw-colored, terete, slender, covered with multicellular (glandular) hairs 0.1-0.5 mm long, occasionally intermixed with simple hairs 1-2 mm long and rarely with a few stellate hairs, glabrate in age. Leaf blades commonly 2 cm long, 1.5 cm wide (rarely to 4.0 cm long, 3.5 cm wide), ovate-lanceolate, deeply cordate, weakly crenate or serrate, acute or obtuse, with a callus-thickening at apex more or less developed on under side, stellate-pubescent above and below, concolorous or very slightly discolorous, palmately 5-7 nerved. Petioles from slightly shorter than to much longer than the lamina, with pubescence like that of stem but with stellate hairs common especially at apex, sometimes red-pigmented except green at apex. Stipules linear, 3-4 mm long, 1 mm wide, pubescent, caducous, the scars often raised. Peduncles solitary in the axils, 1-4 cm long, usually exceeding the subtending petiole, articulated 3-5 mm below the calyx, with pubescence like that of stem except the long simple hairs more abundant. Calyx 8-17 mm long, 20-veined at the base, invested with stellate hairs, long simple hairs, and some multicellular hairs, 5-lobed, ca. 2/3-divided; lobes cordate and somewhat plicate at the base, approximately equaling the fruit. Petals 14-18 mm long, 10-14 mm broad, orange, glabrous except on margin of claw where white-stellate-pubescent. Staminal column 3 mm long, glabrous, orange, 10-nerved, antheriferous at summit; filaments 1.0-1.5 mm long, orange; anthers and pollen yellow. Styles 7, glabrous, yellow, exceeding androecium; stigmas capitate, 0.4 mm diameter, maroon. Fruit a schizocarp of 7 mericarps, the septicidal dehiscence imperfect, the loculicidal dehiscence complete to the base; mericarps

(8-) 10-11(-15) mm long (including the apical spines), externally with both stellate hairs and long (1-2 mm) simple hairs, internally with a few stellate hairs near the base; each half-mericarp (after dehiscence at maturity) with a prominent costa along dorsal margin that at apex joins a comparable costa from ventral margin to form the apical spine 1-4 mm long. Seeds blackish, reniform, 2.1 mm long, 1.9 mm wide, muriculate, apparently 2 per mericarp.

Type: Mexico: Coahuila: Cuatro Cienegas Basin, route 30 at north end of Sierra San Marcos, on roadside, 14 Aug 1975, Pinkava & Reeves 13044 (holotype: ASU; isotypes: pf and to be distributed by ASU).

Paratypes: Cuatro Cienegas Basin, 1.8 mi SSW of Poso de la Becerra opposite Laguna Grande, 9 June 1968, Pinkava, Lehto, & Keil 5193 (ASU); Bajada, NW of Poso de Anteojo, in desert, 12 Jun 1968, Pinkava, Lehto, & Keil 5481 (ASU); Mt. Anteojo, 17 Jun 1968, Pinkava, Lehto, & Keil 5745 (ASU). Western Coahuila, Sierra de San Antonio, canyon at San Antonio de los Alamos, 2-3 Sep 1940, Johnston & Muller 885 (TEX).

The new species, which is illustrated in Fig. 1 and Fig. 13, A-B, is named in honor of Donald J. Pinkava, collector of the type material. It is clearly allied to *Abutilon wrightii* A. Gray and *A. hypoleucum* A. Gray, but it is distinct from both in several characters. Standley (1923), Kearney (1955), and Correll & Johnston (1970) differentiate *A. wrightii* and *A. hypoleucum* by the presence or absence, respectively, of long simple hairs on the stems, but this character is an imperfect basis for the distinction. Because he relied on this single character, Kearney erred (loc. cit., p. 253, note 32) in treating *A. selerianum* Ulbrich as a synonym of *A. wrightii*; it is in fact a synonym of *A. hypoleucum*. The characters presented in Table 1 clarify the differences between these two species and indicate the distinctiveness of *A. pinkavae*.

Abutilon pinkavae is known only from Coahuila. *A. wrightii* occurs from the Edwards Plateau of Texas south to Coahuila, Nuevo Leon, and Tamaulipas and west to Sonora. *A. hypoleucum* occurs from the Rio Grande Valley of South Texas, south through Coahuila, Nuevo León, Tamaulipas, and San Luis Potosí to Veracruz. I have seen one specimen of *A. hypoleucum* from Oaxaca (S. R. Hill 1774), but it is from northernmost Oaxaca on the Veracruz border near Tuxtepec, in the lowlands bordering the Gulf of Mexico. *A. wrightii* and *A. hypoleucum* are fully sympatric in many parts of northern Mexico, but my observations show no evidence of intergradation. I do not know whether *A. pinkavae* is sympatric with the other two species.

Chromosome counts of *n* = 7 have been reported for both *A. wrightii* (Krapovickas, 1967; Bates, 1976) and *A. hypoleucum* (Bates & Blanchard, 1970; Bates, 1976), but no count is yet known for *A. pinkavae*.

Table 1. Comparison of selected characters of three species of Abutilon.

	A. pinkavae	A. wrightii	A. hypolecum
growth habit	erect, to 0.5 m	procumbent or ascending	erect, to 1.5 m
stem diameter	up to 2 mm	up to 2 mm	<2 mm
stem pubescence	with few or no stellate hairs	including stellate hairs	including stellate hairs
leaf length	2-4 cm	2-4 cm	up to 12 cm
leaf margin	obscurely dentate	prominently dentate	dentate
leaf color	nearly concolorous	markedly discolorous	markedly discolorous
leaf pubescence (on under surface of mature leaf)	scattered stellate hairs	matted (white) stellate	matted (white) stellate
leaf apex	with small callus growth	lacking callus	lacking callus
calyx length	subequal to fruit	exceeding fruit	subequal to or exceeding fruit
petal size	14-18 mm	14-18 mm	20-25 mm
petal color	orange	pale yellow	yellow

(Continued)

Table 1. Comparison of selected characters of three species of Abutilon. (Continued)

	A. pinkavae	A. wrightii	A. hypolecum
no. of stigmas or carpels	7	6-9	13-15
mericarp apex	spinescent	acuminate	acuminate
dorsal line of dehiscence of mericarp	costate	ecostate	costate (but costae masked by pubescence)
inner carpel wall	sparsely stellate-pubescent basally	glabrous	glabrous
no. seed per carpel	2 (probably)	3	3
seed length	2.1 mm	2.6 mm	2.1 mm
seed surface	muriculate	muriculate	smooth

2. Dendrosida breedlovei Fryxell, sp. nov.

Dendrosida foliis straminei-puberulis, stipulis brevis (1.0-1.5 mm), calycibus parvis (10-12 mm longis).

Shrub or tree to 7 m tall. Twigs yellowish puberulent, becoming glabrate, the hairs stellate, ca. 0.2 mm long. Leaf lamina to 5 cm long, 3 cm broad, truncate or slightly cuneate at base, ovate or (rarely) weakly 3-lobed, the margin undulate-crenate or -serrate, rounded acute apically, palmately 5-7 nerved, minutely stellate-puberulent below, glabrate above but retaining hairs on main veins, somewhat discolorous, the veins prominently raised below, yellowish. Petioles up to 12 mm long, yellowish-puberulent. Stipules 1.0-1.5 mm long, deciduous, inconspicuous. Pedicels 4-10 mm long, axillary but crowded at branch tips. Calyces 10-12 mm long, 1 cm broad (in fruit), 10-ribbed from the base, the commissural ribs more prominent than the midribs of the lobes, minutely yellowish puberulent; lobes 3.5-5.0 mm broad, 3-nerved, the lateral nerves submarginal. Petals yellow, 15 mm long, densely ciliate-margined on claw but otherwise glabrous. Staminal column 4 mm long, pallid, stellate-pubescent, 5-nerved; filaments arising from apex of staminal column, 2-3 mm long; pollen yellow-orange. Styles ca. 8-9, pallid, slightly exceeding the stamens. Fruit a schizocarp of ca. 8-9 mericarps; mericarps 5.5 mm tall, 3.5 mm wide, sparsely stellate-pubescent on apex but otherwise glabrous, the lower portion 1-seeded, indehiscent, dorsally smooth but medially furrowed, laterally slightly reticulate at base, the upper portion dehiscent, divergent, acute.

Type: Mexico: Chiapas: Municipio de Cintalapa de Figueroa, 5 km west of Rizo de Oro along Mexican Highway 190, steep slope along ravines with Tropical Deciduous Forest, Zanthoxylum, Phyllanthus, Agonandra, and Guazuma; elevation 820 m, 18 Apr 1972, Breedlove 24629 (holotype: DS, isotype: pf); same citation, Breedlove 24644 (paratypes: DS, pf).

The new species, which is illustrated in Fig. 2, is named in honor of Dennis E. Breedlove, collector of the type material and knowledgeable authority on the flora of Chiapas, whence the new species comes. Indeed, the genus Dendrosida as a whole is known principally from the state of Chiapas, except for D. sharpiana (Miranda) Fryxell subsp. occidentalis Fryxell, which occurs in the state of Guerrero (cf. Fryxell, 1971), and a specimen of D. sharpiana recently examined (Carlson 2209) from Cerro Guiengola, Oaxaca. The three species now comprised in the genus are compared in Table 2. The measurement of carpel length (14-15 mm) given in the key to species (Fryxell, 1971) is taken from the original description of Sida sharpiana Miranda and is in error. Table 2 gives the correct length.

Table 2. Comparison of selected characters of the species of *Dendrosida*.

	D. batesii	*D. sharpiana*	*D. breedlovei*
Leaf form	deeply cordate, 3-lobed, to 18 cm long	truncate, simple, to 15 cm long	truncate, usually to 5 cm long
Foliar pubescence	glabrate	glabrate	minutely yellowish-puberulent
Petiole length	to 14 cm	to 6 cm	to 1.2 cm
Stipule length	4 mm	6-13 mm	1.0-1.5 mm
Calyx length	14-16 mm	15-20 mm	10-12 mm
Petal length	--	20-40 mm	15 mm
Mericarp length	5-8 mm	8-9 mm	5.5 mm

3. Hampea breedlovei Fryxell, sp. nov.

Hampea pedicellis longis (usque ad 11 cm) et gracilibus; fructibus amplis (3 cm diametro), pendulis, intus perfecte glabris; seminibus 2-3 in quoque loculo.

Tree 7 m tall in montane rain forest. Young branch tips minutely brown-puberulent soon becoming glabrate, green, minutely nigro-punctate. Leaf lamina entire, broadly elliptic, up to 25 cm long, 10 cm broad, palmately 3-nerved (or 5-nerved and the outermost pair submarginal), glabrate, minutely nigro-punctate; foliar nectary single on midrib, inconspicuous, 1-2 mm long, slit-like, 1-3 cm from base of lamina. Petioles up to 13.5 cm long (1/4-1/2 length of lamina), glabrate, punctate. Stipules 2-5 mm long, subulate, minutely brown-puberulent, caducous. Pedicels axillary, solitary, 3 cm long (in flower) to 11 cm long (in fruit), slender (1.0-1.5 mm diameter), glabrate, punctate. Bractlets of the involucel 3, brown-puberulent, subulate, 1.5-2.0 mm long, appressed to calyx, persistent but inconspicuous. Calyx 8 mm long, minutely puberulent proximally, glabrate and densely nigro-punctate distally except for five marginal tufts of brown hairs that are vestigial calyx lobes, otherwise truncate, becoming torn with the expansion of the flower. Petals (in bud) pallid, densely yellowish lepidote externally. Flowers otherwise unknown. Fruit pendulous, subspherical, 3 cm long, ligneous, 3-celled, greenish, glabrous within. Seeds 2 or 3 per locule, arillate, glabrous and shiny, ca. 1 cm long, almost black; aril presumably white (drying tan), surrounding half of seed.

Type: Mexico: Chiapas: Municipio of Rayón: in the selva negra 10 km above Rayón Mezcalapa along road to Jitotol; tree 20 ft tall on steep slope with dense montane rain forest (Magnolia, Podocarpus, Calatola, and Ardisia); elev. 1700 m; 27 Jan 1973, Breedlove & Smith 32601 (holotype: DS-652778).

This species is named in honor of Dennis E. Breedlove, who collected the type specimen and who observed and reported the pendulous fruits, a character not necessarily displayed in dried specimens. The new species, which is illustrated in Fig. 3, is similar in many respects to Hampea longipes Miranda (cf. Fryxell, 1969) but differs in its relatively broader leaves (2.5 times as long as broad) that lack domatia, its single foliar nectary, and its larger, pendulous fruits that are wholly glabrous within rather than pubescent along the suture-margin and which have two or more seeds per locule rather than only one. The slender pedicels attain a length of as much as 11 cm in fruit, longer than is found in any other species in the genus.

4. Hampea montebellensis Fryxell, sp. nov.

Hampea laminis foliorum anguste ellipticis; caulis, petiolis, et pedicellis brunneo-puberulis persistentibus; parietibus interior carpellorum dense albo-pubescentibus.

Tree 20 m tall in montane rain forest. Stems densely and persistently brown-puberulent. Leaf lamina entire, truncate to cuneate, ovate-elliptic, acute or acuminate, palmately 3-5 nerved, with domatia absent, reticulate-veined, up to 14 cm long, 2-3 times as long as broad, obscurely punctate, glabrate above, minutely puberulent below especially on nerves, without marginal cilia. Foliar nectaries 3, inconspicuous, 1 mm long, the central one on midrib 1/4 distance from leaf base or less, the lateral ones sub-basal. Petioles 1/4 length of lamina or less, densely puberulent. Stipules 6-10 mm long, filiform. Flowers unknown. Pedicels (in fruit) 1-3 in the axils, erect, 3-5 cm long, densely puberulent throughout. Involucral nectaries lacking (?); bractlets of the involucel 3, deciduous leaving scars. Calyx 5-6 mm long, irregularly torn and reflexed in fruit, minutely puberulent. Fruits 3-celled, stipitate, spherical, 1.5-2.0 cm long, green-puberulent externally, white-pubescent within. Seeds 1-2 per locule, reddish-brown to nearly black, glabrous, 8-10 mm long, arillate, the aril approximately equaling the seed.

Type: Mexico: Chiapas: Municipio of La Trinitaria, slopes with montane rain forest, _Liquidambar_, _Magnolia_, _Vochysia_, east of Laguna Tzikaw, Monte Bello National Park, elev. 1300 m, 23 Jan 1973, _Breedlove & Smith 32191_ (holotype: DS-655641).

Hampea montebellensis is allied to _H. integerrima_ and _H. longipes_ (cf. Fryxell, 1969). It shares with _H. integerrima_ the dense pubescence on the inner wall of the carpels, a character unique to these two species; this pubescence is white in _H. montebellensis_ and brown in _H. integerrima_. It resembles _H. longipes_ in its relatively narrow, elliptic leaves and its relatively long pedicels. It is distinct from either of these two species in its densely and persistently brown-puberulent stems, petioles, and pedicels and is unique in its densely white-pubescent inner carpel walls. The specific epithet is taken from the type locality, the Lagos de Montebello in Chiapas immediately adjacent to the Guatemalan border. The holotype is illustrated in Fig. 4.

5. _Kosteletzkya blanchardii_ Fryxell, sp. nov.

Kosteletzkya caulibus erectis, herbaceis, hispidis; laminis foliorum infernis valde hastatis, sursum gradatim deminutis atque anguste lanceolatis; inflorescentiis paniculatis; bracteis involucellis 4-6 mm longis, calycibus 6-8 mm longis, petalis 15-18 mm longis, roseolis macula flavida ad basim margine rubello; fructibus ca. 8 mm diametro.

Erect herbaceous perennial, the stems green, hispid with simple transparent hairs 1-2 mm long with a bulbous base, and with narrow longitudinal rows of minute recurved (or curled) hairs.

Leaf lamina markedly hastate below, palmately 5-7-nerved, up to 8 cm long, the central lobe triangular and more than twice as long as broad, serrate, acute, sparsely hirsute below with appressed simple hairs 1 mm long and a few 3-4-armed stellate hairs, the hairs similar but fewer on upper surface; upper leaves progressively reduced becoming narrowly lanceolate, without lobes, and 5-6 times as long as broad. Petioles up to 2.5 cm long, with pubescence like that of stem. Stipules filiform, 5 mm long, ciliate. Inflorescence a diffuse panicle. Flowers axillary, solitary or paired, sometimes one member of pair a multi-florate inflorescence. Pedicels up to 6 cm long (in fruit), slender, with pubescence like that of stem, articulated near apex. Involucel of 7-9 bracts at base of calyx; bracts linear, 4-6 mm long, hispid. Calyx 6-8 mm long, ca. 2/3-divided, sparsely hispid; lobes cordate-ovate, 3-veined, up to 4 mm broad (in fruit). Corolla rotate; petals 15-18 mm long, 12-15 mm broad, stellate-pubescent (3-armed hairs) externally in bud, glabrous within and on claw, pink with a yellow spot at base that is bordered by red. Staminal column glabrous, pallid, ca. 1 cm long, with anthers scattered along upper portion; filaments 1.0-1.5 mm long; anthers pale yellow, ca. 30; pollen yellowish, spherical, echinate. Styles 5, free, essentially glabrous, exceeding androecium by 2-3 mm; stigmas capitate, 0.5-0.8 mm diameter, reddish with whitish hairs on stigmatic surface. Capsule 5-celled, depressed, 5-winged, 3-4 mm high, ca. 8 mm diameter, minutely pubescent throughout and strigose on wings, transversely rugose. Seeds unknown. Chromosome number: $\underline{n} = 19$ (Blanchard, 1974, as *K. pentasperma*).

Type: Mexico: Michoacán: S of Zitácuaro, between Benito Juárez and Tuzantla (ca. 13 mi N of Tuzantla); alt. 4200 ft; in wet ground by roadside; flowers pink with yellow center (bordered by red), 15 Oct 1970, *Fryxell, Bates, & Blanchard 1650* (holotype: BH, isotype: pf). Paratype: Zitácuaro-Santa Anna, *Hinton 13338* (US).

The specific epithet is chosen to honor O. J. Blanchard Jr., participant in the collection of the type material and determiner of the chromosome number of this and other species of *Kosteletzkya* (Blanchard, 1974).

A useful treatment of the American species of *Kosteletzkya* has not yet been written. The genus is very distinctive, especially in its fruit structure but also in other characters such as floral morphology, investiture, chromosome number, and a preference for wet soils. The Mexican species occur from near sea level to elevations of almost 2000 m and show a wide range of morphological diversity. Nevertheless, the present species and the two following are clearly distinct from others previously described.

Kosteletzkya blanchardii is distinctive for the combination of hastate leaves and a rotate corolla with large pink petals having a yellow spot at base with a red border. It is illustrated in Fig. 5.

6. Kosteletzkya ramosa Fryxell, sp. nov.

Kosteletzkya caulibus erectis, ramosis, dense stellato-tomentosis; laminis foliorum late cordatis; inflorescentiis paniculatis; bracteis involucelli 3-5 mm longis; calycibus 4-7 mm longis, petalis 22-25 mm longis, roseolis; fructibus ca. 6 mm diametro.

Perennial to 2 m tall, much branched above; stems densely and persistently stellate-tomentose, with inconspicuous longitudinal lines of dense minute hairs. Leaf lamina broadly cordate-ovate with some indication of weakly developed lobing, up to 10-11 cm long, equally broad, basally cordate, crenate-serrate, acute, palmately 7-9(-11)-nerved, moderately stellate-pubescent above and below, the hairs principally 2-3-armed above, 4-6-armed below. Petioles up to 4 cm long, densely stellate-tomentose. Stipules caducous, not seen. Inflorescence a terminal branching panicle mostly above the leaves. Pedicels 2-6 mm long, minutely stellate-pubescent (hairs 0.1-0.3 mm) and sometimes with a few coarse hairs 1-2 mm long. Involucel of ca. 10 bracts at base of calyx; bracts linear, 3-5 mm long, ciliate (hairs 1-2 mm long). Calyx 4-7 mm long, ca. 2/3-divided, minutely stellate-pubescent; lobes ovate-triangular, obscurely 3-nerved. Corolla rotate; petals pale pink (darker in bud), 22-25 mm long, pubescent externally in bud, glabrous within and on claw. Staminal column 18 mm long, slender, pallid, glabrous or with peg-like emergences toward base, apically 5-dentate; filaments 1-2 mm long, glabrous, emerging from column in 2-3 groups, the proximal group abortive and sterile; anthers few (ca. 25), secund, yellowish; pollen yellow, spherical, echinate. Styles exceeding androecium by 6-7 mm, free apically for 3-4 mm, slightly pubescent, reddish; stigmas 5, capitate, reddish, inconspicuously villous. Capsule 5-celled, depressed, 5-winged, 3-4 mm high, ca. 6 mm diameter, minutely stellate-pubescent and also prominently strigose throughout. Seeds unknown.

Type: Mexico: Jalisco: roadside ditch 1 mi E of Ayo el Chico, elev. ca. 1550 m, local; perennial to 2 m high, much branched above; flowers pale pink; 23 Aug 1958, McVaugh, Loveland & Pippen 17230 (holotype: MICH; isotypes: pf and to be distributed by MICH).

The specific epithet is chosen in reference to the collectors' description "much branched above." The species is distinctive for its broadly cordate leaves, its dense stellate pubescence on stems and petioles, its relatively small calyx and relatively large rotate corolla, and its paniculate inflorescence. An isotype of K. ramosa is illustrated in Fig. 6.

7. Kosteletzkya reclinata Fryxell, sp. nov.

Kosteletzkya caulibus reclinatis, hispidis; laminis foliorum late cordatis; inflorescentiis racemosis; bracteis involucelli 8-12 mm longis, calycibus 8-10 mm longis, petalis 25-30 mm longis, roseolis; fructibus 10 mm diametro.

Reclining subshrub, the stems woody at the base, with two types of pubescence: long, simple bulb-based hairs 2-3(-4) mm long that are uniformly distributed, and minute, fine hairs ca. 0.5 mm long in narrow, dense, longitudinal rows. Leaf lamina broadly cordate-ovate, up to 8 cm long, more or less as broad as long, with an open basal sinus, coarsely dentate, acute to short-acuminate, palmately 7-9-nerved, moderately hirsute above and below (the margins ciliate) with hairs 1-2 mm long, the hairs usually simple but sometimes stellately 2-5-armed. Petioles 1-3 cm long, hispid with pubescence like that of stem. Stipules filiform, 10-15 mm long, prominently ciliate, the hairs 1-2 mm long, caducous. Inflorescence a leafless apical raceme 6-12 cm long, except that the lowermost flowers are subtended by leaves. Pedicels ca. 1 cm long in inflorescence (to 2.5 cm in foliage) with hispid pubescence like that of stem. Involucel of ca. 10 bracts immediately below the calyx; bracts filiform, prominently hispid-ciliate, spreading and arcuate in fruit, 8-12 mm long. Calyx 8-10 mm long (slightly accrescent in fruit), hirsute, ca. 2/3-divided, the lobes 3-veined, sometimes purplish. Corolla rotate; petals 2.5-3.0 cm long, externally pubescent in bud (with both coarse, stellate hairs and minute multicellular hairs), pink. Androecium 2 cm long, 1 mm diameter, pallid, with a few, minute, peg-like protruberances but otherwise glabrous, apically 5-dentate, antheriferous toward apex; filaments 1.0-1.5 mm long, more or less secundly arranged; anthers yellow, ca. 30; pollen yellow, spherical, echinate. Styles and stigmas exceeding androecium by 8 mm; styles 5, free apically for ca. 3 mm, minutely white-pubescent with multicellular hairs; stigmas 5, capitate, 0.5-1.0 mm diameter, reddish, densely villous. Capsules 5-celled, depressed, 6 mm long, 10 mm diameter, 5-winged, minutely stellate-pubescent throughout and with a few coarse, simple hairs, the carpel walls transversely ridged. Seeds unknown.

Type: Mexico: Jalisco: near Km 158, road from Zapotlanejo, ca. 7 mi WNW of Tototlan; adobe soil, poorly drained and periodically flooded meadow; elev. ca. 1800 m, abundant. Reclining, the stems 1 m long, woody at base; flowers clear pink; anthers yellow; stigmas reddish. 24 Aug 1958, McVaugh, Loveland, and Pippen 17259 (holotype: MICH: isotypes: pf and to be distributed by MICH).

The specific epithet of K. reclinata refers to the growth habit as given by the collectors. The species is distinctive for this growth habit and for its broadly cordate leaves, its racemose inflorescence, its hispid investiture of stems and petioles, its relatively large involucel, calyx, and fruit, and its large rotate corolla with pink petals. An isotype is illustrated in Fig. 7.

8. Pavonia biflora Fryxell, sp. nov.

Pavonia non viscida, fruticosa pedunculis axillaribus, floribus in umbellis binatis; bracteolis involucellorum 5, distinctis, late lanceolatis (12-14 mm longis, 5-6 mm latis); corollis grandis, roseis faucibus sanguineis; mericarpiis glabris, rugulosis.

Viscid shrub to 2.5 m tall. Younger stems with both short (<1 mm) glandular hairs and long (2 mm) non-glandular hairs; only the glandular hairs persisting on older stems. Leaf lamina simple, ovate-cordate, serrate, acuminate, to 10.5 cm long, 7 cm wide, palmately 9-11-nerved, discolorous, sparsely pubescent above (with both stellate and simple hairs), densely white-stellate-pubescent below. Petioles up to 4 cm long, with pubescence like that of stem. Stipules filiform, 6-8 mm long, densely ciliate. Peduncles axillary, usually solitary, up to 10 cm long, with pubescence like that of stem, usually umbellately 2-flowered; pedicels articulated up to 1 cm long. Involucel of 5 distinct bracts; bracts broadly lanceolate, 12-14 mm long, 5-6 mm broad, broadest near middle, narrowed below to cuneate base, apically acute, densely pubescent within and without, long-ciliate only near base. Calyx 10-11 mm long, ca. half-divided, glabrous within, pubescent without, the lobes apically long-ciliate (hairs 2 mm) on entire margin. Corolla 4.5 cm long, sparsely and obscurely pubescent externally, glabrous on claw; petals pink with dark red spot at base. Androecium ca. 2.5 cm long, the stamens cream [fide Irwin et al. 26416], scattered throughout length of staminal column. Styles and stigmas 10, exceeding androecium. Mericarps 5, ca. 6 mm long, glabrous, rugulose.

Type: Brazil: Distrito Federal: Cachoeira Piripiripau, ca. 15 km S of Planaltina; gallery and adjacent cerrado, sandy soil, common in disturbed gallery, 20 Feb 1970, Irwin et al. 26416 (holotype: UB; isotypes: NY, pf).

Pavonia biflora has its closest affinity with Pavonia garckeana Gürke, from which it differs in its paired (rather than solitary) flowers, its 5 lanceolate (rather than 4 cordate) bracts of the involucel, a different pubescence pattern, and possibly a greater stature and larger leaves. The specific epithet of this species, which is illustrated in Fig. 8, is chosen in reference to its distinctively paired flowers.

9. Pavonia macdougallii Fryxell, sp. nov. sectionis Lebretoniae.

Pavonia caulis petiolis pedicellisque dense hirsutis, pilis patentibus et non-viscidis; bracteolis involucellorum 5, distinctis, lanceolatis; margine calycis dense ciliatis; corollis grandis albisque.

Shrub 1.0-1.5 m tall. Stems densely covered with patent simple hairs 2(-3) mm long and with shorter stellate hairs. Leaf lamina up to 12 cm long, 8 cm broad, cordate-ovate, shallowly crenate to subentire, acute to acuminate, discolorous, green and sparsely pubescent above, densely white-stellate-pubescent below, palmately 7-9(-11)-nerved, the nerves pallid and raised above and below. Petioles up to 6 cm long, with the long simple hairs somewhat sparser than those on stem. Stipules 4-8 mm long, 1 mm broad at base, narrowly triangular, ciliate. Pedicels axillary, solitary, up to 5 cm long (in flower), exceeding the subtending petiole, with long simple hairs somewhat denser and slightly longer than those of the stem. Bracts of the involucel 5, distinct, lanceolate, 1-nerved, 15-20 mm long, 2.5-4 mm broad, broadest near the middle, acute, minutely wooly without, with simple hairs 1-2 mm long within and on margin. Calyx 8-10 mm long, half-divided, the lobes whitish, prominently 5-veined, densely ciliate, the hairs 3 mm long. Corolla white, 3.0-3.5 cm long, stellate-pubescent externally. Fruits schizocarpic, 8-9 mm diameter; mericarps 5, indehiscent, brownish, 5 mm high, minutely pubescent, prominently keeled dorsally and ventrally, reticulate elsewhere, the reticulations expanded to produce 3 or 4 excrescenses on each side of mericarp. Seed [immature] solitary, brownish, with weak hairs sparsely scattered over surface.

Type: Mexico: Oaxaca: [Distrito de] Tehuantepec: Tapesco, south of Tres Cruces, 3000 ft elevation, shrub with white flowers, in sun, 1 Nov 1971, MacDougall H 54 (holotype: NY, isotype: pf). Paratypes: [Distrito de] Tehuantepec: Cerro San Pedro, ca. 600 m elev., 8 Oct 1969, MacDougall 498.S (ENCB); Cerro Guiengola, 8 Dec 1970, MacDougall 617.S (ENCB).

Tres Cruces is due north of the city of Tehuantepec at 16°40'N, 95°16'W; the type locality Tapesco, thus, is near the summit of Cerro Laollaga (elev. 1243 m). Tapesco does not appear on maps available to me, nor is it listed in the otherwise useful gazeteer of collecting localities of MacDougall published earlier by Goodwin (1969).

The specific epithet is chosen to honor the late Thomas MacDougall, collector of the type specimen and assiduous collector of both plants and animals of Oaxaca (Stix, 1975).

Pavonia macdougallii, which is illustrated in Fig. 9, is closely allied to the recently described *P. fryxellii* Krapovickas, from which it differs in its broader bracts of the involucel; its long, simple, non-glandular hairs of the stem, petioles, pedicel, involucel, and calyx; and its somewhat smaller corolla. *P. fryxellii* is notably viscid, whereas *P. macdougallii* is evidently not. *P. macdougallii* occurs to the southeast of the range of *P. fryxellii*.

10. *Pavonia submutica* Fryxell, sp. nov.

Pavonia stellato-pubescentes fruticosa; laminis foliorum late ovatis; bracteolis involucellorum ca. 15, arcuatis, filiformibus, 20-25(-30) mm longis, copiose ciliatis (pilis 1-3 mm longis); calycibus 10-18 mm longis; mericarpiis laevibus, acumine apicale atque 2 acuminibus lateralibus.

Shrub up to 2 m tall. Stems evenly stellate-pubescent, the hairs <1 mm long, persistent. Leaf lamina ovate-triangular, truncate or slightly cordate, finely serrate, acute, up to 9.5 cm long, 6 cm broad, palmately 7-9-nerved, somewhat discolorous, stellate-pubescent above and below. Petioles up to 3 cm long, densely stellate-pubescent. Stipules 8-12 mm long, linear, pubescent, caducous. Flowers more or less apically congested in few-flowered corymibiform inflorescences. Pedicels solitary in the axils, 1-4 cm long, pubescent. Bractlets of the involucel ca. 15, arcuate, filiform, 20-25 (-30) mm long, copiously ciliate, the hairs 1-3 mm long. Calyx 10-18 mm long, pubescent, more than half-divided; lobes acute, 3-veined. Petals yellow, ca. 2 cm long. Staminal column 15 mm long, 1 mm diameter, pallid, glabrous; filaments 3-5 mm long, glabrous, arising throughout length of column; anthers and pollen yellow. Styles and stigmas 10, glabrous, slightly exceeding uppermost anthers. Mericarps 5, smooth, straw-colored, reticulate-veined, the dorsal nerve prominent, with one apical and two lateral points (these much reduced compared to the cusps usual in section Typhalea), sometimes the points having a very few retrorse barbs, or barbs absent.

Type: Mexico: Chiapas: 11 miles east of Tapanatepec on the Chiapas-Oaxaca state line along highway 190, steep heavily wooded slope, elev. 2300 ft; flowers yellow, plant 6 ft tall, 20 Oct 1965, Breedlove & Raven 13715 (holotype: CAS; isotype: pf). Paratypes: Oaxaca: Carretera de Tuxtla Gutierrez a Juchitán, 19-21 km noreste de Tapanatepec, alt. 630 m, 2 Dec 1973, Banda, Maldonado & Koch 73154 (CHAPA, ENCB, pf); 1/2 mi W of Chiapas state line on hwy 190, 1800 ft alt., 23 Jan 1969, Fryxell & Bates 902 (BH, pf); foot of Cerro de la Gineta, 20 km [N of] Tapanatepec, Smith & Ruiz 3237 (US).

Pavonia submutica, which is illustrated in Fig. 10 and Fig. 13, C, is known from a limited area near the northwestern extremity of the Sierra Madre de Chiapas at the Oaxaca-Chiapas boundary. The specific epithet is chosen in reference to the reduced nature of the cusps on the mericarps, which in section Typhalea are usually longer (often very long) and retrorsely barbed. In the new species the cusps are reduced to mere points and the barbs are almost obsolete.

The nearest ally of Pavonia submutica is P. arachnoidea Presl. Distinctive differences between these two species and the following new species, P. monticola, are presented in Table 3 and in Fig. 13, C-E. It is notable that, although these two species differ markedly in size of most floral parts, they have corollas of essentially identical size. The distribution of P. arachnoidea is relatively more northerly (Guerrero to Sinaloa) than that of P. submutica. These observations are based on the examination of, among other specimens, type material of P. arachnoidea (Haenke s.n., PR!).

Table 3. Comparison of three species of *Pavonia*.

	P. arachinoidea	P. submutica	P. monticola
Leaf size (maximum)	6.0 cm long, 4.0 cm broad	9.5 cm long, 6 cm broad	11 cm long, 5.5 cm broad
Flowers	scattered along stem	congested apically	somewhat congested apically
Pedicels	2-3 (or more) times length of involucel	commonly shorter than involucel	4-5 times length of involucel
No. of bracts in involucel	12-15	15	8
Involucel length	10-15 mm	20-25 mm	10-15 mm
Indumentum of involucel	ciliate	ciliate	viscid
Calyx length	5 mm	10-18 mm	7-8 mm
Petal length	18-22 mm	18-22 mm	12 mm
Staminal column length	5 mm	15 mm	12 mm
Filament length	1-2 mm	3-5 mm	1-3 mm

Pavonia submutica is further compared with P. monticola under the discussion of the latter species.

Bates (1976) has reported a chromosome count of n = 21 for Pavonia arachnoidea, but no count is yet known for P. submutica.

11. Pavonia monticola Fryxell, sp. nov.

Pavonia fruticosa viscida, laminis foliorium anguste ovatis acuminatis, pedunculis in axillis solitariis vel binatis, plerumque petiolos subtendentes excedentibus, bracteolis involucellorum octo linearibus patentibus calycem excedentibus, calycibus ciliatis nervis marginibusque atrovirentibus, corollis flavis, mericarpiis cuspide subapicali (0.3 mm) glochidiis retrorsis.

Shrub to 2 m tall. Stems erect, densely pubescent with both stellate and simple, glandular hairs 0.5 mm long. Leaf lamina narrowly ovate, up to 11 cm long, about twice as long as broad, discolorous, cordate, doubly serrate, acuminate, palmately 9-11-nerved, stellate-pubescent above and beneath, with denser coarser pubescence beneath and with intermixture of glandular hairs above. Petioles approximately equaling leaf width, with pubescence like that of stem with addition of a few long simple hairs (1-2 mm) especially at distal end. Stipules 4-12 mm long, narrowly linear, glandular-pubescent, relatively persistent. Peduncles axillary, solitary or more commonly paired, up to 5.5 cm long, equaling or (usually) exceeding subtending petiole, with pubescence like stem, articulated above the middle, the pedicel (in fruit) 7-13 mm long. Involucel of 8 bractlets; bractlets spreading, linear, viscid, 10-15 mm long, 1 mm broad. Calyx 7-8 mm long, ca. 1/2-divided into 5 lobes; the lobes ciliate (hairs 1.0-1.5 mm long), 3-nerved, the nerves and margins dark green, the intercostal areas whitish. Petals yellow throughout, ca. 12 mm long, stellate-pubescent externally, glabrous within, densely ciliate on claw. Staminal column glabrous, almost equaling petals, surmounted by 5 narrow teeth, antheriferous throughout length, the anthers tending to be "stratified" at 3 or 4 levels; filaments 1-3 mm long, the lowermost the longest; pollen yellow, spherical, echinate. Styles 10, glabrous, slightly exserted; stigmas capitate, villous, ca. 0.2 mm diameter. Fruit a schizocarp of 5 mericarps, oblate or somewhat obovate; mericarps 5 mm long, trigonal in cross-section, the walls smooth or with poorly developed reticulation, the juncture of the dorsal and lateral walls winged (the wing 0.1-0.2 mm wide) with a small (0.3 mm) triangular cusp subapically on median nerve of dorsal wall bearing a few retrorse barbs, with a few additional retrorse barbs on lateral margin (wing); mericarps otherwise glabrous; seed solitary, 4 mm long, brownish, glabrous.

Type: Mexico: Chiapas: steep heavily wooded slope along Mexican highway 190, 11 miles NE of Tapanatepec on the line between Chiapas and Oaxaca; elev. 2300 ft, flowers yellow; shrub 6 ft tall, 20 Oct 1965, Breedlove & Raven 13716 (holotype: CAS; isotype: pf).

Chiapas: Municipio de Cintalapa, near the microwave station of La Mina, 12 km S of Mexican highway 190 near Rizo de Oro; elev. 1000 m; crest of the Sierra with Pinus and Quercus and riparian situations with Seasonal Evergreen Forest, 16 Oct 1971, Breedlove & Thorne 20685 (paratype: DS).

Both Pavonia monticola and P. submutica are described from the same type locality. Their general aspect and their mericarp morphology are quite dissimilar (cf. Table 3 and Fig. 13) and they are not to be confused. The involucel of P. monticola is 8-parted, spreading, and viscid; that of P. submutica is ca. 15-parted, arcuate, ciliate, and about twice as long as that of P. monticola. The peduncles are many times longer than the involucel in P. monticola, subequal to it in P. submutica. The leaves are narrower and the petioles longer in P. monticola than in P. submutica. Both species are known from two or more collections each, and there is no suggestion of intergradation.

P. monticola, an isotype of which is illustrated in Fig. 11, bears a superficial resemblance to P. paniculata, particularly if the nature of the inflorescence is not well represented in the specimen at hand. However, a closer examination can easily distinguish them, especially an examination of the mature fruits (Fig. 13, E-F), which in P. paniculata are reticulate but otherwise unornamented and which in P. monticola bear a retrorsely barbed subapical cusp and a lateral wing. P. monticola is evidently closely allied to the poorly known species P. hirtiflora Bentham, in which the flowers are always solitary rather than usually paired in P. monticola.

12. Sida andersonii Fryxell, sp. nov.

Sida dense stellato-pubescentes, pilis sessilis atque stipitatis immixtis; laminis foliorum late rhombiformibus, obtusis, discoloribus; pedicellis brevibus, apice aggregatis in inflorescentia ramosis corymbiformibus; corollis flavidis faucibus rubris; mericarpiis 8, fuscis, apice dense pubescentibus.

Branching shrub to 1 m tall. Stems densely stellate-pubescent with both sessile and stalked hairs. Leaf lamina broadly rhomboid, up to 4 cm long, 2.5 cm broad, smaller and narrower above in the inflorescence, discolorous, minutely soft-pubescent above and below, whitish below, truncate or subcordate at base, entire proximally, serrate distally, obtuse, palmately 3(-5)-nerved. Petioles up to 8 mm long, with pubescence like that of stem. Stipules linear, pubescent, 5-7 mm long. Flowers aggregated terminally in branched corymbiform inflorescences. Pedicels solitary in the axils or sometimes paired, 3-10 mm long, stellate-pubescent. Calyces 5-7 mm long, densely stellate-pubescent without, essentially glabrous within, broadly rounded and 10-nerved at base. Petals 6-7 mm long, glabrous, pale yellow with red base. Staminal column 1.5 mm long, pallid, glabrous; filaments emerging at apex of column, pallid, 1.5

mm long; anthers and pollen yellow. Styles and stigmas 8, reddish, glabrous, about equaling the filaments. Fruit oblate, 5 mm diameter, of 8 mericarps, densely pubescent apically; mature mericarps 2.5-3.0 mm tall, blackish, lightly reticulate laterally, white- or yellow-pubescent on apical portion of dorsal wall (otherwise glabrous), with 2 minute (up to 1 mm) spines at apex, broadly trigonal in cross-section. Seed solitary, pubescent on hilum, otherwise glabrous and smooth.

Type: Brazil: Minas Gerais: Serra do Espinhaço, 25 km by road NE of Diamantina, 2 km W of Rio Jequití; elev. 790 m; dense cerrado on rocky (quartzite) hillside and woods along stream; soil sandy; shrub to 1 m tall; corolla cream with red center, 9 Apr 1973, Anderson et al. 8348 (holotype: UB; isotypes: NY, pf). Paratypes: Brazil: Goias: 35 km by road E of Cristalina; elev. 990 m; cerrado; shrub 75 cm tall; corolla yellow with red center, 6 Apr 1973, Anderson et al. 8293 (NY, UB, pf).

The specific epithet is chosen to honor William R. Anderson, leader of the expedition on which the type material was collected and able student of the Malpighiaceae.

Sida andersonii fails to key out satisfactorily in Kearney (1958) or other available keys to South American *Sida*. It shows a superficial resemblance to the Brazilian *S. galheirensis* Ulbrich, but shows a stronger resemblance to the African *Sida ovata* Forssk. It is evidently allied to that group of species characterized by rhomboid leaves, including the well-known pantropical weed *S. rhombifolia* Linnaeus. *S. andersonii* stands apart in its densely pubescent herbage, its relatively broad rhombic leaves, and its distinctively pubescent fruits. It is illustrated in Fig. 12.

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NOTE ADDED:

The publication of *Hampea bracteolata* Lundell (Wrightia 5:357. 1977) has just come to my attention. *Hampea montebellensis* and *H. bracteolata* are similar in many respects, but differ in enough characters to be considered distinct species. *H. montebellensis* lacks domatia, has a calyx 5-6 mm long, lacks involucellar nectaries, has a deciduous involucel, and one to two seeds per locule. *H. bracteolata*, on the other hand, has conspicuous domatia, a calyx up to 8 mm long, large involucellar nectaries, a persistent involucel, and only one seed per locule.

Figure 1. Isotype of Abutilon pinkavae.

Figure 2. Holotype of Dendrosida breedlovei.

Figure 3. Holotype of Hampea breedlovei.

Figure 4. Holotype of Hampea montebellensis.

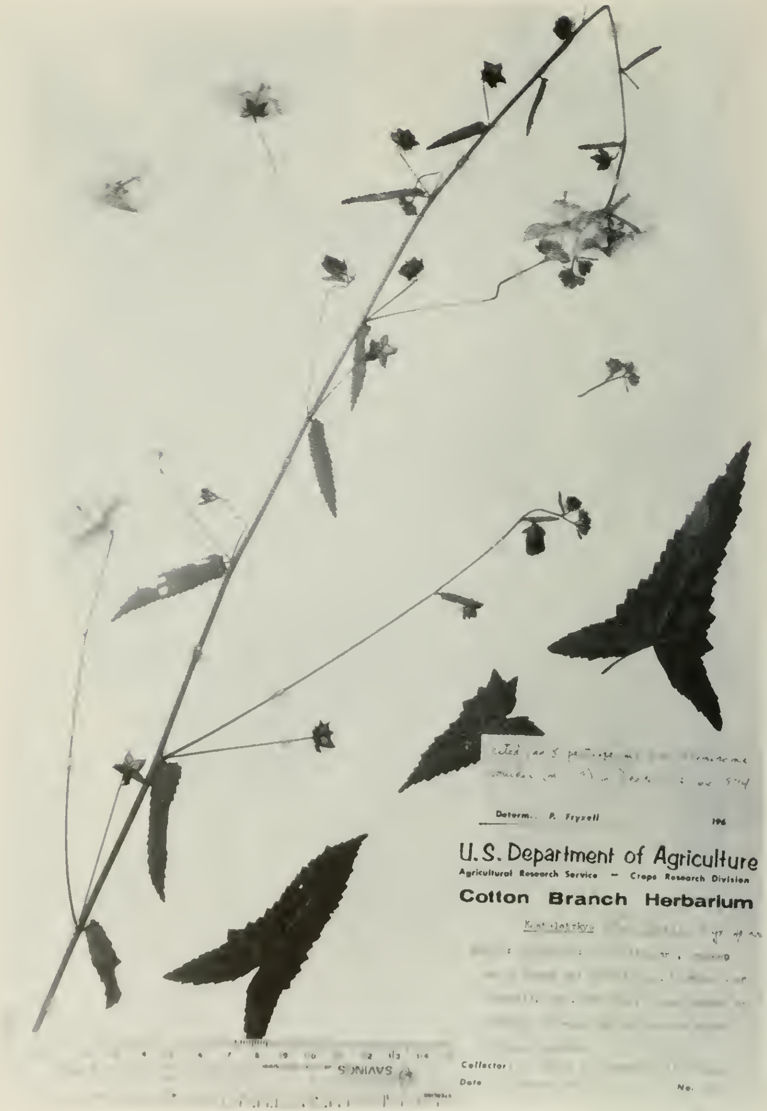

Figure 5. Isotype of Kosteletzkya blanchardii.

Figure 6. Isotype of Kosteletzkya ramosa.

Figure 7. Isotype of Kosteletzkya reclinata.

Figure 8. Isotype of Pavonia biflora.

Figure 9. Isotype of Pavonia macdougallii.

Figure 10. Isotype of Pavonia submutica.

Figure 11. Isotype of Pavonia monticola.

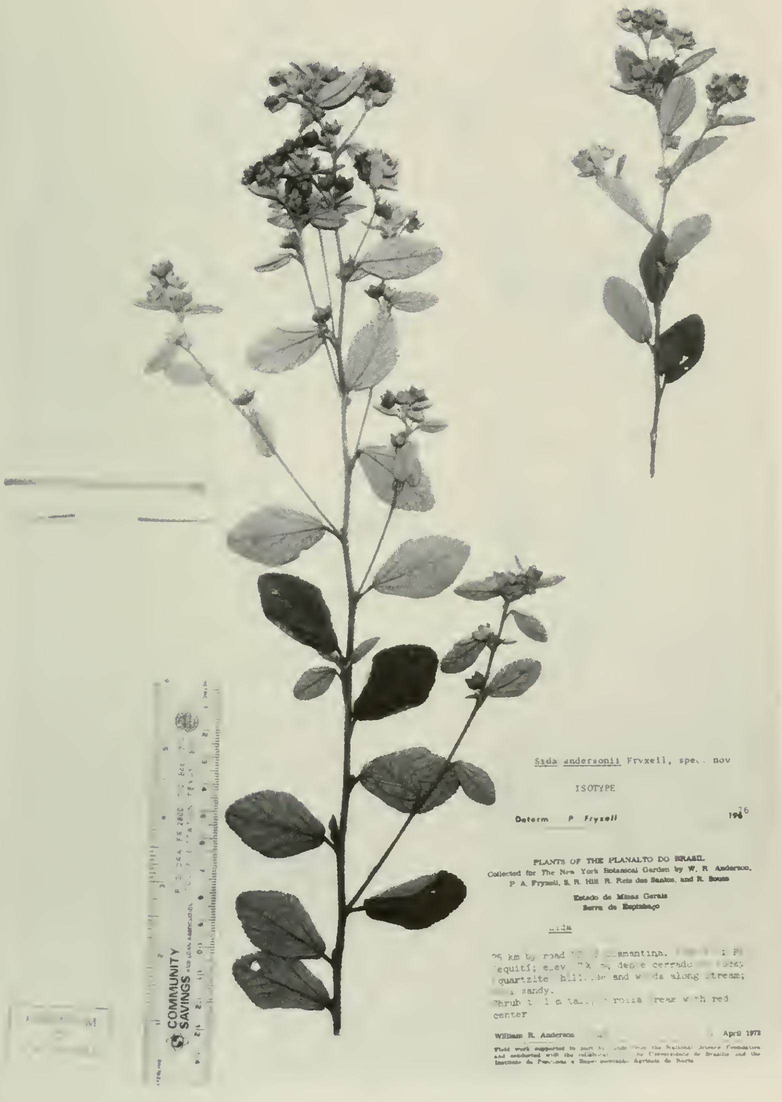

Figure 12. Isotype of Sida andersonii.

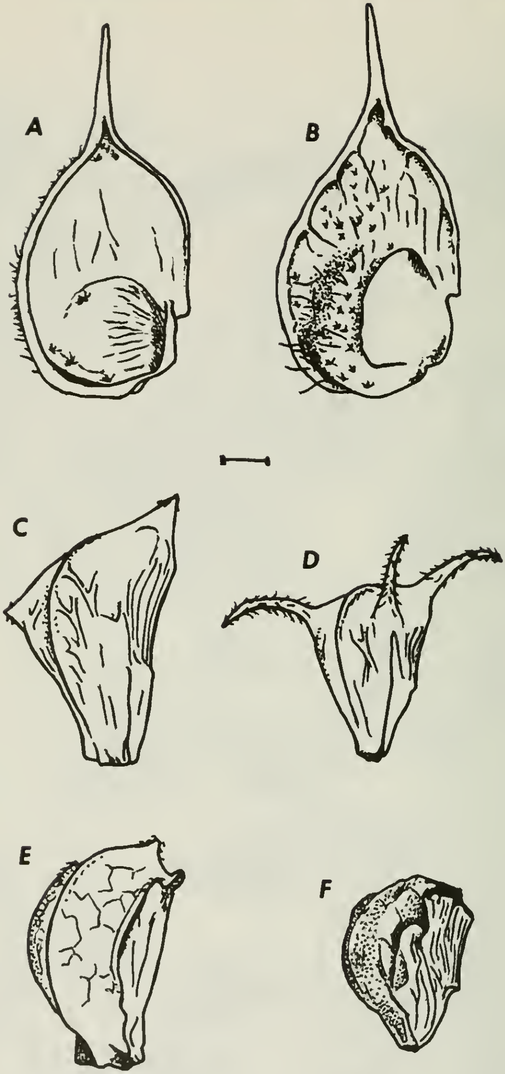

Figure 13. Mericarps of selected species. A-B, Abutilon pinkavae (Pinkava & Reeves 13044); A, interior of mericarp; B, exterior of mericarp. C, Pavonia submutica (Fryxell & Bates 902); D, Pavonia arachnoidea (Palmer 153); E, Pavonia monticola (Breedlove & Raven 13716). Pavonia paniculata (Dwyer & Liesner 12308). Scale = 1 mm.

NOTEWORTHY GRASSES FROM MEXICO V[1]

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This is an annotated list of the grasses which have been reported for Mexico. Much work remains to be done before a final draft, that can remain reasonably stable, appears. However, it is felt that a complete list at this time will be a useful tool for range managers and ecologists working with the Mexican flora.

[1]Published with approval of the director, Wyoming Agricultural Experiment Station as Journal Article No. 932.

ACROCERAS Stapf — Paniceae

5 - 6 species, both hemispheres, subtropical.

1. A. oryzoides (Swartz)Stapf
   (Panicum zizanioides HBK)
   Pantropical, probably native.
   Southern Mexico: Veracruz, Oaxaca, Chiapas, Tabasco, Campeche.

AEGILOPS L. — Hordeae

20 - 30 species, circum-Mediterranean.

2. A. cylindrica Host.
   Introduced.
   Northern Mexico: Reported only for Chihuahua where cultivated.

AEGOPOGON Humb. & Bonpl. — Chlorideae

3 species, New World.

3. A. cenchroides Humb. & Bonpl. var. cenchroides
   Mexico to Columbia and Venezuela, native.
   Common from Chihuahua to Chiapas.

3a. A. cenchroides var breviculmis (Scribn.)Beetle
   Same distribution as the species but less common, native.

4. A. tenellus (DC)Trin. var. tenellus
   Arizona to Guatemala, native.
   Common from Baja Norte and Chihuahua south to Chiapas.

4a. A. tenellus var. abortivus (Fourn.)Beetle
   Northern range of the species but less common, native.

AGROPYRON Gaertn. — Hordeae

50 - 60 species, both hemispheres, temperate.

5. A. arizonicum Scribn. & Smith
   (A. spicatum (Pursh)Scribn. var arizonicum (Scribn. & Smith)Jones
   Northern Mexico and adjacent United States, native.
   Mountains: Sonora, Chihuahua, Coahuila, Nuevo Leon, Zacatecas and San Luis Potosi.
6. A. repens (L.)Beauv.
   Introduced.
   Northern Mexico and the central highlands: Baja Norte, Chihuahua, Durango, Hidalgo, Mexico, Tlaxcala, Puebla.
7. A. trachycaulum(Link)Malte
   Boreal North America south in the mountains to Mexico, native.
   Mountains: Baja Norte, Chihuahua, Coahuila, Nuevo Leon, Tamaulipas Hidalgo and Puebla.

Note: Valdes, Jesus, et al., 1975, have reported Agropyron cristatum (L.)Gaertn., A. elongatum(Host)Beauv., A. intermedium(Host)Beauv., A. smithii Rydb., and A. trichophorum(Link)Richt. under cultivation in the state of Chihuahua.

AGROSTIS L. — Agrostideae

150 species, New World and Old World, both hemispheres, temperate.

8. A. alba L.
   (Incl. Mexican references to A. virletii Fourn. & A. gigantea Roth).
   Introduced.
   Mesic sites: Baja Norte, Durango, San Luis Potosi, Michoacan, Mexico and Tlaxcala.
9. A. berlandieri Fourn.
   Mexico, endemic.
   Known only from the vicinity of the type locality (Totoniho) in the State of Mexico.
10. A. blasdalei Hitchc.
   California and Mexico, native.
   Coastal dunes: Baja Norte.
11. A. borealis Hartm.
   (including Mexican references to A. pickeringii Tuckerman)
   Circumboreal, south in the mountains to Mexico, native.
   Mountains: Puebla.
12. A. bourgaei Fourn.
   Either an introduced variation of A. alba or an endemic.
   Mountains: Hidalgo, Mexico, and Tlaxcala.
13. A. diegoensis Vasey
   Western United States south to Baja Norte, Mexico.
   Coast range: Baja Norte.
14. A. durangensis Mez
   Mexico, endemic.
   Wet places: Durango (type loc.) and Distr. Federal.
15. A. elliottiana Schultes
   Maryland to Illinois south to Georgia and Texas; Mexico, native.
   Waste Places: reported only for Yucatan.
16. A. exarata Trin.
   Alaska and western North America south to Mexico.
   Moist places: Baja Norte, Chihuahua, Coahuila, Durango and Mexico.
17. A. ghiesbreghtii Fourn.
   Mexico, endemic.
   Central Mountains: Hidalgo, Mexico, Morelos, Guerrero, Oaxaca and Pico de Orizaba.
18. A. hiemalis (Walt.)B.S.P.
   Newfoundland to Alaska and south in the mountains to central Mexico.
   Mountains: Chihuahua, Coahuila, Durango, Michoacan, Mexico, Puebla.
19. A. liebmannii (Fourn.)Hitchc.
   Mexico, endemic.
   Type loc: Chinantla, Veracruz.
20. A. microphylla Steud.
   California and Mexico, native.
   Coastal: Baja Norte.
21. A. palustris Huds.
   Introduced.
   Marshes: Baja Norte.
22. A. perennans (Walt.)Tuckerman
   (including Mexican reports of A. decumbens Link, A. schiedeana Trin., A. chinantla Fourn. and A. fasciculata (HBK) R.&S.)

22. A. perennans (Walt.)Tuckerman (continued)
Quebec to Minnesota, and south to Florida and Guatemala.
Mountains: Durango, San Luis Potosi, Jalisco, Hidalgo, Mexico, Tlaxcala, Puebla, Veracruz, Oaxaca, and Chiapas.
23. A. rosei Scribn. & Merr.
Mexico, endemic.
Mountains: Durango, Zacatecas, and Mexico.
24. A. scabra Willd.
Newfoundland to Alaska south to Mexico.
Mountains: Baja Norte, Chihuahua, Coahuila, Durango,Sinaloa, San Luis Potosi, Queretaro, Mexico and Morelos.
25. A. schaffneri Fourn.
Mexico, endemic.
Mountains: Queretaro, Jalisco, Mexico, Tlaxcala, Puebla, Chiapas.
26. A. semiverticillata (Forsk.) Christ.
Introduced.
Wet places, common throughout Mexico, except only the Yucatan Peninsula.
27. A. stolonifera L.
Introduced.
Wet places: reported by Ivan Johnson (1943) for Coahuila.
28. A. subrepens (Hitchc.) Hitchc.
Mexico and Venezuela, native.
Wet places: Chihuahua.
29. A. tacubayensis Fourn.
Mexico, endemic.
Mountains: Michoacan and State of Mexico.
30. A. thyrsigera Mez
Mexico, endemic.
Mountains: Hidalgo, Mexico, and Veracruz.
31. A. tolucensis HBK
Mexico: south to Chile.
Mountains: Jalisco, Michoacan, Mexico, Tlaxcala, Guerrero, and Pico de Orizaba.
32. A. vinosa Swallen
Mexico and Guatemala, native.
Mountains: Jalisco, Mexico, Hidalgo, Tlaxcala.
33. A. virescens HBK
Mexico, endemic.
Mountains: Jalisco, Michoacan, Mexico, Tlaxcala and Pico de Orizaba

ALLOLEPIS Soderstrom and Decker — Eragrosteae
One species, North America.
34. A. texana (Vasey) Soderstrom and Decker
Texas and Mexico, native.
Salt flats: Chihuahua, Coahuila, Tamaulipas and Durango.

ALOPECURUS L. — Agrostideae
20 - 30 species, Temperate regions.
35. A. geniculatus L.
Northern hemisphere, temperate, native.
Wet places: at its southern extreme reported from Chihuahua.

ANDROPOGON L. Andropogoneae

About 100 species, temperate to subtropical, worldwide.

36. A. (Anatherum) bicornis L.
Southern Mexico to Argentina, native.
Pine savanna or brush: Nayarit, Hidalgo, Puebla, Oaxaca, Veracruz, Chiapas, Tabasco and Campeche.
37. A. (Anatherum) bourgaei Hack.
(including A. glaucescens Fourn.)
Mexico, endemic.
Stream draws: Veracruz (type loc. Rio Blanco), Oaxaca, and Chiapas.
38. A. (Schizachyrium) brevifolius (Sw.) Nees
Tropical and subtropical regions of world, described from "Jamaica", native?
Pine savanna: Sonora, Baja Sur, Sinaloa, Nayarit, Zacatecas, Jalisco, Colima, Michoacan, Mexico, Morelos, Guerrero, Veracruz, Oaxaca, Chiapas.
39. A. (Schizachyrium) cirratus Hack.
Mexico and adjacent United States, native.
Pine savannas: Sonora, Chihuahua, Durango, Zacatecas, San Luis Potosi, Michoacan, Mexico, Morelos, Guerrero, Oaxaca.
40. A. (Schizachyrium) condensatus HBK
(including A. rectirhachis Fourn. from Veracruz)
As var. elongatum Roberty: Mexico to Paraguay.
As subsp. elongatus subvar. exserens Hack. in Mart. Fl. Bras. 2:297. 1883: Brazil and Mexico.
Note: by some authors combined with A. microstachyus Desv.
41. A. (Amphilophis) condylotrichus Hochst.
(including A. piptatherus Hack.)
Mexico and West Indies to Colombia, Venezuela and northern Brazil, native.
Subtropical clearings: Sinaloa, Jalisco, Colima, Michoacan, Veracruz, and Oaxaca.
42. A. (Anatherum) elliottii Chapm.
Eastern United States, Cuba, southern Mexico to British Honduras, native.
Pine savannas: Chiapas.
43. A. (Schizachyrium) gaumeri (Nash) Hitchc.
Mexico, endemic.
Brush: Chiapas, Campeche, Yucatan.
44. A. gerardi Vitman
(including A. furcatus Muhl.)
United States to Honduras, native.
Pine forests: Coahuila, Durango, Sinaloa, Jalisco, Michoacan, Hidalgo, Mexico, Morelos, Puebla, Oaxaca and Chiapas.
45. A. (Anatherum) glomeratus (Walt.) B.S.P.
Southeastern United States, Mexico, and the West Indies to Panama, native.
Common in open areas throughout Mexico.
46. A. hallii Hack.
North Dakota and Montana south to northern Mexico, native.
Sandy soils: Chihuahua.

47. A. (Schizachyrium) hirtiflorus (Nees)Kunth var. hirtiflorus
Southern United States and West Indies to Bolivia and Uruguay, native.
Pine forests and brush: common throughout Mexico.

47a. A. (Schizachyrium) hirtiflorus var. feensis (Fourn.)Hack.
Same distribution as the species.

48. A. leucostachyus HBK
Southern Mexico and the West Indies to Argentina, native.
Pine forests: Guerrero, Veracruz, Chiapas, Tabasco.

49. A. (Anatherum) liebmannii Hack.
(Anatherum)virginicum subvar. liebmannii (Hack.)Roberty
Mexico, endemic.
Pine forests: Nayarit, Jalisco, Michoacan, Hidalgo, Puebla, Veracruz.

50. A. (Schizachyrium) littoralis Nash
Massachusetts to Mexico, native.
Coastal: Tamaulipas, Veracruz, Tabasco, Campeche.

51. A. maderensis Swallen
Mexico, endemic.
Canyons: Coahuila.

52. A. (Schizachyrium) malacostachyum Presl
Mexico to Costa Rica, native.
Rocky hills: Jalisco, Guerrero, Puebla, Oaxaca, Chiapas, Yucatan.

53. A. mexicanus Hitchc.
Mexico, endemic.
Open woods: Nayarit, Jalisco (type loc.) and Chiapas.

54. A. (Schizachyrium) microstachyus Desv.
Mexico and West Indies to Argentina, native.
Pine forests or brush: Sonora, Sinaloa, Jalisco, Tamaulipas, San Luis Potosi, Hidalgo, Morelos, Guerrero, Puebla, Veracruz, Oaxaca, Tabasco, and Chiapas.

55. A. (Schizachyrium) muelleri (Nash) Hitchc.
(a tetraploid variation of A. scoparius)
Mexico, endemic.
Coastal: Veracruz.

56. A. (Schizachyrium) myosurus Presl.
Mexico, endemic.
Pine woods: Chihuahua, Durango, Jalisco, Michoacan, Guerrero, and Oaxaca.

57. A. (Anatherum) pringlei Scribn. & Merr.
(Anatherum argyraeum Roberty var. pringlei (Scribn. & Merr.) Roberty.
Mexico, endemic.
Central mountains: Michoacan, Mexico, Puebla, Veracruz, Oaxaca.

58. A. salzmanni (Trin.)Nash.
Mexico to Paraguay (type from Brazil)native.
Brush: Tamaulipas, Veracruz, Oaxaca.

59. A, selloanus (Hack.)Hack.
Mexico and West Indies to Argentina, native.
Pine woods: Oaxaca and Chiapas.

60. A. semiberbis (Nees)Kunth
    Florida, Mexico, West Indies to Argentina, native.
    Brush: Mexico, Chiapas, Yucatan.
61. A.(Schizachyrium) semiglabrum (Nash), N.Amer Fl. 17:103.1912.
    Mexico, endemic.
    Chihuahua (type loc.) "near Colonia Garcia".
62. A. semitectus Swallen
    Mexico and Guatemala, native.
    Brush: Jalisco and Guerrero.
63. A. spadiceus Swallen
    Mexico, ednemic.
    Coahuila (type loc.).
64. A. (Schizachyrium) tener (Nees)Kunth
    Southern United States and West Indies south to Argentina, native.
    Brush: Sonora, Durango, Jalisco, Tamaulipas, San Luis Potosi, Guanajuato, Mexico, Morelos, Veracruz, Oaxaca, and Chiapas.
65. A. ternarius Michx.
    Delaware to Kentucky and Kansas, south to Florida and Mexico, native.
    Sandy soil: Coahuila.
66. A. virginicus L.
    Southern United States and West Indies south to Panama, native.
    Pine woods: Coahuila, Nuevo Leon, Veracruz and Chiapas.
67. A. yucatanus Swallen
    Mexico, endemic.
    Brush: Yucatan.

ANTHEPHORA Schreb. Chlorideae

4 - 5 species in Africa, one in tropical America.

68. A. hermaphrodita (L.)Kuntze
    Florida (where introduced), West Indies and Mexico south to Peru and Brazil, native.
    Brush: Baja Norte, Baja Sur, Sinaloa, Nayarit, Jalisco, Colima, Michoacan, Mexico, Morelos, Guerrero, Veracruz, Oaxaca, Chiapas and the Yucatan Peninsula.

ANTHOXANTHUM L. Aveneae

3 - 4 species, European.

69. A. odoratum L.
    Introduced.
    Occasional in cultivated areas: Hidalgo, Chiapas.

ARISTIDA L. Aristideae

200 species throughout the subtropics of the world.

70. A. adscensionis L. var. adscensionis
    Widespread in subtropics of both New World and Old World, native?
    Brush: common throughout Mexico.

70a. A. adscensionis var. abortiva Beetle
    California and northern Mexico, native.
    Dry washes: Baja Sur, Coahuila, Chihuahua and Durango.

70b. A. adscensionis var. coarctata (HBK)Kuntze
West Indies and Mexico south to Venezuela, native.
Brush: Jalisco, Tamaulipas, Campeche, Yucatan.

70c. A. adscensionis var. decolorata (Fourn.) Beetle
Mexico, endemic.
Brush: Baja Sur, Sonora, Guerrero, Oaxaca, Chiapas and Yucatan.

70d. A. adscensionis var. interrupta(Cav.)Beetle.
Mexico, endemic.
Brush: Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi, Veracruz.

70e. A. adscensionis var. modesta Hack.
California and Arizona south to Argentina, native.
Dry washes: Baja Norte, Chihuahua, Durango, Sinaloa, Zacatecas, San Luis Potosi, Jalisco and Guanajuato.

70f. A. adscensionis var. nigrescens (Presl)Beetle
Mexico, endemic.
Dry washes: Baja Sur, Sonora, Zacatecas, Guerrero, Oaxaca.

71. A. appressa Vasey
Southern Mexico, endemic (according to Henrard).
Dry banks: San Luis Potosi south to Oaxaca.

72. A. arizonica Vasey
Colorado and Texas south to Central Mexico (acc. Henrard),native.
Dry banks: northern states (except Baja and Tamaulipas) south to the central highlands.

73. A. barbata Fourn.
(including A. havardi Vasey)
Texas to Arizona and central Mexico, native.
Dry banks: northern states south to Districto Federal.

74. A. californica Thurb.
Southern California and southwestern Arizona to northwestern Mexico, native.
Dry washes: Baja Norte, Baja Sur and Sonora.

75. A. capillacea Lam.
Mexico to Bolivia and Brazil, native.
Pine forests: Sinaloa, Nayarit and Mexico.

76. A. curvifolia Fourn.
Mexico, endemic.
Pine savanna: Coahuila, Nuevo Leon, Durango, Zacatecas, San Luis Potosi and Oaxaca.

77. A. divaricata H. & B.
(including A. palmeri Vasey)
Kansas to southern California south to Mexico.
Dry banks: northern states south to Oaxaca.

78. A. fendleriana Steud.
North Dakota and Montana, south to Nevada, southern California and Mexico, native.
Dry banks: Coahuila, Nuevo Leon and San Luis Potosi.

79. A. floridana (Chapman)Vasey
Florida and Yucatan Peninsula, native.
Brush: Campeche, Yucatan and Quintana Roo.

80. A. fournieriana Hitchc.
(including A. geminiflora Fourn.)
Mexico, endemic,
Brush: Veracruz.
81. A. gentilis Henr.
Mexico, endemic.
Pine woods: Sonora, Durango, Aguascalientes, Guanajuato, Hidalgo, and Oaxaca.
82. A. glabrata (Vasey)Hitchc.
Arizona and Mexico, native.
Dry banks: Sonora, Baja Norte and Baja Sur.
83. A. glauca (Nees)Walp.
(including A. reverchonii Vasey)
Southern California, Nevada and Utah south to Texas and Mexico, native.
Dry banks: All northern border states and San Luis Potosi, Veracruz and Puebla.
84. A. hamulosa Henr,
(including A. gentilis Henr. var. breviaristata Henr.)
Southwestern United States to Guatemala, native.
Oak forests: Baja Norte, Sonora, Chihuahua, Durango, Zacatecas, Aquascalientes, San Luis Potosi, Guanajuato, Queretaro, Mexico, Puebla, Veracruz and Oaxaca.
85. A. hintoni Hitchc.
Mexico, endemic.
Pine savanna: Tamaulipas, Jalisco, Michoacan, Mexico, Guerrero and Oaxaca.
86. A. hitchcockiana Henr.
Mexico, endemic.
Pine savanna: Jalisco, Puebla, Oaxaca (type loc.).
87. A. jacquiniana Tausch var. jacquiniana
Mexico to Ecuador, native.
Pine savanna: Jalisco.
87a. A. jacquiniana var. subaequilonga Henr.
Mexico, endemic.
Pine savanna: Jalisco.
88. A. jorulensis Kunth
Mexico to Panama, native.
Dry banks: Sonora, Sinaloa, Nayarit, Jalisco, Colima, Guerrero, Oaxaca, Veracruz and Chiapas.
89. A. lagascae Henr.
Mexican, endemic.
State of Mexico (type loc.).
90. A. laxa Cav. var. laxa
(including A. spadicea HBK)
Mexico, endemic.
Dry banks and dunes: Sonora, Chihuahua, Sinaloa, Nayarit, Jalisco, San Luis Potosi, Mexico, Morelos, Puebla and Oaxaca.
90a. A. laxa var. longiramea (Presl) Henr.
Mexico, endemic.
Dry banks: Jalisco to Oaxaca.

91. A. liebmanni Fourn.
Mexico, endemic.
Dry banks: Veracruz (type loc.), Oaxaca and Chiapas.
92. A. longespica Poir.
New Hampshire to Michigan south to Florida, Texas, Mexico, native.
Sandy soil: Tamaulipas.
93. A. longiseta Steud. var. longiseta
Western U. S. to northern Mexico, native.
Plains: Baja Norte, Chihuahua, Coahuila and Nuevo Leon.
93a. A. longiseta var. robusta Merr.
Western United States and New Mexico to northern Mexico, native.
Plains: Chihuahua.
94. A. marginalis Ekman
Mexico; Venezuela, Columbia to Brazil and Paraguay (native?).
Barancas: Chihuahua (acc. Gentry, 1942).
95. A. mexicana Scribn.
Mexico, endemic? - reported by Henrard (1929) for Guatemala but not confirmed by Swallen (1955).
Dry banks: Mexico, Distr. Fed. and Puebla.
96. A. orcuttiana Vasey.
Texas to California south to central Mexico, native.
Plains: Sonora, Chihuahua, Coahuila, Nuevo Leon, Durango, Nayarit, Jalisco, Guanajuato, Michoacan, Mexico, Tlaxcala.
97. A. orizabensis Fourn.
Mexico to Panama, native.
Brush: Sinaloa, Durango, Jalisco, Guanajuato, Michoacan, Mexico, Guerrero, Tlaxcala, Puebla, Veracruz, Oaxaca, Chiapas.
98. A. pansa Woot. & Standl. var. pansa
Texas and Arizona south to central Mexico, native.
Plains: Sonora, Chihuahua, Coahuila, Nuevo Leon, south to Puebla.
98a. A. pansa var. dissita (Johnston) Beetle.
Same distribution as the species.
99. A. parishii Hitchc.
Nevada to California and northern Mexico, native.
Dry washes: Baja Norte, Coahuila.
100. A. peninsularis Hitchc.
Mexico, endemic.
Dunes: Baja Norte and Sonora.
101. A. purpurascens Poir.
Massachusetts to Wisconsin and Kansas south to British Honduras, native.
Sandy soil: Coahuila.
102. A. purpurea Nutt.
Arkansas and Kansas to central Mexico, native.
Plains: Coahuila, Nuevo Leon, Tamaulipas, Durango, San Luis Potosi, Hidalgo and Puebla.
103. A. purpusiana Hitchc.
Mexico, endemic.
Dry wash: Baja Sur.

104. A. roemeriana Scheele
(including A. micrantha Nash)
Texas and New Mexico to central Mexico, native.
Plains: Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, Durango, Zacatecas, San Luis Potosi, Puebla.

105. A. schiedeana Trin. & Rupr.
Mexico and Guatemala, native.
Pine savannas throughout Mexico.

106. A. scribneriana Hitchc.
(including A. lanuginosa Scribn.)
Mexico, endemic.
Brush: Durango, Jalisco, Guanajuato, Michoacan, Guerrero.

107. A. ternipes Cav. var. ternipes.
Southwestern United States, West Indies to Colombia, native.
Brush: common throughout Mexico.

107a. A. ternipes Cav. var. minor(Vasey)Hitchc.
Same distribution as the species.

108. A. vaginata Hitchc.
Mexico, endemic.
Revillagigedo Islands (Soccoro Isld.) type loc.

109. A. wrightii Nash.
Southern California and Colorado, Texas, south to central Mexico, native.
Plains: Chihuahua, Coahuila, Nuevo Leon, Sinaloa, Durango, Zacatecas, San Luis Potosi, Mexico, Puebla, Oaxaca.

ARTHRAXON Beauv. — Andropogoneae

About 20 species in the Old World tropics.

110. A. quartinianus (A.Rich.)Nash
Introduced.
Brush: Chiapas.

ARUNDINELLA Raddi — Arundinelleae

20 species, pantropical.

111. A. berteroniana (Schult.)Hitchc. & Chase
(including A. peruviana Steud.)
Mexico to Brazil, native.
Brush: Sinaloa, Nuevo Leon, Tamaulipas, San Luis Potosi, Jalisco, Colima, Michoacan, Hidalgo, Mexico, Morelos, Puebla, Guerrero, Veracruz, Oaxaca, Chiapas and Tabasco.

112. A. confinis (Schult.)Hitchc. & Chase
(including A. hispida (H.& B.)Kuntze) A. martinicensis Trin., and A. pallida Nees)
Mexico and West Indies south to Panama, native.
Dry banks: Sonora, Jalisco, Michoacan, Mexico, Guerrero, Veracruz, Oaxaca, Chiapas and Tabasco.

113. A. deppeana Nees
(including A. phragmitoides Griseb.)
Mexico and West Indies south to Brazil, native.
Pine savanna: Nuevo Leon, Sinaloa, Nayarit, Jalisco, Colima, Guerrero, Hidalgo, Mexico, Veracruz, Oaxaca, Chiapas, Tabasco.

114. *A. palmeri* Vasey
Mexico, endemic.
Dry banks: Sonora, Nayarit, Jalisco, Mexico, Guerrero, Veracruz.

ARUNDO L. — Arundinae
5 - 6 species, Old World, subtropics.
115. *A. donax* L.
Introduced.
Cultivated and adventive throughout Mexico.

AVENA L. — Aveneae
About 10 species, Old World, temperate.
116. *A. barbata* Brot.
Introduced.
Coastal hills: Baja Norte.
117. *A. fatua* L.
Introduced.
Common weed throughout Mexico.
118. *A. sativa* L.
Introduced.
Cultivated and an escape, scattered localities from the northern states south to central Mexico.

AXONOPUS Beauv. — Paniceae
About 80 species, tropical and subtropical, New World.
119. *A. affinis* Chase
Southeastern United States, West Indies to Argentina, native.
Wet places: Hidalgo, Puebla, Veracruz and Chiapas.
120. *A. arseni* Swallen
Mexico, endemic.
Wet places: Colima, Michoacan and Distr. Federal.
121. *A. ater* Chase
Mexico, endemic.
Wet places: Veracruz.
122. *A. centralis* Chase
Mexico, endemic.
Wet places: Nayarit, Jalisco and Colima.
123. *A. chrysites* (Steud.) Kuhlm.
Mexico and Central America, native.
Wet places: "Mex. Galeotti" acc. to Black, 1963.
124. *A. compressus* (Sw.)Beauv.
Pantropical (native?).
Wet places: Nuevo Leon and Sinaloa south to Yucatan Peninsula, often cultivated.
125. *A. deludens* Chase
Mexico, endemic.
Wet places: Jalisco.
126. *A. elongatus* Swallen
Mexico and Guatemala, native.
Wet places: Chiapas.

127. A. mexicanus Black
Mexico, endemic.
Wet places: Sinaloa.
128. A. multipes Swallen
Mexico, endemic.
Wet places: Veracruz.
129. A. poiophyllus Chase
Mexico to Honduras, native.
Wet places: Tamaulipas and Chiapas.
130. A. purpusii (Mez)Chase
Mexico to Argentina, native.
Wet places: Veracruz, Oaxaca, Chiapas, Tabasco.
131. A. reederi Black
Mexico, endemic.
Wet places: Chiapas.
132. A. rosei (Scribn. & Merr.)Chase
Mexico, endemic.
Wet places, Nayarit.
133. A. scoparius (Flügge) Kúhlm.
Mexico to Peru (acc. to Black, 1963), native.
Wet places, "Mex. Galeotti 227" (acc. to Black, 1963).

BAMBUSA Schreb. Bambuseae
100 or more in the Old World tropics and in the New World tropics as Section Guadua.
134. B. (Guadua) aculeata (Rupr.)Hitchc.
Mexico south to Panama, native.
Tropical forest margin, San Luis Potosi, Veracruz and Campeche.
135. B. (Guadua) amplexifolia (Presl) Schultes
Mexico to Colombia and Venezuela.
Tropical forest margin, Sinaloa.
136. B. (Guadua) longifolia (Fourn.)McClure.
(including Arthrostylidium spinosum Swallen)
Mexico, endemic.
Thickets, Durango, Nayarit, San Luis Potosi, Mexico, Oaxaca, Chiapas and Campeche.
137. B. vulgaris Schrad.
Introduced.
Cultivated, scattered localities throughout Mexico.

BLEPHARIDACHNE Hack. Eragrosteae
2 species, North America.
138. B. bigelovii (S.Wats.)Hack.
Texas and northern Mexico, native.
Chihuahuan desert: Coahuila.

BLEPHARONEURON Nash Eragrosteae
One species, North America.
139. B. tricholepis (Torr.)Nash
Colorado and Utah south to central Mexico, native.
Pine woods: northern border states south to Tlaxcala and Distr. Fed.

BOTHRIOCHLOA Andropogoneae

About 30 species, tropic and subtropics of the world.

140. B. alta (Hitchc.)Henr.
Texas and New Mexico south to Bolivia and Argentina, native.
Dry banks: Durango, Zacatecas, San Luis Potosi, Jalisco, Guanajuato, Queretaro, Oaxaca, Chiapas.

141. B. barbinodis (Lag.)Herter var. barbinodis
(including Andropogon emersus Fourn.)
California, Colorado and Texas south to central Mexico; Argentina and Uruguay, native.
Dry banks: all the northern border states south to Veracruz and Oaxaca.

141a. B. barbinodis var. perforata (Trin.)Gould
Same distribution as the species,

142. B. campii (Swallen) deWet
Mexico and Ecuador, native.
Dry banks, Oaxaca.

143. B. hirtifolia (Presl)Henr.
(including Andropogon Schaffneri Griseb. and A. hirtifolius var. pubiflorus (Fourn.)Hack.)
Mexico, endemic.
Dry banks: Michoacan, Distr. Fed., Veracruz, Oaxaca and Chiapas.

144. B. hyrida (Gould)Gould
Texas and Mexico, native.
Dry banks: Coahuila.

145. B. ischaemum (L.) Keng var. songarica (Rupr.) Cel.& Henr.
Introduced.
Cultivated & escaped: Nuevo Leon, Tamaulipas, Michoacan.

146. B. palmeri (Hack.)Gould
(B. barbinodis var. palmeri (Hack.)deWet)
Mexico, endemic.
Dry banks: Durango, Zacatecas, Jalisco, Michoacan and Guanajuato.

147. B. pertusa (L.)Camus
Introduced.
Dry banks: Tamaulipas, San Luis Potosi, Campeche and Yucatan.

148. B. piptathera (Hack.)Gould
Mexico and Brazil.
Dry banks: Chiapas.

149. B. reevesii (Gould)Gould
Mexico, endemic.
Dry banks: Coahuila.

150. B. saccharoides (Sw.)Rydb. var. saccharoides.
Southwestern United States and West Indies to Argentina, native.
Dry banks: common throughout Mexico except for the Yucatan Peninsula.

150a. B. saccharoides var. laguroides (DC)Beetle.
Same distribution as the species, native.

150b. B. saccharoides var. longipaniculata (Gould)Gould.
Texas to Panama, native.
Dry banks: Nuevo Leon.

151. B. schlumbergeri (Fourn.)Henr.
(B. barbinodas var. schlumbergeri (Fourn. ex Hemsl.)deWet).
Mexico and Guatemala, native.
Dry banks: Durango and San Luis Potosi, south to Oaxaca.
152. B. springfieldii (Gould)Parodi
United States and Mexico, native.
Dry banks: Nayarit.
153. B. wrightii (Hack.)Henr.
New Mexico and Mexico, native.
Dry banks: Chihuahua, Durango, Nuevo Leon and San Luis Potosi.

BOUTELOUA Lag. Chlorideae
Species about 40 in the Americas.
154. B. alamosana Vasey
Mexico, endemic.
Rocky banks: Sonora (type loc.).
155. B. annua Swallen
Mexico, endemic.
Dry banks: Baja Sur (type loc.).
156. B. arenosa Vasey
Mexico, endemic.
Sandy soil: Sonora (type loc.), Sinaloa and Baja Sur.
157. B. aristidoides (HB)Griseb.
(including B. aristidoides var. arizonica Jones).
Texas to southern California, Mexico and South America, native.
Dry soils: northern border states south to Oaxaca.
158. B. barbata Lag.
Colorado and Utah south to Mexico; Argentina, native.
Dry soils: northern border states south to Oaxaca.
159. B. breviseta Vasey
(including B. ramosa Scribn.)
U. S. and Mexico, native.
Dry washes: Chihuahua, Coahuila, Nuevo Leon, Durango, Zacatecas, San Luis Potosi and Veracruz.
160. B. chasei Swallen
Mexico, endemic.
Gypsum: Coahuila, Nuevo Leon, Zacatecas and San Luis Potosi.
161. B. chondrosioides (HBK)Benth.
(including B. havardii Vasey).
Texas and Arizona south to Honduras, native.
Rocky slopes: Sonora and Chihuahua south to Chiapas.
162. B. curtipendula (Michx.)Torr. var curtipendula.
Canada to central Mexico, native.
Grassland: northern border states south to central Mexico.
162a. B. curtipendula var. caespitosa Gould and Kapadia
U. S. and Mexico; Venezuela to Argentina, native.
Dry banks: northern border states south to Chiapas.
162b. B. curtipendula var. tenuis Gould and Kapadia
Mexico, endemic.
Dry banks: Chihuahua south to Chiapas.

163. B. distans Swallen
Mexico, endemic.
Dry banks: Oaxaca (type loc.)
164. B. disticha (Kunth)Benth.
Mexico and West Indies to Peru and Argentina, native.
Dry banks: Jalisco, Michoacan and Guerrero.
165. B. elata J. & C. Reeder
Mexico, endemic.
Rocky cliffs: Jalisco, Colima and Chiapas.
166. B. eludens Griffiths
U. S. and Mexico, native.
Dry banks: Sonora, Chihuahua and Coahuila.
167. B. eriopoda (Torr.)Torr.
U. S. and northern Mexico, native.
Dry slopes: Sonora, Chihuahua, Coahuila, Nuevo Leon and Durango.
168. B. eriostachya (Swallen)Reeder
(B. eriopoda var. eriostachya Swallen)
Mexico, endemic.
Dry banks: Coahuila.
169. B. gentryi Gould
Mexico, endemic.
Dry banks: Durango, Jalisco.
170. B. glandulosa (Cerv.)Swallen
(including B. hirticulmis Scribn.)
Mexico and Guatemala, native.
Limestone balds: Sonora, Chihuahua and Baja Sur, south to Chiapas.
171. B. gracilis (HBK)Lag.
U. S. and Mexico; native; South America (introduced?).
Grasslands: northern border states to Puebla.
172. B. heterostega (Trin.)Griffiths
West Indies and Mexico, native.
Brush: Nuevo Leon.
173. B. hirsuta Lag.
U. S. and Mexico, native.
Thickets: throughout Mexico except for the Yucatan Peninsula.
174. B. johnstonii Swallen
Mexico, endemic.
Gypsum: Coahuila.
175. B. juncea (Desv.)Hitchc.
Mexico, endemic.
Thickets: Hidalgo, Mexico, Morelos and Guerrero.
176. B. karwinskii (Fourn.)Griffiths
Mexico, endemic.
Gypsum: Coahuila, Nuevo Leon, Zacatecas, San Luis Potosi and Tamaulipas.
177. B. longiseta Gould
Mexico, endemic.
Dry slopes: Oaxaca and Chiapas (type loc.).

178. B. media (Fourn.)Gould and Kapadia
(including B. latifolia Swallen and B. pringlei Scribn.)
Mexico, endemic.
Dry slopes: Baja Sur, San Luis Potosi, Colima, Michoacan, Mexico, Morelos, Guerrero, Oaxaca and Chiapas.
179. B. parryi (Fourn.)Griffiths
New Mexico and Arizona to Mexico, native.
Rocky slopes: northern border states south to Guanajuato.
180. B. pedicellata Swallen
Mexico, endemic.
Rocky slopes: Tlaxcala and Puebla (type loc.).
181. B. purpurea Gould and Kapadia
Mexico, endemic.
Heavy black soils: central mountains.
182. B. radicosa (Fourn.)Griffiths
Southern New Mexico and southern California to Mexico, native.
Dry slopes: northern border states south to Oaxaca.
183. B. reflexa Swallen
Mexico, endemic.
Dry washes: Sonora, Sinaloa and Baja Sur.
184. B. repens (HBK)Scribn. & Merr.
(including B. filiformis (Fourn.)Griffiths)
Texas to Arizona, West Indies to Venezuela and Colombia, native.
Dry slopes: common throughout Mexico.
185. B. rigidiseta (Steud.)Hitchc.
(including B. texana S. Wats.)
Oklahoma and Texas and northern Mexico, native.
Grassland: Sonora, Coahuila, Nuevo Leon and Tamaulipas.
186. B. rothrockii (Cervant)Swallen
(including B. hirticulmis Scribn.)
Southern California and Arizona to northern Mexico, native.
Mesas: Sonora, Chihuahua, Coahuila, Nuevo Leon, Sinaloa, Durango and Baja Sur.
187. B. scorpioides Lag.
Mexico, endemic.
Dry flats: Chihuahua and Nuevo Leon south to Puebla.
188. B. simplex Lag.
(including B. tenuis (Beauv.)Griseb.)
Southwestern United States to Argentina, native.
Dry flats: northern border states south to Veracruz and Oaxaca.
189. B. sonorae Griffiths
Mexico, endemic.
Dry washes: Sonora, Sinaloa and Baja Sur.
190. B. triaena (Trin.)Scribn.
Mexico and Guatemala, native.
Thickets: Coahuila and Sinaloa south to Yucatan Peninsula.

191. B. trifida Thurb.
Texas to California and northern Mexico, native.
Grasslands: Chihuahua, Coahuila, Nuevo Leon, Tamaulipas and San Luis Potosi.

192. B. uniflora Vasey var. uniflora
United States and northern Mexico, native.
Rocky slopes: Nuevo Leon and Coahuila.

192a. B. uniflora var. coahuilensis Gould and Kapadia
Mexico, endemic.
Rocky slopes: Coahuila, Nuevo Leon, Tamaulipas, Zacatecas, San Luis Potosi and Aquascalientes.

193. B. warnockii Gould and Kapadia
Texas and New Mexico south to north central Mexico
Grassland: Coahuila.

194. B. williamsii Swallen
Mexico to Honduras, native.
Rocky slopes: Zacatecas, Jalisco, Guerrero, Oaxaca and Chiapas.

BRACHIARIA Griseb. Paniceae
About 15, tropics and subtropics of the world.

195. B. ciliatissima (Buckl.)Chase
Arkansas, Oklahoma, Texas and Mexico, native.
Sandy soils: Tamaulipas and Nuevo Leon.

196. B. mexiana Hitchc.
Mexico, endemic.
Sandy soils: Chihuahua to Tamaulipas and south to Oaxaca.

197. B. ophyrodes Chase
Mexico, endemic.
Sandy soils: Tamaulipas and Nuevo Leon.

198. B. plantaginea (Link)Hitchc.
United States (where introduced?); Mexico to Bolivia and Brazil, native.
Sandy soils: Durango to Tamaulipas and south to Oaxaca.

199. B. platyphylla (Griseb.)Nash
U. S., Cuba and Mexico, native.
Wet places: reported for Mexico by Gould (1975).

200. B. purpurascens (Raddi)Henr.
(Panicum purpurascens Raddi)
Pantropical (introduced in the Americas?)
Ditches and cultivated: Baja Sur, Tamaulipas, Colima, Jalisco, Mexico, Veracruz, Oaxaca, Chiapas, Tabasco, Campeche, Yucatan and Quintana Roo.

201. B. reptans (L.) Gard. & Hubb.
Pantropical (introduced in the Americas?)
Ditches: Sonora, Sinaloa, Nuevo Leon, Tamaulipas, Colima, Jalisco, Guerrero, Veracruz, Oaxaca, Chiapas, Campeche and Yucatan.

202. B. subquadripara (Trin.)Hitchc.
Introduced.
Ditches: Nuevo Leon, Veracruz and Yucatan.

BRACHYPODIUM Beauv. Festuceae

About 15 species in the Old World; two in subtropical America.

203. *B. mexicanum* (R. & S.)Link
Mexico to Bolivia, native.
Dry banks; common from Baja Sur to Nuevo Leon and south to Chiapas.

204. *B. pringlei* Scribn.
Mexico, endemic.
Dry banks: Coahuila, Nuevo Leon and Tamaulipas.

205. *B. sylvaticum* (Huds.)Beauv.
Introduced.
Forest margin: Distr. Federal.

BRIZA L. Festuceae

Three annuals in the Old World; about 15 New World perennials.

206. *B. minor* L.
Introduced.
Roadsides: Jalisco, Mexico, Puebla and Veracruz.

207. *B. rotundata* (HBK)Steud.
Mexico and Guatemala, native.
Pine savanna: Nuevo Leon and Tamaulipas south to Chiapas.

BROMUS L. Brachypodeae

About 100 species, temperate zone world-wide.

208. *B. anomalus* Rupr.
United States and Mexico, native.
Pine savanna: northern border states south to Veracruz and Oaxaca.

209. *B. arizonicus* (Shear)Stebbins
United States and Mexico, native.
Dry washes: Nuevo Leon and Baja Norte.

210. *B. attenuatus* Swallen
Mexico, endemic.
Pine savanna: Nuevo Leon and Hidalgo.

211. *B. carinatus* H. & A.
United States to central America, native.
Pine savanna: common throughout Mexico.

212. *B. ciliatus* L.
Canada and United States south to northern Mexico, native.
Pine savanna: Baja Norte and Sonora.

213. *B. densus* Swallen
Mexico, endemic.
Pine savanna: Coahuila, Nuevo Leon and Tamaulipas.

214. *B. diandrus* Roth
(*B. rigidus* Roth)
Introduced.
Roadsides: Baja Norte, Puebla.

215. B. dolichocarpus Wagnon
Mexico, endemic.
Pine savanna: Colima, Jalisco, Michoacan, Hidalgo, Mexico, Morelos and Oaxaca.
216. B. lanatipes (Shear)Rydb.
(including B. pinetorum Swallen)
U. S. and northern Mexico, native.
Pine savanna: Coahuila.
217. B. marginatus Nees
Canada to northern Mexico, native.
Pine savanna: Nuevo Leon and Sonora.
218. B. meyeri Swallen
Mexico, endemic.
Pine savanna: Nuevo Leon.
219. B. mollis L.
Introduced.
Dry hills: Baja Norte.
220. B. mucroglumis Wagnon
(including B. thysanoglottis Soderstrom & Beaman).
Mexico, endemic.
Pine savanna: Chihuahua, Durango and Baja Sur.
221. B. polyanthus Scribn.
Western U. S. and northern Mexico, native.
Pine savanna: Sonora.
222. B. porteri (Coult.)Nash
(including B. frondosus (Shear)Woot. & Standl.)
Canada to Mexico, native.
Pine savanna: northern border states south to Campeche.
223. B. rubens L.
Introduced.
Dry hills: Baja Norte.
224. B. tectorum L.
Introduced.
Dry hills: Baja Norte and Chihuahua.
225. B. trinii Desv.
California and northern Mexico; Chile, native.
Coastal hills: Baja Norte.
226. B. unioloides HBK.
Introduced.
Ditches and cultivated: Chihuahua, Coahuila, Hidalgo and Mexico.
227. B. wildenowii Kunth
Introduced.
Ditches and cultivated: northern border states south to Chiapas.

BUCHLOE Engelm. Chlorideae
One species in North America.
228. B. dactyloides (Nutt.)Engelm.
Grassland: northern border states south to central mountains.

BUCHLOMINUS RRR Chlorideae
One, endemic to Mexico.
229. B. nervatus (Swallen)RRR
Mexico, endemic
Hidalgo and Mexico.

CALAMAGROSTIS Adans. Agrostideae
About 150 species, temperate, worldwide.
230. C. eriantha (HBK)Steud.
Mexico, endemic.
Pine savanna: Mexico, Puebla, Veracruz and Oaxaca.
231. C. junciformis (HB)Steud.
Mexico and Guatemala, native.
Mountain slopes: "Nevada de Toluca", type loc.
232. C. orizabae (Rupr.)Steud.
(including C. erectifolia Hitchc. and C. plumosa (Fourn.) Scribn.)
Mexico, endemic.
Mountain slopes: "Mount Orizabae", type loc., and Nevada de Colima.
233. C. pringlei Beal
Mexico (endemic?; closely related to C. guatemalensis Hitchc.)
Mountain slopes: Chihuahua.
234. C. tolucensis (HB)Trin.
(including C. mcvaughei Sohns)
Mexico, endemic.
Mountain slopes, central mountains.
235. C. valida Sohns
Mexico, endemic.
Mountain slopes: Jalisco.
236. C. volcanica Swallen
Mexico and Guatemala.
Mountain slopes: "Vulcan Tacana".

CALAMOCHLOA Fourn. Chlorideae
One species, endemic.
237. C. filifolia Fourn.
Brush: San Luis Potosi.

CATHESTECUM Presl Chlorideae
Species six, North and Central America.
238. C. brevifolium Swallen
Mexico and Central America, native.
Dry slopes: Sonora and Chihuahua south to Chiapas.
239. C. erectum Vasey and Hack.
Texas to Arizona and adjacent Mexico, native.
Dry slopes: Chihuahua.
240. C. multifidum Griffiths
Mexico, endemic.
Dry slopes: Mexico, Morelos, Guerrero and Oaxaca.

241. _C. prostratum_ Presl
(including _C. annum_ Swallen)
Mexico, endemic.
Dry slopes and flats: Queretaro, Jalisco, Morelos, Guerrero and Oaxaca.

242. _C. varium_ Swallen
Mexico, endemic.
Dry slopes: Puebla and Oaxaca.

CENCHRUS L. Paniceae

Species about 20, worldwide.

243. _C. brownii_ R. & S.
(including _C. viridis_ Spreng.)
Florida and West Indies to Bolivia and Brazil, native.
Sandy soil: Baja Sur and Mayarit; Nuevo Leon and Tamaulipas; south to the Yucatan Peninsula.

244. _C. ciliaris_ L.
Introduced? (closely related to _C. multiflorus_ Presl which is said to be native).
Ditches and cultivated: common throughout Mexico.

245. _C. echinatus_ L.
Southern United States, West Indies to Argentina, native.
Ditches: common throughout Mexico.

246. _C. incertus_ Curtis
(including _C. pauciflorus_ Benth.)
Southern United States, West Indies to South America, native.
Ditches: common throughout Mexico.

247. _C. longispinus_ (Hack.)Fernald
United States and West Indies to Venezuela, native.
Ditches: Durango, Tamaulipas and Campeche.

248. _C. multiflorus_ Presl
(including _Pennisetum karwinskyi_ Schrad.)
Native? (closely related to _C. ciliaris_ L. which is said to be introduced); also in Central America.
Dry flats: southern Sonora and southern Chihuahua south along the west coast of Mexico to Chiapas.

249. _C. myosuroides_ HBK
Florida and West Indies south to South America, native.
Northern border states south to Veracruz and Oaxaca.

250. _C. palmeri_ Vasey
Mexico, endemic.
Sandy soils: Baja Norte, Baja Sur and Sonora (type loc.).

251. _C. pilosus_ HBK
(including _C. pallidus_ Fourn.)
Mexico south to Peru, native.
Dry slopes: Jalisco, Colima south to Yucatan.

CHABOISSAEA Fourn. Eragrosteae

One species, endemic.

252. C. ligulata Fourn.
(Muhlenbergia ligulata (Fourn.)Scribn. & Merr.)
Mexico, endemic.
Dry slopes: Chihuahua south to Mexico.

CHAETIUM Nees Andropogoneae

3 species in the Americas.

253. C. bromoides (Presl)Benth.
Mexico and Central America, native.
Dry slopes: Chihuahua south to Campeche.

CHLORIS Sw. Chlorideae

70 species, subtropics, worldwide.

254. C. andropogonoides Fourn.
Texas and northern Mexico, native.
Ditches: Coahuila, Nuevo Leon, Tamaulipas and San Luis Potosi.

255. C. aristata (Cervantes)Swallen
(including references to C. rufescens Lag. and Mexican references to C. orthonoton).
Mexico and Central America, native.
Coahuila, Nuevo Leon, south to Chiapas.

256. C. brandegei (Vasey)Swallen
Mexico, endemic.
Arroyos: Baja Norte and Baja Sur.

257. C. chloridea (Presl)Hitchc.
(C. clandestina Scribn. & Merr.)
U. S. and Mexico to Central America, native.
Dry slopes: Baja California and Sonora south to Chiapas; Nuevo Leon, Tamaulipas, San Luis Potosi south to Chiapas.

258. C. ciliata Sw.
U. S., West Indies and Mexico to Argentina, native.
Grassland: Coahuila, Nuevo Leon, Tamaulipas south to Yucatan Peninsula.

259. C. crinita Lag.
(Trichloris crinita (Lag.) Parodi)
Texas south to Argentina, native.
Dry washes: Chihuahua, Coahuila, Nuevo Leon, Durango and San Luis Potosi.

260. C. cucullata Bisch.
Texas and northern Mexico, native.
Ditches: Coahuila, Nuevo Leon and Tamaulipas.

261. C. gayana Kunth
Introduced.
Cultivated and escaped: Coahuila, Nuevo Leon, Mexico and Chiapas.

262. C. inflata Link
(Including references to C. barbata (L.) Sw.)
Pantropical and subtropics, introduced?
Dry washes: Sonora, Tamaulipas, Veracruz and the Yucatan Peninsula.

263. C. pluriflora (Fourn.)Clayton
Texas, Mexico, Central and South America, native.
Dry washes: Coahuila, Nuevo Leon, Tamaulipas, Oaxaca, Campeche.
264. C. radiata (L.)Sw.
West Indies and Mexico to Paraguay, native.
Ditches: Nuevo Leon, Morelos, Veracruz and Oaxaca.
265. C. subdolichostachya Muller
(including C. latisquamea Nash)
Texas and northern Mexico, native.
Sandy soils: Coahuila, Nuevo Leon and Tamaulipas.
266. C. submutica HBK
Mexico, endemic.
Dry washes: common from the northern border states south to Chiapas.
267. C. verticillata Nutt.
United States to northern Mexico, native.
Plains: reported only from Coahuila.
268. C. virgata Sw.
Pantropical, native? (U.S., West Indies south to Argentina).
Ditches: common throughout Mexico.

CHUSQUEA Bambuseae
About 100 species in the Americas.
269. C. bilimeki Fourn.
Mexico, endemic.
Thickets: San Luis Potosi and Veracruz.
270. C. carinata Fourn.
Mexico, endemic.
Thickets: Veracruz.
271. C. galeottiana Rupr.
Mexico, endemic.
Thickets: Guerrero, Oaxaca(type loc.) and Chiapas.
272. C. heydei Hitchc.
Mexico and Guatemala, native.
Thickets: west coast from Jalisco to Chiapas.
273. C. liebmannii Fourn.
Mexico, endemic.
Thickets: Sinaloa, Oaxaca (type loc.) and Chiapas.
274. C. longifolia Swallen
Southern Mexico to Panama, native.
Thickets: Chiapas.
275. C. muelleri Munro
Mexico, endemic.
Thickets: Veracruz.
276. C. nelsonii Scribn. & Smith
Mexico, endemic.
Thickets: Chiapas.

277. *C. serrulata* Pilger
Mexico, endemic.
Thickets: Chiapas.
278. *C. simpliciflora* Munro
Mexico and Guatemala, native.
Thickets: "Mexico" according to Swallen: Grasses of Guatemala.
279. *C. spinosa* Fourn.
Mexico, endemic.
Thickets: Puebla.
280. *C. sulcata* Swallen
Mexico, endemic.
Thickets: Chiapas.

CINNA L. Agrostideae
3 species, one in N. America and Eurasia, one in Nam. and one in Mexico south to South America.
281. *C. poaeformis* (HBK) Scribn. & Merr.
Mexico, Costa Rica, Panama, Colombia, Venezuela, Peru, native.
Pine savanna: Hidalgo, Mexico, Morelos, Puebla, Oaxaca, Chiapas.

COELORACHIS Brongn. Andropogoneae
Tropics of the World, about 25 species.
282. *C. ramosa* (Fourn.) Nash
(*Manisuris ramosa* (Fourn.)Hitchc.)
Mexico to Panama and Colombia, native.
Ditches: Michoacan, Veracruz, Tabasco and Campeche.

COIX L. Andropoganeae
4 in the Old World tropics.
283. *C. lacryma-jobi* L.
Introduced.
Cultivated and escaped: Coahuila, Nuevo Leon, Veracruz, Oaxaca, Chiapas, Tabasco and Yucatan.

CORTADERIA Stapf Arundinae
15 species in South America.
284. *C. dioica* (Spreng.)Speg.
(including references to *C. selloana* (Scult.)Aschers. & Graebn.)
Introduced.
Cultivated as an ornamental: Chihuahua, Nuevo Leon, Queretaro, Mexico and Puebla.

COTTEA Kunth Pappophoreae
One species, New World.
285. *C. pappophoroides* Kunth
Bicentric: U.S. and Mexico; Ecuador to Peru and Argentina, native.
Dry slopes: northern border states south to Oaxaca.

CRYPTOCHLOA Swallen Olyreae
4 species in Mexico, Central and South America.
286. _C. granulifera_ Swallen
Mexico to Ecuador, native.
Tropical forest: Veracruz and Chiapas.
287. _C. strictiflora_ (Fourn.)Swallen
(_Strephium strictiflorum_ Fourn. _Raddia strictiflora_ (Fourn.) Chase and _Olyra strictiflora_ (Fourn.)Hemsl.)
Mexico, endemic.
Tropical forest: Veracruz.

CTENIUM Panzer Chlorideae
20 species, world tropics.
288. _C. planifolium_ (Presl)Kunth
(_Campulosus planifolius_ Presl)
Mexico, endemic.
Brush: Mexico, Oaxaca and Chiapas.
289. _C. plumosum_ (Hitchc.)Swallen
Mexico, endemic.
Brush: Sinaloa and Nayarit.

CYCLOSTACHYA Reeder and Reeder Chlorideae
One species in Mexico.
290. _C. stolonifera_ (Scribn.)Reeder and Reeder
Mexico, endemic.
Dry flats: Zacatecas, San Luis Potosi, Aguascalientes, Hidalgo and Mexico.

CYMBOPOGON Spreng. Andropogoneae
About 60 species in the Old World tropics.
291. _C. citratus_ (DC)Stapf
Introduced.
Persistent after cultivation: Nuevo Leon, Veracruz, Chiapas and Yucatan.
292. _C. nardus_ (L.) Rendle
Introduced.
Persistent after cultivation: Nuevo Leon and Yucatan.

CYNODON L. Rich. Chlorideae
6 species, one pantropical, others African.
293. _C. dactylon_ (L.)Pers.
Pantropical, native?
Common throughout Mexico.
294. _C. plectostachyum_ (Schum.)Pilger
Introduced.
Persistent after cultivation: Nuevo Leon, Veracruz and Baja Sur.

DACTYLIS L. Festuceae

About 5 species, temperate, Old World.

295. _D. glomerata_ L.
Introduced.
Persistent after or escaped from cultivation: Mexico, Puebla, Oaxaca and Chiapas.

DACTYLOCTENIUM Willd. Chlorideae

13 Old World species, subtropical.

296. _D. aegyptium_ (L.) Willd.
Introduced.
Common weed throughout Mexico.

DANTHONIA Lam. & DC. Danthoneae

100 species, temperate, worldwide.

297. _D. filifolia_ Hubbard
Mexico, endemic.
Pine savanna: Puebla (type loc.) and Chiapas.

DESCHAMPASIA Beauv. Aveneae

50 species, temperate, worldwide.

298. _D. danthonioides_ (Trin.)Munro
Alaska to Baja California: Chile, native.
Moist places: Baja Norte only.
299. _D. elongata_ (Hook.) Munro
Alaska to central Mexico; Chile, native.
Mt. slopes: Jalisco, Hidalgo, Mexico and Morelos.
300. _D. flexuosa_ (L.)Trin.
Amphiatlantic, south in mountain to Mexico, native.
Mountain slopes: Chihuahua, Nuevo Leon.
301. _D. liebmanniana_ (Fourn.)Hitchc.
Mexico, endemic.
Central mountains: Michoacan, Mexico and Puebla.
302. _D. pringlei_ Scribn.
Mexico, endemic.
Sierra Madre: Sonora and Chihuahua south to Puebla.
303. _D. straminea_ Hitchc.
Mexico, endemic.
Central mountains: Mexico and Puebla.

DICHANTHIUM Willemet Andropogoneae

10 species, Old World subtropics.

304. _D. annulatum_ (Forsk.)Stapf
Introduced.
Cultivated and escaped: Tamaulipas and Quintana Roo.
305. _D. aristatum_ (Poir.) C. E. Hubb.
Introduced.
Cultivated and escaped: Nuevo Leon and Tamaulipas.
306. _D. sericeum_ (R.Br.)Camus
Introduced.
Cultivated and escaped: Tamaulipas.

DIECTOMIS HBK Andropogoneae

Two species in the Americas.

307. D. fastigiata (Sw.)HBK
(Andropogon fastigiatus Sw.)
Pantropical, native?
Thickets: Tamaulipas, Sonora, Nayarit, Jalisco, Colima, Michoacan, Mexíco, Morelos, Guerrero, Oaxaca, Chiapas.

308. D. laxa Nees
(D. angustata Presl, Andropogon angustata (Presl)Steud.)
Cuba and Mexico, south to northern Brazil, native.
Pine savanna: Sinaloa south to Chiapas.

DIGITARIA Heist. Paniceae

300 species, worldwide, temperate and tropical.

309. D. similis Nom. Nov.
(Trichachne affinis Swallen, not D. affinis R. & S., 1917; not D. affinis Opiz, 1836.)
Mexico, endemic.
Brush: Nuevo Leon, Tamaulipas, San Luis Potosi, Tabasco, Quintana Roo.

310. D. argillacea (Hitchc. & Chase)Fern.
West Indies and Mexico, south to Panama.
Brush: Sonora, Nayarit, Michoacan south to Chiapas.

311. D. argyrostachya (Steud.)Fern.
Java, Sumatra, Bali, Celebes and Philippines. Introduced in West Indies. Reported for Mexico by John Reeder; Hidalgo, Guanajuato, Mexico and Michoacan. Introduced?

312. D. bicomis (Lam.) R. & S.
(D. diversiflora Swallen)
(D. chrysoblephara Fig. & DeNot.)
Pantropical, introduced?
Mexico, a common weed at lower elevations.

313. D. californica (Benth.)Henr.
(Trichachne californica (Benth.)Chase)
U. S. south to Bolivia and Argentina.
Dry slopes: northern border states south to Puebla.

314. D. cayoensis Swallen
Mexico and British Honduras.
Brush: Yucatan.

315. D. ciliaris Retz.
(D. adscendens (HBK)Henr.)
Pantropical, native?
Common weed throughout Mexico.

316. D. curtigluma Hitchc.
Mexico to Panama.
Brush: Jalisco, Michoacan, Mexico, Puebla and Chiapas.

317. D. distans (Chase)Fernald
Mexico, endemic.
Pond margin: Jalisco.

318. D. filiformis (L.)Koeler
Eastern United States south to Mexico, native.
Weedy: Chihuahua, Coahuila, Durango, Zacatecas, Jalisco, Oaxaca and Chiapas.
319. D. hitchcockii (Chase)Stuckert
(Trichachne hitchcockii Chase)
Texas and New Mexico, native.
Dry slopes: Coahuila, Nuevo Leon, Tamaulipas and San Luis Potosi.
320. D. horizontalis Willd.
Pantropical, native?
Weedy: Sinaloa, Nayarit, Jalisco, Colima, Michoacan. Nuevo Leon, Tamaulipas, San Luis Potosi, Veracruz, Oaxaca, Chiapas, Yucatan and Quintana Roo.
321. D. insularis (L.)Mez
(Trichachne insularis (L.)Nees)
United States, Mexico, West Indies south to Argentina, native.
Brush: common throughout Mexico except for Baja California and the central mountains.
322. D. leucites (Trin.)Henr. var. leucites
Mexico and Guatemala, native.
Dry banks: Nuevo Leon, San Luis Potosi, Jalisco, Michoacan, Mexico, Morelos, Puebla, Veracruz and Chiapas.
322a. D. leucites var. glabella(Chase)Henr.
Mexico, endemic.
Dry banks: Veracruz and Michoacan.
323. D. leucocoma (Nash)Urban
Florida, West Indies and Mexico, native.
Dry banks: Mexico and Veracruz.
324. D. patens (Swallen)Henr.
(Trichachne patens Swallen)
Texas and northern Mexico, native.
Sandy soil: Sonora, Coahuila and Nuevo Leon.
315. D. obtusa Swallen
Southern Mexico to Guatemala, native.
Dry banks: Morelos, Veracruz, Oaxaca and Chiapas.
326. D. pentzii Stent. var. minor Stent.
(references to D. decumbens)
Introduced.
Persistent after cultivation: Tamaulipas, San Luis Potosi, Nayarit, Veracruz, Tabasco, Chiapas and Campeche.
327. D. sanguinalis (L.)Scop.
Pantropical, native?
Scattered localities in northern Mexico south to Queretaro.
328. D. vidascens Link.
Pantropical, native?
Weedy: Chiapas.

DISSANTHELIUM Trin. Aveneae

329. D. californicum (Nutt.)Benth.
Islands off the coast of California and Baja California, native.
Dry slopes: Baja California acc. to Hitchcock.
330. D. calycinum (Presl)Hitchc.
(D. sclerochloides Fourn.)
Bicentric: Mexico and Chile, native.
Dry slopes: Mexico and San Luis Potosi.

DISTICHLIS Raf. Eragrosteae
6 species in the Americas.
331. D. spicata (L.)Greene var. spicata
Coastal, Canada and U. S. to Central America, native.
Salt marshes: Tamaulipas, Veracruz, Tabasco, Yucatan, Quintana Roo and Chiapas.
331a. D. spicata var divaricata Beetle
California and Mexico, native.
Western salt deserts: Coahuila, San Luis Potosi and Jalisco west to Baja California.
331b. D. spicata var. mexicana Beetle
Mexico, endemic.
Central plains: alkaline soils, Durango and Coahuila south to Puebla.
331c. D. spicata var. stolonifera Beetle
California and Mexico, native.
West coast salt flats: Baja Norte and Sonora.
331d. D. spicata var stricta (Torr.)Beetle
U. S. and Mexico.
Interior salt flats: northern border states south to Puebla.

ECHINOCHLOA Beauv. Paniceae
20 species, subtropics and temperate, worldwide.
332. E. colonum (L.)Link
Pantropical, introduced?
Moist places: common throughout Mexico.
333. E. crusgalli (L.)Beauv.
Europe, U. S., Mexico. Introduced?
Weedy: occasional throughout Mexico.
334. E. cruspavonis (HBK)Schult.
Subtropics of the world, introduced?
Wet places: occasional throughout Mexico.
335. E. holciformis (HBK)Chase
Mexico and Guatemala, native.
Wet places: Durango, Jalisco, Guanajuato, Michoacan, Mexico.
336. E. muricata (Beauv.)Fern.
U. S. and northern Mexico, native.
Wet places: Sonora and Chihuahua.

337. E. oplismenoides (Fourn.)Hitchc.
Mexico, endemic.
Wet places: Chihuahua, Durango, Zacatecas and Mexico.
338. E. polystachya (HBK)Hitchc.
U. S., West Indies, south to Argentina, native.
Wet places: Sonora and Chihuahua, south to Campeche.
339. E. pyramidalis (Lam.)Hitchc. and Chase
Introduced.
Wet places: Campeche.
340. E. walteri (Pursh)Heller
U. S., Cuba, Mexico and Guatemala, native.
Wet places: Chihuahua, Coahuila, San Luis Potosi, Tabasco, Campeche.

ELEUSINE Gaertn. Chlorideae
Species about six, South America and Old World.
341. E. indica (L.)Gaertn.
Introduced
Weedy: common throughout Mexico.
341a. E. indica var. brachystachya Trin.
(including the cultivated E. corocana (L.)Gaertn.)
Introduced.
Weedy: Chihuahua, Jalisco, Michoacan, Mexico, Morelos and Yucatan.
342. E. multiflora Hochst. ex A.Rich.
Introduced.
Weedy: Sinaloa, Mexico, Tlaxcala, Puebla, Oaxaca and Chiapas.

ELYMUS L. Hordeae
75 species in temperate parts of the northern hemisphere.
343. E. canadensis L.
United States and northern Mexico, native.
Dry banks: Chihuahua, Coahuila and Nuevo Leon.
343a. E. canadensis var. villosus (Muhl.)Shinners
Canada to northern Mexico, native.
Dry banks: Nuevo Leon.
344. E. condensatus Presl
California and Baja California, native.
Coastal bluffs: Baja Norte.
345. E. pringlei Scribn. & Merr.
Mexico, endemic.
Dry banks: Coahuila, Nuevo Leon, San Luis Potosi, Puebla and Veracruz.
346. E. triticoides Buckl.
Washington and Montana south to Baja California, Arizona and Texas, native.
Coastal bluffs: Baja Norte.

ELYONURUS Humb. & Bonpl. Andropogoneae

Species about 15, subtropical and tropical, worldwide.

347. E. candidus (Trin.)Hack. var. barbiculmis (Hack.)Roberty
U. S. and northern Mexico, native.
Grasslands: Sonora, Chihuahua and Durango.

348. E. tripsacoides Humb. & Bonpl. var. tripsacoides
Mexico to Brazil, native.
Grasslands: Sinaloa, Michoacan and Veracruz.

348a. E. tripsacoides var. ciliaris (HBK)Hack.
Mexico south to Venezuela, native.
Grasslands: Chihuahua south to Chiapas.

348b. E. tripsacoides var. sericeus Hack.
Mexico, endemic.
Rare: Veracruz.

ENNEAPOGON Desv. Eragrosteae

35 species in the Old World, one in the Americas.

349. E. desvauxii Beauv.
U. S. south to Peru and Argentina, native.
Grasslands: northern border states south to Oaxaca.

ERAGROSTIS Host. Eragrosteae

200 species, temperate and tropical, worldwide.

350. E. acutiflora (HBK)Nees
Mexico to Brazil, native.
Pine savanna: Oaxaca.

351. E. bahiensis Schrad.
Mexico, Guatemala, Brazil, native.
Wet places: Chiapas and Tabasco.

352. E. barrelieri Dav.
Introduced.
Scattered localities throughout Mexico.

353. E. cilianensis (All.)Link
(including E. major Host.)
Introduced.
Scattered localities throughout Mexico.

354. E. ciliaris (L.)R.Br.
Pantropical, introduced?
Weedy: common throughout Mexico.

355. E. curtipedicellata Buckl.
U. S. to northern Mexico, native.
Sandy soil: Coahuila and Nuevo Leon.

356. E. curvula (Schrad.)Nees
Introduced.
Cultivated: Nuevo Leon

357. E. diffusa Buckl. var. diffusa
U. S., Mexico and Guatemala, native.
Weedy: common throughout Mexico.

357a. E. diffusa var. arida(Hitchc.)Beetle
Same distribution as var. diffusa.
Weedy: common in northern and central Mexico.

358. E. diversiflora Vasey
Mexico, endemic.
Coastal: Sinaloa, Colima and Revillagigedo Islands.
359. E. domingensis (Pers.)Steud.
West Indies and Mexico south to Colombia, native.
Coastal dunes: Veracruz, Chiapas, Tabasco, Campeche and Yucatan.
360. E. ellioitti S. wats.
U. S., West Indies, Mexico and Honduras, native.
Pine savanna: Tamaulipas, Michoacan, Veracruz, Chiapas and Quintana Roo.
361. E. erosa Scribn.
U. S. and northern Mexico, native.
Dry slopes: Coahuila and Nuevo Leon.
362. E. glandulosa Harvey
Mexico and Guatemala, native.
Weedy: Jalisco, Guerrero and Morelos.
363. E. glomerata (Walt.)L. H. Dewey
U. S., Mexico south to Argentina, native
Wet sandy soil: Colima, Guerrero and Morelos.
364. E. glutinosa (Sw.)Trin.
West Indies and Mexico to Brazil, native.
Weedy: Jalisco.
365. E. hirsuta (Michx.) Nees
Southeastern U. S., Mexico to Central America, native.
Pine savanna, Oaxaca and Tabasco.
366. E. hirta Fourn.
Mexico and Central America, native.
Rocky slopes: San Luis Potosi and Chiapas.
367. E. hypnoides (Lam.)B.S.P.
(Neeragrostis hypnoides (Lam.)Bush)
U. S. and West Indies, south to Argentina, native.
Wet, sandy soil: Baja Sur; Tamaulipas and San Luis Potosi; Guerrero, Oaxaca, Chiapas, Veracruz, Tabasco.
368. E. intermedia Hitchc.
U. S., Mexico and Guatemala, native.
Rocky slopes: common throughout Mexico.
369. E. lehmanniana Nees
Introduced.
Cultivated: Chihuahua.
370. E. limbata Fourn.
(E. limbata var. major Fourn.)
Mexico, endemic.
Weedy: northern border states south to Chiapas.
371. E. longiramea Swallen
Mexico, endemic.
Pine savanna: Tamaulipas.
372. E. lugens Nees
United States and Mexico south to Argentina, native.
Dry slopes: northern border states south to Chiapas.

373. *E. lutescens* Scribn.
United States and northern Mexico, native.
Weedy: reported for "Mexico" by Hitchcock, Man. Grasses U.S.
374. *E. maypurensis*(HBK)Steud.
Mexico to Bolivia and Brazil, native.
Weedy: Sinaloa and Durango south to Chiapas.
375. *E. mexicana* (Hornem.)Link
(including *E. neomexicana* Vasey)
U. S. and Mexico south to Brazil, native.
Pine savanna: northern border states south to Chiapas.
376. *E. minor* Host
(*E. poaeoides* Beauv.)
Introduced.
Weedy: Mexico, Puebla, Veracruz.
377. *E. obtusiflora* (Fourn.)Scribn.
Mexico, endemic.
Salt flats: Chihuahua, Coahuila, Nuevo Leon, Mexico and Veracruz.
378. *E. orcuttiana* Vasey
U. S. and northern Mexico, native.
Weedy: Baja Sur.
379. *E. oreophila* Harvey
Mexico, endemic.
Rocky slopes: Baja Sur, Coahuila, Nuevo Leon, Michoacan and Hidalgo (type loc.).
380. *E. palmeri* Wats.
Texas and northern Mexico, native.
Open slopes: northern border states except for Baja Norte.
381. *E. pectinacea* (Michx.)Nees
United States and Mexico, native.
Weedy: Coahuila and Zacatecas.
382. *E. pilosa* (L.)Beauv.
Introduced.
Weedy: common, northern border states south to Chiapas.
383. *E. plumbea* Scribn.
Mexico, endemic.
Dry slopes: Jalisco (type loc.), Colima, Michoacan, San Luis Potosi, Puebla, Veracruz.
384. *E. pringlei* Mattei
(including *E. pusilla* Scribn. and *E. scribneriana* Hitchc.)
Mexico, endemic.
Weedy: Chihuahua, Durango and Jalisco.
385. *E. prolifera* (Sw.)Steud.
(including *E. excelsa* Griseb. and *E. gigantea* Trin.)
West Indies, southern Mexico and Central America to Brazil, native.
Weedy: Michoacan, Veracruz and Quintana Roo.

386. E. reptans (Michx.)Nees
(including Neeragrostis reptans (Michx.)Nicora)
U. S. south to northern Mexico, native.
Wet, sandy soil: Baja Norte and Coahuila.
387. E. secundiflora Presl
(including E. beyrichii Smith and E. oxylepis (Torr.) Torr.)
U. S. and Mexico, native.
Weedy: Chihuahua (where cultivated); Tamaulipas south to the Yucatan Peninsula.
388. E. sessilispica Buckl.
U. S. and northern Mexico, native.
Sandy prairies: Chihuahua and Tamaulipas.
389. E. silveana Swallen
Texas and Mexico, native.
Sandy soils: "Cardenas, San Luis Potosi" acc. to Harvey.
390. E. simpliciflora (Presl)Steud.
Southern Mexico to Panama, native.
Weedy:"southern Mexico" acc. to Swallen: Grasses of Guatemala.
391. E. spectabilis (Pursh)Steud.
U. S., Mexico and British Honduras, native.
Weedy: "northeastern Mexico" acc. to Harvey.
392. E. spicata Vasey
Texas and Mexico, native.
Coastal: Tamaulipas and Baja Sur.
393. E. superba Peyr.
Introduced.
Cultivated: Chihuahua.
394. E. swalleni Hitchc.
Texas and Mexico, native.
Sandy soil: San Luis Potosi, Jalisco, Veracruz and Chiapas.
395. E. tenella (L.)Beauv.
(including E. amabilis L. and E. plumosa Link)
Pantropical, introduced?
Weedy: Baja Sur, Nayarit, Colima, Guerrero, Puebla, Veracruz, Oaxaca, Tabasco, Yucatan and Quintana Roo.
396. E. tephrosanthos Schult.
U. S., West Indies, south to Brazil, native.
Weedy: common throughout Mexico.
397. E. trichocolea Hack. and Arech.
U. S. and Mexico to Uruguay.
Sandy soil: Nuevo Leon, Puebla and Chiapas.
398. E. virescens Presl
Introduced.
Jalisco (based on an identification by Harvey).
399. E. viscosa (Retz.)Trin.
Introduced.
Sandy soil: Baja Norte, Baja Sur, Sinaloa, Durango, Guerrero and Chiapas.

400. E. yucatana Harvey
Mexico, endemic.
Sandy soil: Yucatan.

ERIANTHUS Michx., Andropogoneae
Twenty-five species, temperate & subtropical, worldwide.
401. E. giganteus (Walt.)Muhl.
(including E. saccharoides Michx.)
U. S., Cuba and Mexico, native.
Swamps: Mexico and Veracruz.
402. E. trinii Hack.
Mexico and South America, native.
Swamps: Nuevo Leon, San Luis Potosi, Veracruz and Chiapas.

ERIOCHLOA HBK Paniceae
Twenty-five species, subtropical, worldwide.
403. E. aristata Vasey
Mexico and Guatemala, native.
Wet places: common from Sonora and Chihuahua south to Chiapas.
404. E. boxiana Hitchc.
West Indies and Mexico, native.
Swamps: Yucatan.
405. E. lemmoni Vasey and Scribn. var. lemmoni
(including E. gracilis (Fourn.)Hitchc. var minor (Vasey) Hitchc.)
U. S. and northern Mexico, native.
Weedy: Chihuahua, Coahuila, Sinaloa, Jalisco and Colima.
405a. E. lemmoni var. gracilis (Fourn.)Gould
Same distribution as the species, native.
Weedy: northern border states south to Oaxaca.
406. E. nelsoni Scribn. & Smith
Mexico, Guatemala and Nicaragua, native.
Open slopes: Jalisco, Michoacan, Guerrero, Mexico, Morelos and Oaxaca (type loc.).
407. E. punctata (L.)Desv.
U. S., West Indies, Mexico south to Argentina, native.
Open slopes: Chihuahua, Coahuila and Nuevo Leon, south to Chiapas and Tabasco.
408. E. sericea (Scheele)Munro
U. S. and northern Mexico, native.
Grassland: Coahuila.

ERIOCHRYSIS Beauv. Andropogoneae
Nine species, 4 in America, four in Africa, one in India.
409. E. cayennensis Beauv.
Southern Mexico south to northern Argentina and Brazil, native.
Swamps: Oaxaca, Veracruz, Chiapas, Tabasco.

ERIONEURON Nash Eragrosteae

5 species, southwest U. S. and Mexico.

410. E. avenaceum (HBK)Tateoka var. avenaceum
U. S. and Mexico, native.
Dry slopes: Coahuila and Nuevo Leon south to Oaxaca.

410a. E. avenaceum var. grandiflorum (Vasey)Gould
U. S. and Mexico, native.
Chihuahua, Coahuila and Nuevo Leon, Durango, Zacatecas and San Luis Potosi.

410b. E. avenaceum (HBK)Tateoka var. nealleyi (Vasey)Gould.
U. S. and Mexico, native.
Open range: Chihuahua, Coahuila, Nuevo Leon, Durango, Zacatecas and Queretaro.

411. E. pilosum (Buckl.)Nash
U. S. and Mexico, native.
Open range: Chihuahua, Coahuila, Tamaulipas, Zacatecas, Aguascalientes, San Luis Potosi and Oaxaca.

412. E. pulchellum (HBK)Tateoka
U. S. and Mexico, native.
Open range: northern border states south to Mexico.

EUCHLAENA Schrad. Andropogoneae

2 species in Mexico and Central America.

413. E. mexicana Schrad.
Cultivated, endemic? (native of the Americas).
Cultivated: from Chihuahua south to Chiapas.

EUSTACHYS Desv. Chlorideae

12 species, tropics and subtropics, worldwide.

414. E. petraea (Sw.)Desf.
U. S., West Indies, Mexico and Central America, native.
East coast, Nuevo Leon, Tamaulipas, Veracruz, Tabasco and the Yucatan Peninsula.

FESTUCA L. Festuceae

About 150 species, temperate, worldwide.

415. F. amplissima Rupr.
Mexico and Central America, native.
High mountains: especially the central plateau, Sinaloa, Michoacan, Hidalgo, Mexico, Morelos, Guerrero, Puebla, Oaxaca and Chiapas.

416. F. arizonica Vasey
(including F. pinetorum Swallen)
U. S. and northern Mexico, native.
Pine savanna: Nuevo Leon.

417. F. arundinacea Schreb.
Introduced.
Cultivated: Hidalgo, Mexico, Puebla.

418. F. breviglumis Swallen
Mexico and Central America, native.
High forests: Chiapas.

419. F. glauca Lam.
Introduced.
Cultivated: Mexico.
420. F. hephaestophila Nees
Mexico, endemic.
Central mountains: Mexico and Puebla.
421. F. ligulata Swallen
Texas and northern Mexico.
Mountain slopes: Coahuila.
422. F. livida Willd.
(Helleria livida (HBK)Fourn.)
Mexico, endemic.
Central mountains: Mexico, Puebla and Veracruz.
423. F. mirabilis Piper
Mexico, endemic.
Mountain slopes: Chihuahua, San Luis Potosi (type loc.), Hidalgo and Mexico.
424. F. ovina L.
(including references to var. elliptica (Beal)Piper, var. callosa Piper, and var. brachyphylla(Schult.)Piper).
Circumboreal and south in the high mountains, native.
Mountain slopes: Chihuahua, Durango, Nuevo Leon and Puebla.
425. F. rosei Piper
Mexico, endemic.
Central mountains: Michoacan and Mexico.
426. F. rubra L.
Circumboreal and south in the high mountains, native.
Mountain slopes: Chihuahua and Mexico.
427. F. tolucensis HBK
Mexico and Central America, native.
Pine savanna: Chihuahua south to Chiapas.
428. F. wildenoviana Schult.
Mexico, endemic.
Central mountains: Guerrero, Mexico and Puebla.

FOURNIERA Scribn. Chlorideae
Monotypic
429. F. mexicana Scribn.
Mexico, endemic.
Ravine: Guerrero.

GASTRIDIUM Beauv. Agrostideae
4 or 5 species, Mediterranean.
430. Gastridium ventricosum (Gouan)Schinz & Thell.
Introduced.
Dry hills: Baja Norte.

GLYCERIA R. Br. Festuceae

35 species, temperate, worldwide.

431. G. fluitans (L.)R. Br.
Circumboreal and south in the high mountains, native.
Central mountains: Queretaro, Hidalgo and Mexico.

432. G. septentrionalis Hitchc.
Canada south to Mexico, native.
Wet places: reported by Hernandez-X for San Luis Potosi.

433. G. striata (Lam.)Hitchc.
Canada south to central Mexico, native.
Wet places: northern border states south to Chiapas.

433a. G. striata var mexicana Kelso
Mexico and Guatemala, native.
Wet places: Nuevo Leon.

GOUINIA Fourn. Chlorideae

13 species, subtropical, in the Americas.

434. G. guatemalensis (Hack.)Swallen
Mexico and Central America, native.
Brush: Chiapas, Campeche and Yucatan.

435. G. longiramea Swallen
Mexico, endemic.
Brush: Yucatan and Quintana Roo.

436. G. mexicana (Scribn.)Vasey
Mexico, endemic.
Brush: San Luis Potosi.

437. G. papillosa Swallen
Mexico, endemic.
Brush: Yucatan and Quintana Roo.

438. G. ramosa Swallen
Mexico, endemic.
Brush: Quintana Roo.

439. G. virgata (Presl)Scribn.
Mexico south to Peru, Bolivia and Brazil, native.
Brush: Sonora and Nuevo Leon south to Chiapas.

GYMNOPOGON Beauv. Chlorideae

15 species, subtropical, Americas.

440. G. spicatus (Spreng.)Kuntze
Mexico and West Indies south to Argentina, native.
Pine savanna: Veracruz and Chiapas.

GYNERIUM Willd. Arundineae

Monotypic.

441. G. sagittatum (Aubl.)Beauv.
Southern Mexico to Paraguay, native.
Thickets: Oaxaca, Veracruz, Chiapas and Tabasco.

HACKELOCHLOA Kuntze — Paniceae

Monotypic.

442. *H. granularis* (L.)Kuntze
Pantropical, native?
Weedy: occasional throughout Mexico.

HEMARTHRIA R. Br. — Andropogoneae

12 species, Old World, tropics and subtropics.

443. *H. fasciculata* (Lam.)Kunth.
(including *H. altissima* (Poir.)Stapf & Hubb.)
Introduced.
Open slopes: Coahuila, Nuevo Leon, San Luis Potosi, Mexico, Veracruz, Chiapas and Tabasco.

HETEROPOGON Pers. — Andropogoneae

8 species, subtropics, worldwide.

444. *H. contortus* (L.)Beauv.
U. S., West Indies, and Mexico south to Argentina (native?), also in the Old World.
Weedy: common throughout Mexico.

445. *H. melanocarpus* (Ell.)Benth.
Pantropical, native?
Weedy: northern border states south to Chiapas.

HIEROCHLOE R. Br. — Aveneae

Species 15-20, temperate, worldwide.

446. *H. mexicana* (Rupr.)Benth.
Mexico and Guatemala, native.
Pine savanna: Oaxaca (type loc.) and Chiapas.

HILARIA HBK — Chlorideae

Six species, in the Americas.

447. *H. belangeri* (Steud.)Nash
U. S. south to central Mexico, native.
Grassland: northern border states south to Puebla and Guerrero.

447a. *H. belangeri* var. *longifolia* (Vasey)Hitchc.
Reported in both U. S. and Mexico.
Rocky hills, Sonora (type loc.).

448. *H. cenchroides* HBK
Mexico and Guatemala, native.
Open slopes: common from northern border states south to Chiapas.

449. *H. ciliata* (Scribn.)Nash
Mexico, endemic.
Open slopes: Sonora, Nayarit, San Luis Potosi, Jalisco (type loc.), Guerrero and Veracruz.

450. *H. hintoni* Sohns
Mexico, endemic.
Queretaro, Mexico and Guerrero.

451. H. mutica (Buckl.)Benth.
U. S. and northern Mexico , native.
Dry flats: Chihuahua, Coahuila, Nuevo Leon, Durango and Zacatecas.

452. H. rigida (Thurb.)Benth.
U. S. and northern Mexico , native.
Desert: Baja Norte, Sonora and Chihuahua.

453. H. semplei Sohns
Mexico, endemic.
Llanos, Michoacan (type loc.).

454. H. swalleni Cory
Texas and northern Mexico , native.
Grasslands: Chihuahua, Coahuila, Nuevo Leon, Durango, Zacatecas and San Luis Potosi.

HOLCUS L. Aveneae
About 8 species, Old World, temperate.

455. H. lanatus L.
Introduced.
Weedy: Puebla, Veracruz and Chiapas.

HOMOLEPIS Chase Paniceae
Three species in tropical America.

456. H. aturensis (HBK)Chase
Southern Mexico to Bolivia and Brazil, native.
Marshes: Oaxaca, Chiapas, Veracruz and Tabasco.

HORDEUM L. Hordeae
Twenty-five species, temperate, worldwide.

457. H. californicum Covas and Stebbins
Introduced.
Weedy: State of Mexico (Distr. Fed.)

458. H. glaucum Steud.
(including references to H. murinum L.)
Introduced.
Mediterranean: Baja Norte.

459. H. jubatum L.
Introduced.
Weedy: Coahuila, San Luis Potosi, Mexico and Puebla.

460. H. pusillum Nutt. var. pusillum
U. S. and northern Mexico, native.
Weedy: Baja Norte.

460a. H. pusillum var. pubens Hitchc.
U. S. and Northern Mexico, native.
Weedy: Coahuila.

461. H. stebbinsii Covas
Introduced.
Weedy: Baja California.

462. H. vulgare L.
Introduced.
Cultivated: scattered localities in northern Mexico.

HYMENACHNE Beauv. Paniceae

10 species, tropics, worldwide.

463. H. amplexicaule (Rudge)Nees
Mexico and West Indies south to Argentina, native.
Marshes: Sinaloa, Colima, Michoacan, Guerrero, Oaxaca, Veracruz, Chiapas and Tabasco.

HYPARRHENIA Andropogoneae

Seventy species, tropical and subtropical Africa, one in Americas.

464. H. bracteata (H.& B.)Stapf
Mexico to Brazil and Paraguay, native?
Marshes: Veracruz and Chiapas.

465. H. dissoluta (Nees)Hubbard
(Hyparrhenia ruprechtii Fourn.)
Introduced.
Rocky slopes : Sinaloa, Jalisco, Michoacan, Mexico, Chiapas and Yucatan.

466. H. hirta (Nees)Stapf
Introduced.
Cultivated: Nuevo Leon.

467. H. rufa (Nees)Stapf
Introduced.
Cultivated and escaped: Veracruz, Oaxaca, Chiapas, Tabasco and the Yucatan Peninsula.

ICHNANTHUS Beauv. Paniceae

About 50 species in the New World tropics, 2 in the Old World tropics.

468. I. axillaris (Nees)Hitchc. and Chase
Mexico and West Indies, south to Brazil, native.
Swamps: Chiapas.

469. I. lanceolatus Scribn. & Sm.
Mexico and British Honduras, native.
Brush: Yucatan Peninsula.

470. I. mexicanus Fourn.
Mexico and British Honduras, native.
Oak forest: Oaxaca.

471. I. nemorsus (Sw.)Doell.
West Indies and Mexico south to Panama,native.
Brush: San Luis Potosi, Hidalgo, Veracruz and Chiapas.

472. I. pallens (Sw.)Munro
(including Panicum schlechtendalii monstrosum Fourn. from Mirador, Veracruz).
Mexico and West Indies south to tropical S. America.
Brush: San Luis Potosi, Puebla, Veracruz, Oaxaca, Chiapas, Tabasco and Quintana Roo.

473. I. standleyi Hitchc.
Mexico and Central America, native.
Forest margin: Chiapas.

474. _I. tenuis_ (Presl)Hitchc. and Chase
Mexico, Central America, south to Brazil, native.
Brush: Chiapas.

IMPERATA Cyrilla Andropogoneae
Ten species, subtropical, worldwide.
475. _I. brasiliensis_ Trin.
Florida, Mexico, and south to Argentina, native.
Brush: Veracruz, Tabasco and Chiapas.
476. _I. brevifolia_ Vasey
(_I. hookeri_ Rupr.)
Texas to California and Mexico, native.
Brush: Baja Norte, Sonora, Chihuahua and Jalisco.
477. _I. contracta_ (HBK)Hitchc.
Mexico and West Indies south to Brazil, native.
Grassland: Veracruz, Tabasco, Chiapas and Campeche.
478. _I. cylindrica_ (L.)Beauv.
Introduced.
Cultivated or escaped: Chiapas, reported by Gould.

ISACHNE R. Br. Paniceae
Twenty-five species, tropics, worldwide.
479. _I. arundinacea_ (Sw.)Griseb.
Mexico, Central America to Peru, native.
Pine savanna: Puebla, Veracruz, Oaxaca, Chiapas.
480. _I. pubescens_ Swallen
Mexico and Guatemala, native.
Pine savanna, Veracruz.

ISCHAEMUM L. Paniceae
Fifty species, tropics, worldwide.
481. _I. latifolium_ (Spreng)Kunth
Mexico and West Indies south to Brazil, native.
Weedy: Veracruz, Oaxaca, Chiapas and Campeche.

IXOPHORUS Schlecht. Paniceae
Monotypic.
482. _I. unisetus_ (Presl)Schlecht.
(_I. pringlei_ Scribn.)
Mexico, Cuba and Central America, Colombia and Venezuela, native.
Swamps: Sinaloa and Tamaulipas south to Chiapas.

JOUVEA Fourn. Eragrosteae
Two species, Mexico and Central America.
483. _J. pilosa_ (Presl)Scribn.
Mexico and Central America, native.
Sand dunes: western coastal states; Tamaulipas, Yucatan.
484. _J. straminea_ Fourn.
Mexico and Central America, native.
Salt marshes: west coast from Sinaloa to Chiapas.

KOELERIA Pers. Aveneae
Fifty species, temperate, worldwide.
485. K. californica (Domin)Beetle
U. S. and Mexico, native.
Dry slopes: northern border states south to Mexico and Tlaxcala.

LAMARCKIA Moench. Festuceae
Monotypic.
486. L. aurea (L.)Moench.
Introduced.
Weedy: Baja Norte.

LASIACIS (Griseb.)Hitchc. Paniceae
Thirty species in American tropics.
487. L. divaricata (L.)Hitchc.
Florida, West Indies, Mexico south to Argentina, native.
Tropical forest margin: Baja Sur, Sinaloa, Nuevo Leon, San Luis Potosi south to Yucatan Peninsula.
488. L. globosa Hitchc.
Mexico, endemic.
Tropical forest margin: Guerrero (type loc.) and Veracruz.
489. L. grisebachii (Nash)Hitchc.
Mexico, Cuba and Central America, native.
Tropical forest margin: Veracruz, Chiapas, Campeche and Quintana Roo.
490. L. lancifolia Swallen
Mexico, endemic.
Thickets: Yucatan.
491. L. oaxacensis (Steud.)Hitchc.
West Indies, Mexico, Central America, south to Peru, native.
Brush: Michoacan, Oaxaca, Veracruz and Chiapas.
492. L. papillosa Swallen
Mexico and Central America, native.
Brush: San Luis Potosi, Veracruz and the Yucatan Peninsula.
493. L. procerrima (Hack.)Hitchc.
Mexico to Peru and Brazil, native.
Brush: Sinaloa, Nayarit south to Chiapas.
494. L. rhizophora (Fourn.)Hitchc.
Mexico and Central America, native.
Thickets: Veracruz and Chiapas.
495. L. rugelii (Griseb.)Hitchc.
West Indies and Mexico, native.
Thickets: Yucatan.
496. L. ruscifolia (HBK)Hitchc.
(including L. compacta Hitchc. and L. liebmanniana Hitchc.)
West Indies, Mexico south to Peru and Argentina, native.

Brush: Sonora, Chihuahua and Nuevo Leon south to the Yucatan Peninsula.

497. L. scabrior Hitchc.
Mexico, Central America, Colombia and Ecuador, native.
Brush: Veracruz.

498. L. sloanei (Griseb.)Hitchc.
West Indies and Mexico, Central America, Colombia and Venezuela, native.
Brush: San Luis Potosi, Chiapas and Yucatan Peninsula.

499. L. sorghoidea (Desv.)Hitchc. and Chase
West Indies, Mexico, Central America south to Bolivia and Argentina, native.
Brush: Sonora, Jalisco, San Luis Potosi, Mexico, Oaxaca and Chiapas.

LEERSIA Sw. Oryzeae

Ten species, worldwide, aquatic.

500. L. distichophylla Bal. & Poit.
(L. grandiflora Prod.)
Mexico, south to northern Argentina, native.
Aquatic: Nuevo Leon south to Campeche.

501. L. hexandra Sw.
Pantropical, native?
Aquatic: Durango, Jalisco, south to Chiapas and Tabasco.

502. L. ligularis Trin.
Mexico, endemic.
Aquatic: Puebla, Veracruz and Yucatan (var. breviligularis).

503. L. monandra Sw.
U. S., West Indies and Mexico, native.
Aquatic: Nuevo Leon and Tamaulipas, San Luis Potosi, Tabasco and Yucatan.

504. L. oryzoides (L.) Sw.
Canada, U. S. and northern Mexico, native.
Aquatic: Nuevo Leon and Tamaulipas.

LEPTOCHLOA Beauv. Chlorideae

Seventy species, subtropical, worldwide.

505. L. aquatica Scribn.
Mexico, endemic.
Aquatic: Jalisco, Morelos (Type loc.) and Guerrero.

506. L. domingensis (Jacq.)Trin.
Mexico, endemic.
Swales: Tamaulipas, San Luis Potosi, south to Yucatan Peninsula.

507. L. dubia (HBK)Nees
U. S., Mexico and Argentina, native.
Swales: northern border states, south to Oaxaca.

508. L. fascicularis (Lam.)Gray
U. S. and Mexico, Central and South America, native.
Swales: common throughout Mexico.

509. L. filiformis (Lam.)Beauv.
U. S. south to Argentina, native.
Swales, weedy: common throughout Mexico.
510. L. nealleyi Vasey
U. S. and Mexico, native.
Swales: Tamaulipas, Veracruz and Yucatan.
511. L. panicoides (Presl)Hitchc.
U. S., Mexico and Brazil, native.
Swales: Sonora, Sinaloa, Nayarit, Colima, Guerrero, Morelos, Oaxaca and Tabasco.
512. L. scabra Nees
U. S., Mexico, West Indies, south to Brazil, native.
Swales: Sonora, Sinaloa, Michoacan, Chiapas and Tabasco.
513. L. uninervia (Presl)Hitchc. and Chase
U. S., Mexico, West Indies, south to Argentina, native.
Swales: Baja Norte, Baja Sur, Sonora, Sinaloa, Jalisco, Guanajuato and Oaxaca.
514. L. virgata (L.)Beauv.
U. S., Mexico, West Indies, south to Argentina, native.
Swales: Tamaulipas and San Luis Potosi, south to Yucatan Peninsula.
515. L. viscida (Scribn.)Beal
U. S. and northern Mexico, native.
Weedy: Baja Sur, Sonora, Sinaloa and Chihuahua.

LEPTOCORYPHIUM Nees — Paniceae

One or two species in tropical America.
516. L. lanatum (HBK)Nees
West Indies, Mexico, Central America to Argentina, native.
Pine savanna: Chiapas, Veracruz and Tabasco

LEPTOLOMA Chase — Paniceae

Four species, one North America, three in Australia.
517. L. cognatum (Schultes)Chase
Canada, U. S. and northern Mexico, native.
Sandy soil: Chihuahua, Coahuila, Nuevo Leon, Durango, Zacatecas and San Luis Potosi.

LIMNODEA Dewey — Agrostideae

Monotypic
518. L. arkansana (Nutt.)Dewey
U. S. and northern Mexico, native.
Grassland: Coahuila.

LITHACHNE Beauv. — Olyreae

Four species, tropical America.
519. L. pauciflora (Sw.)Beauv.
West Indies and Mexico south to Argentina, native.
Tropical forest: San Luis Potosi, Veracruz and Chiapas.

LOLIUM L. Festuceae

Fifteen species, temperate, Old World.

520. L. multiflorum Lam.
Introduced.
Weedy: scattered localities throughout Mexico.

521. L. perenne L.
Introduced.
Cultivated and escaped: scattered localities throughout Mexico.

LUZIOLA Juss. Zizanieae

Eight species in tropical America.

522. L. peruviana Gmel.
Mexico, Cuba, south to Argentina, native.
Marshes: Jalisco, Queretaro, Mexico, Veracruz, Chiapas and Tabasco.

LYCURUS HBK Eragrosteae

Six species, temperate and subtropical America.

523. L. phleoides HBK var. phleoides
U. S. and Mexico, native.
Grassland: northern border states south to Chiapas.

523a. L. phleoides var. glaucifolium Beal
U. S. and Mexico, native.
Grassland: Sonora and Chihuahua.

MATUDACALAMUS Maekawa Bambusoideae

Monotypic

524. M. laxus Maekawa
Mexico, endemic.
Tropical forest margin: Chiapas (type loc.).

MELICA L. Meliceae

Sixty species, temperate, worldwide.

525. M. frutescens Scribn.
California and Baja California, native.
Brush: Baja Norte.

526. M. imperfecta Trin.
California and Baja California, native.
Brush: Baja Norte.

527. M. montezumae Piper
(including M. alba Hitchc.)
Texas and northern Mexico, native.
Rocky slopes: Chihuahua, Coahuila and Nuevo Leon.

528. M. mutica Walt.
U. S. and northern Mexico, native.
Moist woods: Coahuila.

529. M. nitens (Scribn.)Nutt.
U. S. and northern Mexico, native.
Woods and grasslands: Coahuila and Nuevo Leon.

530. M. porteri Scribn.
U. S. and northern Mexico, native.
Grassland: Chihuahua.

MELINIS Beauv. Melinideae
Fifteen species in Africa.
531. M. minutiflora Beauv.
Introduced.
Roadsides: Michoacan, Mexico, Puebla, Veracruz, Chiapas and Tabasco.

MESOSETUM Steud. Paniceae
Thirty species, American tropics, mostly Brazil.
532. M. pittieri Hitchc.
Mexico and Central America, native.
Pine savanna: Oaxaca and Chiapas.

533. M. tabascoense Beetle
Mexico, endemic.
Tropical forest margin: Tabasco.

METCALFIA Conert Festuceae
Monotypic
534. M. mexicana (Scribn.)Conert
Mexico, endemic.
Pine savanna: Coahuila, Nuevo Leon, San Luis Potosi, Puebla and Chiapas.

MICROCHLOA R. Br. Chlorideae
Five or 6 species, tropics, worldwide.
535. M. kunthii Desv.
Mexico, Central America and S. America, native.
Rocky ground: Baja California and Chihuahua south to Oaxaca.

MONANTHOCHLOE Engelm. Aeluropodeae
Three species in the Americas.
536. M. littoralis Engelm.
U. S., Cuba and Mexico, native.
Baja Norte, Baja Sur, Sonora, Sinaloa, Coahuila, Tamaulipas, Chiapas and Yucatan.

MUHLENBERGIA Schreb. Eragrosteae
One hundred sixty species, centered in Mexico, but worldwide.
537. M. alamosae Vasey
Mexico, endemic.
Open slopes: Baja Norte, Sonora, Chihuahua, Sinaloa, Durango, Jalisco and Morelos.

538. M. alta Hitchc.
Mexico, endemic.
Open slopes: Jalisco.

539. M. angustifolia Swallen
Mexico, endemic.
Open slopes: Jalisco.

540. M. annua (Vasey)Swallen
Mexico, endemic.
Open slopes, Chihuahua.

541. M. appressa Gooding
Arizona and Mexico, native.
Open slopes: Baja Sur.

542. M. arenacea (Buckl.)Hitchc.
U. S. and northern Mexiço, native.
Sandy soils: Sonora, Chihuahua, Coahuila and Zacatecas.

543. M. arenicola Buckl.
U. S. and northern Mexico, native.
Sandy soil: Chihuahua, Coahuila, Nuevo Leon, Durango, Zacatecas and San Luis Potosi.

544. M. argentea Vasey
Mexico, endemic.
Open slopes: Chihuahua.

545. M. arizonica Scribn.
U. S. and northern Mexico, native.
Open slopes: Sonora, Chihuahua, Coahuila, Sinaloa and Durango.

546. M. arseni Hitchc.
U. S. and northern Mexico, native.
Open slopes: Baja Norte.

547. M. articulata Scribn.
Mexico, endemic.
Gypsum soils: San Luis Potosi, Guanajuato and Hidalgo.

548. M. asperifolia (Nees and Mey.)Parodi
Bicentric, Canada, U. S. and Mexico; also southern Argentina, native.
Moist flats: Baja Norte, Chihuahua, Coahuila, Durango and San Luis Potosi.

549. M. biloba Hitchc.
Mexico, endemic.
Open slopes: Chihuahua and Durango.

550. M. brandegei Reeder
Mexico, endemic.
Desert: Baja Sur.

551. M. brevifolia Scribn.
Mexico, endemic.
Open slopes: Jalisco

552. M. breviligula Hitchc.
Mexico and Central America, native.
Pine savanna: "Southern Mexico", acc. Swallen, cf. Grasses of Guatemala.

553. M. brevis Gooding
U. S. and Mexico, native.
Swales: Chihuahua, Durango, Zacatecas, San Luis Potosi and Mexico.
554. M. breviseta Griseb.
Mexico, endemic.
Brush: Jalisco, Michoacan, Mexico and Veracruz (type loc.: Orizaba).
555. M. capillaris ILam.)Trin.
U. S., West Indies and Mexico, native.
Woodlands: Chihuahua, Mexico, Chiapas and Quintana Roo.
556. M. ciliata (HBK)Kunth
Mexico, Central America, Ecuador and Peru, native.
Open slopes: Sonora and Chihuahua south to Chiapas.
557. M. confusa (Fourn.)Swallen
Mexico and Guatemala ,native.
Open slopes: northern border states south to Chiapas.
558. M. crispiseta Hitchc.
Mexico, endemic.
Open slopes: Chihuahua, Durango and San Luis Potosi.
559. M. curvula Swallen
Mexico, endemic.
Oak woods: Guanajuato (type loc.) and San Luis Potosi.
560. M. decumbens Swallen
Mexico, endemic.
Sandy soil: Chihuahua.
561. M. depauperata Scribn.
(M. schaffneri Scribn.)
U. S. and Mexico, native.
Open slopes: Chihuahua and Coahuila south to Mexico.
562. M. distans Swallen
Mexico and Guatemala, native.
Open slopes: Durango, Zacatecas, San Luis Potosi south to Chiapas.
563. M. distichophylla (Presl)Kunth
Mexico, endemic.
Jalisco south to Chiapas.
564. M. diversiglumis Trin.
(M. trinii Fourn.)
Mexico, Central America, Colombia and Venezuela to Peru, native.
Oak brush: Sinaloa south to Chiapas.
565. M. dubia Fourn.
(M. acuminata Vasey)
U. S. and Mexico, native.
Pine savanna: Chihuahua, Coahuila and Nuevo Leon south to Mexico and Veracruz.
566. M. dubioides Gooding
U. S. and northern Mexico, native.
Canyons: Coahuila.

567. M. dumosa Scribn.
(M. dumosa var. minor Scribn.)
U. S. and Mexico, native.
Canyons: Sonora and Chihuahua south to Michoacan.

568. M. elongata Scribn.
Mexico, endemic.
Open slopes: Sonora and Chihuahua; also Mexico acc. to Matuda.

569. M. eludens C. Reeder
U. S. and northern Mexico, native.
Rocky woods: Chihuahua and Durango.

570. M. emersleyi Vasey
Southwestern U. S. to Panama, native.
Pine-oak forests: northern border states south to Chiapas.

571. M. eriophylla Swallen
Mexico, endemic.
Oak woods: Mexico.

572. M. filiformis (Thurb.)Rydb. var. fortis Kelso.
U. S. and Mexico, native.
Swales: Durango.

573. M. firma Beal
(M. densiflora Scribn. & Merr.)
Mexico, endemic.
Pine savanna: Coahuila, San Luis Potosi south to Oaxaca (type loc.).

574. M. flavida Vasey
Mexico, endemic.
Open slopes: Chihuahua, Jalisco and Hidalgo.

575. M. flaviseta Scribn.
Mexico, endemic.
Pine savanna: Durango.

576. M. fragilis Swallen
U. S. and Mexico, native.
Open ground: Chihuahua, Coahuila, Aguascalientes, Guanajuato and Chiapas.

577. M. gigantea (Fourn.) Hitchc.
Mexico, endemic.
Pine savanna:Sinaloa and Durango south to Chiapas.

578. M. glabrata (HBK)Kunth
Mexico, endemic.
Pine savanna: San Luis Potosi, Guanajuato (type loc.) and Mexico.

579. M. glauca (Nees)Mez
(M. huahuacana Vasey)
U. S. and northern Mexico, native.
Pine savanna: Chiahua and Coahuila south to Mexico.

580. M. goodingii Socerstom
Arizona and Sonora, native.
Desert: Sonora.

581. *M. gradis* Vasey
Mexico, endemic.
Canyon: Sonora south to Jalisco.
582. *M. gypsophila* Reeder and Reeder
Mexico, endemic.
Gypsophorous soils: Coahuila, Nuevo Leon and San Luis Potosi.
583. *M. hintoni* Swallen
Mexico, endemic.
Central mountains: Mexico.
584. *M. implicata* (HBK)Kunth
(*M. erecta* Presl)
Mexico, Central America to Colombia and Venezuela, native.
Wet banks: Chihuahua south to Chiapas.
585. *M. iridifolia* Soderstrom
Mexico, endemic.
Pine savanna: Jalisco.
586. *M. leptoura* (Piper)Hitchc.
Mexico, endemic.
Pine savanna: Chihuahua.
587. *M. lindheimeri* Hitchc.
Texas and Coahuila, native.
Limestone: Coahuila.
588. *M. longiglumis* Vasey
Mexico, endemic.
Pine savanna: Aguascalientes, Jalisco and Michoacan.
589. *M. longiligula* Hitchc.
U. S. and Mexico, native.
Canyons: Sonora, Chihuahua, Coahuila, Nuevo Leon and Durango.
590. *M. lucida* Swallen
Mexico, endemic.
Pine savanna: Chihuahua.
591. *M. macrotis* (Piper)Hitchc.
Mexico, endemic.
Pine savanna: Sinaloa and Durango south to Chiapas.
592. *M. macroura* (HBK)Hitchc.
Mexico and Guatemala, native.
Open slopes: Chihuahua and Nuevo Leon south to Chiapas.
593. *M. matudae* Sohns
Mexico, endemic.
Pine savanna: Morelos.
594. *M. microsperma* (DC)Kunth
U. S., Mexico, Colombia and Venezuela to Peru, native.
Moist banks: Baja California, Sonora and Chihuahua south to Chiapas.
595. *M. minutissima* (Steud.)Swallen
(*M. texana* Buckl.)
U. S. and Mexico, native.
Moist banks: Baja Norte & Chihuahua south to Mexico and Tlaxcala.

596. M. montana (Nutt.)Hitchc.
(M. enermis (Scribn.)Hitchc., M. gracilis var. breviaristata Vasey, and M. gracilis var major Vasey)
U. S., Mexico and Guatemala, native.
Pine savanna: Sonora, Chihuahua and Coahuila south to Oaxaca.

597. M. mutica (Rupr.)Hitchc.
Mexico, endemic.
Pine savanna: Veracruz and Chiapas.

598. M. nigra Hitchc.
Mexico and Guatemala, native.
Pine savanna: Mexico and Chiapas.

599. M. palmeri Vasey
Mexico, endemic.
Pine savanna: Chihuahua.

600. M. Parviglumis Vasey
U. S., Cuba and Mexico, native.
Rocky slopes: Chihuahua, Coahuila, Nuevo Leon and San Luis Potosi.

601. M. pauciflora Buckl
(M. neomexicana Vasey and M. pringlei Scribn.)
U. S. and northern Mexico, native.
Rocky slopes: Sonora, Chihuahua, Coahuila and Nuevo Leon.

602. M. pectinata C. Gooding
Arizona and Mexico, native.
Rocky slopes: Sonora, Chihuahua, Durango and Jalisco.

603. M. plumbea (Trin.)Hitchc.
Mexico, endemic.
Central mountains: Mexico and Puebla.

604. M. polycaulis Scribn.
U. S. and Mexico, native.
Rocky slopes: Sonora and Chihuahua south to Hidalgo.

605. M. porteri Scribn.
U. S. and Mexico, native.
Brush: Sonora, Chihuahua, Coahuila, Nuevo Leon and Durango.

606. M. presliana Hitchc.
Mexico and Guatemala, native.
Pine savanna: Chiapas.

607. M. pubescens (HBK)Hitchc.
Mexico, endemic.
Pine savanna: Chihuahua, Coahuila and Nuevo Leon south to Chiapas.

608. M. pubigluma Swallen
Mexico, endemic.
Canyons: Coahuila and Nuevo Leon.

609. M. pulcherrima Scribn.
Arizona and Mexico, native.
Pine savanna: Chihuahua, Durango and Morelos.

610. M. purpusii Mez
Mexico, endemic.
Gypsum soils: San Luis Potosi.
611. M. pusilla Steud.
(M. bourgaei Fourn. and refs to M. peruviana)
Mexico and Guatemala, native.
Mountain meadows: Sonora and Chihuahua south to Chiapas.
612. M. quadridentata (HBK)Kunth
(M. anomala Fourn. and M. gracilis (HBK)Kunth)
Mexico and Guatemala, native.
Pine savanna: Jalisco south to Chiapas.
613. M. ramulosa (HBK)Swallen
Mexico to Costa Rica, native.
Meadows: Sonora, Baja Sur, Jalisco and San Luis Potosi, south to Chiapas.
614. M. reederorum Soderstrom
Mexico, endemic.
Canyons: Durango, Jalisco.
615. M. repens (Presl)Hitchc.
U. S. and Mexico, native.
Sandy soil: northern border states south to Chiapas.
616. M. richardsonis (Trin.)Rydb.
Canada south to Mexico, native.
Meadows: northern border states south to Puebla.
617. M. rigens (Benth.)Hitchc.
(M. mundula Johnston)
U. S. and Mexico, native.
Canyons: northern border states south to Puebla.
618. M. rigida (HBK)Kunth
(M. affinis Trin., M. berlandieri Trin., M. elegans (HBK)Kunth, M. laxiflora Scribn. and M. mucronata (HBK) Kunth)
U. S. and Mexico, native.
Canyons: northern border states south to Chiapas.
619. M. robusta (Fourn.)Hitchc.
(M. fournieriana Hitchc.)
Mexico, endemic.
Oak-pine savanna: Sonora and Chihuahua south to Chiapas.
620. M. schmitzii Hack.
(M. diehlii Jones)
Mexico, endemic.
Pine savanna: Chihuahua, Hidalgo and Mexico.
621. M. schreberi Gmel.
(M. botteri Fourn.)
U. S. and Mexico, native.
Woods: Hidalgo and Veracruz.
622. M. scoparia Vasey
(M. carinata Mez)
Mexico, endemic.
Pine savanna: Sonora and Chihuahua south to Michoacan.

623. M. seatoni Scribn.
Mexico, endemic.
Pine savanna: Puebla.
624. M. setarioides Fourn.
(M. polygonoides Hack.)
Mexico and Central America, native.
Pine savanna: Veracruz and Chiapas.
625. M. setifolia Vasey
Texas, New Mexico and northern Mexico, native.
Calcareous soil: Chihuahua, Coahuila and San Luis Potosi.
626. M. shepherdi (Vasey)Swallen
Mexico, endemic.
Ledges: Chihuahua and Durango.
627. M. sinuosa Swallen
U. S. and Mexico, native.
Moist slopes: Sonora and Chihuahua.
628. M. speciosa Vasey
Mexico, endemic.
Pine savanna: Chihuahua south to Puebla.
629. M. spiciformis Trin.
(M. acutifolia Fourn.)
Mexico, endemic.
Pine savanna: San Luis Potosi, Michoacan, Hidalgo, Veracruz, Oaxaca and Chiapas.
630. M. stricta (Presl)Kunth
(M. elata Vasey, M. longifolia Vasey)
Mexico, endemic.
Pine savanna: Durango, Nayarit, Jalisco, Colima, Michoacan, Mexico, Morelos and Veracruz.
631. M. strictior Scribn.
Mexico, endemic.
Pine savanna: Chihuahua, Durango and Mexico.
632. M. subaristata Swallen
Mexico, endemic.
Canyon: Durango.
633. M. subbiflora Hitchc.
Mexico, endemic.
Moist slopes: Durango.
634. M. tenella (HBK)Trin.
(M. exilis Fourn. and M. sprengelii Trin.)
Mexico to Panama.
Moist slopes: Sonora and Chihuahua south to Chiapas.
635. M. tenuifolia (HBK)Trin.
(M. longiseta Benth., M. monticola Buckl., M. quitensis (HBK)Hitchc.)
Mexico, endemic.
Northern border states south to Oaxaca.
636. M. tenuissima (Presl)Kunth
(M. nebulosa Scribn.)
Mexico and Panama, native.
Moist slopes: Nayarit, Jalisco and Colima.

637. M. torreyi (Kunth)Hitchc.
U. S. and northern Mexico, native.
Grasslands: Sonora and Chihuahua.
638. M. utilis (Torr.)Hitchc.
U. S. and Mexico, native.
Grasslands: Chihuahua, Sonora, Durango and Mexico.
639. M. vaginata Swallen
Mexico and Guatemala, native.
Meadows: Sinaloa, Durango, Michoacan, Mexico and Hidalgo.
640. M. versicolor Swallen
Mexico, endemic.
Pine savanna: Guanajuato south to Chiapas.
641. M. villiflora Hitchc.
Mexico, endemic.
Gypsum soils: Coahuila, Nuevo Leon, Zacatecas, San Luis Potosi and Hidalgo.
642. M. virescens (HBK)Kunth
(M. straminea Hitchc.)
New Mexico and Arizona south to Mexico, native.
Canyons: northern border states south to Michoacan.
643. M. virletii (Fourn.) Soderstrom
Mexico, endemic.
High plains: Durango south to Puebla.
644. M. watsoniana Hitchc.
(M. scabra Wats.)
Mexico, endemic.
Desert: San Luis Potosi.
645. M. wolfii (Vasey)Rydb.
U. S. and Mexico, native.
Pine savanna: Chihuahua and Durango.
646. M. wrightii Vasey
U. S. and Mexico, native.
Grasslands: Baja Norte and Chihuahua.
647. M. xanthodes Soderstrom
Mexico, endemic
Pine savanna: Chiapas.

MUNROA Torr. Eragrosteae
One species in western N. America and two in Argentina.
648. M. squarrosa (Nutt.)Torr.
Canada, U. S. and Mexico, native.
Grassland: Chihuahua.

NEYRAUDIA Hook. f. Arundineae
Small, Old World genus.
649. N. reynaudiana (Kunth)Keng.
Introduced.
Cultivated or escaped: Veracruz.

OLYRA L. Olyreae

25 species in the American tropics, one in Africa.

650. O. cordifolia HBK
Southern Mexico, Venezuela to Paraguay, native.
Tropical forest margin: Chiapas.

651. O. latifolia L.
Florida, Mexico and West Indies south to Brazil and northern Argentina, native.
Tropical forest margin: San Luis Potosi, Michoacan, Veracruz, Oaxaca, Chiapas, Tabasco and Yucatan.

652. O. yucatana Chase
Mexico, Guatemala and British Honduras, native.
Tropical forest margin: San Luis Potosi, Oaxaca, Chiapas and the Yucatan Peninsula.

OPIZIA Presl Chlorideae

Monotypic

653. O. stolonifera Presl
Cuba and Mexico, native.
Dry slopes and flats: Jalisco south to Yucatan.

OPLISMENUS Beauv. Paniceae

Ten species, tropics, worldwide.

654. O. burmanni (Retz.)Beauv.
(O. cristatus Presl, O. affinis Presl)
Pantropical, introduced?
Weedy: Sonora and Baja Sur south to the Yucatan Peninsula.

655. O. hirtellus (L.)Beauv.
Mexico and West Indies south to Argentina, native.
Forest margin: northern border states south to Yucatan Peninsula.

656. O. rariflorus Presl
(O. thiebauti Fourn.)
Southern Mexico south to Peru, native.
Pine savanna: Sinaloa south to Chiapas.

657. O. setarius (Lam.)R. & S.
U. S., West Indies and Mexico south to northern Argentina, native.
Forests: Nuevo Leon south to Quintana Roo.

ORCUTTIA Vasey Festuceae

Five species in California and Baja California.

658. O. californica Vasey
California and Baja California, native.
Vernal pools: Baja Norte

659. O. fragilis Swallen
Mexico, endemic.
Vernal pool: Baja Sur.

ORTHOCLADA Beauv. Eragrosteae
Monotypic.
660. O. laxa (L. Rich.)Beauv.
(O. rariflora Beauv.)
Mexico, south to Peru and Brazil, native.
Tropical forest margin: Oaxaca, Veracruz, Chiapas and Tabasco.

ORYZA L. Oryzeae
Twenty-nine species, pantropical.
661. O. alta Swallen
Mexico to Paraguay, native.
Aquatic: Tabasco.
662. O. latifolia Desv.
Mexico and West Indies south to Paraguay and Brazil, native.
Aquatic: Sinaloa, Colima, Oaxaca and Chiapas.
663. O. perennis Moench.
West Indies, Mexico, Brazil, native.
Aquatic: Chiapas.
664. O. sativa L.
Introduced.
Cultivated: Colima, Chiapas, and other states.

ORYZOPSIS Michx. Stipeae
Twenty species, temperate, worldwide.
665. O. florulenta Pilger
Mexico to Colombia, native.
Central mountains: Mexico, Tlaxcala and Puebla.
666. O. hymenoides (R. & S.)Ricker
U. S. and Mexico, native.
Sandy soil: Baja Norte.

PANICUM L Paniceae
Probably 500 species, pantropical and subtropical, occasionally temperate.
667. P. (Dichanthelium) albomaculatum Scribn.
Mexico and Guatemala, native.
Rocky hills: Jalisco, Michoacan and Mexico.
668. P. amarulum Hitchc. (# Virgata)
U. S., Bahamas, Cuba and Mexico, native.
Coastal dunes: Veracruz, Tabasco, Campeche and Quintana Roo.
669. P. amarum Ell. (# Virgata)
U. S. and West Indies and Mexico.
Coastal dunes: "eastern coast of Mexico" acc. to Gould: Grasses of Texas.
670. P. (Dichanthelium) angustifolium Ell.
U. S., Mexico and Nicaragua, native.
Pine savanna: Chiapas.

671. P. antidotale Retz. (# Maxima)
Introduced.
Cultivated and escaped: scattered localities throughout Mexico.
672. P. aquaticum Poir.
Mexico, Central America and South America, native.
Aquatic: Colima.
673. P. (Dichanthelium) arenicoloides Asche
(P. orthophyllum Ashe)
U. S., Cuba, Mexico, Central America and Colombia and Venezuela, native.
Pine-oak savannas: Chiapas.
674. P. (Brachiaria) arizonicum Scribn. & Merr.
U. S. and Mexico, native.
Sandy soil: Baja California, Sonora, Chihuahua and Coahuila, Sinaloa, Durango, Oaxaca and Chiapas.
675. P. arundinariae Trin. (# Parviglumia)
(P. virgultorum Hack.)
Mexico to Panama, native.
"Southern Mexico" according to Swallen: Grasses of Guatemala. Also reported for San Luis Potosi by Hernandez-X; Veracruz.
676. P. bartlettii Swallen (# Trichoidea)
Mexico, Guatemala and British Honduras, native.
Moist woods: San Luis Potosi, Veracruz, Oaxaca, Chiapas, Campeche and Quintana Roo.
677. P. biglandulare Scribn. & Smith (# Stolonifera)
Mexico and Guatemala, native.
Pine-oak savanna: Guerrero, Oaxaca and Chiapas.
678. P. boliviense Hack.
Mexico to Argentina, native.
Woods: Tamaulipas, San Luis Potosi, Veracruz, Oaxaca, Chiapas and Tabasco.
679. P. breviramosum Swallen
Mexico and Guatemala, native.
Pine savanna: Chiapas, acc. to Gould.
680. P. bulbosum HBK (# Maxima)
(P. bulbosum var. minor Vasey)
U. S., Mexico, Guatemala, Colombia, Ecuador, native.
Brush: throughout Mexico except for Baja California and the Yucatan Peninsula.
681. P. (Dichanthelium) caerulescens Hack.
U.S., Cuba and Mexico, native.
Marshes: Quintana Roo.
682. P. capillare L. (# Capillaria)
U. S. and Mexico, native.
Weedy: Sonora.
683. P. capillarioides Vasey (# Diffusa)
Grassland: Texas and northern Mexico, native.
Sandy soil: Nuevo Leon, Tamaulipas and San Luis Potosi.

684. P. cayennense Lam. (# Capillaria)
(P. pedunculare Willd.)
Mexico and West Indies to Panama and northern S. America, native.
Stream bottoms: Chiapas.
685. P. (Dichanthelium) ciliatum Ell.
U. S. and Mexico, native.
Coastal plain: "Mexico" acc. to Hitchcock: Man. Grasses of U. S.
686. P. coloratum L.
Introduced.
Cultivated: Sonora.
687. P. (Dichanthelium) commutatum Schult.
U. S. and Mexico.
Brush: Chiapas (acc. to Gould).
688. P. condensum Nash (# Agrostoidia)
U. S., West Indies and Mexico, native.
Swamps: Veracruz and Coahuila.
689. P. cordovense Fourn.
(Ichnanthus apiculatus Scribn.)
Mexico, endemic.
Brush: Veracruz.
690. P. cupreum Hitchc. & Chase (# Laxa)
Mexico, endemic.
Brush: Mexico (type loc.) and Durango.
691. P. cyanescens Nees
Mexico, Central America to Peru and Brazil, native.
Stream bottoms: Chiapas and Tabasco.
692. P. decolorans HBK (# Capillaria)
(P. parcum Hitchc. & Chase)
Mexico and Central America, native.
Brush: Sinaloa, Coahuila, San Luis Potosi, south to Chiapas.
693. P. dichomiflorum Michx. (# Dichotomiflora)
Canada, U. S., and West Indies, Mexico, native.
Weedy: Durango (acc. to Chase).
694. P. diffusum Sw. (# Diffusa)
U. S. and West Indies, Mexico to Brazil, native.
Weedy: "eastern Mexico" acc. to Gould: Grasses of Texas.
695. P. (Dichanthelium) ensifolium Baldw.
U. S. and Mexico, native.
Bogs: Chihuahua, Hidalgo and Chiapas.
696. P. fasciculatum Sw. (# Fasciculata)
(P. fasciculatum var. reticulatum (Torr.)Beal)
U. S., West Indies, Mexico south to Brazil, native.
Weedy: common throughout Mexico.
697. P. frondescens Meyer (# Stolonifera)
(P. keglii Steud.)
Mexico and Central America to northern Argentina, native.
Woods: Veracruz, Chiapas and Tabasco.

698. P. ghiesbreghtii Fourn. (# Diffusa)
U. S., West Indies, Cuba and Mexico to northern South America, native.
Brush: throughout Mexico, except for Baja California.

699. P. glutinosum Sw.
Mexico, West Indies to Argentina, native.
Forests: Veracruz and Chiapas.

700. P. gouinii Fourn. (# Virgata)
U. S. and Mexico, native.
Coastal: Veracruz.

701. P. hallii Vasey var. hallii (# Diffusa)
U. S. and Mexico, native.
Clay soils: northern border states (except for Baja Calif.) south to Hidalgo.

701a. P. hallii var. filipes (Scribn.)Waller
U. S. and Mexico, native.
Clay soils: Coahuila, Nuevo Leon and Tamaulipas south to Oaxaca.

702. P. havardii Vasey (# Virgata)
U. S. and Mexico, native.
Sandy soil: Chihuahua.

703. P. hians Ell. (# Laxa)
U. S. and Mexico, south to Panama, native.
Coastal plain: Tamaulipas and Veracruz.

704. P. hintoni Swallen
Mexico, endemic.
Central mountains: Mexico (type loc.).

705. P. hirsutum Sw. (# Diffusa)
West Indies and Mexico south to Brazil, native.
Sandy soil: Colima, San Luis Potosi, Oaxaca, Tabasco and Campeche.

706. P. hirticaule Presl (#Capillaria)
U. S., Cuba and Mexico south to Argentina, native.
Weedy: common throughout Mexico.

707. P. ichnanthoides Fourn.
Mexico and Central America, native.
Dry slopes: Puebla, Veracruz and Chiapas.

708. P. joorii Vasey
U. S. and Mexico, native.
Coastal: Veracruz.

709. P. (Dichanthelium) lanuginosum Ell. var lanuginosum
U. S. and Mexico, native.
Sandy woods: Nuevo Leon

709a. P. lanuginosum var. lindheimeri (Nash)Fern.
U. S. and Mexico, native.
Sandy woods: Coahuila.

710. P. (Dichanthelium)laxiflorum Lam.
U. S. and Mexico, native.
Chiapas (acc. to Gould).

711. P. laxum Sw.
West Indies, Mexico, Central America to Paraguay, native.
Coastal brush: Sinaloa south to Chiapas; San Luis Potosi south to Yucatan.
712. P. lepidulum Hitchc. & Chase (# Diffusa)
Mexico and Guatemala, native.
Weedy: Sonora, Chihuahua and Coahuila south to Chiapas.
713. P. (Dichanthelium) linearifolium Scribn.
U. S. south to Mexico, native.
Grassland: Chiapas (acc. to Gould).
714. P. longum Hitchc. and Chase (# Laxa)
Mexico, endemic.
Brush: Veracruz (type loc.).
715. P. maximum Jacq. (# Maxima)
Introduced.
Cultivated and escaped: common throughout Mexico except for Baja California.
716. P. mertensii Roth
(including P. megiston Schult.)
Mexico and Central America south to Argentina, native.
Swamps: Tabasco.
717. P. molle Sw. (# Fasciculata)
Mexico and West Indies south to Argentina, native.
Coastal plain: Sinaloa south to Chiapas, Veracruz to Yucatan, native.
718. P. (Dichanthelium) nitidum Lam.
(P. multirameum Scribn. & P. subbarbulatum Scribn. & Merr.)
U. S. and Mexico, and various islands of the Carribean, native.
Sandy soils, woods: Veracruz and Chiapas.
719. P. (Dichanthelium) nodatum Hitchc. and Chase
Texas and Tamaulipas, native.
Grassland: Tamaulipas.
720. P. obtusum HBK
U. S. and Mexico, native.
Grasslands: northern border states south to Puebla.
721. P. oligosanthes Schult.
U. S. to northern Mexico, native.
Woodlands: Coahuila and Nuevo Leon.
722. P. olivaceum Hitchc. & Chase
Mexico, Central America and Venezuela.
Pine savanna: Nuevo Leon, Veracruz and Chiapas.
723. P. (Dichanthelium) ovinum Scribn. & Smith.
U. S. and Mexico, native.
Brush and Grassland: Veracruz.
724. P. pampinosum Hitchc. & Chase (# Capillaria)
U. S., Mexico and Guatemala, native.
Weedy: Sonora and Chihuahua, south to Oaxaca.

725. P. parviglume Hack. (# Parviglumia)
Mexico, Guatemala, British Honduras and Costa Rica, native.
Pine-oak savanna: Veracruz and Chiapas.
726. P. (Dichanthelium) pedicellatum Vasey
Texas and Mexico, native.
Limestone: Coahuila and Nuevo Leon.
727. P. pilcomayense Hack.
Introduced? (S.E. Texas and N.E. Mexico)
Cultivated: Nuevo Leon.
728. P. pilosum Sw. (# Laxa)
Mexico and West Indies to Argentina, native.
Swamps: San Luis Potosi, Veracruz, Chiapas, Tabasco and Quintana Roo.
729. P. plenum Hitchc. & Chase (# Maxima)
U. S. and Mexico, native.
Grassland: Sonora, Chihuahua, Coahuila, Durango and Veracruz.
730. P. polygonatum Schrad. (# Laxa)
Southern Mexico to Paraguay, native.
Stream bottoms: Veracruz and Chiapas.
731. P. (Dichanthelium) pseudopubescens Nash
U. S., Mexico and Guatemala, native.
Oak-savanna: San Luis Potosi.
732. P. pilchellum Raddi (# Stolonifera)
Mexico, British Honduras, Martinique to Bolivia and Brazil, native.
Streambottoms: Veracruz and Chiapas.
733. P. rigidulum Nees (# Agrostoidea)
(P. agrostoides Spreng.)
U. S., West Indies and Mexico, native.
Streambanks: Coahuila.
734. P. rudgei R. & S.
(P. dasytrichum Spreng.)
Mexico, Jamaica and Trinidad to Bolivia and Brazil, native.
Brush: Tabasco.
735. P. rugulosum Trin.
(P. millegrana Poir.)
Mexico to Brazil, native.
Swamps: Veracruz, Oaxaca and Chiapas.
736. P. schaffneri Hack. (# Parviglumia)
Mexico to Brazil, native.
Streambanks: Veracruz.
737. P. schmitzii Hack. (# Parviglumia)
Mexico, endemic.
Brush: San Luis Potosi and Veracruz.
738. P. (Dichanthelium) scribnerianum Ell.
U. S. and Mexico, native.
Brush: Sonora, Chihuahua and Coahuila; also Chiapas.

739. P. sellowii Nees
(P. lasianthum Trin. and P. puberulum Trin.)
Mexico and West Indies south to Paraguay and Argentina, native.
Brush: Veracruz and Chiapas.
740. P. sonorum Beal (# Capillaria)
U. S. and northern Mexico, native.
Desert brush: Sonora, Chihuahua and Sinaloa; also Chiapas.
741. P. (Dichanthelium) sphaerocarpon Ell.
U. S. and Mexico south to Venezuela, native.
Open slopes: northern border states south to Chiapas.
742. P. stagnatile Hitchc. and Chase
Mexico and Central America, native.
Swamps: Veracruz and Tabasco.
743. P. stoloniferum Poir. (# Stolonifera)
Southern Mexico and Guatemala south to Argentina, native.
Swamps: Chiapas.
744. P. stramineum Hitchc. & Chase (# Capillaria)
U. S. and Mexico, native.
Sonora, Sinaloa, Durango, Nuevo Leon, Nayarit, Michoacan and Guerrero.
745. P. strigosum Muhl. (# Laxiflora)
(P. longipedunculatum Scribn.)
Mexico, West Indies, Central America and Colombia, native.
Brush: Veracruz and Chiapas.
746. P. succosum Hitchc. and Chase
Mexico, endemic.
Ponds: Jalisco (type loc.) and Mexico.
747. P. (Dichanthelium) tennesseense Ashe
U. S. and Mexico, native.
Brush: Nuevo Leon and Veracruz.
748. P. texanum Buckl. (# Fasciculata)
U. S. and Mexico, native.
Weedy: Nuevo Leon and Tamaulipas.
749. P. transiens Swallen
Mexico and Guatemala, native.
Mountain mesa: Nuevo Leon and Tamaulipas (type loc.).
750. P. trichanthum Nees (# Trichoidea)
Mexico and West Indies to Paraguay, native.
Swamps: Colima, San Luis Potosi, Veracruz and Campeche.
751. P. trichoides Swartz (# Trichoidea)
Mexico and West Indies south to Peru and Brazil.
Coastal plain, thickets: Sonora south to Chiapas; San Luis Potosi south to Yucatan.
752. P. variifolium Swallen
Mexico, endemic.
Brush: Yucatan (type loc.) and Quintana Roo.

753. P. vaseyanum Scribn. (# Dichotomiflora)
Mexico, endemic.
Brush: Chihuahua, Aguascalientes and Jalisco.
754. P. venosum Swallen
Mexico, endemic.
Ditch: Michoacan (type loc.)
755. P. (Dichanthelium) villosissimum Nash
U. S., Mexico and Central America, native.
Pine savanna: Nuevo Leon and Puebla.
756. P. virgatum L. (# Virgata)
U.S. and Mexico, native.
Grassland: Chihuahua, Coahuila, Jalisco and Chiapas.
757. P. (Dichanthelium) viscidellum Scribn.
(P. reflexopilum Steud.)
Mexico, Central America and Colombia, native.
Pine savanna: Veracruz.
758. P. (Dichanthelium) xalapense HBK
U. S., Cuba, Mexico and Central America, native.
Pine savanna: Hidalgo, Puebla, Veracruz and Chiapas.
759. P. (Dichanthelium) yadkinense Ashe
U. S. and Mexico, native.
Brush: Puebla.

PAPPOPHORUM Schreb. Pappophoreae
Ten species in the Americas.
760. P. bicolor Fourn.
U. S. and Mexico, native.
Grassland: Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, Mexico and Veracruz.
761. P. pappiferum (Lam.)Kuntze
Mexico and South America, native.
Brush: Veracruz and Oaxaca.
762. P. subbulbosum Arech.
Mexico and South America, native.
Brush: Sonora.
763. P. vaginatum Buckl.
(including Mexican references to P. mucronulatum)
U. S. and Mexico, native.
Brush: Sonora, Coahuila, Nuevo Leon, Durango and Zacatecas.

PARAPHOLIS Hubb. Monerneae
Five or 6 species, Old World.
764. P. incurvus (L.)C. E. Hubb.
Introduced.
Sea marshes: Baja Norte.

PASPALIDIUM Stapf Paniceae

Five or 6 species, Old World.

765. *P. geminatum* (Forsk.)Stapf var. *geminatum*
Introduced.
Aquatic: scattered localities throughout Mexico.

765a. *P. geminatum* var. *paludivagum* (Hitchc. and Chase) Gould
U. S. and Mexico south to Argentina, native.
Swamps: Jalisco and Michoacan.

PASPALUM L. Paniceae

Four hundred species in tropics and subtropics, worldwide.

766. *P. acuminatum* Raddi
U. S. and Mexico south to Argentina, native.
Aquatic: Michoacan.

767. *P. adoperiens* (Fourn.)Chase
Mexico and Central America, native.
Aquatic: Veracruz (type loc.) and Chiapas.

768. *P. affine* Steud.
Mexico and Guatemala, native.
Swamps: Veracruz and Chiapas.

769. *P. alcalinum* Mez
Mexico to Paraguay and Argentina, native.
Swamps: San Luis Potosi (type loc.)

770. *P. arsenei* Chase
Mexico, endemic.
Mountain slopes: Jalisco, Michoacan and Puebla (type loc).

771. *P. blodgettii* Chapm.
U. S., Mexico, West Indies and Central America, native.
Brush: Tamaulipas, Veracruz south to Yucatan Peninsula.

772. *P. boscianum* Flügge
U. S., Mexico, Central America, Puerto Rico and northern Brazil, native.
Swamps: Chiapas.

773. *P. botterii* (Fourn.)Chase
Mexico and Central America, native.
Swamps: Sonora south to Colima; Nuevo Leon south to Yucatan.

774. *P. caespitosum* Flügge
U. S., West Indies, Mexico and Central America, native.
Pine savanna: Veracruz, Chiapas, Tabasco and the Yucatan Peninsula.

775. *P. candidum* (Humb. & Bonpl.)Kunth
Southern Mexico to Chile, native.
Weedy: Veracruz and Chiapas.

776. P. clavuliferum Wright
(P. pittierii Hack.)
Mexico and Central America to Brazil, native.
Brush: Nayarit, Jalisco, Colima, Oaxaca and Yucatan.
777. P. conjugatum Bergius
U. S. and Mexico to Argentina, native.
Tropical forest margin: Sinaloa south to Chiapas; Nuevo Leon and Tamaulipas south to Quintana Roo.
777a. P. conjugatum var. parviflorum Doell.
Coastal: same distribution as the species.
777b. P. conjugatum var. pubescens Doell.
Mexico to Brazil, native.
Tropical forest margin: San Luis Potosi, Veracruz, Hidalgo, Chiapas and Campeche.
778. P. conspersum Schrad.
Southern Mexico to Argentina, native.
Marshes: Jalisco and Morelos.
779. P. convexum H. & B.
(P. villifolium Steud., P. encylocarpum Nees, P. hemicryptum Wright, P. inops Vasey)
Mexico, Carribean to Brazil, native.
Oak brush: Sonora and Chihuahua south to Chiapas.
780. P. corcovadense Raddi
Mexico, British Honduras, Brazil, native.
Stream bank: Oaxaca.
781. P. costaricense Mez
Mexico and Central America, native.
Pine-oak forests: Chiapas.
782. P. crassum Chase
Mexico, endemic.
Brush: Jalisco, Colima (type loc.), Michoacan and Mexico.
783. P. crinitum Chase
Mexico, endemic.
Brush: Coahuila and Nuevo Leon, San Luis Potosi (type loc.), Jalisco and Puebla.
784. P. culiacanum Vasey
Mexico, endemic.
Mountains: Sinaloa.
785. P. cymbiforme Fourn.
Mexico and Central America, native.
Brush: Mexico (type loc.) and Veracruz.
786. P. dilatatum Poir.
Introduced.
Reported only for the State of Mexico.
787. P. distichum L.
(incl. P. paspaloides Scribn.)
U. S. and West Indies south to Argentina, native.
Ditches: throughout Mexico except for the Yucatan Peninsula.

788. P. erectum Chase
Mexico, endemic.
Colima (type loc.).
789. P. fasciculatum Willd.
Mexico south to Argentina, native.
Swamps: Veracruz,Chiapas, Tabasco and Campeche.
790. P. fimbriatum HBK
Introduced?
Weedy: Yucatan and Quintana Roo.
791. P. guayanarum Beetle
Mexico, endemic.
Ledges: Sinaloa (type loc.).
792. P. hartwegianum Fourn.
Southern Texas and Mexico, native.
Ditches: scattered localities throughout Mexico.
793. P. heterotrichon Trin.
Mexico south to Brazil, native.
Ditches: Chiapas.
794. P. humboldtianum Flügge
Mexico to Panama, western South America to Argentina, native.
Pine forests: throughout Mexico except for the Yucatan Peninsula.
795. P. jaliscanum Chase
Mexico to Guatemala, native.
Pine forests: Nayarit, Jalisco (type loc.), San Luis Potosi, Veracruz and Chiapas.
796. P. langei (Fourn.)Nash
U. S., West Indies and Central America, native.
Brush: lowland areas of Mexico (absent from the central plateau).
797. P. lentiginosum Presl
Mexico and Guatemala, native.
Swamps: Sonora, Sinaloa, Morelos, Colima and Chiapas.
798. P. leptachne Chase
Mexico, endemic.
Brush: Nayarit (type loc.).
799. P. lividum Trin.
U. S. and West Indies south to Argentina, native.
Ditches: scattered localities throughout Mexico except for the Yucatan Peninsula.
800. P. longicuspe Nash
Mexico, endemic.
Swamps: west coast, Nayarit south to Oaxaca (type loc. Jalisco).
801. P. malacophylum Trin.
Mexico south to Argentina, native.
Swamps: San Luis Potosi, Veracruz and Yucatan.
802. P. mayanum Chase
Mexico, endemic.
Swamps: Yucatan (type loc.) and Chiapas.

803. P. millegrana Schrad.
Mexico south to Brazil, native.
Swamps: Chiapas, Tabasco and Yucatan.
804. P. minus Fourn.
Texas, West Indies south to Paraguay, native.
Swamps: Michoacan, Oaxaca, Veracruz, Chiapas and Tabasco.
805. P. multicaule Poir.
Mexico, West Indies to Brazil, native.
Pine woods: Veracruz.
806. P. mutabile Chase
Mexico, endemic.
Brush: Coahuila, Nuevo Leon, Tamaulipas San Luis Potosi and Veracruz.
807. P. nelsoni Chase
Mexico, endemic.
Brush: Chiapas (type loc.).
808. P. notatum Flügge
U. S. (where introduced?), Mexico, West Indies south to Argentina (where native?).
Swamps: southern Nuevo Leon and Tamaulipas to Nayarit and all of southern Mexico.
809. P. orbiculatum Poir.
Mexico and West Indies south to Paraguay, native.
Swamps: Sinaloa, Guerrero, Veracruz, Chiapas and Tabasco.
810. P. palmeri Chase
Mexico, endemic.
Brush: Sonora (type loc.).
811. P. paniculatum L.
(P. hemisphericum Poir., P. strictum Pers., P. cordovense Fourn.).
Mexico and West Indies south to Argentina, native.
Swamps: southern Sinaloa and eastern San Luis Potosi southward through the Yucatan Peninsula.
812. P. paucispicatum Vasey
Mexico, endemic.
Brush: Sonora, Chihuahua and Nuevo Leon south to Oaxaca.
813. P. pectinatum Nees
Mexico to southern Brazil, native.
Pine woods: Sinaloa south to Tabasco.
814. P. plenum Chase
Mexico south to Peru, native.
Swamps: Nayarit, Veracruz (type loc.) and Tabasco.
815. P. pleostachyum Doell.
Haiti, Mexico and Brazil, native.
Swamps: Tamaulipas.

816. P. plicatulum Michx.
(P. undulatum Poir., P. lenticulare HBK, P. montevidense Spreng., P. antillense Husnot, P. pauperculum Fourn.)
U. S. and West Indies south to Argentina, native.
Thickets: Sinaloa south to Chiapas, Nuevo Leon and Tamaulipas south to Tabasco.
817. P. prostratum Scribn. & Merr.
Mexico, endemic.
Southern Durango south to Chiapas.
818. P. pubiflorum Rupr. var. pubiflorum
U. S., Cuba and Mexico, native.
Swamps: northern border states south to Oaxaca and Veracruz.
818a. P. pubiflorum var. glabrum Vasey
U. S. and Mexico, native.
Oaxaca.
819. P. repens Bergius
Southern Mexico to northern Argentina, native.
Aquatic: Oaxaca and Tabasco.
820. P. rudimentosum Steud.
Type loc.: Oaxaca, endemic.
Affin P. affine Steud.?
821. P. sanguineolentum Trin.
(including Mexican refs to P. erianthum)
Mexico south to Brazil, native.
Oaxaca, according to Chase.
822. P. setaceum Michx. var. setaceum
U. S. and Mexico, native.
Tamaulipas, Veracruz and Chiapas.
822a. P. setaceum Michx. var. ciliatifolium (Michx.)Vasey
(P. ciliatifolium Michx., P. propinquum Nash, P. debile Muhl.)
U. S. and Mexico, native.
Chihuahua and Veracruz.
822b. P. setaceum var. stramineum (Nash)Banks
U. S. and Mexico, native.
Sonora, Chihuahua and San Luis Potosi.
823. P. sparsum Chase
Mexico, endemic.
Brush: Yucatan and Campeche.
824. P. squamulatum Fourn.
(including P. sumichrasti Fourn.)
Mexico and Central America, native.
Oak woods: Baja Sur and Sinaloa south to Chiapas.
825. P. stellatum Humb. & Bonpl.
Southern Mexico to Argentina, native.
Sandy soils, pine woods: Oaxaca and Chiapas.
826. P. tenellum Willd.
Mexico south to Brazil, native.
Sonora, Jalisco, Michoacan, Mexico and Morelos.

827. P. tinctum Chase
Mexico and Guatemala, native.
Jalisco, Guanajuato (type loc.), Michoacan and Morelos.
828. P. umbratile Chase
Mexico and Central America, native.
Shady banks: Nuevo Leon, Tamaulipas, Veracruz and Yucatan.
829. P. unispicatum (Scribn. & Merr.)Nash
Mexico, endemic.
Jalisco, Nuevo Leon, Tamaulipas south to Chiapas (type loc.: Oaxaca).
830. P. urvillei Steud.
Introduced.
Nuevo Leon.
831. P. vaginatum Sw.
U. S., West Indies south to Argentina and Chile, native.
Coastal: Baja Sur, Tamaulipas south to Yucatan Peninsula.
832. P. variabile (Fourn.)Nash
Mexico, endemic.
Wood: Nuevo Leon and Tamaulipas south to Veracruz and Oaxaca.
833. P. virgatum L.
U. S. and West Indies south to Argentina, native.
Swamps: Jalisco, San Luis Potosi and Tamaulipas south to Chiapas and Tabasco.
834. P. virletii Fourn.
Mexico, endemic.
Brush: San Luis Potosi (type loc.) and Veracruz.

PENNISETUM L. Paniceae
Eighty species, tropics and subtropics, worldwide.
835. P. bambusiforme (Fourn.) Hemsl.
Mexico and Central America south to Peru, native.
Dry banks: San Luis Potosi, Jalisco, Veracruz (type loc.), Oaxaca and Chiapas.
836. P. clandestinum Host.
Introduced.
Commonly cultivated: Nuevo Leon, San Luis Potosi, Colima, Mexico, Morelos, Tlaxcala, Puebla, Veracruz and Chiapas.
837. P. complanatum (Nees)Hemsl.
(including P. mexicanum (Fourn.)Hemsl.)
Mexico and Central America, native.
Pine-oak forests: Sinaloa, Morelos, Veracruz, Chiapas, Tabasco and the Yucatan Peninsula.
838. P. crinitum (HBK)Spreng.
Mexico, endemic.
Brush: Durango, Jalisco, Guanajuato, Michoacan, Mexico and Guerrero.

839. P. distachyum (Fourn.)Rupr.
(including references to P. tristachyum in Mexico)
Mexico and Central America, native.
Veracruz and Oaxaca.

840. P. durum Beal
(including P. pringlei Leeke)
Mexico, endemic.
Chihuahua and Oaxaca.

841. P. glaucum (L.)R.Br.
(P. typhoideum)
Introduced.
Cultivated: Nuevo Leon and Mexico.

842. P. nervosum (Nees)Trin.
Mexico, Guatemala, Ecuador and Brazil to Argentina, native.
San Luis Potosi, Veracruz and Chiapas.

843. P. purpureum Schum.
Introduced.
Cultivated and escaped: Nuevo Leon south to Chiapas and Tabasco.

844. P. setosum (Sw.)L.Rich.
U. S., West Indies and Mexico south to Bolivia and Brazil, native.
Pine woods: Sinaloa south to Chiapas; Tamaulipas, Veracruz, Mexico.

845. P. villosum R. Br.
Introduced.
Cultivated: Sinaloa, Durango, Nuevo Leon and Mexico.

PENTARRHAPHIS HBK — Chlorideae

Two species in Mexico and Central America.

846. P. polymorpha (Fourn.)Griffiths
Mexico, endemic.
Rocky places: Sinaloa and Durango south to Morelos.

847. P. scabra HBK
Mexico, Central America, Colombia , native.
Rocky slopes: Jalsico, Queretaro (type loc.), Oaxaca, Chiapas and Tabasco.

PEREILEMA Presl — Eragrosteae

Three species, Mexico, Central America and northern South America.

848. P. beyrichianum (Kunth)Hichc.
Mexico, Central America south to Brazil , native.
Shady banks: Chiapas.

849. P. ciliatum Fourn.
(including var. violaceum Fourn.)
Mexico, endemic.
Shady banks: Sinaloa, Jalisco, Mexico, Morelos, Veracruz (type loc.) and Chiapas.

850. P. crinitum Presl
(including var. cirratum Fourn.)
Mexico and Central America south to Colombia, Ecuador and Brazil, native
Shady banks: Baja Sur, Chihuahua south to Chiapas.

PEYRITSCHIA Fourn. Aveneae
Monotypic.
851. P. koelerioides Fourn.
Mexico, endemic.
Dry slopes: Mexico (type loc.), Morelos, Hidalgo and Oaxaca.

PHALARIS L. Phalarideae
Twenty species, mostly northern hemisphere, subtemperate.
852. P. arundinacea L.
Introduced.
Cultivated: reported in Chihuahua.
853. P. canariensis L.
Introduced.
Cultivated and escaped: scattered localities throughout Mexico.
854. P. caroliniana Walt.
U. S. and northern Mexico, native.
Ditches: Sonora, Chihuahua and Coahuila.
855. P. minor Retz.
Introduced.
Weedy: reported for Baja Norte and Mexico.
856. P. tuberosa L. var. stenoptera (Hack.)Hitchc.
Introduced.
Cultivated: reported only for Chihuahua.

PHARUS L. Olyreae
Eight species in the American tropics.
857. P. glaber HBK
Mexico and West Indies south to northern Argentina, native.
Tropical woods: Chiapas and Tabasco.
858. P. latifolius L.
Mexico to Peru and Brazil, native.
Moist woods: San Luis Potosi and Veracruz.
859. P. parvifolius Nash
Mexico and West Indies to Brazil, native.
Tropical woods: Veracruz.

PHLEUM L. Aveneae
Four species, temperate regions of the world.
860. P. alpinum L.
Circumboreal and high mountains of the southern hemisphere, native.
Mountain grasslands: Nuevo Leon, Mexico and Puebla.

PHRAGMITES Adans. Arundineae

Three species, worldwide.

861. P. australis (Cav.)Trin.
(P. communis Trin.)
Worldwide.
Scattered localities throughout Mexico.

PHYLLOSTACHYS Sieb. Bambuseae

Old World.

862. P. aurea A. & C. Riviere
Introduced.
Commonly cultivated: scattered localities throughout Mexico.

PIPTOCHAETIUM Presl Stipeae

Ten species, Mexico and Central and South America.

863. P. brevicalyx (Fourn.)Ricker
Mexico, endemic.
Pine woods: San Luis Potosi and Hidalgo.
864. P. fimbriatum (HBK)Hitchc.
(Oryzopsis seleri Pilger)
U. S., Mexico and Guatemala, native.
Pine woods: throughout Mexico except Tabasco and the Yucatan Peninsula.
865. P. stipoides (Trin. & Rupr.)Hack.
(including Mexican references to P. ovatum)
Mexico and South America, native.
Pine woods: Nuevo Leon and Tamaulipas.

POA L. Festucea

One hundred fifty species, temperate regions, worldwide.

866. P. albescens Hitchc.
Mexico, endemic.
Mountains: Chihuahua (type locality).
867. P. alpina L.
Circumboreal, native.
Mountain meadows: reported for Mexico by Hitchcock, 1936, and Hulten, 1958.
868. P. annua L.
Introduced.
Weedy: common throughout Mexico except for Tabasco and the Yucatan Peninsula.
869. P. bigelovii Vasey and Scribn.
U. S. and Mexico, native.
Ditches: Baja Norte, Chihuahua, Coahuila and Nuevo Leon.
870. P. bolanderi Vasey
U. S. and Mexico, native.
Ditches: Chihuahua and San Luis Potosi
871. P. conglomerata Rupr.
Mexico, endemic.
Central mountains; Mexico, Puebla and Veracruz (type loc.).

872. P. fendleriana (Steud.)Vasey
U. S. and Mexico, native.
Dry slopes: Baja Norte.
873. P. filiculmis Swallen
Mexico, endemic.
Dry slopes: Coahuila (type loc.).
874. P. griffithsii Hitchc.
Mexico, endemic.
Dry slopes: Sonora (type loc.).
875. P. involuta Hitchc.
U. S. and northern Mexico, native.
Reported for Chihuahua, Coahuila and Zacatecas.
876. P. longiligula Scribn. & Williams
U. S. and Mexico.
Dry slopes: Baja Norte.
877. P. mulleri Swallen
Mexico, endemic.
Mountain meadows: Nuevo Leon (type loc.).
878. P. nervosa (Hook.)Vasey
Canada to northern Mexico, native.
Open woods: Coahuila and Nuevo Leon.
879. P. orcuttiana Vasey
California and Mexico, native.
Dry slopes: Baja Norte.
880. P. orizabensis Hitchc.
Mexico, endemic.
Central mountains: Puebla and Mexico.
881. P. pratensis L.
Introduced.
Cultivated: Coahuila, Nuevo Leon, Mexico and Veracruz.
882. P. ruprechtii Rupr.
Mexico, endemic.
Coahuila, Nuevo Leon, Tamaulipas and Mexico (type loc.).
883. P. scabrella (Thurb.)Benth.
U. S. and Mexico, native.
Dry woods: Baja Norte.
884. P. seleri Pilger
(P. guatemalensis Hitchc.)
Mexico and Guatemala, native.
Mountain: Chiapas.
885. P. sharpii Swallen
Mexico, endemic.
Shady soil: Veracruz.
886. P. strictiramea Hitchc.
Mexico, endemic.
Ledges: Chihuahua (type loc.).
887. P. villaroeli Phil.
Mexico and Chile, native.
Mountains: Mexico and Puebla.

POLYPOGON Desf. Aveneae
Ten species, temperate, worldwide.
888. P. elongatus HBK.
Mexico to Argentina, native.
Ditches: Chihuahua, Coahuila and Nuevo Leon south to Chiapas.
889. P. interruptus HBK.
(including Mexican references to P. littoralis)
Canada south to Argentina, native.
Ditches: Baja Norte, Nuevo Leon and the central mountains.
890. P. maritimus L.
Introduced.
Ditches: Nuevo Leon.
891. P. monspeliensis (L.)Desf.
Introduced.
Ditches: Baja Norte to Coahuila; Puebla.

PRINGLEOCHLOA Scribn. Chlorideae
Monotypic.
892. P. stolonifera (Fourn.)Scribn.
Mexico, endemic.
Known only from Puebla.

PSEUDECHINOLAENA Stapf Paniceae
Monotypic.
893. P. polystachya (HBK)Stapf.
Mexico to Paraguay; tropical Africa.
Weedy: Puebla, Oaxaca, Veracruz, Chiapas and Tabasco.

REEDEROCHLOA Soderstrom and Decker Chlorideae
Monotypic.
894. R. eludens Soderstrom and Decker
Mexico, endemic.
Inland salt flats: Durango (type loc.) and San Luis Potosi.

REIMAROCHLOA Hitchc. Paniceae
Four species in the American tropics.
895. R. oligostachya (Munro)Hitchc.
Florida, Cuba and Mexico, native.
Ditches: Colima and Tabasco.

RHIPIDOCLADUM McClure Bambuseae
Eleven species in the American tropics.
896. R. bittieri (Hackel)McClure
Mexico and Guatemala, native.
Tropical wood margins: Chiapas and Campeche.

RHYNCHELYTRUM Nees Paniceae

About 35 species, mostly African.

897. R. repens (Willd.)C. E. Hubb.
(R. roseum (Nees)Stapf and Hubb.)
Introduced.
Common roadside weed throughout Mexico.

SACCHARUM L. Andropogoneae

About 10 species in the Old World tropics.

898. S. officinarum L.
Introduced.
Cultivated in most lowland areas.

SACCIOLEPIS Nash Paniceae

Thirty species, tropical, worldwide.

899. S. myuros (Lam.)Chase
Mexico and Cuba south to Brazil, native.
Marshes: Jalisco, Veracruz and Oaxaca.

SCHAFFNERELLA Nash Chlorideae

Monotypic.

900. S. gracilis (Benth.)Nash
Mexico, endemic.
San Luis Potosi (type loc.).

SCHISMUS Beauv. Danthoneae

Five old World species, Mediterranean and desert climates.

901. S. barbatus (L.)Thell.
Introduced.
Weedy: Baja Norte.

SCLEROPOGON Phil. Eragrosteae

Monotypic.

902. S. brevifolius Phil.
U. S. south to Chile and Argentina, native.
Dry flats: northern border states south to Puebla.

SECALE L. Hordeae

Five species in temperate Europe and Asia.

903. S. cereale L.
Introduced.
Occasionally cultivated: Nuevo Leon, Mexico.

SETARIA Beauv. Paniceae

One hundred species, both temperate and tropical, worldwide.

904. S. adhaerans (Forssk.)Chiov.
Pantropical, native?
Weedy: Chihuahua, Coahuila and Nuevo Leon.

905. S. (Panicum) chapmani (Vasey)Pilger
U. S., Bahamas and Mexico, native.
Coastal sand: Yucatan.
906. S. geniculata (Lam.)Beauv.
Subtropics, worldwide, native?
Weedy: common throughout Mexico.
907. S. grisebachii Fourn.
(S. yucatana Herrm.)
U. S. and Mexico, native.
Weedy: common throughout Mexico.
908. S. latifolia (Scribn.)Herrm.
Mexico, endemic.
Brush: Durango (type loc.) and Oaxaca.
909. S. leucopila (Scribn. & Merr.)K. Schum.
U. S. and Mexico, native.
Banks: northern border states (type loc.: Coahuila) south to Puebla.
910. S. liebmannii Fourn.
U. S. and Central America, native.
Weedy: Baja Sur and Sonora south to Oaxaca and Veracruz.
911. S. longipila Fourn.
Mexico and Central America, native.
Woods: Nayarit.
912. S. lutescens (Wiegel.)Hubb.
(including some references to S. glauca).
Introduced.
Reported throughout Mexico (except Baja and the Yucatan Peninsula).
913. S. macrosperma (Scribn. & Merr.)Schum.
U. S., Bahamas and northern Mexico, native.
Moist banks: Tamaulipas, Nuevo Leon and Durango.
914. S. macrostachya HBK
U. S. and Mexico, native.
Moist banks: throughout Mexico (except Baja Norte and the Yucatan Peninsula).
915. S. magna Griseb.
U.S., Mexico, Carribean and Costa Rica, native.
Coastal: Yucatan.
916. S. palmeri Henrard
(S. rigida (Scribn. & Merr.)Schum.)
Mexico, endemic.
Desert brush: Baja Sur.
917. S. palmifolia (Koen.)Stapf
Introduced.
Cultivated: Sonora and Baja Sur.
918. S. paniculifera (Steud.)Fourn.
(S. effusa Fourn.)
West Indies and southern Mexico to Colombia, native.
Pine woods: San Luis Potosi, Veracruz, Puebla, Oaxaca, Chiapas and Tabasco.

919. S. poiretiana (Schultes)Kunth
Mexico, Brazil, Peru and Bolivia, native.
Moist banks: San Luis Potosi, Puebla, Veracruz, Oaxaca and Chiapas.
920. S. ramiseta (Scribn.)Pilger
(Panicum ramisetum Scribn.)
U. S. and Mexico, native.
Brush: Tamaulipas, Nuevo Leon and Coahuila.
921. S. rariflora Mikan
Mexico and West Indies to Brazil, native.
Tamaulipas.
922. S. scandens Schrad.
Mexico and Central America south to Argentina, native.
Wet banks: Mexico, Oaxaca, Veracruz, Chiapas, Campeche and Yucatan.
923. S. scheelei (Steud.)Hitchc.
U. S. and Mexico, native.
Chihuahua to Tamaulipas and south to Jalisco, Hidalgo and Veracruz.
924. S. setosa (Sw.)Beauv.
Introduced?
Reported only from Nuevo Leon.
925. S. tenax (L.Rich.)Desv.
Mexico and West Indies, Central America south to Argentina, native.
Pine woods: Nuevo Leon, San Luis Potosi, Jalisco, south to Yucatan.
925a. S. tenax var. antrorsa Romingen
Mexico, endemic.
Brush: Yucatan (type loc.) and Veracruz.
926. S. texana Emery
Texas and Mexico, native.
Shady banks: Tamaulipas and Nuevo Leon.
927. S. verticillata (L.)Beauv.
Introduced.
Reported from Baja Sur, Durango, Coahuila and Puebla.
928. S. villosissima (Scribn. & Merr.)K. Schum.
Southwestern U. S. and adj. Mexico, native.
Igneous rocks: Sonora and Coahuila.
929. S. viridis (L.)Beauv.
Introduced?
Reported from Sonora, Chihuahua, San Luis Potosi and Veracruz.
930. S. vulpiseta (Lam.)R. & S.
Mexico and Caribbean to South America, native.
Reported from San Luis Potosi, Oaxaca, Chiapas, Veracruz and Yucatan.

SETARIOPSIS Scribn. Paniceae

Two species in Mexico and northern South America.

931. S. auriculata (Fourn.) Scribn.
Mexico and Central America, Colombia and Venezuela, native.
Grassy plains: Sonora and Chihuahua south to the Yucatan Peninsula.

932. S. latiglumis (Vasey)Scribn.
Mexico, endemic.
Chihuahua (type loc.) south to Chiapas.

SITANION Raf. Hordeae

Six species in North America.

933. S. jubatum J. G. Smith
U. S. and Mexico, native.
Mesic slopes: Baja Norte.

934. S. longifolium J. G. Smith
U. S. and Mexico, native.
Deserts and mountains: northern border states south to Puebla.

SORGHASTRUM Nash Andropogoneae

Fifteen species, temperate and tropical America and Africa.

935. S. brunneum Swallen
Mexico and Guatemala, native.
Oak woods: Hidalgo, Guerrero and Chiapas.

936. S. galeotii Fourn.
(including Mexican references to S. stipoides)
Mexico, endemic.
Reported only from Veracruz.

937. S. incompletum (Presl)Nash
Mexico to Colombia and Venezuela; tropical Africa, native.
Pine woods: Jalisco south to Chiapas.

938. S. liebmannianum Hitchc.
Mexico, endemic.
Reported only from Veracruz.

939. S. nudipes Nash
Mexico, endemic.
Pine woods: Chihuahua (type loc.) and Sonora.

940. S. nutans (L.)Nash
Canada south to Mexico; South America, native.
Grassy slopes: northern border states south to Oaxaca and Veracruz.

941. S. setosum (Griseb.)Hitchc.
(including Mexican references to S. agrostoides)
(S. francavillanum (Fourn.)Hitchc., S. parviflorum (Desv.)Hitchc. & Chase)

SORGHUM Moench. Andropogoneae

Thirty-five species, mostly African.

942. _S. almum_ Parodi
Introduced.
Cultivated in Chihuahua and Nuevo Leon.

943. _S. bicolor_ (L.)Moench.
(_S. vulgare_ Pers.)
Introduced.
Cultivated throughout Mexico.

944. _S. drummondii_ (Nees)Hackel
Introduced?
Cultivated: Chiapas, Campeche and Yucatan.

945. _S. halepense_ (L.)Pers.
Introduced.
Common weed throughout Mexico.

946. _S. trichocladum_ (Rupr.)Kuntze
Native? Mexico and Central America.
Oak forests: Nayarit and Oaxaca (type loc.).

SPARTINA Chlorideae

About 16 species, mostly American.

947. _S. cynosuroides_ (L.)Roth
U. S. and Mexico, native.
Atlantic coastal marshes: reported only from Tamaulipas.

948. _S. foliosa_ Trin.
U. S. and Mexico, native.
Pacific coastal marshes: Baja Norte and Baja Sur.

949. _S. patens_ (Ait.)Muhl.
(including _S. patens_ var. _juncea_ Hitchc.
U. S., West Indies and Mexico, native.
Atlantic coastal marshes: Tamaulipas, Veracruz, Tabasco, Campeche and Quintana Roo.

950. _S. spartinae_ (Trin.)Munro
U.S., Mexico, Central America south to Argentina, native.
Coastal and inland marshes: Coahuila, Nuevo Leon and Tamaulipas south to the Yucatan Peninsula.

SPHENOPHOLIS Scribn. Aveneae

Five species in North America.

951. _S. obtusata_ (Michx.)Scribn.
(_S. obtusata_ var. _major_ (Torr.)Erdman)
Alaska and Hudson Bay south to Mexico, native.
Moist places: northern border states south to Oaxaca.

SPOROBOLUS R. Br. Eragrosteae

One hundred species in temperate and tropical regions, worldwide.

952. _S. airoides_ (Torr.)Torr. var. _airoides_.
(_S. schaffneri_ Mez)
U. S. and Mexico, native.

S. airoides (Torr.)Torr. var. airoides (cont'd)
Alkali flats: northern border states south to Durango and San Luis Potosi.

952a. S. airoides var wrightii(Munro)Gould
U. S. and Mexico, native.
Alkali flats: northern border states south as far as Mexico and Hidalgo.

953. S. atrovirens Kunth
Mexico, endemic.
Baja Norte, Durango; Tamaulipas south to the Yucatan Peninsula.

954. S. buckleyi Vasey
U. S. and Mexico; British Honduras, native.
Shady flats: Nuevo Leon and Tamaulipas south to the Yucatan Peninsula.

955. S. contractus Hitchc.
U. S. and Mexico, native.
Gravel slopes: Baja Norte, Sonora, Chihuahua, Coahuila and San Luis Potosi.

956. S. cryptandrus(Torr.)A. Gray
U. S. and Mexico, native.
Sandy soils: northern border states and Baja Sur.

957. S. cubensis Hitchc.
Mexico, West Indies; Central America south to Bolivia, native.
"Southern Mexico" according to Swallen:Grasses of Guatemala.

958. S. domingensis(Trin.)Kunth
Florida, Carribean and Mexico, native.
Beaches: Yucatan and Quintana Roo.

959. S. flexuosus(Thurb.)Rydb.
U. S. and northern Mexico, native.
Mesas: Sonora, Chihuahua and Coahuila.

960. S. giganteus Nash
U. S. and Mexico, native.
Mesas: Chihuahua and Coahuila.

961. S. indicus(L.)R.Br.
(S. poiretii R. & S., S. berteroanus Hitchc.)
Mexico and West Indies to Colombia and Brazil, native.
Sandy pine uplands: throughout Mexico.

962. S. junceus(Michx.)Kunth
U. S. and Mexico, native.
Pine barrens: Veracruz and Chiapas.

963. S. macrospermus Scribn.
Mexico and Guatemala, native.
Pine-oak:forests: Jalisco (type loc.) south to Chiapas.

964. S. mulleri(Fourn.)Hitchc.
(S. erectus Hitchc.)
Mexico, endemic.
Known only from Veracruz.

965. S. nealleyi Vasey
U. S. and Mexico, native.
Gypsophilous soils: Coahuila and San Luis Potosi.
966. S. palmeri Scribn.
Mexico, endemic.
Alkaline soils: known only from Durango.
967. S. patens Swallen
U. S. and Mexico, native.
Known only from Sonora.
968. S. pulvinatus Swallen
U. S. and Mexico, native.
Wet gravels: northern border states south to Oaxaca.
969. S. purpurascens (Sw.)Hamilt.
U. S., West Indies, Mexico; Central America south to Peru, native.
Salt flats: Revillagigedo Islands, Veracruz and Chiapas.
970. S. pyramidatus (Lam.)Hitchc.
(S. argutus Kunth)
U. S., West Indies, Mexico; Central America south to Argentina, native.
Salt flats: common throughout Mexico.
971. S. regis I.M. Johnston
Mexico, endemic.
Salt flats: known only from Coahuila.
972. S. spiciformis Swallen
Mexico, endemic.
Known only from Coahuila.
973. S. trichodes Hitchc.
Mexico, endemic.
Chihuahua, Jalisco (type loc.), Michoacan, Mexico and Veracruz.
974. S. virginicus (L.)Kunth
Tropical and subtropical coasts, worldwide.
Coastal dunes and flats: Baja California, Sonora; Tamaulipas south to the Yucatan Peninsula.

STENOTAPHRUM Trin. Paniceae
Seven species, tropical and subtropical, worldwide.
975. S. secundatum (Walt.)Ktze.
Tropics and subtropics, worldwide, native?
Commonly cultivated throughout Mexico.

STIPA L. Stipeae
One hundred fifty species, temperate, worldwide.
976. S. acuta Swallen
Mexico, endemic.
Rocky soils: Carneras Pass, Coahuila.
977. S. alta Swallen
Mexico, endemic.
Desert shrub: known only from Coahuila.

978. *S. angustifolia* Hitchc.
Mexico, endemic.
Mountain grassland: Coahuila (type loc.), Nuevo Leon, Tamaulipas and Puebla.

979. *S. bracteata* Swallen
Mexico, endemic.
Known only from Baja Norte.

980. *S. cernua* Stebbins and Love
U. S. and Mexico, native.
Reported only from Baja Norte.

981. *S. clandestina* Hack.
Mexico, endemic.
Coahuila and Nuevo Leon, San Luis Potosi, Zacatecas, Aquascalientes and Michoacan.

982. *S. columbiana* Macoun var. *nelsoni* (Scribn.)Hitchc.
Canada, south to Mexico, native.
Dry plains: reported only from Baja Norte.

983. *S. constricta* Hitchc.
Mexico, endemic.
Rocky slopes: Hidalgo (type loc.), Veracruz, Mexico and Oaxaca.

984. *S. coronata* Thurb.
U. S. and Mexico, native.
Rocky slopes: reported only from Baja Norte.

985. *S. diegoensis* Swallen
U. S. and Mexico, native.
Rocky slopes: reported only from Baja Norte.

986. *S. editorum* Fourn.
Mexico, endemic.
Rocky slopes: Coahuila, Nuevo Leon and Tamaulipas south to Puebla.

987. *S. eminens* Cav.
U. S. and Mexico, native.
Rocky slopes: northern border states south to Oaxaca.

988. *S. ichu* (Ruiz. & Pav.)Kunth
(*S. liebmannii* Fourn.)
Mexico south to Argentina, native.
Rocky slopes: San Luis Potosi south to Oaxaca.

989. *S. leiantha* Hitchc.
Mexico, endemic.
Rocky slopes: known only from Puebla.

990. *S. lepida* Hitchc.
U. S. and Mexico, native.
Rocky slopes: reported only from Baja Norte.

991. *S. leucotricha* Trin. & Rupr.
U. S. and Mexico, native.
Grassland: Coahuila, Nuevo Leon and Tamaulipas south to Mexico.

992. *S. linearifolia* Fourn.
Mexico and Guatemala, native.
Central mountains: type from Mexico "prope Tacubaya".

993. _S. linearis_ Swallen
Mexico, endemic.
Rocky slopes: known only from Nuevo Leon.
994. _S. lobata_ Swallen
U. S. and Mexico, native.
Reported only for Coahuila, cf. Hernandez X, 1964.
995. _S. mexicana_ Hitchc.
Mexico, endemic.
Central mountains: Mexico and Hidalgo.
996. _S. mucronata_ HBK
Mexico south to Argentina and Chile, native.
Mountains: Chihua, Coahuila and Nuevo Leon south to Chiapas.
997. _S. multinodis_ Scribn.
Mexico, endemic.
Mountains: Chihuahua, Coahuila and Nuevo Leon south to Puebla.
998. _S. neomexicana_ (Thurb.)Scribn.
U. S. and Mexico, native.
Coahuila, Nuevo Leon and San Luis Potosi.
999. _S. parishii_ Vasey
U. S. and Mexico, native.
Deserts: reported only for Baja Norte.
1000. _S. pringlei_ (Beal)Scribn.
U. S. and Mexico, native.
Rocky slopes: northern border states.
1001. _S. pulchra_ Hitchc.
U. S. and Mexico, native.
Dry slopes: reported only for Baja Norte.
1002. _S. robusta_ (Vasey)Scribn.
(_S. vaseyi_ Scribn.)
U. S. and Mexico, native.
Rocky slopes: Baja Norte, Coahuila and Nuevo Leon.
1003. _S. speciosa_ Trin. & Rupr.
U. S. and Mexico, southern South America, native.
Rocky slopes: reported only from Baja Norte.
1004. _S. tenuissima_ Trin.
Mexico; also Chile and Argentina, native.
Rocky slopes: Coahuila, Nuevo Leon, San Luis Potosi, Veracruz and Puebla.
1005. _S. virescens_ HBK
Mexico and Guatemala, native.
Pine woods: Coahuila, Nuevo Leon south to Chiapas.
1006. _S. virletti_ Fourn.
Mexico, endemic.
Known only from San Luis Potosi.

STIPORYZOPSIS Johnson — Stipeae

Two or three species in North America.

1007. S. bloomeri (Bol.)Johnson
Introduced.
Cultivated: reported only from Coahuila.

STREPTOCHAETA Schrad. — Olyreae

Two species in tropical America.

1008. S. sodiroana Hack.
Mexico south to Ecuador, native.
Tropical forest: reported only from Chiapas.

1009. S. spicata Schrad.
Mexico south to Brazil, native.
Tropical forest: Veracruz and Chiapas.

STREPTOGYNE Beauv. — Streptogyneae

One species in the American tropics.

1010. S. americana Hubb.
(including refs. to S. crinita)
Mexico and Trinidad south to Brazil, native.
Tropical woods: reported only from Veracruz.

THRASYA HBK — Paniceae

Twenty species in the American tropics

1011. T. campylostachya (Hack.)Chase
Mexico south to Bolivia, native.
Pine forests: Veracruz, Oaxaca and Chiapas.

TRACHYPOGON Nees — Andropogoneae

Fifteen species in American tropics.

1012. T. angustifolius (HBK)Nees
Mexico and Central America, native.
Grasslands: San Luis Potosi, Veracruz, Oaxaca, Chiapas, Tabasco and Campeche.

1013. T. canescens Nees
Mexico; Nicaragua; South America, native
Grasslands: reported only from Oaxaca.

1014. T. gouini Fourn.
Mexico, endemic (introduced in Cuba).
Veracruz (type loc.).

1015. T. karwinskyi (Hack.)Nash
Mexico, endemic.
Known only from the type locality: "Mexico".

1016. T. montufari (HBK)Nees
Mexico and Ecuador, native.
Zacatecas and San Luis Potosi south to Chiapas.

1017. T. palmeri Nash
Mexico, endemic.
Known only from Jalisco.

1018. T. plumosus (H.&B.)Nees
(T. dactyloides (Steud.)Fourn.; T. dissoluta Nees;
T. muelleri Fourn.)
U. S., south to tropical South America, native.
Reported only from Veracruz.
1019. T. secundus (Presl)Scribn.
U. S. and Mexico south to Argentina, native.
Baja Norte, Sonora and Chihuahua south to Chiapas
and Tabasco.

TRAGUS Hall Zoysieae
Three species in tropics and subtropics, worldwide.
1020. T. berteronianus Schult.
Introduced.
Northern border states south to Oaxaca.

TRIDENS R. & S. Eragrosteae
Sixteen North American species.
1021. T. albescsns (Vasey)Woot. & Standl.
U. S. and Mexico, native.
Swales: Chihuahua, Coahuila, Nuevo Leon and
Tamaulipas.
1022. T. elongatus (Buckl.)Nash
U. S. and Mexico, native.
Grassland: reported only from Nuevo Leon.
1023. T. eragrostoides (Vasey & Scribn.)Nash
U. S., Cuba and Mexico, native.
Swales: Nuevo Leon, Oaxaca and Yucatan.
1024. T. flavus (L.)Hitchc.
U. S. and Mexico, native.
Swales: reported only for Nuevo Leon.
1025. T. muticus (Torr.)Nash
U. S. and Mexico, native.
Swales: northern border states south to Durango,
Zacatecas and San Luis Potosi.
1026. T. texanus (S. Wats.)Nash
U. S. and Mexico, native.
Swales: Coahuila, Nuevo Leon, Tamaulipas and San Luis
Potosi.

TRINIOCHLOA Hitchc. Aveneae
Three American species.
1027. T. laxa Hitchc.
Ravine: reported only for Chihuahua.
1028. T. micrantha (Scribn.)Hitchc.
Mexico, endemic.
Reported only for Mexico and Morelos (type loc.),
native.
1029. T. stipoides (HBK)Hitchc.
Mexico south to Bolivia, native.
Pine woods: San Luis Potosi south to Chiapas.

TRIPOGON Roth Eragrosteae

Ten species, one in Americas, others African and in the East Indies.

1030. T. spicatus (Nees)Ekman
U.S., Cuba, Mexico and South America, native?
Dry banks: Durango, Aguascalientes, San Luis Potosi and Veracruz.

TRIPSACUM L. Andropogoneae

Nine species in the Americas.

1031. T. dactyloides (L.)L.
U. S., West Indies and Mexico, native.
Grasslands: Coahuila and Nuevo Leon south to Guerrero.

1032. T. lanceolatum Rupr.
(T. acutiflorum Fourn.; T. lemmoni Vasey)
Mexico, Honduras and Panama, native.
Pine woods: common throughout Mexico.

1033. T. laxum Nash
(T. fasciculatum Trin.)
Mexico and Central America, native.
Tropical forest margin: Morelos, Guerrero, Oaxaca.

1034. T. maizar Hernandez X and Randolph
Mexico, endemic.
Reported only for San Luis Potosi.

1035. T. pilosum Scribn. and Merr.
Mexico, endemic.
Forest margin: Chihuahua south to Chiapas.

TRISETUM Pers. Aveneae

Seventy-five species in temperate regions, worldwide.

1036. T. deyeuxioides (HBK)Kunth
Mexico and Central America south to Ecuador, native.
Mountain meadows: Chihuahua and Nuevo Leon south to Chiapas.

1037. T. evolutum (Fourn.)Hitchc.
Mexico, endemic.
Nuevo Leon, San Luis Potosi, Jalisco, Michoacan, Mexico, Guerrero and Veracruz (type loc.).

1038. T. filifolium Scribn.
Mexico, endemic.
Pine, oak woods: Chihuahua (type loc.) and Durango.

1039. T. interruptum Fourn.
(T. californicum Vasey)
U. S. and Mexico, native.
Reported for Baja Norte (type loc. for T. californicum).

1040. T. irazeunse (Kuntze)Hitchc.
(T. fournieranum Hitchc.)
Mexico and Central America south to Ecuador, native.
Pine woods: San Luis Potosi south to Chiapas.

1041. T. palmeri Hitchc.
Mexico, endemic.
Sonora, Coahuila, Sinaloa, Durango (type loc.) and Jalisco.

1042. T. pringlei (Scribn.)Hitchc.
Mexico south to Panama, native.
Meadows: Oaxaca (type loc.) and Chiapas.

1043. T. rosei Scribn. and Merr.
Mexico and Guatemala, native.
Mountains: Hidalgo, Mexico, Puebla and Chiapas.

1044. T. spicatum (L.)Richt.
Arctic-alpine and south in the mountains, native.
Mountains: Coahuila and Nuevo Leon south to Puebla.

1045. T. viride (HBK)Kunth
Mexico, endemic.
Mountains: Queretaro (type loc.), Mexico and Oaxaca.

1046. T. virletii Fourn.
Mexico, endemic.
Mountains: Nuevo Leon, San Luis Potosi (type loc.), Michoacan, Guerrero, Mexico, Morelos, Puebla and Veracruz.

TRISTACHYA Nees — Aveneae

Five species in Mexico and South America.

1047. T. angustifolia Hitchc.
Mexico, endemic.
Known only from Nayarit.

1048. T. avenacea (Presl)Scribn. & Merr.
(T. leiostachya Nees)
Mexico and Guatemala, south to Brazil, native.
Forest margin: Jalisco, Michoacan, Mexico, Oaxaca and Chiapas.

1049. T. laxa Scribn. & Merr.
Mexico, endemic.
Durango (type loc.) and Sinaloa.

TRITICUM L. — Hordeae

Many cultivated types.

1050. T. aestivum L.
(T. vulgare Vill.)
Introduced.
Commonly cultivated.

UNIOLA L. — Centotheceae

Ten species in the Americas (cf. Chasmanthium Link)

1051. U. latifolia Michx.
U. S. and Mexico, native.
Reported only for Nuevo Leon.

1052. U. palmeri Vasey
Mexico, endemic.
Baja California, Sonora (type loc.), Durango and Coahuila.
1053. U. paniculata L.
U. S. and Carribean and Mexico, native.
Coastal dunes: Tamaulipas, Veracruz, Tabasco and Chiapas.
1054. U. pittieri Hack.
Mexico and Central America south to Ecuador, native.
Sea beaches: Baja California, Sonora, Sinaloa, Oaxaca and Chiapas.

VULPIA Gmel. Festuceae
Thirty species, temperate Europe and North and South America.
1055. V. bromoides (L.)Gray
(V. dertonensis (All.)Aschers. & Graebn.)
Introduced.
Weedy: reported from Mexico and Chiapas.
1056. V. myuros var. hirsuta Hack.
(V. megalura (Nutt.)Rydb.)
Introduced?
Weedy: Baja Norte, Sonora and Coahuila.
1057. V. pacifica (Piper)Rydb.
Western North America from Canada to Mexico, native.
Pine woods: Baja Norte and Baja Sur.

YUSHANIA Keng Bambuseae
Both Old World and New World, subtropics.
1058. Y. acuminata (Munro)McClure
Mexico, endemic.
Tropical forest margin: Veracruz.
1059. Y. aztecorum McClure and Smith
Mexico, endemic.
Tropical forest margin: Sinaloa, Nayarit, Jalisco and Colima.

ZEA L. Andropogoneae
One or two American species under cultivation.
1060. Z. mays L.
Subtropical America, native.
Commonly cultivated throughout Mexico.
1061. Z. perennis (Hitchc.)Reeves and Mangels.
Mexico, endemic.
Described from Jalisco.

ZEUGITES P. Br. Eragrosteae

Twelve species in the American tropics.

1062. Z. capillaris (Hitchc.)Swallen
Mexico, endemic.
Tropical forest: Jalisco and Colima (type loc.).

1063. Z. hackelii Swallen
(Z. pittieri Hack. var. pringlei Hack.)
(Z. latifolia pringlei (Hack.)Hitchc.)
Mexico, endemic.
Known from Jalisco (type loc.) and Mexico.

1064. Z. latifolia (Fourn.)Hemsl.
Mexico, endemic.
Tropical forest: Jalisco, Guerrero, Oaxaca (type loc.) and Chiapas.

1065. Z. mexicana (Kunth)Trin.
Mexico south to Bolivia, native.
Tropical forest: San Luis Potosi, Hidalgo, Guerrero, Veracruz and Chiapas.

1066. Z. munroana Hemsl.
(Z. hartwegi Fourn.)
Mexico and Guatemala, native.
Tropical forest: Chiapas.

1067. Z. pringlei Scribn.
Mexico, endemic.
Tropical forest: Jalisco, Michoacan, Guerrero, Mexico and Morelos (type loc.).

1068. Z. sagittata Hartley
Mexico, endemic.
Known only from type loc. at "Acatitlan".

1069. Z. smilacifolia Scribn.
Mexico, endemic.
Pine woods: Mexico and Morelos (type loc.).

ZIZANIOPSIS Doell and Asch. Oryzeae

Three or 4 species in the Americas.

1070. Z. miliacea Doell and Asch.
U. S. and Mexico, native.
Aquatic: reported only from Veracruz (R. Cruz Cisneros 140).

NOTES ON NEW AND NOTEWORTHY PLANTS. CV

Harold N. Moldenke

STACHYTARPHETA ANGUSTIFOLIA f. RIONEGRENSIS Moldenke, f. nov.

Haec forma a forma typica speciei serratura foliorum acutiora patentioreque et laminis perfragilibus recedit.

This form differs from the typical form of the species and its previously described New World forms in having its leaf-blades extremely thin and fragile, decidedly nigrescent in drying, the serration on the margins conspicuously more acute and wide-spreading, the individual teeth of varying size.

The type of the form was collected by Carl Friedrich Philipp von Martius in woods at M. Araracoara, along the Rio Negro, Roraima, Brazil, and is deposited in the herbarium of the Botanische Staatssammlung at Munich.

STACHYTARPHETA TRISPICATA var. OVATIFOLIA Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum latiore ovalibus ovatisve 4—4.5 cm. latis recedit.

This variety differs from the typical form of the species in having its leaf-blades distinctly more broadly oval or ovate, the mature ones 4—4.5 cm. wide at the widest point.

The type of the variety was collected by Edmundo Pereira (no. 9754; G. Pabst 8643) 41 km. from Vitória da Conquista, "rumo Anagé", Bahia, Brazil, on January 26, 1965, and is deposited in the herbarium of the Botanische Staatssammlung at Munich. The collector describes it as a shrub, 2--3 m. tall, with blue corollas.

FLORA OF THE NORTH CAUCASUS

Otto & Isa Degener
New York Botanical Garden

We were impressed by the display of modern Floras, many beautifully illustrated in color, at the XII International Botanical Congress in Leningrad in 1975. We felt frustrated that these were figuratively as well as actually closed books to us by being printed in Russian in the Cyrillic alphabet. While on a week's tour of the Caucasus under leadership of Prof. A.I. Galushko, we emphatically expressed our conviction that the Science of Botany was hampered by so many botanists in different parts of the World publishing in a Babel of tongues. We broached the suggestion that Russian works should be accompanied by an English summary; and English, by a Russian one. Workers then would not only profit by foreign research, but would avoid wasting time by duplicating it.

Our opinion expressed to Dr. Galushko in 1975 was evidently convincing. It certainly fits in with Russia's wish for bi-national scientific *collaboration. An example is the 200-page book about the "Flora of the North Caucasus and Questions of its History," edited and in part authored by Dr. Galushko in 1976. Though no English summary appears, subtitles are in English and the 1,000 - 1,200 Latin plant names, such as Achillea millefolium, Equisetum arvense, Quercus rubor and Xanthium californicum, are in Roman type.

Dr. Galushko, mindful of bi-national cooperation, under date of January 20, 1977, wrote us "that the interests of your and our scientists go beyond the limits of their own Contries." Without his kind help, we could never have prepared the following review:
"Flora of the North Caucasus and Questions of its History," A. I. Galushko, Editor & Coauthor. 200 pages. 1976. 1 Pushkin Street, Stavropol, U.S.S. Russia. Price 1 ruble, 20 copeck.

Chapter 1. Galushko, A.I. "An Analysis of the Flora of the Western Part of the Central Caucasus." 125 pages, 17 tables, 11 maps.. The flora of the highest parts of the Main Caucasus, namely Prielbrusye, Balkaria and Western Ossetia is systematically, ecologically and arealogically analysed. It shows that every zone in the Central Caucasus is a refuge. Nine types of areals and 31 complexes have been noted: the boreal areal predominates with 834 species or 36%, the Caucasian with 511 or 22%, the Mediterranean with 312 or 14%, the fore-Asiatic areal with 273 or 12%, and five less important ones. One hundred twenty four endemic taxa are attributed to the North Caucasus. A map shows the above centres of species formation, of which the

*Irwin, H.S. Détente and the Green World. Garden Journ. 176-179. 1976.

biggest, Elbrusski, has 27 endemics and the "Jurassic cuesta" has 21. Another map shows location of the nine principal refuges. The role of epeirogenesis, glacial epochs and the epochs of arid climate in floragenesis is stressed. Contrary to many botanists, the author maintains that the Central Caucasus shows no vertical vicariism; but many examples of horizontal vicariism. This shows the antiquity of the oreophytes in the Caucasus and that the local oreophytes are not connected with the present flora of the plains and elevated areas. In short, the second are not derived from the first.

Regarding the glacial period, contrary to the belief of many others, the author contends that "syncretic" or mixed floras prove the reality of glacial epochs and that the amount of syncretion of the periglacial flora is proportional to how far south glaciation extended. His evidence is based on analysis of recent periglacial floras of glaciers Ulluchiran and Karachul (extending down to 3,200 m.), Azau (2,400 m.), and Besengi (2,130 m.). He maintains it is impossible to explain the floral compositions of every zone without postulating ancient and more recent broad glacial and interglacial migrations. Regarding arid periods, he stresses their exclusive importance in floragenesis, and notes that in the Holocene the North Caucasus (presently part of the Boreal plant association) was a portion of the Mediterranean plant association, and that the flora of the Central Caucasus during the last 20,000 years fluctuated between boreal-mesophytic and xerophytic-Mediterranean as well as xerophytic and steppe-like types. An example of a semiarid zone, or a zone of oreoxerophytes, shows the survival of the period when the Central Caucasus was part of the Mediterranean flora. Two maps illustrate his new floragenetic conclusions on the position of the zones in the glacial (Würm) and in the arid Holocene time. Maps show areas of numerous Caucasian species, the migration of mesophyllic and xerophyllic floras in the Caucasus during the Holocene; and tables listing the species. A chronological survey of the main stages of floragenesis and a table of local changes in the Pliocene-Pleistocene follow.

Chapter 2. Prima, V.M. "Some Questions of the Floragenesis of the Upper Alpine Flora of the Eastern Caucasus." 27 pages, 1 map. This article, verifying Galushko's conclusions, divides the Eastern Caucasus into three districts: Tersko-Argunski, Koisunski and Transsamurski. It compares the alpine and subnival floras of 269 species of the Eastern Caucasus, Verkhnaya Svanetia, Bolshaya Liakhva, Western part of the Central Caucasus, Central Transcaucasus and Maly Caucasus (Armenian plateau).

Chapter 3. Nemirova, E.S. "Geographical Distribution of Species Jurinea Cass., Sect. Neobellae Nemirova and some Questions of the Floragenesis." 4 pages, 1 map. The floragenesis of the genus Jurinea (Asteraceae), an endemic Caucasian Section of Neobellae, is given based on the geographic spreading of its taxa throughout the Caucasus. Two centres of origin and the present occurrence of taxa of Section Neobellae are postulated. The Western Caucasus is the primary center where Pumilae and Levieranae of the Subsection Coronopifoliae and the Subsection Mamullosae thrive. In fact, Mammulosae is endemic to the Western Caucasus. The Central Caucasian centre is a derivative even though an ancient one, within the limits of which the majority of species of Subsection Coronopifolia occur. They developed at the end of the Pliocene. In summary, the wealth of taxa in the Central Caucasus is due to two invasions: one during the Pliocene and one during the Riss-Würm. A map shows the direction of migrátions.

Chapter 4. Prima, V.M. "On Some of the Particularities of the Upper Alpine Flora of the Baba-Dag Mountains." 14 pages. A check list of taxa, many new, on the mountain Baba-Dag shows its relationship in the Caucasian flora.

Chapter 5. "Floragenetical Regions of the Peredovoj Ridges (Terski-Ridge and Sunjenski-Ridge) of Checheno-Ingushetia." 9 pages, 1 map. Five floristic regions and several subregions occur such as the Malgobekski, Bragunski, Eastern part of the Sunjenski Range, and Alkhanchurto-Sunjenski. The Bragunski region is the most original. The most characteristic species are listed.

Chapter 5. Prima, L.C., & Galushko, A.I. "On Aquatic Flora of Kissyk Lake." This article deals with the "Types of Woods and Forestry in the Checheno-Ingushetia."

The reviewers are mortified that after preaching that articles in English should have a brief summary in Russian printed in the Cyrillic alphabet that they can find no Russian scholar in the Island of Hawaii to write it for them, and no printer in Ann Arbor with a Cyrillic font to print it for them! Dr. Galushko, please excuse us.

DIAGNOSIS OF SOME NEW TAXA AND SOME NEW COMBINATIONS IN BIGNONIALES

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In my recently completed Ph.D. dissertation entitled "Leaf architecture and systematics of the Acanthaceae and related families" (University of South Florida, 1976) I have recognized several new taxa and made many new combinations. In anticipation of considerable delay in the publication of the dissertation in its entir~~e~~ity the names of the new taxa and the new combinations are published in this paper.

1. Acanthaceae Juss. emend. Sreem. Synonym: Acanthoideae Lindau emend. Bremek. Proc. Nederl. Akad. Wet. C 58: 163. 1955. Type genus: Acanthus Linn.

2. Justiciaceae (van Tieghem) Sreem. fam. et stat nov. Synonyms: Justicioideae van Tieghem Ann. Sci. Nat. Bot. IX 7: 22. 1908. Ruellioideae Bremek. Proc. Nederl. Akad. Wet. C. 58: 163. 1955. Type genus: Justicia Linn.

3. Meyeniaceae Sreem., fam. nov. Familia Pedaliaceae Thunbergiaceae Thomandersiaceaeque affine, proprie habitu scandenti; foliis simplicibus, haud lobatis, venis actinodromis; calyce 5-lobato; pollinis granis (7)-8-(9) colpatis, perlobatis, peretrematis; capsulis rostratis, 2-4 semina exalbuminata ferentibus. Typus familiae: Meyenia Nees.

4. Nelsoniaceae (Nees) Sreem. fam. et status nov. Synonyms: Acanthaceae Juss. tribus Nelsonieae Nees. DC. Prodr. 11: 48. 1847; Bremekamp, Proc. Nederl. Akad. Wet. C. 56: 545. 1953. Acanthaceae subfam. Nelsonioideae Lindau, Bot. Jahrb. 18: 43. 1894, and Nat. Pflanzenfam. IV. 3b: 288. 1895. Type genus: Nelsonia R. Br.

5. Thomandersiaceae Sreem., fam. novum. Familia Justiciaceae, Pedaliaceae, Acanthaceae Meyeniaceaeque affine, proprie habitu fruticoso; caulibus non articulatis; foliis simplicibus, venis pinnato-camptodromis, cystolithis carentibus; bracteis

inconspicuis; pollinis granis 5-(6)- colpatis, oblatis, peretrematis; capsulis obtusis ad apicem, muris lignosis crassis, semina exalbuminata duo in quoque loculo ferentibus. Typus familiae: Thomandersia Baill.

6. Odontophyllum Sreem., Genus novum, Familia Acanthaceae Juss. tribu Aphelandrea Lindau pertinens, Aphelandra R. Br. affine, proprie foliis serratis vel dentibus, venis pinnato-craspedodromis, venis secondariis vel processis eis dentibus et ultra extensis, spinis acutis simulantibus; nodis caulis saepe appendicibus spinosis bracteoideis armatis.

Type species: Odontophyllum acanthus (Nees) Sreem. comb. nov. Basionym: Aphelandra acanthus Nees, DC. Prodr. 11: 302. 1847.

The following species are included in this genus. (Key to the abbreviations: Leonard = Leonard, E. C., Contributions from the U.S. National Herbarium. Vol. 31, part 2, pages 119-322. 1953; Wass. = Wasshausen, D.C., Phytologia 25: 465-502. 1973).

2. Odontophyllum acanthifolium (Hook.) Sreem. comb. nov. Aphelandra acanthifolia Hook., Icon. Pl. 2, pl. 113. 1837.

3. O. benoistii (Wass.) Sreem. comb. nov. Aphelandra benoistii Wass., 498.

4. O. castanifolium (Britt.) Sreem. comb. nov. Aphelandra castanifolia Britt., Bull. Torrey Bot. Club.27: 76. 1900.

5. O. chrysanthum (Wass.) Sreem. comb. nov. Aphelandra chrysantha Wass., 483.

6. O. cinnabarinum (Wass.) Sreem. comb. nov. Aphelandra cinnabarina Wass., 484.

7. O. cirsioides (Lindau) Sreem. comb. nov. Aphelandra circioides Lindau, Fedde Repert. Nov. Sp. 1: 157. 1905.

8. O. crispatum (Leonard) Sreem. comb. nov. Aphelandra crispatum Leonard, 151.

9. O. cuscoensis (Wass.) Sreem. comb. nov. Aphelandra cuscoensis Wass., 469.

10. O. dasyanthum (Wass.) Sreem. comb. nov. Aphelandra dasyantha Wass., 474.

11. O. euoplum (Leonard) Sreem. comb. nov. Aphelandra euopla Leonard, 138.

12. O. eurystomum (Mildb.) Sreem. comb. nov. Aphelandra eurystoma Mildb. Notizbl. 11: 64. 1930.

13. O. formosum (Spreng.) Sreem. comb. nov. Hygrophila formosa Spreng. Syst. Veg. 2: 828. 1825. Aphelandra formosa (Spreng.) Nees, DC. Prodr. 11: 301. 1847. Ruellia formosa Humb. & Bonp., Pl. Aequin. 1: 167. pl. 48. 1813 non Andrews, 1810, nom. illeg.

Ruellia formosa Humb. & Bonp. is a later homonym of R. formosa Andrews and cannot be considered for purposes of priority. Sprengel's Hygrophila formosa is then to be considered as a new name and not as a combination and dating from 1825. H. formosa Spreng. is to be considered as the basionym for Nees' combination in Aphelandra also.

14. O. gilvum (Leonard) Sreem. comb. nov. Aphelandra gilva Leonard, Contrib. U.S. Nat. Herb. 31(3): 704. 1958.

15. O. grangeri (Leonard) Sreem. comb. nov. Aphelandra grangeri Leonard, Contrib. U.S. Nat. Herb. 31(3): 701. 1958.

16. O. hieronymi (Brisb.) Sreem. comb. nov. Aphelandra hieronymi Grisb. Abh. Ges. Wiss. Goettingen 24: 260. 1879.

17. O. huelensis (Leonard) Sreem. comb. nov. Aphelandra huilensis Leonard, 146.

18. O. inaequalis (Lindau) Sreem. comb. nov. Aphelandra inaequalis Lindau, Bull. Herb. Boiss. Ser. 3: 368. 1895.

19. O. juninensis (Wass.) Sreem. comb. nov. Aphelandra juninensis Wass., 471.

20. O. kokobanthum (Lindau) Sreem. comb. nov. Aphelandra kokobantha Lindau, Ann. Conserv. & Jard. Bot. Geneve 2: 39. 1898.

21. _O. longibracteatum_ (Lindau) Sreem. comb. nov. _Aphelandra longibracteata_ Lindau, Bull. Herb. Bioss. Ser., 3: 367. 1895.

22. _O. luyensis_ (Lindau) Sreem. comb. nov. _Aphelandra luyensis_ Lindau, Notizbl. 8: 245. 1921.

23. _O. lyratum_ (Nees) Sreem. comb. nov. _Aphelandra lyrata_ Nees, DC. Prodr. 11: 302. 1847.

24. _O. macrosiphon_ (Lindau) Sreem. comb. nov. _Aphelandra macrosiphon_ Lindau, Bull. Herb. Boiss. 3: 367. 1895.

25. _O. mucronatum_ (Ruiz. & Pav.) Sreem. comb. nov. _Justicia mucronata_ Ruiz. & Pav., Fl. Peruv. & Chil. Prodr. 1: 8. pl. 10. 1798. _Aphelandra mucronata_ (Ruiz. & Pav.) Nees, DC. Prodr. 11: 301. 1847.

26. _O. mutisii_ (Leonard) Sreem. comb. nov. _Aphelandra mutisii_ Leonard, 136.

27. _O. peruvianum_ (Wass.) Sreem. comb. nov. _Aphelandra peruviana_ Wass., 470.

28. _O. phainum_ (Wass.) Sreem. comb. nov. _Aphelandra phaina_ Wass., 492.

29. _O. phoberum_ (Leonard) Sreem. comb. nov. _Aphelandra phobera_ Leonard, 143.

30. _O. porphyrocarpum_ (Leonard) Sreem. comb. nov. _Aphelandra porphyrocarpa_ Leonard, 140.

31. _O. porphyrolepis_ (Leonard) Sreem. comb. nov. _Aphelandra porphyrolepis_ Leonard, 134.

32. _O. reticulatum_ (Wass.) Sreem. comb. nov. _Aphelandra reticulata_ Wass., 493.

33. _O. rubrum_ (Wass.) Sreem. comb. nov. _Aphelandra rubra_ Wass., 494.

34. _O. runcinatum_ (Klotzsch ex Nees) Sreem. comb. nov. _Aphelandra runcinata_ Klotzsch ex Nees, DC. Prodr. 11: 302. 1847.

35. _O. rusbyi_ (Britt.) Sreem. comb. nov. _Aphelandra rusbyi_ Britt., Bull. Torrey Bot. Club. 27: 77. 1900.

36. O. superbum (Lindau) Sreem. comb. nov. Aphelandra superba Lindau, Ann. K. K. Naturh. Hofmus. Wien. 16:71. 1901.

37. O. tillettii (Wass.) Sreem. comb. nov. Aphelandra tillettii Wass., 473.

38. O. viscosum (Mildb.) Sreem. comb. nov. Aphelandra viscosa Mildb., Notizbl. 11: 66. 1930.

39. O. weberbaueri (Mildb.) Sreem. comb. nov. Aphelandra weberbaueri Mildb., Notizbl. 11: 67. 1930.

40. O. wurdackii (Wass.) Sreem. comb. nov. Aphelandra wurdackii Wass., 472.

7. Andrographis rotundifolia (Sreem.) Sreem. comb. et stat. nov. Andrographis neesiana Wt. var. rotundifolia Sreem. Bull. Bot. Surv. India 8: 91. 1966.

Leaf architecture of A. neesiana Wt. var. rotundifolia shows major differences from that of the typical variety sufficient to raise it to the rank of a species.

I thank the late Professor Robert W. Long (University of South Florida, Tampa, Florida) and Dr. Leo J. Hickey (Division of Paleobotany, Smithsonian Institution, Washington, D.C.) for discussion during the course of this work, and Dr. William D'Arcy (Missouri Botanical Garden, St. Louis) for translating the diagnosis into Latin.

THE VARIATIONS OF DELISSEA SUBCORDATA GAUD.
LOBELIACEAE
HAWAIIAN PLANT STUDIES 62

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Delissea subcordata was one of the four original species when the genus was described by Gaudichaud. It occurs on both mountain ranges of Oahu, in three separate areas, and also on Kauai. The plants of each area have a characteristic habit, and look different from those of the other regions. The flowers and fruits are homogeneous, but divergent characters are evident in the foliage. These plants of different localities are best recognized as varieties.

Key to Varieties of Delissea subcordata

A. Blades broadly obtuse, elliptic ovate, crenate, the base rounded; corolla 60 mm long.
var. *obtusifolia*.

A. Blades acute to subacuminate,

- B. Blades crenate (or serrulate), ovate lanceolate, the base subtruncate, then shortly cuneate; corollas 57-60 mm long.
var. *waikaneensis*.
- B. Blades denticulate or serrate,
  - C. Blades coarsely bidenticulate, lanceolate to ovate, often with several short lobes near the base; corollas 45-50 mm long.
var. *subcordata*.
  - C. Not so,
    - D. Blades biserrate, lanceolate, the base shortly cuneate; corollas 55 mm long.
var. *waialaeensis*.
    - D. Blades coarsely unequally curved denticulate, the base rounded to subcordate.
var. *kauaiensis*.

Delissea subcordata Gaud., var. subcordata. Bot. Voy. Uranie 457, 1829; Atlas pl. 77, 1826-1830; Hillebrand, Fl. Haw. Is. 249, 1888; Rock, B. P. Bishop Mus., Mem. 7(2): 345, pl. 195, 1919; Wimmer in Engler's Pflanzenreich

IV, 276b: 42-43, 1956; Degener, Fl. Haw. 339: 12/28/60.

Holotype: Iles Sandwich, C. Gaudichaud (P). The single leaf preserved is shown in a photo (BISH).

Oahu, Waianae Mts.: from the windward slopes of Mt. Kaala, Degener 20,633; also Forbes 1,813.O; Inouye 76; Mann & Brigham 573; Montgomery et al.; Nagata & Obata 1,117; Russ; and to the south: Palakoa Valley, W. A. Bryan; Puu Kanehoa, Stone 3,455; Kaluaa Gulch, Obata & Palmer325; Puu Kaua, St. John 21,531; Huliwai, Russ.

Original Diagnosis: "ramosa, foliis ovatis, argute dentatis, glabris; calycibus quinque-dentatis."

Var. kauaiensis var. nov.

Diagnosis Holotypi: Foliis 13-18 cm longis 9-11 cm latis ovatis ad elliptici-ovatis subacuminatis basi rotundata ad subcordata interdum in tertia infera cum 1-2 lobis lanceolatis marginibus grosse inaequaliter curvati-denticulatis.

Diagnosis of Holotype: Blades 13-18 cm long, 9-11 cm wide, ovate to elliptic ovate, subacuminate, the base rounded to subcordate, sometimes with 1-2 lanceolate lobes in the lower 1/3, the margin coarsely unequally curved denticulate; petioles 8-16.5 cm long.

Holotypus: Sandwich (=Hawaiian) Islands, Kauai Island, H. Mann & W. T. Brigham (BISH).

Var. obtusifolia Wawra, Flora 31: 7, 1873; Hillebrand, Fl. Haw. Is. 249, 1888; Rock, Bishop Mus., Mem. 7(2): 349, 1919; Wimmer in Engler, Pflanzenreich IV, 276b: 43, 1956; Degener, Fl. Haw. 339: 12/28/60.

Original Diagnosis: "foliis quam praecedenti multo amplioribus, rotundatis."

Expanded Description: Blades 14-22.5 cm long, 9.5-12 cm wide, elliptic ovate, obtuse, the base rounded, the margin crenate; petioles 7-12.5 cm long; corollas 60 mm long.

Holotype: Hawaiian Islands, "Oahu, Halemanŭ, ex hb. Hillebrand." (W).

Specimens Examined: Hawaiian Islands, Oahu Island, Koolau Mts., Waikane, Waikane-Schofield Trail, Oct. 16, 1932, N. H. Krauss.

Var. waialaeensis var. nov.

Diagnosis Holotypi: Laminis 16-24 cm longis 7-9.5 cm latis lanceolatis acutis ad subacuminatis basi breve cuneata biserratis.

Diagnosis of Holotype: Blades 16-24 cm long, 7-9.5 cm wide, lanceolate, acute to subacuminate, the base shortly cuneate, biserrate; petioles 8-18 cm long; corollas 55-60 mm long.

Holotypus: Hawaiian Islands, Oahu Island, Waialae Valley, Oct. 15, 1914, C. N. Forbes 1,945.O. (BISH).

Specimens Examined: Hawaiian Islands, Oahu Island, Wailupe Valley, right fork, 12 Jan. 1920, D. W. Garber & Forbes 173; Wailupe, W. Hillebrand & J. M. Lydgate; Tantalus, G. C. Munro 10; Pauoa Valley, June 1908, J. F. Rock 4,859a; Niu Valley, Aug. 22, 1909, Rock 4,859.

Var. waikaneensis var. nov.

Diagnosis Holotypi: Laminis 14-27 cm longis 7.5-11 cm latis ovati-lanceolatis acutis ad subacuminatis basi subtruncata tum breve cuneata crenatis (vel serrulatis).

Diagnosis of Holotype: Blades 14-27 cm long, 7.5-11 cm wide, ovate lanceolate, acute to subacuminate, the base subtruncate, then shortly cuneate, crenate (or serrulate); petioles 6-16 cm long; corollas 57-60 cm long.

Holotypus: Hawaiian Islands, Oahu Island, Koolau Range, Waikane, May 6, 1934, H. Morley (BISH).

Specimens Examined: Hawaiian Islands, Oahu Island, Waikane Valley, near stream, 1,000 ft alt., 4/17/32, E. P. Hume 540; Waikane, wooded valley, 400 ft alt., June 21, 1931, H. St. John 11,108; Waikane, Waikane-Schofield trail, wet woods, 1,000 ft alt., Oct. 16, 1932, St. John 12,118; Waikane Valley, by ditch trail in small ravine, 400 ft alt., May 10, 1931, W. B. Storey 70.

The specimens cited are all in (Bish), unless otherwise indicated.

ADDITIONAL NOTES ON THE *ERIOCAULACEAE*. LXXVI

Harold N. Moldenke

SYNGONANTHUS NITENS var. KOERNICKEI Ruhl.

Additional bibliography: Moldenke, Phytologia 28: 440 (1974), 31: 382 & 386 (1975), 36: 75 & 78 (1977), and 37: 270 & 273--275. 1977.

Ruhland (1903) describes this variety as "Differt vaginis glabris vel sparse patentissimo-pilosis; pedunculis gracillimis", basing it on *G. Gardner 5279* from Minas Gerais, Brazil, and *Weddell 1914* from "Sümpfen bei Salitre", also Minas Gerais. Obviously this is the same taxon as Körnicke's *Paepalanthus nitens* var. β based on the same cotypes, but Körnicke describes it as "vaginis pilis brevissimis arcte appressis puberulis; pedunculis rigidulis".

Recent collectors describe the plant as a palustrine herb, to 30 cm. tall, the leaves in basal rosettes, the inflorescence-heads grayish or gray-white, and the flowers white. They have found it growing in wet places on campos and on wet slopes among sedges, at 700--1000 m. altitude, flowering and fruiting in August and September. Irwin and his associates report it as "common on wet sandy periodically flooded creekbanks", "locally common, the heads rising to the level of the surrounding grasses on wet slopes", and "locally common, forming dense stands among grasses in cerrado". Silveira (1928) cites *A. Silveira 718* from Serra do Cipó, Minas Gerais, collected in 1921.

Material of this variety has been misidentified and distributed in some herbaria under the designations *Paepalanthus nitens* var. γ Körn., *Syngonanthus gracilis* Ruhl., *S. gracilis* var. *aurea* Ruhl., *S. nitens* (Bong.) Ruhl., and *S. nitens* var. *filiformis* (Bong.) Ruhl. On the other hand, the *Hatschbach 8488*, distributed as *S. nitens* var. *koernickei*, seems better placed as var. *filiformis* and *Hassler 9430* is var. *hirtulus*.

Additional citations: COLOMBIA: Vaupés: *Humbert & Schultes 27319* (P). BRAZIL: Bahia: *Lützelburg 1519* (Mu). Distrito Federal: *Irwin & Soderstrom 5229* (Ld, N, W--2759027), *5824* (Ld, N, N, W--2759026), *5981* (N); *Irwin, Souza, & Reis dos Santos 7867* (Ac, N). Mato Grosso: *Harley 11532* (K). Paraná: *Hatschbach 156* (Sp--53968), *8488* (Z); *F. C. Hoehne s.n.* [6-11-28] (Sp--23453); *Krieger 1004* (Sp--51438). São Paulo: *Brade 6591* (Mu); *Lankester s.n.* [São Paulo, 4.VI.1937] (K). State undetermined: *Sellow C.271* [Serra do San Antonio] (B). PARAGUAY: *Hassler 4671* (Ca--944904, N), *9436* (Ca--950383, Mi, N, V--7007), *9436a* (Ca--929543, N), *9436b* (Ca--950382, N, V--7006).

SYNGONANTHUS NITENS f. MALMII Moldenke, Phytologia 4: 129. 1952.

Bibliography: Moldenke, Phytologia 4: 129 (1952) and 4: 326. 1953; Moldenke, Biol. Abstr. 27: 984. 1953; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

This form differs from the typical form and all other described varieties in having the leaves closely appressed-pilose, the hairs whitish and often reflexed.

Additional citations: BRAZIL: Mato Grosso: Malme 1966a (W—1483447—isotype).

SYNGONANTHUS NITENS f. PILOSUS Moldenke, Phytologia 4: 129—130. 1962.

Bibliography: Moldenke, Phytologia 4: 129--130 (1952) and 4: 326. 1953; Moldenke, Biol. Abstr. 27: 984. 1953; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971; Moldenke, Phytologia 31: 386 (1975), 36: 75 (1977), and 37: 270. 1977.

This form differs from the typical form of the species and all other named forms and varieties in having its leaves spreading-pilose.

Recent collectors have found the plant growing in cerrado and in sandy pantanal, in wet ground at the edge of brejo (sedge meadow), and in marshy areas in cerrado on watersheds, at altitudes of 700—900 m., flowering and fruiting in July and August.

The Rosa collection cited below does not appear to exhibit the spreading-pilose pubescence on the basal leaves, but otherwise the leaves seem to be identical with those of other collections of this form and not with those characteristic of the species in its typical form or other named forms and varieties. It is placed here tentatively.

Material of this form has been misidentified and distributed in herbaria as S. gracilis (Körn.) Ruhl. and S. nitens (Bong.) Ruhl.

Additional citations: BRAZIL: Goiás: Macedo 3353 (N). Mato Grosso: P. W. Richards 6486 (N, Z); Swallen 9611 (N, W--1933187). Rondônia: Maguire, Murça Pires, & Silva 56230 (N), 56459 (N, S); N. A. Rosa 477 [Herb. IPEAN 149907] (Ld). São Paulo: Brade 6578 (Mu).

SYNGONANTHUS NITENS var. VIVIPARUS Moldenke, Phytologia 25: 223. 1973.

Synonymy: Stachytarpheta nitens var. viviparus Hocking, Excerpt. Bot. A.23: 292, sphalm. 1974.

Bibliography: Moldenke, Biol. Abstr. 56: 69. 1973; Moldenke, Phytologia 25: 223 & 230. 1973; Anon., Biol. Abstr. 56 (1): B.A. S.I.C. S.254. 1974; Hocking, Excerpt. Bot. A. 23: 292. 1974; Moldenke, Phytologia 28: 463 (1974) and 30: 74. 1975.

This variety differs from the typical form of the species and all other named forms and varieties in its much smaller stature, the leaves only about 1 cm. in length, the peduncles 5—15 cm.

long, and the flower-heads often conspicuously viviparous with the involucral bractlets becoming leaf-like and 1--8 pedunculate plantlets 2--3 cm. long developing per head.

The type collection is a mixture with Paepalanthus manicatus V. A. Pouls.

Citations: BRAZIL: Bahia: Irwin, Harley, & Smith 32510 (N--isotype, Z--type).

SYNGONANTHUS NITIDUS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-20): 271. 1903.

Synonymy: Eriocaulon nitidum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636. 1831 [not E. nitidum Blume, 1832, nor Buch.-Ham., 1832, nor Hort., 1831]. Paepalanthus nitidus Kunth, Enum. Pl. 3: 528. 1841. Dupatya nitida (Bong.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya nitida Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636 (1831) and ser. 6, 2: 226--227, pl. 14. 1832; Bong., Ess. Monog. Erioc. 35, 63--64, & 226--227, pl. 14. 1832; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 528, 579, 613, & 625. 1841; D. Dietr., Syn. Pl. 5: 262. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 281 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 309, 437--438, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 272, 286, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 419. 1928; Stapf, Ind. Lond. 3: 91. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 19, 30, 38, 51, & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 108, 281, 290, 326, & 492. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Moldenke, Phytologia 17: 488. 1968; Moldenke, Résumé Suppl. 18: 5. 1969; Moldenke, Phytologia 19: 238 & 244. 1970; Moldenke, Fifth Summ. 1: 175 & 483 (1971) and 2: 507, 587, & 964. 1971; Moldenke, Phytologia 33: 25 (1976) and 35: 303. 1977.

Illustrations: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 2: [Ess. Monog. Erioc.] pl. 14. 1832.

Bongard's original (1831) description of this species is "acaule; foliis caespitosis vaginis brevioribus patenti-diffusis, linearibus obtusis glabris; pedunculis caespitosis vaginisque adpresse pilosiusculis. T. XIV. Habitat in Brasilia", based on an unnumbered Riedel collection from "auf etwas feuchten Campos" in Minas Gerais, Brazil, probably deposited in the Leningrad herbarium. Kunth (1841) elaborates on the description, but cites no specimens. Ruhland (1903) adds Glaziou 20011, also from Minas Gerais. Silveira (1928) adds A. Silveira 450 from Serra do Cipó, Minas Gerais, collected in 1905.

Segadas-Vianna and his associates encountered this plant in "locais desnudos da restinga arborescente, dominante, substratum arenoso, topografia local plana, umidade mínima, luminosidade máxima, abundância alta, frequência alta". It has been found in anthesis in March and September and in fruit in September.

The Eriocaulon nitidum credited to Buchanan-Hamilton in the synonymy above is a synonym of E. cinereum R. Br. (not of E. sexangulare as stated by Jackson, 1893), while that credited to Blume and to "Hort." is a synonym of E. sexangulare L.

Material of S. nitidus has been misidentified and distributed in some herbaria under the designations S. habraphys Ruhl. and S. habrophyus Ruhl.

Citations: BRAZIL: Minas Gerais: Glaziou 20011 (B, Z), 20014 (B). Rio de Janeiro: Segadas-Vianna, Dau, Ormond, Machline, & Lorêdo I.940 [Herb. Mus. Nac. Rio Jan. 108889] (W--2370794, Z). MOUNTED ILLUSTRATIONS: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 2: 226--227, pl. 14. 1832 (N, Z).

[to be continued]

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BOOK REVIEWS

Alma L. Moldenke

"GENES, ENZYMES, AND POPULATIONS" edited by Adrian M. Srb, xv & 359 pp., illus., Plenum Publishing Corporation, London NW10 6SE & New York, N. Y. 10011. 1973. $27.00.

This book is Volume 2 in the Basic Life Sciences and it incorporates the proceedings of the 12th International Latin-American Symposium held in Cali, Colombia near the end of 1972 to consider "Fundamental Approaches to Plant and Animal Improvement" through "basic mechanisms that determine and control phenotypes and the ways in which it is possible to manipulate them, both at the laboratory bench and in the open field, in order to produce new individuals with certain features of greater value to mankind and a greater resistance against natural enemies".

Twenty-six well prepared, illustrated and documented papers cover such topics as the molecular aspects of mitochondrial complementation and heterosis in Triticum, cell and tissue culture techniques as aids in economic plant improvement — with a long list of "banked" items, factors favoring formation of androgenetic embryos in anther culture as in Datura and Nicotiana, repair of radiation and chemical damage to DNA in human cells, chromosome knobs in Latin-American maize, insect control with gamma-rays.

It is hoped that enough of this information will filter down in practical "green revolution" form to assist in the nutritional and economic needs of the still increasing third world population.

"CHEMILUMINESCENCE AND BIOLUMINESCENCE" edited by M. J. Cormier, D. M. Hercules, & J. Lee, xvi & 515 pp., illus., Plenum Press of Plenum Publishing Corporation, London NW10 6SE & New York, N. Y. 10011. 1973. $27.50.

This excellent, comprehensive and advanced treatment presents the 33 invited lectures with edited versions of the discussions following them and the abstracts of the contributed papers from the Second International Conference on Chemiluminescence convened at the University of Georgia in October 1972. The papers, offset printed from the typed manuscripts, are arranged according to the following topics: Introduction, Theory and Gas Phase Reactions, Oxygen Reactions, Radical Ions, Organic Reaction Mechanisms, Chemical Mechanism in Bioluminescence, and Applications of Chemiluminescence, with these last three topics of greatest interest to biologists.

Ocean dredging at 10—20 m. of a ton of sea-pansies, Renilla reniformis, yielded 1 mg. of pure Renilla luciferin naturally in light-producing particles herein introduced with the term lumisomes. Lumisomes were found in all species of bioluminescent Anthozoa and Hydrozoa coelenterates studied and they contain luciferase, photoprotein and the green fluorescent protein.

In reference to the "pure, applied or limited" university research programs Dr. Thrush mentioned that when he, Dr. Clyne and Dr. Wayne studied the chemiluminescent $NO + O_3$ reaction it was "entirely for the inherent interest of the problem....but did not foresee its importance in measuring pollution at ground level and from supersonic aircraft".

There are the usual list of participants, list of authors cited in the text and their bibliographies, and a subject index.

"PHYTA" Volume 1, Botanical Society, University of Sri Lanka, Peradeniya Campus, Sri Lanka, 8 pp., mimeographed. 1976.

This issue is devoted to "The Revision of the Flora of Ceylon" by L. H. Cramer S. J. which is currently a joint enterprise of the University of Sri Lanka [=Ceylon], the native Department of Agriculture and the Smithsonian Institution and is supervised by Dr. Ray Fosberg.

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THE NOMENCLATURE OF THE GENUS *BEGONIA*

JACK GOLDING
47 Clinton Ave.
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This is a review and interpretation of the portions of the International Codes of Nomenclature applicable to the names of the genus *Begonia*. Special emphasis is given to the names of hybrids and cultivars.

The rules for naming plants are set forth in *The International Code of Botanical Nomenclature 1972* (ICBN). This Code governs the use of botanical names primarily of wild plants, and names in Latin of cultivated plants, and has a special section, Appendix I, for the names of hybrids.

The names of plants in cultivation with emphasis on natural and artificially created hybrids are governed by *The International Code of Nomenclature for Cultivated Plants 1969* (ICNCP).

These nomenclature Codes were evolved by the diligent work of many experts and, while there is general agreement in the interpretations of their rules, there is no unanimity on all details. There even are some contradictions within the Codes and between them, particularly concerning collective epithets and nothomorphs. I have tried to make those interpretations that will best avoid confusion and provide stability with *Begonia* names.

The orthography and style of writing the names cited have been corrected as required by the rules of *The International Code of Botanical Nomenclature*. The original spelling or style used by the author is within parentheses following the corrected name.

DEFINITIONS

Species is the basic rank for the classification of wild plants. The characteristics of the individuals of this category, while variable, are still within recognizable limits that distinguishes them from all other units within a genus.

Plants of a species, including those of its infraspecific ranks, that are *selfed* (the pollen of a male flower applied to the stigma of a female flower of the same species) produce offspring that are *true* (have characteristics within the same recognizable limits that distinguish the species). These offspring are not considered hybrids and are treated nomenclaturally at the same rank as their parents.

A *variety* is a subdivision of a species, with some minor characteristics that differ from other members of the species.

A *form* is a subdivision of a variety or species that differs from the other members usually by one characteristic.

A *hybrid* is the offspring of the sexual union of plants belonging to different *taxa* (taxonomic groups). The various derivatives from the same parents, or multiple parents of the same two taxa, are designated collectively as a hybrid population, hybrid group, or *grex* (flock).

A *nothomorph* is a botanical designation for wild or cultivated variant of an interspecific hybrid.

A *cultivar* is a selected *culti*vated *var*iety of a plant (either species or hybrid), that is clearly distinguished by any character that is retained when it is reproduced, either sexually or asexually.

HIERARCHY

"Every individual plant is treated as belonging to a number of taxa of consecutively subordinate rank."

The *hierarchy* (all the categories of taxa arranged in order according to their ranks) for the names of *Begonia* (based on the Tippo system of classification) is the same for all plants through the rank of genus as follows:

RANK	NAME
Division	Tracheophyta
Subdivision	Pterospermae
Class	Angiospermae
Subclass	Dicotyledoneae
Order	Begoniales
Family	Begoniaceae
Genus	*Begonia*

Subordinate to the rank of Genus, the categories are different for a species, hybrid or cultivar.

SPECIES NAMES

For a species, the *infrageneric categories* are the ranks subordinate to Genus down to the rank of Species and may be: Subgenus, Section, Subsection, Series, Subseries. Of these, for *Begonia,* only the rank of Section has been used.

Infraspecific categories are the ranks subordinate to Species and may be Subspecies, Variety, Subvariety, Form and Subform. For *Begonia,* the ranks of Subvariety and Subform have not been used and Subspecies has been used very infrequently.

As an example, the hierarchy of the species *Begonia (Lepsia) foliosa* var. *miniata* would be as follows:

RANK	NAME	
Genus	*Begonia*	
Section	*Lepsia*	
species	*foliosa*	(specific epithet)
Variety	*miniata*	(varietal epithet)

A name at the rank of Form may be used in addition to (or instead of) a name at varietal rank.

These names in Latin are printed in a type face that stands out from the rest of the text; frequently this is accomplished by the use of italic type, (or of underlining in typescript). The genus and section names are capitalized, the others are lower-cased. A specific or infraspecific epithet derived directly from the name of a person, may, under the ICBN, be capitalized. For uniformity, I prefer always to use lower case as recommended by the ICBN.

The names of the species may be written *Begonia (Lepsia) foliosa* HBK, but frequently, the section name, *Lepsia,* is omitted.

For accuracy as a bibliographical reference and for full identification, the name or abbreviated name of the author(s) who first validly published the species name is added after the specific epithet: e.g., *Begonia foliosa* HBK (abbreviation for Humboldt, Bonpland & Kunth).

But when the name of a variety is added, the name of the author(s) of the variety must be added, and the author (HBK) of the species epithet may be omitted, e.g., *Begonia foliosa* var. *miniata* Smith & Schubert.

Names at the rank of species, variety and form are used only for naturally occurring plants collected in the wild. But selected distinctive variants of these occurring in cultivation may be given a cultivar name.

HYBRID NAMES

Hybrids are assigned to taxa of two principal ranks, intergeneric [hybrid] and interspecific [hybrid].

An *intergeneric hybrid* is a hybrid between species of two or more genera and has the rank equivalent to genus. I do not know of any intergeneric hybrids of the Family Begoniaceae, so we are not concerned here with this category.

An *interspecific hybrid* is a hvbrid between species (taxa of species rank) of the same genus, and has the same rank as species. I suggest the substitution of "taxa of species rank" for "species" in this definition because the ICBN provides that a hybrid has the same rank as its highest ranking parent. Therefore, an interspecific hybrid can be the derivative of a cross, not only between two species (e.g., *Begonia crispula* X *Begonia dregei*), but also between a hybrid and a species (e.g., *Begonia Xfuscomaculata* X *Begonia heracleifolia*), or between a species and a hybrid cultivar (e.g., *Begonia hydrocotylifolia* X *Begonia* 'Lenore Olivier').

BOTANICAL DESIGNATIONS OF HYBRIDS

Before the establishment of the ICBN, there was no universally accepted style for writing the names of hybrids. Many authors, as was the custom in their time wrote the hybrid names in Latin and did not distinguish them from the names of species.

The botanical names in Latin form for interspecifice hybrids and their derivatives are now governed by the ICBN. Such hybrids are designated either by a formula or a name.

A *formula* consists of the names of the two parents connected by the multiplication sign (X) (e.g., *Begonia olsoniae* Smith & Schubert X *Begonia sutherlandii* Hooker f.) or the name of the genus followed by the specific epithets of the two parents connected by the same sign (e.g., *Begonia olsoniae* X *sutherlandii)*. A formula is a statement of parentage; it clearly designates the entire hybrid population.

The sequence of the names or epithets in a formula may be either alphabetical or with the name or epithet of the female parent first, when it is known. With these optional methods of listing the parents it is not possible to be certain which is the female parent unless it happens to start with a higher initial letter. The ICBN also specifies that all derivatives from the same two species are designated by the same formula (even though the male and female parents are interchanged). For example, with the female parent listed first, the formula for cultivar *Begonia* 'Emeraude' is *Begonia boliviensis* X *veitchii*, and for the cultivar Begonia 'Topaze', it would be *Begonia veitchii* X *boliviensis*. But they are derived from the same two species and must be designated by the same formula, making it impossible to list the female parent first for one of them. It is more logical and less confusing always to list the parents alphabetically.

The *name* of an interspecific hybrid is a binomial consisting of the name of the genus and a multiplication sign (X) preceding a single (one word) epithet; e.g., *Begonia Xweltonensis* J. B. Weber. This is the botanical name of the hybrid and must conform to the rules of the ICBN. When botanical names are used in naming hybrids, all descendants of crosses between individuals of the same parent species should have this same name. So the epithet would be considered the collective diesignation for the entire hybrid population and all the individuals within it.

But this is confusing if applied retroactively to the older botanical hybrid names. These epithets apparently were often based by their authors on one distinctive plant and primarily are used to designate only that individual. When these basic botanical hybrid names are alone (without the additions of a cultivar epithet) they often are used as the designation for the individual.

Some typical examples of basic botanical hybrid names are:

Begonia Xantonietae Brade, Rodriguesia 32:165, t7. 1957 (X *Begonia Antonietae*)

Begonia Xerythrophylla Herincq, Rev. Hortic. Ser 3, 1:111. 1847 (*Begonia erythrophylla*)

Begonia Xingramii Moore, Gard. Mag. Bot. 2: 153,t, 1850. (*Begonia Ingramii*)

Begonia Xweltonensis J. B. Weber, Rev. Hortic. 47:105, 1875. (*Begonia Weltoniensis*)

FORMULAS, NOT EPITHETS

Designations consisting of the epithets of the parents combined in unaltered form by a hyphen, or with the termination of only one epithet changed, are considered to be formulas and not true epithets e.g., *Begonia peltato-sanguinea* A. Dietrich, Alleg. Gartenz. 15:283, 1847 which is not a true epithet but must be considered to be a formula meaning *Begonia peltata* Otto & Dietrich X *Begonia sanguinea* Raddi. *Begonia manicata-dipetala* Berol. is not a true epithet and must be considered to be a formula meaning *Begonia manicata* Brongniart X *Begonia dipetala* Graham. The correct binary name for this hybrid is *Begonia Xwarscewitzii* Herincq.

NOTHOMORPH

Nothomorph is a variant of an interspecific hybrid, that occurs either in the wild or in cultivation. It is designated by a botanical epithet in Latin and is subject to the rules of the ICBN. It has the same relation to a hybrid name that variety and form have to a species name.

Nothomorph is not the same as the category cultivar, which designates only cultivated variants.

An author has the option of designating a cultivated variant of a hybrid, either as a nothomorph by complying to the rules of the ICBN, or as a cultivar per the rules of ICNCP.

Under the ICBN, epithets subordinate to the binary name of a hybrid published before 1 Jan. 1975 at the other ranks (e.g., variety or form, which are to be used only for variants of natural species) are to be changed to the rank of nothomorph. e.g., *Begonia Bunchii* was described in 1914 by L. H. Bailey (Standard Cyclopedia of Horticulture) as a form of *Begonia* X*feastii (Feastii)* (a synonym of *B.* X*erythrophylla* Herincq). The rank of variety or form must be transferred to nothomorph: *Begonia* X*erythrophylla* nm. *bunchii* pro. var.

The hierarchy of the hybrid *Begonia* X*erythrophylla* nm. *bunchii* is:

RANK	NAME
Genus	*Begonia*
Species(Interspecific hybrid)	*erythrophylla*
Nothomorph	*bunchii*

CULTIVAR NAMES

The full name of a cultivar consists of the botanical or common name at species rank and the cultivar epithet.

Cultivar epithets designate different cultivated variations of a population.

Since 1959, cultivar epithets are fancy names in modern language, markedly different from botanical epithets in Latin. The fancy name is distinguished clearly from the botanical or common name, either by placing the abbreviation cv. before it, or by enclosing it within single quotation marks, and by capitalizing each word of the epithet:

Begonia X*fuscomaculata* cv. Reichenheim
Begonia crispula X *dregei* 'Crispie'
Begonia olsoniae X *sutherlandii* cv. Victoria Kartack

A cultivar epithet can be established by publishing in conformance with the rather simple rules of the ICNCP, or by the acceptance of the cultivar name by a registration authority and the inclusion of that name in a register. The international registration authority for *Begonia* is the American Begonia Society. Registration is not mandatory but is highly recommended.

Article 19 of the ICNCP states that a plant of an interspecific hybrid, when introduced into cultivation, must be given a cultivar name in addition to the collective epithet or formula, even if only one cultivar is known.

A formula is clearly a collective designation for the entire hybrid population so it is logical to designate selected individuals from this population by a cultivar epithet e.g.,

Begonia hydrocotylifolia X 'Lenore Olivier' cv. Clara Elizabeth
Begonia hydrocotylifolia X 'Lenore Olivier' Gertrude Nelson

As noted above, botanical hybrid names have been used to designate the individual upon which the author based the name. But by the addition of a cultivar epithet to a basic botanical hybrid name, it is transferred to a collective name for the entire hybrid population.

For example, John Seden crossed *Begonia veitchii* Hooker f. with *Begonia boliviensis* A. DC. One of the progeny was described and illustrated in Veitch's Catalogue of Plants: 2, fig, 1872 and given the name *Begonia Xintermedia*. This basic name *Begonia Xintermedia* is used to designate the individual plant described by Veitch.

From the same two species, L. Van Houtte developed hybrids that were described by him in Flores des Serres 19:26, 1873. They were given the French epithets *Emeraude* and *Topaze*. Since they are selected cultivated variants derived from the same two species, they take the same (now a collective) name *Begonia Xintermedia* plus a cultivar epithet, i.e. *Begonia Xintermedia* 'Emeraude' and *Begonia Xintermedia* 'Topaze'.

G. Legros in Revue Horticole, 66:247, t93 & t94, 1894, described and illustrated a *Begonia* with the epithet *Bertinii (Bertini)*, but he did not know its origin. In an article, *"L'origine du Begonia Bertinii" (Bertini)* in Revue Horticole, 66:294, 1894, Monsieur Lemaitre explainted "The *Begonia Bertinii (Bertini)* is a cross-breeding of *veitchii* and *boliviensis...."* Therefore, this is also designated as a cultivar, *Begonia Xintermedia* 'Bertinii'.

The example after Article 15 ICNCP implies that cultivar names can be abbreviated by the deletion of the epithet at species rank. For precision, when a cultivar epithet is appended to a botanical name, I recommend that the full name be used. For example, if the cultivar name *Begonia Xerythrophylla* 'Helix' was abbreviated, it would become *Begonia* 'Helix' and lose its identity as a cultivar of the interspecific hybrid *Begonia Xerythrophylla*.

COMMON NAMES

The common name for members of the genus *Begonia* in English is begonia. Various begonias have been given common names such as wax begonia, trout begonia and angel wing begonia. The same common name is often used for various plants, or the same plant may have different common names. It is best not to use common names to identify *Begonia*.

GROUP DESIGNATIONS

In addition to the designations of groups by botanical collective epithets, e.g., *Begonia Xcheimantha* Everett, *Begonia Xhiemalis* Fotsch, *Begonia Xtuberhybrida* Voss,- a collective epithet may also be a word or phrase of not more than three words, in a modern language. Normally all derivatives from the same parental combination have the same collective epithet in a modern language, but custom has also established the use of these collective epithets to designate groups of *Begonia* with common horticultural characteristics.

Typical names of this type are:

Begonia Rex-Cultorum Hybrids
Begonia Semperflorens-Cultorum Hybrids
Begonia Tuberhybrida Hybrids

Other group designations are horticultural classifications used as convenient headings in books, catalogues, or to classify similar types of plants in a flower show. Typical groups of this type are: rhizomatous, stemmed, tuberous, semituberous, cane-like, shrub-like, etc.

These do not have any rank in the hierarchy of plant names and are not regulated by either Code. No attempt is made here to list all the potential group and subgroup designations, these are determined and used by other authors for their particular purposes.

ANNOTATED RULES FOR BOTANICAL NAMES OF HYBRIDS

Under Article 40 (ICBN), to be validly published, names of hybrids of specific or lower rank with Latin epithets must comply with the same rules as those for names of nonhybrid taxa of the same rank. These rules are:

1. The names must be effectively published by the general distribution of printed matter, or at least to botanical institutions with libraries accessible to botanists (Art. 29 ICBN). Publication by indelible autograph (handwirtten text that cannot be rubbed out), in a tradesman's catalogue, in nonscientific newspapers, and by printed matter accompanying exsiccata (dried specimens) is considered effective if it was before 1 Jan. 1953. Publication in a seed exchange list is effective before January 1973.

2. To be validly published, a name of a new plant taxon must be accompanied by a Latin description or diagnosis or by reference to a previously and effectively published Latin description or diagnosis of the taxon (Art. 36 ICBN).

Exceptions: (a) names published before 1 Jan. 1935 with a description or diagnosis in other languages. (b) a name published before 1 Jan. 1908 accompanied only by an illustration with analysis showing essential characters.

3. Publication of the name of a new taxon is valid only when the nomenclatural type is indicated [Art. 37 ICBN], except for names published before 1 Jan. 1958.

4. For the name of the taxon to be accurate and complete, it is necessary to cite the name of the author(s) (Art. 46 ICBN).

Under Article 50 of ICBN "When the status of a taxon bearing a binary name is altered from species to interspecific hybrid, or vice versa, the name of the original author must be cited, followed by an indication in parenthesis of the original status. A similar indication of original status must be given, when an infraspecific taxon is altered in status to nothomorph, or vice versa. If it is desirable or necessary to abbreviate such a citation, the indication of original status may be omitted (and usually is)."

For example, *Begonia ricinifolia* A. Dietrich (pro. sp.) was originally published as a species (Allg. Gartenz. 15:282, 1847) but was later determined to be a hybrid (Klotzsch, Begoniaceen: 95, 1855). *Begonia Xweltonensis* nm. *alba* hort. (pro. var.): originally *alba* was published as a variety of *Begonia Xweltonensis* but in accordance with the current rules, it is cited as a nothomorph.

ANNOTATED RULES FOR CULTIVAR NAMES

A cultivar epithet published on or after 1 Jan. 1959 must be a fancy name, except a valid botanical epithet in Latin form for a plant subsequently considered to be a cultivar is to be retained. But, it must be distinguished in the same way as a fancy name by being written in a different type than that used for species names (this is usually roman type), with the initial letter capitalized, and separated from the botanical name by the use of single quotes or the abbreivation cv.

Any cultivar name is legitimate when established in accordance with the articles of the ICNCP, or established by legal process, such as by entry in a statutory register (Art. 33).

Before 1 Jan. 1959, to be legitimate, a name must be published in printed matter distributed to the public (Art. 37). The name must be approved by the originator of the cultivar, or his assignee (Art. 41). The name must be for a cultivar that does, or did, exist (Art. 42).

After 1 Jan. 1959, to be legitimate, a cultivar name must also be:

Published in printed matter dated at least as to the year (Art. 38).

Accompanied by a description, or by reference to a previously published description as a cultivar or in any botanical category (Art. 39).

SUMMARY

Stability in the names of hybrids and cultivars of *Begonia* can be best maintained by observing the following recommendations:

Formulae should be used as collective designations:

Begonia olsonia X *sutherlandii* 'Victoria Kartack'
Begonia dregei X 'Lenore Olivier' cv. Nancy Gail

Botanical names in Latin form based on an individual maybe the designation for that individual, except when followed by a cultivar epithet.

Begonia Xerythrophylla Herincq
Begonia Xfuscomaculata A. Lange
Begonia Xingramii Moore
Begonia Xweltonensis J. B. Weber

The botanical rank, nothomorph, should be used for variants of a basic interspecific hybrid.

Begonia Xerythrophylla nm. *bunchii* Bailey
Begonia Xweltonensis nm. *alba* hort.

Cultivar epithets designate the selected cultivated variants from a population, e.g., the following cultivars were all derived from the same parents designated by the formula *Begonia hydrocotylifolia* X 'Lenore Olivier': *Begonia* 'Clara Elizabeth', *Begonia* 'Gertrude Nelson', *Begonia* 'Lil O'Neil', *Begonia* 'Question Mark' and *Begonia* 'Posy Wahl'.

A cultivar name that includes a botanical name should not be abbreviated, e.g., *Begonia Xerythrophylla* 'Helix'.

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The responsibility for the final determinations of the various interpretations of the Codes is mine.

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NOTES ON EUGENIA (MYRTACEAE) AND HALORAGIS (HALORAGACEAE) FROM SOUTHEASTERN POLYNESIA PACIFIC PLANT STUDIES 34

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Myrtaceae

Eugenia Reinwardtiana (Bl.) DC., forma lutea forma nova.

A specie differt in baccis luteis.

Differing from the species by having yellow drupes, while forma Reinwardtiana has red drupes.

Holotypus: Polynesia, Gambier Islands, Mangareva Island, s. side of Mt. Makoto, crevice of basalt cliff, 350 m alt., 1 m shrub, June 7, 1934, H. St. John 14,901 (BISH).

Specimens Examined: Polynesia, Gambier Islands, Mangareva Island, Mt. Makoto, 380 m alt., June 4, 1934, St. John 14,881 (BISH); ditto, 290 m alt., June 6, 1934, St. John, D. Anderson & E. C. Zimmerman 14,892 (BISH).

Discussion: The fruits of forma lutea are 11-16 mm long, 11-14 mm in diameter, ellipsoid to globose, with an acid, edible pulp.

The species is native to lowland and forehills, and it occurs in Borneo, the Moluccas, Kangean Islands, Kei Islands, Palau, Marianne Islands, Yap, Truk, New Guinea, New Hebrides, Fiji, Samoa, Tonga, Niue, Rarotonga, Tahiti, Society Islands, Marquesas Islands, Austral Islands, Rapa, Pitcairn, Gambier Islands, and Henderson Island.

Haloragaceae

Haloragis erecta (Banks ex Murr.) Oken, subsp. erecta. Polynesia, Austral Islands, Tubuai Island, Mahu, 0-10 m alt., 16-III-1977, N. L. H. Krauss 1,497 (BISH); Raivavae Island, beach s. of Pic Rouge, top of coral sand beach, 1 m alt., plant 1 m tall, Aug. 5, 1934, H. St. John & F. R. Fosberg 15,922 (BISH).

This subsp. erecta is abundant from the beaches to the lowlands, often in disturbed habitats , all over New Zealand; and it is also on the

Chatham and the Kermadec Islands. There it grows to a height of 85 cm, and has the pedicels 0.5-1 mm long. The fruiting specimen from Tubuai, Krauss 1,497, has the pedicels 2-3 mm long; and the Raivavae specimen, St. John & Fosberg 15,922, was from a plant 1 meter tall. In all other characters these collections agree with those of subsp. erecta, as delimited in the monograph by Orchard, (Auckland Inst. & Mus., Bull. 10: 1-299, 1975). It is likely that the more northern and warmer localities in the Austral Islands account for the growth to a larger stature and with longer peduncles. The foliage tallies with the leaves shown in Orchard's figs. 43, 44, and 45, and the fruit with his fig. 48.

It is worthy of comment that in Orchard's key (p. 66) the heading, "7. Lamina ovate to orbicular." which leads to H. erecta, makes no provision for the common, typical, lanceolate shape of the blades.

The Austral Islands lie about 1,500 nautical miles to the northeast of New Zealand. This barrier of open ocean is a broad one. The dispersal of this species to the northeast might have been by sea flotation, but more likely was by bird transport.

Keys to the Flora of Florida -- 4, Nymphaea (Nymphaeaceae) [1]

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ABSTRACT: An amplified key is presented to the 6 native and 2 naturalized species and species-hybrids of *Nymphaea* (Nymphaeaceae) found in the state of Florida, U.S.A. The key is supplemented with discussion of nomenclature and morphology. *Nymphaea odorata* is seen to consist of 2 varieties, one described as new. *Nymphaea blanda* and *N. jamesoniana*, two species of the South American subgenus *Hydrocallis*, are newly reported for Florida and the United States, as apparent natives. A hybrid between *N. mexicana* and *N. odorata* is newly described and named. *Nymphaea capensis* and *N.* X *daubeniana* are reported as naturalized in the state.

The water-lilies of Florida are significantly more varied than is generally appreciated, both by reason of plants escaped and naturalized from horticulture, and by virtue of overlooked tropical species as well as regional patterns of variation and hybridization.

In North America surely the most intractable systematic problem within *Nymphaea* centers on *N. odorata* Ait. This species occurs as a native from southeastern Manitoba, eastward through the Great Lakes states and provinces to Newfoundland and the northeastern United States, south largely on the Coastal Plain to Florida, along the Gulf Coast to Texas and south at least to eastern Nicaragua. Although horticultural selections are now widely introduced and escaped inland, the species originally was largely absent in the interior of the United States. Morphological differences within this elongate native range have been acknowledged by the employment of regional infraspecific taxa: var. *maxima* (Conard) Boivin in Ontario and Quebec, var. *rosea* Pursh on Cape Cod, Massachusetts, var. *minor* Sims in New Jersey, var. *stenophylla* Fern. in Virginia, var. *gigantea* Tricker in Florida, and var. *villosa* Casp. in Texas. The significance of these variants, and the degree of their separation from each other and from typical var. *odorata*, is greatly in need of investigation. It seems probable that at least some of these entities do not merit recognition even at the varietal level.

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[1] This paper is Florida Agricultural Experiment Station Journal Series No. 399.

In Florida, however, it is useful to add still a further variety to the above array. In the sandhill lakes of the Florida panhandle, extending east to perhaps Perry, Taylor County, the preponderant white-flowered water-lily is consistently smaller, more delicate, and largely distinguishable, both in the field and in the herbarium, from the robust var. *gigantea*. The differences are more fully denoted in the accompanying key. From var. *odorata* (and from var. *minor* if that entity is considered separable) the flowers are readily distinguished in that the petals and sepals of the West Florida variant are more slenderly ovate; in proportion the perianth parts are similar to those of var. *gigantea*, the flowers of both presenting a more stellate open aspect than those of the rather closely imbricated camellia-like var. *odorata*.

In size, all parts of the West Florida plant are smaller than those corresponding in var. *gigantea* when both plants are fully developed. As with other species of *Nymphaea*, however, the leaves and particularly the flowers are subject to dwarfing under adverse conditions; the habitats preferred by var. *gigantea* are particularly prone to unseasonal drought, yielding flowers and leaves one season that are less than half the dimension observed on the same plants at another time. This variability, coupled with the tendency of the flowers to increase in size somewhat after anthesis, has obscured a pattern of morphological dissimilarity that deserves recognition. A long-continued interest in this problem, together with an extensive series of excellently prepared specimens generously made available for this study, justifies honoring Dr. Robert K. Godfrey, Tallahassee, Florida.

Nymphaea odorata Ait. var. **godfreyi** Ward, var. nov.

Differt a varietate typica sepalis et petalis gracilioribus minusque imbricativis; differt a varietate *gigantea* floribus parvioribus, foliis parvioribus infra aeque atromarroninis, petiolis et pedunculis similibus filo metallico, rhizomatibus gracilioribus. Holotype: Sandhills pond or small lake, 2 miles south of Crystal Lake, Bay County, Florida. *R. K. Godfrey & R. D. Houk 61557*, 6 Oct 1961 (GH - 3 sheets). Isotypes: (FLAS, FSU). Topotypes: *E. S. Ford 4559*, 13 Aug 1954 (FLAS); *R. K. Godfrey 59850*, 15 June 1960 (FSU).

At infrequent intervals a large-flowered yellow water-lily is found in the state, by its size outside the scale of *N. mexicana* and by its color not *N. odorata* var. *gigantea*. It appears to be a natural hybrid of these two parents and occurs only where both are present. Fruits have neither been collected nor observed, and the putative hybrid is believed to be sterile. A horticultural hybrid of these two species has long been known, but is perhaps derived from *N. odorata* var. *odorata*; it too is sterile. The natural hybrid may first have been collected by R. Kral in the St. Johns

River (*Kral 5523*, 22 Aug 1957, FSU). It has been collected repeatedly in the marshes of Wakulla County. The most northern collection that appears to represent this hybrid is from Sapelo Island, Georgia (*Duncan 20149*, FLAS, FSU, GA, USF).

This attractive plant has no legitimate name at the specific level. As a hybrid, it can, of course, be referred to as *Nymphaea mexicana* X *N. odorata* var. *gigantea*, but there are occasions where a binomial designation is preferrable. The earliest nomenclaturally legitimate combination referring to a hybrid between these species may be *Nymphaea odorata* var. *sulphurea* Conard; yet a later name preempts the specific rank and prohibits transfer of this most appropriate epithet. To avoid the uncertainty of the parentage of this horticultural hybrid, yet to preserve at least the meaning of Conard's epithet and to provide continued association with the name Sulphur Water-lily, the following epithet is chosen.

Nymphaea X **thiona** Ward, hyb. nov.

Hybrida naturalis e *Nymphaea mexicana* Zucc. et *N. odorata* Ait. var. *gigantea* Tricker exorta, ad illud colore floris, ad hoc magnitudine floris; plantae steriles. Perhaps *Nymphaea odorata* var. *sulphurea* H. S. Conard *in* L. H. Bailey, Cyclopedia of American Horticulture, p. 1106. 1901. Not *Nymphaea sulfurea* Gilg, *in* H. Baum, Kunene Sambesi Expedition, p. 235. 1903. Holotype: In drainage canals through marshes, St. Marks Wildlife Refuge, along Lighthouse Road, Wakulla County, Florida. *C. Hoy 10A*, 15 Apr 1962 (GH - 4 sheets). Topotypes: *C. Hoy 12*, 1 Oct 1961 (FSU - flower dissected); *R. K. Godfrey 5779a*, 15 Sept 1958 (FSU - 3 sheets).

Perhaps the most intriguing event to occur during recent studies of *Nymphaea* in Florida was the discovery of two species of subgenus *Hydrocallis*, a largely South American subgenus characterized in part by night-blooming flowers. These species, *N. blanda* and *N. jamesoniana*, are rare or at least inconspicuous, and very few collections are known. Yet all indications point to their native status, and it is hoped that this notice will produce further information about their range and habits. The history of their discovery and the long but only partially successful effort made in the recent past to gain further knowledge of these species has been detailed elsewhere (D. B. Ward, Florida Scientist 40: 155-159. 1977).

Two plants better known in cultivation are here treated as having become part of the state's flora. *Nymphaea* X *daubeniana*, a blue-flowered hybrid quite similar to the native *N. elegans*, is well established at a number of stations mostly along the East Coast. A spectacular scallop-edged African species, probably correctly treated as *N. capensis* var. *zanzibariensis*, is locally established in Indian River and Seminole counties; its first collection (*Kral 5553*, FSU, USF) was reported as a range extension of the largely southern *N. elegans* (R. K. Godfrey & R. Kral, Brittonia 10:168. 1958).

Nymphaea L. Water-lilies

1. Leaf margins deeply sinuate-dentate, the blades 20 - 30 cm. across, suffused with maroon beneath; petals blue to lavender; sepals obscurely many-nerved, without dark lines or spots; escaped from cultivation, locally abundant in sand-bottomed ditches, Indian River County (south of Vero Beach) and Seminole County (near Sanford). May - September. [With many horticultural variations; the Florida escape may be var. *zanzibariensis* (Casp.) Conard.]
CAPE BLUE WATER-LILY. N. capensis Thunb.

1. Leaf margins entire or slightly sinuate (if sinuate, the blades smaller and petals usually not blue; if blue, the sepals with dark lines or spots on back); petals blue, yellow, or white.

  2. Petals blue (at times very pale, almost white, but always with a bluish tinge which deepens on drying); sepals with short (1 - 4 mm.) purple lines or spots on back; carpels not fully fused, the partition between ovary cells double-walled.

    3. Leaves usually wine-red beneath; upper surface of blade without mound of tissue or viviparous plantlet; papillae (protruding tips of transverse sclereids) more closely spaced over veins; petals very faint blue to medium blue; sepals (at anthesis) 4 - 4.5 (- 5.5) cm. long, lengthening somewhat in fruit; shallow ponds of cypress swamps or open marl prairie, and in roadside ditches, locally frequent; south Florida (Dade, Monroe (excluding the Keys), Collier, southern Hendry counties), disjunct to Hernando County (Brooksville). August - November. [*Castalia elegans* (Hook.) Greene]
EVERGLADES WATER-LILY. N. elegans Hook.

    3. Leaves usually green beneath; upper surface of blade with mound of fibrous tissue (rarely with viviparous plantlet) at point above attachment of petiole; papillae densely and uniformly spaced over surface; petals medium to bright blue; sepals (at anthesis) 5 - 6 cm. long; occasional escape from cultivation, ditches and borrow

pits, mostly Florida east coast, particularly Brevard County, north to Nassau County. August - September. [Horticultural hybrid, derived in part from *N. micrantha* Guill. & Perr. of West Africa.]
DAUBEN WATER-LILY. N. X daubeniana O. Thomas

2. Petals white or yellow; sepals with fine closely-spaced lines many mm. long on back, or plain; carpels fully fused, the partition between the ovary cells single-walled.

4. Flowers night-blooming; petals white; sepals with fine closely-spaced longitudinal crimson lines; upper surface of leaf covered both with papillae (tips of transverse sclereids) and short lines (horizontal sclereids); styles clavate.

5. Leaf blade suborbicular, green above and below, thin and easily torn; shallow water of ponds and sloughs, inconspicuous (because of nocturnal flowers) and probably rare; west peninsular Florida: Levy County (Lebanon Station) to Citrus County (Lake Tsala Apopka), possibly to Hillsborough County. September - October. [Florida collections are var. *fenzliana* (Lehm.) Casp., with glabrous petioles and peduncles.]
SLEEPING-BEAUTY WATER-LILY. N. blanda G. F. W. Meyer

5. Leaf blade ovate-cordate to elliptic, green above and purple below (the pigment restricted to numerous short forking dark-purple lines), firm in texture; rare, shallow pond in floodplain of Peace River, DeSoto County (northwest of Arcadia). October - November.
N. jamesoniana Planch.

4. Flowers day-blooming; petals white or yellow; sepals without longitudinal crimson lines; upper surface of leaf covered only with papillae; styles linear.

6. Seeds 2 - 3 mm. in diameter; petals white or with slight yellowish tinge at base; leaves orbicular, the petiole nearly central; overwintering by elongate rhizome, without clusters of banana-like roots.

7. Flower often large, the sepals to 6 - 10 cm. long; leaves medium to large (to 45 cm. broad), maroon beneath but with veins usually greenish; petioles and peduncles thick, spongy; rhizome stout (2 - 4 cm. thick); streams, ponds, edge of lakes, openings in cypress swamps, in ditches and canals, often common; nearly throughout, but rare in south

Florida (absent in Keys), largely replaced in west by the following variety. May - October. [*Castalia lekophylla* Small]
WHITE WATER-LILY. N. odorata Ait.

var. gigantea Tricker

7. Flowers small, the sepals 3.5 - 6 cm. long; leaves small to medium (8 - 20 cm. broad), uniformly dark maroon beneath; petioles and peduncles thin, wiry; rhizome slender (1 - 2 cm. thick); shallow acid sand-bottomed ponds, local; west Florida, east to Wakulla and Taylor counties. April - October.
N. odorata Ait.

var. godfreyi Ward

6. Seeds 4 - 5 mm. in diameter if formed; petals clear sulphur yellow; leaves orbicular or often ovate, with the petiole inserted closer to the basal lobes than to the apex.

8. Plants fertile, fruits forming from pollinated flowers; petals sharply acute; flowers small, the sepals 3 - 5 cm. long; plants overwintering by a short stem to which are attached several descending curved fleshy roots, 1.5 - 3.5 cm. long, resembling miniature bananas; shallow marshes, ditches, occasionally in spring runs; infrequent but widespread, perhaps absent south of Broward County (Hugh Taylor Birch State Park) and west of the Apalachicola River. April - October. [*Castalia flava* (Leitner) Greene]
YELLOW WATER-LILY. N. mexicana Zucc.

8. Plants sterile, fruit never forming; petals acute to slightly rounded; flowers large, the sepals 5 - 8 cm. long; plants overwintering by a short rhizome from which extend long slender stolons; streams and marshes, rare, known in Florida only along the St. Johns River between Brevard and Orange counties, and near St. Marks, Wakulla County. [A natural hybrid of *N. mexicana* and *N. odorata*.] April - October. [*N. odorata* Ait. var. *sulphurea* Conard in Bailey]
SULPHUR WATER-LILY. N. X thiona Ward

Corrections in Paronychia (Caryophyllaceae)

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The author recently completed and published a floristic study of the genus *Paronychia* as it occurs in Florida (Keys to the Flora of Florida -- 2, *Paronychia* (Caryophyllaceae). PHYTOLOGIA 35:414-418. 1977). That study recognized 7 species within the state, one consisting of two subspecies and a second formed of two varieties. New combinations were made in *P. baldwinii* and in *P. erecta*. In large part, the selection of *Paronychia* for publication, rather than another of a number of manuscript treatments of Florida genera and families, was predicated upon the need for these new combinations.

The author, however, was unaware of the existence of a recent monograph of the genus *Paronychia*, by M. N. Chaudhri (A revision of the Paronychiinae. Drukkerij H. Gianotten N. V., Tilburg. 1968). Chaudhri's study, encompassing 109 species worldwide, was conducted in Europe and was dependent for its American collections upon seven U.S. institutions, all located outside the Southeast, while the present study relied heavily on the extensive Florida holdings of FLAS and FSU, as well as on direct field observation.

Even though the two studies were based upon wholly independent sources of information, the conclusions drawn are exceedingly similar. Both studies recognize the same seven Florida species, and under the same names. Both studies exclude from Florida one species (*P. fastigiata*) often reported for the state. And both studies treat two species as containing infraspecific taxa, with the same selection of epithet and rank. The only disparate note is the retention of Chaudhri of two infraspecific taxa (*P. americana* ssp. *pauciflora* and *P. rugelii* var. *interior*) that the present author does not believe worthy of recognition.

It is not often in taxonomic studies that parallel investigations are conducted within the same group but without knowledge of the other's interest; thus it is not often that one can approach an unbiased test of taxonomic judgment. To the extent that the present author's work may be used as a measuring unit, the study of M. N. Chaudhri as it pertains to Florida *Paronychia* is strongly endorsed and supported.

A concomitant consequence of these independent but identical conclusions as to the correct epithet and rank to be assigned to the Florida infraspecific taxa, however, is that the authorship attributed to the new combinations must be that of the first to publish. Accordingly, the two new combinations made by the present author should be replaced as follows:

Paronychia baldwinii (T. & G.) Fenzl in Walp.
ssp. *riparia* (Chapm.) Chaudhri

Paronychia erecta (Chapm.) Shinners
var. *corymbosa* (Small) Chaudhri

NEW COMBINATIONS IN TRADESCANTIA

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Tradescantia occidentalis (Britton) Smyth var. _melanthera_ MacRoberts, comb. nov. _Antherum connectiva fulginea_. Typical _T. occidentalis_ except for the dark brown anther connectives which appear black in the field.

This curious variety, which appears to be unique among _Tradescantia_, presents a striking appearance in the field. It was first found in western Louisiana where all _T. occidentalis_ are rare. Later a large population was discovered in eastern Texas by Dr. Robert Haynes. For perhaps a mile along a roadside only this variety is to be found.

Over 300 specimens of _T. occidantalis_ over its entire range were examined. In about 30% the color of the anther connective could be determined. With the exception of those listed below, all had the normal orange connectives.

Specimens examined: _Louisiana_: Lafayette, Lemon 940 (BR); vicinity of Shreveport, Caddo, MacRoberts 473 (type), 474, 869, 916, 2267 (LSUS); _Texas_: Gregg, MacRoberts 2319, 2323; Haynes 4777 (LSUS); Brazos, Terrell 1 (LSUS); Angelina, McCreary 49 (NLU); _Arkansas_: Ashley, Demaree 14750 (MO); _Oklahoma_, Pawnee, Tyrl & Estes 981 (OKLA).

The variety is apparently confined to east Texas, eastern Oklahoma, southern Arkansas and Louisiana.

Tradescantia ohiensis Rafinesque var. _foliosa_ (Small) MacRoberts, comb. nov. _Vaginae et folia inferiora pilosa_, _plantae parvulae_, _habitat saepe in umbra profunda_. Plants averaging about 60% the height of var. _ohiensis_, the lower sheaths and leaves pilose with long slender eglandular hairs, decreasing above, glabrous in the inflorescence with tufts of eglandular hairs on tips of sepals and bracts; frequently found in dense shade.

Tradescantia foliosa Small, Bull. Torr. Bot. Club 24:(1897): _Tradescantia caniliculata_ Rafinesque, Anderson & Woodson, Contr. Arn. Arb. 9: (1935); _Tradescantia ohiensis_ Rafinesque forma _pilosa_ Waterfall, Rhodora 56 (1934).

I have examined Small's type and several of Waterfall's form as well as numerous examples from western Louisiana; all are unquestionably the same variety. Although several authors have described *T. ohiensis* as having occasional hirsute sheaths, none have commented upon the disparity in size between this variety and typical *ohiensis* nor its occurence in heavily shaded habitats quite unlike those occupied by *T. ohiensis*. A pure stand of var. *foliosa* in dense shade averaged 3.7 ± 1.1 dm. (1.8 - 7.4) while nearby *ohiensis* averaged 6.6 ± 1.9 dm. (3.3 - 9.7). A mixed population (60% *ohiensis*) gave 5.9 ± .7 dm. (4.8 - 7.1) for *foliosa*, 8.6 ± 1.5 dm. (6.1 - 11.9) for *ohiensis*. Fourteen specimens annotated "*forma pilosa*" by Waterfall averaged only 2.7 ± 1.1 (1.0 - 4.6).

Specimens examined: Florida: Lake, Nash 610 (type) (NY); Oklahoma: Leflore, Means 1321; Pontotoc, McCoy 509, 2718; Pushmataha, Hooser 78, Dakens 79; McCurtain, Lloyd 238; Cherokee, Wallis 1564-1; Sequoyah, Wallis 2108; Osage, Liebenheim 51; Delaware, Wallis 2135; Payne, Coryell 867; Cleveland, Waterfall 8755 (OKLA); McCurtain, Barber 589 (LSUS); Louisiana: Caddo, MacRoberts 1692, 2314, 2334 (LSUS).

The variety apparently extends at least throughout the southern range of *T. ohiensis*.

These notes are part of a continuing study of the genus *Tradescantia* and are here published to validate them for the VASC/FLORA SEUS.

Shreveport, LA
12 Sept. 1977

CERTAIN NEW COMBINATIONS IN THE GENUS *CHAMAESYCE* SF GRAY

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The Linnean genus *Euphorbia* is held together by the unifying cyathial feature. Among the champions of the present-day, apart from a few, there is an increasing consensus to consider the cyathial character at the tribal level rather than generic. If so imposed, a number of quite natural genera would be segregated out of *Euphorbia* L. One such chosen 'charade' is the *Chamaesyce* S.F. Gray. The Chamaesyces of the Indian subcontinent can be defined and delimited by their herbaceous or subshrubaceous habit; aborted main axis; opposite, stipulate (interpetiolar), inequilateral (at the base), amphistomatic leaves bearing basic anisocytic stomata and ornamented veins (Kranz syndrome); cyathia with 4 glands (or 5th vestigial); and ecarunculate seeds, etc. This is in congruence with the data from different disciplines. The above unequivocal diagnosis militates against any identificatory problems for the recognition of Chamaesyces from Euphorbias *prima facie*. Therefore, *Chamaesyce* has been accepted as a distinct genus.

Proposing a new classification of the Euphorbiaceae, Webster (1975) reiterated the status of *Chamaesyce* as a distinct genus. Moreover, several of the Indian species (*Euphorbia* sect. *Anisophyllum*) were already changed to *Chamaesyce* by Croizat, Soják and Webster. In view of these and to facilitate expediency of our future studies, ten further indispensable new combinations under the genus *Chamaesyce* are made below:

CHAMAESYCE AURICULARIA (Boiss.) Raju et Rao, comb. nov. Bas.: *Euphorbia auricularia* E. Boissier, Centuria Euphorbiarum 17, 1860; in DC. *loc. cit.* 50, 1862.

Chamaesyce heyneana (Spreng.) J. Soják
C. heyneana subsp. *heyneana*
CHAMAESYCE HEYNEANA subsp. GALIOIDES (Panigrahi) Raju et Rao, comb. nov. Bas.: *Euphorbia heyneana* subsp. *galioides* (Boiss.) G. Panigrahi, Kew Bulletin 29 (4): 697, 1974.

CHAMAESYCE HEYNEANA subsp. NILAGIRICA (Panigrahi) Raju et Rao, comb. nov. Bas.: Euphorbia heyneana subsp. nilagirica (Miq.) G. Panigrahi, Kew Bulletin 29 (4): 697, 1974.

CHAMAESYCE HISPIDA (Boiss.) Raju et Rao, comb. nov. Bas.: Euphorbia hispida E. Boissier, Centuria Euphorbiarum 8, 1860; in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 15 (2): 27, 1862.

CHAMAESYCE LACINIATA (Panigrahi) Raju et Rao, comb. nov. Bas.: Euphorbia laciniata G. Panigrahi, Kew Bulletin 30 (3): 531, 1975.
C. LACINIATA subsp. LACINIATA

CHAMAESYCE LACINIATA subsp. BURMANICA (Panigrahi) Raju et Rao, comb. nov. Bas.: Euphorbia laciniata subsp. burmanica G. Panigrahi, Kew Bulletin 30 (3): 532, 1975.

Chamaesyce linearifolia (Roth) J. Sojak
C. linearifolia var. linearifolia
C. LINEARIFOLIA var. NALLAMALYANA (Ellis) Raju et Rao, comb. nov. Bas.: Euphorbia linearifolia (Roth) var. nallamalyana J.L. Ellis, Bulletin of the Botanical Survey of India 8: 345, 1966.

CHAMAESYCE LONGISTYLA (Boiss.) Raju et Rao, comb. nov. Bas.: Euphorbia longistyla E. Boissier, Centuria Euphorbiarum 9, 1860; in A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 15 (2): 20, 1862.

CHAMAESYCE SENGUPTAE (Bal. & Subr.) Raju et Rao, comb. nov. Bas.: Euphorbia senguptae N.P. Balakrishnan et K. Subramanyam, Bulletin of the Botanical Survey of India 2 (1&2): 175, 1960.

CHAMAESYCE WIGHTIANA (Hooker f.) Raju et Rao, comb. nov. Bas.: Euphorbia wightiana Hooker fil, The Flora of British India 5: 248, 1887.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXIV.

VARIOUS NOTES AND ADDITIONS

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Continuing studies in the Eupatorieae have shown the need for additional new combinations in a number of genera. A few of those included below are required for the projected study of the tribe in northern Central America while others are needed to complete anotations on borrowed material.

Ageratina latipes (Benth.) R.M.King & H.Robinson, comb. nov. *Eupatorium latipes* Benth., Pl. Hartw. 200. 1845. Colombia. This species with distinctive oblong leaves has been considered a synonym of the Ecuadorian *A. viscosa* (H.B.K.) K. & R. Photographs of typical *A. viscosa* show a plant the same as or closely related to *A. dendroides* (Spreng.) K. & R.

Ageratina miquihuana (B.L.Turner) R.M.King & H.Robinson, comb. nov. *Eupatorium miquihuanum* B.L.Turner, Wrightia 5(9):352. 1977. Mexico. An isotype of this Mexican species in the United States National Herbarium shows the species to be an unusual member of the genus *Ageratina* with unequal involucral bracts more like those in some South American species. *Eupatorium astillerum* B.L.Turner from northern Mexico is a minor variant of the species. A specimen (*Pennell 17372*, Coahuila, Sierra Guadalupe, US) shows a number of intermediate features.

Ageratina proba (N.E.Brown) R.M.King & H.Robinson, comb. nov. *Eupatorium probum* N.E.Brown, Gard. Chron. 1: 321. 1890. Peru.

Ageratina subpenninervia (Klatt) R.M.King & H.Robinson, comb. nov. *Eupatorium subpenninervium* Schultz-Bip. ex Klatt, Leopoldina 20:89. 1884. This is the same species recently redescribed as *Eupatorium monticola* L.O.Williams. B.L.Robinson (1926) included in the synonmy *Eupatorium subinclusum* Klatt which was published in the same article as *E. subpenninervium* but did not notice that the installment had a month priority. A fragment of *E. subinclusum* has been seen and while not identified with certainty, it is definitely not the same as *E. subpenninervium*.

Ageratum rugosum Coulter, Bot. Gaz. 20:42. 1895.

Alomia wendlandii B.L.Robinson; Proc. Amer. Acad. 49:452. 1913.

Alomia robinsonianum L.O.Williams, Fieldiana; Bot. 31:27. 1964. nom. nov. for A. wendlandi B.L.R.

Ageratum robinsonianum (L.O.Williams) L.O.Williams, Fieldiana: Bot. 36:81. 1975.

The application of the name wendlandii has been the subject of much confusion. The name was coined by Schultz-Bipontinus but not published. Klatt (1884) mentioned the Schultz-Bip. name in synonymy with the citation of a collection Liebmann 147 from Mexico. Vilmorin (1894) described subspecific variants of the species in polynomial form. These invalid uses of the name were all for material now recognized as the common Ageratum houstonianum Miller. As evident from the herbarium sheet of Liebmann 147 at Paris, the material under the number is mixed. The valid publication of Ageratum wendlandii by B.L.Robinson (1913) was based on a Copenhagen duplicate that is an entirely different species from A. houstonianum. The misinterpretation of the Schultz-Bipontinus concept by B.L.Robinson led Williams (1964) to erroneously believe that the Robinson name was invalid. In fact, the Robinson name would now require transfer into the genus Ageratum if the species were not obviously the same as the previously named Ageratum rugosum which usually has the pappus reduced or essentially lacking.

Austrocritonia taunayana (Glaziou ex B.L.Robinson) R.M. King & H.Robinson, comb. nov. Eupatorium taunayanum Glaziou ex B.L.Robinson, Contr. Gray Herb. n.s. 73:8. 1924. This is the fourth species recognized in this distinctive genus of southern Brazil. The characteristic pappus setae are present having strongly scabrous bases tapering into essentially smooth tips. The species is distinguished from others in the genus by the trinervate leaves with closely serrate margins, thus increasing the already considerable diversity of leaf form found in this small genus.

The species has a resemblance to the genus, Symphyopappus but can be distinguished by the depressed and hirtellous upper side of the midvein of the leaf, the lack of ridges on the branches of the inflorescence, the essentially smooth tips of the pappus setae and the large carpopodium. The midvein of the leaf is raised and essentially glabrous above in Symphyopappus, and the carpopodium is very small, being somewhat enlarged only in S. itatiayensis (Hieron.) K. & R.

Campuloclinium parvulum (Glaziou ex B.L.Robinson) R.M. King & H.Robinson, comb. nov. Eupatorium parvulum Glaziou ex B.L.Robinson, Contr. Gray Herb. n.s. 73:16. 1924. The previous combination of this species (King & Robinson, 1972 Phytologia 24(3):170. 1972) was invalid since it was based on the invalid listing of Glaziou. The name was properly validated in the B.L.Robinson reference.

Chromolaena mucronata (Gardn.) R.M.King & H.Robinson, comb. nov. Eupatorium mucronatum Gardn. Hook. Lond. Journ. Bot. 6:440. 1847. Brazil. In its typical form the species has serrate leaves, but we consider Eupatorium subserratum Gardn. having nearly entire leaves to be a synonym.

Chromolaena quercetorum (L.O.Williams) R.M.King & H.Robinson, comb. nov. Eupatorium quercetorum L.O. Williams, Fieldiana:Botany 36(10):101. 1975. Guatemala. The species is closely related to C. glaberrima and specimens have been seen in the U. S. National Herbarium under the latter name including Williams, Molina, & Williams 41242 from Huehuetenango, Guatemala and Breedlove 13893, 14108; Breedlove & Raven 13394; Cronquist & Sousa 10502 and Matuda 0737 from Chiapas, Mexico.

Critonia magistri (L.O.Williams) R.M.King & H.Robinson, comb. nov. Eupatorium magistri L.O.Williams, Fieldiana: Botany 36(10):90. 1975. The species is what has been called Critonia billbergiana (Beurl.) K. & R. in Guatemala and adjacent Belize. The latter species from Panama and Costa Rica seems to differ slightly by shorter heads and nearly or completely glabrous achenes.

Disynaphia halimifolia (A.P.Decandolle) R.M.King & H. Robinson, comb. nov. Eupatorium halimifolium A.P. Decandolle, Prodr. 5:150. 1836. The species was not recognized in our initial survey of the genus (King & Robinson, 1971b). Baker (1876) identified the central Brazilian species with D. spathulata(Hook. & Arn.) K. & R. The latter, contrary to Baker's treatment had priority and differs by the much broader obovate leaves. Material of D. halimifolia has usually been identified as D. ligulaefolia (Hook. & Arn.)K. & R. of southern Brazil but that species lacks the canescent tomentum of D. halimifolia and has thinner, more densely glanduliferous, more prominently keeled involucral bracts that are not as intensely darkened on the inner surface. Two other species of southern Brazil, D. variolata

(B.L.Robinson) K. & R. and D. littoralis (Cabrera) K. & R. have pubescence as in D. halimifolia but have much shorter primary leaves indistinct from the fascicles and have much smaller heads with thinner bracts.

Gyptis crassipes (Hieron.)R.M.King & H.Robinson, comb. nov. Eupatorium crassipes Hieron., Bot. Jahrb. 22: 780. 1897. In the preliminery study of the genus Gyptis (King & Robinson, 1971a) the species was treated under the name G. alternifolia. B.L.Robinson (1933) in his discussion of the genus pointed out that Eupatorium alternifolium Schultz-Bip. ex Baker was a later homonym. Both Hassler (1916) and B.L.Robinson (1933) treated the species as part of a broad concept with Eupatorium lanigerum Hook. & Arn. We continue to define the species more narrowly and the oldest name for G. alternifolius at the species level now proves to be E. crassipes Hier.

Koanophyllon correlliorum (Plettman) R.M.King & H.Robinson, comb. nov. Eupatorium correlliorum Plettman, Brittonia 29:85. 1977. The holotype is cited as NY by Plettman (1977) but the Botanical Garden has no record of having received the material. Dr. D.S.Correll of the Fairchild Gardens has kindly furnished an isotype and paratype for examination.

Praxelis chiquitensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium chiquitense B.L.Robinson, Contr. Gray Herb. n.s. 68:11. 1923. The species is from Bolivia: Santa Cruz: Prov. Chiquitos, Cerro Pesenema near Santiago de Chiquitos, alt. 800 m Herzog 25. Only a fragment and a photograph from the Gray Herbarium have been seen, but the generic characters are easily recognized. The species is the only linear-leaved member of the genus in Bolivia and differs from such Brazilian species as P. insigne by the fewer series of more pointed involucral bracts.

Raulinoreitzia leptphlebia (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Symphyopappus leptophlebius B.L.Robinson, Contr. Gray Herb. n.s. 96:18. 1931. B.L. Robinson (1931) mentioned the resemblance of this species to E. crenulatum Spreng. which is a Raulinoreitzia. Type fragments seen through the courtesy of the Gray Herbarium show that the species is closely related and should be transfered to the latter genus. The species differs by the broadly lanceolate slender-tipped leaves. The type was from Minas Gerias in Brazil and additional specimens fitting the description have been seen. Brasil: Goias: ca. 20 km N of Alto do Paraiso; Irwin, Harley & Smith 32214, Santa Catarina: Mun. Joacaba, Campo 3 km E of Ponte Serrada; L.B.Smith & R.Klein

11874; Parana: Mun. Rio Bco do Sul, Curiola; G.Hatschbach 16126 (all US). The scattered incidence of the species and the intermediate nature of the leaf shape suggests that the species might be a reoccurring hybrid between the two other widely distributed members of the genus, *R. crenulata* (Spreng.)K & R and *R. tremula* (Hook. & Arn.) K & R.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXV.

A NEW GENUS, *GOYAZIANTHUS*.

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The generic concepts summarized by B.L.Robinson in 1913 were admitted to be artificial, but material seen by the present authors had indicated that Robinson had a rather sound concept of the genus *Symphyopappus* Turcz. Species named by B.L.Robinson were retained in the genus in the recent redefinition (King & Robinson, 1971). Specimens of some of the Robinson species of *Symphyopappus* have only recently been seen. One of these, *S. leptophlebius* proves to belong to a related genus of the *Disynaphia* complex, *Raulinoreitzia*. The second species of principal concern here, *S. tetrastichus*, has the constricted throat of the corolla and greatly thickened style branches that indicate relation to the subtribe Alomiinae which contains *Brickellia* and its relatives.

Goyazianthus R. M. King et H. Robinson, gen. nov. (Eupatorieae) Asteracerum. Plantae suffrutescentes erectae quidem superne alterne ramosae griseo-tomentellae. Caules teretes striati, internodiis plerumque 1.5-2.0 cm longis. Folia plerumque alterna subsessiles anguste oblongo-oblanceolata obtusa vel mucronulata integra base in petiolis angustis indistinctis attenuata inferne valde trinervata supra et subtus griseo-paniculatae vel subcymose, ramis alternis vel oppositis, pedicellis brevibus. Capitula cylindrica; squamae involucri 15-16 persistentes ca. 4-seriatae et plerumque tetrastichae valde inaequilongae lanceolata-oblongae subacutae vel obtusae subherbaceae in margine laterali anguste scariosae extus subtiliter striatae; receptacula plana glabra. Flores 4 in capitulo; corollae tubulares superne angustiores breviter 5-lobatae, lobis oblongis laevibus longioribus quam latioribus extus dense glanduliferis cellulis elongatis; parietibus cellularum subsinuatis. Filamenta antherarum in quadrans basilaris corollae inserta in parte inferiore breves in parte superiore parum incrassata, parietibus cellularum superiorum distincte annulatis; appendices antherarum oblongo-ovatae vix longioribus quam latioribus; styli inferne grosse nodulosi et dense tomentelli, appendicibus stylorum longe incrassato-clavatis laevibus vel mamillosis; achaenia ca. 7-costata dense setifera et glandulifera; carpopodia breviter obturaculiformes assymetica, cellulis minute subquadratis multiseriatis; setae pappi capillares ca. 50 persistentes biformes dense scabridae. Grana pollinis ca. 25 µ in diametro minute papillosae.

Species typica: Symphyopappus tetrastichus B. L. Robinson

Goyazianthus tetrastichus(B. L. Robinson) R. M. King & H. Robinson, comb. nov. Symphyopappus tetrastichus B.L.Robinson, Contr. Gray Herb. n.s. 104:8. 1934. Goyaz: Brazil.

Goyazianthus is one of the many genera of the Alomiinae in Brazil and is one of those with a distinct hirsute node at the base of the style. The pappus with both long and short setae suggests comparison with Dissothrix but that genus has longer setae only over the five ribs of the achene. In the new genus the setae are numerous with long and short rather regularly alternating. Considering all features Goyazianthus seems most closely related to the genus Leptoclinium but even here differences are numerous. In Goyazianthus the leaves are more remote with thin tomentum, the involucral bracts are in four ranks, the heads have only four flowers, and the pappus bears numerous setae with stout bases firmly attached to the upper callus of the achene. The latter character where the pappus falls only as a unit with the upper callus was the basis for placement of the species in Symphyopappus by B. L. Robinson. In Leptoclinium by comparison the leaves are imbricated on the stem, the involucral bracts are not in ranks, the heads have five flowers, and the pappus setae are fragile and individually deciduous, usually being detached by the time the achenes are mature.

The position of Goyazianthus can best be represented by the following key revised from a version prepared a number of years ago. Th fact that some genera may be distinguished in the key by a single character should not be taken as indication that no other differences are known, especially where the single character is one of the initial leads in the key. Only the genus Condylopodium K & R of those now placed in the Alomiinae is ommited from the key. The latter genus with its large pinnately veined leaves is more Critonioid in appearance but is placed in the Alomiinae because of its Brickellia-like node at the base of its style.

Key to the genera of the subtribe Alomiinae

1. Pappus lacking 2

2. Heads with 40-50 flowers; corollas glabrous or with glands; achenes with small papilliform setae, (Mexico) . . . . Alomia

2. Heads with 4-5 flowers; corollas with numerous hairs and glands; achenes glabrous (Brazil) .Planaltoa

1. Pappus present, sometimes deciduous 3

3. Base of style without distinct enlarged node above nectary 4

4. Pappus with basally winged awn or with squamose members. 5

5. Pappus of 5 awns, anther appendages much shorter than wide (Mexico). . . . . Ageratella

5. Pappus of alternating awns and squamae; anther appendages longer than wide. 6

6. Leaves mostly opposite, petiolate with distinct blade; lateral surfaces of achene covered with dense pubescence, cells of carpopodium elongate (SW US., Mexico). . . . . Pleurocoronis

6. Leaves mostly alternate, narrow and sessile; achene with setae restricted to the ribs, cells of carpopodium subquadrate (SW US., W. Mexico) Malperia

4. Pappus of strictly capillary members 7

7. Achenes densely covered with long-stalked glands (Mexico). . . . . Dyscritogyne

7. Achenes with short-stalked glands or setae. . .8

8. Leaf blades with tapering bases 9

9. Corolla with glands externally, with lobes rather oblong; achenes with 5-6 ribs (Bolivia, Chile, Peru) . . . . Helogyne

9. Corolla without glands externally, with lobes mostly triangular; achenes usually with 7-10 ribs. 10

10. Leaves sessile, opposite, linear or squamulose; involucral bracts in 4 or more series (US., Mexico). . . . . Asanthus

10. Leaves petiolate, opposite or whorled, involucral bracts in 2-3 series (Mexico) Steviopsis

8. Leaf blades with truncate or cordate bases. 11

11. Style appendages not enlarged distally; pappus of plumose bristles coalesced at bases (U.S., Mexico, Guat. El Salv.) . . . Carminatia

11. Style appendages enlarged distally; pappus setae not plumose, not coalesced above callus of achene 12

12. Inflorescence with branches spreading at right angles; involucral bracts with attenuate tips; bases of older petioles becoming thickened and embracing stem (Guat.). Pseudokyrsteniopsis

12. Inflorescence with ascending branches; involucral bracts with obtuse or rounded tips; bases of older petioles not usually enlarged 13

13. Heads with 25-30 flowers; corollas funnelform; achenes scabrous or with short setae (U.S.). . . . . Brickelliastrum

13. Heads with 10-16 flowers; corollas tubular; achenes with prominent long setae (Mexico) Kyrsteniopsis

3. Base of style with distinct and abrupt enlarged node at base of style above nectary 14

14. Pappus easily deciduous, usually completely detached from achene at maturity (Brazil). Leptoclinium

14. Pappus persistent 15

15. Pappus of 2 different sizes 16

16. Heads with 4 flowers; leaves mostly alternate; with numerous longer pappus setae alternating with shorter setae (Brazil). . Goyazianthus

16. Heads with 6-8 flowers; leaves opposite; with only 5 longer pappus setae positioned above ribs of achene (Brazil). . . . . Dissothrix

15. Pappus setae without two distinct different sizes. 17

17. Leaves narrowly linear and spirally arranged (Brazil). . . . . Pseudobrickellia

17. Leaves usually ovate or oblong, opposite or whorled on main stems 18

18. Achenes with 8-10 ribs (U.S., and tropical America). . . . . Brickellia

18. Achenes with usually 5 ribs. 19

19. Shrubs; basal node of style glabrous or slightly papillose; corollas and achene densely glanduliferous(Peru) Crossothamnus

19. Herbs or subshrubs; basal node of style covered with hairs; achenes mostly setiferous. 20

20. Leaves with prickles on tips of lobes (N. Mexico) Barroetea

20. Leaves without prickles on tips of lobes 21

21. Corollas flaring, corolla lobes and style branches covered with prominent papillae (Mexico) . . . . Phanerostylis

21. Corollas tubular or very narrowly funnelform, corolla lobes and style branches essentially smooth 22

22. Carpopodia enlarged and contorted with irregularly shaped cells; inflorescene with laxly ascending branches; pappus setae not smooth on outer surface; petioles often narrowly winged (Texas, Mexico). . . . . Flyriella

22. Carpopodia small, short-cylindrical with small cells; inflorescence with stiffly spreading branches; pappus setae smooth on outer surface, scabrae mostly restri-

cted to lateral margins of setae
(Argentina, Bolivia, Brazil)
Austrobrickellia

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NOTES ON MIKANIA (COMPOSITAE) - IV

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The following new species are presented preliminary to a general treatment of <u>Mikania</u> in Peru.

MIKANIA AREOLATA Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ovatis, ad 8 cm longis et 6 cm latis, apice acutis, basi cordatis, marginibus integris; inflorescentiis corymbosis; capitulis ca 12-13 mm longis; corollis ca 6 mm longis, dentibus limbi deltatis, ca 0.5 mm longis; achaeniis ca 4.5 mm longis; pappi setis ca 90-100, ca 5 mm longis, barbellatis.

Liana, stems terete, costate-sulcate after drying, finely puberulent (especially at the nodes), internodes to 20 cm long, nodes slightly enlarged, with lacerate, puberulent, stipular-like enations. Leaves ovate, ca 8 cm long and 6 cm wide, margins entire to somewhat weakly serrate, apices acute, bases cordate, upper surfaces puberulent, palmately 5-7 nerved from the base, nerves puberulent, lower surfaces puberulent-pilose, lighter than above, veins exserted, tertiary veins forming areolae, petiole ca 4 cm long, puberulent. Inflorescence corymbose, ca 6 cm long and 10 cm wide, bracteal similar to cauline, though reduced, branchlets puberulent, branching trichotomously, heads usually arranged in 3's, pedicels 2-5 mm long. Heads 12-13 mm long, exterior bract obovate, 6-7 mm long, somewhat pilose, apices rounded, bases cuneately narrowed to a petiole-like structure, 3-5 nerved, ciliolate, borne at the summit of the pedicel. Involucral scales ca 10 mm long, puberulent, densely so at the tips, greenish, appearing to have lavender tips, apices rounded. Corolla pale greenish-yellow, ca 6 mm long, tube ca 3.5 mm long, throat campanulate, ca 2.5 mm long, teeth deltoid, ca 0.5 mm long. Achene ca 4.5 mm long, black, ribs white. Pappus bristles ca 90-100, whitish, ca 5 mm long, barbellate.

Holotype: PERU: Amazonas: Cerro Calla Calla, 45 km above Balsas, midway on road to Leimebamba, June 19, 1964, P. C. Hutchinson & J. K. Wright 5754 (F).

Superficially *Mikania areolata* resembles *M. cordifolia* (L. f.) Willd. in habit, but may be distinguished by its terete rather than hexagonal stems. The heads are also considerably larger, ca 12-14 mm in length, exterior bract somewhat petiolate, and corolla teeth ca 1/2 or less the length of the throat proper making it clearly separable from *M. cordifolia* with heads ca 10 mm in length, the exterior bract similar to the involucral scales and the corolla teeth around the same length as the throat proper. Similar in head size is *M. chimborazensis* Hieron. with heads ca 15-16 mm long, but with glabrate involucral scales, the corolla ca 9 mm long and the achene ca 6 mm long. *Mikania areolata* has involucral scales that are pilose, the corolla is ca 6 mm long, and the achene ca 4.5 mm long.

MIKANIA BREVIFAUCIA Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis triangularibus, ad 6 cm longis et 3.5 cm latis, apice acuminatis, basi cordatis, marginibus dentatis vel crenatis; inflorescentiis corymbosis; capitulis ca 10 mm longis; corollis ca 6 mm longis, dentibus limbi anguste triangularibus, ca 2.5 mm longis; achaeniis ca 3-3.5 mm longis; pappi setis ca 70, ca 5 mm longis, barbellatis.

Twiner, stems terete, striate to weakly costate, villous, soon glabrate to puberulent, internodes to ca 13 cm long, nodes with laciniate stipular-like enations ca 6 mm wide, the teeth ca 2-3 mm long. Leaves triangular, ca 6 cm long and 3.5 cm wide, villous, glandular, apices acuminate, bases cordate, palmately 3-7 nerved, margins dentate to somewhat crenate, lighter below, petioles to 2 cm long, villous, bracteal leaves similar to cauline, only smaller. Inflorescence corymbose, to ca 9 cm wide and 6 cm long, branchlets terete, villous. Heads ca 10 mm long, pedicels 1-3 mm long, villous, exterior bract lanceolate to narrowly ovate, ca 3.5 mm long, pilose to somewhat villous, apices acuminate. Involucral scales linear to lanceolate, densely pilose to villous, apices acuminate. Corolla ca 6 mm long, tube ca 3.5 mm long, throat scarcely distinguishable from tube, ca 0.5 mm long, teeth narrowly triangular, ca 2.5 mm long. Achene 3-3.5 mm long, brownish with white ribs, slightly pubescent toward the top (near pappus bristles). Pappus bristles ca 70, white, ca 5 mm long, weakly barbellate, narrowed toward the apex.

Holotype: PERU: Cuzco: Convencion, Tanamanche to Quellomayo, 3700 m, July 25, 1944, C. Vargas C. 4447 (F).

Salient diagnostic characters include the triangular leaves with dentate to crenate margins and the stipular-like nodal appendages. These appendages are ca 6 mm wide with laciniate teeth ca 2-3 mm long. The corolla is ca 6 mm long, the throat proper scarcely distinguishable from the tube and the narrowly lanceolate teeth of ca 2.5 mm in length imparts a somewhat rotate appearance. As a whole, the plant is villous, some parts densely so.

Related species include Mikania cordifolia (L. f.) Willd., a widespread species, and M. cristata Robins. of Costa Rica and Panama, because of similar habits, inflorescence, head size, etc. The two above species have ovate leaves with entire margins, clearly different from the triangular leaves with dentate to crenate margins of M. brevifaucia. The new species also lacks the hexagonal stems of M. cordifolia. The stipular-like enantions are much smaller than those of M. cristata, a nearly glabrate plant.

MIKANIA CONGLOMERATA Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ovatis, ad 22 cm longis et 15 cm latis, apice caudatis, basi truncatis vel subcordatis, marginibus integris; inflorescentiis conglomeratis, capitulis ca 6 mm longis; corollis ca 4 mm longis, dentibus limbi deltatis, ca 0.5 mm longis; achaeniis ca 2 mm longis; pappi setis ca 35, ca 4 mm longis, barbellatis.

Liana, stems terete, striate, with white sessile glands, internodes to 30 cm long. Leaves broadly ovate, somewhat coriaceous, to ca 22 cm long and 15 cm wide, margins entire, revolute, apices caudate, bases truncate to subcordate, upper surfaces glabrate, subpinnately 5-7 nerved from near the base, tertiary veins prominent, transverse, lower surfaces glabrate, veins exserted, petiole to ca 5 cm long, sulcate. Inflorescence paniculate, heads sessile, disposed in very dense sphaerical glomerules ca 2 cm in diameter, branchlets angular-flattened, puberulent. Involucral scales elliptic-oblong, ca 4 mm long, puberulent, apices rounded, ciliolate. Corolla ca 4 mm long, white, scarcely fragrant, tube ca 1.5 mm long, throat narrowly campanulate, ca 2.5 mm long, teeth deltiod, ca 0.5 mm long. Achene (immature) ca 2 mm long. Pappus bristles ca 35, ca 4 mm long, barbellate, slightly thickened at the tips.

Holotype: PERU: Huánuco. Pachitea, Honoria, Bosque Nacional de Iparia, a lo largo del Río Pachitea cerca del campamento Miel de Abeja, October 24, 1967, J. Schunke V. 2249 (US).

Mikania conglomerata is characterized by large leaves up to 22 cm long and 15 cm wide with caudate apices. Heads are sessile and congested at the tips of the branches into very dense spherical glomerules ca 2 cm in diameter. Among the Peruvian species of *Mikania*, this new species superficially resembles *M. hookeriana* H. & B., which lacks the dense glomerules and caudate leaf apices. *Mikania hookeriana* also possesses involucral scales with prominently swollen bases, not found in *M. conglomerata*. The broadly ovate leaves distinguish the new species from *M. desmocephala* Robins. of Peru and Bolivia, a plant with ovate-oblong leaves.

MIKANIA GLANDULIFERA Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis late ellipticis, ad 13 cm longis et 6 cm latis, apice attenuato-caudatis, basi truncatis, marginibus integris; paniculis capitulis in spicas; capitulis ca 6 mm longis; corollis ca 3 mm longis, dentibus limbi ca 0.7 mm longis; achaeniis ca 2 mm longis; pappi setis ca 35-40, ca 3.5 mm longis, scabridis.

Liana, stems terete, striate-costate, glabrate, with dark glandular punctations, especially near the nodes, internodes to ca 16 cm long. Leaves elliptic to elliptic-ovate, membranous, to ca 13 cm long and 6 cm wide, margins entire, apices attenuate-caudate, bases tuncate to obtuse, upper surfaces glabrate, with dark glandular punctations near midvein, pinnately veined, lower surfaces with dark glandular punctations, petiole to ca 3 cm long, with dark glands. Inflorescence paniculate, the ultimate segments spicately arranged, branchlets angular, puberulent, with dark glands. Heads sessile, ca 6 mm long, exterior bract lance-elliptic, to ca 1.5 mm long, apices acute, often with dark glands. Involucral scales elliptic-oblong, ca 5 mm long, glabrate, with a few glands, apices rounded, densely pilose, bases somewhat swollen. Corolla ca 3 mm long, white, tube ca 1.5 mm long, throat ca 1.5 mm long, turbinate, teeth lanceolate, ca 0.7 mm long. Achene ca 2 mm long, brownish. Pappus bristles ca 35-40, white, ca 3.5 mm long, scabrid.

Holotype: PERU: Huánuco: Pachitea, Bosque Nacional de Iparia, Río Pachitea cerca del campamento Miel de Abeja, January 6, 1967, Jose Schunke V. 1487 (US).

The strictly spicately disposed heads and elliptic-oblong membranous leaves characterize this species. In addition, the leaf surfaces, stems and heads have dark glandular punctations. Involucral scales are glabrate with pilose tips and ca 5 mm in length. It is seemingly near Mikania leiostachya Benth., a plant with subcoriaceous leaves, lacking evident glandular punctations and with involucral scales 3-3.5 mm long.

MIKANIA HEXAGONOCAULIS Holmes & McDaniel, sp. nov.

Suffrutex volubilis, caulibus hexagonis; foliis ovato-ellipticis, ad 14 cm longis et 6 cm latis, apice attenuatis, basi rotundis, marginibus integris; inflorescentiis corymbosis; capitulis ca 12 mm longis, sessilibus, ternatis; corollis ca 5.5 mm longis, dentibus limbi triangularibus, ca 0.8 mm longis; achaeniis 4.5 mm longis; pappi setis ca 60-70, ca 6.5 mm longis, barbellatis.

Climbing liana, stems hexagonal, reddish-brown, finely puberulent to somewhat scurfy. Leaves ovate-elliptic, semi-fleshy, to ca 14 cm long and 6 cm wide, margins entire, apices attenuate, bases rounded, intense green when fresh, pinnately veined, secondary veins closely following midvein after branching, then abruptly separating and arching toward the apex, above finely puberulent, below lighter, glandular and somewhat puberulent, petiole 1.5-2 cm long. Inflorescence corymbose, ca 8 cm wide and 7 cm long, branchlets angular, densely puberulent. Heads sessile in groups of 3's, ca 12 mm long, exterior bract ovate, ca 1 mm long, glandular and weakly puberulent. Involucral scales greenish-yellow, the outer oblong, 6 mm long, weakly glandular, puberulent, apices rounded, margins ciliate, the inner narrowly obovate, ca 7 mm long, glandular, puberulent, apices obtuse, margins ciliate. Corolla narrow, white, ca 5.5 mm long, the throat scarcely distinguishable from the tube, teeth narrowly triangular, ca 0.8 mm long. Achene ca 4.5 mm long, gradually enlarging from base to apex, olivaceous. Pappus bristles ca 60-70, white, barbellate, ca 6.5 mm long.

Holotype: PERU: San Martín: Palo Branco, al oeste del puente; Mariscal Caceres, Tocache Nuevo, December 16, 1972, J. Schunke V. 5734 (F).

Mikania hexagonocaulis is characterized by its hexagonal stem and sessile, ternately disposed heads. It is apparently related to M. parviflora (Aubl.) Karst. as seen in head disposition and leaf characters. However,

M. parviflora possesses a terete stem and has exterior bracts nearly as long as the involucre and somewhat petiolate, clearly distinct from the sessile ovate bract of ca 1 mm long of M. hexagonocaulis. The corolla throat and tube of the new species are scarcely discernible, those of M. parviflora are readily discernible.

MIKANIA PENDULA Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ovatis, ad 10 cm longis et 5 cm latis, apice attenuatis, basi subcordatis, marginibus serratis; paniculis capitulis in spicas; capitulis ca 5-6 mm longis; corollis ca 3-4 mm longis; dentibus limbi triangularibus, ca 0.5 mm longis; achaeniis ca 2 mm longis; pappi setis ca 35-40, ca 3 mm longis, barbellatis.

Slightly woody liana, stems terete, striate-costulate, glabrous to sparingly puberulent, internodes to 12 cm long. Leaves ovate, to ca 10 cm long and 5 cm wide, margins serrate, teeth ca 1 cm apart, apices attenuate, bases subcordate, upper surfaces glabrous, 5-7 nerved from the base, tertiary veins prominent, lower surfaces glabrate, often glandular atomiferous, petiole to ca 3.5 cm long, glabrous. Inflorescence paniculate, the ultimate branches spicately disposed, branchlets irregularly angled to flattened, slightly pilose. Heads 5-6 mm long, exterior bract elliptic, ca one-half the length of the involucre, glabrate, somewhat ciliate toward the rounded apex. Involucral scales oblong, ca 3-4.5 mm long, glabrate to puberulent, apices obtuse, bases slightly enlarged. Corolla narrowly funnelform, ca 3-4 mm long, glandular, tube 1-2 mm long, throat gradually expanded, ca 1-2 mm long, teeth triangular, ca 0.5 mm long. Achene ca 2 mm long, greenish. Pappus bristles ca 35-40, white, ca 3 mm long, barbellate.

Holotype: PERU: Cuzco: Convencion, Quellomayo to Lucumayo, 2800 m, July 26, 1944, C. Vargas C. 4485 (F).
Paratype: PERU: Cuzco: Huallpocunca, Pillahuanta, Paucantambo, 2800-3100 m, June 14, 1940, C. Vargas C. 1917 (GH).

Known only from Cuzco, Peru. The new species is characterized by ovate leaves with subcordate bases, palmate nerves and prominently serrate margins. Heads are disposed in spikes. The only other Peruvian species of Mikania known to possess serrate leaves, though not always, and spicately disposed heads is the easily distinguishable M. psilostachya, a scabrous plant with heads ca 10 mm long. Mikania pendula is smooth and has heads ca 5-6 mm long.

As noted on the label of the holotype, this species is named for its pendent habit.

MIKANIA SIMPSONII Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis verticillatis ovatis, ad 14 cm longis et 6.5 cm latis, apice attenuatis, basi acutis ad obtusis, marginibus integris; paniculis capitulis in spicas; capitulis ca 6.5 mm longis; corollis ca 3 mm longis; dentibus limbi lanceolatis, ca 1.0 mm longis; achaeniis ca 2.5 mm longis; pappi setis ca 33-35, ca 3.5 mm longis, barbellatis.

Liana, stem terete, pithy, lightly puberulent, soon glabrate, internodes ca 6.5 cm long. Leaves verticillate (3 at a node), ovate, to ca 14 cm long and 6.5 cm wide, margins entire, apices attenuate, bases acute to obtuse, upper surfaces dark green, glabrous, pinnately veined, with 2-3 pairs of secondary veins prominent and arching toward the apex, lower surfaces medium green, glabrous, reticulate-alveolate, with at least the prominent veins darkened, petioles to ca 2.5 cm long, thickish. Inflorescence a lax panicle with the heads ultimately disposed in rather open spikes, to ca 20 cm long and 25 cm wide, the branchlets irregularly angled to terete, puberulent, with linear bracts near the base, ca 0.5-1.5 cm long. Heads ca 6.5 mm long, exterior bract lance-ovate, ca 1/3 the length of the involucre, glabrate, apices acuminate. Involucral scales oblong, ca 4 mm long, glabrate, apices rounded, white inside. Corolla ca 3 mm long, tube ca 1.5 mm long, throat abruptly expanded, ca 1.5 mm long, corolla teeth lanceolate, ca 1.0 mm long, distinctly longer than the throat proper. Achene ca 2.5 mm long, glabrous, dark brown, ribs white, distinctly narrowed at the apex. Pappus bristles ca 33-35, light carneous, ca 3.5 mm long, barbellate, thickened at the tips.

Holotype: PERU: Loreto: Maynas, Alto Nanay, trail near Santa Maria de Nanay, March 4, 1968, Donald R. Simpson 781 (US).

This species known only from the type is the only Peruvian Mikania with whorled leaves. Among the Brazilian Mikania there are two species with whorled leaves and heads disposed in spikes, M. subverticillata Sch.-Bip. with considerably smaller dentate leaves and M. triphylla

Sprengel ex Baker with narrowly lanceolate leaves. Both of these species have corolla teeth distinctly shorter than the throat proper. Mikania simpsonii has ovate entire leaves with the corolla teeth greater than the length of the throat proper. Another similar species is M. araguensis Badillo of Aragua, Venezuela, with whorled leaves and spicately disposed heads. However, this species has elliptic leaves with cuneiform bases and corolla teeth shorter in length than the throat proper.

MIKANIA TURBARICOLA Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ovatis, ad 7 cm longis et 4 cm latis, apice attenuatis, basi truncatis, marginibus integris ad irregulatim dentatis; paniculis ad 15 cm longis; capitulis ca 9 mm longis; corollis ca 4.5 mm longis, dentibus limbi deltatis, ca 0.5 mm longis; achaeniis ca 3 mm longis; pappi setis ca 28-30, barbellatis.

Subshrub to short vine, stems terete to angled, sulcate after drying, internodes to 5 cm long. Leaves ovate, semi-coriaceous, to ca 7 cm long and 4 cm wide, margins entire to irregularly and coarsely dentate, the teeth remote, apices attenuate, bases truncate to rounded, upper surfaces glabrous, sparsely glandular-punctate, 5-nerved from near the base, lower surfaces glabrate, glandular-punctate, petiole ca 1 cm long, grooved above. Inflorescence paniculate, to ca 15 cm long and 6 cm wide, branchlets somewhat angled, crisped puberulent to pilose, pedicels ca 2-6 mm long, angular, crisped puberulent to pilose. Heads ca 9 mm long, exterior bract lance-linear to oblanceolate, ca 3.5 mm long, borne slightly beneath the head, puberulent. Involucral scales lanceolate to lance-elliptic, ca 6 mm long, puberulent, ciliolate at apex, apices acute. Corolla white, ca 4.5 mm long, glandular, tube ca 1.7 mm long, throat semi-campanulate, ca 2.7 mm long, teeth deltoid, ca 0.5 mm long. Achene (immature) ca 3 mm long, green, glandular. Pappus bristles ca 28-30, white, ca 4.5 mm long, barbellate, thickened at tips.

Holotype: PERU: Amazonas: Chachapoyas, Jalca zone 3-6 km w of Molinopampas, 2200-2450 m, July 19, 1962, J. J. Wurdack 1399 (US).

The new species is a subshrub or short vine, the holotype collected above 2000 m in a seepage Sphagnum bog. Nodes are short, leaves somewhat thickish and with mostly entire margins, but often with irregular spaced and prominent dentations. Branchlets of the paniculate inflorescence are crisped puberulent to pilose. Apparently, this species does not have close affinities with any known Peruvian species of Mikania.

MIKANIA WOYTKOWSKII Holmes & McDaniel, sp. nov.

Herba volubilis; foliis ellipticis vel anguste ovatis, ad 7 cm longis et 2.5 cm latis, apice acutatis vel acuminatis, basi cuneatis; paniculis capitulis in spicas; capitulis ca 6-7 mm longis; corollis ca 3.5-4 mm longis, dentibus limbi deltatis; ca 0.5 mm longis; achaeniis ca 2 mm longis; pappi setis ca 35, ca 4 mm longis, barbellatis, ad apicem incrassatis.

Herbaceous liana, stems terete, costate, hollow, glabrous, internodes to 10 cm long. Leaves elliptic to narrowly ovate, to 7 cm long and 2.5 cm wide, margins entire, apices acute to acuminate, bases cuneate, upper surfaces glabrous, 3-5 nerved from the base, veins exserted, lower surfaces glabrous, veins exserted. Inflorescence a panicle, the ultimate branches spicate, branchlets costate, puberulent. Heads 6-7 mm long, exterior bract elliptic, ca 1/2-1/3 the length of the involucre, lightly puberulent, apices acute, margins lightly ciliate. Involucral scales elliptic-oblong, ca 4.5 mm long, glabrate, 3-5(7) rather obscurely nerved, apices obtuse. Corolla funnelform, ca 3.5-4 mm long, white, tube ca 1.5-2 mm long, throat ca 2 mm long, teeth deltoid, ca 0.5 mm long. Achene ca 2 mm long, glandular, dark brown (immature). Pappus bristles ca 35, ca 4 mm long, white, barbellate, thickened toward the tips.

Holotype: PERU: Loreto: Boqueron Padre Abad, 470 m, August 20, 1946, F. Woytkowski 34393 (F).

Mikania woytkowski appears to be a soft herbaceous, slender twining vine. Leaves are elliptic to narrowly ovate, 3-5 nerved from near the base with the reticulating veins obscure and with cuneate bases. Involucral scales are elliptic and about 4.5 mm long. It approaches nearest to M. oreopola Robins. in characters of inflorescence, but the latter species has ovate leaves with very prominent reticulating veins and obtuse bases. Involucral scales are elliptic, but 3 mm or less in length in M. oreopola. Known only from the type and named after the collector.

THE NATIVE HAWAIIAN ALTERNANTHERA (AMARANTHACEAE) HAWAIIAN PLANT STUDIES 63

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Amaranthaceae

Alternanthera Menziesii St. John, Jardin Botanique del'Etat, Bruxelles, Bull. 27(1): 49-50, 52-54, fig. 2, 1957.

A. echinocephala sensu Fosb., Micronesica 2: 143-144, 1966, non (Hook.f.) Christophersen, Nyt Mag. Natur. B, 70: 73, 1932.

Discussion: Alternanthera Menziesii was described by the writer, based wholly upon a collection by A. Menzies, labelled only Sandwich Islands (BM). Dr. Archibald Menzies was surgeon and naturalist under Capt. George Vancouver on his world voyage on the "Discovery." During the years from 1792 to 1794, they made three visits to the Sandwich (or Hawaiian) Islands, and landed on the six largest islands. Menzies made trips and collections from the sea shore to as high as the summit of Mauna Loa (13,680 ft alt.), but all his specimens are labelled merely Sandwich Islands. He kept a journal of his trip. The Hawaiian portion of this has been published (Menzies, ed. Wilson, 1920) and this totals 199 pages in length. It includes accounts of people, places, climate, geology, birds, and I believe the only mention of plants is that on Hualalai there were Sophora and Dodonaea. Nowhere does he list his plant collections and their localities, so his journal is not helpful in phytogeography and taxonomy.

Degener and Sherff (1935) had described a new genus, Zemisne Menziesii, based upon a Menzies collection marked Sandwich Islands. This proved to be a member of the genus Scalesia, and a synonym of S. affinis Hook. f., subsp. gumifera (Hook. f.) Harling, a native of the Galapagos Islands.

Later, in his index under Zemisne, Degener (Fl. Haw., K^{14}, 12/27/57) wrote, "Another genus and species collected by Menzies and to be considered Galapagean rather than Hawaiian until evidence turns up to prove the contrary, is the amaranthaceous Alternanthera menziesi (sphalm for menziesii) St. John, in Bull. Jard. Bot. Etat Brux., 27: 49-54, 1957."

Fosberg (1966: 143-144) expressed the same opinion and reduced A. Menziesii to the synonymy of A. echinocephala (Hook f.) Christophersen, of the Galapagos and Peru. This species is well presented in Wiggins and Porter (1971: 187, fig. 35a-d).

The writer has recently had the opportunity to compare his species with good collections of A. echinocephala which is a species with the blades 4-9 cm long, 1-3 cm wide, lanceolate to elliptic, mucronate; sepals subequal; filament tube 4-5 mm long; anthers about 2 mm long; pseudostaminodia laciniate at tip, shorter than or equalling the stamens. A. Menziesii has the blades 1-3.2 cm long, 3.5-6.5 mm wide, lance-linear, obtuse; sepals unequal, the shorter ones 5/6 the length of the longer ones; filament tube 5-6 mm long; anthers 1.4 mm long; and the pseudostaminodia ligulate, acute, exceeding the anthers.

These differences seem to the writer sufficient to justify A. Menziesii as a distinct species. It has not been collected subsequent to Menzies' time. If found on the Sandwich Islands, as labeled by Menzies, it is a species descended from similar species native to the Galapagos or South America. This is quite possible, and there are other Hawaiian species of similar American ancestry.

An herbarium specimen may bear an incorrect label, and the case of the Zemisne or Scalesia implies that other Menzies collections may be in error. There is, however, other evidence on this question. While hunting in the British Museum of Natural History for the Sandwich Islands plants collected by David Nelson of Capt. Cook's third voyage, the author searched in all plant families that occur in Polynesia, and in their genera of like distribution, and in all genera that he did not recognize, and in such European genera as an 18th Century botanist might have put an Hawaiian plant in. In this search totalling five weeks, lists were also kept of collections by other early botanists. One of these was a list of the Sandwich Islands plants collected by Menzies. It totals 112 species, and of these one is an adventive still present in the islands, but the remaining 111 species are indigenous, or endemic, or cultivated crop plants of early aboriginal introduction. All of these are genuine Hawaiian plants. Thus it is evident that the accuracy of the geographic data on Menzies' Sandwich Islands plants is almost 100%. The writer sees no reason to doubt that Menzies collected a species of <u>Alternanthera</u> on the Sandwich Islands.

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THE GENUS *RHOPALEPHORA* HASSK. (COMMELINACEAE)

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In my monograph of *Aneilema* R. Br. (Faden, 1975) I consider *Rhopalephora* Hassk. a distinct genus. In the past, the species which I include in *Rhopalephora* have usually been placed in *Aneilema* (e.g., Clarke, 1881; Hooker, 1892; Brückner, 1930) or in *Dictyospermum* Wight (e.g., Wight, 1853; Morton, 1966). The purpose of the present paper is to make the new combinations in *Rhopalephora* which will be needed in forthcoming floristic treatments of the Commelinaceae. *Rhopalephora* is distinguishable from *Aneilema*, its closest relative, by the following combination of characters: cincinni elongate and attached to a very short inflorescence axis, filaments fused basally, ovary and capsule densely covered with hook-hairs and smaller, glandular, capitate hairs, and ventral capsule valve deciduous. *Rhopalephora* is separable from *Dictyospermum* by its inflorescence form and its cincinnus bracts persistent; bracteoles perfoliate, persistent; fruiting pedicels longer than the capsules, erect; petals clawed; filaments long, slender, basally fused; ovary and capsule stipitate, puberulous; and capsules bivalved, commonly with unequally developed locules.

Rhopalephora consists of about four ill-defined species separated from one another largely on characters of the mature capsules. The genus occurs in Madagascar (*R. rugosa*) and from India and Sri Lanka to the Fiji Islands. Final taxonomic treatment of the species must await further studies, particularly of living material.

Rhopalephora Hassk., Bot. Zeitung (Berlin) 1864: 58. 1864.
Type species: *Rhopalephora micrantha* (Vahl) Faden.
Dictyospermum Wight, Icon. Pl. Ind. Orient. 6: 29. 1853, pro parte.
Piletocarpus Hassk., Flora 49: 212. 1866, in clavi.

The following new combinations are required:

Rhopalephora micrantha (Vahl) Faden, **comb. nov.**
Commelina micrantha Vahl, Enum. Pl. 2: 178. 1805-06.
Aneilema micranthum (Vahl) Kunth, Enum. Pl. 4: 70. 1843.
Commelina monadelpha Bl., Enum. Pl. Jav. 1: 4. 1827.
Aneilema monadelphum (Bl.) Kunth, Enum. Pl. 4: 70. 1843.
Aneilema scaberrimum (Bl.) Kunth var. *monadelphum* (Bl.) Rolla Rao, Notes Roy. Bot. Gard. Edinburgh 25: 183. 1964.
Rhopalephora blumei Hassk., Bot. Zeitung (Berlin) 1864: 59. 1864. Lectotype: Java, Salak, April, 1784, *Blume s.n.* (L!) (holotype of *Commelina monadelpha* Bl.).

Rhopalephora scaberrima (Bl.) Faden, **comb. nov.**
Commelina scaberrima Bl., Enum. Pl. Jav. 1: 4. 1827.
Aneilema scaberrimum (Bl.) Kunth, Enum. Pl. 4: 69. 1843.
Dictyospermum scaberrimum (Bl.) Panigrahi, Phytologia 29: 338. 1975.
Dictyospermum protensum Wight, Icon. Pl. Ind. Orient. 6: 30, Tab. 2071. 1853.
Lamprodithyros protensus (Wight) Hassk., Flora 46: 389. 1863.
Piletocarpus protensus (Wight) Hassk., Commel. Ind., 15. 1870, including vars. α. *latifolius* Hassk., β. *intermedius* Hassk., and γ. *angustifolius* Hassk.
Aneilema protensum (Wight) Wall. ex C. B. Clarke, J. Linn. Soc., Bot. 11: 450. 1871.

Rhopalephora vitiensis (Seem.) Faden, **comb. nov.**
Aneilema vitiense Seem., Fl. Vitiense, 314. 1868.
Piletocarpus ? vitiensis (Seem.) Hassk., Commel. Ind., 18. 1870.
Dictyospermum vitiense (Seem.) J. K. Morton, J. Linn. Soc., Bot. 59: 436. 1966.
Aneilema keyense Warb., Bot. Jahrb. Syst. 13: 269. 1890 (cf. Lauterbach, Bot. Jahrb. Syst. 50: 63. 1913).
Dictyospermum keyense (Warb.) J. K. Morton, J. Linn. Soc., Bot. 59: 436. 1966.

Rhopalephora rugosa (Perrier) Faden, **comb. nov.**
Aneilema rugosum Perrier, Notul. Syst. (Paris) 5: 195. 1936.

The typification and synonymy of *Commelina micrantha* Vahl require some comment. The type is No. 3207 in the Jussieu Herbarium (P-JU). On the label is the phrase, "ex India^{A} tulit Lahaye -- dedit Thullier 1800." Lahaye, however, did not collect in the Old World (Chaudhri, Vegter & Wal, 1972), and *Rhopalephora* is not known from the New World. If the collector was actually Lahaie, some of whose collections are doubtfully in the Jussieu Herbarium (Chaudhri, Vegter & Wal, loc. cit.), then the specimen could have come from Java, which Lahaie visited and in which this species occurs. In any event, the "India^{A}" on the label does not appear to be India in the modern sense, in which neither Lahaye nor Lahaie collected, and from which this species is unknown. Until further evidence is obtained, both the origin and collector of this specimen must be considered uncertain.

Also belonging in *Rhopalephora* but requiring further study before their status can be determined are *Aneilema vitiense* Seem. var. *petiolata* C. B. Clarke (in DC., Monogr. Phan. 3: 220. 1881) and the nomen nudum *Commelina trifida* Thunb. (Mus. Nat. Acad. Upsal., Append. XVIII. 1809).

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NEW COMBINATION IN WITHERINGIA

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WITHERINGIA LINDENII (Dunal) Steyermark, comb. nov.

Fregirardia lindenii Dunal in DC. Prodr. 13(1):503.1852.
Brachistus lindenii (Dunal) Pittier, Catalogo Fl. Venez. 2:358. 1947.
Brachistus tovarensis Pittier, Catalogo Fl. Venez. 2:357. 1947, nomen nudum.

In connection with the preparation of the Flora of Avila and Naiguatá, it has been necessary to find the correct name for the plant passing as Brachistus lindenii (Dunal) Pittier, with yellow green corollas with lobes longer than broad, non-accrescent, truncate calyx, pubescent filaments, and dimorphic, geminate, long acuminate leaves. This taxon was originally described as Fregirardia lindenii by Dunal from a plant collected by Linden (Linden 218) "circa Caracas", and agrees in all respects with recently collected material from the Caracas area, except for the tetramerous instead of the usually pentamerous flowers, a character found to vary within many species of the Solanaceae.

Fregirardia lindenii was combined with Fregirardia riparia (H.B.K.) Dunal under the genus Dunalia by Señora Benitez de Rojas (Rev. Fac. Agron. (Maracay) 7 (3): 46. 1974) as Dunalia riparia (H.B.K.) Benitez, the latter species treated by D'Arcy as Witheringia riparia H.B.K. (Ann. Mo. Bot. Gard. 60:768.1973). Witheringia riparia was described from the Andes of Quindu, Colombia (H.B.K., Nov. Gen. Sp. 3: 16. 1818) from plants having "ramulis...hispido-pilosis", leaves "subtus in nervo pilosis" with the "nervo medio..inferne hispido-piloso". In contrast, Fregirardia lindenii has the leaves mainly glabrous throughout, and the stems glabrous or only sparingly pubescent. Moreover, in Fregirardia lindenii the calyx is usually sparsely pilose, whereas in F. riparia it is glabrous.

All the material seen from Cerro Avila and adjacent Caracas area agrees with Fregirardia lindenii having mainly glabrous leaves, mainly glabrous or glabrate stems, and mainly sparsely pilose calyx.

Hunziker (Bol. Acad. Nac. Cienc. (Cordoba) 41: 211-422. 1960) maintained Dunalia as a distinct genus in the classical sense, i.e. species only with basal appendiculate filaments being included, whereas Sleumer (Lilloa 23: 117-142. 1950) and Macbride (Field Mus. Nat. Hist. Bot. Ser. 8 (2): 130. 1930), following the concept of Kuntze (Rev. Gen. Pl. 2: 447-456. 1891; 3: 218-229. 1898), united the genera Dunalia and Acnistus. In her description of the genus Dunalia (op. cit. p. 43), Benitez Rojas refers to the filaments as "generalmente con apéndices dentiformes en la porción basal soldado al tubo". Although she places Fregirardia lindenii under Dunalia as Dunalia riparia, it is to be noted that the filaments of Fregirardia lindenii lack the dentiform basal appendages, characteristic of Dunalia in the classical sense.

In his treatment of Witheringia, Hunziker (Kurtziana 5: 104. 1969) pointed out that the filaments of that genus are nearly always provided with a dense amount of pubescence on their inner side. Such a type of pubescence, it should be noted, is encountered in Fregirardia lindenii. Hunziker also noted that the calyx in Witheringia (op. cit. p. 108) may or may not be accrescent, and that this character has no generic significance. He divided the genus into two sections: 1)Witheringia, including species such as W. solanacea L'Her., in which the calyx border is truncate and entire, scarcely never accrescent, and 2)Brachistus, in which the calyx border is 5-lobed, 5-dentate, or 5-pointed, and slightly to greatly accrescent. D'Arcy (Ann. Mo. Bot. Gard. 60: 761. 1973) has followed Hunziker's treatment with some reservation, and has considered Fregirardia as doubtfully synonymous with Witheringia.

In her studies of "Los Generos de las Solanaceae de Venezuela" (Rev. Fac. Agron. (Maracay) 7: 42-46. 1974), Benitez de Rojas, in taking up the genus Dunalia H.B.K., has included some species previously placed in Acnistus, Brachistus, Fregirardia, and Witheringia (in part). In her key to the genera (op. cit. pp. 33-34) she attempts to differentiate Dunalia from Witheringia as follows: "Corola tubiforme con el limbo muy estrecho o angostoacampanada con el limbo corto" (Dunalia) as contrasted with "Corola rotacea o acampanada con el limbo ancho" (Witheringia). In her concept, Witheringia solanacea L'Her should be retained in Witheringia proper, whereas Witheringia riparia H.B.K. is placed in Dunalia as D. riparia. Hunziker, however, (Kurtziana 5: 169. 1969) considers Witheringia riparia as pertaining to the genus Acnistus. D'Arcy (op. cit. p. 770) described Witheringia riparia as having an accrescent calyx "investing the entire fruit except at the open but somewhat contracted apex", whereas Benitez de Rojas (op. cit. p. 43) described the calyx of Dunalia as "no acrescente o muy poco". Hunziker (op. cit. p. 111) included under Witheringia, section Witheringia, only those species having the calyx "no acrescente, o que crece muy poco durante la fructificación."

The plants of Cerro Avila and the Caracas area, here under discussion, have the calyx non-accrescent in fructification. The characters employed by Benitez de Rojas to differentiate the Venezuelan species of Witheringia from the Venezuelan species which she would assign to Dunalia, are not mutually exclusive characters to separate the taxa of those respective genera. And, if one follows Hunziker in retaining for Dunalia in the classical sense only those species having basal appendages on the filaments, then neither the venezuelan Fregirardia dunalii nor the colombian and panamanian Fregirardia riparia (= Witheringia riparia), both of which lack such appendages, can be included in Dunalia, as treated by Benitez de Rojas.

In view of the differences already elaborated between Fregirardia lindenii and F. riparia, I am treating them as separate taxa. The following specimens of Fregirardia lindenii (= Witheringia lindenii) have been examined, all in VEN herbarium.

VENEZUELA: Distrito Federal: Las Aguaitas, 2000 m., 11 Aug. 1973, Delascio 2053; below Club Junkolandia, off road Caracas-Colonia Tovar, 1700 m., 24 July 1975, Berry 939; Parque Nacional El Avila, Quebrada Chacaito, 1900 m., 12 Aug. 1977, Manara s.n.; same locality, 1 Oct. 1976, Manara s.n.. Aragua: Colonia Tovar, pica hacia El Limon, 1700 m., May 1969, Aristeguieta 7152, 7124.

ADDITIONAL NOTES ON THE *ERIOCAULACEAE*. LXXVII

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SYNGONANTHUS NIVEO-AUREUS Alv. Silv., Fl. Mont. 1: 375—376. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 375—376 & 419. 1928; A. W. Hill, Ind. Kew. Suppl. 9: 272. 1938; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Angely, Fl. Paran. 10: 4. 1957; Moldenke, Résumé 108 & 492. 1959; Moldenke, Résumé Suppl. 6: 8. 1963; Moldenke, Fifth Summ. 1: 175 & 369 (1971) and 2: 964. 1971.

This species is based on *A. Silveira 579* from "In pratis arenosis siccisque in Serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. Silveira (1928) comments that the species is "A *S. venusto* Alv. Silv., cum quo primo aspectu facile confunditur, foliis planis basi albidis (nec supra convexis necque basi fulvo-castaneis) et florum structura perbene distincta". Thus far it is known only from the original collection, but Angely (1957) asserts that it is cultivated in Brazil. I suspect that this may be an error in identification for *S. elegans* (Bong.) Ruhl., whose variously dyed inflorescences are sold in many Brazilian (and other) markets — the material probably collected in the wild and not from cultivated plants.

SYNGONANTHUS NIVEUS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 275—276. 1903.

Synonymy: *Eriocaulon niveum* Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 635. 1831 [not *E. niveum* Hoffmgg., 1841]. *Paepalanthus niveus* Kunth, Enum. Pl. 3: 527. 1841. *Paepalanthus niveus* var. *major* Körn. in Mart., Fl. Bras. 3 (1): 435—436, pl. 57, fig. 1. 1863. *Paepalanthus niveus* var. α Körn. in Mart., Fl. Bras. 3 (1): 436. 1863. *Dupatya nivea* (Bong.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. *Paepalanthus niveus* (Bong.) Kunth apud Malme, Bih. Svensk. Vet.-Akad. Handl. 27 (3), no. 11: 31. 1901. *Dupatya nivea* Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. *Syngonanthus niveus* (Kunth) Ruhl. ex Moldenke, Résumé 352, in syn. 1959. *Paepalanthus niveus* var. α Kunth ex Moldenke, Résumé Suppl. 1: 21, in syn. 1959. *Paepalanthus niveus* var. β Körn. ex Moldenke, Résumé Suppl. 1: 21, in syn. 1959. *Paepalanthus nivens* Kunth apud Rennó, Levant. Herb. Inst. Agron. Minas 70, sphalm. 1960. *Syngonanthus nivens* (Bong.) Ruhl. apud Rennó, Levant. Herb. Inst. Agron. Minas 72, sphalm. 1960. *Syngonanthus niveus* Ruhl. ex Moldenke, Résumé Suppl. 12: 12, in syn. 1965. *Eriocaulon eburneum* Mart. ex Moldenke, Phytologia 34: 273, in syn. 1976.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser 6, 1: 635. 1831; Bong., Ess. Monog. Erioc. 35—36. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 527—528, 578, 579, 613, & 625. 1841; D. Dietr., Syn. Pl. 5: 262. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 281 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 285, 435—438, 500, & 507, pl. 57, fig. 1. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Malme, Bih. Svensk. Vet.-Akad. Handl. 27 (3), no. 11: 31. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 273, 275—276, 286, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 419. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 57. 1930; Stapf, Ind. Lond. 4: 158 (1930) and 6: 248. 1931; E. J. Alexander, Journ. N. Y. Bot. Gard. 36: 221. 1935; Sampaio, Bol. Mus. Nac. Rio Jan. 13: 199. 1937; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 19, 30, 38, 51, & 59. 1946; Moldenke, Alph. List Cit. 1: 223 (1946) and 2: 355. 1948; Moldenke, Phytologia 2: 498. 1948; Moldenke, Alph. List Cit. 3: 710, 731, & 855 (1949) and 4: 1304. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 326. 1953; Angely, Fl. Paran. 10: 4. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 108, 281, 290, 326, 352, & 492. 1959; Moldenke, Résumé Suppl. 1: 21. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 70 & 72. 1960; Moldenke, Résumé Suppl. 3: 34 & 35 (1962), 6: 8 (1963), and 11: 5. 1964; Moldenke, Phytologia 10: 489. 1964; Hocking, Excerpt. Bot. A.9: 290. 1965; Moldenke, Biol. Abstr. 46: 3616. 1965; Moldenke, Résumé Suppl. 12: 12. 1965; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 149, 158—162, 175, & 190. 1969; Moldenke, Phytologia 20: 258. 1970; Moldenke, Fifth Summ. 1: 175 & 483 (1971) and 2: 508, 587, 638, & 964. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1163 & Ind. 12 & 28. 1972; Moldenke, Phytologia 33: 25 (1976), 34: 273 (1976), 35: 292, 303, 310, 315, 349, 442, & 446—449 (1977), 36: 35 & 40 (1977), and 37: 79. 1977.

Illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 57, fig. 1. 1863.

Bongard's original (1831) description of this handsome species is "acaule; foliis caespitosis, vaginis subaequantibus setaceis pilosis glaucescentibus; pedunculis caespitosis tenuibus subglabris; vaginis pilosiusculis. Tab. XXXVII. Habitat in arenosis siccis Serra da St. Joze, Provinciae Para. Flor. Junio. Obs. Praecedenti [E. elegans] affine, a quo differt; 1) statura minore; 2) foliis glaucis, basi non lanatis". Kunth (1841) adds a Luschnath unnumbered collection from "prope Cabo Frio...in herb. Luc." He affirms that the plate 37, cited by Bongard, was never actually published [probably exists only in the Leningrad library or herbarium]. He repeats Bongard's "Praecedenti affinis differt stature minore, foliis glaucis, basi non lanatis" and then adds "nec non, fide iconis Bongardianae, structura florum" — indicating that he apparently had seen the plate. He states that his greatly amplified description of the species is drawn from the Luschnath collection.

Recent collectors refer to the inflorescence-heads as "branco-sujo" and have found the plant growing on campos in areas of grassy meadows and adjacent sandy campos, in sandy ground with quartzite fragments, and on campos carpeted with herbaceous grasses and sparse shrubs, at altitudes of 1000—1950 m., flowering from December to February, April, June to August, and October, and fruiting in July, August and from December to February. Irwin and his associates refer to it as a cespitose herb, the inflorescences to about 15 cm. tall, the heads cream or white, and encountered it on wet campos in a region of sandy and gravelly campos with cerrado on outcrops, and in sand beneath overhanging rocks on sandstone summits in areas of soil-filled cracks and depressions and adjacent precipices and steep valleys.

Vernacular names recorded for the plant are "capipoatinga", "sempre-viva", and "sempreviva da terra". Angely (1957) reports it cultivated in Brazil, but possibly he means that the dried inflorescences are sold commercially in markets.

Ruhland (1903) cites the following collections from the Berlin herbarium: BRAZIL: Bahia: Martius s.n. [Camamú]; Riedel 559; Sena s.n. [Herb. Schwacke 14146 & 14406]. Minas Gerais: Glaziou 15547, 15549, 16398, 17314, 17315, 17376, & 17841; Magalhães Gomes 627; Pizzaro 43; L. Riedel 294; Schwacke 6388, 11059, 11988, & 12109; Ule s.n. [Serra do Ouro Preto]; Weddell 1894; Wied-Neuwied s.n. [Rio Grande de Belmonte]. Rio de Janeiro: Luschnath 1081; Martius s.n. [Campos inter Macahé et Campos]. However, I regard Glaziou 15549 as representing S. elegantulus Ruhl. and Glaziou 16398 as S. elegans var. elanatus Ruhl.

It seems most probable that, in spite of Bongard's original statement of "Para" as the place of collection of the type, the actual type of this species is L. Riedel 294 from Serra de S. Jozé in Minas Gerais, deposited in the Leningrad herbarium.

Ruhland (1903) notes that the "Species valde variabilis, sed etiam specimina longissime a type divergentia (a. e. spec. a cl. Pizarro collecta) formis intermediis adeo conjuncta sunt, ut varietates Koernickeanas melius extinguendas esse putem". He also avers that S. niveus is closely related to S. aciphyllus (Bong.) Ruhl., and this is certainly true. Malme (1901) cites Regnell III.1265 from São Paulo [which I, however, regard as S. elegantulus Ruhl.], while Silveira (1928) adds his no. 223 from the Serra do Cipó, Minas Gerais, collected in 1896.

Eriocaulon eburneum Mart. is apparently based on Martius s.n. from "in arena quarzosa district. adam. Majo 1818" in the Munich herbarium where it is accompanied by a short Latin description. The Clausen 208 in the Bailey Hortorium herbarium consists only of leaves and is placed here tentatively. The Eriocaulon niveum of Hoffmannsegg, referred to in the synonymy above, is a synonym of Philodice hoffmannseggii Mart. It should also be noted here that the Malme (1901) reference in the bibliography is sometimes cited as "1903" and the Angely (1972) work is sometimes cited as "1970", the title-page (but incorrect) date.

Material of S. niveus has been misidentified and distributed in some herbaria as S. elegans var. elanatus Ruhl. and as S. elegantulus Ruhl. On the other hand, the Glaziou 16395 & 16398, Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25459, and Irwin, Reis dos Santos, Souza, & Fonsêca 22019, distributed as S. niveus, are actually S. elegans var. elanatus Ruhl., while Glaziou 15549 & 17841, Herb. Jard. Bot. Belo Horiz. 26610 in part, Irwin, Harley, & Onishi 29129, Irwin, Reis dos Santos, Souza, & Fonsêca 22019, and Magalhães Gomes 66 as well as Schultes & López 10308 are S. elegantulus Ruhl. and Martius 559, 1081, s.n. [in arena quarzosa districtu adam., Majo 1818], & s.n. [in arenosis haud procul a mari prope Camamú, Dec.], Mexia 5734, and Riedel 559 are S. niveus var. rosulatus (Körn.) Moldenke.

Additional citations: BRAZIL: Minas Gerais: P. Clausen 208 (Ba); Emygdio, Duarte, Becker, & Silva Santos 3603 (N); G. Gardner 5282 (B, S); Glaziou 16395 (W—483530); Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25459 (Ld, N, W—2759025); Mendes Magalhães 6022 [Herb. Jard. Bot. Belo Horiz. 48279] (Z); L. Monteiro de Sousa 39 [Herb. Cent. Pesq. Florest. 6209] (Z). State undetermined: Herb. A. Braun s.n. (B). CULTIVATED [in trade]: Germany: Herb. Hermann 1251 (Hm). MOUNTED ILLUSTRATIONS: Körn. in Mart., Fl. Bras. 3 (1): pl. 57, fig. 1, 1863 (N, Z).

SYNGONANTHUS NIVEUS var. ROSULATUS (Körn.) Moldenke, Phytologia 3: 425. 1951

Synonymy: Paepalanthus niveus var. rosulatum Körn. in Mart., Fl. Bras. 3 (1): 435—436. 1863. Paepalanthus niveus var. rosulatus Körn. apud Moldenke, Phytologia 3: 425, in syn. 1951.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 435—436. 1863; Moldenke, Phytologia 3: 425. 1951; Moldenke, Résumé 108, 327, & 493. 1959; Moldenke, Phytologia 20: 258. 1970; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 587 & 964. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1163 & Ind. 28. 1972; Moldenke, Phytologia 36: 35 (1977) and 37: 79. 1977.

Körnicke's original (1863) description of this variety is "foliis rigidioribus rosularis plerumque patenti-diffusis, angustissime linearibus, 4—17 lin. longis; pedunculis gracilibus, 3.5—9.5 pollicaribus". He cites the following collections as cotypes: BRAZIL: Bahia: Martius s.n. [in arenosis haud procul a mari prope Camamú, Decembri]; L. Riedel 559. Minas Gerais: Martius s.n. [in arenosis quarzosis districtu adamanti, Majo]; Wied-

Neuwied s.n. [ad fluvium Rio Grande de Belmonte]. Rio de Janeiro: Luschnath s.n. [Boa Perna; Martius 1081]; Martius s.n. [inter Macahé et Campos].

This plant has been found growing "in disintegrated rock between crags", at altitudes of 1200--1260 m., flowering and fruiting in September. Miss Mexia describes it as an abundant herb growing in extensive colonies. Her no. 5734 is a mixture with Leiothrix spergula Ruhl. The vernacular name, "sempreviva", is recorded.

Material of this taxon has been misidentified and distributed in some herbaria as Eriocaulon eburneum Mart., Paepalanthus niveus var. β Körn., Syngonanthus habrophyus Ruhl., or as typical S. niveus (Bong.) Ruhl.

Citations: BRAZIL: Bahia: Herb. Zuccarini s.n. [Bahia] (Mu); Martius s.n. [in arenosis haud procul a mari prope Camamú, Dec.] (Mu--117--cotype, Mu--118--cotype). Minas Gerais: Hatschbach 27340 (S, Z); Hatschbach & Ahumada 31685 (W--2706753), 31686 (Ld, N); Martius s.n. [In arena quarzosa districtu adam., Majo 1818] (Mu--115--cotype); Mexia 5734 in part [Herb. Leonard 7657] (B, B, Ba, Go, Mi, Ut--502240A, W--1571898). Rio de Janeiro: Martius 559 (Mu--119--cotype); E. Pereira 491 [Herb. Brad. 6114] (Bd); L. Riedel 559 (B--cotype, Mu--cotype, Ut--410--cotype). State undetermined: Luschnath s.n. [Herb. Martius 1081] (B--cotype, Mu--116--cotype).

SYNGONANTHUS NIVEUS var. STRIGOSUS Moldenke, Phytologia 10: 489. 1964.

Bibliography: Moldenke, Phytologia 10: 489. 1964; Moldenke, Résumé Suppl. 11: 5. 1964; J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl., issue 246. 1965; Hocking, Excerpt. Bot. A.9: 290. 1965; Moldenke, Biol. Abstr. 46: 3616. 1965; Schubert, Assoc. Trop. Biol. Bull. 5: 68. 1965; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

This variety differs from the typical form of the species in having the sheaths white-strigose with closely appressed antrorse hairs.

Citations: BRAZIL: Bahia: A. P. Duarte 5926 [Herb. Brad. 15440] (Z--type).

SYNGONANTHUS OBLONGUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 260. 1903.

Synonymy: Paepalanthus oblongus Körn. in Mart., Fl. Bras. 3 (1): 446. 1863. Dupatya oblonga (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya oblonga Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus oblongus (Körn.) Herzog apud Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 278, 288, 446--

447, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 246, 260, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 419. 1928; Herzog in Fedde, Repert. Spec. Nov. 29: 212. 1931; Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Alph. List Cit. 1: 132. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5, 19, 30, 51, & 59. 1946; Moldenke, Phytologia 2: 493 & 498. 1948; Moldenke, Alph. List Cit. 3: 955. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61, 92, & 213. 1949; Moldenke, Mem. N. Y. Bot. Gard. 8: 102. 1953; Moldenke, Phytologia 4: 327. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 69, 73, 108, 281, 327, & 493. 1959; Moldenke, Résumé Suppl. 1: 7. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 3: 12. 1962; Moldenke, Fifth Summ. 1: 120, 127, 175, & 483 (1971) and 2: 587 & 964. 1971; Moldenke, Phytologia 25: 244 (1973), 31: 382, 386, & 408 (1975), 34: 256 (1976), and 36: 63 & 65. 1977.

This species appears to be based on G. Gardner 2962 from Piauí, Brazil, deposited in the herbarium of the Botanisches Museum in Berlin, where it was photographed by Macbride as his type photograph number 10693. Körnicke, in his original description (1863), cites also Spruce 2578, but Ruhland (1903) apparently has designated the Gardner collection as the type collection of typical S. oblongus, since he regards the Spruce collection as the type collection of his var. aequinoctialis. He comments that the "Species foliis planis, latis ab affinibus valde diversa", citing only the Gardner collection for the typical form of the species. Silveira (1928) cites A. Silveira 614 from Goiás, collected in 1912.

Recent collectors describe the plant as a small herb, 20 cm. tall, with pale-green leaves, white flower-heads, and white flowers. They have found it growing on sandy savannas on a quartzite base, in rills, beside small springs on slopes, at the base of waterfalls, in forests by rocky rapids, and in "open peaty ground trodden by cattle partially shaded by gallery forest and Mauritia palms", at 230—1300 m. altitude, flowering in June, July, September, and November, and in fruit in June and September.

Microscopically, the inflorescence-heads on the typical form of this species seem more obviously villous than they do in var. aequinoctialis Ruhl.

The Murça Pires 739, distributed as and previously cited by me (1953) as S. oblongus, appears to be better placed as var. aequinoctialis, as do also Cuatrecasas 7158, Fróes 25385, García-Barriga 13716, Maguire & Maguire 29158, and Schultes 5823.

Additional citations: COLOMBIA: Amazonas-Vaupés: Schultes &

Cabrera 17617 (Ss, W--2113110). Vaupés: Schultes & Cabrera 17519 (Ss), 17555 (W--2113109), 19677 (Ss), 19692 (Ss), 19753 (Ss). VENEZUELA: Bolívar: Cardona 2857 (Ve); J. A. Steyermark 90341 (Ca). BRAZIL: Amazônas: Berg, Bisby, Steward, & Ramos P.18192 (Ld, N). Maranhão: Prance 2100 (Ac, N, S). Matto Grosso: Argent, Ramos, Richards, & Souza 6321 (Ld, N). Pará: Ducke s.n. [Herb. Mus. Goeldi 11951] (Bs); Fróes 29940 (Hk, Z); Hemming 12 (S, S). Piauí: G. Gardner 2962 [Macbride photos 10693] (N--photo of type, W--photo of type). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B).

SYNGONANTHUS OBLONGUS var. AEQUINOCTIALIS Ruhl. in Engl., Pflanzenreich 13 (4-30): 260. 1903.

Synonymy: Syngonanthus oblongus var. aequinoxialis Ruhl. apud Alv. Silv., Fl Mont. 1: 419. 1928. Syngonanthus oblongus f. brevipes Herzog in Fedde, Repert. Spec. Nov. 29: 212. 1931.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 260 & 293. 1903; Alv. Silv., Fl. Mont. 1: 419. 1928; Herzog in Fedde, Repert. Spec. Nov. 29: 212. 1931; Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Phytologia 2: 493 & 498. 1948; Moldenke, Alph. List Cit. 3: 955. 1949; Moldenke, Known Geogr. Distrib. Verbenac,m [ed. 2], 92 & 213. 1949; Moldenke, Mem. N. Y. Bot. Gard. 8: 102. 1953; Moldenke, Phytologia 4: 328. 1953; Moldenke, Résumé 108, 352, & 493. 1959; Moldenke, Résumé Suppl. 1: 7. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 587, 638, & 964. 1971; Moldenke, Phytologia 31: 382 & 408. 1975.

This variety is based on R. Spruce 2578, collected "bei Panuré am Ufer des Rio Uaupès", Amazônas, Brazil, deposited in the Berlin herbarium. An isotype in the Copenhagen herbarium was photographed by Macbride as his type photograph no. 22291. Ruhland (1903) says of the variety "Differt a forma typica foliis caulinis latioribus, utrinque pilis brevissimis, arcte appressis, dense puberulis, dein glabrescentibus et pilorum residuis quasi albopunctulatis." The variety is not well-marked, but in general its flower-heads appear macroscopically more glabrescent than do those of the typical form.

Recent collectors describe the plant as an herb, with stems only 3--11 cm. long during anthesis, "roseate leaves, pedicels [peduncles] green", the inflorescence-heads and flowers white, and the subtending bracts green and translucent. The have found it growing in dense groups in rocky soil, on savannas, at the edge of rivers among granite rocks, and in marshy places in forests in areas of cerrado on hillsides of white sand and dense forests at the base of the hills, at altitudes of 140--1300 m., flowering from March to May and September to November, and fruiting in March. Gentry encountered it "in campina and adjacent roadside and streamside".

Silveira (1928) cites A. Silveira 614 from Bahia, collected in 1912, but he also cites the same number and date, but from Goiás, as typical S. oblongus.

Herzog's f. brevipes is based on Lützelburg 23907 & 23938 from "Rio Papori, Yapu, am Fall", Amazônas, Brazil, deposited in the Munich herbarium, but Herzog comments on the sheet of the former number "vielleicht zu var. aequinoctialis Ruhl. gehörig", while in his original description (1931) he says: "Diese durch kurze Pedunculi abweichende, aber durch Blattbreite und Form wie auch Blutenbau einwandfrei zu S. oblongus gehörende Form ist vielleicht zu Ruhlands var. aequinoctialis zu stellen." He describes the form as "A typo differt pedunculis abbreviatis 3—5 cm. longis." Lützelburg 23907 is from "Tiquie, Floresta, uf Sand am Ufer".

Material of this variety has been abundantly identified and distributed in herbaria as the very similar typical S. oblongus (Körn.) Ruhl.

Additional citations: COLOMBIA: Vaupés: Cuatrecasas 7158 (N); García-Barriga 13716 (N); R. E. Schultes 5823 (N). VENEZUELA: Amazonas: Maguire & Maguire 29158 (N). BRAZIL: Amazônas: Black 48-2621 (W—2655154); Fróes 25385 (N); A. Gentry 12955 (Ld); Lützelburg 23907 (Mu), 23938 [N. Y. Bot. Gard. type photos new ser. neg. 8879] (Mu, N—photo, Z—photo); Murça Pires 739 (N, N, W—2655153); Nelson & Lima P.21062 (Z); Spruce 2578 [2745; Macbride photos 22291; U. S. Nat. Herb. photo 5884] (B—type, B—isotype, N—photo of isotype, P—isotype, W—photo of isotype). Bahia: Lützelburg 659 (Mu). Pará: W. R. Anderson 10644 (Ld, N); Sick s.n. [Herb. Brad. 4618] (Bd).

SYNGONANTHUS OBTUSIFOLIUS Moldenke, Mem. N. Y. Bot. Gard. 9: 410—411. 1957.

Bibliography: Moldenke, Mem. N. Y. Bot. Gard. 9: 410—411. 1957; Moldenke, Résumé 74 & 492. 1959; G. Taylor, Ind. Kew. Suppl. 13: 132. 1966; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 964. 1971.

Citations: VENEZUELA: Bolívar: Steyermark & Wurdack 406 (Mu—isotype, N—type).

SYNGONANTHUS ONEILLII Moldenke, Phytologia 1: 346—347. 1939.

Synonymy: Paepalanthus oneilii Moldenke, Known Geogr. Distrib. Erioc. 51, in syn. 1946. Syngonanthus o'neillii Moldenke, Known Geogr. Distrib. Erioc. 59, in syn. 1946.

Bibliography: Moldenke, Phytologia 1: 346—347. 1939; Moldenke, Carnegie Inst. Wash. Publ. 522: 144 & 146. 1940; Moldenke, Known Geogr. Distrib. Erioc. 4, 51, & 59. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 224. 1947; Moldenke, Alph. List Cit. 3: 777. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 37 & 213. 1949; Moldenke, Phytologia 4: 328. 1953; Standl. & Steyerm., Fieldiana Bot. 24: 378—380. 1958; Moldenke, Résumé 44, 327, 352, & 493. 1959; Moldenke, Fifth Summ. 1: 82 (1971) and 2: 587, 638, & 964. 1971; Moldenke, Phytologia 35: 306. 1977.

Additional citations: BELIZE: O'Neill 8548 (S—isotype).

SYNGONANTHUS PAEPALOPHYLLUS Alv. Silv., Fl. Mont. 1: 377--378, pl. 240. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 377--378 & 419, pl. 240. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 272. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 92 & 213. 1949; Moldenke, Phytologia 4: 328. 1953; Moldenke, Résumé 108 & 492. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 240. 1928.

This species is based on A. Silveira 522 which, however, seems to consist of two separate collections: (1) "In campis arenosis, inter saxa quartziiosa, montis Tombadouro, prope Diamantina, Minas: Apr. 1908" and (2) "inter Serro et Datas, Jun. 1925", also in Minas Gerais, Brazil, both deposited in the Silveira herbarium. Thus far the species is known only from these two collections. Silveira (1928) comments that "Praeter alia, indumento farinoso foliorum vaginarumque ab affinibus S. Rupprechtiano et S. Kegeliano praecipue differt".

Curiously, Worsdell (1941) erroneously cites "t. 239", instead of 240, as the illustration of this species in Silveira's work.

SYNGONANTHUS PAKARAIMENSIS Moldenke, Mem. N. Y. Bot. Gard. 9: 282. 1957.

Synonymy: Syngonanthus pacaraimensis Moldenke, Résumé Suppl. 4: 13, in syn. 1962.

Bibliography: Moldenke, Mem. N. Y. Bot. Gard. 9: 282. 1957; Moldenke, Résumé 74, 76, & 493. 1959; Moldenke, Résumé Suppl. 4: 13. 1962; G. Taylor, Ind. Kew. Suppl. 13: 132. 1966; Moldenke, Fifth Summ. 1: 127 & 131 (1971) and 2: 638 & 964. 1971.

Phelps refers to this plant as "very common, typical sundew plant, wine-colored, rare in bloom". The Ruiz-Terán & López-Palacios 11147 collection, cited below, is described by the collectors as "Hierba rosulada, cespitosa. Roseta de unos 3 cm. de alto. Escapo de 10--15 cm. Capítulos hemisféricos; involucro blanquecino verdósulo; flores blancas". It matches perfectly the Steyermark 93761 from the same state, but differs markedly from the type collection, Maguire & Fanshawe 32539, from Guyana. Recent collectors have encountered the species on savannas, at 1100--2000 m. altitude, flowering in July and November, and in fruit in July.

Citations: VENEZUELA: Bolívar: Cardona 2008 (Ve, Ve); Foldats 2638 (N, Ve--40465); B. Maguire 33231 (N), 33748 (Mu, N); Phelps 417 (Ve); Ruiz-Terán & López-Palacios 11147 (Ld); J. A. Steyermark 93761 (N, Z). GUYANA: Maguire & Fanshawe 32539 (N--type).

SYNGONANTHUS PALLENS Alv. Silv., Fl. Mont. 1: 349--350, pl. 221. 1928.

Synonymy: Syngonanthus pallidus Alv. Silv. ex Moldenke, Known

Geogr. Distrib. Erioc. 59, sphalm. 1946.

Bibliography: Alv. Silv., Fl. Mont. 1: 349—350 & 419, pl. 221. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 272. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 93 & 213. 1949; Moldenke, Résumé 108, 352, & 493. 1959; Moldenke, Phytologia 20: 89. 1970; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 638 & 964. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 221. 1928.

This species is based on A. Silveira 848 from "In campis prope Itacambira", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. On page 419 of his work (1928) Silveira cites a no. 948 from the same locality and also collected in 1926. It is not plain if this is intended as a correction of the number given in the original description, if it is a typographic error, or even if it represents a second collection. As far as is knwon to me, the species is known only from this original (or two) collection and Silveira (1928) says of it "Species ob forma bractearum involucrantium et pilositatem foliorum et vaginarum ab affinibus bene distincta".

The M. A. Chase 10360, distributed as S. pallens, actually is Leiothrix argentea Alv. Silv.

SYNGONANTHUS PARAËNSIS Ruhl. in Engl., Pflanzenreich 13 (4-30): 264—265. 1903.

Synonymy: Syngonanthus paraensis Ruhl. ex Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 264—265 & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Alph. List Cit. 3: 956. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 93 & 213. 1949; Moldenke, Phytologia 4: 328. 1953; Moldenke, Résumé 108 & 493. 1959; Moldenke, Résumé Suppl. 12: 12. 1965; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 638 & 964. 1971; Moldenke, Phytologia 29: 294 (1974), 31: 386 (1975), and 35: 452. 1977.

This species is based on R. Spruce 107 from "an Katarakten des Flusses Aripecurú", Pará, Brazil, collected in December, 1849, and deposited in the Munich herbarium. An isotype at Munich was photographed there by Macbride as his type photograph number 18747. Ruhland (1903) cites only the type collection, but comments that "Hujus speciei nihil vidi nisi specimina 2 herbarii Monacensis".

The species has been found growing in disturbed white sand areas, in anthesis in April, July, and December, fruiting in July, and superficially bears considerable resemblance to S. ferrensis Alv. Silv., differing by characters noted under that species in this series of notes.

Additional citations: BRAZIL: Amapá: Egler & Irwin 46578 (N, Z). Amazônas: Prance & Lleras 23730 (Ld, N). Pará: Spruce 107 [Macbride photos 18747] (Mu—type, W—photo of isotype). Flores Island: Murça Pires 422 (N, N, W—2655151).

SYNGONANTHUS PAUCIFLORUS Alv. Silv., Fl. Mont. 1: 356—357, pl. 226. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 356—357 & 419, pl. 226. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 896. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 272. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 93 & 213. 1949; Moldenke, Résumé 108 & 493. 1959; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971; Moldenke, Phytologia 35: 452 (1977), 36: 74 (1977), and 37: 257. 1977.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 226. 1928.

This species is based on A. Silveira 725 from "In campis humidis inter Formiga et Candêas", Minas Gerais, Brazil, collected in October, 1922, and deposited in the Silveira herbarium. Silveira (1928) notes that the species "Ab affinibus S. plano Ruhl. et llanorum Ruhl. propter pilositatem praecipue differt". On page 419 he cites his no. 725 from just "Formiga" and avers that it was collected in 1921. If these are typographic errors or intended as correction of what he says on page 357 in the original description of the species is not clear.

It should also be noted that Worsdell (1941) cites "t. 225" as the illustration of S. pauciflorus when actually that plate depicts S. ferrensis Alv. Silv., for which he mis-cites "t. 224".

Syngonanthus pauciflorus in habit resembles S. gracilis (Bong.) Ruhl. Thus far it is known only from the original collection.

SYNGONANTHUS PAUPER Ruhl. in Engl., Pflanzenreich 13 (4-30): 274. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 274, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 419. 1928; Moldenke, Known Geogr. Distrib. Erioc. 19 & 59. 1946; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 93 & 213. 1949; Moldenke, Phytologia 4: 328. 1953; Moldenke, Résumé 108 & 493. 1959; Renmó, Levant. Herb. Agron. Minas 72. 1960; Moldenke, Résumé Suppl. 12: 5. 1965; Moldenke, Fifth Summ. 1: 175 (1971) and 2: 964. 1971; Moldenke, Phytologia 35: 335 & 448 (1977) and 37: 79. 1977.

This species is based on Sena s.n. [Herb. Schwacke 14557] from the Serra do Cipó, Minas Gerais, Brazil, and deposited in the Berlin herbarium, where it was photographed by Macbride as his type photograph number 10694. Ruhland (1903) cites only this original collection and comments that the "Species foliis insignis". Silveira (1928) cites A. Silveira 540, also from the Serra do Cipó, collected in 1909.

Collectors have found this plant in flower in June and August. Material has been misidentified and distributed in some herbaria as *S. habrophyus* Ruhl. On the other hand, the *Pereira 3157* [Pabst 3992], distributed as *S. pauper*, actually is *S. elegantulus* Ruhl.

Additional citations: BRAZIL: Guanabará: *Brade 11004* [Herb. Mus. Nac. Rio Jan. 26708] (Ja, N); *H. F. Martins 247* [Herb. Cent. Pesq. Florest. 1129] (Ac). Minas Gerais: *Sena s.n.* [Herb. Schwacke 14557; Macbride photos 14557] (B—type, N—photo of type, W—photo of type, Z—isotype).

SYNGONANTHUS PERUVIANUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 253—254. 1903.

Synonymy: *Paepalanthus peruvianus* (Ruhl.) Macbr., Field Mus. Publ. Bot. 11: 8. 1931. *Eriocaulon acaule* Pennell ex Moldenke, Résumé 285, in syn. 1959 [not *E. acaule* Fosberg, 1965]. *Paepalanthus peruvianus* Hieron. ex Moldenke, Résumé Suppl. 1: 21, in syn. 1959. *Paepalanthus peruvianus* Ruhl. ex Moldenke, Résumé Suppl. 1: 21, in syn. 1959.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 244, 253, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; J. F. Macbr., Field Mus. Publ. Bot. 11: 8 (1931) and 13 (363): 491—492. 1936; A. W. Hill, Ind. Kew. Suppl. 9: 199. 1938; Fedde in Just, Bot. Jahresber. 59 (2): 20. 1939; Moldenke, Known Geogr. Distrib. Erioc. 7, 52, & 59. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 73 & 213. 1949; Moldenke, Phytologia 4: 328. 1953; Moldenke, Résumé 84, 285, 327, & 493. 1959; Moldenke, Résumé Suppl. 1: 21. 1959; Soukup, Biota 2: 302. 1959; Moldenke, Phytologia 17: 452. 1968; Moldenke, Fifth Summ. 1: 143 (1971) and 2: 492, 587, & 964. 1971; Moldenke, Phytologia 35: 431. 1977.

This species is based on *Stübel 19b* from Cuesta de Léjia, near Moyobamba, San Martín, Peru, collected between April and June, 1875, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10695. Unfortunately, Ruhland (1903) mis-read the original collection label as "196" and so cited it in his original description, and this was blindly copied by Macbride (1936), who cited only this collection.

Recent collectors describe the plant as an herb with white inflorescence-heads and flowers and have encountered it "in wet *Sphagnum* over sand" and "locally abundant in seepages on wet slopes in Jalca zone", at altitudes of 2400—3250 m., flowering and fruiting in June, July, and October.

The *Eriocaulon acaule* Fosberg, referred to in the synonymy above, is a synonym of *E. kinabaluense* Van Royen.

Ruhland (1903) comments in connection with *S. peruvianus* that the "Species a *S. eriophyllo* proximo foliis paullo latioribus, capitulis multo majoribus et manifeste flavidis, bracteis involucrantibus rigido-curvatis, sepalis floris ♀ carinatis etc. differt".

In the herbarium of the Royal Botanic Gardens, Kew, there is a Lobb collection labeled by Hooker "S. Chili". Although thus labeled as from southern Chile, according to the late Dr. Carlos Muñoz, the family Eriocaulaceae is not represented in Chile. Lobb actually collected all over western South America from Colombia to Chile, as well as in Brazil and Argentina. According to a letter to me from Sir George Taylor, dated July 5, 1963, "Hooker often made mistakes in labelling his specimens (he had so much to do). Moreover, there has been confusion over the labelling of Lobb's plants (see Killip in 'Smithsonian Miscellaneous Collections', vol. 87, no. 1 (1932)". The Kew specimens is from Hooker's own herbarium and probably came from somewhere in Peru.

The Hutchison & Wright collection, cited below, is said to be deposited also in the herbaria of the University of Michigan, University of California Berkeley, Missouri Botanical Garden, Paris, Leiden, Field Museum, United States National Museum, and San Marcos University in Lima, but I have not as yet seen these specimens for verification.

Material of this species has been misidentified and distributed in many herbaria as S. compactus Ruhl.

Additional citations: PERU: Amazonas: Hegewald s.n. [Herb. Hamann 3012] (Hm); Hutchison & Wright 5556 (Mu, N, Z); F. W. Pennell 15769 (N); Segástegui 6062 (W--2471688); Wurdack 1338 (N, N, S, W--2403684), 1379 (N, W--2403686). San Martín: Stübel 19b [Macbride photos 10695] (B--isotype, B--type, N--photo of type, W--photo of type). Department undetermined: Lobb s.n. ["S. Chili"] (K).

SYNGONANTHUS PHELPSAE Moldenke in Maguire & Phelps, Bol. Soc. Venez. Cienc. Nat. 14: 12--13. 1952.

Bibliography: Moldenke in Maguire & Phelps, Bol. Soc. Venez. Cienc. Nat. 14: 12--13. 1952; Moldenke in Maguire, Mem. N. Y. Bot. Gard. 8: 102. 1953; Moldenke in Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9: 282--283. 1957; Moldenke, Phytologia 4: 329. 1953; Moldenke, Résumé 74 & 493. 1959; G. Taylor, Ind. Kew. Suppl. 12: 138. 1959; Moldenke, Résumé Suppl. 3: 12. 1962; Sandoval, Biol. Abstr. 46: 2128. 1965; Moldenke, Résumé Suppl. 17: 2. 1968; Moldenke, Fifth Summ. 1: 127 & 128 (1971) and 2: 964 & 968. 1971; Moldenke, Biol. Abstr. 53: 5252. 1972; Moldenke in Steyerm., Maguire, & al., Mem. N. Y. Bot. Gard. 23: 852. 1972; J. A. Steyerm., Biotropica 6: 7 & 10. 1974; J. A. Steyerm., Act. Bot. Venez. 10: 225 & 232. 1975.

Maguire and his associates encountered this plant "in marshy area on cumbre" and "frequent herb of wet places in open savannas on precipitous slopes fringed by woodland". It has been found growing at 1500--2000 m. altitude, flowering in February and December.

The Maguire 32801 and Maguire & Politi 27697, distributed and in the latter case even previously cited by me as S. phelpsae, are better placed as var. elongatus Moldenke.

Additional citations: VENEZUELA: Amazonas: Maguire, Phelps, Hitchcock, & Budowski 31707 (Z—drawings of type); Phelps 30 (Ve). Bolívar: B. Maguire 32885 (N); J. A. Steyermark 93696 (N, Z). State undetermined: J. A. Steyermark 54653 (Ve).

SYNGONANTHUS PHELPSAE var. CARDONAE Moldenke, Bol. Soc. Venez. Cienc. Nat. 23: 100. 1962.

Bibliography: Moldenke, Bol. Soc. Venez. Cienc. Nat. 23: 100. 1962; Moldenke, Résumé Suppl. 3: 12. 1962; Sandoval, Biol. Abstr. 46: 2128. 1965; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 964. 1971.

This variety differs from the typical form of the species in having its stems 14--17 cm. long and the densely congested leaves covering the entire stem, linear, and about 2 cm. long.

Citations: VENEZUELA: Bolívar: Cardona 1990 (Ve—type), s.n. (Ve).

SYNGONANTHUS PHELPSAE var. ELONGATUS Moldenke in Maguire, Mem. N. Y. Bot. Gard. 8: 102. 1953.

Synonymy: Syngonanthus phelpsae var. elogatus J. A. Steyerm., Act. Bot. Venez. 10: 225, sphalm. 1975.

Bibliography: Moldenke, Phytologia 4: 329. 1953; Moldenke in Maguire, Mem. N. Y. Bot. Gard. 8: 102. 1953; Moldenke, Résumé 74 & 493. 1959; Moldenke, Résumé Suppl. 11: 4. 1964; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 964. 1971; J. A. Steyerm., Biotropica 6: 7 & 10. 1974; J. A. Steyerm., Act. Bot. Venez. 10: 225 & 232. 1975.

This variety differs from the typical form of the species in having its stems 5 cm. long and the leaves 2.5--4 cm. long.

Collectors describe the plant as growing in clumps, the leaves green, erect, and soft, and the inflorescence-heads gray-whitish. They have found it growing at 800—1800 m. altitude, in flower in February, July, and September, and in fruit in March, July, and September. Maguire refers to it as "frequent in bog-marsh savannas", while Steyermark and his associates say that it is "common in dense tufts" bordering forested areas.

Ruiz-Terán & López-Palacios record the name "aribái-panárukusí" and describe the plant as a "hierba heliófila y psamófila; rósula de unos 3 cm. de alto; escapos de 10—15 [or 15—20] cm. delgados; hojas finas, 4--5 cm.; capítulos hemisféricos, 3—4 mm. de diámetro; flores blancas". They encountered it on "orillas de la carretera".

Material has been misidentified and distributed in some herbaria as typical S. phelpsae Moldenke.

Additional citations: VENEZUELA: Amazonas: Maguire & Politi 27697 (N, Ve); J. A. Steyermark 105141 (Ld), 105223 (Ft). Bolívar: B. Maguire 32801 (N); Ruiz-Terán & López-Palacios 11220 (Ld), 11222 (Ld); J. A. Steyermark 93475 (Lw, N, N, S), 93504

(N, Z); Steyermark, Espinoza, & Brewer-Carias 109423 (Ld).

SYNGONANTHUS PHELPSAE var. PILOSUS Moldenke in Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9: 282--283. 1957.

Bibliography: Moldenke in Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9: 282--283. 1957; Moldenke, Résumé 74 & 493. 1959; Moldenke, Fifth Summ. 1: 128 (1971) and 2: 964. 1971.

This variety differs from the typical form of the species in having the leaves densely appressed-pilose with silvery hairs.

Maguire and his associates refer to it as "locally frequent in clumps in rocky savannas" and found it growing at altitudes of 1900--2100 m., flowering in December.

Citations: VENEZUELA: Amazonas: Maguire, Wurdack, & Bunting 37308 (Mu--isotype, N--type); Maguire, Wurdack, & Maguire 42261 (N, S).

SYNGONANTHUS PHELPSAE var. VIRIDIS Moldenke, Phytologia 22: 126. 1971.

Bibliography: Moldenke, Phytologia 22: 126. 1971; Moldenke, Fifth Summ. 2: 964 & 968. 1971; Hocking, Excerpt. Bot. A.21: 30. 1972; Moldenke, Biol. Abstr. 53: 5252. 1972.

This variety differs from the typical form of the species in having black involucral bractlets and bright-green glabrous or subglabrous leaves.

Steyermark describes the leaves as pale-green and subcoriaceous and the flower-heads white and found the plants growing in dense clumps on swampy savannas at 2300 m. altitude. Thus far it is known only from the original collection.

Citations: BRAZIL: Amazônas: J. A. Steyermark 103840 (N--type).

SYNGONANTHUS PHILCOXII Moldenke, Phytologia 26: 178. 1973.

Bibliography: Anon., Biol. Abstr. 56 (10): B.A.S.I.C. S.265. 1973; Moldenke, Biol. Abstr. 56: 5366. 1973; Moldenke, Phytologia 26: 178. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974.

Citations: BRAZIL: Mato Grosso: Philcox, Fereira, & Bertoldo 3316 [N. Y. Bot. Gard. photo N.S. 8752] (K--type, N--photo of type, Z--isotype).

SYNGONANTHUS PHILODICOIDES (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 266. 1903.

Synonymy: Paepalanthus philodicoides Körn. in Mart., Fl. Bras. 3 (1): 469. 1863. Dupatya philodicodes Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya philodicoides Kuntze apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 266, in syn. 1903. Paepalanthus philodecoides Koern. ex Moldenke, Phytologia 4: 329, in syn. 1953.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 469--470 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Ruhl. in Engl., Pflanzenreich 13 (4-30): 264, 266, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908.

[to be continued]

Alma L. Moldenke

"AMERICAN FOREST POLICY IN DEVELOPMENT" by Stephen Hopkins Spurr, vii & 88 pp., University of Washington Press, London & Seattle, Washington 98105. 1976. $6.95.

The George S. Long Endowment Fund, established in 1975 by his daughter Helen "to promote better understanding of forestry, natural resources and conservation", commemorates the life work of the Weyerhauser timber industrialist who was also a natural resources conservationist. The dean of the College of Forest Resources administers its program.

This neat little book shares the first three lectures with many more forestry students, timber workers, forest managers and policy setters, environmentalists, economists and political leaders than the original audience. "Biological Productivity of American Forests" is based on Professor Spurr's work on the Committee on Renewable Resources for Industrial Materials (=CORRIM) and projects a tripling or quadrupling as possible. "The Need for an American Forest Policy: Its Basic Elements" stresses the need for conservation education, forestry research on all levels and sufficient legal and fiscal opportunities for forest land management agencies. "Timber Policies: Today and Tomorrow" pragmatically assesses the likely increase under predictable economic, social and political conditions.

"PALAEOBIOLOGY OF ANGIOSPERM ORIGINS: Problems of Mesozoic Seed-plant Evolution" by Norman F. Hughes, vii & 242 pp., illus., Cambridge University Press, Cambridge CB2 1RP, London NW1 2DB, Melbourne 3206 & New York, N. Y. 10022. 1976. $21.50.

This challenging study of interest to geologists, botanists, taxonomists, palaeontologists and advanced students in these fields is published in the Cambridge Earth Science Series under the general editorship of W. B. Harland. In it the palaeogeologist-author shakes his finger at the type of botanist who builds a whole plant family on a piece of fossilized nondescript petal and again at the palaeontologist who explains "the extinctions of dinosaurs through catastrophic cosmic events .....[when] direct continuing physical causes, such as unusually high temperatures at the end of the Cretaceous seem more likely. ...The high temperatures indicated for the Cretaceous seas by oxygen isotope studies on belemnites are perhaps the main guide to all the unusual evolutionary expansion of land plants and animals that took place together from Albian through Palaeocene time". He also concludes that none of the pre-Cretaceous fossils so far found represents an angiosperm.

The book presents a logical plea for the re-evaluation of fossil material by the newer techniques with more awareness of the effects of continental drift based on plate tectonics, with comparisons within the same time units, with a chance to devise a data-handling code and with a descriptive and not a Linnean binomial naming until much more accurate information is available. Perhaps an analogy can be made with those Fungi Imperfecti that become assigned to certain other groups when their diagnostic fruiting bodies are finally discovered.

"McGRAW-HILL DICTIONARY OF SCIENTIFIC TECHNICAL TERMS" edited by Daniel N. Lapedes & staff, xv & 1634 & 26 pp. (appendix & tables), illus., McGraw-Hill Book Company, Inc., St. Louis, San Francisco, Düsseldorf, Johannesburg, Kuala Lumpur, London, Mexico City, Montreal, New Delhi, Panama, Paris, São Paulo, Singapore, Sydney, Tokyo, Toronto, Wellington & New York, N. Y. 10036. 1974. $39.50.

Since mathematical symbols, chemical formulae, photographs, drawings of plants, animals and special structures, and well presented diagrams are universally comprehensible or comprehended and since technical English language can be read by so many of those scientists, technicians, technologists, writers, students of several fields of knowledge and the interested public who want or need to know, this book becomes a wonderful investment world wide! There are almost 100,000 definitions with careful cross-referencing, there are almost 3,000 illustrations, there are almost 100 separate scientific and/or technical disciplines or areas of research covered. All is carefully, attractively and accurately prepared. Therefore this is truly the "world's most comprehensive single-volume reference" of great value in many more than the above-mentioned cities for their libraries, technical schools, colleges, universities, specialized industries and laboratories.

"FIELDBOOK OF NATURAL HISTORY" Second Edition by E. Laurence Palmer & H. Seymour Fowler, xviii & 779 pp., illus., McGraw-Hill Book Company, Inc., St. Louis, San Francisco, Düsseldorf, Johannesburg, Kuala Lumpur, London, Mexico City, Montreal, New Delhi, Panama, Paris, São Paulo, Singapore, Sydney, Tokyo, Toronto & New York, N. Y. 10036. 1975. $19.95.

There must be thousands of American and southern Canadian families who still treasure the original 1949 edition of Prof. Palmer's work as well as Anne Comstock's earlier natural history volume because of some naturalist-oriented teacher, professor, librarian or general reader (and nature observer) on the recent family tree. Our own immediate family started with much used copies from both sides.

Because printing plates wear out after repeated use and because information needs to be modernized, the late, much admired Dr. Palmer had already started collecting material for this revision. But the bulk of this task has been executed by Prof. Fowler, resulting in this new, larger, attractive format that is more easily legible, that displays its more than 2,000 illustrative photographs and drawings more effectively, that incorporates data gathered from space exploration and geology, and that describes many more species of plants and animals.

With today's renewed interest in man's place in the care and use of the environment and in outdoors recreation this comprehensive and readily comprehensible source book with its accurate illustrations should prove a wonderful guide for families, students and teachers on several levels from kindergarten to graduate education training, for wildlife management, outdoor education, etc. For large enough groups there is a text edition available for $16.

The printing is unusually clear. Unfortunately, the name Lantana montevidensis is misspelled.

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