October 1965

The Boxwood Bulletin

A QUARTERLY DEVOTED TO MAN'S OLDEST GARDEN ORNAMENTAL

Sarcococca confusa: shoot bearing male and female flowers of the current year together with ripe fruits of the previous year, about natural size.

Curtis's Bot. Mag. t. 9449 (1936).

Boyce, Va. Vol. 5 No. 2

Edited Under The Direction Of
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Entered as second-class mail matter at Post Office
Boyce, Virginia

Printed in U. S. A. by
Carr Publishing Co., Inc., Boyce, Va.

STATEMENT OF OWNERSHIP MANAGEMENT AND CIRCULATION

1. Date of Filing: October 30, 1965.
2. Title of Publication: The Boxwood Bulletin.
3. Frequency of Issue: Quarterly.
4. Location of Known Office of Publication (Street, city, county, state, zip code): Blandy Experimental Farm, Boyce, Virginia 22620.
5. Location of the Headquarters or General Business Office of the Publishers (Not printers): Blandy Experimental Farm, Boyce, Virginia.
6. Names and Address of Publisher, Editor, and Managing Editor: Publisher, The American Boxwood Society, Boyce, Virginia; Editor: Mrs. Edgar M. Whiting, Winchester, Virginia.
7. Owner: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and address of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.) Name, The American Boxwood Society, Boyce, Virginia (Non-Profit Organization).
8. Known Bondholders, Mortgages, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities (If there are none, so state): None.

The Boxwood Bulletin

October 1965 Vol. 5, No. 2

EDITORS — *For this Special Issue*
DR. J. T. BALDWIN, JR.
MRS. EDGAR M. WHITING

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The Relatives of BUXUS

Introduction

It has been our purpose to put together a botanical-horticultural conspectus of the Buxaceae except for *Buxus* itself. We have followed rather closely the treatment of the family as given by J. Hutchinson (1959) in *The Family of Flowering Plants,* Vol. I, p. 184, Oxford University Press, wherein he recognizes for the family six genera:

A. Stamens numerous; no rudimentary ovary in male flower

B. Leaves alternate; fruit a drupe ... *Styloceras*

BB. Leaves opposite; fruit a capsule ... *Simmondsia*

AA. Stamens definte

C. Woody shrubs with entire leaves

D. Sepals 4; stamens 4, opposite the sepals

E. Leaves alternate; fruits indehiscent ... *Sarcococca*

EE. Leaves opposite; fruits capsular ... *Buxus*

DD. Sepals 4; stamens 6 ... *Notobuxus*

CC. Herbs with procumbent stems ... *Pachysandra*

We are deeply grateful to the five authors who have jointly produced the synopsis that follows and to other individuals who have cooperated with us in various ways.

To know something of the authors will make their writings more meaningful; accordingly, included here are brief statements about these individuals.

Who's Who for 1964 records for the Hon. Lewis Palmer: Fellow, Linnaean Society; Director, Equitable Life Assurance Society; Treasurer, since 1953, Royal Horticultural Society, and Member of Council (1937) and Vice-Chairman (1952). He was born in 1894 and educated at Winchester and at Christ Church, Oxford, and was granted an M. A. (Oxon.) in 1919. He was employed first in shipping and then in industry from 1919 to 1948, when he retired. He calls gardening his recreation. As one would judge from the summary here given, he is widely known as a horticulturist. His account of *Sarcococca* is doubtless the best to be published in the United States and will very likely stimulate increased usage of this group of plants.

Bernard Verdcourt is also English. He was born in 1925 at Luton, Bedfordshire, and educated at the grammar school there and at Reading University, B. Sc. (Physics), 1945; Ph. D. (Botany), 1955. After graduation from college he worked for three years as microscopist, photographer, mycologist, and analyst for the Printing, Packaging and Allied Trades Research Association. Then, after a year at Kew, he became in 1949 Botanist at the Amani Herbarium in Tanganyika, which was later to become the East African Herbarium at Nairobi of which he was Botanist-in-Charge, 1958-1964. At present he is Principal Research Fellow, Royal Botanic Gardens, Kew, working on the *Flora of Tropical East Africa.*

Gabriel Edwin was born in New York City in 1926. He got a B. S. degree from George Washington University in 1949; he was a graduate student there from 1949 to 1963, when he was granted a Ph. D. in botany for systematic studies on hollies. During those years he did curatorial work in the Herbarium of the U. S. National Arboretum. He is now Assistant Curator of Vascular Plants, Chicago Natural History Museum.

Herbert C. Robbins was born at Alamo, Tennessee, in 1929. He holds degrees from three institutions in that State; B. S., Union College, 1951; M. A., Peabody College, 1952; Ph. D., Vanderbilt University, 1962. He has taught at Belmont College, at Vanderbilt University, at Baylor University, and, since 1963, has been Associate Professor and Chairman, Department of Biology, at Kentucky Southern College. His doctoral dissertation, which because of excessive demands upon his time he has not readied for publication, was on *Pachysandra.* We are particularly grateful for his permission to publish extracts from his dissertation in *The Boxwood Bulletin.*

Howard Scott Gentry, born in Temecula, California, in 1903, got an A. B. from the University of California in 1931 and a Ph. D. in botany from the University of Michigan in 1946. From 1933 to 1941 he was a collector of scientific specimens, especially in Mexico; among other assignments was that of field palaeontologist for the American Museum of Natural History, and on occasion it has delighted me to introduce him as my only friend for whom a fossil camel is named. Except for a short period when Gentry was research associate with the Hancock Foundation of Southern California, he has since 1942 been with the U. S. Department of Agriculture and especially concerned with agricultural exploration in various parts of the United States, Central America (probably knows the flora of Mexico better than any other botanist), Asia, and Africa (considers the flora of Southern Africa to be the most fascinating that he has seen). He has rightly been called "one of the world's top-ranking field botanists". Since 1950 he has had the rank of Senior Botanist, Section of Plant Introduction, Agricultural Research Service. His scientific attention has been devoted to the flora, vegetation, plant evolution, and plant geography of Mexico. He has a special interest in the taxonomy of *Agave,* a most difficult genus.

J. T. Baldwin, Jr.

Fig. 1. *Sarcococca hookeriana* var. *digyna*.

Fig. 2. *Sarcococca confusa*, as a low hedge.

Sarcococca: Sweet Box

by

THE HON. LEWIS PALMER

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All lovers of Boxwood have, I am sure, enjoyed the way in which a venerable bush, or ancient hedge, of *Buxus sempervirens* will impregnate the air around it with the agreeable odour of its pollen when the plant is in flower on a warm sunny day in late Spring. But while the odour of Boxwood is agreeable and unlike the odour of any other commonly cultivated plant, it could hardly be called sweet or fragrant. In this the Boxwood differs from its near relations the SARCOCOCCAS, or as I prefer to call them, the Sweet Boxes, which have the same property of being able on a suitable day to impregnate the air for a considerable distance around them with their very sweet honey-like scent. And the Sweet Boxes will do this at a time when most other plants are wrapped in their winter sleep.

In England, beginning some years about Christmas time, when the Winter is a mild one, the various species of *Sarcococca* will provide a succession of fragrant blossom until the end of March. And a few sprigs of it cut during this season and brought into the living room will provide a vase of fragrance scarcely inferior to that provided by the Winter Sweet (*Chimonanthus*).

Most of the SARCOCOCCAS are native of South-East Asia, and, with the exception of a few outlying species from Western China and the Himalaya, not frost hardy in the temperate zone. Some five species have been introduced to cultivation in the open in British gardens during the present century and have proved Winter hardy in many parts. Of these only two have, in my garden, entirely resisted the worst conditions of the Winters during the last twenty-five years. Two others have suffered, one a very little damage and one a considerable amount, and have recovered; one succumbed altogether during the Winter of 1961/62 when the weather charts recorded that my garden lay within the coldest patch in the whole of the British Isles. Contrary to what one would expect from the fore-going my garden lies right in the South of England but inland from the sea on rather a cold north facing slope on a chalk soil. In Winter the minimum temperature is usually around 10° to 15° F. but exceptionally -2° to -5° F has been experienced.

Like their cousin *Buxus sempervirens the* SARCOCOCCAS are slow-growing evergreens with bright green leathery leaves. The flowers are axillary and unisexual but borne on the same shoots. The female flowers are inconspicuous and consist of an ovary and style with 2 or 3 stigmas protruding from a sheath of tiny imbricated scales. The male flowers, which are borne in great profusion, consist of a bunch of usually white stamens about one inch long and tipped with pink or cream coloured anthers. The fruit is a drupe, generally black, but in *S. ruscifolia* bright red, which ripens in the early Winter and persists on the bush until late Spring; so that ripe berries and flowers occur simultaneously. Like the Boxwood, the Sweet Boxes flourish best in neutral or alkaline soils and do not seem so happy in soils of a low pH. For any of my readers who would like further information about the taxonomy of *Sarcococca* I cannot do better than refer them to the excellent article by J. Robert Sealy of the Kew Herbarium which appeared in the journal of the London Royal Horticultural Society for July 1949.

During the past twenty-five years I have cultivated all the species and varieties of Sweet Box that I could find amenable to open air cultivation. My experience with them has been as follows, in the order in which they come into bloom:-

Sarcococca saligna, native of the Himalaya. This is a shrub about 4 to 5 feet high with drooping willow like branches and rather pale bright green long-pointed willow like leaves about 6 inches long by 1 inch broad. Unlike the other Sweet Boxes I have grown its male flowers are green and scentless. In addition to this its resistance to frost is very indifferent so that I consider it the least interesting member of the family. With me it was never happy and always suffered in the winter so that it was always untidy, and now I have lost both my plants altogether. But, in fairness, I must add that I have seen it in gardens where it can withstand the winter conditions, and there it builds up a rather attractive broad bun-shaped bush which is an asset in any group of evergreens. I have never seen the fruit.

Sarcococca hookeriana var. *digyna,* native of Western China (Fig. 1). Of this there are two variants in cultivation, one greatly superior to the other. The best sort has leathery narrow willow shaped leaves about 4 inches in length by 5/8 of an inch broad. The stems which grow straight up from underground rhizomes have a red bark and branch out at the top making a sort of mushroom shaped bush about 3 feet high. The flowers are white and strongly scented and the anthers cream coloured. The other sort is a smaller shrub with paler green leaves and green

Fig. 3. *Sarcoccocca humilis* (2 forms). *S. confusa* in background.

bark, and usually pale pink anthers. In both sorts the female flowers have 2 stigmas, the fruits are black with a purplish bloom, and the plants entirely frost hardy in Britain.

Sarcococca ruscifolia, native of Central China. Unlike the previous species this grows on a single stem making eventually a stout bush some 5 or 6 feet high. It has darkish green foliage, each leaf shaped like the ace of spades with a fine point and about 2½ inches long. When happy it produces its flowers in great profusion and is extremely fragrant. In this species the female flowers have 3 stigmas and the male flowers cream coloured anthers. The berries are red and very decorative but for an aggravating tendency to hide behind a leaf. Although it will stand an average winter, this species is somewhat less hardy than others. In the severe winter of 1961/62 the largest bush in my garden was killed outright. Its stem measured 2¼ inches in diameter.

Sarcococca confusa (Fig. 2). This species, as its name implies, was the cause of some confusion among taxonomists. There is a plate of it in the *Botanical Magazine* T 9449 purporting to represent *S. humilis,* a very different species. This plate was drawn from material raised from seed sent back, about 1904, from China by E. H. Wilson of the Arnold Arboretum. J. Robert Sealy of the Kew Herbarium (who investigated the matter in 1947 and eventually described this as a new species, which he named *S. confusa,* from plants which were then cultivated in a number of British gardens), could find no record of its collection by Wilson, or any herbarium material from specimens collected in the wild. The plant is intermediate between the last species and the following one, in shape of leaf and in bearing female flowers with either 2 or 3 stigmas on the same shoot. Its origin therefore must remain a mystery until trained collectors can again penetrate to Western China. It may be that Wilson's native collectors gathered some seed from a species that he did not see himself, and brought him no herbarium material of it; or may be that they gathered fruits from a chance natural hybrid, that they did not recognize as such: but, if so, it was one of those very rare hybrids that breed true from seed, and are, in fact, newly created species. The plant is very robust in constitution and sows itself with great freedom in my garden. Some years I have to deal ruthlessly with the hundreds of seedlings that appear under and around the parent bushes. Like *S. ruscifolia* this species makes a stout bush growing on a single stem about 5 to 6 feet high. Its leaves are elliptic about 2¼ inches long by 7/8 of an inch broad and pointed. It produces abundance of fragrant flowers with cream coloured anthers. The fruits are shining black berries which do not conceal themselves behind the leaves. I have grown this species as a low evergreen hedge about 3 foot high, and its habit of perfuming the air in winter makes it particularly attractive for this purpose. It stands clipping quite well provided the clipping is done after flowering and well before midsummer. If the clipping is left too late there is a danger that brown patches will appear the following winter. This species is 99% hardy in my garden. It has only once suffered damage in 25 years

and then only in an exceptionally severe winter and to quite a minor extent.

Sarcococca humilis, native of Western China (Fig. 3). This is a low growing bush rarely attaining more than 2 feet in height. It consists like *S. hookeriana v. digyna* of a number of stems arising from creeping underground rhizomes. The leaves are broad willow shaped, rather darkish green, about 3 inches long by 3/4 inch broad. The female flowers have 2 stigmas, and the male flowers are fragrant and carry bright pink anthers. The fruits are black with a purplish bloom and more pointed or eggshaped than those of other species. The plant is absolutely hardy and very ornamental for positions where a dense low-growing ground covering shrub is required.

Sarcococca ruscifolia var. *chinensis,* native of Western China (Fig. 4). This differs from *S. ruscifolia* in having rather pale green leaves with longer points and paler scarlet berries. In my garden it has not grown to the same size as the type, but it has withstood severe frost more successfully. It is considerably later than the type in coming into flower but is equally decorative as a garden shrub for a somewhat sheltered place except in mild climates.

Sarcococca hookeriana, native of the Himalaya. It was thought that this species had been lost to cultivation when Mr. Sealy wrote his paper referred to above, but, subsequently, I discovered it growing in three different gardens, and through the kindness of their owners obtained some plants. It is like its variety a shrub with 2 variants. One grows on a single stem and makes a woody not very attractive bush about 3 to 4 feet high. The other is low growing and throws up stems from creeping rhizomes, but instead of making a compact dense bush, as is the case with *S. humilis,* these come up at some distance from each other making a distinctly spotty effect. The leaves are leathery and rugose, dull green and 2½ inches long by 3/4 inch broad. The flowers are sparsely produced, the females with 3 stigmas and the males, fragrant, with deep pink anthers. It has much less garden value than the others although it is perfectly hardy. It is always the last to flower in my garden. I have never seen any fruits on it.

Fig. 4. *Sarcococca ruscifolia* var. *chinensis.*

Photographs made by E. A. Sollars, Winchester, Eng.

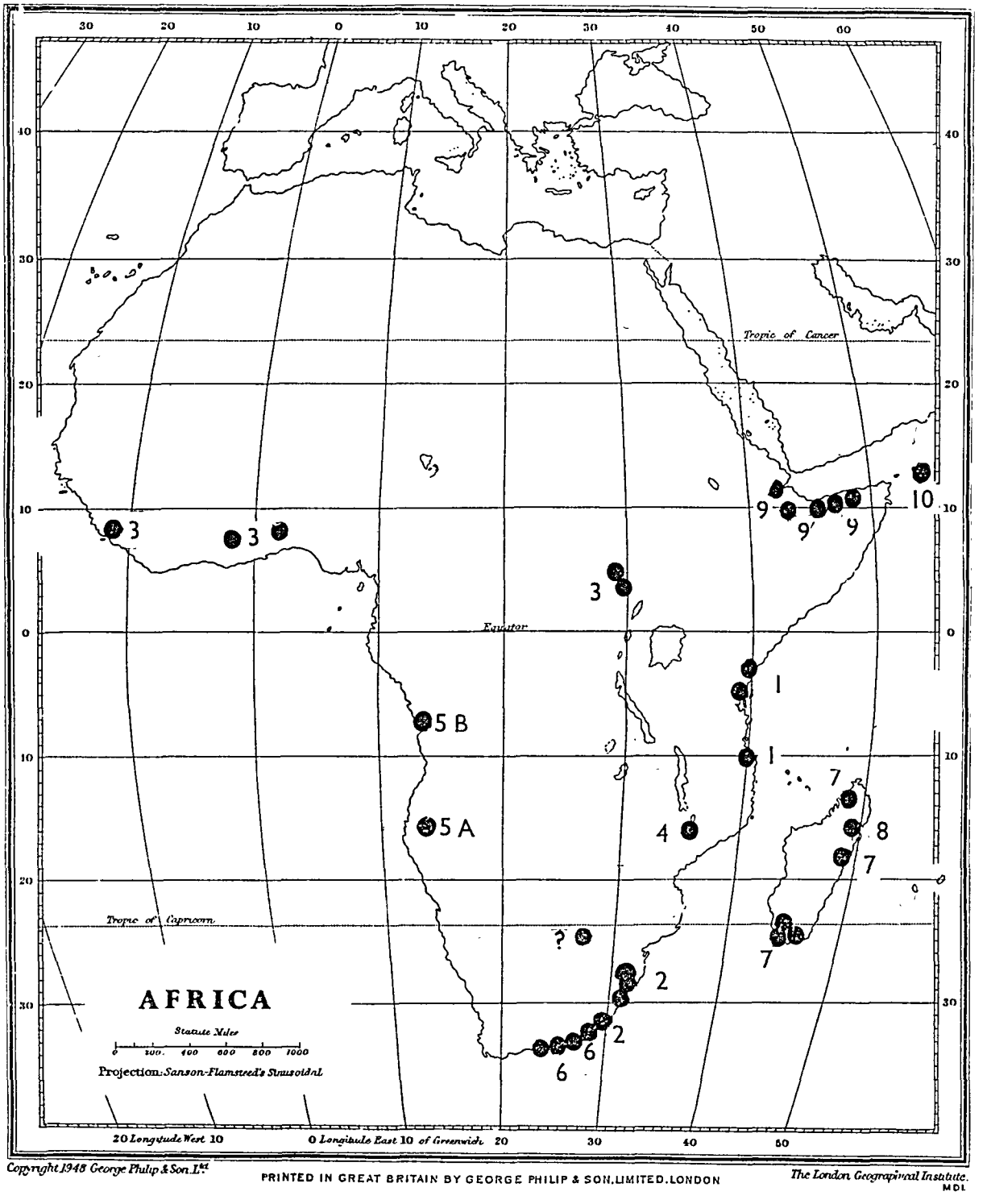

Fig. 1. Distribution of the African Buxaceae. Numbers follow the order in the text.

African Boxes

by

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The family Buxaceae is certainly not conspicuous in Tropical Africa, only one member being of any real importance, the Knysna or Cape box, which has a useful timber with the properties one expects of boxwood. They are scarcely even of any importance ecologically, save for *Buxus hildebrandtii* Baill., which is a dominant in the evergreen scrub zone, below the juniper belt, in the upland areas of the Northern Region of the Somali Republic and in the north-eastern part of Ethiopia.

In all there are some 10 boxes in Tropical Africa and Madagascar. Apart from *Buxus hildebrandtii* mentioned above, and the closely similar *Buxus pedicellata* (van Tieghem) Hutch., differing in minor characters which is confined to Socotra, the family is represented by the genus *Notobuxus* which contains 7 or 8 species. The distribution is illustrated in the accompanying map (Fig 1). *Notobuxus* was first described by Oliver in 1882 to accommodate a plant which had been sent to him from Natal. He distinguished it from *Buxus* because the male flowers had 6 stamens and no rudimentary ovary; the stamens consisted of sessile anthers. Other South African species were, however, maintained in *Buxus*. In 1899, Gilg erected *Macropodandra* for a plant collected by Stuhlmann in the Central African Lakes area, now in the extreme north-east corner of the Congo Republic. Hutchinson reduced this to *Notobuxus* in 1912; at that time the boxes were retained in the Euphorbiaceae as Bentham and Hooker had done but later, in his *Families of Flowering Plants*, Hutchinson considered the group merited family rank, as indeed Loiseleur had suggested as long ago as 1819. In his treatment of the boxes in the *Flora of Tropical Africa*, Hutchinson maintains three species in the genus *Buxus*, but Phillips later pointed out that the characters used to separate *Notobuxus* from *Buxus* resulted in geographical anomalies. There was clearly only one genus in Southern Africa, and Phillips recast the characters as follows:-

Buxus — stamens 4; anthers supported by filaments; rudimentary ovary present in the male flowers.

Notobuxus — stamens 4-8; anthers sessile; rudimentary ovary absent in male flowers.

These may seem slender reasons for maintaining the genus and Hutchinson in a note on the Kew covers dated 1963 states "*Notobuxus* now seems hardly distinct". Mathou in a detailed study of the whole family considered that the tropical African members should not form a separate genus but only a subsection, namely section *Probuxus* Mathou subsection *Buxella* (van Tieghem) Mathou. It is convenient to retain the genus *Notobuxus*, however, since it is a group with a decisive character coupled with a distinctive distribution. It perhaps should be mentioned that van Tieghem produced two further generic names *Buxanthus* (for *Buxus hildebrandtii* and a new species) and *Buxella* (for *Buxus macowanii* and *Buxus madagascarica*) now placed in *Notobuxus*. Capuron has recently described a *Buxus macrocarpa* from Madagascar distinguished by its very large fruits; no flowers were available, but it seems likely it will prove to be a *Notobuxus;* until they are available it had best remain where it is. The following key to African boxes is based on a quick look at the material rather than on any true study. The species are then briefly enumerated.

Capsule large attaining 3 cm. in length ---------- *Buxus macrocarpa*

Capsule much smaller:

Anthers sessile:

Leaves tapering to an acute or subacute apex:

Anthers 4 ---------- *Notobuxus nyasica*

Anthers 6 ---------- *Notobuxus acuminata*

Leaves rounded or at least obtuse at the apex:

Leaves larger; costa raised beneath, impressed above, side veins well spaced and visible; anthers 6 or more:

Each inflorescence with 4 male flowers around a female flower; anthers 1 mm. long ---- *Notobuxus obtusifolia*

Each inflorescence with usually 2 male flowers around a female flower; anthers 2.5 mm. long ---- *Notobuxus natalensis*

Leaves smaller; costa raised on both sides, side veins close, venation mostly obscure; anthers 4:

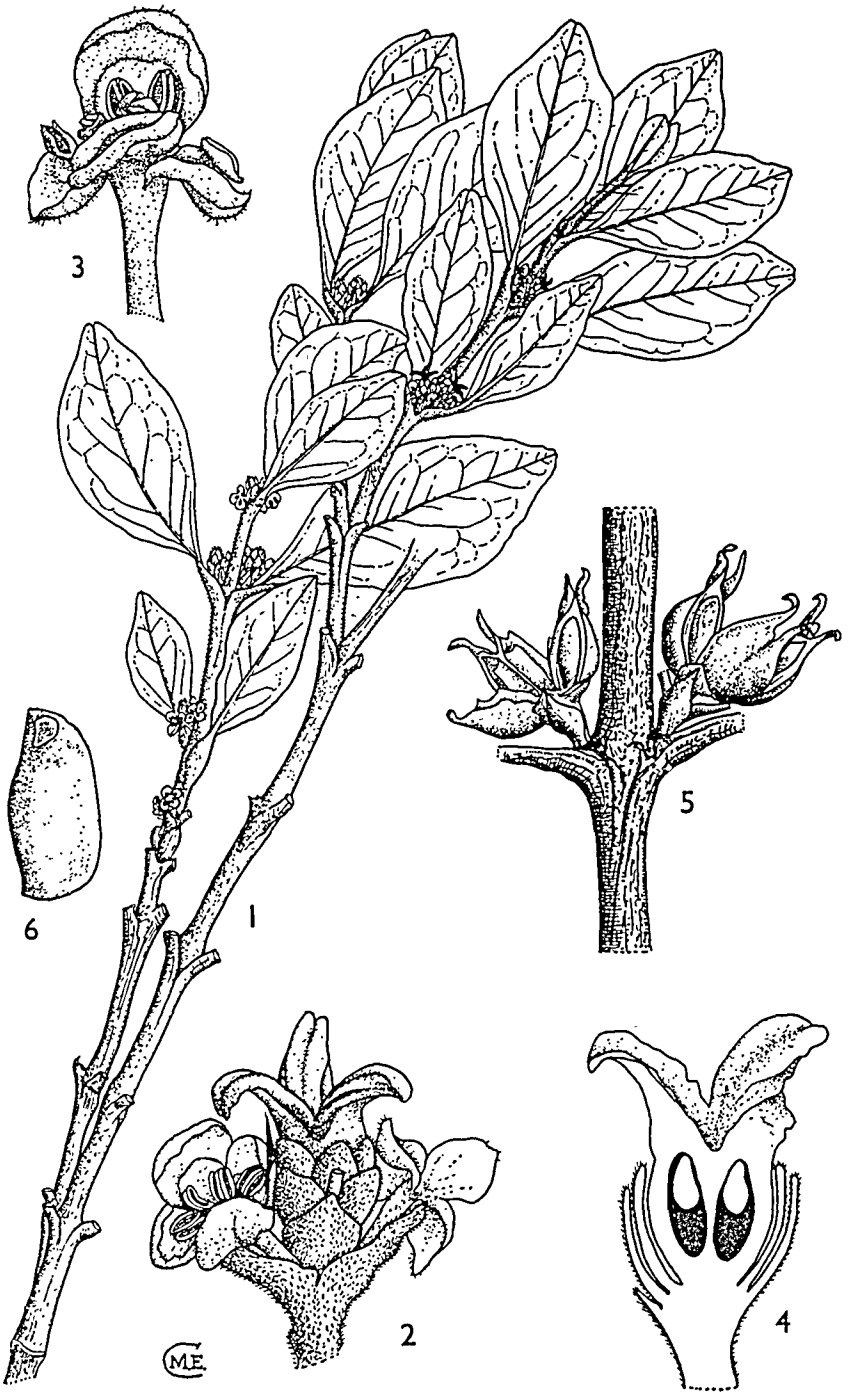


Fig. 2. *Notobuxus obtusifolia.* 1, flowering branch, X 1; 2, inflorescence, X 6; 3, male flower, X 8; 4, female flower in section, X 8; fruits, after dehiscence, X 2; 6, seed, X 6. 1-4 from *Greenway* 4138; 5 & 6, from *Rawlins* 765. *This plate reprinted from Flora of Tropical East Africa* (1962) *with permission of Ministry of Overseas Development and at the request of Mr. E. Milne-Redhead.*

Leaves larger 2-9 cm. long, glabrous; venation obscure (Madagascar) ____ *Notobuxus madagascarica*

Leaves smaller 1.5-2.5 cm. long (African mainland)
Leaves and stems pubescent ____ *Notobuxus benguellensis* var. *hirta*

Leaves and stems glabrous:
Venation mostly obscure ____ *Notobuxus macowanii*

Venation close and raised ____ *Notobuxus benguellensis* var. *benguellensis*

Filaments developed:
Inflorescence sessile or subsessile, male flowers sessile or nearly so; sepals ovate, woolly-ciliate; female sepals shortly pointed, coriaceous, woolly-ciliate ____ *Buxus hildebrandtii*

Inflorescence stalked; male flowers shortly stalked, sepals lanceolate, shortly and sparingly ciliate; female sepals truncate, thin, not ciliate ____ *Buxus pedicellata*

1. *Notobuxus obtusifolia* Mildbr.* Fig. 2

Small shrub or tree 1-6 m. tall with corky bark. Leaves oblong-elliptic, obovate, oblong or ovate, narrowed above to an obtuse or notched apex, wedge-shaped at the base, glabrous, or pubescent on the midrib beneath, 1.6-7.6 cm. long and 0.75-3.4 cm. wide. Flowers green, in reduced axillary inflorescences consisting of one terminal subsessile female flower with four shortly stalked male flowers beneath it. Capsule ovoid, blackish, 7 mm. long. Seeds black and shining, oblong-ovoid or 3-angled, 4 mm. long and 2 mm. wide. Kenya and Tanganyika, coastal forests.

2. *Notobuxus natalensis* Oliv.

This is closely similar to *Notobuxus obtusifolia* and clearly derived from the same ancestor in the not too distant past; it might in fact be best to rank the two as subspecies. Several plants have exactly the same distribution as the sum of the distributions of these two. The Natal species differs by having mostly 2 male flowers per inflorescence, longer anthers and longer horn-like projections on the capsule. Natal and E. Cape Province.

3. *Notobuxus acuminata* (Gilg) Hutch. (Macropodandra acuminata Gilg)

Shrub or small tree 3-4 m. tall. Leaves elliptic or oblong-elliptic, abruptly acuminate at the apex, wedge-shaped at the base, glabrous, 5-11 cm. long, 2-4.5 cm. wide. Flowers green, in reduced axillary inflorescences consisting of a subsessile female flower surrounded by 2 male flowers on pedicels 6-10 mm. long. Capsule ovoid, 10-12 mm. long, 6-7 mm. wide. Seeds black and shining, oblong, plano-convex, 6-7 mm. long. Sierra Leone, Dahomey, Ghana, Nigeria and N.E. Congo Republic.

4. *Notobuxus nyasica* (Hutch.) Phillips (Buxus nyasica Hutch.)

Shrub or small tree, glabrous. Leaves lanceolate to narrowly ovate-lanceolate, somewhat thickened, long acuminate to an obtuse or subacute tip, wedge-shaped at the base, about 6.5 cm. long and 2 cm. wide; midrib and lateral nerves evident on both surfaces. Inflorescences axillary with one male and one female flower or, in upper inflorescences, a pair of female flowers; anthers 4. Fruit not seen. Malawi: Mt. Mlanje. Only a drawing of the type specimen has been seen; this drawing is preserved at Kew but the actual type was probably destroyed at Berlin. How the Scott Elliot specimen came to be there and not at Kew is curious. No other material has been seen although the mountain has been explored a good deal.

5a. *Notobuxus benguellensis* (Gilg) Hutch. (Buxus benguellensis Gilg, Buxus macowanii Oliv. var. benguellensis (Gilg) Mathou)

A shrub or small tree; glabrous. Leaves narrowly oblanceolate or rhomboid-oblanceolate, rather thick, obtuse at the apex, wedge-shaped at the base, about 2 cm. long, 0.8 cm. wide, costa raised above, venation close and raised above but obscure beneath. Flowers not seen. Angola: Huilla.

5b. var. *hirta* Hutch. (Buxus hirta (Hutch.) Mathou)

Stems and leaves covered with short hairs. Male flowers solitary, subsessile, surrounded by 3 or 4 small scaly bracts; anthers 4. Female flowers and fruits not seen. Angola: Loanda, 10 miles north of the mouth of R. Lifuni.

6. *Notobuxus macowanii* (Oliv.) Phillips (Buxus macowanii Oliv., Buxella macowanii (Oliv.) van Tieghem)

Shrub or small tree 3-7.5 m. tall. Leaves elliptic, rather thick, obtuse at the apex, narrowly wedge-shaped at the base, 1.5-2.5 cm. long, 0.4-1.7 cm. wide, costa raised above but rest of venation obscure although surface may be wrinkled. Flowers green, in reduced axil-

* Mildbraed, Brenan and myself have all treated *Notobuxus* as if it were of masculine gender hence the spelling *N. obtusifolius* will be seen. Undoubtedly it is more correct to consider it feminine as Hutchinson did; it is not evident what gender Oliver intended it to have.

lary inflorescences, unisexual or consisting of 1 or 2 male and female flowers together; female flowers shortly pedicellate with supporting bracts; male flowers subsessile with 4 anthers. Capsule ovoid, 10-12 mm. long, 7 mm. wide. Seeds black and shining, 3-angled, 6-7 mm. long. South Africa: East London, Port Elizabeth, etc.

A specimen from the E. Cape, Alexandria has the venation more marked and is similar to *Notobuxus benguellensis*; another specimen from the Transvaal, near Krantzberg Mt. has the venation marked and is very close to the latter species. These intermediate specimens suggest the specific limits between the two need examining. In fact Mlle. Mathou reduced *benguellensis* to a variety of *macowanii* while retaining *hirta* as a full species.

7. *Notobuxus madagascarica* (Baill.) Phillips
(Buxus madagascarica Baill., Buxella madagascarica (Baill.) van Tieghem)

Shrub 2-5 m. tall, glabrous. Leaves variable, linear to ovate-lanceolate or lanceolate, 2-9 cm. long, 0.1-4.8 cm. wide, the linear ones on young unbranched shoots, usually obtuse but sometimes attenuated, more or less wedge-shaped at the base, midrib raised above, venation obscure on both sides. Inflorescences consisting of a female flower with several male flowers surrounding it or of 2-4 male flowers only; anthers 4. Capsule ovoid, 5.6 (-7.5) mm. long, 5 mm. wide. Seeds black, shining, 4.5 mm. long. Madagascar. Perrier de la Bathie, who wrote up this plant (under *Buxus*) for the *Flora of Madagascar* described three subspecies, *sambiranensis, tropophila* and *xerophila.*

8. *Buxus macrocarpa* Capuron

Tree, 15 m. tall, glabrous. Leaves ovate, elliptic, thick, acuminate but actual apex acute or emarginate, wedge-shaped at the base, 6-9.5 cm. long, 2.3-4 cm. wide; mid-rib raised above, lateral nerves numerous, slightly prominent. Flowers not known. Capsule subglobose, 3 cm. long, 2.5 cm. wide; seeds black, 1.2-1.5 cm. long, Madagascar.

9. *Buxus hildebrandtii* Baill.
(Buxanthus hildebrandtii (Baill.) van Tieghem, Buxus calophylla Pax)

Tree about 6 m. tall. Leaves obovate or oblanceolate, rounded or emarginate at the apex, acute at the base, thick, 2.5-6.3 cm. long, 0.6-2.5 cm. wide, venation rather indistinct. Inflorescences subsessile or very shortly stalked, each cyme made up of a terminal female flower with surrounding male flowers; anthers 4, filaments 3 mm. long, rudimentary ovary present. Capsule ovoid, 1-1.2 cm. long, 7 mm. wide, seeds ellipsoid, brown and shining, 5 mm. long. N.E. Ethiopia and Somali Republic (N. Region).

10. *Buxus pedicellata* (van Tieghem) Hutch.
(Buxanthus pedicellatus van Tieghem)

Shrub about 3 m. tall. Leaves oblanceolate, rounded-obovate or almost round, rounded at the apex or even emarginate, wedge-shaped at the base, thick, 2-4 cm. long, 0.5-2.5 cm wide, venation indistinct. Inflorescences stalked, made up of 3-4 cymes each having 3-5 flowers, the terminal one female or all male; anthers 4, filaments 3 mm. long; rudimentary ovary present in male flower. Capsule ovoid, 1-1.2 cm. long. Seeds brown and shining, 7 mm. long. Socotra.

I think further study will show that this is not separable from the last. A number of this island's supposed endemics have now been found on the mainland.

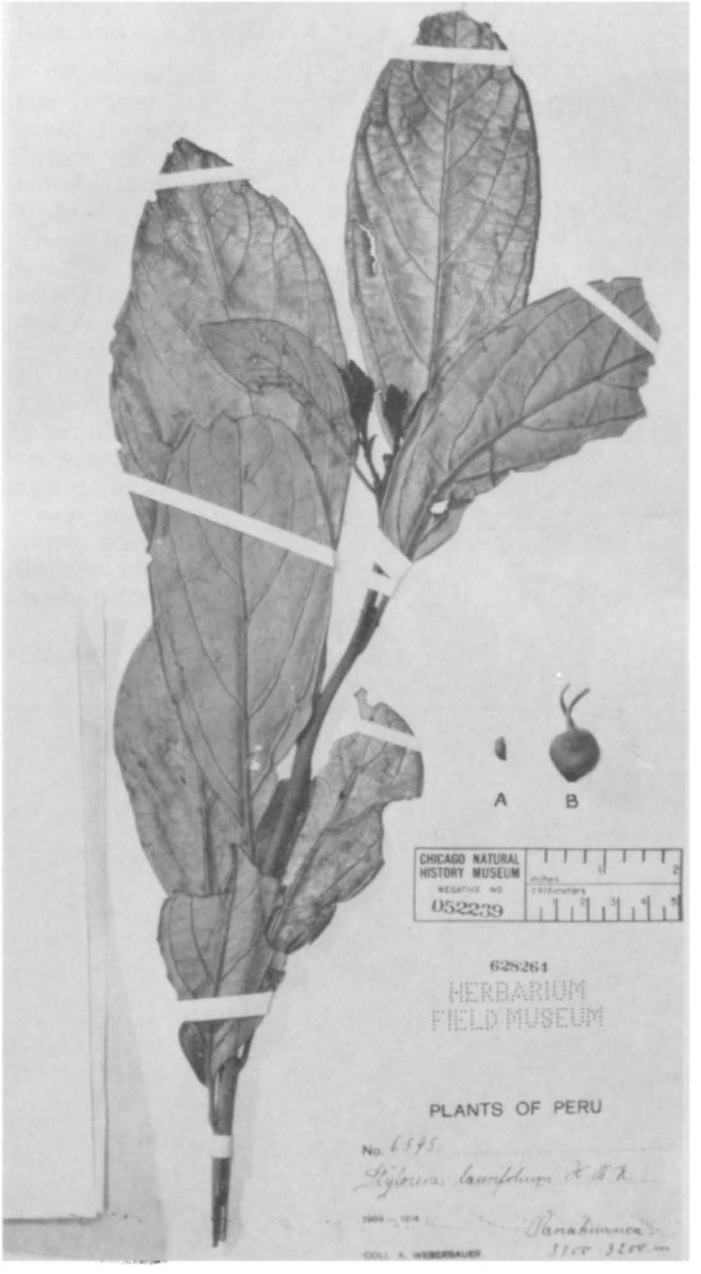
My thanks are due to the Director, Royal Botanic Gardens, Kew, for allowing me to use the Herbarium and Library of that institution.

Styloceras: South American Relative of Buxus

by

Dr. Gabriel Edwin

Chicago Natural History Museum, Chicago, Illinois



Adrian de Jussieu described *Styloceras* in 1824 from specimens collected in Ecuador: *S. kunthianum.* Other authors later described two additional species: *S. columnare* from Bolivia and *S. laurifolium* (Fig. 1), with a fairly wide distribution in Colombia, Ecuador, Peru, and Bolivia. All these plants are trees usually less than twenty-five feet tall, rarely up to forty feet. They occur in the Andes at elevations between 8,000 and 11,500 feet.

The botanist separates *Styloceras* from other representatives of the Buxaceae by a combination of technical characters. The fruit is a drupe and, accordingly, does not split regularly, nor does it have external sutures or septa. The ovary and fruit are usually 2 — (rarely 3) — locular with two ovules or seed in each locule. (There is, however, rather frequent abortion). False septa often develop in the mature ovary or young fruit to give the false impression of a 4-6-locular structure with each locule bearing a single ovule or seed. The horns of the fruit are often longer than the body. The male flower lacks sepals as well as petals, has numerous (6-30) stamens that are very large and sessile or almost so, has no rudiment of an ovary; the flower is subtended by one small bract on the side away from the axis. The genus is a good one, which means that its species fall readily together and should not be confused with other members of the family.

In their wonderful book, *Timbers of the New World,* Record and Hess state that wood specimens of *S. laurifolium* only had been available for study. The tree has deeply furrowed, corky bark. It has wood that is uniformly yellowish white and with a medium luster. The tree is highly esteemed locally for joinery. Though a first class timber, the tree is apparently without commercial possibilities because it occurs so sparsely.

Fig. 1. Herbarium specimen of *Styloceras laurifolium* (female), showing fruit and seed.

Courtesy of Chicago Natural History Museum

Pachysandra procumbens showing characteristic habit and with male flowers above the female, about natural size.

Bot. Reg. t. 33 (1815)

Pachysandra

by

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Pachysandra is a small genus of low-growing subshrubs and perennial herbs. Of the four species currently recognized, three are native to Eastern Asia and one to Eastern North America.

Pachysandra terminalis (Fig. 1), widely used in the United States and in Europe as an ornamental ground cover, is native to North Central China and Japan. It occurs there abundantly in deciduous woods of mountainous regions. *P. axillaris* and *P. stylosa* are found in Western China and Formosa. These species are less well known than *P. terminalis*. The American *P. procumbens* (Fig. 2) is distributed from north central Kentucky, through central and eastern Tennessee and western North Carolina into Mississippi, Alabama, and western Georgia, and as far south as Jackson County, Florida, and the Tunica Hills area of northern Louisiana. This plant is usually restricted to deciduous woods, most often on gentle to rather steep slopes of shaded ravines, and generally near a small stream. The soil of these situations is frequently calcareous, a mixture of moist clay and chert, with a circum-neutral pH. Rarely does one find representatives of this species in abundance.

The foliage of *Pachysandra* is evergreen or semi-evergreen. *P. stylosa* and *P. axillaris* are woody subshrubs with stems usually under eighteen inches. *P. terminalis* and *P. procumbens* are prostrate or decumbent herbs six to twelve inches high and with a clonal habit. A clone consists of many aerial shoots that arise from an extensive underground rhizome. Excavations of clones of *P. procumbens* reveal as many as thirty-eight aerial shoots connected by means of a single rhizome.

Development of the rhizome system of *P. procumbens* is as follows: after anthesis in March and April, the aerial stem dies and abscission occurs just above the inflorescence and leaves a short stump on the rhizome; a lateral bud already present on this stub-like portion of the axis then gives rise to a new aerial stem; this process is repeated annually and results in a well-developed, sympodially branched rhizome. It is possible, within limits, to estimate the age of a clone by counting the segments of a single sympodial axis, because each segment is, in most cases, equivalent to an annual increment of linear growth. The age of one clone was determined to be thirty-four years; this is surprising for a plant of

Fig. 1. *Pachysandra terminalis* at U. S. National Arboretum.

Fig. 2. *Pachysandra procumbens.*

such small stature. Much older clones may well exist in nature. An entire population might quite possibly be in a single clone that in time and by sympodial branching- perhaps followed by fragmentation- came to occupy a single site.

The leaves of *Pachysandra* are alternate, simple, and petiolate. They are approximate at the summit of the aerial stem of *P. procumbens* and *P. terminalis* and are progressively larger from the apex toward the base. The leaves of these two species are less widely spaced than in *P. stylosa* and *P. axillaris.* The size of the leaf varies less for these last-named plants than for the first two. Leaf shape is highly variable in the genus: broadly ovate to obovate in *P. procumbens* and *P. terminalis;* ovate to oblong-ovate in *P. axillaris;* broadly ovate, ovate-oblong, spatulate, elliptical, or obovate in *P. stylosa.* The leaf of *P. procumbens* is dark green above and dull green beneath and becomes silvery mottled with age. The leaf of *P. terminalis* is glossy dark green above and pale green beneath.

Structures of flowers and inflorescences are essentially the same throughout the genus. Flowers are apetalous and unisexual. The spicate inflorescence has one to five pistillate flowers attached toward the base of the peduncle and below the many (5-40), spirally-arranged, sessile, staminate flowers. The inflorescence is either terminal or axillary. As the specific name suggests, the inflorescence of *P. terminalis* is terminal. *P. procumbens* has an axillary inflorescence subtended by bracts and located at the base of the aerial stem. The other two species have inflorescences axillary to foliage leaves and with one short-cylindic or globose inflorescence at a node.

Each staminate flower has four sepals and stamens with filaments much longer than the sepals and attached to the receptacle around a central, rectangular nectary. Each pistillate flower is subtended by a number (7-13) of distinct, herbaceous bracts. *P. terminalis* has two carpels; the other species, three. Each carpel has two locules, each with a single ovule. The two or three broad and thickish styles are divergent or recurved and are stigmatic along the inner surface.

P. procumbens usually flowers during late March and early April. During flowering the peduncle elongates rapidly; the flowers expand; a spike often four inches long is formed. The dazzling white, fleshy filaments elongate rapidly- as much as two millimeters in twenty-four hours- and reach a length twice that of the calyx.

During anthesis the staminate flowers emit a penetrating odor faintly resembling that of carnations, or, to some people, the essence of ammonia. The odor can be detected from a distance of several feet when the air is still. The quality of the odor changes as anthesis progresses: it is first pleasantly fragrant and then sharp and somewhat annoying.

The pollen of *P. procumbens* falls from the staminate flowers onto the pistillate ones below. After anthesis the stamens abciss; in falling they carry a certain amount of adherent pollen thus providing an additional opportunity for pollination. Insects that visit the male flowers may play an accidental role in pollination by the dislodgment of anthers or pollen grains that may fall to the stigmatic surfaces below.

The mature fruit of *Pachysandra* is essentially subglobose, lobed, and indehiscent. The styles persist at the top like curved horns. The fruit of *P. terminalis* is baccate; of the other species, capsular. Data on herbarium labels for *P. terminalis* collected in China and Japan indicate that its fruits are eaten by the native people. The fruits are comparable in size to the Delaware grape and are said to have a decidedly sweet taste.

The seeds of all species are trigonal in outline. The seed coat is smooth, hard, and glossy and varies from dark brown to black. Seeds of *P. procumbens* have a prominent caruncle whereas in other species this structure is inconspicuous or absent.

Seeds of *P. procumbens* are shed in July and August. Although considered a capsule, the fruit does not dehisce along sutures at maturity, rather the somewhat fleshy tissue surrounding the base of the fruit becomes very soft and ruptures and thus allows the seed to drop out. The seed remain dormant during fall and winter and germinate in the spring, usually the latter part of March or early April. Actually, fruit and seed production for most populations of this species are rare. For example, a survey of several hundred plants in a ravine near Nashville, Tennessee, yielded only twenty-five fruits with seeds. The potential number of seeds per fruit is six; that number is rarely produced: in most cases, when fruit is set, fewer than four seeds reach maturity.

Japanese pachysandra (*P. terminalis*), though introduced into the United States as recently as 1882, is one of the most widely used ground-cover plants. Its glossy, evergreen leaves, its low and rapidly creeping growth, its extreme tolerance for shade, its easy propagation from cuttings of aerial stems and rhizomes are all attributes that have contributed to the popularity of this plant as a ground cover, especially in shady places where it is difficult to establish grass. This plant, however, is subject to attack by pests such as scale insects and a fungus that causes canker blight or leaf spot.

The horticultural variety *P. terminalis variegata* (Fig. 3) has smaller leaves than those of the species and with ivory white areas chiefly along the margins. It is a handsome plant. Wayside Gardens often have a photograph of this variety in their catalogue. They offer it as 'Silveredge' and suggest that in addition to its effectiveness as a ground cover it is an extremely attractive house plant all winter lang.

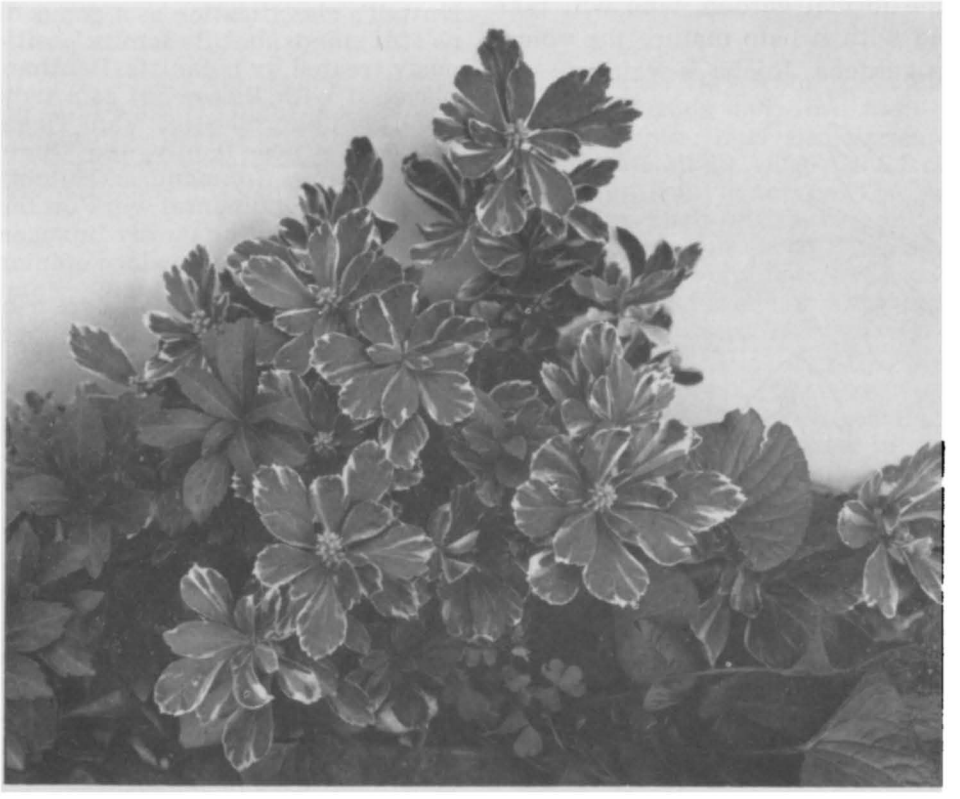

Fig. 3. *Pachysandra terminalis* var. *variegata* at "Heronwood", Upperville, Virginia.

Photograph, Howard Allen, Middleburg, Va.

A Desert Boxwood Still in the Desert

by

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The Jojoba or *Simmondsia chinensis* (Link) Schneider of the boxwood family is still unselected and undeveloped as an ornamental. Its dense leafy habit, its xerophytic nature, and its genetic variability could make it the desert boxwood for arid land gardens. In its native habitat, the Sonoran Desert, it fits grayly and inconspicuously into a community of plants, many of which have been made spectacular by sun and drought, as the odd forms of thorn shrubs, giant cacti, agaves, and other succulents. With such striking companions it is little wonder that Jojoba has been overlooked. Perhaps it will be the boxwood fancier, with an imaginative appreciation for the formal garden, who will take Jojoba in hand and with it help mature the young art of our western gardens. Jojoba is waiting.

The name Jojoba (pronounced hohoba) comes to us from the colonial Spaniards, who took it from the Papago Indian name, "hohowi" (1). Botanically, in the United States it was known for almost one hundred years as *Simmondsia californica* Nuttall, described from a collection made near San Diego in 1844 (2). However, unknown to Nuttall, the same species had been described in 1822, as *Buxus chinensis,* by H. F. Link in Germany, who was led to believe that the collection originated in China (3). Since the nomenclatorial rule of name priority obtains, we are compelled to call our California plant after China. As I recall, the confusion began when plants collected on one of the early voyages were labeled as from China, when actually they had been collected earlier on the same voyage in California. Nuttall's classification as a genus distinct from *Buxus* still stands, but its family position has been variously treated by botanists. Bentham and Hooker (4) placed it with *Buxus* but as a tribe "Buxae" in the family Euphorbiaceae. Van Tieghem (5) in 1897 proposed a new family, the "Simmondioacées" for the one genus *Simmondsia.* Hutchinson, however, in his recent monumental work on family classification (6) retains it in the family Buxaceae, and this represents a concensus of modern opinion.

Errors are still made in describing *Simmondsia*: e.g., as monoecious, but it is dioecious; capsules as 1-seeded, but they are 1-3-seeded. Perfect flowers rarely occur but have never been observed to develop fruits. The pollen has been described as large, heavy, and not of the wind-borne type. Having read this and noting that the plant has no known pollinators, and having observed isolated female plants with large normal seeds, I thought Jojoba might be apomictic. Accordingly, in the spring of 1957, near Aguanga, California, about two hundred paper bags were tied over pistillate branches. This prevented pollen of neighboring male plants from contacting the receptive stigmas of the female plants. No fruit was set under these bags, while the branches without bags developed their normal set of fruits and seeds. At least the Jojoba bushes at Aguanga that year were not apomictic, and the pollen was seen to fly in the wind when a staminate plant was shaken. Judging from this and isolated seed-bearing plants, pollen commonly is borne by the wind for a half mile or more.

Fig. 1. Fruiting Jojoba in four forms: A, typical; B, nodal; C, fascicled; D, racemose.

Fig. 2. Natural cover of Jojoba and other shrubs on sandy clay hills near San Vicente, Baja California.

Fruit differences (Fig. 1) are hereditary, but the genetic constitution of this unique plant is quite unknown. The long generation period of 5 to 7 years does not lend itself readily to genetic manipulation of progeny and has doubtless discouraged genetic curiosity.

Although variable, Jojoba is always Jojoba; once known in detail, it is thereafter easily recognized. The variability of fruiting types (Fig. 1) could mean different species in some genera but not in *Simmondsia*. There are no other correlative morphological characters to justify division into several species. The variations in habit, foliage, flower, and fruit occur at random throughout the various populations in such a way that not even good subspecies can be devised.*Simmondsia* remains a monotypic genus. The genetic variants could be designated as forms or varieties and doubtless will be, whenever Jojoba comes firmly into culture. In 1957, a detailed study was made throught the Jojoba area to assess its possibilities as a potential cultivate (7). Its seeds contain about 50% liquid wax of potential value to industry. As a prospective ornamental, some of its features and variable characters are described below. For other details concerning the nature of Jojoba, the reader is referred to a previous article, "The Natural History of Jojoba" (7).

In habit Jojoba is always a shrub, sometimes with a single stem, but more often with several. Rarely the crown may be rather open and broken, but mostly it is dense and twiggy. Infrequently it forms a rather strictly erect bush, but more commonly it is a dense, broad, hemispherical shrub (Figs. 2, 3). It may sucker out deeply from the roots, especially after fire.

The leaves vary from green and yellowish green to gray glaucous and, in a more uncommon form, bluish-glaucous. Leaf size varies considerably, but this may result in large part from soil conditions rather than from genotype. The leaves are opposite, though one plant with leaves in a whorl of three at a node has been observed. The leaves are always entire, thick, sclerophyllous, ovate to oblong, and long-lived; they last for one or two years, depending upon moisture conditions. They have a thick waxy coating.

The flowers are without petals. The male flowers are borne in small clusters in the leaf axils and, when open, are conspicuous but hardly showy. They are commonly held in the bud over winter and on into spring, just how long depending upon rains and temperatures. After opening the flowers rapidly shed pollen and remain shriveled indefinitely on the stems. The female flowers are small and inconspicuous, green like the leaves, and usually solitary in the leaf axils. They commonly reach bud stage in the fall and remain closed until the following spring, when the stigmas elongate and become receptive (Fig. 4).

Some of the habit and leaf variants in combination afford ornamental forms suitable for landscaping, for hedges, or just as something green and leafy in dry seasons when most other southwestern plants are leafless. The Boyce Thompson Southwestern Arboretum near Superior, Arizona, maintained a pruned Jojoba hedge for many years, and it may still be there. Fig. 5 shows an unpruned hedge at Tucson, Arizona.

For those who may be interested in exploring through the wild Jojoba stands for interesting Jojo-

ba variants, I am including field notes made in earlier years on some of the populations visited.

Camp Creek Population — N. of Phoenix, Arizona.

This population is distinguished by the frequency of long-lobed calyces (equaling or exceeding the capsules) and by the wide variety of capsule and habit types. Being along the northern limits of Jojoba distribution and at 3,000 to 3,500 feet elevation, the whole Camp Creek population should be relatively cold hardy.

Tucson Mountain Population — W. of Tucson, Ariz.

Consists of rather strict, twiggy, dense bushes of low to medium stature with pointed capsules at every other node. It is less variable than other populations mentioned here. The environment is arid with rocky coarse atrital soils containing mixtures of clay and a caliche substratum. Progeny cultivated from this population have given very poor seed yields.

Santa Marga Population — *ca.* four miles S. of San Vicente, Baja California.

Occupies a small area of several acres with heavy clay soil subject to polygonal cracking; unusual soil type for Jojoba. Morphologically, this population is characterized by a big-leaved, grayish, strong-shooted, cespitose shrub with large strong-peduncled capsules having thick valves. This is not the only place where this form occurs, but it is uncommonly abundant here.

Santo Tomas Population — Baja California.

Is characterized by long-peduncled capsules and a relatively high percentage of shrubs with fascicled fruits, especially in a corner of the valley about two miles N. W. of town near the highway. Here, about 10-20% of the pistillate plants show about 20% or more of their fruiting nodes in fascicles.

San Telmo Population — Baja California.

This is a maritime form striking in its consistently low-mounded habit, the bushes seldom exceeding

Fig. 3. A dense, robust, symmetrical shrub: second growth after a brush fire thirty years previous.

Fig. 4. Pistillate flowers on March 10, just before extrusion of the pistils.

½ m in stature. They grow rather closely with other members of the coastal sage brush community. It appears to be a climatic type characteristic of the California seaboard.

Upper San Telmo Valley Population — Baja Calif.

The plants here are commonly about two m. tall, have short seeds, clonal or cespitose growth, and variable capsule forms. On the whole, it is quite similar to the Aguanga population in Southern California.

When the above note was written there were several thousands of plants composing the population, but since then much of the valley has been cleared for cultivation. A much reduced population still exists scattered upon the bordering hills. Within the last fifteen years many thousands of acres containing Jojoba have been cleared for cultivation in northern Baja California. The species is still common there but in more relic form. When last visited in 1961, the San Matias Pass in northern Baja California still had many thousands of plants.

The large seeds of Jojoba germinate readily in moist sandy soil with day temperatures at 80°F and above. They transplant well if held through the first year in tar paper pots, but seedlings of only a few months may die of root damage in moving. Where winter temperatures fall below 25°F, plants should be held protected through the first, and even better, through the second winter so that hard wood can develop. The wild shrubs in Arizona are known to survive winter lows of 15°F, but seedlings have been killed at 25°F.

Cuttings from the new flowering shoots root readily in moist sand, especially with the aid of root-promoting substances. Such propagations have been

known to set fruit in their second year. So far as observed, however, the root systems of such propagations develop poorly; growth is slow. I have not observed developments after the second year.

Jojoba needs well-drained deep soil. It grows naturally in gravel, sand, or in rocky calcareous soils. A fine experimental planting at Riverside, California, was apparently ruined by over-irrigation and a rising water table. Roots commonly penetrate to eight or ten feet below the ground surface.

It may be that Jojoba would grow on the coarser terrace soils of our Southeast where winter lows are not severe. Seeds have been sent to many countries, as Argentina and to the Old World. We have reports that it has done well in Israel, which has a California type of climate, and in the Canary Islands. These have been trial plantings, quite preliminary to making a real domesticate of Jojoba. The long process of selecting and breeding the proper varieties for a given place and purpose has hardly begun.

Jojoba's finest attribute is variability, giving man his most cherished function: the opportunity to choose. As with boxwood, the choice is generically narrow, but it is there; rare cheese should be sliced thin. In this age when industry and suburbia are feverishly inciting sameness and political philosophies are extolling conformity, perhaps man can relearn the value of difference with a thing like Jojoba.

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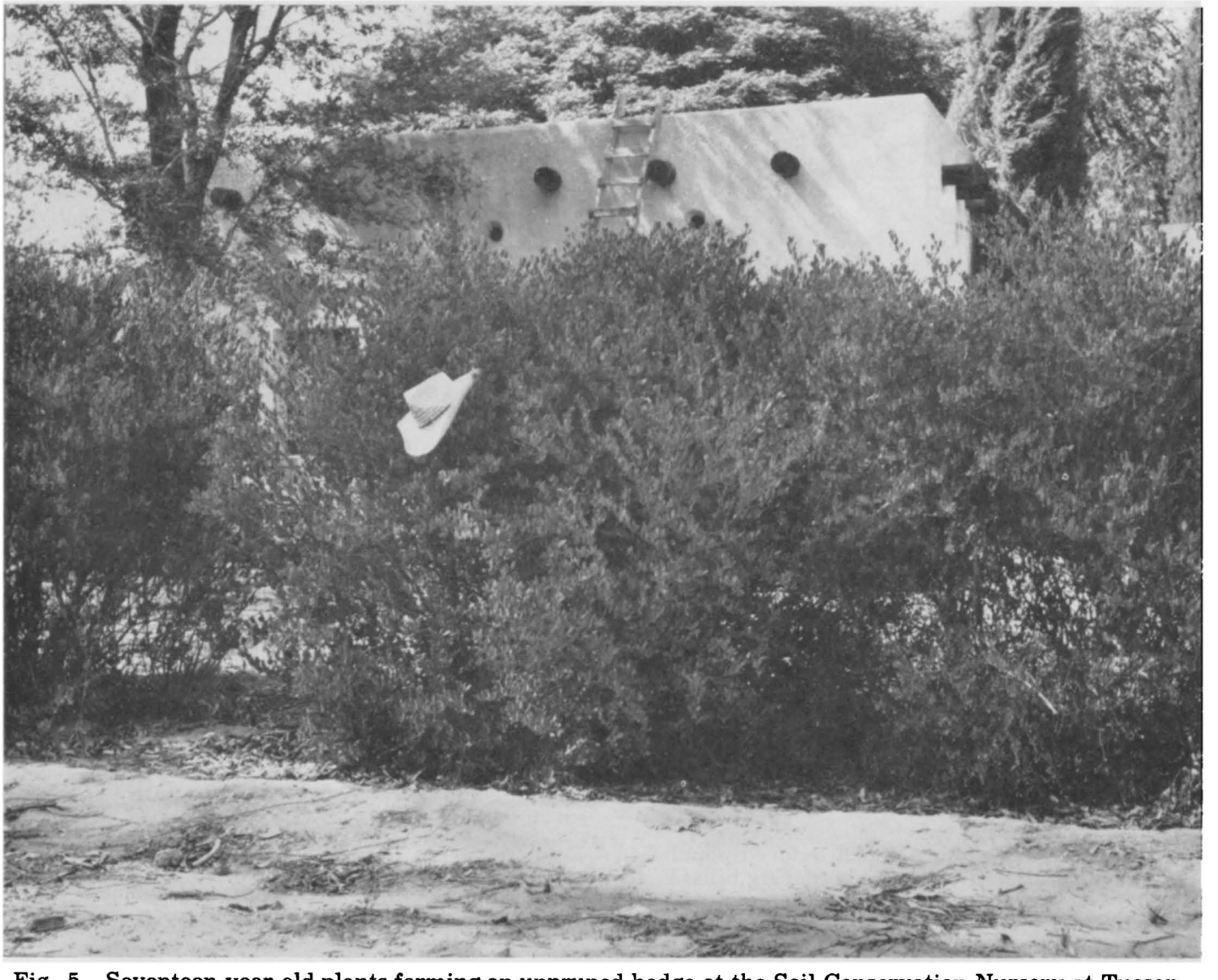

Fig. 5. Seventeen-year-old plants forming an unpruned hedge at the Soil Conservation Nursery at Tucson, Arizona. Soil is a sandy loam.

The American Boxwood Society

Purposes (as copied from the Society Constitution):

"The objects of this Society are educational. It shall investigate, assemble, record, preserve, and disseminate among its members, and to other selected and suitable individuals, publications, and institutions, pertinent information on the care, propagation, and uses of boxwood, knowledge of its commercial, horticultural, scientific, and other aspects, and appreciation of its unusual place in the gardens, literature, and effections of mankind for more than 3000 years of recorded history.

"It shall encourage and facilitate contacts and the exchange of information between members of the Society, foster and search for new species and varieties of boxwood, aid in their scientific study and classification, lend support to the collection and care of a plantation of all types of boxwood, help in making the use and planting of boxwood popular and distribute useful and informative articles upon boxwood for the benefit of its members.

"It shall collect printed material upon and illustrations of boxwood species and varieties, of significant boxwood collections, and of historic or otherwise notable gardens in this country and abroad displaying boxwood. It shall assemble and make available to members information upon the locations and visiting hours of public arboreta and commercial nurseries where there is boxwood and, where permission is granted, shall provide information upon the introductions necessary or other requisite conditions, under which members may obtain permission, in this country and abroad, to visit private gardens having boxwood but not customarily open to the public.

"The society shall cooperate in particular with those persons and organizations likewise dedicated to the preservation of what is good and beautiful in the United States and to the improvement and beautification of what is not."

Eligibility:

All persons interested in the objectives of the Society are welcomed to membership, subject to approval of the membership committee.

Activities:

At present the main activity of the Society is centered on acquiring and sharing all possible information on boxwood. To this end (1) it holds an annual spring meeting at which there are plant and literature exhibits, talks by authorities on boxwood, and a mutual sharing of experiences; and, (2) it publishes THE BOXWOOD BULLETIN, presenting articles on all phases of boxwood and also serving as a clearing house for members to present experiences, photographs, information and questions concerning box.

The Society sponsors a boxwood collection at its headquarters at The Orland E. White Research Arboretum, of the Blandy Experimental Farm, Boyce, Virginia. In this collection it tests new acquisitions for hardiness, maintains as complete a list as possible of hardy cultivars, and — under glass — carries plants of a number of boxwood types not hardy in the area. Other activities include recognition awards in the field of interest of the Society, and the maintenance, at its headquarters, of a library dealing with the literature on boxwood.

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A subscription to the Boxwood Bulletin is included as one of the benefits of membership in the American Boxwood Society, with $2.00 of the dues of each member being allotted for the Bulletin subscription.

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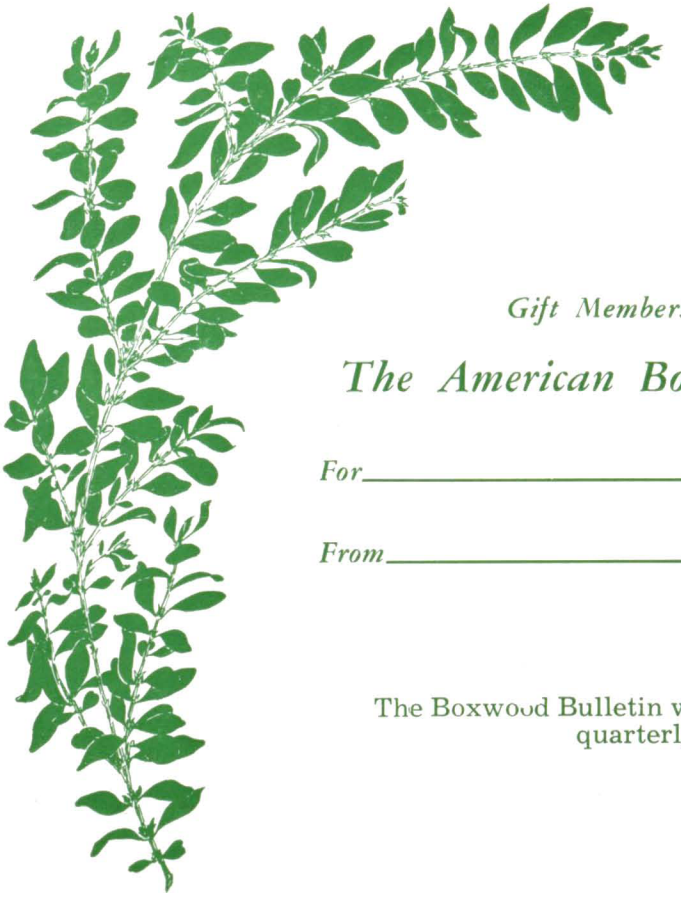

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