SMITHSONIAN CONTRIBUTIONS TO BOTANY • NUMBER 31

A Monograph of the Lichen Genus *Pseudoparmelia* Lynge (Parmeliaceae)

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SMITHSONIAN INSTITUTION PRESS
City of Washington
1976

ABSTRACT

Hale, Mason E., Jr. A Monograph of the Lichen Genus *Pseudoparmelia* Lynge (Parmeliaceae). *Smithsonian Contributions to Botany,* number 31, 62 pages, 18 figures, 1976.—A world monograph of the genus *Pseudoparmelia* is presented. There are 76 species, most occurring in dry subtemperate to tropical areas and especially concentrated in the arid scrub lands of South Africa, Australia, and Brazil. The genus is characterized by an unusually high number of species with divaricatic acid and related orcinol depsides. The following new species are described: *P. callichroa* Kurokawa, *P. concomitans* Hale, *P. conlabrosa* Hale, *P. dahlii* Hale, *P. neoquintaria* Hale, *P. subambigua* Hale, *P. subamplexa* Hale, and *P. venezolana* Hale. The following new combinations are made: *P. corrugativa* (Kurokawa and Filson) Hale, *P. exornata* (Zahlbruckner) Hale, *P. gerlachei* (Zahlbruckner) Hale, *P. papillosa* (Lynge ex Gyelnik) Hale, *P. rodriguesiana* (Hue) Hale, *P. schistacea* (Kurokawa and Filson) Hale, *P. scotophylla* (Kurokawa) Hale, and *P. spodochroa* (Kurokawa and Filson) Hale.

OFFICIAL PUBLICATION DATE is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year*. SERIES COVER DESIGN: Leaf clearing from the Katsura tree *Cercidiphyllum japonicum* Siebold and Zuccarini.

Library of Congress Cataloging in Publication Data
Hale, Mason E.
A monograph of the lichen genus *Pseudoparmelia* Lynge (Parmeliaceae)
(Smithsonian contributions to botany ; no. 31)
Bibliography: p.
Includes index
Supt. of Docs. no.: SI 1.29:31
1. Pseudoparmelia. I. Title. II. Series: Smithsonian Institution. Smithsonian contributions to botany ; no. 31.
QK1.S2747 no. 31 [QK585.P2] 581'.08s [589'.1] 75-619375

Contents

A Monograph of the Lichen Genus *Pseudoparmelia* Lynge (Parmeliaceae)

Mason E. Hale Jr.

Introduction

This world monograph of the lichen genus *Pseudoparmelia* is part of my continuing effort to revise the parmelioid genera. Although these genera are usually lumped under the collective name *Parmelia,* recent studies with the scanning-electron microscope have demonstrated that species previously classified under *Parmelia* fall into two distinct groups, one with a paraplectenchymatous upper cortex and very frequently with pseudocyphellae, typified by *Parmelia saxatilis* (L.) Acharius and including the *P. borreri* group, and another with a palisade plectenchymatous upper cortex and an overlying pored epicortex but never with pseudocyphellae (Hale, 1973a).

The epicorticate group includes several heterogeneous elements differing, for example, in marginal ornamentation (cilia, bulbate cilia), rhizine branching patterns (simple or dichotomously branched), and lobe configuration and width (broad apically rotund to narrow obtuse lobes). These elements are, in my opinion, biologically isolated and represent good genera, as follows: *Bulbothrix* Hale with bulbate cilia and no cortical pigments (Hale, 1974), *Hypotrachyna* (Vainio) Hale with narrow eciliate lobes and dichotomously branched rhizines (Hale, 1975a), *Parmelina* Hale with narrow ciliate lobes (Hale, 1974), *Parmotrema* Massalongo with broad rotund lobes (Hale, 1965a), *Pseudoparmelia* Lynge with narrow eciliate lobes, *Relicina* (Hale and Kurokawa) Hale with bulbate cilia and usnic acid in the cortex (Hale, 1975b), and *Xanthoparmelia* (Vainio) Hale with narrow eciliate lobes and usnic acid in the cortex (Hale, 1974).

As with *Hypotrachyna* (Hale, 1975a) and *Relicina* (Hale, 1975b), much of the initial work on the chemistry of *Pseudoparmelia* was completed before thin-layer chromatography came into use in 1965. Thus it has been necessary to reinvestigate the chemistry of many specimens. Even with the application of the most recent techniques, however, this monograph can be considered definitive only in the broadest sense. Fresh lichen collections are now being made every year in exotic regions, especially in Africa, Australia, and South America, by botanists and more significantly by professional lichenologists, who had not previously collected outside temperate areas and who choose to identify the specimens themselves rather than send them to a monographer. Under these circumstances, any monograph will be incomplete in two respects. For one, information on new records not available for study will be omitted, records that could profoundly affect interpretations of phytogeography. The older specimens now preserved in herbaria are a pitifully inadequate representation of lichen floras. Secondly, unpublished new species which are sure to be found in a genus as large as *Pseudoparmelia* obviously cannot be included in the keys, and this lack makes species identification more difficult for lichen students. This monograph is offered, then, with full realization of its limitations but with the hope that it will provide a base for later workers.

ACKNOWLEDGMENTS.—I am much indebted to curators who sent specimens on loan and often allowed considerable extensions of loan periods.

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These include Mr. Peter James (BM), Dr. A. J. Kostermans (BO), Dr. A. Robyns (BR), Mr. M. S. Christiansen (C), Dr. W. A. Weber (COLO), Dr. W. L. Culberson (DUKE), Dr. L. Williams (F), Dr. I. M. Lamb (FH), Dr. C. E. Bonner (G), Mr. C. E. Palmar (GLAM), Dr. T. Ahti (H), Dr. H. Schindler (KR), Dr. J. Poelt (M), Dr. H. A. Imshaug (MSC), Dr. H. Osorio (MVM), Dr. C. T. Rogerson (NY), Dr. Hildur Krog (O), Dr. E. F. Warburg (OXF), Mme. Jovet-Ast (PC), Dr. C. E. Smith (PH), Dr. S. Ahlner (S), Dr. S. Kurokawa (TNS), Dr. R. Alava (TUR), Dr. I. Tavares (UC), Dr. R. Santesson (UPS), Dr. H. Riedl (W), Dr. J. W. Thomson (WIS), and Dr. G. Cufodontis (WU). Dr. Ove Almborn (LD) lent his own extensive collections in addition to materials from BOL, L, PRE, and TRH which he had on hand for study. Dr. Z. Cernohorský kindly arranged for loans from BP at a time when travel in Hungary was not permitted. The late Dr. H. des Abbayes (REN) was extremely generous in sending loans as well as duplicates of type-collections of the new species he was describing. For allowing me to examine collections in their private herbaria, I am especially indebted to Dr. D. D. Awasthi, Dr. Gunnar Degelius, Dr. M. Mahu, Dr. T. D. V. Swinscow, and Dr. Rolf Santesson.

The specimens were photographed by the Smithsonian Office of Printing and Photographic Services. Scanning-electron microscope photographs were prepared by the Smithsonian Scanning-Electron Microscope Laboratory.

Dr. S. Kurokawa assisted with species identifications, chemical tests, and descriptions prior to 1961, and his help is gratefully acknowledged. Field studies have been supported at various times by the National Science Foundation, National Geographic Society, Smithsonian Research Foundation, and the Morden-Smithsonian Fund. Cooperative field studies were conducted in India with the Maharashtra Association for the Cultivation of Science, working with Dr. P. G. Patwardhan, and in Venezuela with Dr. M. López-Figueiras of the Universidad de los Andes. Finally, I wish to thank Dr. Ove Almborn for reading the entire manuscript and checking the bibliography and spelling of place names.

Morphology

THALLUS.—The thallus is typically foliose, orbicular, 3–15 cm in diameter, and uniformly adnate, even at the margin. The degree of adnation varies from nearly subcrustose in *P. xanthomelaena* (Figure 18*e*) to loosely adnate in *P. caperata.* Comparable eciliate species of *Parmotrema* have wider, more or less marginally erect lobes. Lobe configuration is variable. While some species have sublinear, apically obtuse lobes 0.5–2.0 mm wide (Figures 6*b,d,* 10*e,* 12*d*), an even larger number have subirregular, apically rotund lobes 2–6 mm wide (Figures 6*a,c,* 9*a,* 10*c,* 12*c*). Lobes in both types are often contiguous and crowded. There is no marginal ornamentation in *Pseudoparmelia;* the margins are smooth and sometimes black rimmed.

The lower surface of the thallus is either black or pale brown, and this color difference, although variable in some of the saxicolous species, can be an important taxonomic character. Broader lobed species with a black lower surface, such as the well-known *P. caperata,* usually have a narrow brown zone at the lobe tips. While most species have a shiny paraplectenchymatous lower surface (Figure 1*c*), species in the *P. amplexa* group *(P. amplexa, P. pachydactyla,* and *P. subamplexa)* have a minutely grained, velvety appearing black lower surface to the margin (Figure 1*a,b*). This is caused by an irregularly thickened, minutely papillose cell layer sloughing from the lower cortex, a phenomenon which I have not seen in any other parmelioid genera.

Rhizines are uniformly simple and produced in moderate abundance (Figure 1*d*). The only exception to this rule is *P. intertexta,* which usually has pale branched rhizines, not unlike those of some species of *Relicina* but not as agglutinated (Hale, 1975b). Broad-lobed species usually lack rhizines along the margins at lobe tips or at most have a zone of short papillae. The rhizines are often blunt with pale, penicillate tips (Reznik et al., 1968).

The internal structure of *Pseudoparmelia* presents no unusual features (Figure 2*a,c,f*). The upper cortex has a basic palisade structure (Figure 2*d*) and is overlain by a thin pored epicortex (Figure 1*e,f*), as I had previously discovered by using the scanning-electron microscope (Hale, 1973a). The medullary hyphae are often conspicuously encrusted with lichen substances. The lower cortex is paraplectenchymatous (Figure 2*e*). In these respects it is identical with the other epicorticate genera in the family.

VEGETATIVE PROPAGULES.—The isidia in *Pseudo-*

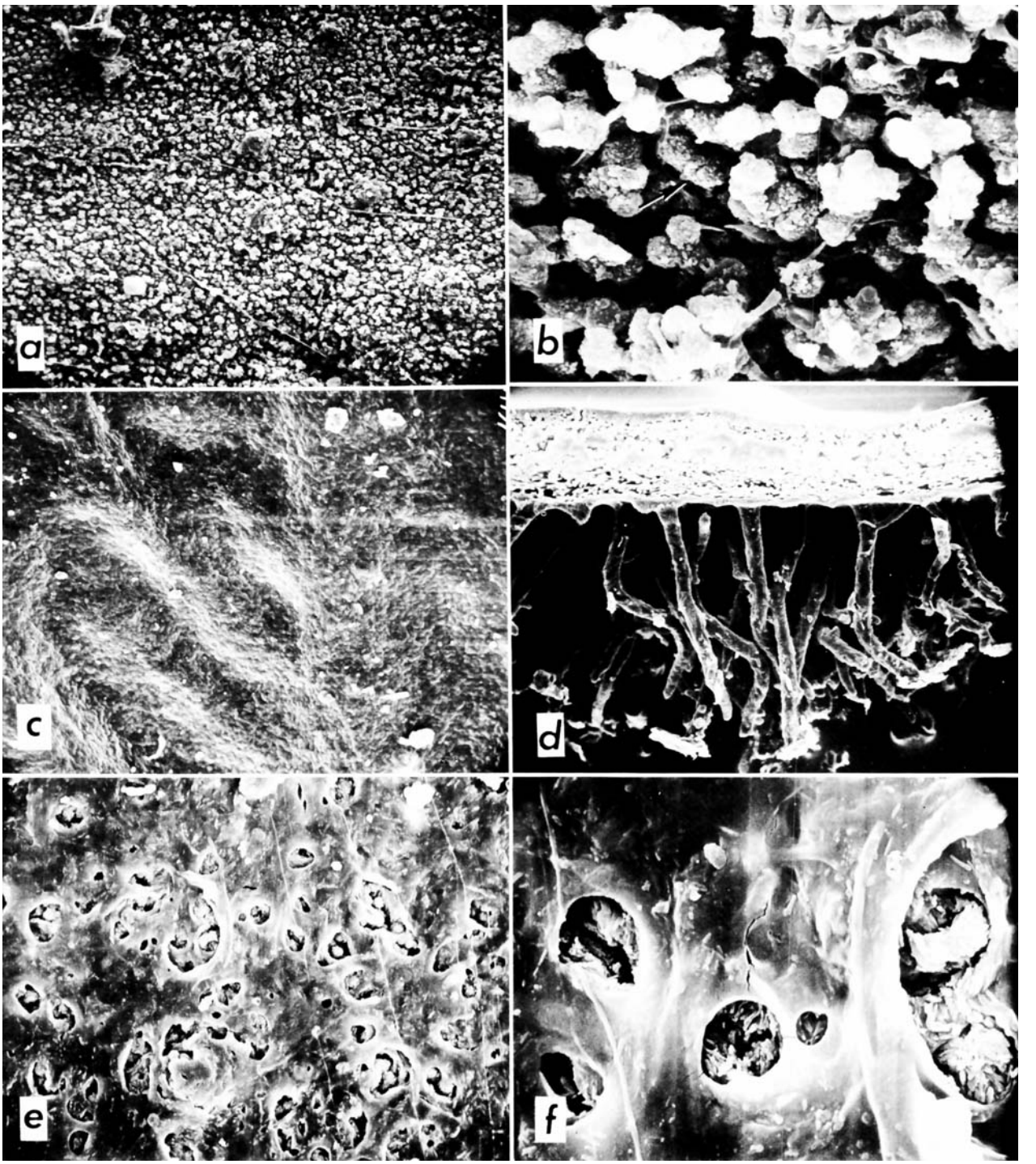

FIGURE 1.—Morphology of *Pseudoparmelia: a,* lower surface of *P. amplexa (Degelius* s. n.) (× 160); *b,* enlargement of surface in *a* (× 1600) with arrow pointing to a papilla; *c,* lower surface of *P. rutidota (Degelius* A–37) (×160); *d,* cross section of *P. malaccensis* to show simple rhizines (*Hale* 30353) (×140); *e,* surface of *P. rahengensis* showing pored epicortex (*Kurokawa* 1602) (× 400); *f,* enlargement of surface in *e* showing pores and aggregations of crystals of usnic acid (× 1600). (All photographs taken with the scanning-electron microscope.)

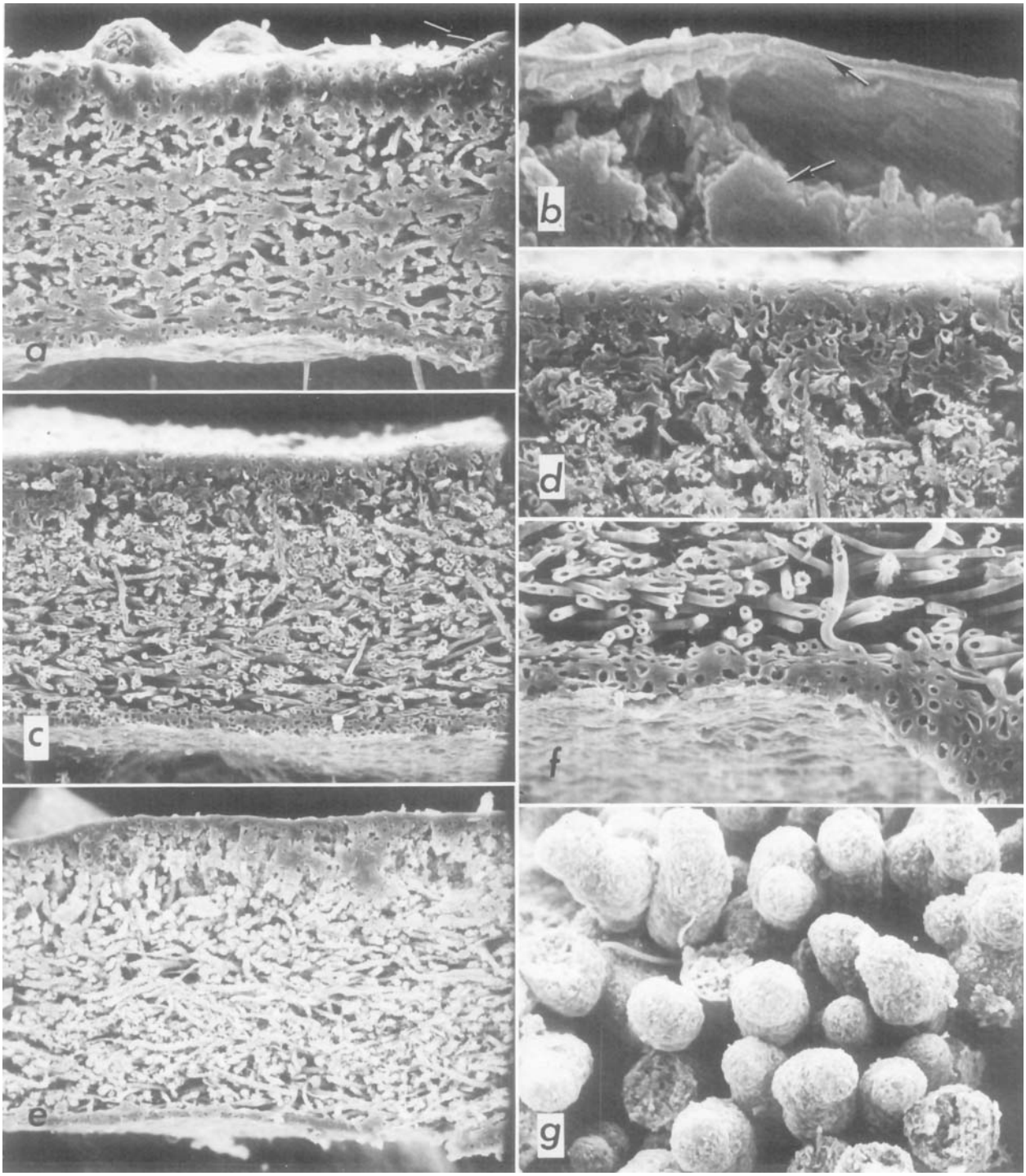

FIGURE 2.—Morphology of *Pseudoparmelia: a,* longitudinal cross section of *P. venezolana* with arrow in upper right pointing to the epicortex *(Hale* 45526a) (× 390); *b,* enlargement of epicortex in *a* (upper arrow) and upper cells of the cortex (lower arrow) (× 4000); *c,* longitudinal cross section of *P. spodochroa* (*Weber* 47220) (× 370); *d,* enlargement of upper cortex in *c* (× 800); *e,* longitudinal cross section of *P. sphaerospora* (*Culberson* 10324) (× 240); *f,* enlargement of lower cortex in *e* (× 800); *g,* isidia of *P. dahlii* (isotype in US) (× 160).

parmelia are quite uniform. Twenty species *(P. adspersa, P. amazonica, P. annexa, P. arcana, P. basutoensis, P. caroliniana, P. cinerascens, P. concrescens, P. conlabrosa, P. cyphellata, P. dahlii* (Figure 2*g*), *P. ecaperata, P. ischnoides, P. malaccensis, P. martinicana, P. neoquintaria, P. salacinifera, P. scotophylla, P. subtortula,* and *P. venezolana)* have normal, cylindrical, simple to sparsely branched isidia. Two additional species *(P. pachydactyla* and *P. papillosa)* have abnormally thickened but otherwise normal isidia (Figure 14*d*). No species have lobulate, procumbent, or ciliate isidia.

Pustules have been described and illustrated for *Hypotrachyna* (Hale, 1975a), and they are more or less the same in *Pseudoparmelia* (Figure 7*b*), very thickened, fragile, hollow isidioid structures which usually break open apically. Some then produce soredia, while in other cases no soredia form. Seven species *(P. baltimorensis, P. eruptens, P. geesterani, P. owariensis, P. pustulescens, P. schistacea,* and *P. zimbabwensis)* have largely nonsorediate pustules. One species *(P. raunkiaeri)* has heavily sorediate pustules.

Soralia occur in 14 species: *P. alabamensis, P. aptata, P. caperata, P. carneopruinata, P. crozalsiana, P. cryptochlorophaea, P. epileuca, P. gerlachei, P. labrosa, P. leucoxantha, P. soredians, P. subambigua, P. subamplexa,* and *P. texana.* They are usually orbicular and discrete except in *P. caperata,* which has coalescent, more diffuse soralia. All are strictly laminal except for *P. leucoxantha* (Figure 13*b*), where the soralia are largely submarginal. It is perhaps noteworthy that all of the sorediate species, excepting P. *alabamensis,* are corticolous; sorediate, obligately saxicolous species are very rare in the genus.

The remaining 32 species lack any vegetative propagules. The older lobes, however, may become lobulate or heavily rugose, although, as pointed out above, no species have true laminal lobulae (phyllidia) or lobulate isidia. Virtually all of these species are fertile.

Apothecia.—Apothecia, found so far in 47 of the 76 species, are extremely uniform. They are sessile to subpedicellate and 1–3 mm (rarely to 6 mm) in diameter. The disc is always imperforate. The asci contain eight spores, and the bulk of the species have spores in the range of 6–10 μm wide and 7–13 μm long. *Pseudoparmelia caperata* and *P. concomitans* have the largest spores, up to 24 μm long.

Chemistry

The chemical constitutents of *Pseudoparmelia* were first summarized by Hale and Kurokawa (1964) on the basis of microcrystal tests. I have retested most of the species with thin-layer chromatography, using solvent systems A and B of C. Culberson (1972) and in large part confirming the earlier results. The lichen substances in the genus are listed below under the presently accepted classification with number of species containing each substance in parentheses.

Aliphatic Acids

Caperatic acid (5)
Protolichesterinic acid (3)
Others (2)

Aromatic Compounds

Orcinol Series

para-Depsides
- Divaricatic acid (9)
- Evernic acid (1)
- Gyrophoric acid (4)
- Lecanoric acid (4)
- Obtusatic acid (1)
- Perlatolic acid (2)

meta-Depsides
- Crytochlorophaeic acid (1)
- Sekikaic acid (1)

Depsidones
- Neoloxodic acid (2)
- Norlobaridone (3)

β-Orcinol Series

para-Depsides
- Atranorin (55)
- Barbatic acid (1)
- 4–0–Demethylbarbatic acid (1)

Depsidones
- Constictic acid (5)
- Fumarprotocetraric acid (1)
- Norstictic acid (2)
- Physodalic acid (2)
- Protocetraric acid (25)
- Salazinic acid (7)
- Stictic acid (8)
- Succinprotocetraric acid (1)

Dibenzofuranes

Usnic acid (20)

ANTHRAQUINONES

Skyrin (2)
Undetermined (3)

Unidentified substances presumed to be depsidones are known in *P. chalybeizans* ("chalybeizans" unknown), *P. chapadensis, P. exornata* and *P. papillosa* ("conformata" unknown), and *P. neoquintaria* ("quintaria" unknowns). Unidentified depsides or orcinol depsidones are probably present in *P. vanderbylii*. Unidentified yellow pigments have been reported for *P. arcana, P. baltimorensis, P. condyloides, P. corrugativa, P. cyphellata, P. rutidota,* and *P. sphaerospora,* but none of these are accompanied by triterpenoids. Details on these will be found in "Taxonomic Treatment."

Divaricatic acid, perlatolic acid, and sekikaic acid are all accompanied by 1 to 3 weaker, as yet unidentified spots falling below the main acid. Perlatolic acid may occur mixed with (or even be replaced by) stenosporic acid, but these two substances are not resolved in the solvent systems employed here. Gyrophoric acid always occurs as an accessory with protocetraric acid, never alone, and norstictic is accompanied by salazinic acid or stictic acid.

While I hope to discuss the chemical features of *Pseudoparmelia* in relation to the other parmelioid genera in a separate article, several chemical traits stand out. The abundance of orcinol series depsides, especially divaricatic acid, is noteworthy and in fact characterizes the genus. The absence of the commoner orcinol series depsidones such as alectoronic acid is significant, as is also the absence of echinocarpic acid, galbinic acid, lichexanthone, and triterpenoids, and the rarity of barbatic acid and norstictic acid.

Ecology and Habitats

Knowledge of the ecology of any lichen group can enhance our understanding of difficult species complexes, and it is best if this knowledge is gained through firsthand experience in the field. Herbarium labels often omit important data on general vegetation, substratum, and elevation. While I have collected specimens of *Pseudoparmelia* in various parts of the world, I have never visited Africa or Australia, two very important centers for the genus. It is still possible, however, to draw a general picture of the ecological requirements of the genus.

It is evident, for example, that *Pseudoparmelia* is best developed in temperate, subtropical, and arid tropical regions at low to mid elevations. This is in contrast to the strong boreal requirements of *Parmelia,* and the highland tropical preferences of *Hypotrachyna* (Hale, 1975a). Only two species, *P. baltimorensis* and *P. caperata,* grow as far north as the southern edge of the boreal forest, although in the Southern Hemisphere *P. gerlachei* occurs in subantarctic localities. At the same time only four species occur with any frequency in humid lowland tropical forests: *P. sphaerospora* in the Americas and Africa and *P. dahlii, P. intertexta,* and *P. malaccensis* in Southeast Asia.

Pseudoparmelia occurs most abundantly in the arid desert or sclerophyll scrublands of Africa and Australia. In these two regions alone nearly 30 obligately saxicolous species are known and most of them are endemic. The approximately 40 obligately corticolous species in the genus occur mostly in open deciduous secondary forest or in disturbed sites such as pastures, parks, and botanical gardens. About 8 species occur on either rocks or trees, the most typical being *P. texana.* These are generally habitats of great environmental stress with intense insolation and prolonged drought.

Pseudoparmelia competes with two other parmelioid genera: *Parmotrema,* which is mainly corticolous, and *Xanthoparmelia,* a saxicolous group. In South Africa *Parmelia* subgenus *Melanoparmelia* is also well devolped on rocks, and as a result *Pseudoparmelia, Xanthoparmelia,* and the *Melanoparmeliae* often have similar lobe configuration and close thallus adnation. They all have simple rhizines, lack marginal cilia, and rarely produce soredia. It may represent an example of convergent evolution for three genera in these stressed environments.

Another possible example of convergent evolution is represented by the three usnic-acid containing species in the humid lowland forests, *P. dahlii, P. intertexta,* and *P. malaccensis.* They occupy the same habitats (in particular canopy branches in dipterocarp forests) and have the same narrow, appressed, sublinear lobes and yellow pigmentation (usnic acid) as *Relicina* (Hale, 1975b) but lack the marginal bulbate cilia.

Formation of Morphs and Chemical Populations

A detailed discussion of morph formation and speciation in *Hypotrachyna* (Hale, 1975a), which applies equally well to *Pseudoparmelia,* has already been presented. Briefly, one assumes that nonfertile isidiate and sorediate morphs have evolved from fertile nonisidiate or nonsorediate parent species and that lacking any means of sexual reproduction the morphs tend to conserve chemical traits. A parent morph may be traced rather easily, may already be modified through the usual genetic changes, or may have become extinct and now be represented only by the vegetative morph. While application of the morph concept may be somewhat arbitrary in actual practice, it has offered a reasonable explanation of species evolution in several foliose genera.

There are seven theoretically possible combinations of parents and vegetative morphs if we consider only soredia and isidia (Figure 3). Pustules, which in any event are not common, would be considered as an offshoot of isidia. In *Pseudoparmelia* the largest category is the 16 fertile species which, as far as we can determine from herbarium collections now available, have not produced any vegetative morphs. Some will undoubtedly be found eventually, but the presumption is that these species *(P. callichroa, P. caribaea, P. chapadensis, P. concomitans, P. condyloides, P. corrugativa, P. hypomilta, P. inornata, P. lecanoracea, P. rodriguesiana, P. rupicola, P. rutidota, P. somaliensis, P. subtiliacea, P. vanderbylii,* and *P. violacea*), most rather rare, have not yet evolved successful vegetative morphs.

Referring again to Figure 3, the next largest category is 12 isidiate morphs for which no corresponding parents have been discovered. These include *P. adspersa, P. amazonica, P. arcana, P. caroliniana, P. cinerascens, P. dahlii, P. geesterani, P. neoquintaria, P. owariensis, P. rahengensis, P. salacinifera,* and *P. venezolana.* We might assume in this instance that the morphs evolved from a nonisidiate parent which has not been able to survive and propagate or which has not yet been discovered.

Coexisting parents and isidiate morphs (but with no sorediate morph) are represented by the following nine species pairs: *P. exornata – P. papillosa, P. intertexta – P. malaccensis* (tentative), *P. molybdiza – P. annexa, P. prolata – P. basutoensis, P. spodochroa – P. scotophylla, P. tortula – P. subtortula, P. xanthomelaena – P. ischnoides,* and *P. zambiensis – P. ecaperata.*

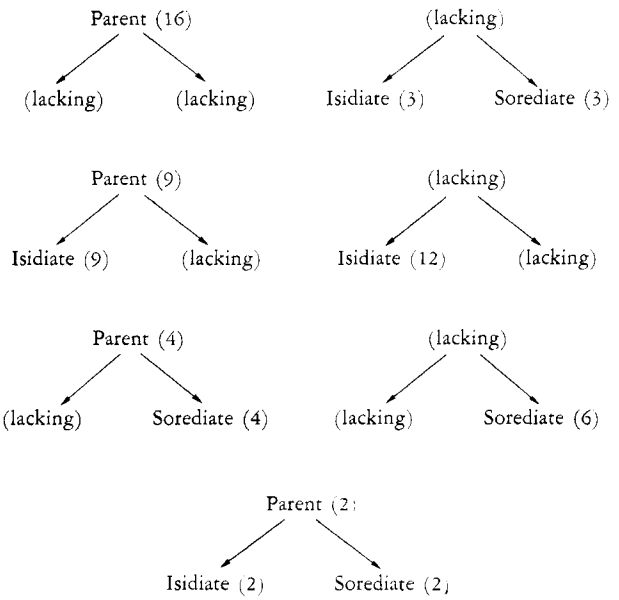

FIGURE 3.—Patterns of morph formation in *Pseudoparmelia* with number of species in each category in parentheses.

Soredia are comparatively rare in *Pseudoparmelia.* There are four parent species with corresponding sorediate morphs: *P. epileuca – P. schelpei, P. ferax – P. gerlachei, P. inhaminensis – P. crozalsiana* (tentative), and *P. scrobicularis – P. carneopruinata.* Six sorediate species, *P. alabamensis, P. aptata, P. cryptochlorophaea, P. leucoxantha, P. soredians,* and *P. subambigua,* appear to have no nonsorediate parent.

Two groups of species have the full complement of morphs: *P. amplexa – P. pachydactyla – P. subamplexa* and *P. nairobiensis – P. concrescens – P. texana* (including as well *P. eruptens).* A third series, *P. rutidota – P. baltimorensis* (coarsely pustulate) *– P. caperata* (sorediate), is another possibility but the species here all diverge rather widely from each other in some details.

A final group of four species, *P. martinicana – P. raunkiaeri* and *P. conlabrosa – P. labrosa,* represent isidiate-sorediate morph pairs but have no fertile parent extant.

Of the remaining species in the genus, *P. geesterani, P. pustulescens, P. schistacea,* and *P. zim-*

babwensis are pustulate and have no obvious relatives.

There is a particularly interesting group of saxicolous species in South Africa, including *P. molybdiza* (lecanoric acid), *P. spodochroa* (salazinic acid), *P. tortula* (norlobaridone), and *P. vanderbylii* (unknown depsides). They are so similar externally that chemical tests are needed to separate them. While this group may have evolved from a common parent, the chemical evolution has followed very different pathways. The presumptive isidiate morphs of three of these *(P. annexa, P. scotophylla,* and *P. subtortula)* are also sufficiently similar that chemical tests are required for positive identification.

If one subscribes to the concept of vegetative morphs, it then follows that morphologically identical but chemically different vegetative morphs have evolved from different parents through parallel evolution and are therefore polyphyletic (W. Culberson, 1973). *Pseudoparmelia texana* (divaricatic acid) and *P. aptata* (perlatolic acid), for example, differ in distribution, *P. texana* being pan-temperate whereas *P. aptata* occurs only in the Old World. The two acids involved are para-depsides, divaricatic acid having a C_3H_7 side chain and perlatolic acid C_5H_{11} side chains (Figure 4). Another chemical pair, *P. owariensis* (divaricatic acid) and *P. pustulescens* (sekikaic acid), is confined to the Old World and

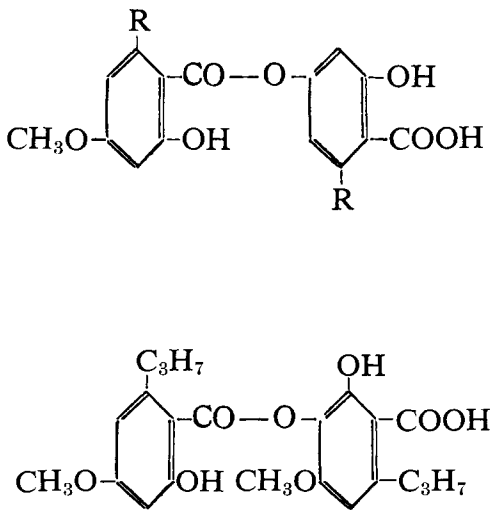

FIGURE 4.—Comparison of molecular structures of acids in *Pseudoparmelia:* Divaricatic acid (R = C_3H_7) and perlatolic acid (R = C_5H_{11}) (above) and sekikaic acid (below).

appears to be sympatric. The acids are particularly interesting since sekikaic acid is a meta-depside and divaricatic acid the homologous para-depside (Figure 4).

Rarer species with chemical differences used as taxonomic characters include *P. dahlii* (lecanoric acid) and *P. rahengensis* (barbatic acid group) in Southeast Asia. *Pseudoparmelia rutidota,* a common species in Australia and southwestern United States into tropical America, contains protocetraric acid; a virtually indistinguishable population, *P. exornata,* contains protocetraric acid with the "conformata" unknown and occurs principally in Uruguay. Other close relatives include *P. ferax,* which contains physodalic acid, and *P. callichroa,* which contains a fatty acid.

The presence or absence of usnic acid is the main criterion for recognizing *P. nairobiensis* (usnic acid absent in the cortex) and *P. zambiensis* (usnic acid present) and their corresponding isidiate morphs, *P. concrescens* and *P. ecaperata.*

Phytogeography

The *Pseudoparmelia* floras of various geopolitical units are listed below. Many countries are so poorly collected, of course, that no meaningful floristic comparisons can be made. However, the United States, West Indies, Venezuela, South Africa, and perhaps Brazil and Australia are all rather well known. Several lichenologists are now working in East Africa and Australia, and their studies, when completed, will fill in many gaps.

North America

Canada: *P. baltimorensis, P. caperata.*

United States: *P. alabamensis, P. amazonica, P. baltimorensis, P. caperata, P. caroliniana, P. crozalsiana, P. cryptochlorophaea, P. martinicana, P. rutidota, P. salacinifera, P. sphaerospora, P. texana.*

Mexico and Central America

Mexico: *P. amazonica, P. carneopruinata, P. caroliniana, P. crozalsiana, P. leucoxantha, P. martinicana, P. raunkiaeri, P. rutidota, P. salacinifera, P. sphaerospora, P. texana.*

Guatemala: *P. caperata, P. sphaerospora.*

Honduras: *P. amazonica, P. carneopruinata, P. caroliniana, P. cryptochlorophaea, P. salacinifera, P. texana.*

Nicaragua: *P. caroliniana.*

Costa Rica: *P. carneopruinata, P. caroliniana, P. sphaerospora, P. texana.*

Panama: *P. caroliniana, P. sphaerospora, P. texana.*

West Indies

Bahamas: *P. sphaerospora.*
Cuba: *P. amazonica, P. caribaea, P. caroliniana, P. salacinifera, P. sphaerospora.*
Jamaica: *P. carneopruinata, P. caroliniana, P. cryptochlorophaea, P. raunkiaeri.*
Hispaniola: *P. caperata, P. caroliniana, P. cryptochlorophaea, P. inornata, P. martinicana, P. raunkiaeri, P. sphaerospora, P. texana.*
Puerto Rico: *P. amazonica, P. martinicana.*
Lesser Antilles and Virgin Islands: *P. caribaea, P. cryptochlorophaea, P. inornata, P. martinicana, P. raunkiaeri, P. sphaerospora.*
Trinidad: *P. amazonica.*

South America

Colombia: *P. amazonica, P. carneopruinata, P. salacinifera.*
Venezuela: *P. amazonica, P. caperata, P. carnepruinata, P. P. caroliniana, P. cryptochlorophaea, P. martinicana, P. salacinifera, P. scrobicularis, P. sphaerospora, P. texana, P. venezolana.*
Ecuador: *P. caroliniana.*
Peru: *P. caperata, P. rutidota, P. sphaerospora, P. texana.*
Bolivia: *P. rutidota.*
French Guyana: *P. caribaea, P. sphaerospora.*
Brazil: *P. amazonica, P. caperata, P. carneopruinata, P. caroliniana, P. chapadensis, P. cinerascens, P. crozalsiana, P. cyphellata, P. exornata, P. hypomilta, P. leucoxantha, P. papillosa, P. rupicola, P. rutidota, P. salacinifera, P. scrobicularis, P. sphaerospora, P. texana.*
Uruguay: *P. carneopruinata, P. crozalsiana, P. exornata, P. papillosa, P. rutidota, P. texana.*
Paraguay: *P. cinerascens, P. scrobicularis.*
Argentina: *P. caperata, P. carneopruinata, P. crozalsiana, P. gerlachei, P. papillosa, P. rutidota, P. scrobicularis, P. soredians.*
Chile: *P. caperata, p. ferax, P. gerlachei, P. labrosa, P. rutidota, P. soredians, P. subambigua, P. texana.*

Europe and Africa

Europe: *P. caperata, P. caroliniana, P. carneopruinata, P. crozalsiana, P. soredians.*
Tunisia: *P. caperata.*
Guinea: *P. ecaperata, P. pustulescens, P. rodriguesiana, P. sphaerospora.*
Ivory Coast: *P. caroliniana, P. ecaperata, P. malaccensis, P. owariensis, P. rodriguesiana, P. texana.*
Cameroon: *P. sphaerospora.*
Ethiopia: *P. aptata.*
Somalia: *P. somaliensis.*
Uganda: *P. annexa, P. arcana, P. caroliniana, P. concrescens, P. molybdiza, P. nairobiensis, P. owariensis, P. pustulescens, P. somaliensis, P. subtortula, P. texana.*
Urundi: *P. somaliensis.*
Kenya: *P. caperata, P. epileuca, P. nairobiensis, P. pachydactyla, P. soredians, P. subtortula, P. texana.*
Zaire: *P. concrescens, P. crozalsiana, P. sphaerospora.*
Rhodesia: *P. subamplexa, P. tortula.*
Angola: *P. amplexa, P. annexa, P. arcana, P. caroliniana, P. concrescens, P. ecaperata, P. inhaminensis, P. nairobiensis, P. pustulescens, P. sphaerospora, P. texana.*
Malawi: *P. ecaperata.*
Zambia: *P. somaliensis, P. zambiensis.*
Tanzania: *P. aptata, P. molybdiza, P. nairobiensis, P. somaliensis, P. sphaerospora, P. texana.*
Moçambique: *P. concrescens, P. epileuca, P. eruptens, P. malaccensis, P. schelpei.*
Union of South Africa: *P. amplexa, P. annexa, P. aptata, P. arcana, P. basutoensis, P. concrescens, P. condyloides, P. crozalsiana, P. eruptens, P. geesterani, P. ischnoides, P. lecanoracea, P. molybdiza, P. prolata, P. pustulescens, P. rodriguesiana, P. soredians, P. spodochroa, P. texana, P. tortula, P. vanderbylii, P. violacea, P. xanthomelaena.*
Madagascar: *P. rodriguesiana, P. somaliensis, P. sphaerospora, P. texana.*

Asia

India: *P. aptata, P. caperata, P. crozalsiana, P. ecaperata, P. malaccensis, P. pustulescens, P. texana.*
Sri Lanka: *P. dahlii, P. texana.*
Thailand: *P. adspersa, P. ecaperata, P. owariensis, P. rahengensis, P. salacinifera, P. texana.*
Laos: *P. caroliniana*
China: *P. caperata.*
Japan: *P. aptata, P. caperata, P. owariensis, P. texana.*
Hong Kong: *P. owariensis.*
Taiwan: *P. amazonica.*
Philippines: *P. adspersa, P. intertexta, P. malaccensis.*
Malaysia: *P. intertexta, P. malaccensis.*
Indonesia: *P. aptata, P. intertexta, P. malaccensis, P. texana.*
New Guinea: *P. intertexta.*

Australia and New Zealand

Australia: *P. aptata, P. caperata, P. conlabrosa, P. corrugativa, P. ferax, P. intertexta, P. labrosa, P. neoquintaria, P. rutidota, P. schistacea, P. scotophylla, P. soredians, P. spodochroa, P. subtiliacea, P. texana, P. xanthomelaena.*
New Zealand: *P. caperata, P. labrosa, P. rutidota, P. soredians, P. subtiliacea.*

Pacific Region

New Caledonia: *P. concomitans.*
Hawaii: *P. caperata, P. texana.*

The greatest concentration of species is found in South Africa. This region with adjacent countries has a flora of 35 species, nearly half of the species in the genus (Figure 5). At least 15 of these are endemic and most saxicolous. Australia, a region of similar climate and vegetation, has 16 species, of which 5 *(P. aptata, P. soredians, P. spodochroa, P. texana,* and *P. xanthomelaena)* also occur in Africa.

In the New World, Brazil has the most species, 18, of which 6 are endemic. North America has 12 species but only 2 *(P. alabamensis* and *P. baltimorensis)* are endemic there.

Temperate and tropical eastern Asia (India to

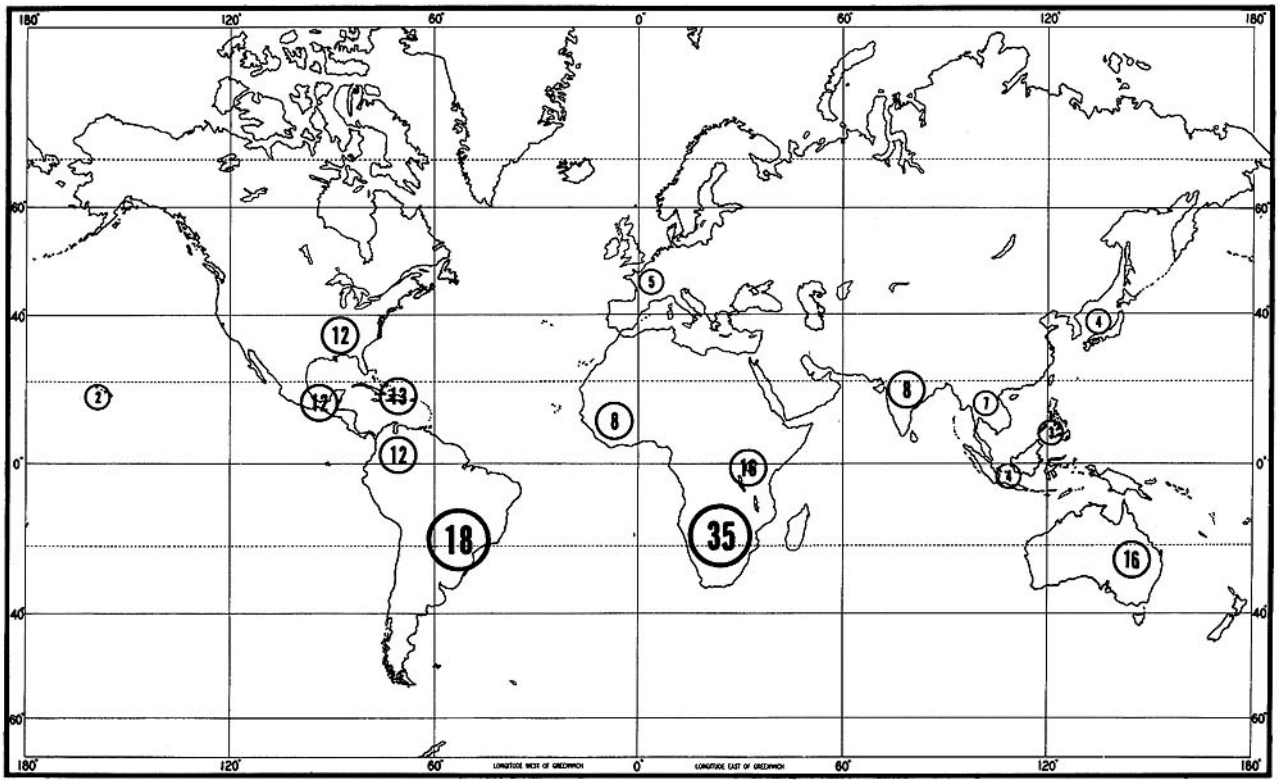

FIGURE 5.—Number of species of *Pseudoparmelia* by major geopolitical regions.

Japan) has a rather small *Pseudoparmelia* flora of only 14 species, 4 of them endemic and the remainder pantemperate or also widespread in Africa. In general the Old World and New World floras are quite distinct. The Old World, however, is much richer with about 55 species in contrast to the 30 species so far collected in North and South America.

Some idea of the abundance of the various species can be gained by tabulating the number of countries (as listed above) where each species has been reported. This crude method of comparison does not, of course, take into consideration the relative sizes of the countries or the intensity of collecting, but it is unlikely that the order of abundance will be greatly changed by future collecting. The following species occur in five or more countries: *P. texana* (24), *P. caperata* (17), *P. sphaerospora* (16), *P. caroliniana* (13), *P. amazonica* (9), *P. carneopruinata* (9), *P. crozalsiana* (9), *P. rutidota* (9), *P. salacinifera* (8), *P. ecaperata* (7), *P. aptata* (7), *P. concrescens* (6), *P. cryptochlorophaea* (6), *P. malaccensis* (6), *P. martinicana* (6), *P. soredians* (6), *P. intertexta,* (5), and *P. owariensis* (5). Within its range *P. caperata* is undoubtedly the the most commonly collected foliose lichen, followed by *P. caroliniana* and in Asia *P. ecaperata.*

Twenty-nine species, nearly half the genus total, have been found so far in only one country, as can be determined from the lists of specimens examined in the species treatment, and while many of these will be found in other countries with more intensive collecting, this great a number reflects the high degree of endemism characteristic of the genus.

Taxonomic Treatment

The 76 species of *Pseudoparmelia* are arranged below in alphabetic order. All specimens collected by Hale are deposited in the Smithsonian Institution (US), and the herbarium acronym is not cited for these.

The following key is divided into three sections: isidiate species, sorediate species, and nonisidiate, nonsorediate species.

Keys to the Species of *Pseudoparmelia*

Isidiate

1. Thallus greenish yellow (usnic acid present).
   2. Thallus black below with at most a narrow brown zone at the lobe tips.
      3. Isidia fine, no more than 0.2 mm thick; medulla P−. ..... ***P. ecaperata***
      3. Isidia thick and inflated, 0.5–1 mm thick; medulla P+ red.
         4. Lower surface velvety black to the margin. ..... ***P. pachydactyla***
         4. Lower surface shiny black with a narrow brown zone at the lobe tips.
            5. Isidia dense, cylindrical. ..... ***P. papillosa***
            5. Isidia irregularly scattered, often breaking open apically. ..... ***P. baltimorensis***
   2. Thallus uniformly pale brown below.
      6. Medulla P+ red (protocetraric acid). ..... ***P. malaccensis***
      6. Medulla P−.
         7. Medulla C+ red (lecanoric acid). ..... ***P. dahlii***
         7. Medulla C− or C+ orange (barbatic acid). ..... ***P. rahengensis***
1. Thallus whitish to greenish mineral gray (usnic acid lacking).
   8. Collected on trees.
      9. Lower surface uniformly pale brown.
         10. Isidia moderate to dense, 1 mm high; medulla K+ red (salazinic acid). ..... ***P. salacinifera***
         10. Isidia sparse, 2–3 mm high; medulla K− or K+ yellow (stictic acid) ..... ***P. cyphellata***
      9. Lower surface black toward the center and black at the margin or with a narrow brown zone at the lobe tips.
         11. Isidia inflated, pustulate, 2–3 mm high ..... ***P. eruptens***
         11. Isidia not inflated or pustulate, to 1 mm high.
            12. Upper surface finely reticulately cracked and strongly white-reticulate ..... ***P. caroliniana***
            12. Upper surface continuous, not white-reticulate.
               13. Medulla P−.
                  14. Medulla C+ red (lecanoric acid). ..... ***P. conlabrosa***
                  14. Medulla C− (divaricatic acid). ..... ***P. concrescens***
               13. Medulla P+ red or orange.
                  15. Medulla K+ (salazinic acid) ..... ***P. cinerascens***
                  15. Medulla K−.
                     16. Fumarprotocetraric acid present. ..... ***P. adspersa***
                     16. Protocetraric acid present.
                        17. Isidia fragile, crumbling; lobe tips white-reticulate. ..... ***P. martinicana***
                        17. Isidia normal; lobes not white-reticulate. ..... ***P. amazonica***
   8. Collected on rocks.
      18. Isidia coarse, pustulate, usually erupting apically.
         19. Medulla K+ red (salazinic acid). ..... ***P. geesterani***
         19. Medulla K−.
            20. Medulla P+ red (protocetraric acid). ..... ***P. zimbabwensis***
            20. Medulla P−.
               21. Divaricatic acid present. ..... ***P. owariensis***
               21. Divaricatic acid absent.
                  22. Sekikaic acid present. ..... ***P. pustulescens***
                  22. Caperatic acid present. ..... ***P. schistacea***
      18. Isidia normal, thin and cylindrical, not pustulate.
         23. Medulla P+ red or orange.
            24. Lobes 2–3 mm wide, apically subrotund. ..... ***P. scotophylla***
            24. Lobes about 1 mm wide.
               25. Medulla K−; collected in South America. ..... ***P. venezolana***
               25. Medulla K+ yellow (stictic acid); collected in Africa. ..... ***P. ischnoides***
         23. Medulla P−.
            26. Lobes 2–4 mm wide, apically subrotund.

27. Upper surface finely reticulately cracked. ..... ***P. caroliniana***
27. Upper surface continuous and smooth. ..... ***P. subtortula***

26. Lobes 1–2 mm wide, apically obtuse.
28. Lower surface black. ..... ***P. annexa***
28. Lower surface uniformly brown or tan.
29. Thallus very closely appressed. ..... ***P. arcana***
29. Thallus adnate to loosely adnate.
30. "Quintaria" unknowns present; collected in Australia. ..... ***P. neoquintaria***
30. "Quintaria" unknowns absent; collected in Africa.
31. Norlobaridone present. ..... ***P. subtortula***
31. Norlobaridone absent. ..... ***P. basutoensis***

Sorediate Species

1. Thallus greenish yellow (usnic acid present).
2. Lower surface uniformly velvety black below to the margin. ..... ***P. subamplexa***
2. Lower surface shiny, black at the center and dark brown in a narrow zone at the lobe tips.
3. Medulla K+ yellow turning red (salazinic acid). ..... ***P. soredians***
3. Medulla K−.
4. Medulla C+ red (lecanoric acid), P−. ..... ***P. subambigua***
4. Medulla C−, P+ red or orange.
5. Soralia mostly laminal, becoming diffuse. ..... ***P. caperata***
5. Soralia mostly apical or marginal.
6. Soralia generally orbicular; collected in Antarctic regions or the high Andes. ..... ***P. gerlachei***
6. Soralia elongate along lobe margins; collected in mid-elevation tropical regions. ..... ***P. leucoxantha***

1. Thallus whitish to greenish mineral gray (usnic acid absent).
7. Medulla P+ orange or red.
8. Upper surface broadly reticulately ridged and foveolate (without lens); stictic acid present.
9. Lobes subirregular, 2–5 mm wide. ..... ***P. crozalsiana***
9. Lobes sublinear, 1–2.5 mm wide. ..... ***P. carneopruinata***
8. Upper surface smooth and plane; protocetraric acid present.
10. Soredia coarse, densely produced over the upper surface in coalescing soralia. ..... ***P. raunkiaeri***
10. Soredia farinose, produced in discrete orbicular soralia.
11. Collected on rocks ..... ***P. alabamensis***
11. Collected on trees ..... ***P. epileuca***
7. Medulla P−.
12. Medulla C+ deep red (lecanoric acid). ..... ***P. labrosa***
12. Medulla C− or C+ fleeting pink.
13. Soralia strongly capitate along lobe margins. ..... ***P. cryptochlorophaea***
13. Soralia not capitate, entirely laminal.
14. Divaricatic acid present. ..... ***P. texana***
14. Perlatolic acid present. ..... ***P. aptata***

Nonisidiate, Nonsorediate Species

1. Thallus greenish yellow (usnic acid present; *P. chapadensis, P. hypomilta,* and *P. sphaerospora* appear to be greenish yellow but lack usnic acid).
2. Lower surface brown or tan throughout.
3. Collected on trees. ..... ***P. intertexta***
3. Collected on rocks. ..... ***P. chapadensis***
2. Lower surface black.
4. Lower surface velvety black to the margin. ..... ***P. amplexa***
4. Lower surface shiny black and often with a narrow brown zone at the lobe tips.
5. Medulla P−.
6. Collected in Africa. ..... ***P. zambiensis***
6. Collected in South America. ..... ***P. callichroa***

5. Medulla P+ red.
7. Physodalic acid present. ..... ***P. ferax***
7. Physodalic acid absent.
8. Protocetraric acid present. ..... ***P. rutidota***
8. Protocetraric acid and the "conformata" unknown present. ..... ***P. exornata***

1. Thallus whitish to greenish mineral gray (usnic acid absent; *P. chapadensis, P. hypomilta, P. sphaerospora,* and sometimes *P. violacea* appear to be yellowish green but lack usnic acid).
9. Medulla pigmented purple to yellow.
10. Medulla completely deep purple. ..... ***P. violacea***
10. Medulla yellow or orange.
11. Medulla completely pale orange-yellow (*P. condyloides* appears yellow but contains no pigment.) ..... ***P. sphaerospora***
11. Medulla pigmented only in the lower half.
12. Collected on rocks. ..... ***P. lecanoracea***
12. Collected on trees.
13. Lower surface brown; collected in South America. ..... ***P. hypomilta***
13. Lower surface black; collected in Australia. ..... ***P. corrugativa***
9. Medulla white.
14. Collected on trees.
15. Lower surface uniformly brown.
16. Medulla P+ red (protocetraric acid). ..... ***P. somaliensis***
16. Medulla P− or P+ faint orange (stictic acid). ..... ***P. sphaerospora***
15. Lower surface black (often with a narrow brown zone at the lobe tips).
17. Medulla P−.
18. Collected in Africa; divaricatic acid present. ..... ***P. nairobiensis***
18. Collected in Australia and New Zealand; caperatic acid present. ..... ***P. subtiliacea***
17. Medulla P+ red or orange.
19. Medulla K+ yellow (stictic acid); surface of lobes reticulately ridged and foveolate (without lens).
20. Lobes 1–2 mm wide; collected in South America. ..... ***P. scrobicularis***
20. Lobes 2–4 mm wide; collected in Africa. ..... ***P. inhaminensis***
19. Medulla K− (protocetraric acid).
21. Lobes 1–2 mm wide. ..... ***P. schelpei***
21. Lobes 3–6 mm wide.
22. Medulla C−; collected in the West Indies ..... ***P. inornata***
22. Medulla C+ rose; collected in New Caledonia. ..... ***P. concomitans***
14. Collected on rocks.
23. Lower surface uniformly brown.
24. Medulla P+ orange (salazinic acid).
25. "Chalybeizans" unknown present. ..... ***P. condyloides***
25. "Chalybeizans" unknown absent. ..... ***P. spodochroa***
24. Medulla P−.
26. Medulla C+ red (lecanoric acid). ..... ***P. molybdiza***
26. Medulla C−.
27. Thallus rather loosely attached on rocks and soil; lobes subelongate. ..... ***P. prolata***
27. Thallus tightly adnate on rocks; lobes shorter, apically rotund.
28. Norlobaridone present. ..... ***P. tortula***
28. Unknown substances present. ..... ***P. vanderbylii***
23. Lower surface black (brown only in a narrow zone at the lobe tips).
29. Medulla P+ orange or red.
30. Lobes less than 1 mm wide. ..... ***P. xanthomelaena***
30. Lobes 2–4 mm wide.
31. Medulla K−; collected in the Caribbean region ..... ***P. caribaea***
31. Medulla K+ yellow or red (salazinic acid); collected in Australia and Africa. ..... ***P. spodochroa***
29. Medulla P−.
32. Collected in South America. ..... ***P. rupicola***

32. Collected in Africa.
    33. Medulla C+ red (lecanoric acid). ..... ***P. molybdiza***
    33. Medulla C− (divaricatic acid). ..... ***P. rodriguesiana***

Pseudoparmelia

Pseudoparmelia Lynge, 1914:15.

TYPE-SPECIES.—*Pseudoparmelia cyphellata* Lynge, 1914:15.

Lynge erected this genus on the basis of a single collection from Brazil, citing the presence of "pseudocyphellae" on the lower surface as the main difference from *Parmelia*. Santesson (1942) demonstrated conclusively that these are in reality artifacts caused by rhizines that had been torn off, revealing the medulla in irregular patches. He did not reject the genus, as implied in the title of his article, but regarded it as a synonym of *Parmelia*. I do not believe that one could invoke Article 71 of the *Code of Botanical Nomenclature* here to reject *Pseudoparmelia*. The gashes of dislodged rhizines on the lower cortex are not monstrosities in the accepted sense. Lynge simply described a new genus on a mistaken interpretation of the morphology. In any event, Article 71 was deleted from the *Code* at the sessions of the International Botanical Congress in Leningrad in 1975. The only lichenologist to use this genus name in practice was Gyelnik (1933), whose species *(Pseudoparmelia aradensis* and *P. pseudofallax)* have been placed in *Cetrelia* (Culberson and Culberson, 1968).

Pseudoparmelia adspersa

FIGURE 6*a*

Pseudoparmelia adspersa (Vainio) Hale, 1974:189.
Parmelia adspersa Vainio, 1907:168 [type collection: Lem Ngob, Siam, *Schmidt* XV (TUR, lectotype; C, isolectotype)].
Parmelia filipina Hale, 1972a:99 [type collection: Tagaytay, Cavite, Philippine, *Hale* 26809 (US, holotype; TNS, UPS, isotypes)].

DESCRIPTION.—Thallus adnate on trunks, whitish ashy gray, 5–8 cm broad; lobes subrotund, 3–6 mm wide, the upper surface plane, continuous or finely cracked with age, densely isidiate, the isidia mostly simple, cylindrical, 0.1–0.15 mm high, 0.05 mm in diameter; lower surface black except for a narrow dark brown zone along the margins, sparsely to moderately rhizinate. Apothecia (from *Hale* 26976) rare, substipitate, 2–4 mm in diameter, the amphithecium isidiate; spores 8, 5 × 10–12 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC−, P+ red; atranorin, fumarprotocetraric acid, and succinprotocetraric acid.

DISTRIBUTION.—Philippines, Thailand.

HABITAT.—Planted *Casuarina* trees at low to mid elevation (200–2000 m).

REMARKS.—The type collections (*Schmidt* XV and XXXIV) are fragmentary. When I finally resolved the chemistry with TLC, I soon discovered that the species is the same as *Parmelia filipina*. Des Abbayes (1958) compared *P. adspersa* with *Parmelia inactiva* (Zahlbruckner) Vainio, a much larger amphigymnioid lichen containing protocetraric acid. I had compared it with *Pseudoparmelia carolinana* (Nylander) Hale, which contains perlatolic acid and has a more consistently and conspicuously cracked cortex.

SPECIMENS EXAMINED.—Philippines: Quezon Province, *Hale* 26976; Mountain Province, *Santos* 88 (PHU, US).

Pseudoparmelia alabamensis

FIGURE 6*b*

Pseudoparmelia alabamensis (Hale and McCullough) Hale, 1974:189.
Parmelia alabamensis Hale and McCullough, 1968:44 [type collection: St. Clair County, Alabama, *Hale and McCullough* 24072 (US; isotypes in DUKE, UPS)].

DESCRIPTION.—Thallus closely adnate on rock, ashy white, 2–4 cm broad; lobes narrow and sublinear, contiguous, 0.8–1.2 mm wide; upper surface transversely cracked with age, sorediate, the soralia laminal, capitate; lower surface black, moderately rhizinate, the rhizines black. Apothecia unknown.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC− or rose, P+ red; atranorin and protocetraric acid.

DISTRIBUTION.—United States (Tennessee and Alabama).

HABITAT.—On large sandstone rocks in open deciduous forests at about 300 m elevation.

REMARKS.—This species is unique among the North American *Pseudoparmeliae*. An African spe-

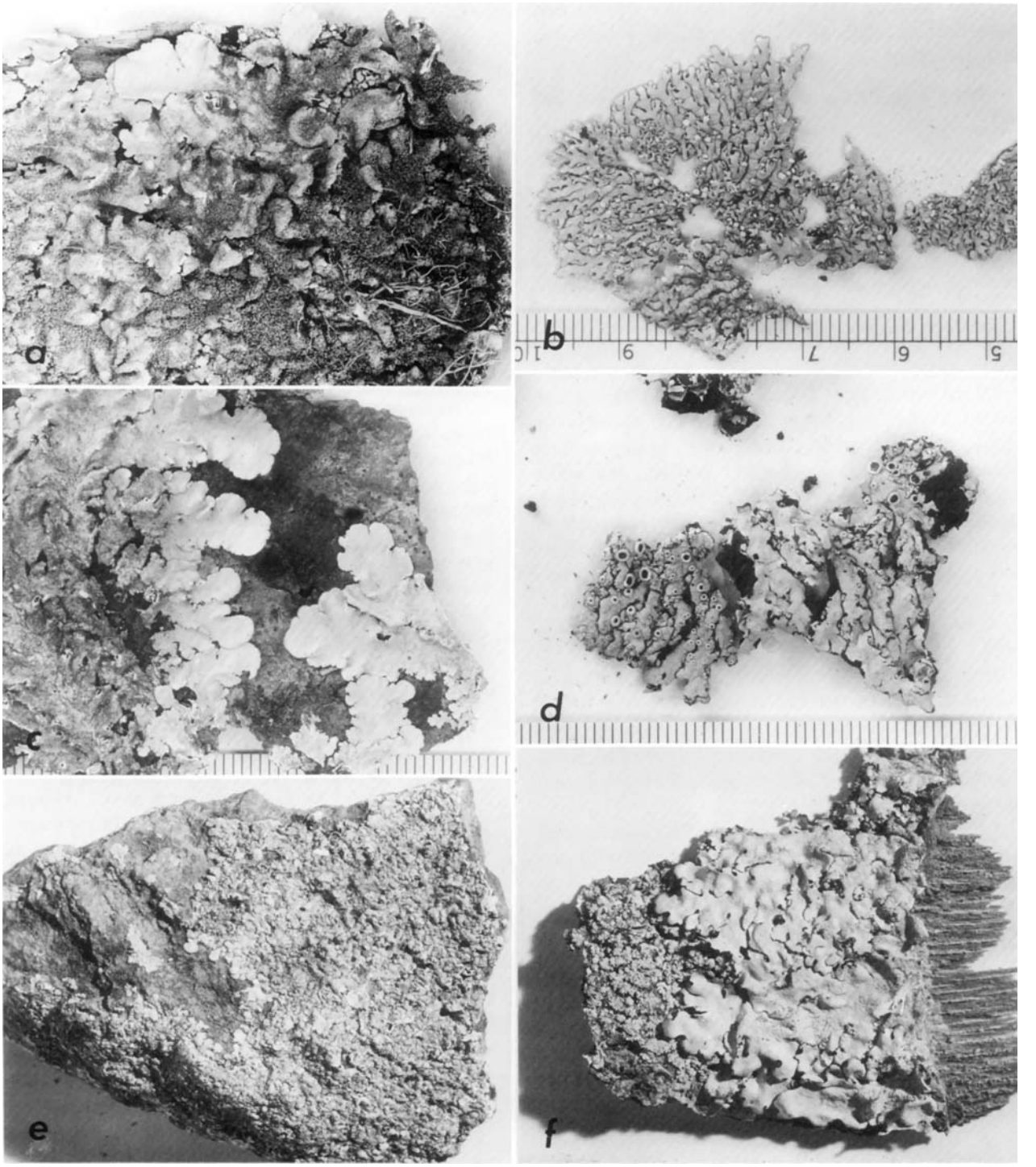

FIGURE 6.—Species of *Pseudoparmelia: a, P. adspersa (Hale* 26809, holotype of *Parmelia filipina* Hale); *b, P. alabamensis (McCullough* 1842 in US); *c, P. amazonica (Hale* 19389); *d, P. amplexa (Gossweiler* 3256e in US); *e, P. annexa (Almborn* 5683, holotype in LD); *f, P. aptata (Almborn* 6548 in LD). (Scale in mm.)

cies, *P. epileuca* (Hale) Hale, also has soredia and protocetraric acid, but it is corticolous and has broader lobes.

SPECIMENS EXAMINED.—United States: Tennessee, *Hale* 36927.

Pseudoparmelia amazonica

FIGURE 6*c*

Pseudoparmelia amazonica (Nylander) Hale, 1974:189.
Parmelia amazonica Nylander, 1885:611 [type collection: Santarem, Brazil, *Spruce* 111 (H, Nylander herbarium number 35111, lectotype; BM, G, NY, W, PC, isolectotypes)].

DESCRIPTION.—Thallus closely adnate on bark, 5–10 cm broad, light mineral gray and turning buff in the herbarium; lobes subirregular, apically rotund, 2–6 mm wide, contiguous; upper surface plane, continuous, moderately isidiate, the isidia rarely branched, to 2 mm high; lower surface black, densely rhizinate except for a narrow naked or papillate zone along the margins. Apothecia rare, 1–3 mm in diameter; spores 8, 8–10 × 13–16 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ rose, P+ red; atranorin and protocetraric acid.

DISTRIBUTION.—United States (Florida), Central America, West Indies, Colombia, Venezuela, Brazil, Guinea, and Taiwan.

HABITAT.—On trees (conifers, palm trees, deciduous trees), *Opuntia,* and on rocks in open forests at 100–1500 m elevation.

REMARKS.—Superficially this species could be confused with *P. salacinifera* (Hale) Hale, which has a pale brown lower surface and salazinic acid. The two occupy very similar habitats (trees in open secondary forests) and geographic ranges.

SPECIMENS EXAMINED.—United States: Florida, *Hale* 34139, 16859, 17668, 17696, *Moore* 3357 (DUKE, US), *Rapp* 311, 662 (US). Mexico: Veracruz, *Hale* 19389; Chiapas, *Hale* 19972 (DUKE, LD, US), *Hale* 20187 (BM, US), 20607a. Honduras: El Paraíso, *Standley* 560 (F): Morazán, *Standley and Williams* 1643 (F). Cuba: Pinar del Rio, *Imshaug* 25289, 25310, 25333 (MSC); Oriente, *Hioram* 5963 (US). Puerto Rico: *Howe* 1162 (NY). Trinidad: *Wedermann* 2305 (8). Colombia: Santander, *Killip* 15212, *Nee and Mori* 3768 (US). Venezuela: Mérida, *Nash* 2025 (US). Bolivia: El Beni, *Wedermann* 2305 (S). Brazil: Minas Gerais, *Vainio* 588 (BM, TUR), 603 (BM, TUR); Rio de Janeiro *Burchell* 946 (BM); Mato Grosso, *Malme* s.n., 20506b (S), 2369, 2408 (LD, S, US). Guinea: N'Zérékoré, *Santesson* 10573a (UPS). Taiwan: *Asahina* (TNS).

Pseudoparmelia amplexa

FIGURE 6*d*

Pseudoparmelia amplexa (Stirton) Hale, 1974:189.
Parmelia amplexa Stirton, 1877:212 [type collection: Somerset East, Union of South Africa, *MacOwan* (BM, lectotype; GLAM, isolectotype)].
Parmelia caperata var. *glaucopis* Müller Argoviensis, 1894:258 [type collection: Matangiri, Seen Region, Africa, *Stuhlmann* 359 (559 on type label) (G, lectotype; BM, isolectotype)].
Parmelia glaucopis (Müller Argoviensis) Vainio, 1900:4.
Parmelia subconspersa var. *benguellensis* Vainio *in* Welwitsch, 1901:401 [type collection: Mt. Morro de Lopollo, Huílla, Angola, *Welwitsch* 31 (BM, lectotype)].
Parmelia benguellensis (Vainio) Dodge, 1959:70.
Pseudoparmelia benguellensis (Vainio) Hale, 1974:189.

DESCRIPTION.—Thallus rather closely adnate on bark, coriaceous, greenish yellow, 3–5 cm broad; lobes sublinear, crowded, partly black rimmed, 1–2 mm wide; upper surface plane, dull, rugose and becoming lobulate with age and heavily pycnidiate; lower surface black and minutely velvety to the margin, sparcely to moderately rhizinate. Apothecia numerous, sessile, 1–2 mm in diameter; spores 8, 7–8 × 16–18 μm.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC−, or KC+ rose, P+ red; usnic acid and protocetraric acid with or without a trace of atranorin.

DISTRIBUTION.—Southern Africa.

HABITAT.—On trunks and branches of trees in open rocky areas.

REMARKS.—I had at first identified all African specimens as *Pseudoparmelia rutidota* (Hooker and Taylor) Hale, but close examination showed that they have consistently narrow lobes and a jet black velvety lower surface (Figure 1*a, b*). By comparison, *P. rutidota,* which is known from Australia and the New World, often has quite broad lobes (to 5 mm wide) and a shiny surface below and brown bare zone near the tips. The sorediate morph of *P. amplexa* is *P. subamplexa* Hale and the isidiate morph is *P. pachydactyla* (Hale) Hale. All three appear to lack any fatty acids, in contrast to the *P. rutidota* group, which usually produces one or more of the common fatty acids.

SPECIMENS EXAMINED.—Rhodesia: *Kofler* (LD, US), *Schütte* (LD, US), *Sheppard* 2 (US). Angola: Bié, *Gossweiler* 3256e (BM, US), *Degelius* (Degelius herbarium, US); Huíla, *Degelius* (Degelius herbarium); Moxico, *Degelius* (Degelius herbarium, US).

Pseudoparmelia annexa

FIGURE 6*e*

Pseudoparmelia annexa (Kurokawa) Hale, 1974:189.
Parmelia annexa Kurokawa, in Hale and Kurokawa, 1964:151 [type collection: Caledon, Cape Province, Union of South Africa, *Almborn* 5683 (LD, holotype; isotype in US)].

DESCRIPTION.—Thallus tightly adnate on rock, ashy mineral gray, 3–7 cm broad; lobes subirregular to sublinear, 0.7–3.5 mm wide; upper surface plane, shiny, continuous or irregularly cracked with age, moderately isidiate, the isidia mostly simple, about 0.2 mm high, darkening at the tips; lower surface black, sparsely rhizinate. Apothecia adnate, 1.5–5 mm in diameter, the amphithecium isidiate; spores 8, 5 × 7–8 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C+, KC+ red, P−; atranorin and lecanoric acid.

DISTRIBUTION.—Uganda, Angola, and Union of South Africa.

HABITAT.—On exposed rock outcrops from sea level to 1200 m.

REMARKS.—This rare saxicolous species is the isidiate morph or close relative of *P. molybdiza* (Nylander) Hale, which lacks isidia and has generally broader lobes. Both are African endemics.

SPECIMENS EXAMINED.—*Uganda:* Pian, *Swinscow* 6/1970 (BM, US), Other records from Angola and South Africa are listed in Hale and Kurokawa (1964:151).

Pseudoparmelia aptata

FIGURE 6*f*

Pseudoparmelia aptata (Krempelhuber) Hale, 1974:189.
Parmelia aptata Krempelhuber *in* Nylander, 1869:291 [type collection: Kotgurh, Himalayas, India, *Skoliczka* 509 (M, lectotype; BM, H, K, US, isolectotypes)].
Parmelia asmarana Vainio, 1898b:37 [type collection: Asmara, Ethiopia, *Levander* (TUR, Vainio herbarium number 2664, lectotype)].
Parmelia nipponica Zahlbruckner, 1927:353 [type collection: Hachinoche, Japan, *Faurie* 1239 (W, lectotype)].

DESCRIPTION.—Thallus adnate on bark, whitish mineral gray, 6–12 cm broad; lobes sublinear to subirregular, more or less apically rotund, 2–5 mm wide; upper surface plane, continuous or cracked with age, laminally sorediate, the soralia capitate; medulla white except for pale orange pigmentation below the soralia; lower surface black, sparsely rhizinate except for a narrow marginal papillate zone. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ rose, P−; atranorin, perlatolic acid, and an unidentified pigment.

DISTRIBUTION.—Africa, India, Indonesia, Australia, and Japan.

HABITAT.—On trees (*Pinus,* deciduous trees), secondary forests at low to mid elevations.

REMARKS.—This Old World lichen is externally similar to *P. texana* (Tuckerman) Hale, which contains divaricatic acid and is pantropical-pantemperate. It apparently evolved in the Old World as a chemical variant from a now extinct fertile perlatolic acid-containing progenitor, related perhaps to *P. nairobiensis* (Steiner and Zahlbruckner) Hale. It is basically sympatric with *P. texana* in most of Asia and in Japan comprises about two-thirds of the specimens in this group. Chemical tests must be made to separate the species.

SPECIMENS EXAMINED.—Tanzania: *Höeg* (TRH). Union of South Africa: Natal, *Almborn* 6548, 8538, 8697, 9643 (LD), *Höeg* (TRH). India: Sikkim, *Hara* (TNS). Japan: Province Aki, *Hale* 29517, 29542; Province Ohmi, *Hale* 29473. Indonesia: Java, *Groenhart* 8853, 8854 (BOR), 2197, 5322, 5324 (L, US), *Neervoort* 753 (BOR). Australia: Queensland, *Bailey* (BM).

Pseudoparmelia arcana

FIGURE 7*a*

Pseudoparmelia arcana (Kurokawa) Hale, 1974:189.
Parmelia arcana Kurokawa in Hale and Kurokawa, 1964:151 [type collection: Baba, Moçâmedes, Angola, *Degelius* (Degelius herbarium; isotype in US)].

DESCRIPTION.—Thallus tightly appressed on rock, ashy white, 3–7 cm in diameter; lobes sublinear, crowded and appearing subareolate toward the center, 0.3–1 mm wide; upper surface plane to convex, continuous to tangentially cracked, moderately isidiate, the isidia mostly simple, about 0.2 mm high; medulla white or in part pale yellow; lower surface brown to pale brown, sparsely rhizinate. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC−, P−; atranorin, fatty acids, and unidentified pigments.

DISTRIBUTION.—Angola and Union of South Africa.

HABITAT.—On rocks in dry open areas at about 1000 m elevation.

REMARKS.—This rarely collected species seems to be related to *P. annexa* (Kurokawa) Hale, which contains lecanoric acid. The yellow pigmentation does not seem to be a consistent character to judge from the few specimens available.

SPECIMENS EXAMINED.—Union of South Africa: Basutoland, *Kofler* (LD); Cape Province, *Höeg* (TRH); Orange Free State, *Plank* (PRE).

Pseudoparmelia baltimorensis

FIGURE 7*b*

Pseudoparmelia baltimorensis (Gyelnik and Fóriss) Hale, 1974:189.

Parmelia baltimorensis Gyelnik and Fóriss in Gyelnik, 1931a: 167 [type collection: Gunpowder River, Baltimore County, Maryland, *Plitt* (BP, holotype; US, isotype)].

DESCRIPTION.—Thallus closely to loosely adnate on rocks, yellowish green, up to 15 cm broad but colonies often coalescing and covering extensive areas of rock; lobes sublinear to irregular, apically subrotund, 3–5 mm wide; upper surface plane, becoming covered toward the center with large, thick, simple or branched isidioid pustules, fragile and breaking open apically but not becoming sorediate; lower surface black except for a narrow, smooth to rugose, papillate, brown zone along the margins, moderately rhizinate. Apothecia rare, substipitate, 1–3 mm in diameter, the amphithecium pustulate; spores 8, 6–7 × 13–15 μm.

CHEMISTRY.—Cortex K−, medulla K−, C− or C+ rose, KC+ rose, P+ red; usnic acid, protocetraric acid, and very frequently gyrophoric acid.

DISTRIBUTION.—Eastern United States and adjacent Canada.

HABITAT.—Sandstone and granite rocks in open deciduous forests.

REMARKS.—This species had been confused with the equally common but usually corticolous *P. caperata* (L.) Hale. The distinction between the coarse laminal pustules of *P. baltimorensis* and the more or less diffuse soralia of *P. caperata,* as well as the presence of gyrophoric acid as an accessory substance in *P. baltimorensis,* was recently discovered by Dr. W. L. Culberson (in litt.), who kindly showed me his preliminary results. He is now preparing a paper on the biology of these two species that will present much more detailed information.

REPRESENTATIVE SPECIMENS EXAMINED (all in US).—Canada: Ontario, *Hale.* United States: Massachusetts, *Hutchinson* 1744; Connecticut, *Hale* 19076; New Jersey, *Hale* 17266; Pennsylvania, *Becking* 57070315, *Hale* 16292, *Heller, White* 210; Maryland, *Hermann* 13768, *Leonard* 2933, 3086, *Norden* 27, *Plitt;* West Virginia, *Hale* 10734, 13016; Kentucky, *Allen* 545, *Hale* 13115; Illinois, *Hale* 13926, 14029, *Skorepa* 943; Wisconsin, *Hale* 23542, *Thomson* 919; Minnesota, *Hale* 23479; Missouri, *Greenman* 4763, *Ireland* 3238, *Schoop* 254; Virginia, *Hale* 15107, 17317, *Luttrell* 120, 4876; North Carolina, *Culberson* in *Lichenes Selecti Exsiccati* 915, *Hale* 16371; Tennessee, *Degelius, Hale* 31118, *Phillips* 321; South Carolina, *Hale* 7747; Georgia, *Hale* 30877; Alabama, *Hale* 7125, 33841, *McCullough* 344, 2032; Mississippi, *Hale* 7846; Arkansas, *Hale* in *Lichenes Americani Exsiccati* 2, *Hale* 3644, 3813, *Moore* 259; South Dakota, *Vischer* 4; Kansas, *Hale* 2934, 4534; Oklahoma, *Hale* 5053; Texas, *Hale* 34317. A number of records in other herbaria would have been identified as *Parmelia caperata* by me before 1970; it was impractical to borrow these specimens again and correct the names.

Pseudoparmelia basutoensis

FIGURE 7*c*

Pseudoparmelia basutoensis (Hale) Hale, 1974:189.

Parmelia basutoensis Hale, 1972b:342 [type collection: Roma, Basutoland, Union of South Africa, *Kofler* (LD, holotype; isotype in US)].

DESCRIPTION.—Thallus adnate on rocks, pale greenish white, 3–5 cm broad; lobes sublinear to subirregular, contiguous, 2–3 mm wide; upper surface plane, isidiate, the isidia cylindrical, simple; lower surface pale brown, sparsely rhizinate. Apothecia sparse, 1–3 mm in diameter, spores not found.

CHEMISTRY.—Cortex K+ yellow, medulla negative with all reagents; atranorin and an unknown substance.

DISTRIBUTION.—Union of South Africa.

HABITAT.—Rocks in dry regions.

REMARKS.—As I pointed out in the original description, this species has the general aspect of a *Xanthoparmelia* but lacks usnic acid. The nonisidiate morph and presumptive parent is *P. prolata* (Hale) Hale (see below), but neither species has been collected in sufficient quantity for more definitive statements on biology and possible evolution of the group. The unknown substance appears to be a new fatty acid that reacts faintly yellow with sulfuric acid. The same substance has been discovered in a brown *Parmelia, P. scabrella* Esslinger (Esslinger, 1976).

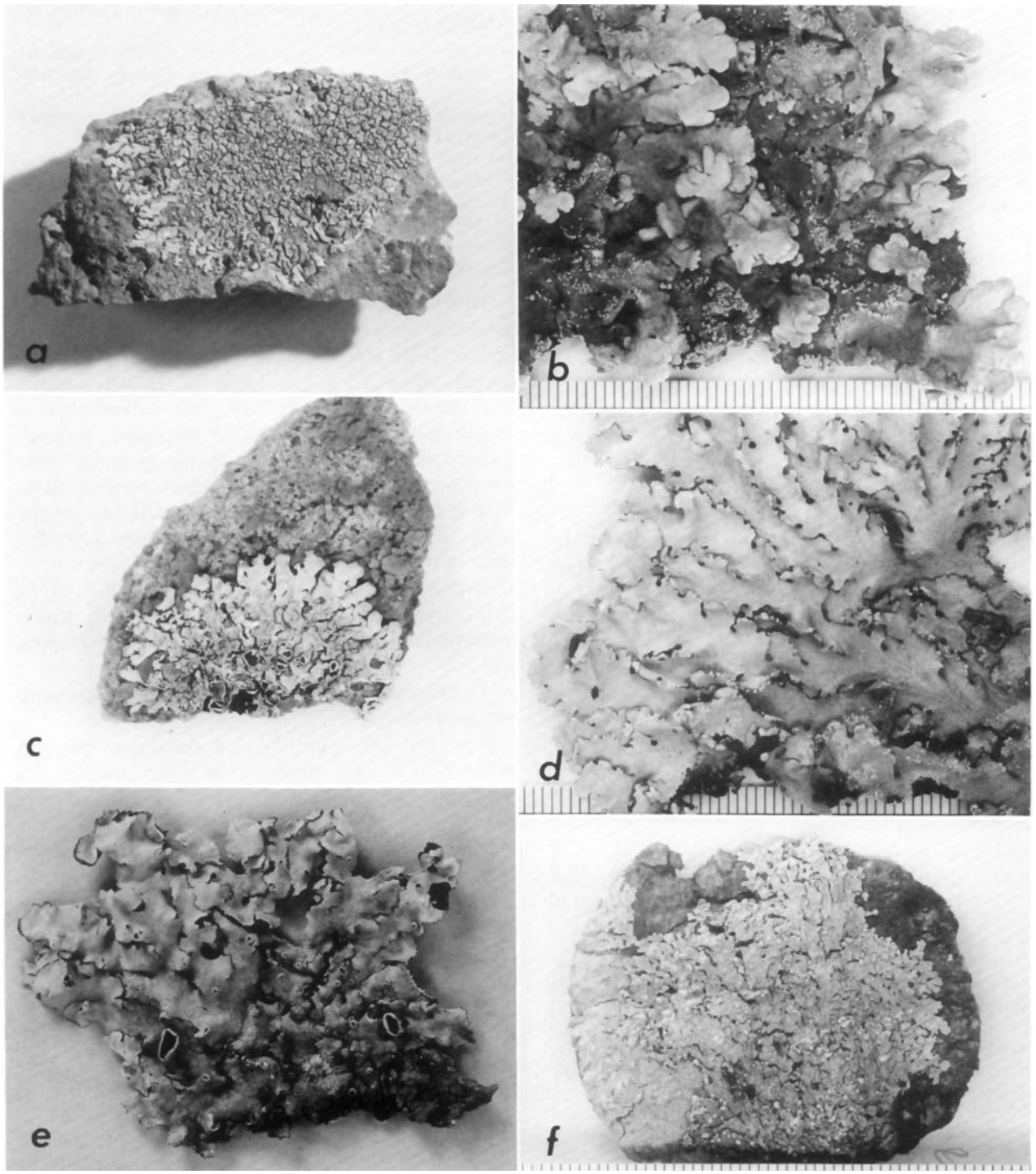

FIGURE 7.—Species of *Pseudoparmelia: a, P. arcana (Degelius,* isotype in US); *b, baltimorensis (Luttrell* 3369 in US); *c, P. basutoensis (Hewitt,* holotype in TRH); *d, P. caperata (Plitt* in US); *e, P. caribaea (Gallo* 494, holotype in US); *f, P. carneopruinata (Hale* 42912). (Scale in mm.)

Pseudoparmelia callichroa Kurokawa, new species

DESCRIPTION.—Thallus adnatus, ramulicola, viridi-flavicans, 3–6 cm latus, lobis subirregularibus, congestis, apice subrotundatis; superne planus vel mox irregulariter rugosus, isidiis sorediisque destitutus; cortex superior 10–13 μm crassus, epicortex perforatus, stratum gonidiale 12 μm crassum, medulla alba, 100–120 μm crassa, cortex inferior 12–13 μm crassus; subtus niger, nitidus, modice rhizinosus, rhizinis simplicibus, nigris. Apothecia numerosa, amphithecio ruguloso, margine crenato, 1.0–4.5 mm diametro; hymenium 70–85 μm altum; sporae 8:nae, 6–8 × 13–16 μm.

CHEMISTRY.—Cortex K−, medulla negative with all reagents; usnic acid and protolichesterinic acid.

HOLOTYPE.—Chile: Colchagua, Hacienda de Conquenes, *P. Dusén* 91, 22 August 1896 (S; US, isotype).

DISTRIBUTION.—Chile.

HABITAT.—On twigs.

REMARKS.—This species would probably be identified as *P. rutidota* (Hooker and Taylor) Hale without a chemical test (*P. rutidota* is P+ red with protocetraric acid). The thallus is smaller but we need many more collections to determine whether any morphological characters correlate with the chemical difference.

Pseudoparmelia caperata

FIGURE 7*d*

Pseudoparmelia caperata (L.) Hale, 1974:189.

Lichen caperatus L. 1753:1147 [type collection: England, *Dillenius, Historia Muscorum* 193, specimen represented by *pl. 25: fig. 97* (OXF, lectotype)].

Parmelia caperata (L.) Acharius, 1803:216.

Parmelia caperata b. *cyliphora* Acharius, 1814:196 [type collection: North America, *Muhlenberg* (H, lectotype; UPS, isolectotype); listed in error as "*cylisphora.*"]

Parmelia perlata var. *flavicans* Tuckerman, 1866:13 [type collection: California, *Bolander* 70 (FH-Tuck, holotype)].

Parmelia euplecta Stirton, 1877–78:299 [type collection: Brisbane, Australia, *Bailey* (BM, lectotype)].

Parmelia flavicans (Tuckerman) Tuckerman, 1882:53 [not *P. flavicans* (Swartz) Acharius, 1803:268 (= *Teloschistes*)].

Parmelia ochroleuca f. *sorediosa* Müller Argoviensis, 1883b: 77 [type collection: Mt. Dromedary, Australia, *Reader* (G, lectotype)].

Parmelia subglauca Nylander *in* Gasilien, 1894:126 [type collection: Saint Omer, France (H, lectotype: BM, PC isotypes)].

Parmelia cylisphora [sic] (Acharius) Vainio, 1896b:7.

Parmelia caperata var. *subglauca* (Nylander *in* Gasilien) Nylander, 1896:35.

Parmelia caperata f. *laevissima* Gyelnik, 1928:587 [type collection: Meleghegy, Fehér, Hungary, *Gyelnik* (BP, holotype)].

Parmelia herreana Zahlbruckner, 1929:239 [based on *P. flavicans* (Tuckerman) Tuckerman].

Parmelia pseudosorediosa Gyelnik, 1931b:288 [based on *Parmelia ochroleuca* f. *sorediosa* Müller Argoviensis].

Parmelia negativa Gyelnik 1934:301 [type collection: Salisbury Cove, Maine, *Plitt* (BP, holotype)].

Pseudoparmelia euplecta (Stirton) Hale, 1974:190.

Pseudoparmelia pseudosorediosa (Gyelnik) Hale, 1974:190.

DESCRIPTION.—Thallus adnate to loosely attached, growing on bark or more rarely on rocks, yellowish green, 5–20 cm in diameter, coalescing to form larger colonies; lobes subirregular, apically rotund, 3–8 mm wide; upper surface plane to undulate or rugulose, continuous, sorediate, the soralia laminal, diffuse and coalescing; medulla rarely orange near the lower cortex; lower surface black, moderately to sparsely rhizinate except for a naked brown rugose zone along the margins. Apothecia very rare, 2–5 mm in diameter; spores 8, 8–13 × 17–24 μm.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC+ rose, P+ red, atranorin, caperatic, protocetraric, and usnic acids; if pigmented, skyrin present.

DISTRIBUTION.—Pantemperate on all major continents (Figure 8).

HABITAT.—On conifers and deciduous trees in temperate forests, common on rocks only at the northern part of its range, from sea level to over 3000 m elevation.

REMARKS.—This is by far the most widespread and commonly collected foliose lichen in all temperate areas of the world. The range in morphological variation is very small and the chemistry remarkably uniform. In eastern North America it can be confused with the primarily saxicolous *P. baltimorensis* (see discussion above). The presumptive nonsorediate parent seems to be *P. rutidota* (Hooker and Taylor) Hale (see below).

Older authors consistently placed this species in *Parmelia* section *Amphigymnia* (= *Parmotrema*). The lobes, however, are clearly adnate at the margins, the bare rim below is very narrow, the tips of rhizines near the margin are frayed, and the apothecia are adnate and nonperforate. This combination of characters relates the species much more closely to *Pseudoparmelia* than to *Parmotrema*.

The species is apparently present in Australia

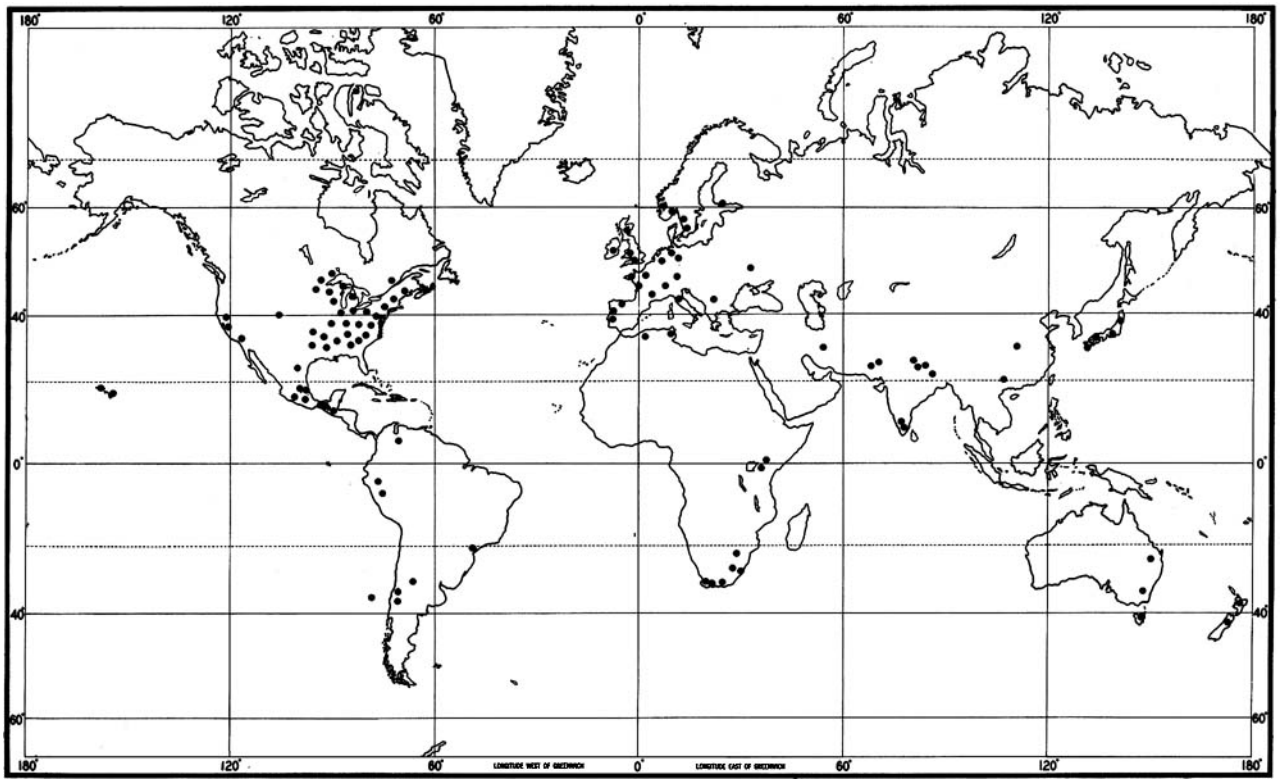

FIGURE 8.—World distribution of *Pseudoparmelia caperata*. (Dots may represent more than one collection.)

and New Zealand, represented by the anonomously pustulate *P. euplecta*. *Parmelia ochroleuca f. sorediosa*, also described from Australia, is atypical in having rather discrete orbicular soralia. Future studies in this region may show that these populations are distinct from *P. caperata*.

SPECIMENS EXAMINED.—See Figure 8 for localities of specimens annotated in the major herbaria. Some specimens from eastern North America which I annotated before about 1972, especially those on rock, will be *P. baltimorensis*.

Pseudoparmelia caribaea

FIGURE 7*e*

Pseudoparmelia caribaea (Hale) Hale, 1974:189.
Parmelia caribaea Hale *in* Hale and Kurokawa, 1964:152 [type collection: St. Barthélemy, West Indies, *Le Gallo* 494 (US, holotype)].

DESCRIPTION.—Thallus adnate on rocks, ashy white, rather coriaceous, 6–10 cm broad; lobes irregularly sublinear, often densely imbricate, 3–6 mm wide; upper surface plane or rugulose, cracked with age; lower surface black, moderately rhizinate. Apothecia subpedicellate, at first globose, urceolate at maturity, up to 5 mm in diameter; spores 8, 4–5 × 10–13 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ rose, P+ red; atranorin and protocetraric acid.

DISTRIBUTION.—West Indies and French Guiana.

HABITAT.—On schist and volcanic rocks in open areas up to 275 m elevation.

REMARKS.—Except for the two specimens from French Guiana and the Isle of Pines, *P. caribaea* is confined to St. Barthélemy, where it has been collected many times. There are no close relatives in the genus.

SPECIMENS EXAMINED.—Cuba: Isle of Pines, *Britton et al.* 14436, 15237 (US). St. Barthélemy: *Le Gallo* 403, 424, 527, 536, 546 (US), 2604 (MSC, US). French Guyana: *Degelius* (Degelius herbarium).

Pseudoparmelia carneopruinata

FIGURE 7*f*

Pseudoparmelia carneopruinata (Zahlbruckner) Hale, 1974: 189.

Parmelia carneopruinata Zahlbruckner, 1902:419 [type collection: Rio de Janeiro, Brazil, *Höhnel* 164 (W, lectotype)].

Parmelia sbarbaronis Bouly de Lesdain, 1923:278 [type collection: Catalupe, Varezze, Liguria, Italy, *Gresino* 11467 (F, lectotype)]

DESCRIPTION.—Thallus closely adnate, corticolous, greenish mineral gray or in the herbarium buff, 5–9 cm in diameter; lobes sublinear, 1–2.5 mm wide; upper surface strongly reticulately ridged and rugulose, becoming pruinose near the lobe tips, sometimes densely lobulate, sorediate, soralia about 1 mm wide, often coalescing; lower surface black, sparsely rhizinate. Apothecia rare, adnate, 1–4 mm in diameter, the disc pruinose or naked, the amphithecium sorediate; spores 8, 6–9 × 9–13 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow, C−, KC−, P+ pale orange; atranorin, stictic acid, and constictic acid with associated unknowns.

DISTRIBUTION.—Mexico, Central America, West Indies, Colombia, Venezuela, Brazil, Uruguay, Argentina, and southern Europe.

HABITAT.—On shade trees in banana and coffee plantations and on deciduous trees in open pastures at 300–2000 m elevation.

REMARKS.—This species is closely related to *P. scrobicularis* (Krempelhuber) Hale, which is or at least may be the nonsorediate progenitor. Another very close sorediate species, *P. crozalsiana* (Bouly de Lesdain) Hale, has much broader, subrotund lobes and a wider, more temperate distribution. The two species, however, probably intergrade and are not always easily distinguished.

SPECIMENS EXAMINED.—Mexico: Nayarit, *Weber* 33609 (COLO); Veracruz, *Hale* 19398, 19432 (DUKE, US), 19452, 19654, 19672, 19794, 21081, 21195. Honduras: Morazán, *Standley* 11655 (F, US), 11657 (F). Costa Rica: San José, *Standley* 34811 (US). Jamaica: *Orcutt* 5603 (US), *Plitt* (US). Colombia: *Lindig* 2590 (G). Venezuela: Mérida, *Hale* 42785, 42912. Brazil: Minas Gerais, *Mexia* 5322 (BM); São Paulo, *Schindler* 4512, 4525 (KR, US). Uruguay: Canelones, *Osorio* 6236 (MVM). Argentina: Jujuy, *Fries* 43b (S). Europe: Italy, *Sbarbaro* (TUR).

Pseudoparmelia caroliniana

FIGURE 9*a*

Pseudoparmelia caroliniana (Nylander) Hale, 1974:189.

Parmelia caroliniana Nylander, 1885:614 [type collection: South Carolina, *Ravenel* 404 (H, lectotype; FH-Tuck, isolectotype)].

Parmelia perlata var. *subrevoluta* Müller Argoviensis, 1880:267 [type collection: Petropolis, Brazil, *Deventer* 45 (G, lectotype)].

Parmelia isidiophora Zahlbruckner, 1902:420 [type collection: Botanical Garden, Rio de Janeiro, Brazil, *Höhnel* 169, (W, lectotype)].

Parmelia luteola Zahlbruckner, 1909:170 [type collection: Near Barra Mansa, São Paulo, Brazil, *Wettstein and Schiffner* (W, lectotype)].

Parmelia wainoana Lynge, 1914:87 [type collection: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2435C (S, lectotype)].

Pyxine azorea Nylander, 1895:100 [type collection: Azores, *Michel* 66 (H, lectotype)].

DESCRIPTION.—Thallus closely adnate to bark, rarely on rock, 5–10 cm broad; lobes subirregular, rotund, 2–5 mm wide; upper surface plane, reticulately white-maculate and finely cracked, densely isidiate, the isidia 1–3 mm high, often branched; lower surface black, very rarely uniformly dark brown, moderately rhizinate except for a narrow naked or papillate zone along the margins. Apothecia rare, adnate, 1–3 mm in diameter, the amphithecium isidiate; spores 8, 6–8 × 13–15 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ faint rose or purple, P−; atranorin and perlatolic acid with associated unknowns.

DISTRIBUTION.—Southeastern United States, Mexico, Central America, West Indies, Venezuela, Ecuador, Brazil, Azores, Africa, and Thailand.

HABITAT.—On trees (conifers and deciduous trees) in coffee plantations, secondary forest, and pastures and rarely on rocks from sea level to 2800 m elevation.

REMARKS.—The first study of this species was done by Culberson (1957), who clarified its relation and frequent confusion with *Parmelia rudecta* Acharius, another widespread species which differs in having pseudocyphellae and lecanoric acid as well as a paraplectenchymatous upper cortex. *Pseudoparmelia caroliniana* is the only isidiate species in the genus with perlatolic acid; *P. aptata* (Krempelhuber) Hale also has perlatolic acid but is sorediate and lacks the fine reticulation so characteristic of *P. caroliniana*. I wish to thank Dr. T. D. V. Swinscow for pointing out the synoymy of *Pyxine azorea*.

SPECIMENS EXAMINED.—United States: See Culberson (1957) for localities over the range in the United States and Moore (1968:223) for specimens from Florida. Mexico: Hidalgo,

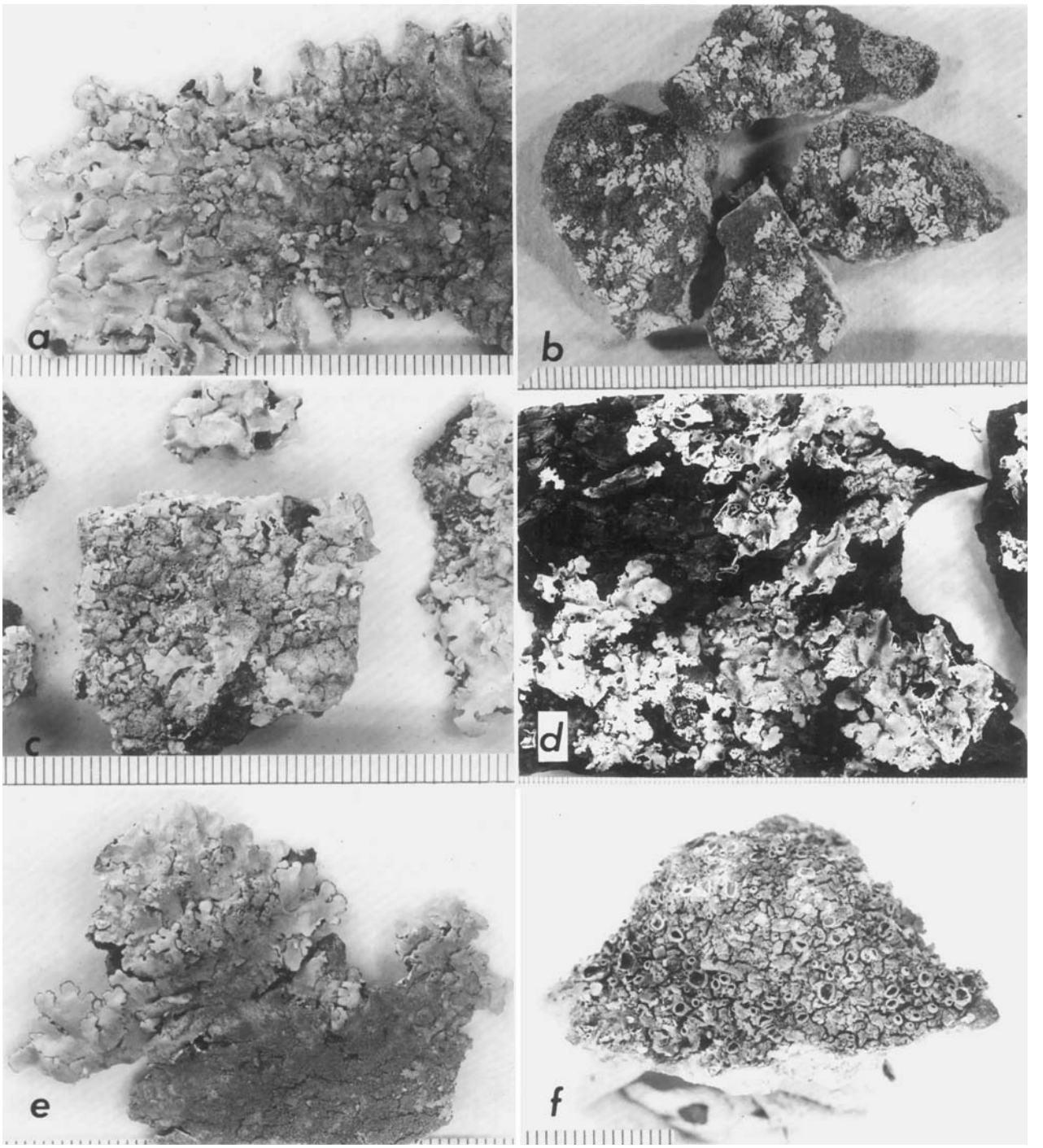

FIGURE 9.—Species of *Pseudoparmelia: a, P. caroliana* (*Hale* 20144); *b, P. chapadensis* (*Malme* 2297B, lectotype in S); *c, P. cinerascens* (*Xavier* 713 in US); *d, P. concomitans* (*Hill* 12091, holotype in BM); *e, P. concrescens* (*Swinscow* 2U 24/21 in BM); *f, P. condyloides* (*Almborn* 4882, holotype in LD). (Scale in mm.)

Robinson (US); Veracruz, *Hale* 19471, 19488, 21131, 21135; Chiapas, *Hale* 19900, 20104, 20144, 20215, 21310, 20333. Honduras: Morazán, *Standley* 238, 11603 (F). Nicaragua: *Standley* 8432 (F). Costa Rica: Guanacaste, *Standley* 44370 (US). Panama: Chiriquí, *Hale* 38804. Cuba: *Wright* 71 (FH, M, PC, UPS, US); Oriente, *Imshaug* 24763, 24858 (MSC). Jamaica: *Imshaug* 13762, 14200 (MSC), *Plitt* (US). Haiti: Ouest, *Imshaug* 22542, 22859, 22954, 23061 (MSC, US), *Wetmore* 2882, 3076, 3149, 3207 (MSC, US), *Leonard* 3709b (US). Dominican Republic: Cordillera Central, *Imshaug* 23714 (MSC, US, WIS), 23718 (BM, G, MSC); La Vega, *Allard* 18033 (US). Venezuela: Distrito Federal, *Dennis* 1503 (BM). *Santesson* 6672, 6681 (S); Mérida, *Hale* 42039, 42196, 43318, 44081, 44225; Táchira, *Hale* 45632, 45649. Ecuador: Galápagos, *Johannsen* 10 (WIS), *Weber* 40031 (COLO, UPS). Brazil: Rio de Janeiro, *Eiten* 7373 (US); São Paulo, *Eiten* 2978, (US) *Osorio* 4925 (MVM); Santa Catarina, *Reitz and Klein* 13145, 15398 (US). Europe: Portugal, *Persson* (UPS). Ivory Coast: Man, *Santesson* 10494 (UPS, US). Uganda: Burahiya County, *Swinscow* 2U 18 (BM); Kyadondo County, *Swinscow* 2U 1/7 (BM). Angola: Huíla, *Degelius* (Degelius herbarium). Laos: *Tsuyama* 19 (TNS).

Pseudoparmelia chapadensis

FIGURE 9*b*

Pseudoparmelia chapadensis (Lynge) Hale, 1974:189.
Parmelia chapadensis Lynge, 1914:153 [type collection: near Bocca da Serra, Serra da Chapada, Mato Grosso, Brazil, *Malme* 2297B (S, lectotype)].

DESCRIPTION.—Thallus closely adnate on rock, yellowish green, 1–1.5 cm broad; lobes sublinear, short, 0.5 mm wide, convex and expanded at the tips; medulla yellowish; lower surface pale brown, moderately rhizinate. Apothecia common, sessile, 0.5–1.0 mm in diameter; spores 8, 4–5 × 8–10 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+, C+, KC+ yellowish, P+ red; unidentified substances present.

DISTRIBUTION.—Brazil.

HABITAT.—Rocks in open areas.

REMARKS.—This peculiar species is tentatively placed in *Pseudoparmelia* because the lobes are eciliate and the rhizines simple. Contrary to my earlier findings (Hale, 1960), it does not contain usnic acid or protocetraric acid. The yellow coloration is caused by unidentified pigments in both the cortex and the medulla. Perhaps additional collections will clarify the status of the species.

Pseudoparmelia cinerascens

FIGURE 9*c*

Pseudoparmelia cinerascens (Lynge) Hale, 1974:189.
Parmelia cinerascens Lynge, 1914:104 [type collection: Paraguari, Paraguay, *Malme* 1498 (S, lectotype)].

DESCRIPTION.—Thallus adnate, fragile, ashy mineral gray, 4–5 cm broad; lobes short, becoming imbricate, 1–3 mm wide; upper surface plane, irregularly cracked with age, densely isidiate, isidia cylindrical, simple or branched; lower surface black, rhizines moderate to sparse. Apothecia abundant, adnate; spores 8, 6 × 12 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow turning red, C−, KC−, P+ orange; atranorin and salazinic acid.

DISTRIBUTION.—Brazil and Paraguay.

HABITAT.—On trees in open forest.

REMARKS.—This rare species is superficially near *P. salacinifera* (Hale) Hale, which differs in having a pale brown lower surface.

SPECIMENS EXAMINED.—Brazil: Pernambuco, *Xavier* 713 (US).

Pseudoparmelia concomitans, new species

FIGURE 9*d*

DESCRIPTION.—Thallus laxe adnatus, corticola, bubalino-albidus, coriaceus, 4–6 cm latus, lobis subirregularibus, apice rotundatis, 3–5 mm latis; superne planus, nitidus albo-maculatusque, sorediis et isidiis destitutus; cortex superior 10–14 μm crassus, epicortex sparse perforatus, stratum gonidiale 10–12 μm crassum, medulla 90–110 μm crassa, Cortex inferior 8–10 μm crassus; subtus niger, sparse rhizinosus, ambitu nudus, castaneus, nitidus. Apothecia numerosa, substipitata, 1–2 mm diametro; sporae 8:nae, 12 × 20–23 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C+, KC+ red, P+ red, atranorin, gyrophoric acid, and protocetraric acid.

HOLOTYPE.—New Caledonia: Baie des Crabes, Île de Pins, on fallen branches of *Araucaria cookii, D. J. Hill* 12124 (BM; US, isotype).

DISTRIBUTION.—New Caledonia.

HABITAT.—On branches of *Araucaria*.

REMARKS.—This species is known only from the type collection and seems unrelated to any other *Pseudoparmeliae*. The lobes are coriaceous and strongly white maculate. Only *P. martinicana* produces this combination of medullary substances but it is an isidiate, fragile lichen confined to the West Indies.

Pseudoparmelia concrescens

FIGURE 9*e*

Pseudoparmelia concrescens (Vainio) Hale
Parmelia concrescens Vainio, 1901:400 [type collection: Serra

da Xella, Huíla, Angola, *Welwitsch* 30 pro parte (TUR, lectotype; BM, isolectotype)].

Parmelia capensis Nylander, 1885:613 [type collection: Cape of Good Hope, Union of South Africa, *Drège* (H, Nylander herbarium number 35174, lectotype; PC, isotype); not *P. capensis* (Acharius) Sprengel, 1827:280 (=*Teloschistes*)].

Parmelia austroafricana Zahlbruckner, 1929:152 [type: based on *P. capensis* Nylander].

Parmelia caffrorum Zahlbruckner, 1932a:555 [type: based on *P. capensis* Nylander].

DESCRIPTION.—Thallus adnate on bark, ashy mineral gray, 4–10 cm in diameter; lobes irregularly sublinear, 1–3 mm wide; upper surface plane, continuous or cracked on older lobes, densely isidiate, the isidia short, cylindrical, mostly simple; lower surface black, sparsely rhizinate. Apothecia rare, adnate, 2–3 mm in diameter; spores 8, 5 × 7–8 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ faint wine red, P−; atranorin and divaricatic acid with associated unknowns.

DISTRIBUTION.—Southern Africa.

HABITAT.—On trees or rocks in open woodland at 1000–2300 m elevation.

REMARKS.—This is one of the commoner, more widespread lichens in Africa. It is presumed to be an isidiate morph of *P. nairobiensis* (Steiner and Zahlbruckner) Hale, with which it is sympatric. It is also close to the more widespread *P. ecaperata* (Müller Argoviensis) Hale, which differs in containing usnic acid in the cortex.

SPECIMENS EXAMINED.—Uganda: *Dummer* 602 (US); Busiro County, *Swinscow* 2U 24/21 (BM, US); Kinkizi County, *Dale* L46 (BM, US). Zaire (Congo): *Degelius* (Degelius herbarium, US), *Höeg* (TRH), *Louis* 7494 (BR), *de Witte* 2675 (BR). Angola: Cuanza-Sul, *Degelius;* Bié, *Degelius;* Huíla, *Degelius;* Moxico, *Degelius* (all Degelius herbarium). Rhodesia: *Arnell* 1282a (LD), *Schütte* 46c (LD, US). Moçambique: *Almborn* 6888, 7015 (LD). Union of South Africa: Natal, *Almborn* 8637 (LD).

Pseudoparmelia condyloides

FIGURE 9*f*

Pseudoparmelia condyloides (Kurokawa) Hale, 1974:189.

Parmelia condyloides Kurokawa in Hale, 1972:343 [type collection: Kamieskroon, Namaqualand, Union of South Africa, *Almborn* 4882 (LD, holotype; TNS, US, isotypes)].

DESCRIPTION.—Thallus closely adnate on rock, dark mineral gray with a yellowish cast, 3–5 cm broad; lobes subirregular to sublinear, crowded, 1.5–2.5 mm wide; upper surface plane to rugose-bullate, the cortex breaking away easily; lower surface pale brown, moderately rhizinate, the rhizines pale. Apothecia numerous, adnate, 1–2 mm in diameter; spores 8, 4 × 5 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow turning red, C−, KC−, P+ orange; atranorin, "chalybeizans" unknown, salazinic acid, and a pale yellow unidentified pigment.

DISTRIBUTION.—South Africa.

HABITAT.—On rocks in open dry areas.

REMARKS.—This is another species of *Pseudoparmelia* that bears a close resemblance to *Xanthoparmelia*. The "chalybeizans" unknown, in fact, was previously known only in *Xanthoparmelia* (Hale, 1972b). This specimen apparently endemic to the arid regions of South Africa.

SPECIMENS EXAMINED.—Material from the Union of South Africa is listed in Hale (1972b:343).

Pseudoparmelia conlabrosa, new species

FIGURE 10*a*

DESCRIPTION.—Thallus arcte adnatus, corticola, viridi-albidus, 3–5 cm latus, lobis sublinearibus, apice plus minusve subrotundatis, congestis, 2–2.5 mm latis; superne undulatus, nitidus, apice alboreticulatus, dense isidiatus, isidiis cylindricis, pro maxima parte simplicibus, usque ad 0.5 mm altis; cortex superior 10–12 μm crassus, epicorticatus, epicortice perforato, stratum gonidiale ca 10 μm crassum, medulla alba, ca 100 μm crassa, cortex inferior paraplectenchymatus, 8–10 μm crassus; subtus niger, modice rhizinosus, rhizinis nigris, simplicibus. Apothecia ignota.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C+, KC+ red, P−; atranorin and lecanoric acid.

HOLOTYPE.—Australia: New South Wales, between Majors Creek and Araluen, *Weber and McVean* L-47102, 18 October 1967 (US; COLO, isotype).

REMARKS.—This species is obviously related to *Pseudoparmelia labrosa* (Zahlbruckner) Hale, a sorediate species with lecanoric acid also known from Australia. No parent morph has yet been discovered for these two species.

Pseudoparmelia corrugativa, new combination

Parmelia corrugativa Kurokawa and Filson, 1975:38 [type collection: Near Bulhunnah, South Australia, *Rogers* 553 (MEL, holotype) (not seen)].

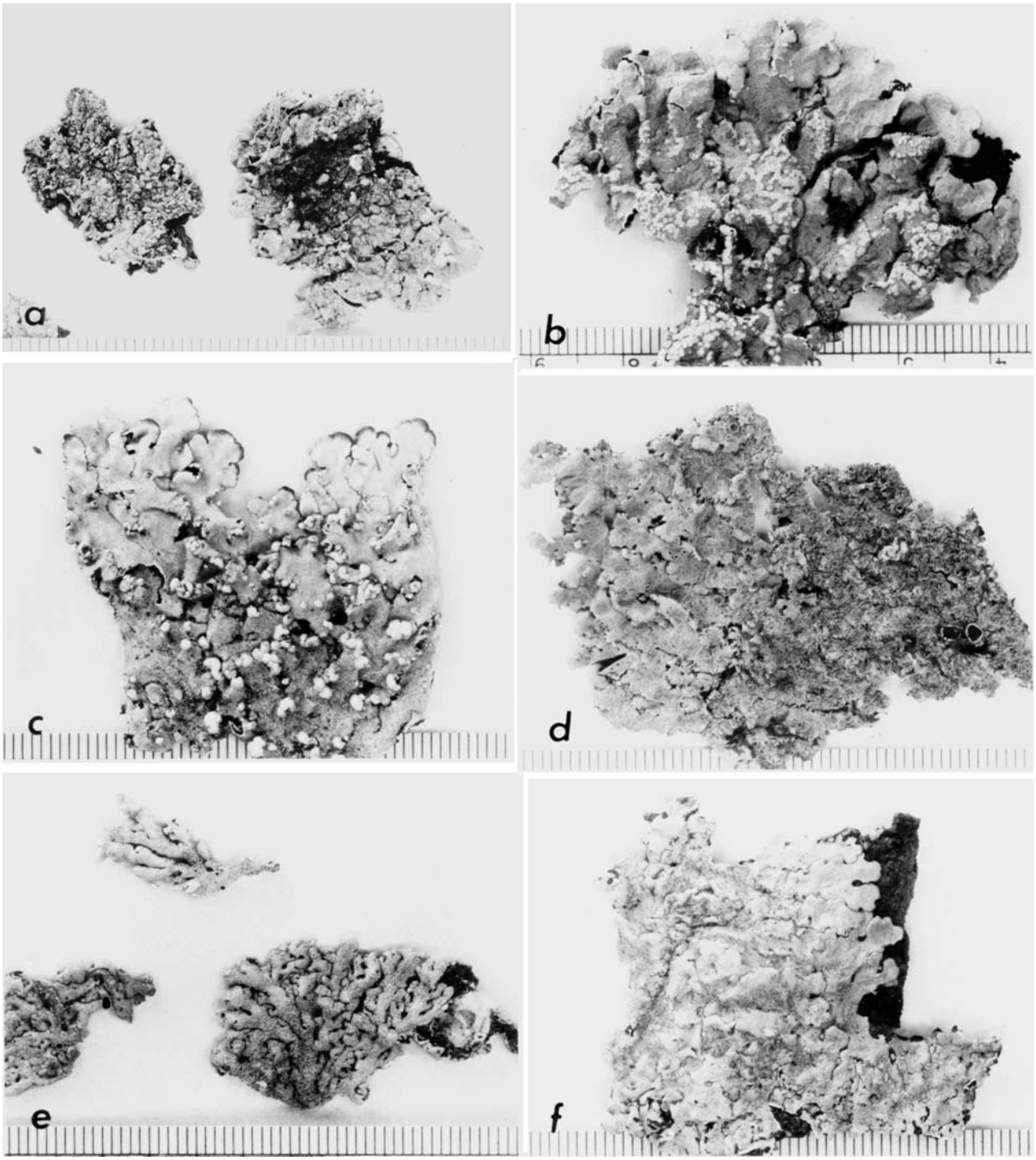

FIGURE 10.—Species of *Pseudoparmelia: a, P. conlabrosa (Weber and McVean* L–47102, holotype in US); *b, P. crozalsiana (Culberson* 6586 in US); *c, P. cryptochlorophaea (Hale* 19771); *d, P. cyphellata (Malme* 2532B, isolectotype in US); *e, P. dahlii (Dahl,* isotype in US); *f, P. ecaperata (Tsuyama* 5 in US). (Scale in mm.)

DESCRIPTION.—Thallus closely adnate on twigs, whitish mineral gray, about 6 cm broad; lobes irregularly elongate, apically rotund, 1.5–3 mm wide; upper surface rugulose; medulla white in the upper part and deep yellow in the lower half; lower surface black, sparsely rhizinate. Apothecia numerous, 1–4 mm in diameter; spores 8, 7 × 10 μm.

CHEMISTRY.—Cortex K+ yellow, medulla negative with color reagents except for the pigment which is K+ purple, atranorin, and unidentified substances.

DISTRIBUTION.—South Australia.

HABITAT.—On twigs of tree in open area.

REMARKS.—This species is very similar to *P. subtiliacea* (Nylander) Hale, which differs in having a white medulla without pigments but with fatty acids. One additional specimen, which I have not seen, was collected by Rogers (95) in Para-Wirra National Park, South Australia. The species is well illustrated in Kurokawa and Filson (1975) (pl. 1: fig. 3).

Pseudoparmelia crozalsiana

FIGURE 10*b*

Pseudoparmelia crozalsiana (Bouly de Lesdain) Hale, 1974: 189.

Parmelia crozalsiana Bouly de Lesdain *ex* Harmand, 1909: 555 [type collection: Agde, Hérault, France, *De Crozals*, May 1909 (US, lectotype)].

DESCRIPTION.—Thallus adnate to bark, greenish mineral gray, 5–10 cm broad; lobes subirregular, 3–6 mm wide; upper surface strongly reticulately ridged and wrinkled, sometimes white-pruinose, sorediate, the soralia often produced along the ridges, coalescing; lower surface black, moderately rhizinate except for a narrow brown marginal zone. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow, C−, KC−, P+ pale orange, atranorin, stictic acid, constictic acid, and associated unknowns.

DISTRIBUTION.—Eastern United States, Mexico, Brazil, Uruguay, Argentina, France, Italy, Zaire, Union of South Africa, and India.

HABITAT.—On trees in open secondary forests at 100–2000 m elevation.

REMARKS.—I first identified this species in North America in 1960 (Hale, 1960) where it had been misidentified as *Parmelina aurulenta* (Tuckerman) Hale, a ciliate species. Since then it has been recognized from many localities. The lobes are usually quite broad and apically subrotund and the reticulate wrinkles very distinct without magnification. Once the chemistry is recognized, it could only be confused with *Parmelia carneopruinata* (see below), which has lobes less than half as wide on the average. There seems to be no nonsorediate progenitor extant, unless we consider it to be the rare African species *P. inhaminensis* (Dodge) Hale.

When I first examined the surface of this species with the scanning-electron microscope (Hale, 1973a), I noted a strongly nodular surface without pores, an anamolous condition for the genus. However, examination of other species has shown that pores do occur rarely but that even though the species does not seem to have a paraplectenchymatus upper cortex, as one would expect in a nonepicorticate *Parmelia*, the cortical structure of this species is rather atypical.

SPECIMENS EXAMINED.—United States: Illinois, *Hale* 13980, *Skorepa* 1757 (US); Indiana, *Hale* 14097; Kentucky, *Hale* 13691; Ohio, *Hale* 13576; Virginia, *Hale* 15232, 15761, 18455; Arkansas, *Keck* 1216 (US); Alabama, *Hale* 33829. Mexico: Mexico, *Hinton* 7724 bis (BM); Veracruz, *Hale* 19494. Venezuela: Mérida, *Hale* 42288, 42312, 43049a; Táchira, *Hale* 45704. Brazil: Mato Grosso, *Malme* 2243C (S); Paraná, *Montes* 10121 (DUKE); Pernambuco, *Xavier* 700 (US). Uruguay: Lavalleja, *Osorio* 3667 (DUKE); Maldonado, *Osorio* 4879 (US); Rivera, *Osorio* 1075 (US). Argentina: Tucumán, *Venturi* 336 (DAR). Europe: Italy, *Davies* (BM), *Sbarbaro* (US), *Sbarbaro* in *Lichenotheca Parva* 32 (M), *Sbarbaro* in *Lichenes Selecti Exsiccati* 96 (H, LD, US). Uganda: Mawakota County, *Swinscow* 2U 41/2 (BM, US). Zaire: *Louis* 8150 (BR). Union of South Africa: Natal, *Almborn* 8636 (LD), *Höeg* (TRH). India: Tamil Nadu, *Awasthi* 4276 (Awasthi herbarium), *Hale* 43976.

Pseudoparmelia cryptochlorophaea

FIGURE 10*c*

Pseudoparmelia cryptochlorophaea (Hale) Hale, 1974:189.

Parmelia cryptochlorophaea Hale, 1959:18 [type collection: Ciudad Trujillo, Dominican Republic, *Allard* 15715a (US, holotype)].

DESCRIPTION.—Thallus adnate to appressed on large branches, 5–10 cm in diameter, light mineral gray but soon turning buff in the herbarium; lobes 3–5 mm wide, apically subrotund, crowded; upper surface rugulose and shiny, more or less reticulate white-maculate at the tips, becoming cracked in older parts; margins sorediate, the soredia in dense

erect soralia, 0.6–1.0 mm thick, 1–1.5 mm high; lower surface black and rhizinate at the center, brown and naked to papillose in a narrow zone at the margins. Apothecia rare, 1–3 mm in diameter, spores 8, 4–5 × 6–9 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ rose, P−; atranorin, caperatic acid (C. Culberson, 1965), and cryptochlorophaeic acid.

DISTRIBUTION.—Southern United States, Mexico, Central America, West Indies, Venezuela, and Brazil.

HABITAT.—On trees (cashew, *Xylopia,* bamboo, etc.) in mature forests at sea level to 500 m elevation.

REMARKS.—The most unusual feature of this New World species is the chemistry, the only reported occurrence of cryptochlorophaeic acid in the Parmeliaceae. The capitate soralia are also unique. The white reticulation is similar to that in the *Parmelia texana* group, with which it is obviously closely allied.

SPECIMENS EXAMINED.—United States: Georgia, *Hale* 16797, 21985; Florida, *Hale* 16989, 17584, 17609, 21674, 21815, 21839, *Rapp* (US) (for further records from Florida in DUKE see Moore, 1968:225). Mexico: Veracruz, *Hale* 19771, 19811. Honduras: Comayagua, *Standley* 5462, 5930 (F). Jamaica: *Imshaug* 15967, 15969 (US), *Plitt* s.n. (US). Dominican Republic: La Vega, *Allard* 16833, 16845, 16854, 16861, 18028; Santiago, *Imshaug* 23884 (MSC, US); Santo Domingo, *Allard* 15715, 16182, 16187, 16191a (US). Trinidad: *Degelius* s.n. (Degelius herbarium); *Lassen* (C); *Lewis* 347 (PH). Venezuela: Barinas, *Steyermark and Rabe* 96533 (US); Mérida, *Hale* 42505a. Brazil: Ceará, *Cutler* 8072c (F); Rio de Janeiro, *Glaziou* 1848 (M).

Pseudoparmelia cyphellata

FIGURE 10*d*

Pseudoparmelia cyphellata Lynge, 1914:15 [type collection: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2532B (S, lectotype; LD, UPS, US, isolectotypes)].
Parmelia cyphellata (Lynge) Santesson, 1942:473.

DESCRIPTION.—Thallus as in *P. sphaerospora* (see below) except the upper surface isidiate, isidia cylindrical, rather sparse, up to 1 mm tall. Apothecia abundant, adnate to substipitate, 2–3 mm in diameter; spores 8, about 5 × 7 μm.

CHEMISTRY.—Cortex K+ yellowish, medulla yellowish to orange with color reagents; atranorin, stictic acid, and an unidentified pigment.

DISTRIBUTION.—Brazil.

HABITAT.—On trunks of trees in forest.

REMARKS.—This species is clearly the isidiate morph of *P. sphaerospora* (Nylander) Hale. Unfortunately it is still known only from the type locality.

Pseudoparmelia dahlii, new species

FIGURE 10*e*

Thallus adnatus, corticola, viridi-flavicans, 3–4 cm latus, lobis sublinearibus, contiguis, 1.5–2.0 mm latis; superne convexus, opacus, dense isidiatus, isidiis cylindricis, simplicibus, usque ad 0.5 mm altis; cortex superior 12–14 μm crassus, epicorticatus; stratum gonidiale 15–20 μm crassum; medulla alba, 140–160 μm crassa; cortex inferior paraplectenchymatus, 12–14 μm crassus; subtus pallide castaneus, dense rhizinosus, rhizinis pallidis, simplicibus, elongatis. Apothecia adnata, 1 mm diametro; hymenium 40–45 μm altum; sporae 8:nae, 6 × 7–9 μm.

CHEMISTRY.—Cortex K−, medulla K−, C+, KC+ red, P−, usnic acid, caperatic acid and lecanoric acid.

HOLOTYPE.—Sri Lanka: Polonnaruwa, *E. Dahl,* 6 January 1972 (O; US isotype).

DISTRIBUTION.—Sri Lanka.

HABITAT.—On trees in lowland forest.

REMARKS.—Superficially this lichen resembles *P. malaccensis* (Nylander) Hale very closely, but the rhizines are denser and longer, the lobes thicker and dull without alboreticulate patterning, and the chemical components different. It is, however, clearly a member of the *P. intertexta-P. malaccensis* lowland rain forest complex. Another closely related species, *P. rahengensis* (Vainio) Hale, which occurs in the higher elevation monsoon forest in Thailand, is also externally very close. Chemical tests are needed to identify the species. I wish to thank Dr. Hildur Krog for allowing me to see the specimens and to describe them.

SPECIMENS EXAMINED.—Sri Lanka: Dambulla, *Dahl* (O, US).

Pseudoparmelia ecaperata

FIGURE 10*f*

Pseudoparmelia ecaperata (Müller Argoviensis) Hale, 1974: 190.
Parmelia ecaperata Müller Argoviensis, 1891:378 [type collection: Shire River, "Zambesica," Africa, *Kirk* (G, lectotype; BM, isolectotype)].

Parmelia malaccensis var. *laeteflavens* Vainio, 1921:38 [type-collection: Doi Sutep, Thailand, *Hosseus,* 1904 (TUR, Vainio herbarium number 2764, lectotype)].
Parmelia laeteflavens (Vainio) Gyelnik, 1938a:32.
Parmelia djalonensis des Abbayes, 1951:966 [type collection: Fouta-Djalon, Dalaba, Guinea, *des Abbayes* (REN, lectotype)]

DESCRIPTION.—Thallus as in *P. concrescens* (see above) except yellowish green. Apothecia rare, 1–4 mm in diameter, the amphithecium isidiate; spores 8, 6 × 11–14 μm.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC+ faint wine red, P−; atranorin, divaricatic acid, and usnic acid, rarely with protolichesterinic acid.

DISTRIBUTION.—Africa, Nepal, India, and Thailand.

HABITAT.—On trees or more rarely rocks in open forest up to 2000 m elevation.

REMARKS.—This species represents the isidiate morph of *P. zambiensis* (Hale) Hale. It also represents the usnic acid-containing counterpart of *P. concrescens,* a species which does not occur outside of Africa. It has no relationship to *P. caperata,* as the name might be construed to imply, which contains protocetraric acid.

SPECIMENS EXAMINED.—Ivory Coast: Séguéla, *Santesson* 10698a, 10702b (UPS, US). Guinea: N'Zérékoré, *Santesson* 10568a (UPS, US). Zaire: *Höeg* (TRH), *Schmitt* 3048 (BR). Angola: Bié, *Degelius* (Degelius herbarium); Cuanza Sul, *Degelius* (Degelius herbarium); Huíla, *Degelius* (Degelius herbarium); Moxico, *Degelius* (Degelius herbarium). Rhodesia: *Angus* (BM), *Höeg* (TRH), *Kofler* (LD), *Schütte* 61b (LD, US). Malawi: *Jellicoe* 55 (BM). Nepal: *Poelt* 107, 114 (M, US), *Noordyte* (L), *Togashi* (TNS). India: Tamil Nadu, *Awasthi* 4431, 4432 (Awasthi herbarium, US), *Degelius* As-256 (Degelius herbarium), *Foreau* 54 (Awasthi herbarium, US), *Hale* 43673, 43713, 43866, 43948; Uttar Pradesh, *Awasthi* 3496, 3972 (Awasthi herbarium). Thailand: *Kurokawa* 1670, 1954 (TNS, US), *Tsuyama* (TNS, US).

Pseudoparmelia epileuca

FIGURE 11*a*

Pseudoparmelia epileuca (Hale) Hale, 1974:190.
Parmelia epileuca Hale, 1972:343 [type collection: District Inhambane, Moçambique, *Schelpe* 4461 (BOL, holotype; isotypes in LD, US)].

DESCRIPTIONS.—Thallus closely adnate on bark, ashy white, 3–5 cm broad; lobes sublinear, contiguous, with smooth dark rimmed margins, 1.5–2.0 mm wide; upper surface plane, sorediate, the soralia orbicular, confluent with age; lower surface black, moderately rhizinate. Apothecia unknown.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC−, P+ red; atranorin and protocetraric acid.

DISTRIBUTION.—Kenya and Moçambique.

HABITAT.—On coconut and other trees in open forest or savanna up to 300 m elevation.

REMARKS.—This rare lichen appears to be the sorediate morph of *P. schelpei* (Hale) Hale, which also occurs in Moçambique. Two superficially related sorediate species with protocetraric acid occur in the New World: *P. alabamensis* (Hale and McCullough) Hale, which is saxicolous and has generally narrower lobes, and *P. raukiaeri* (Vainio) Hale, which has irregular pustular soredia.

SPECIMENS EXAMINED.—Kenya: Coast Province, *Santesson* 20898 (UPS, US), Moçambique: Sul do Save, *Schelpe* 4461a (BOL, US), 4460a, 4461b (BOL).

Pseudoparmelia eruptens

FIGURE 11*b*

Pseudoparmelia eruptens (Kurokawa) Hale, 1974:190.
Parmelia eruptens Kurokawa *in* Hale and Kurokawa, 1964: 153 [type collection: Lydenburg, Transvaal, Union of South Africa, *Almborn* 7498 (LD, holotype; US, isotype)].

DESCRIPTION.—Thallus adnate, corticolous, whitish mineral gray to buff in the herbarium, 5–8 cm broad; lobes subirregular, rotund, 2–8 mm wide; upper surface plane, continuous, moderately isidiate-pustulate, the isidia irregularly inflated, basally constricted, bursting apically; lower surface black, sparsely rhizinate except for a narrow naked zone at the tips. Apothecia rare, adnate, 1–3 mm in diameter, the amphithecium coarsely isidiate; spores 8, 5–7 × 19–12 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC− or KC+ purple violet, P−; atranorin and divaricatic acid with associated unknowns.

DISTRIBUTION.—Moçambique and Union of South Africa.

HABITAT.—On trees (and rocks?) in open forest.

REMARKS.—This rare species is probably most closely related to sorediate *P. texana* (Tuckerman) Hale. The large pustules of *P. eruptens* do not become sorediate.

SPECIMENS EXAMINED.—Moçambique: *Mitchell* 332 (US). Union of South Africa: Transvaal, *Maas Geesteranus* 6453 (L, US), 6455 (L).

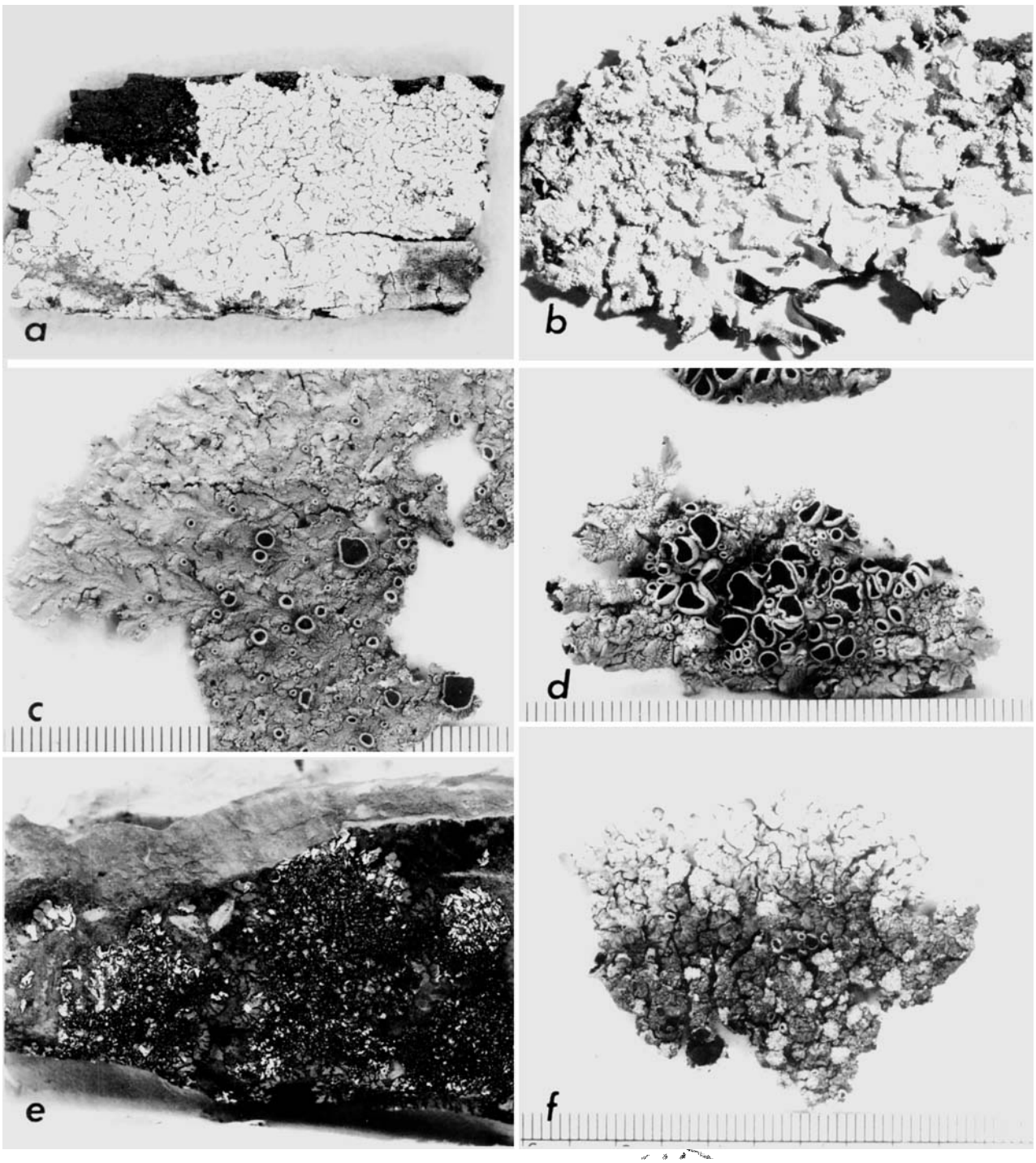

FIGURE 11.—Species of *Pseudoparmelia: a, P. epileuca (Schelpe* 4461b, isotype in BOL); *b, P. eruptens (Almborn* 7498, holotype in LD); *c, P. exornata (Lamb* 1101 in US); *d, P. ferax (Rogers* 1326 in US); *e, P. geesterani (Maas Geesteranus* 6405, holotype in L); *f, P. gerlachei (Santesson* 6495 in US). (Scale in mm.)

Pseudoparmelia exornata, new combination

FIGURE 11*c*

Parmelia caperata var. *exornata* Zahlbruckner, 1912:379 [type collection: Cerillos Canelones, Uruguay, *Felippone* 431 (W, lectotype; G, isolectotype)].

Parmelia rutidota f. *filizans* Lynge, 1914:153 [type collection: Quinta, Rio Grande do Sul, Brazil, *Malme* 727 (S, lectotype)].

DESCRIPTION.—Thallus adnate to closely adnate on bark, yellowish green, 4–10 cm broad; lobes subirregular, contiguous, apically subrotund, 2–4 mm wide, sometimes marginally dissected, becoming lobulate and crowded toward the center, with numerous pycnidia; lower surface black and sparsely rhizinate but with a rugose bare brown zone at the margin near the tips. Apothecia common, adnate to substipitate, 2–5 mm in diameter, the rim crenate; spores 8, 8–10 × 15–18 μm.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC− or KC+ rose, P+ orange; usnic acid, protocetraric acid, and the "conformata" unknown.

DISTRIBUTION.—Southeastern Brazil and Uruguay.

HABITAT.—On trees in open forest at 300–600 m elevation.

REMARKS.—This species is closely related to *P. rutidota* in chemistry and morphology. It produces an unidentified substance, the "conformata" unknown, just below protocetraric acid in the hexane solvent, the same chemistry known for its presumptive isidiate morph, the saxicolous *P. papillosa*. The lobes tend to be thinner and more filiform and finely lacinate than typical *P. rutidota*. It occupies a restricted range in Brazil and Uruguay, whereas *P. rutidota* occurs sporadically in the Andean chain and in northern Brazil, as well as in North America and Australia.

SPECIMENS EXAMINED.—Brazil: Rio Grande do Sul, *Malme* 715 (S). Uruguay: Lavalleja, *Lamb* 1101 (FH, US); San José, *Osorio* 877, 6154, 6195 (MVM); Tacuarembo, *Osorio* 1106, 1165 (MVM); Treinta y tres, *Osorio* 5979 (MVM).

Pseudoparmelia ferax

FIGURE 11*d*

Pseudoparmelia ferax (Müller Argoviensis) Hale, 1974:190.

Parmelia ferax Müller Argoviensis, 1886:257 [type collection: Australia: New South Wales, Gutawang, *Hamilton* 2 (G, lectotype)].

Parmelia obversa Stirton, 1899:76 [type collection: Australia, *Paton* (GLAM, lectotype; BM, isolectotype)].

Parmelia citrinescens Gyelnik, 1938b:271 [type collection: Lago Nahuel, Puerto Blest, Patagonia, Argentina, *Dusén* 163 (BP, holotype; S, US, isotypes)].

DESCRIPTION.—Thallus closely adnate on bark, greenish yellow, 5–8 cm broad; lobes subirregular, crowded, apically rotund, 3–4 mm wide; upper surface soon wrinkled and rugose, in part warty and lobulate; lower surface black and coarsely rhizinate except for a narrow brown zone at the margins. Apothecia common, sessile, plane to almost urceolate, 2–4 mm in diameter; spores 8, 7–8 × 13–16 μm.

CHEMISTRY.—Cortex K+ yellowish, medulla K−, C−, KC−, P+ red; atranorin, usnic acid, and physodalic acid.

DISTRIBUTION.—Australia and Chile.

HABITAT.—On branches and trunks of shrubs and trees in arid habitats up to 1200 m elevation.

REMARKS.—This species was almost always identified as *"Parmelia rutidota"* until the chemistry was clarified by Kurokawa (1967). *Pseudoparmelia rutidota* contains protocetraric acid and generally has a more expanded thallus. While described from Australia, *P. ferax* seems to be most common in Chile.

SPECIMENS EXAMINED.—Australia: South Australia, *Rogers* 1320, 1326 (US); Victoria, *Filson* 6597 (US). Chile: Aconcagua, *Follmann* 11784-L (US); Nuble, *Mahu* 3538 (US); Santiago, *Mahu* 1117, 2034, 3334 (US), *Santesson* 7124 (S, US); Valparaiso, *Imshaug* 36657 (MSC), *Rundel* 7335 (US).

Pseudoparmelia geesterani

FIGURE 11*e*

Pseudoparmelia geesterani (Hale) Hale, 1974:190.

Parmelia geesterani Hale, 1972b:344 [type collection: Transvaal, Union of South Africa, *Maas Geesteranus* 6405 (L, holotype; LD, US, isotypes)].

DESCRIPTION.—Thallus closely adnate on rock, dark olive greenish to whitish, 2–4 cm broad; lobes sublinear, crowded, 0.5–1.0 mm wide; upper surface plane, isidiate, isidia coarse and irregularly inflated; lower surface brown or blackening, sparsely rhizinate. Apothecia unknown.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow turning red, C−, KC−, P+ orange; atranorin and salazinic acid.

DISTRIBUTION.—Union of South Africa.

HABITAT.—On exposed rocks at 1500–1800 m elevation.

REMARKS.—This lichen is still known only from

the type collection. It is not closely related to any other *Pseudoparmeliae* although it might be confused with isidiate-pustulate *P. owariensis* (Asahina) Hale or *P. imperfecta* (Kurokawa) Hale.

Pseudoparmelia gerlachei

FIGURE 11*f*

Parmelia gerlachei Zahlbruckner, 1929:137 [type collection: based on *Parmelia antarctica* Vainio].

Parmelia antarctica Vainio, 1903:13 [type collection: Cap van Beneden, Terre de Danco, *Gerlache* 226 (TUR, Vainio herbarium number 2839, lectotype); not *P. antarctica* Bitter, 1901:248 (= *Hypogymnia*)].

Xanthoparmelia gerlachei (Zahlbruckner) Hale, 1974:487.

DESCRIPTION.—Thallus closely adnate on rock, rather coriaceous, pale greenish yellow, 3–5 cm broad; lobes subirregular, crowded, apically rotund, 2–4 mm wide; upper surface dull, sometimes lightly pruinose, broadly rugose or foveolate, appearing somewhat inflated, soredia developing in orbicular to irregular laminal, capitate soralia 2–4 mm in diameter; lower surface black and moderately rhizinate, papillate in a narrow brown marginal zone. Apothecia not found.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC−, P+ red; usnic acid and either physodalic acid or protocetraric acid or a mixture of both.

DISTRIBUTION.—Andean mountain chain and Antarctica.

HABITAT.—On rocks in exposed paramo or tundra at 2900–3800 m in the Andes and to sea level in Antarctica.

REMARKS.—I had previously considered this to be a *Xanthoparmelia* because of the saxicolous habitat and presence of usnic acid. The apically rotund lobe configuration and penicillate rhizines and papillae at the margin, as well as physodalic acid, are more characteristic of *Pseudoparmelia,* as suggested by Kurokawa (1967). *Pseudoparmelia gerlachei* has evolved in extremely harsh environments where trees are completely absent. The most closely related species and the probable progenitor is *P. ferax* (Müller Argoviensis) Hale, which occurs on trees in Australia and Chile. Both species contain physodalic acid in the "typical" state, but *P. gerlachei* in Venezuela contains only protocetraric acid whereas Chilean and Argentinian specimens produce both acids. This combination is similar to that in *Hypotrachyna physodalica* (Hale) Hale (Hale, 1975a).

SPECIMENS EXAMINED.—Venezuela: Mérida, *Hale* 42706, 42843, 44667, 44676. Chile: Magallanes, *Santesson* 1924 (S, US). Argentina: Santa Cruz, *Santesson* 7079 (S, US). Antarctica: Graham Land, *Lamb* 2644 (FH, US); Cap van Beneden, *Gerlache* (TUR, Vainio herbarium numbers 2840, 2841, syntypes of *P. antarctica*).

Pseudoparmelia hypomilta

FIGURE 12*a*

Pseudoparmelia hypomilta (Fée) Hale, 1974:190.

Parmelia hypomilta Fée, 1837:123 [type collection: Peru (G, lectotype; H, isolectotype)].

Parmelia regnellii Lynge, 1914:40 [type collection: São João d'el Rey, Minas Gerais, Brazil, *Malme* 308 (S, lectotype; BM, MICH, isolectotypes)].

Parmelia regnellii f. *arida* Lynge, 1914:141 [type collection: Bocca da Serra, Mato Grosso, Brazil, *Malme* 2240 (S, lectotype; UPS, US, isolectotypes)].

DESCRIPTION.—Thallus closely adnate on bark, rather coriaceous, buff to straw colored, 1–3 cm broad; lobes sublinear 1.0–1.5 mm wide, often black rimmed; upper surface plane to convex, densely white maculate; medulla white in upper half, dull red in the lower half; lower surface brown, moderately rhizinate, the rhizines brown. Apothecia (description from *Malme* 171) common, adnate, 1–2 mm in diameter; spores 8, more or less uniseriate, 5×6 μm.

CHEMISTRY.—Cortex K+ yellowish, medulla K+, C+, KC+ yellowish (pigment K+ purple), P−; atranorin and unidentified substances.

DISTRIBUTION.—Brazil.

HABITAT.—On trees and rocks in open forests.

REMARKS.—*Pseudoparmelia hypomilta* is a variable species in terms of lobe width. Lynge's f. *arida* has quite narrow lobes (1 mm or less) but the types of *P. hypomilta* and *Parmelia regnellii* are comparable in size. While it is difficult to generalize on a species so poorly represented in herbaria, it seems closely related to *P. congruens* but is readily differentiated by the medullary pigment and, as far as we can determine, common occurrence on rock.

SPECIMENS EXAMINED.—Brazil: Minas Gerais, *Gardner* (BM), *Malme* 171 (LD, UC, US), *Warming* 302 (M); Mato Grosso, *Malme* 2240 (S,US), *Malme* in *Lichenes Austroamericani* 92 (G, LD, S, UPS).

Pseudoparmelia inhaminensis

FIGURE 12*b*

Pseudoparmelia inhaminensis (Dodge) Hale, 1974:190.

Parmelia inhaminensis Dodge, 1959:130 [type collection: Inhambane, Inhamine, Angola, *Sousa* (BM, holotype)].

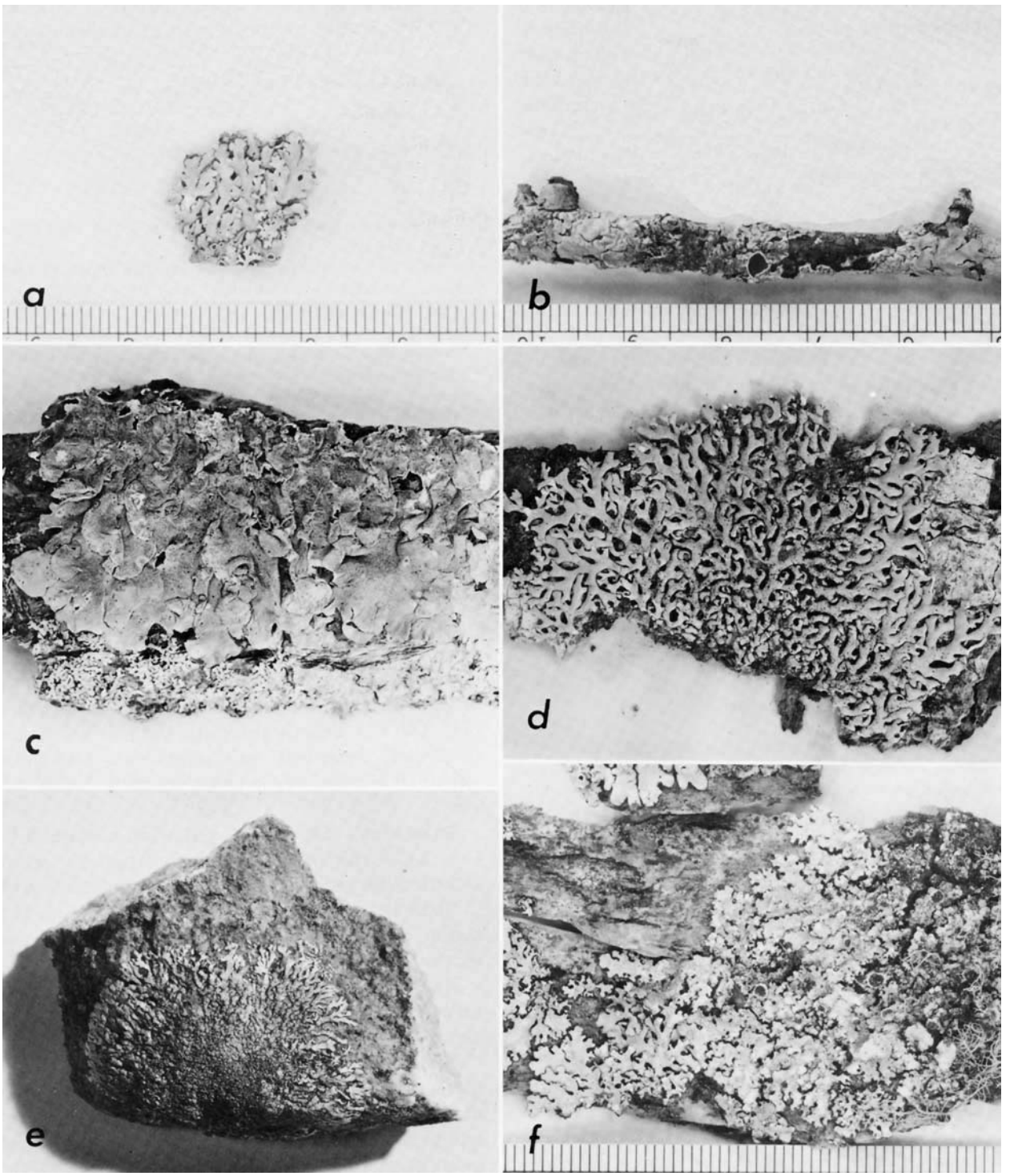

FIGURE 12.—Species of *Pseudoparmelia: a, P. hypomilta (Malme* 2745B in US); *b. P. inhaminensis (Degelius* in US); *c, P. inornata (Imshaug* 24454, isotype in US); *d, P. intertexta (Pentype,* lectotype of *P. gracilis* Müller Argoviensis in G); *e, P. ischnoides (Almborn* 1698, holotype in LD); *f, P. labrosa (James* 577 in US). (Scale in mm.)

DESCRIPTION.—Thallus adnate on twigs, soft and fragile, buff mineral gray, 3–5 cm broad; lobes subirregular, apically rotund, 1.5–2 mm wide; upper surface more or less regularly rugose and wrinkled, the cortex easily breaking away, heavily pycnidiate; lower surface black and moderately rhizinate except for a narrow brown, bare zone at the tips. Apothecia substipitate, 2 mm in diameter; spores 8, 5–8 × 10–12 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow, C−, KC−, P+ orange; atranorin, stictic acid, and constictic acid.

REMARKS.—The chemical constituents and rugose upper surface place *P. inhaminensis* close to *P. crozalsiana* (Bouly de Lesdain) Hale, which is sorediate, and *P. scrobicularis* (Krempelhuber) Hale, which is nonsorediate and has a pruinose apothecial disc, a smaller, very rugose thallus, and unusually large conidiospores (about 20 μm long). The conidiospores of *P. inhaminensis* are about 12μm long. It is a possible candidate as nonsorediate progenitor of *P. crozalsiana*.

SPECIMENS EXAMINED.—Angola: Moçâmedes, *Degelius* (Degelius herbarium, US).

Pseudoparmelia inornata

FIGURE 12*c*

Pseudoparmelia inornata (Hale) Hale, 1974:190.
Parmelia inornata Hale, 1971a:32 [type collection: Grand Cayman, *Imshaug* 24454 (MSC, holotype; US, isotype)].

DESCRIPTION.—Thallus adnate on bark, pale greenish mineral gray, 5–10 cm broad; lobes subirregular, apically rotund, 3–7 mm wide; upper surface plane, continuous to cracked with age, usually densely pycnidiate, white-reticulate at the lobe tips; lower surface black and sparsely rhizinate except for a narrow bare, brown zone at the margins. Apothecia common, substipitate, 2–4 mm in diameter; spores 8, 7–8 × 16–18 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ rose, P+ red; atranorin and protocetraric acid.

DISTRIBUTION.—West Indies.

HABITAT.—On trees in shaded woods near sea level.

REMARKS.—This rather broad-lobed species might be considered as a possible progenitor of isidiate *P. martinicana* (Nylander) Hale, but it is more coriaceous and has a different aspect. It appears to be best developed in dry sea-level forests of smaller islands.

SPECIMENS EXAMINED.—Records from the Bahamas, Grand Cayman, and Haiti are listed in Hale (1971:32).

Pseudoparmelia intertexta

FIGURE 12*d*

Pseudoparmelia intertexta (Montagne and van den Bosch) Hale, 1974:190.
Parmelia intertexta Montagne and van den Bosch *in* Montagne, 1856:327 [type collection: Java, *Junghuhn* (L, lectotype; PC, isolectotype)].
Parmelia ecoronata Nylander, 1873:64 [type collection: Pulo-Penang, Malaya, *Collingham* [Cunningham in publication] (H, Nylander herbarium number 32999, lectotype)].
Parmelia subrupta Nylander *in* Nylander and Crombie, 1883: 51 [type collection: Allagajah, near Malacca, Malaya, *Maingay* (BM, lectotype; H, isolectotype)].
Parmelia gracilis Müller Argoviensis, 1887:317 [type collection: Daintree River, Australia, *Pentzke* (G, lectotype); not *Parmelia gracilis* (Persoon) Sprengel, 1827:277 (= *Usnea*)].
Parmelia relicina var. *ecoronata* (Nylander) Müller Argoviensis, 1891:378.
Parmelia gracilenta Vainio, 1900:6 [type collection: Based on *Parmelia gracilis* Müller Argoviensis].

DESCRIPTION.—Thallus closely adnate, corticolous, marguerite yellow, 3–10 cm in diameter; lobes sublinear-elongate, 0.5–2 mm wide; upper surface more or less convex, faintly maculate; lower surface pale brown to tan, densely rhizinate, the rhizines simple to densely branched, pale. Apothecia numerous, adnate, 0.7–2 mm in diameter; spores 8, 3–5 × 5–7 μm.

CHEMISTRY.—Cortex K+ yellowish, medulla K−, C−, KC+ rose, P+ orange red; atranorin, protocetraric acid, protolichesterinic acid, and usnic acid.

DISTRIBUTION.—Andaman Islands, Thailand, Malaysia, Philippines, Indonesia, New Guinea, and Australia.

HABITAT.—On canopy branches of trees (dipterocarps and *Quercus*) in rain forest at 150–1600 m elevation.

REMARKS.—This is one of two *Pseudoparmeliae* (the other being *P. malaccensis* (Nylander) Hale) that have evolved in the Southeast Asian rain forests, primarily on dipterocarps. The only other common parmelioid genus there is *Relicina* (Hale, 1975b), which is also characterized by a closely adnate habit and presence of usnic acid. *Pseudoparmelia intertexta* is a presumptive nonisidiate progenitor of *P. malaccensis* (Nylander) Hale (see

discussion under that species), although it is anomalous in having branched rhizines.

SPECIMENS EXAMINED.—Andaman Islands: *Kurz* 3 (M, UPS, W). Thailand: Chang, *Schmidt* XVI (TUR). Malaya: Pahang, *Hale* 30184, 30225, 30482, 30498; Selangor, *Hale* 30073, 30260, 30261, 30264, 30299, 31188. Philippines: Mountain Province, *Hale* 25811; Negros Occidental Province, *Hale* 26422, 26511, 26523. Malaysia: Sabah, *Hale* 28206, 28813, 29065, 30363, 30364. New Guinea: *Versteegh* (L, US).

Pseudoparmelia ischnoides

FIGURE 12*e*

Pseudoparmelia ischnoides (Kurokawa) Hale, 1974:190.
Parmelia ischnoides Kurokawa *in* Hale and Kurokawa, 1964: 155 [type collection: Window Stream, Kirstenbosch, Wynberg, Cape Province, Union of South Africa, *Almborn* 1698 (LD, holotype; TNS, US, isotypes)].

DESCRIPTION.—Thallus closely adnate on rock, fragile, whitish ashy gray, 4–10 cm in diameter; lobes sublinear-elongate, 0.5–2 mm wide; upper surface plane to convex, continuous, isidiate, the isidia short, simple, darkening at the tips; lower surface black, sparsely rhizinate. Apothecia adnate, 1–2 mm in diameter, the amphithecium isidiate; spores 8, 5–6 × 7–8 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow, C−, KC−, P+ pale orange; atranorin, stictic acid, and constictic acid.

DISTRIBUTION.—Union of South Africa.

HABITAT.—On rocks in open areas.

REMARKS.—This species has a very limited range in South Africa and probably represents a typical Cape endemic. It bears a superficial resemblance to two other small saxicolous species, *P. annexa* (Kurokawa) Hale (lecanoric acid present) and *P. arcana* (Kurokawa) Hale (fatty acids, pale below).

SPECIMENS EXAMINED.—See Hale and Kurokawa (1964:156) for records in the Union of South Africa.

Pseudoparmelia labrosa

FIGURE 12*f*

Pseudoparmelia labrosa (Zahlbruckner) Hale, 1974:190.
Parmelia tenuirima var. *labrosa* Zahlbruckner, 1941:108 [type collection: Saddle Hill, Dunedin, New Zealand, *Thomson* V34 (W, lectotype)].
Parmelia labrosa (Zahlbruckner) Hale, 1968:325.

DESCRIPTION.—Thallus adnate on bark, light buff mineral gray, 4–8 cm broad; lobes subirregular, apically subrotund, 1.5–3 mm wide; upper surface plane to rugulose, shiny, sorediate, the soralia originating from coarse pustular ridges, becoming irregular to diffuse; lower surface black and moderately rhizinate. Apothecia adnate, 3–5 mm in diameter; the rim sorediate; spores 8, 5 × 10–12 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C+, KC+ red, P−; atranorin and lecanoric acid.

DISTRIBUTION.—Australia, New Zealand, and Chile.

HABITAT.—On trees (*Drachophyllum, Myrsine, Hymenanthera,* and *Betula*) in open woods at low elevations.

REMARKS.—The lobe configuration places this austral species near *P. texana* (Tuckerman) Hale, but the soralia are more diffuse and the chemistry is distinct. The parallel isidiate morph is probably *P. conlabrosa* Hale; there seems to be no fertile progenitor. The syntype of *P. tenuirima* var. *labrosa* (*Thomson* 2A 683 in W) is *Parmotrema reticulatum* (Taylor) Choisy.

SPECIMENS EXAMINED.—Chile: Chiloe, *Santesson* 2262 (S). Other records from Australia and New Zealand are listed in Hale (1968:325).

Pseudoparmelia lecanoracea

FIGURE 13*a*

Pseudoparmelia lecanoracea (Müller Argoviensis) Hale, 1974: 190.
Parmelia lecanoracea Müller Argoviensis, 1888:529 [type collection: Arisdrift, Oranje River, Namaqualand, Union of South Africa, *Schenck* 543 (G, lectotype)].

DESCRIPTION.—Thallus closely adnate, appearing areolate at the center, pruinose whitish buff, 2–3 cm broad; lobes sublinear, 0.6–1.0 mm wide, black rimmed; upper surface convex, rugose with age, roughened; medulla pigmented reddish yellow in the lower half; lower surface tan or darkening, moderately rhizinate, the rhizines brown. Apothecia rare, adnate, 1 mm in diameter; spores 8, 7 × 8–10 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C+, KC+ rose; atranorin and evernic acid; pigmented medulla K+ purple, skyrin present.

DISTRIBUTION.—Union of South Africa.

HABITAT.—On rocks.

REMARKS.—This species is still only known from the rather fragmentary type collection. As Müller noted, it could be confused with a *Lecanora*. The

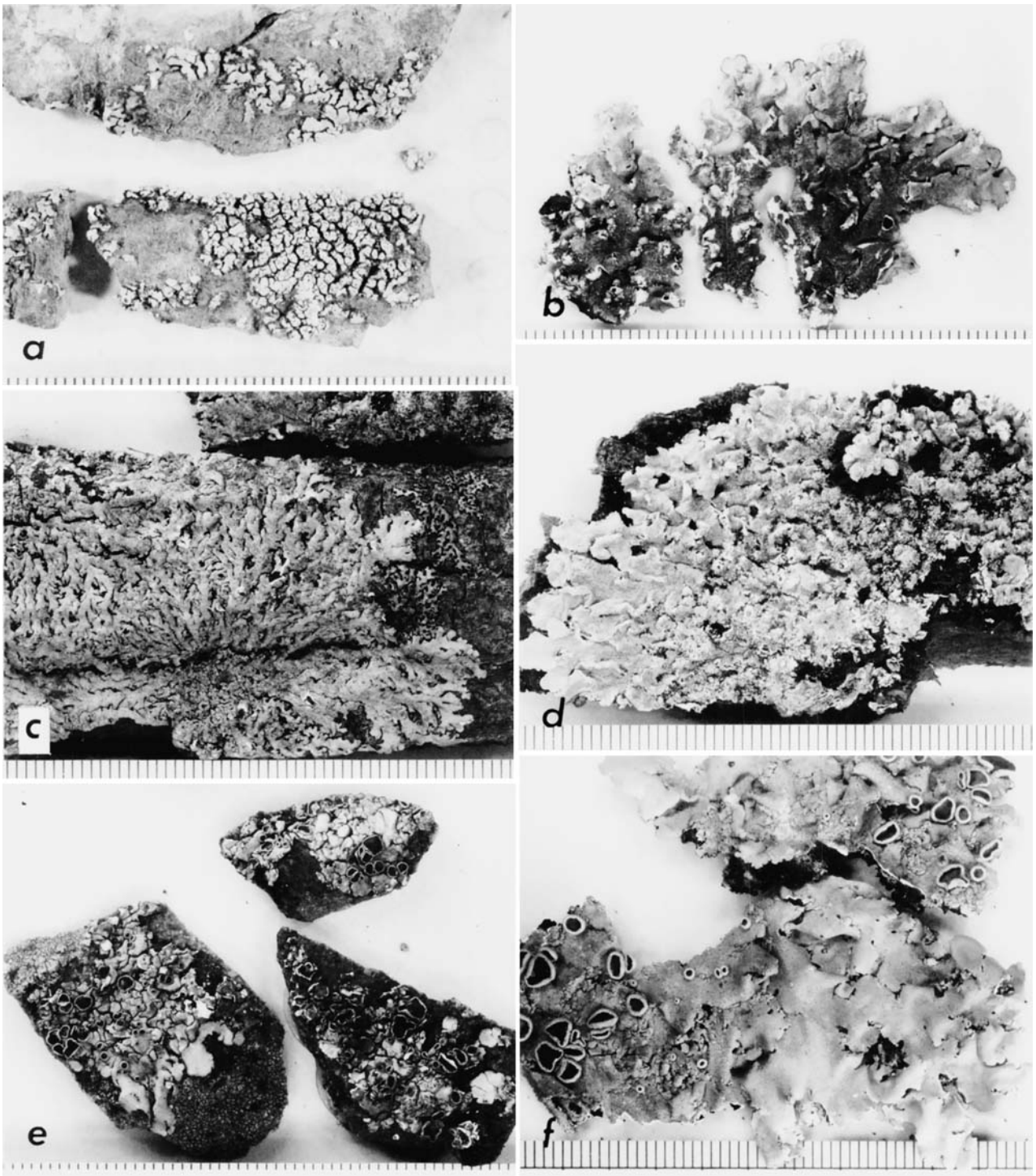

FIGURE 13.—Species of *Pseudoparmelia: a, P. lecanoracea* (*Schenck* 543, lectotype in G); *b, P. leucoxantha* (*Eiten* 4497A in US); *c, P. malaccensis* (*Hale* 24859); *d, P. martinicana* (*Hale* 35662); *e, P. molybdiza* (*Degelius* SA–39 in US); *f, P. nairobiensis* (*Swinscow* 6/1970 n US). (Scale in mm.)

chemistry is anomalous for the genus. It is included here in the hope that future workers will be in a better position to assess its exact relationship.

Pseudoparmelia leucoxantha

FIGURE 13*b*

Pseudoparmelia leucoxantha (Müller Argoviensis) Hale, 1974: 190.

Parmelia leucoxantha Müller Argoviensis, 1881:85 [type collection: Brazil, São Paulo, *Puiggari* 1050 (G, lectotype; W, isolectotype)].

DESCRIPTION.—Thallus adnate to loosely attached on rock or bark, dull greenish yellow, 3–6 cm broad; lobes subirregular, apically rotund, 3–5 mm wide; upper surface plane, rimose with age, sorediate along the margins and in part on the surface, soralia irregular in capitate or elongate masses, the soredia coarse; lower surface black and sparsely rhizinate except for a brown, bare or papillate zone along the margins. Apothecia rare, sessile, up to 2 mm in diameter, the amphithecium sorediate; spores not developed.

CHEMISTRY.—Cortex K+ yellowish, medulla K−, C−, KC− or KC+ rose, P+ red; atranorin (trace), usnic acid, and protocetraric acid.

DISTRIBUTION.—Mexico and Brazil.

HABITAT.—On sandstone boulders, more rarely on trees, in dry scrubby areas (chapada vegetation in Brazil) at 300–1100 m elevation.

REMARKS.—There is considerable resemblance to *Pseudoparmelia caperata* (L.) Hale in lobe configuration, but the soralia are more discrete and distinctly marginal and lateral. It may well have evolved from nonsorediate *P. rutidota* (Hooker and Taylor) Hale but differs in substratum.

SPECIMENS EXAMINED.—Mexico: Oaxaca, *Hale* 20643, 20648. Brazil: Maranhão, *Eiten and Eiten* 4497A (US); Mato Grosso, *Malme* (S); São Paulo, *Schindler* 4564b (KR, US).

Parmelia malaccensis

FIGURE 13*c*

Pseudoparmelia malaccensis (Nylander) Hale, 1974:190.

Parmelia malaccensis Nylander *in* Nylander and Crombie, 1883:52 [type collection: St. Johns Hill, Malacca, Malaya, *Maingay* 21 (BM, lectotype; FH, H, Nylander herbarium number 34984, isolectotypes)].

DESCRIPTION.—Thallus closely adnate on bark, yellowish green, 2–8 cm in diameter; lobes short, sublinear, 0.5–1.5 mm wide; upper surface plane to convex, shiny, distinctly white reticulate at the lobe tips, tangentially cracked with age, isidiate, the isidia simple, 0.2–0.5 mm high; lower surface pale brown, densely rhizinate, the rhizines simple to sparsely branched, becoming dark brown. Apothecia rare, adnate, 1–2 mm in diameter; spores 8, 4–5 × 6–7 μm.

CHEMISTRY.—Cortex K+ yellowish, medulla K−, C−, KC+ rose, P+ red; protocetraric acid and usnic acid.

DISTRIBUTION.—Africa, India, Sri Lanka, Indonesia, Malaysia, and the Philippines.

HABITAT.—On trunks and canopy branches of trees in lowland rain forest from sea level to 150 m elevation.

REMARKS.—While I tentatively consider this as the isidiate morph of *P. intertexta,* mostly because of the chemical characters and similar habitat in the lowland rain forest of Southeast Asia, the two species have diverged considerably in rhizine structure. The rhizines of *P. malaccensis* are simple and often turn darker brown that the lower cortex; they are pale and rather richly branched in *P. intertexta.* The upper cortex is strongly white-reticulate in *P. malaccensis,* continuous in *P. intertexta.*

SPECIMENS EXAMINED.—Ivory Coast: *Santesson* 10397a (UPS, US). India: Tamil Nadu, *Höeg* (Awasthi herbarium, US). Sri Lanka: *Fosberg* 51032 (US). Philippines: Basilan, *Hale* 24941, 25331; Zamboanga del Norte, *Hale* 24727; Zamboanga del Sur, *Hale* 24859. Malaya: Selangor, Hale 30055, 30068, 30262, 30266, 30284, 30292, 30295, 31187. Sarawak: *Hale* 29992, 29994, 29998, 30000. Sabah: *Hale* 30353, 30362, 30368. Indonesia: Java, *Spanjaard* 6102 (L).

Parmelia martinicana

FIGURE 13*d*

Pseudoparmelia martinicana (Nylander) Hale, 1974:190.

Parmelia martinicana Nylander, 1885:609 [type collection: Martinique, *Tardin* (H, lectotype)].

DESCRIPTION.—Thallus adnate, 3–9 cm broad, pale tan mineral gray; lobes irregular, subrotund, short, 2–5 mm wide; upper surface becoming rugose toward the center, densely isidiate, isidia initially papillate, cylindrical to irregularly thickened, simple or branched, rarely turning granular at the tips; lower surface black and sparsely rhizinate at the center, rugose, brown, and naked in a narrow zone at the margin. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellowish, medulla K−, C+, KC+ rose, P+ orange red; atranorin, gyrophoric acid, and protocetraric acid (rarely with norlobaridone).

DISTRIBUTION.—Southeastern United States, Mexico, West Indies, and Venezuela.

HABITAT.—On tree trunks and branches in pastures and secondary forests from sea level to 1000 m elevation.

REMARKS.—This is one on the commonest foliose lichens in scrub forest and dry savanna in the West Indies. It may be related to nonisidiate *P. inornata* (Hale) Hale but has a thinner, more fragile thallus. It is most closely related to *P. raunkiaeri* (Vainio) Hale, which is distinctly coarsely pustulate-sorediate. One specimen (*Allard* 17325) contained norlobaridone in addition to protocetraric acid, but further collections should be examined before deciding whether this population represents a distinct species or not.

SPECIMENS EXAMINED.—United States: Florida, *Hale* 36813, 36864. Mexico: Veracruz, *Hale* 19743. Bahamas: *Merrill* (US), *Britton* 942, 1080 (FH). Cuba: Pinar del Rio, *Imshaug* 25289 (MSC); Guantanamo, *Hioram* 2701 (US); Oriente, *Hioram* 5477, 5706 (US). Dominican Republic: *Allard* 17325 (US), *Wetmore* 3922 (MSC), 3947 (MSC, US). Puerto Rico: *Britton* 1691 (FH, NY). St. Croix: *Britton* 75 (NY, US), *Boergessen* (C), *Raunkiaer* 547 (C), *Paulsen* (C). St. Martin: Le Gallo 478b, 571 (US). St. Barthélemy: *Le Gallo* 415, 497, 515, 521, 542a, 545, 563 (US). Guadeloupe: *Culberson* 14536, 14544 (DUKE), *Degelius* (Degelius herbarium) *Duss* (C), 489 (NY), *Le Gallo* 465, 471, 489, 574, 575, 580 (US), 2729 (MSC), 2741 (BM). Dominica: *Imshaug* 33159, 33282 (MSC) (other records listed in Hale, 1971:18). Martinique: *Culberson* 14732 (DUKE), *Degelius* (Degelius herbarium), *Jardin* (H). St. Lucia: *Imshaug* 29701, 29968, 30144 (MSC), *Evans* 75 (FH, NY, YU), 101 (US). St. Vincent: *Elliott* (TUR), *Imshaug* 30369, 30692 (MSC). Tobago: *Imshaug* 31565 (MSC). Trinidad: *Broadway* 8099 (BM). Venezuela: Magdalena, *Broadway* 805 (US).

Pseudoparmelia molybdiza

FIGURE 13*e*

Pseudoparmelia molybdiza (Nylander) Hale, 1974:190.

Parmelia molybdiza Nylander *in* Crombie, 1876a:19 [type collection: Table Mountain, Cape of Good Hope, Union of South Africa, *Eaton* (BM, lectotype; H, Nylander herbarium number 35234, isolectotype)].

Parmelia atrichoides Nylander *in* Crombie, 1876b:167 [type collection: Cape of Good Hope, Union of South Africa, *Eaton* (BM, lectotype; H, isolectotype)].

Parmelia brachyphylla Müller Argoviensis, 1886:256 [type collection: Near Lydenburg, Transvaal, Union of South Africa, *Wilms* 2752 (BM, lectotype).

Parmelia perfissa Steiner and Zahlbruckner, 1926:519 [type collection: Port Elizabeth, Cape Province, Union of South Africa, *Brunnthaler* (W, lectotype; WU, isolectotype)].

DESCRIPTION.—Thallus adnate to appressed on rock, whitish mineral gray, 4–8 cm broad; lobes subirregular, apically rotund, crowded toward the thallus center, 2–3 mm wide; upper surface plane, rimose with age; lower surface dark brown and blackening, moderately rhizinate. Apothecia numerous, adnate, 1–2.5 mm in diameter; spores 8, 5 × 6 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C+, KC+ red, P−; atranorin and lecanoric acid.

DISTRIBUTION.—Uganda and Union of South Africa.

HABITAT.—On rocks in open or partly shaded habitats from sea level to about 1200 m elevation.

REMARKS.—*Pseudoparmelia molybdiza* is especially common in Cape Province. The isidiate morph appears to be *P. annexa* (Kurokawa) Hale. The brilliant C+ red test identifies it immediately. *Pseudoparmelia spodochroa* (Kurokawa and Filson) Hale, *P. tortula* (Kurokawa) Hale, and even *P. vanderbylii* (Zahlbruckner) Hale are very similar externally and occur in the same localities where *P. molybdiza* is found. They would be differentiated by a negative C test.

SPECIMENS EXAMINED.—Uganda: Pian County, *Swinscow* 2U 31/10A (BM, US). Union of South Africa: Natal, *Almborn* 8645, *Höeg* (TRH); Transvaal, *Maas Geesteranus* (L); Basutoland, *Kofler* (LD); Orange Free State, *Almborn* 5818, 5831, 5834 (LD); Cape Province, *Almborn* 1803, 2065, 2066, 2067, 4837, 4948, 4980, 5690, 11115 (LD), *Degelius* SA–39 (US), *Höeg* (LD, TRH), *Maas Geesteranus* 6706, 6707, 6730 (L).

Pseudoparmelia nairobiensis

FIGURE 13*f*

Pseudoparmelia nairobiensis (Steiner and Zahlbruckner) Hale, 1974:190.

Parmelia nairobiensis ("neirobiensis") Steiner and Zahlbruckner, 1926:517 [type collection: Nairobi, Kenya, *Schröder* 287 (W, lectotype)].

Parmelia gracilescens var. *angolensis* Vainio *in* Welwitsch, 1901:401 [type collection: Serra da Xella, Huíla, Angola, *Welwitsch* 30 pro parte (TUR, Vainio herbarium number 3059, lectotype)].

Parmelia angolensis (Vainio) Dodge, 1959:103.

Parmelia ganguellensis Dodge, 1959:109 [type collection: Ganguelas and Ambuelas, Benguela, Angola, *Gossweiler* (BM, lectotype)].

Parmelia hansfordii Dodge, 1959:127 [type collection: Kampala, Uganda, *Hansford* 1455 (BM, lectotype)].

DESCRIPTION.—Thallus loosely adnate to appressed on bark, rather coriaceous, greenish to buff mineral gray, 5–10 cm broad; lobes sublinear to subirregular, usually apically subrotund, 2–5 mm wide, often becoming marginally lobulate with age; upper surface plane, shiny, usually conspicuously pycnidiate, reticulately rimose with age; lower surface black except for a narrow marginal brown zone, sparsely to moderately rhizinate. Apothecia common, adnate, 2–5 mm in diameter; spores 8, 6–8 × 8–13 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ faint violet or KC−, P−; atranorin and divaricatic acid with associated unknowns.

DISTRIBUTION.—Kenya, Uganda, Angola, Zaire, Rhodesia, and Tanzania.

HABITAT.—On trees and rocks in open or secondary forest at 1000–1700 m elevation.

REMARKS.—This is one of the more common foliose lichens in central Africa. It appears to be (or at least would be similar to) the progenitor for isidiate *P. concrescens* (Vainio) Hale and sorediate *P. texana* (Tuckerman) Hale.

SPECIMENS EXAMINED.—Uganda: Buddu County, *Lye* L167 (BM, US); Burahiya County, *Swinscow* 2U 17/21 (BM, US). Kenya: Central Province, *Maas Geesteranus* 10272 in *Lichenes Africani* 29 (L, LD, US). Zaire: *Degelius* (Degelius herbarium), *Louis* 4857E, 4858 (BR). Tanzania: Kilimanjaro Prov., *Santesson* 20959 (UPS). Angola: Bié, *Degelius* (Degelius herbarium); Huíla, *Degelius* (Degelius herbarium); Moxico, *Degelius* (Degelius herbarium). Rhodesia: *Bankart* (BM), *Bullock* 2105 pars, *Höeg* (TRH). Tanzania: *Proctor* 1023 B (BM).

Pseudoparmelia neoquintaria, new species

FIGURE 14*a*

DESCRIPTION.—Thallus laxe adnatus, saxicola, cinereo-albidus, 3–7 cm latus, lobis sublinearibus, 1–2 mm latis, margine laciniatis; superne planus, continuus vel aetate rimosus, isidiatus, isidiis cylindricis, simplicibus vel ramosis, usque ad 0.5 mm altis; cortex superior 10–15 μm crassus, epicorticatus, epicortice perforato, stratum gonidiale 10–15 μm crassum, medulla alba, ca 200 μm crassa, cortex inferior paraplectenchymatus, 10–12 μm crassus; subtus castaneus, modice rhizinosus, rhizinis elongatis, simplicibus, castaneis. Apothecia ignota.

CHEMISTRY.—Cortex K+ yellow, medulla K− or K+ reddish, C−, KC−, P−; atranorin and the "quintaria" unknowns.

HOLOTYPE.—Australia: New South Wales, Mount Wilson, Blue Mountains, *G.E and G. Du Rietz* 781, 12 November 1926 (UPS; US, isotype).

DISTRIBUTION.—Australia.

HABITAT.—On exposed sandstone rocks.

REMARKS.—The thallus of this unique species is rather loosely attached with a tendency for the lobes to become revolute, a kind of growth form often seen with soil-inhabiting *Xanthoparmeliae* growing under harsh conditions. The "quintaria" unknowns have been discovered in the brown *Parmeliae* and in *Xanthoparmelia quintaria* (Hale) Hale, which has quite different lobe configuration and a black lower surface.

Pseudoparmelia owariensis

FIGURE 14*b*

Pseudoparmelia owariensis (Asahina) Hale, 1974:190.
Parmelia owariensis Asahina, 1953:135 [type collection: Inuyama, Province Owari, Japan, *Asahina* (TNS, lectotype)].

DESCRIPTION.—Thallus closely adnate on rocks, whitish mineral gray, 2–5 cm broad; lobes sublinear, 0.5–2 mm wide; upper surface plane, continuous or cracked with age, isidiate-pustulate, the isidia coarse, short, cylindrical to irregularly inflated, bursting open apically; lower surface black, sparsely rhizinate. Apothecia unknown.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ faint purple violet, P−, atranorin, and divaricatic acid with associated unknowns.

DISTRIBUTION.—Africa, Thailand, Hong Kong, and Japan.

HABITAT.—On rocks in open areas at lower elevations.

REMARKS.—*Pseudoparmelia owariensis* is a member of a saxicolous pustulate complex that also includes *P. pustulescens*. These two species cannot be distinguished except by chemical tests. Many more specimens will have to be examined to comprehend more fully their relationships.

SPECIMENS EXAMINED.—Ivory Coast: Séguéla, *Santesson* 10713a (UPS). Uganda: Nyabushozi County, *Swinscow* 2U 22/2A, 2Z 22/4 (BM, US). Thailand: *Kurokawa* 1718, 1719, 1720, 1723, 1724, 1814, 1874 (TNS). Hong Kong: *Thrower* 1189 (BM).

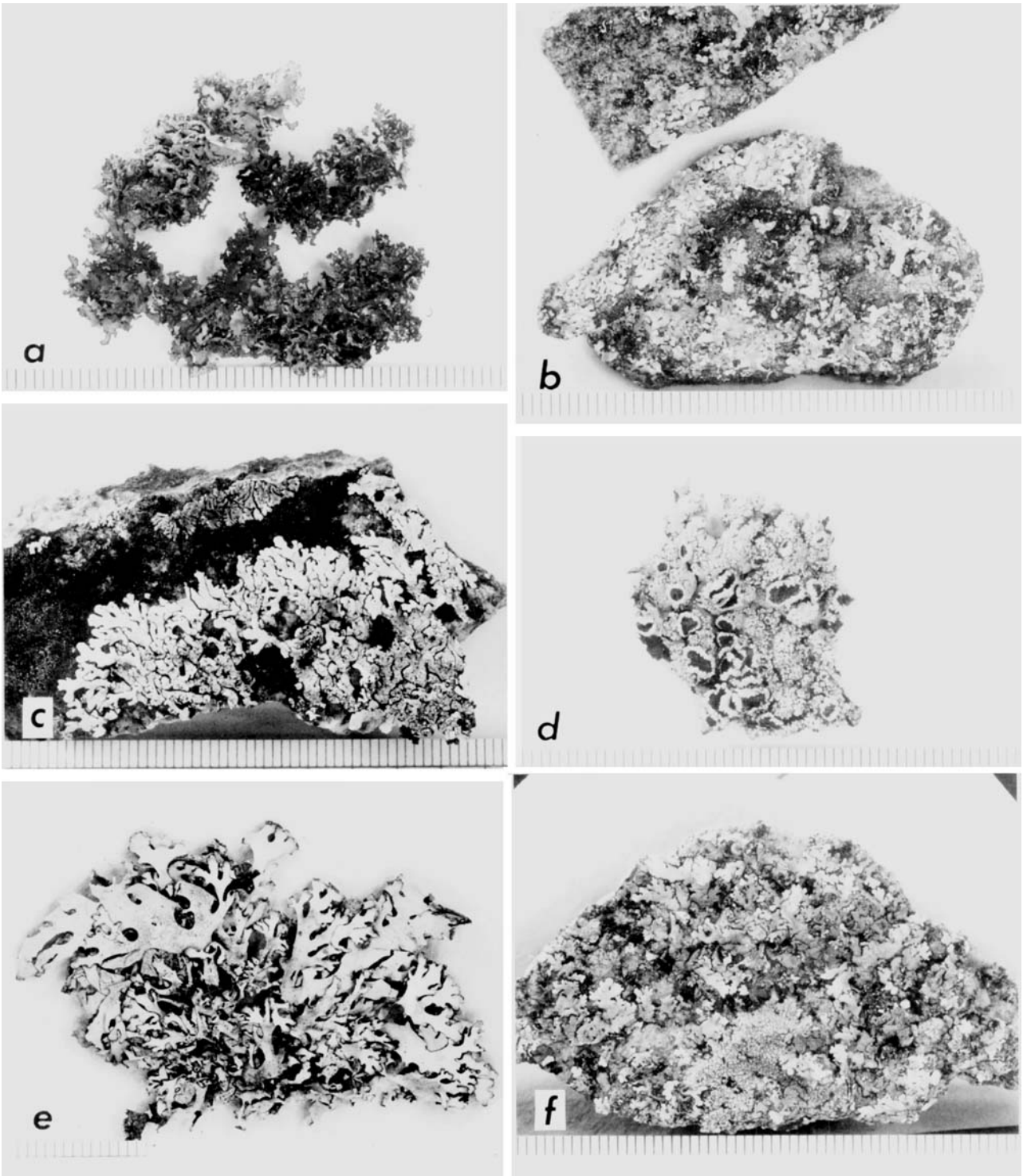

FIGURE 14.—Species of *Pseudoparmelia: a, P. neoquintaria* (*Du Rietz* 781, holotype in US); *b, P. owariensis* (*Kurokawa* 1874 in US); *c, P. pachydactyla* (Kofler in US); *d, P. papillosa* (*Zorrón* 2334 in US); *e, P. prolata* (*Höeg,* holotype in TRH); *f, P. pustulescens* (*Santesson* 10691b in US). (Scale in mm.)

Pseudoparmelia pachydactyla

FIGURE 14*c*

Pseudoparmelia pachydactyla (Hale) Hale, 1974:191.
Parmelia caperata var. *isidiophora* Steiner, 1897:215 [type collection: Athi Plains, Kenya, *Liechtenstein* (WU, lectotype)].
Parmelia pachydactyla Hale, 1972b:345 [type collection: based on *P. caperata* var. *isidiophora* Steiner].
Parmelia steineri Dodge, 1959:125 [type collection: based on *P. caperata* var. *isidiophora* Steiner; not *P. steineri* Gyelnik, 1938b:289 (= *Xanthoparmelia molliuscula* (Acharius) Hale)].

DESCRIPTION.—Thallus closely adnate on rock, light greenish yellow, 4–6 cm broad; lobes sublinear, crowded toward the center of the thallus, 1–1.5 mm wide; upper surface plane, dull, isidiate, the isidia scattered, thick, about 0.3 mm wide and to 0.5 mm high; lower surface black and velvety to the margin, sparsely rhizinate, the rhizines coarse, dull. Apothecia unknown.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC− or KC+ rose, P+ red; usnic acid and protocetraric acid.

DISTRIBUTION.—Kenya and Rhodesia.

HABITAT.—On rocks in semiarid regions at mid elevation.

REMARKS.—The black velvety lower surface is identical to that of *Pseudoparmelia amplexa* (Stirton) Hale, the presumptive parent species. The sorediate morph is *P. subamplexa* Hale. *Pseudoparmelia pachydactyla* is different from both of these species in being saxicolous.

SPECIMENS EXAMINED.—Rhodesia: Division Victoria, *Kofler* (LD, US).

Pseudoparmelia papillosa, new combination

FIGURE 14*d*

Parmelia papillosa Lynge ex Gyelnik, 1935:43 [type collection: Canelones, La Paz, Uruguay, *F. Felippone* 752 (W, lectotype)].
Xanthoparmelia papillosa (Lynge ex Gyelnik) Hale, 1974: 488.

DESCRIPTION.—Thallus adnate on rock, greenish yellow, 4–6 cm broad; lobes subirregular, apically rotund, 2–4 mm wide; upper surface plane and shiny, somewhat white-reticulate at the tips, becoming rugose and densely isidiate toward the center, the isidia irregularly inflated, to 0.4 mm thick and up to 1 mm high, solid but the tips easily eroding away, not becoming sorediate; lower surface black and moderately rhizinate except for a bare or papillate zone at the tips. Apothecia common, substipitate and often appearing immersed among the isidia, 1.5–3 mm in diameter, the amphithecium and rim densely isidiate; spores 8, 7–8 × 16–18 μm.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC−, or KC+ reddish, P+ red; usnic acid, protocetraric acid, and the "conformata" unknown.

DISTRIBUTION.—Brazil, Uruguay, and Argentina.

HABITAT.—On acidic rocks in open areas from sea level to 1000 m elevation.

REMARKS.—While I had recently transferred this species to *Xanthoparmelia*, partly because of its saxicolous habit, it displays features characteristic of *Pseudoparmelia*: broad, apically rotund lobes, a bare or papillate brown zone at the tips below, rhizines with brown, fibrous tips, and presence of protocetraric acid which is rare in *Xanthoparmelia*, especially in New World species. As so delimited, *P. papillosa* is another offshoot from the *P. rutidota* complex differentiated by the very large almost pustular isidia. A comparable saxicolous species containing protocetraric acid, without the "conformata" unknown, *P. baltimorensis* (Gyelnik and Fóriss) Hale, has even larger more typically pustular outgrowths.

SPECIMENS EXAMINED.—Brazil: Santa Catarina, *Reitz and Klein* 15977, 16120 (US). Uruguay: Lavalleja, *Lamb* 1107 (FH, US); Maldonado, *Osorio* 5026 (MVM, US); Rocha, *Herter* 826a (H, S, US), *Zorrón* 2334 (US); Treinta y Tres, *Herter* 2 (H). Argentina: Buenos Aires, *Eyerdam* 2369b (F).

Pseudoparmelia prolata

FIGURE 14*e*

Pseudoparmelia prolata (Hale) Hale, 1974:191.
Parmelia prolata Hale, 1972:344 [type collection: Cape Province, Union of South Africa, *Höeg* (TRH, holotype; LD, US, isotypes)].

DESCRIPTION.—Thallus adnate to loosely attached on rock or rarely on soil, pale olivaceous mineral gray, 4–7 cm broad; lobes sublinear, extended, almost divaricate, 2–3 mm wide; upper surface plane, shiny; lower surface pale brown, moderately rhizinate, the rhizines pale brown. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellow, medulla negative with all reagents; atranorin and an unknown spot (aliphatic compound?).

DISTRIBUTION.—Union of South Africa.

HABITAT.—On rocks, more rarely on loose soil, in open areas.

REMARKS.—The general configuration of this species is that of a *Xanthoparmelia*. In many respects it resembles *P. neoquintaria* Hale, which occurs in similar habitats in Australia but has a different chemistry. The isidiate morph is *P. basutoensis* (Hale) Hale.

SPECIMENS EXAMINED.—See Hale (1972b:344) for records from the Union of South Africa.

Pseudoparmelia pustulescens

FIGURE 14*f*

Pseudoparmelia pustulescens (Kurokawa) Hale, 1974:191.
Parmelia pustulescens Kurokawa *in* Hale and Kurokawa, 1964:156 [type collection: Vila Flor, Humbo, Angola, *Degelius* (Degelius herbarium, holotype; TNS, US, isotypes)].
Parmelia imperfecta Kurokawa *in* Hale and Kurokawa, 1964: 155 [type collection: Bergville, Natal, Union of South Africa, *Almborn* 8815 (LD, holotype; US, isotype)].

DESCRIPTION.—Thallus as in *P. owariensis* (see above). Apothecia adnate, 1–2 mm in diameter, the amphithecium pustulate; spores 8, 4–5 × 7–9 μm.

CHEMISTRY:—Medulla K−, C−, KC−, P−; atranorin, sekikaic acid, fatty acids, and unknown substances.

DISTRIBUTION.—Africa and India.

HABITAT.—On rocks in open areas up to 2000 m elevation.

REMARKS.—This species is essentially indistinguishable from *P. owariensis* (Asahina) Hale and a chemical test is needed to separate them. They appear to be sympatric although collected together only in the Ivory Coast. By using thin-layer chromatography I had earlier synonymized *P. imperfecta* (Hale, 1972b).

SPECIMENS EXAMINED.—Ivory Coast: Séguéla, *Santesson* 10691b (UPS, US). Guinea: Zérékoré, *Santesson* 10584. Union of South Africa: Natal, *Almborn* 6110 (LD), *Höeg* (TRH). India: Tamil Nadu, *Hale* 43674.

Pseudoparmelia rahengensis

FIGURE 15*a*

Pseudoparmelia rahengensis (Vainio) Hale, 1974:191.
Parmelia rahengensis Vainio, 1921:39 [type collection: Nong Boa, near Raheng, Thailand, *Hosseus* 320 (TUR, lectotype)].

DESCRIPTION.—Thallus closely adnate on bark or rock, yellowish green, 3–6 cm broad; lobes sublinear, 0.5–2 mm wide; upper surface convex, continuous, densely isidiate, the isidia mostly simple, to 0.2 mm high; lower surface brown to tan, moderately rhizinate, the rhizines tan. Apothecia adnate, 1–3 mm in diameter, the amphithecium sparsely isidiate; spores 8, 3 × 5 μm.

CHEMISTRY.—Cortex K+ yellowish, medulla K−, C−, or C+ yellow, KC+ orange, P− or P+ faint; barbatic acid, obtusatic acid, 4-0-demethyl-barbatic acid, unidentified substance, rarely with an unidentified pigment.

DISTRIBUTION.—Thailand.

HABITAT.—On tree bark or rocks in open deciduous forests at 300–1350 m.

REMARKS.—This species is unique in producing barbatic acid. Is is superficially similar to two other narrow lobed, usnic acid-containing Asian species, *P. dahlii* Hale (lecanoric acid), and *P. malaccensis* (Nylander) Hale (protocetraric acid). Chemical tests should be made to separate them.

SPECIMENS EXAMINED.—Thailand: *Kerr* L28, (BM, US), *Kurokawa* 1602, 1815 (TNS, US).

Pseudoparmelia raunkiaeri

FIGURE 15*b*

Pseudoparmelia raunkiaeri (Vainio) Hale, 1974:191.
Parmelia raunkiaeri Vainio, 1915:19 [type collection: Cane Bay, St. Croix, *Raunkiaer* 461 (TUR, Vainio herbarium number 2752, lectotype; C, FH, isotypes)].
Parmelia scabrosa Vainio, 1896a:33 [type collection: Chateau Belair, St. Vincent, *Elliott* 249 (TUR, lectotype; BM, isolectotype); not *Parmelia scabrosa* Taylor, 1847:162 (= *Xanthoparmelia scabrosa* (Taylor) Hale)].
Parmelia vincentina Zahlbruckner, 1929:222 [type collection: based on *Parmelia scabrosa* Vainio].

DESCRIPTION.—Thallus closely adnate on bark, light buff mineral gray, 5–8 cm broad; lobes subirregular, apically rotund, 2–4 mm wide; upper surface plane, becoming irregularly rugose toward the center, pustulate-sorediate, the pustules coalescing in a coarsely sorediate mass in older portions; lower surface black and sparsely rhizinate except for a narrow bare, brown zone at the tips. Apothecia unknown.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC−, or C+ KC+ rose; atranorin and protocetraric acid with or without gyrophoric acid and unidentified fatty acids.

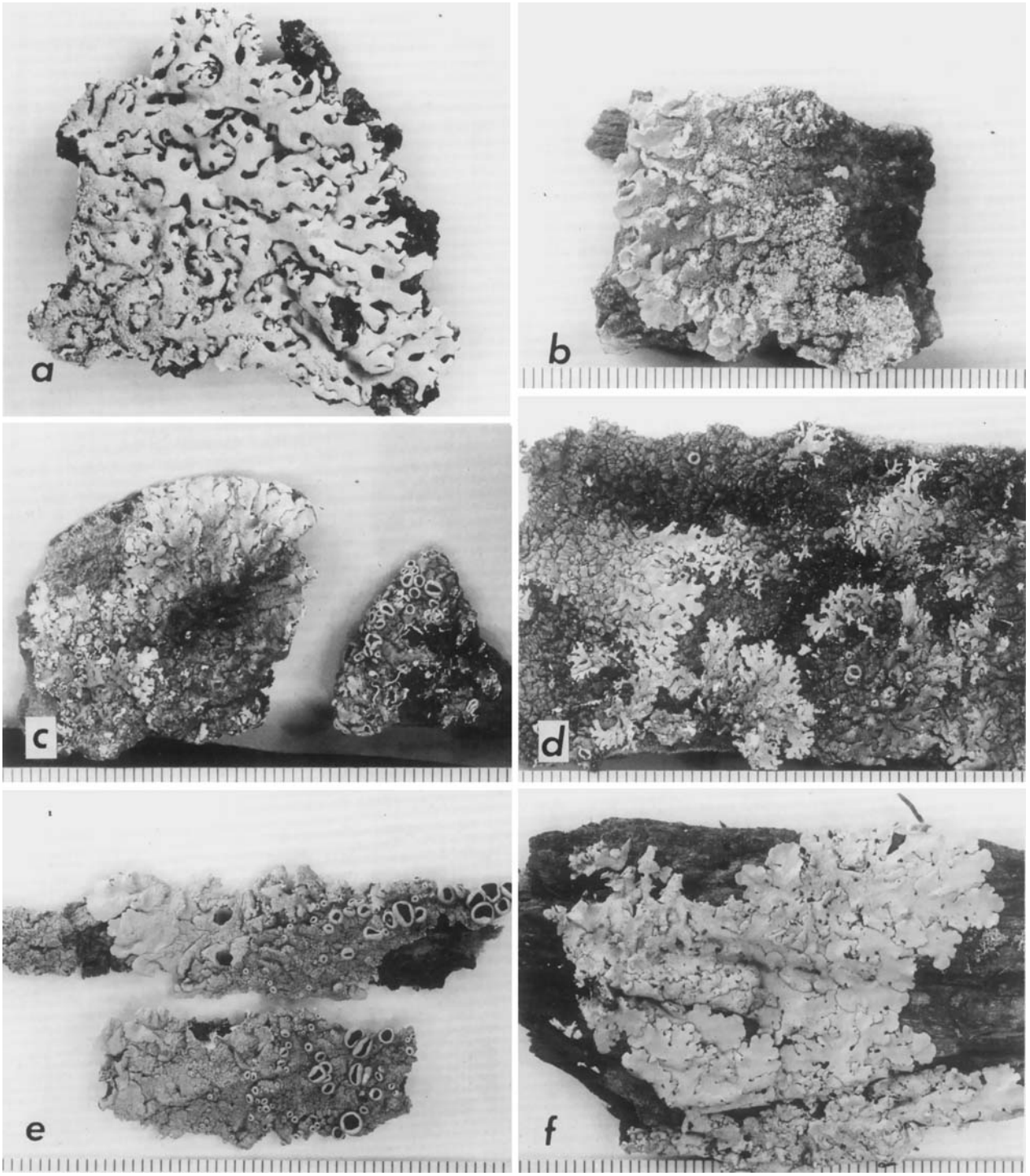

FIGURE 15. Species of *Pseudoparmelia: a, P. rahengensis* (*Kurokawa* 1602 in US); *b, P. raunkiaeri* (*Evans* in US); *c, P. rodriguesiana* (*Santesson* 105 60a in US); *d, P. rupicola* (*Reitz and Klein* 16113 in US); *e, P. rutidota* (*Heller* 260 in US); *f, P. salacinifera* (*Moore* 4406 in US). (Scale in mm except for *P. rahengensis* which is ×3.)

DISTRIBUTION.—West Indies and Mexico.

HABITAT.—On trees in dry, open or secondary forest at sea level to 500 m elevation.

REMARKS.—The soredia of this species are rather coarse and originate from small pustulate-isidiate growths on the upper surface. These burst open and coalesce so that the major part of the thallus is sorediate. The relationship to another West Indian species, isidiate *P. martinicana* (Nylander) Hale, is very close. The chemistry is variable. Specimens from St. Croix (including the lectotype) and Grand Cayman lack gyrophoric acid. All others contain both protocetraric and gyrophoric acids, as does *P. martinicana*.

SPECIMENS EXAMINED.—Mexico: Tamaulipas, *Pursell* 5197 (US). Cuba: Oriente, *Hioram* 5545 (US). Grand Cayman: *Imshaug* 24480, 24449 (MSC, US), 24508 (MSC). Jamaica: *Imshaug* 15000, 15571 (MSC), 15653, 16044 (MSC, US). Haiti: Sud, *Imshaug* 23119, 23140 (MSC). Dominican Republic: Santiago, *Wetmore* 3910 (MSC). St. Croix: *Britton* 77 (NY, US), *Evans* (US, YU), *Raunkiaer* 461 (C). Tortola: *Fishlock* 495 (FH, NY). St. Barthélemy: *Le Gallo* 426, 520, 547, 584 (US), 2626 (MSC). Monserrat: *Evans* 46 (US, YU) Guadeloupe: *Degelius* (Degelius herbarium).

Pseudoparmelia rodriguesiana

FIGURE 15*c*

Parmelia rodriguesiana Hue, 1899:167 [type collection: Ambositra, Madagascar, *Rodriguez* (PC, lectotypes)].

DESCRIPTION.—Thallus closely adnate on rock, whitish mineral gray, 5–10 cm in diameter; lobes sublinear to subirregular, 2–3 mm wide; upper surface plane to rugulose, cracked with age; lower surface black, sparsely rhizinate except for a narrow naked zone near the tips. Apothecia common, sessile, 2–8 mm in diameter; spores 8, 5–7 × 8–13 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ faint purple violet or KC−; P−; atranorin and divaricatic acid with associated unknowns.

DISTRIBUTION.—Guinea, Ivory Coast, Angola, Union of South Africa, and Madagascar.

HABITAT.—On open or exposed rocks at 1000–1700 m elevation.

REMARKS.—This rarely collected lichen would seem to be closely related to *P. nairobiensis* (Steiner and Zahlbruckner) Hale, which is normally corticolous and somewhat larger and more loosely adnate. Further field studies will be needed to determine the exact relationship between these two species. *Pseudoparmelia rupicola* (Lynge) Hale in South America is also saxicolous and contains divaricatic acid, but it has smaller, closely appressed lobes.

SPECIMENS EXAMINED.—Guinea: N'Zérékoré, *Santesson* 10560a (UPS, US). Ivory Coast: Man, *Santesson* 10635 bis (UPS, US). Angola: Huambo, *Degelius* (Degelius herbarium, US). Union of South Africa: Natal, *Almborn* 8594 (US); Transvaal, *Kofler* (LD).

Pseudoparmelia rupicola

FIGURE 15*d*

Pseudoparmelia rupicola (Lynge) Hale, 1974:191.

Parmelia rupicola Lynge, 1914:132 [type collection: Porto Alegre, Rio Grande do Sul, Brazil, *Malme* 1339 (S, lectotype)].

DESCRIPTION.—Thallus closely adnate on rock, whitish to ivory mineral gray, 4–8 cm broad; lobes sublinear, contiguous, 1–2 mm wide; upper surface plane to rugulose, shiny, transversely rimose with age, becoming lobulate toward the center; lower surface black except for a dark brown zone at the tips, moderately rhizinate, the rhizines black. Apothecia common, adnate, 1–1.5 mm in diameter; spores 8, 6 × 7–8 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC− or KC+ wine colored, P−; atranorin and divaricatic acid with associated unknowns.

DISTRIBUTION.—Brazil and Uruguay.

HABITAT.—On sandstone outcrops in open areas at about 1000 m elevation.

REMARKS.—*Pseudoparmelia rupicola* closely resembles sorediate *P. alabamensis* (Hale and McCullough) Hale in lobe configuration and adnation on sandstone, and they may be remotely related. Strictly saxicolous species of *Pseudoparmelia* are rare in New World.

SPECIMENS EXAMINED.—Brazil Catarina, *Reitz and Klein* 16111, 16113, 16115, 16121 (US). Uruguay: Lavalleja, *Osorio* 6425 (MVM); Rocha, *Hosseus* (H).

Pseudoparmelia rutidota

FIGURE 15*e*

Pseudoparmelia rutidota (Hooker and Taylor) Hale, 1974: 191.

Parmelia rutidota Hooker and Taylor, 1844:645 [type collection: Van Diemen's Land, Australia (FH, lectotype)].

Parmelia caperata var. *caperatula* Nylander, 1860:377 [type

collection: Australia (H, Nylander herbarium number 35731, lectotype; FH, isolectotype)].

Parmelia caperata f. *ramealis* Nylander, 1861:373 [type collection: Andes, Bolivia, *Mandon* (H, Nylander herbarium number 35692, lectotype; FH, S, isolectotypes)].

Parmelia jelinekii Krempelhuber, 1868:321 [type collection: Australia, *Jelinek* 27 (M, lectotype; W, isolectotype)].

Parmelia ochroleuca Müller Argoviensis, 1882:306 [type collection: Near Illawarra, Australia, *Kirton* 1 (G, lectotype); not *Parmelia ochroleuca* Taylor, 1848:24 (= *Sticta*)].

Parmelia splendidula Delise *ex* Nylander, 1885:605 [type collection: Peru (H, Nylander herbarium number 35733, lectotype)].

Parmelia caperatula (Nylander) Nylander, 1885:606.

Parmelia subcaperatula Nylander, 1885:606 [type collection: Derwent River, Tasmania, *Brown* (H, Nylander herbarium number 35730, lectotype; BM, isolectotype)].

Parmelia confertula Stirton, 1899:77 [type collection: Brisbane, Australia, *Bailey* (BM, lectotype)].

DESCRIPTION.—Thallus adnate to appressed on bark, light greenish yellow, 3–8 cm broad; lobes subirregular, apically rotund, contiguous, 2–4 mm wide; upper surface plane or becoming rugulose and cracked on older lobes; medulla white but sometimes with a reddish pigment near the lower cortex; lower surface black, shiny, sparsely rhizinate, usually with a bare dark brown naked zone at the tips. Apothecia common, sessile, the rim crenate, 1–3 mm in diameter; spores 8, 7–10 × 14–20 μm.

CHEMISTRY.—Cortex K− or K+ yellowish, medulla K−, C−, KC− or KC+ rose, P+ red; usnic acid, rarely atranorin, protocetraric acid with or without associated unknowns, and with or without caperatic acid (and protolichesterinic acid?) and unidentified K+ purple pigments.

DISTRIBUTION.—United States, Mexico, South America, and Australia.

HABITAT.—On trunks and branches of trees in semiarid regions at 100–2000 m elevation.

REMARKS.—*Pseudoparmelia rutidota* is a rather variable species, as one might assume from the long list of synonyms. It occurs very commonly in certain semiarid regions, especially Texas in the United States and New South Wales in Australia. Outside of this it is relatively rare. The comparable African populations appear to consist entirely of *P. amplexa* (Stirton) Hale, a smaller, more congested species with a black velvety lower surface. On the other hand, some specimens from Mexico and South America are quite a bit larger than the average. Obviously environmental modification plays a role in this variation. Basically *P. rutidota* could be, or closely resemble, a now extinct progenitor (or progenitors?) of the sorediate morph *P. caperata* (L.) Hale, the pustulate morph *P. baltimorensis* (Gyelnik and Fóriss) Hale, and the isidiate morph *P. papillosa* (Gyelnik) Hale. None of these fit their respective roles perfectly but together they form a coherent species group.

Chemical variation centers around the presence or absence of fatty acids, in most cases caperatic acid, and a medullary pigment. There seems to be no geographic pattern here, but assuredly many more field studies and collections are needed to determine this. For the present a rather broad species concept seems unavoidable.

SPECIMENS EXAMINED.—United States: Texas, *Darrow* 4863 (US), *Hale* 5316, 5504, *Heller* in *Lichenes boreali-americani* 197 and *Decades of North American Lichens* 260 (US), *Hubricht* B1891, B1927, *Jermy* (US), *Jones* (US), *Orchard* 4 (US), *Slater* 3 (US), *Whitehouse* 2283, 2289, 2290 (US). Mexico: Tamaulipas, *Nakanishi* 184 (US), *Purcell* 5564, 5601 (US). Bolivia: *Mandon* (BM). Brazil: Pernambuco, *Xavier* 776, 815, 816, 826. Chile: Valparaíso, *Follmann* 13013 (US). Uruguay: *Lorentz* 740 (M); Minas, *Herter* 90669 (H). Argentina: *Lorentz* (M). Australia: New South Wales, *Degelius* A-37, A-38 (Degelius herbarium, US), *Doing* (L, US), *Du Rietz* 683, 693 (UPS, US), *Hamilton* L1812 (NSW), *Watts* L1817 (NSW); South Australia, *Rogers* 1463, 1697 (US); Western Australia, *Irvine* (G); Tasmania, *Pearcey* (BM); Victoria, *Filson* 5419 (US); Australian Capital Territory, *Weber in Lichenes Exsiccati* 268 (US).

Pseudoparmelia salacinifera

FIGURE 15*f*

Pseudoparmelia salacinifera (Hale) Hale, 1974:191.

Parmelia salacinifera Hale in Hale and Kurokawa, 1964:157 [type collection: Sanford, Seminole County, Florida, *Rapp* (US, holotype; FLAS, isotype)].

DESCRIPTION.—Thallus adnate on bark, light ashy buff, 6–12 cm broad; lobes subirregular, apically subrotund, 3–5 mm wide; upper surface plane to rugulose, fissured with age, moderately isidiate, the isidia simple, to 0.3 mm high; lower surface brown to tan, moderately rhizinate except for a narrow naked zone along the margins. Apothecia rare, 2–4 mm in diameter, the amphithecium isidiate; spores 8, 8–9 × 13–16 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow turning red, C−, KC−, P+ pale orange; atranorin and salazinic acid.

DISTRIBUTION.—Southeastern United States, Mexico, Central America, West Indies, Colombia, Venezuela, Brazil, and Thailand.

HABITAT.—On trees (deciduous trees, palm, conifers) in open or secondary forest from sea level to 1000 m elevation.

REMARKS.—The distinguishing features of this species are the isidia and pale brown lower surface. The only other comparable salazinic acid-containing species is saxicolous *P. scotophylla* Kurokawa from Australia. It has a smaller thallus and small spores. *Pseudoparmelia cinerascens* (Lynge) Hale has a black lower surface. The only other species that could be confused with it because of the similar habitat, range, thallus color, and lobe configuration is *P. amazonica* (Nylander) Hale, which has a black lower surface and contains protocetraric acid (K−).

SPECIMENS EXAMINED.—United States: Georgia, *Hale* 16843; Florida, *Hale* 7994, 16714, 17045, 17083, 17735, 21690, 21967, *Moore* 4406 (DUKE, US). *Rapp* (FLAS, US), *Standley* 13084 (US). See Moore (1968:225) for further records from Florida. Merico: Chiapas, *Hale* 20607. Honduras: Comayagua, *Standley* 6522 (F, US); Cortés, *Morton* 7896 (US). Cuba: Pinar del Rio, *Imshaug* 25215 (MSC, US). Jamaica: *Plitt* (US). Colombia: Santander, *Nee and Mori* 3736 (US). Venezuela: Maracay, *Nash* 1946 (US). Brazil: Maranhão, *Eiten* 4198 (US); Mato Grosso, *Malme* (UPS). Thailand: *Kurokawa* 1931 (TNS, US).

Pseudoparmelia schelpei

FIGURE 16*a*

Pseudoparmelia schelpei (Hale) Hale, 1974:191.
Parmelia schelpei Hale, 1972b:344 [type collection: Maxixe, Sul do Save, Moçambique, *Schelpe* 4460 (BOL, holotype; LD, US, isotypes)].

DESCRIPTION.—Thallus closely adnate on bark, whitish mineral gray, 2–4 cm broad; lobes sublinear, crowded, 1.5–2.0 mm wide; upper surface plane, dull, rugulose with age; lower surface black, sparsely rhizinate. Apothecia numerous, adnate, 1–2 mm in diameter; spores 8, 4 × 8–10 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, K− or KC+ rose, P+ orange; atranorin and protocetraric acid.

DISTRIBUTION.—Moçambique.

HABITAT.—On coconut palms near sea level.

REMARKS.—No other species in *Pseudoparmelia* has protocetraric acid and such narrow lobes. *Pseudoparmelia caribaea* (Hale) Hale, a saxicolous species in the West Indies, is much larger. The sorediate morph of *P. schelpei* is presumed to be *P. epileuca* (Hale) Hale, which also occurs in Moçambique as well as in Kenya. I suspect both species will be more frequently collected as lichenologists visit coastal localities in East Africa.

SPECIMENS EXAMINED.—Moçambique: *Mogg* 2099 (PRE, US).

Pseudoparmelia schistacea, new combination

Parmelia schistacea Kurokawa and Filson, 1975:44 [type collection: 65.5 km west of Kingoonya, South Australia, *Filson* 11921 (MEL, holotype) (not seen)].

DESCRIPTION.—Thallus closely adnate, pale olivaceous gray, 2–4 cm broad; lobes sublinear-elongate, crowded at the center of the thallus, 0.5–1.5 mm wide; upper surface plane to convex, shiny, becoming tangentially rimose, pustulate; medulla white; lower surface pale brown, sparsely rhizinate. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC−, P−; atranorin, a trace of usnic acid, caperatic acid, and an unidentified fatty acid.

DISTRIBUTION.—Australia.

HABITAT.—On rocks in open areas.

REMARKS.—The authors of this species compare it with *P. arcana* (Kurokawa) Hale, both having closely adnate, almost subcrustose thalli. They have different morphologies, however, *P. arcana* being typically isidiate. A trace of usnic acid is alleged to occur in *P. schistacea*. The species is illustrated in Kurokawa and Filson (1975, pl. 4: fig. 1).

Pseudoparmelia scotophylla, new combination

FIGURE 16*b*

Parmelia scotophylla Kurokawa in Kurokawa and Filson, 1975:45 [type collection: Ardglen Gap, Liverpool Range, New South Wales, Australia, *Kurokawa* 5174 (TNS, holotype; MEL, isotype) (not seen)].

DESCRIPTION.—Thallus closely adnate, whitish to dark mineral gray, 4–12 cm broad; lobes sublinear, congested, apically subrotund, 1–2 mm wide; upper surface plane, shiny, becoming densely isidiate, the isidia cylindrical, simple, the tips blackened; lower surface dark brown or blackening, sparsely to moderately rhizinate, the rhizines brown or black, simple. Apothecia (from type description) substipitate, 6 mm in diameter, the amphithecium isidiate; spores 8, 5 × 7–8 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow turning red, C−, KC−, P+ orange; atranorin and salazinic acid.

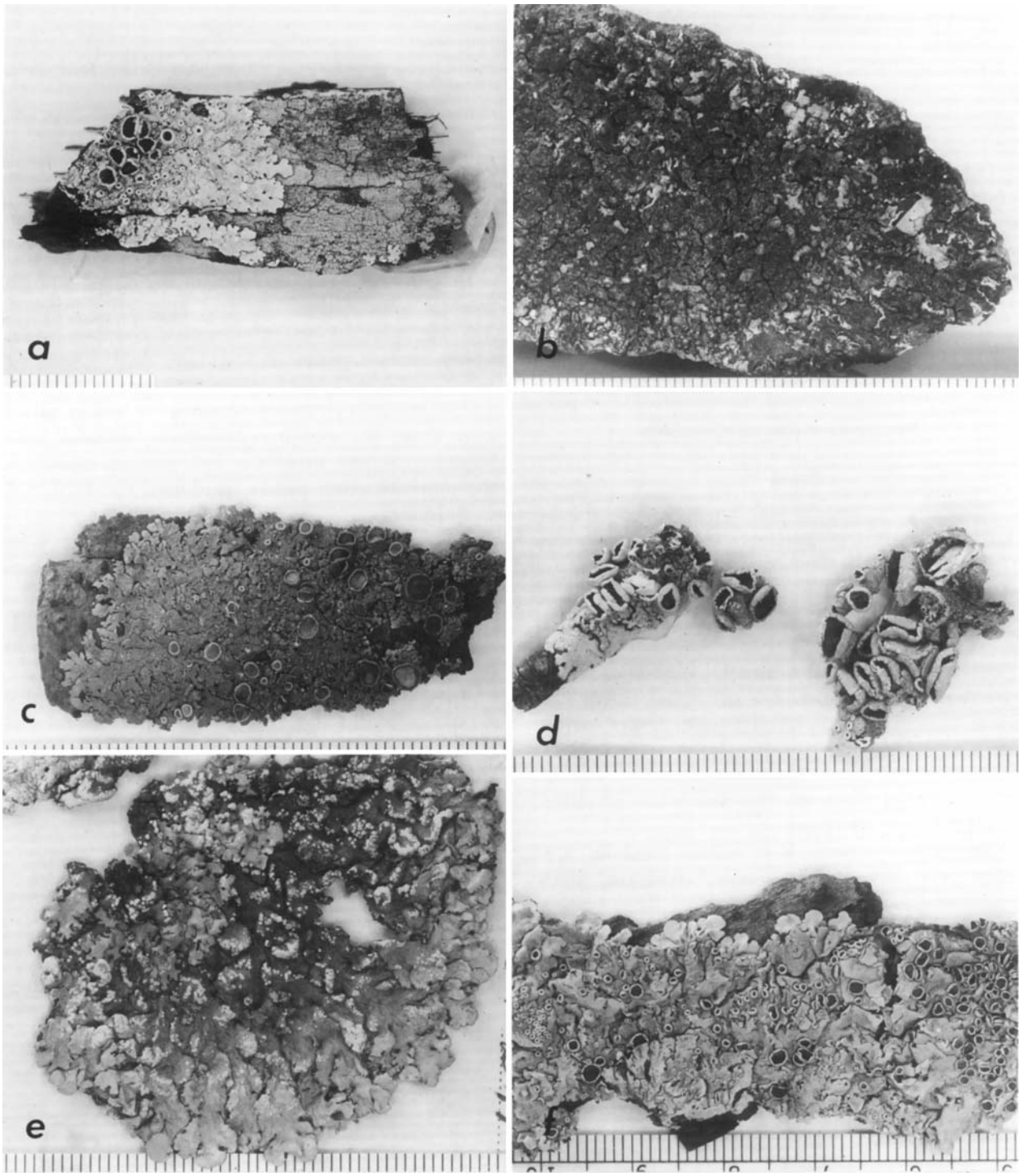

FIGURE 16.—Species of *Pseudoparmelia: a, P. schelpei* (*Schelpe* 4460, isotype in US); *b. P. scotophylla* (*Weber* L–47301 in US); *c, P. scrobicularis* (*Malme* 1949, isotype of *Parmelia longiconida Lynge* in US); *d, P. somaliensis* (*Jellicoe* 40 in US); *e, P. soredians* (*Sampaio* 247 in US); *f, P. sphaerospora* (*Hale* 21970A). (Scale in mm.)

DISTRIBUTION.—Australia.

HABITAT.—On rocks in dry shrubby sclerophyll woodlands.

REMARKS.—This species is part of the *Pseudoparmelia molybdiza* (Nylander) Hale complex, characterized by isidia and salazinic acid. The color of the lower surface seems to be variable, dark brown and blackening or remaining rather pale. A closely related nonisidiate species and possible progenitor is *P. spodochroa* (Kurokawa and Filson) Hale, which usually contains both salazinic and norstictic acids.

SPECIMENS EXAMINED.—Australia: New South Wales, *Du Rietz* 389 (UPS, US).

Pseudoparmelia scrobicularis

FIGURE 16*c*

Pseudoparmelia scrobicularis (Krempelhuber) Hale, 1974:191.
Parmelia scrobicularis Krempelhuber, 1873:10 [type collection: Lagoa Santa, Brazil, *Warming* (M, lectotype)].
Parmelia longiconida Lynge, 1914:130 [type collection: Rio Apa, Colonia Risso, Paraguay, *Malme* 1949 (S, lectotype: LD, US, W, isolectotypes)].

DESCRIPTION.—Thallus closely adnate on bark, light buff mineral gray, 2–5 cm broad; lobes sublinear, contiguous, 1.0–1.5 mm wide; upper surface finely foveolate, dull to shiny, lower surface black, moderately rhizinate. Apothecia common, adnate, 1.5–2.5 mm in diameter, the disc white pruinose; spores 8, 6–7 × 10–12 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow, C−, KC−, P+ orange; atranorin, stictic acid, and constictic acid.

DISTRIBUTION.—South America.

HABITAT.—On trees in open or secondary forest.

REMARKS.—The reticulate wrinkles are very strongly developed but are not visible without low power magnification. Two possibly related species, *P. carneopruinata* (Zahlbruckner) Hale, a presumptive sorediate morph, and *P. crozalsiana* (Bouly de Lesdain) Hale, have broad reticulately ridged lobes.

SPECIMENS EXAMINED.—Venezuela: Distrito Federal, *Ernst* (G). Brazil: Minas Gerais, *Henschen* (UPS). Paraguay: *Malme* (UPS); Paraguara, *Balansa* (G). Argentina: Misiones, *Montes* 10089 pro parte (LD).

Pseudoparmelia somaliensis

FIGURE 16*d*

Pseudoparmelia somaliensis (Müller Argoviensis) Hale, 1974: 191.
Parmelia somaliensis Müller Argoviensis, 1885:501 [type collection: Somalia, *Hildebrandt* (G, lectotype)].
Parmelia scottii Vainio, 1898a:40 [type collection: Ruwenzori, Africa, *Scott-Elliott* (TUR, Vainio herbarium number 2693, lectotype)].
Parmelia ramulicola Dodge, 1959:172 [type collection: Madagascar, *Hildebrandt* (FH, holotype)].

DESCRIPTION.—Thallus adnate on twigs, whitish mineral gray, rather soft and appearing inflated, 3–5 cm broad; lobes subirregular, 2–5 mm wide; upper surface plane to rugulose, dull, becoming white-pruinose; lower surface dark brown to black and moderately rhizinate except for a brown naked zone along the margins. Apothecia common, substipitate, almost urceolate, 2–5 mm in diameter, the amphithecium rugose, pruinose; spores 8, 5–7 × 9–13 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ rose, P+ red; atranorin and protocetraric acid.

DISTRIBUTION.—Central Africa and Madagascar.

HABITAT.—On twigs and branches of trees in open areas up to 2300 m elevation.

REMARKS.—The most characteristic habitat of this species is small twigs. The thallus is thick and soft with large apothecia. There are no close relatives in the genus for this African endemic.

SPECIMENS EXAMINED.—Zambia: *Jellicoe* 40 (BM, US). Tanzania: *Höeg* (TRH).

Pseudoparmelia soredians

FIGURE 16*e*

Pseudoparmelia soredians (Nylander) Hale, 1974:191.
Parmelia soredians Nylander, 1872:426 [type collection: Força, Reale, Spain, *Nylander* (H, Nylander herbarium number 34690, lectotype)].
Parmelia conspersa var. *polyphylla* f. *sorediosa* Müller Argoviensis, 1891:378 [type collection: San Miguel, Azores, *Godman* (G, lectotype)].
Parmelia san-miguelii Gyelnik, 1931b:288 [type collection: based on *P. conspersa* var. *polyphylla* f. *sorediosa* Müller Argoviensis].
Parmelia halmaiana Gyelnik, 1935:47 [type collection: Bergues, France, *Bouly de Lesdain*, in *Zahlbruckner Lichenes Rariores Exsiccati* 236 (BP, holotype; BM, BPI, MICH, UPS, isotypes)].

DESCRIPTION.—Thallus adnate on branches and trunks of trees, rarely on rocks, yellowish green, 6–15 cm broad; lobes subirregular, apically rotund, 2–5 mm wide; upper surface plane, shiny, becoming rugose toward the center, sorediate, soralia orbicular, coalescing, often occurring along ridges and wrinkles; lower surface black except for a marginal brown zone, sparsely rhizinate, the rhizines black. Apothecia rare, adnate; spores not seen.

CHEMISTRY.—Cortex K−, medulla K+ yellow turning red, C−, KC−, P+ orange; usnic acid and salazinic acid.

DISTRIBUTION.—Europe, Central and South Africa, Argentina, Chile, and New Zealand.

HABITAT.—On trees and rarely on rocks in open forests.

REMARKS.—This species is similar to *P. caperata* (L.) Hale except for the discrete, orbicular soralia and different chemistry (*P. caperata* is P+ red with protocetraric acid). It is totally absent from North America and eastern Asia, where *P. caperata* is very common. In England it behaves as a Mediterranean species, occurring mostly in the southeastern parts of the country where rainfall is low and there are no severe frosts (James and Rose, 1973).

SPECIMENS EXAMINED.—Europe: Ireland, *Mitchell* (M); England, *Holmes* (BM); France, *Crozals* (US), *Dahl* (WIS), *des Abbayes* in *Lichenes Armorici Spectabiles* 13 (LD), *Mangillon* 668 (US), *Santesson* 10077 (UPS); Portugal, *Persoon* (UPS), *Sampaio* in *Lichenes de Portugal* 247 (LD, M, US), *Tavares* in *Lichenes Lusitaniae selecti exsiccati* 140 (H, LD, M, US, WIS); Italy, *Sbarbaro* (US), *Sbarbaro* in *Lichenes Selecti Exsiccati* 24 (H, LD, M, US). Kenya: Central Province, *Maas Geesteranus* (L). Union of South Africa: Transvaal, *Almborn* 6603, 7501, 7505 (LD), *Höeg* (TRH); Natal, *Almborn* 9641, 9763 (LD), *Höeg* (TRH); Basutoland, *Kofler* (LD); Cape Province, *Almborn* 1604, 1997, 1998, 2030, 2099, 2100, 2153, 2121, 4108, 4735, 5361, 10662, 10862 (LD), *Höeg* (TRH), *Kofler* (LD), *Maas Geesteranus* 6623 (L), *Penfield* 220 (PRE). Argentina: Buenos Aires, *Santesson* 48 (S); Chubut, *Santesson* 195 (S). Chile: Santiago, *Mahu* 1117, 2034 (US); Concepción, *Barros* 3, 193 (H). New Zealand: *Scott* 323 (BM).

Pseudoparmelia sphaerospora, new combination

FIGURE 16*f*

Parmelia sphaerospora Nylander, 1859:254 [type collection: Madagascar, (H, lectotype; PC, isolectotype)].
Parmelia leucochlora Tuckerman in Nylander, 1860:392.
Parmelia cubensis Nylander, 1885:611.
Parmelia uleana Müller Argoviensis, 1889:506.
Parmelia flavidoglauca Vainio, 1890:65.
Parmelia endoxantha Merrill, 1909:73.
Parmelia bipindensis Dodge, 1959:59.
Parmelia zenkeri Dodge, 1959:74.
[Full citations of the synonyms are given in Hale (1971b:10).]

DESCRIPTION.—Thallus closely adnate on bark, 5–10 cm in diameter, pale greenish or yellowish mineral gray, often turning chamois in the herbarium; lobes sublinear-elongate, 2–4 mm wide; upper surface plane to convex, more or less maculate, rugulose to minutely pitted with age; medulla white to pale yellow; lower surface light tan to pale olive brown or darkening, rugose, moderately rhizinate, the rhizines simple, tan. Apothecia common, adnate, 2–3 mm in diameter; spores 8, 6–8 × 7–9 μm.

CHEMISTRY.—Cortex K− or K+ yellowish, medulla yellowish to orange with color reagents; atranorin, stictic acid, norstictic acid, gyrophoric acid, "quintaria" unknowns, and an unidentified yellow pigment in various combinations. The majority of specimens contained atranorin and the pigment; the next largest group (about 20% of the specimens) had atranorin, stictic acid, and the pigment. The other combinations (atranorin with the "quintaria" unknown, with stictic and norstictic acids, or with gyrophoric acid) occurred in only a few specimens.

DISTRIBUTION.—Southeastern United States, Mexico, Central America, West Indies, South America, and Central Africa.

HABITAT.—On shaded tree trunks in mature forests, *Taxodium* swamps, or orchards from sea level to 1100 m elevation.

REMARKS.—I had previously discussed the occurrence of this species in Dominica under the name *Parmelia congruens* Acharius (Hale, 1971b:11). After making as definitive a summary as possible of the chemistry, however, I discovered that the lectotype of *P. congruens* contains usnic and hypoprotocetraric acids and is better placed in the genus *Xanthoparmelia*, leaving *P. sphaerospora* as the earliest name for the *Pseudoparmelia* species. The medullary color often darkens in old herbarium specimens. The isidiate morph is *P. cyphellata* Lynge.

SPECIMENS EXAMINED.—United States: South Carolina, *Culberson* 10329 (DUKE, US); Georgia, *Egan* El-3403, El-6744 (US), *Hale* 16832; Alabama, *Evans* 93, 201, 345, 371 (US); Mississippi, *McDaniel* L-3 (US), *Pursell* 3083, 3153, 4181 (US);

Louisiana, *Langlois* 47 (US); Texas, *Jermy* (US); Florida, *Calkins* 2 (US), *Culberson* 10893 (DUKE, US), *Hale* 16728, 16889, 17652, 17738, 21623, 34134, 36829, 36887, *Nash* 2035 (US), *Rapp* 19, 2086 (US), *Rapp* in *Cryptogamae Vindobonenses* 3654 (US), *Rapp* in *Lichenes Rariores Exsiccati* 379 (BM, UPS, US), *Standley* 73421 (US) (for further records from Florida see Moore 1968:224). Mexico: Jalisco, *Wirth* (US); Chiapas, *Hale* 20030, 20174. Guatemala: Baja Verapaz, *Hale* 45998, *Kellerman* 8045 (US). Panama: Cocle, *Hale* 43571; Panama, *Hale* 38546. Costa Rica: *Tonduz* (US). Bahamas: *Brace* 6792 (FH, NY). Cuba: *Wright* 76 (BM, FH, G, NY, UPS, US); Pinar del Rio, *Imshaug* 25349, 25376 (MSC). Haiti: Nord, *Leonard* 8023 (S, US), 9002 (NY). Dominica: *Hale* 35636, 35775, 35779. Venezuela: Distrito Federal, *Dennis* 1548 (BM); Guarico, *Goodland* 2 (US), *Nilson* 1500 (UPS). Peru: San Martín, *Allard* 2254a, 22255a (US). French Guiana: *Degelius* (Degelius herbarium). Brazil: *Spruce* 130 (BM); Maranhão, *Eiten* 3887 (US); Goias, *Irwin* 32073 (NY, US); Mato Grosso, *Malme* in *Lichenes Austroamericani* 96 (BM, LD, S, UC, US), 2642 (UC, UPS, US), *Ramos* 6545 (BM); São Paulo, *Schindler* 4586 (US). Cameroon: *Zenker* 4053 (BR). Zaire: *Höeg* (TRH), *Louis* 6765, 7151, 8482 (BR, US). Guinea: *Santesson* 10574 (UPS, US). Angola: *Gossweiler* 8013a (BM). Tanzania: *Höeg* (TRH). Madagascar: *des Abbayes* in *Lichenes Madagascarienses* 5 (US).

Pseudoparmelia spodochroa, new combination

FIGURE 17*a*

Parmelia spodochroa Kurokawa and Filson, 1975:46 [type collection: Warren Gorge, Flinders Range, South Australia, *R. Filson* 11976 (MEL, holotype; TNS, isotype) (not seen)].

DESCRIPTION.—Thallus adnate on rock, whitish to dark mineral gray, 3–6 cm broad; lobes sublinear, apically subrotund, contiguous, becoming lobulate with age, 1.5–2.5 mm wide; upper surface plane, transversely rimose with age; lower surface brown or blackening, moderately rhizinate, the rhizines brown or black. Apothecia (from *Degelius* SA–57) adnate, 2–3 mm in diameter; spores 8, 6 × 8–11 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow turning red, C−, KC−, P+ orange; atranorin, salazinic acid, and usually norstictic acid.

DISTRIBUTION.—Australia and Union of South Africa.

HABITAT.—On more or less exposed rocks in dry woodlands.

REMARKS.—This species is represented by only five collections, which diverge rather widely in several characters. The color of the lower surface, for example, varies from almost entirely black to pale brown. Chemistry is uniform except for *Almborn* 4900 and the holotype, which lack norstictic. The lobe surface is smooth and shiny except for *Degelius* SA–57, which has a roughened, almost coarsely pruinose surface, a trait seen in specimens of other genera that grow in exposed desert regions. Further collecting in Africa and Australia will be needed to decide whether the limits of the species as described here are too broad.

SPECIMENS EXAMINED.—Australia: Australian Capital Territory, *Weber* L–47220, L–47282 (COLO, US). Union of South Africa: Cape Province, *Almborn* 4900 (LD, US), *Degelius* SA–57 (Degelius herbarium, US).

Pseudoparmelia subambigua, new species

FIGURE 17*b*

DESCRIPTION.—Thallus arcte adnatus, mollis, viridi-flavicans, 5–10 cm latus, lobis subirregularibus, brevibus, apice subrotundatis, congestis, 1.0–3.0 mm latis; superne planus, centrum versus rugosus, dense sorediatus, soraliis orbicularibus, confluentibus; cortex superior 8–10 μm crassus, epicortex perforatus, stratum gonidiale 20 μm crassum, medulla alba, 110–120 μm crassa, cortex inferior 7–10 μm crassus; subtus niger, sparse rhizinosus, rhizinis simplicibus, nigris. Apothecia ignota.

CHEMISTRY.—Cortex K−, medulla K−, C+, KC+ red, P−; usnic acid and lecanoric acid.

HOLOTYPE.—Chile: Antofagasta, Paposo Quebrada Guanillo, elevation 880 m, *M. Mahu* 3405, 12 September 1972 (US; Mahu herbarium, isotype).

DISTRIBUTION.—Chile.

HABITAT.—On shrubs and fence posts in open areas from sea level to 900 m elevation.

REMARKS.—This lichen could easily be misidentified as *Parmeliopsis ambigua* (Acharius) Nylander. The lower surface is black, however, and the chemistry distinctive. Larger specimens may also resemble *Pseudoparmelia soredians* (Nylander) Hale, which contains salazinic acid and which may well be the most closely related species. It is known only from Chile.

SPECIMENS EXAMINED.—Chile: Coquimbo, *Rundel* 7230 (US), *Santesson* 2519 (S, US); Santiago, *Rundel* 7323 (US); Valparaíso, *Santesson* 2808 (S, US).

Pseudoparmelia subamplexa, new species

FIGURE 17*c*

DESCRIPTION.—Thallus ut in *Pseudoparmelia amplexa* (Stirton) Hale sed superficie sorediatus, soraliis

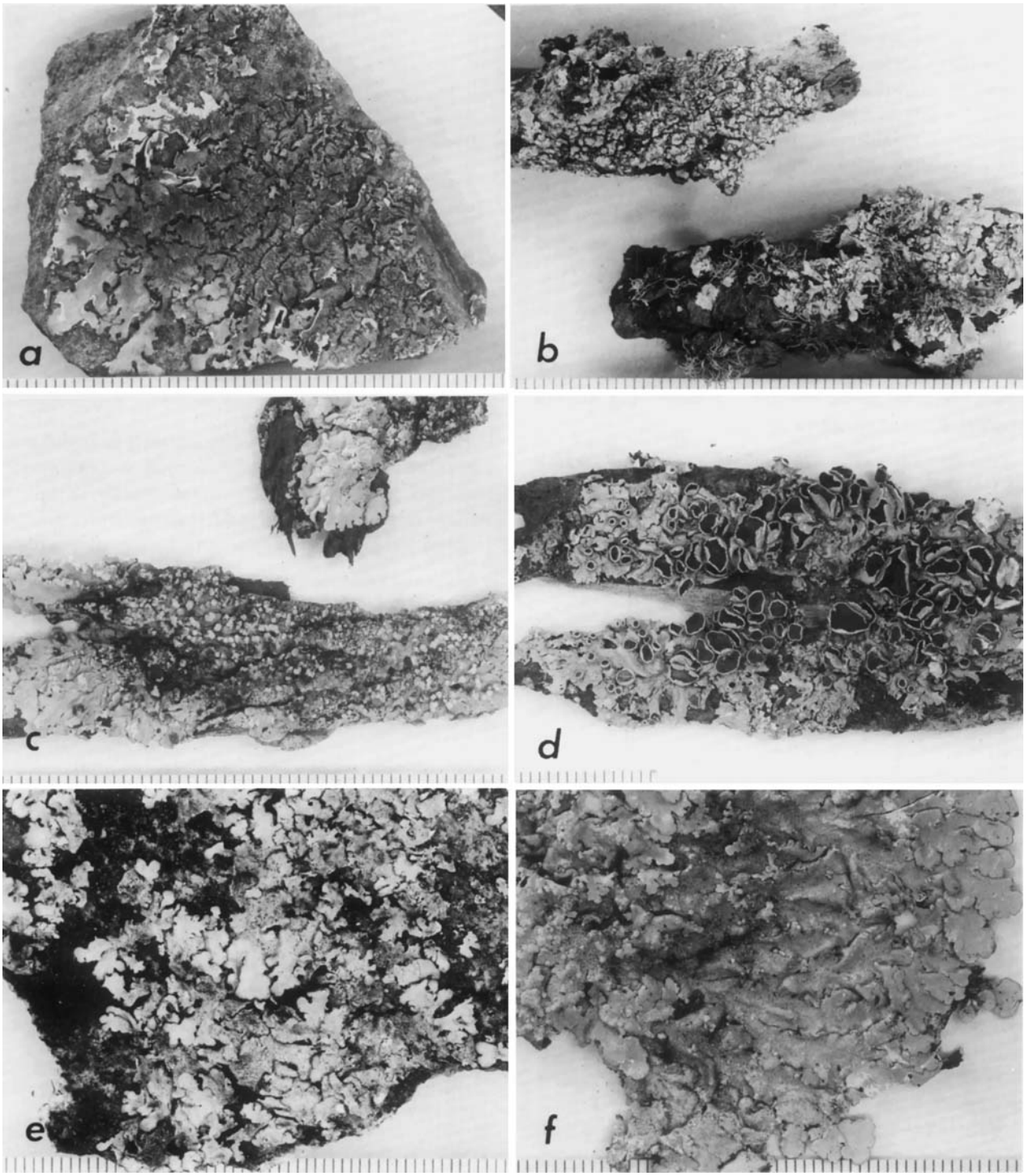

FIGURE 17.—Species of *Pseudoparmelia: a, P. spodochroa* (*Weber* L–47220 in US); *b, P. subambigua* (*Santesson* 2519 in US); *c, P. subamplexa* (*Schütte* 34k, isotype in US); *d, P. subtiliacea* (*Knight* 7, lectotype in H); *e, P. subtortula* (*Lye* L202A, holotype in BM); *f, P. texana* (*Hale* 42248). (Scale in mm.)

orbicularibus, discretis vel pro parte confluentibus; cortex superior 15–18 μm crassus, epicortatus, epicortice perforato, stratum gonidiale 15–20 μm crassum, medulla alba, 110–130 μm alta, cortex inferior 14–20 μm crassus; subtus niger, opacus, modice rhizinosus, rhizinis simplicibus. Apothecia ignota.

CHEMISTRY.—Cortex K−, C−, KC− or KC+ rose, P+ red; usnic acid and protocetraric acid.

HOLOTYPE.—On tree, Chishawasha, Salisbury District, S. Rhodesia, *K. Schütte* 34k, 30 December 1953 (LD; US, isotype).

DISTRIBUTION.—Rhodesia.

HABITAT.—On trees in arid scrub land.

REMARKS.—This is the sorediate morph of *P. amplexa* (Stirton) Hale. It has the same peculiar black velvety lower surface. As with the parent species, it is restricted to Africa.

SPECIMENS EXAMINED.—Rhodesia, *Höeg* (TRH, US), *Schütte* 42 (LD, US).

Pseudoparmelia subtiliacea

FIGURE 17*d*

Pseudoparmelia subtiliacea (Nylander) Hale, 1974:191.
Parmelia subtiliaeea Nylander, 1885:614 [type collection: New Zealand, *Knight* (H, Nylander herbarium number 35176, lectotype; UPS, isolectotype)].
Parmelia tiliacea var. *feracissima* Müller Argoviensis, 1886: 256 [type collection: Guntawang, New South Wales, Australia, *Hamilton* 5 (G, lectotype)].

DESCRIPTION.—Thallus adnate on twigs, whitish mineral gray, 3–5 cm broad; lobes subirregular, black rimmed, 1.5–3 mm wide; upper surface plane to rugulose or foveolate; lower surface black, sparsely rhizinate. Apothecia common, substipitate, 1–5 mm in diameter; spores 8, 6–7 × 12–14 μm.

CHEMISTRY.—Cortex K+ yellow, medulla negative with all reagents; atranorin and caperatic acid.

DISTRIBUTION.—Australia and New Zealand.

HABITAT.—On twigs of subalpine shrubs and in dry scrub land.

REMARKS.—*Pseudoparmelia subtiliacea* is a very rare lichen and as a consequence it is poorly understood. The only close relative seems to be another Australian lichen, *P. corrugativa* (Filson and Kurokawa) Hale, which has a pigment in the lower half of the medulla.

Pseudoparmelia subtortula

FIGURE 17*e*

Pseudoparmelia subtortula (Hale) Hale, 1974:191.
Parmelia subtortula Hale, 1973b:3 [type collection: E. Mengo District, Uganda, *Lye* L202A (BM, holotype; US, isotype)].

DESCRIPTION.—Thallus as in *P. tortula* (Hale) Hale (see below) except the upper surface isidiate, the isidia cylindrical, simple. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ rose, P−; atranorin, norlobaridone, and neoloxodic acid.

DISTRIBUTION.—Uganda and Kenya.

HABITAT.—On rocks in open areas at about 1000 m elevation.

REMARKS.—*Pseudoparmelia subtortula* is the presumptive isidiate morph of *P. tortula,* a species with identical chemistry, which occurs chiefly in South Africa. Both are saxicolous African endemics unique in producing norlobaridone and neoloxodic acid.

SPECIMENS EXAMINED.—See Hale (1973b) for records from Uganda and Kenya.

Pseudoparmelia texana

FIGURE 17*f*

Pseudoparmelia texana (Tuckerman) Hale, 1974:191.
Parmelia texana Tuckerman, 1858:424 [type collection: Blanco, Texas, *Wright* (FH, lectotype; M, US, isolectotypes)].
Parmelia sublaevigata var. *texana* (Tuckerman) Nylander *in* Triana and Planchon, 1867:307.
Parmelia confluescens Nylander, 1875:725 [type collection: St. Paul (H, Nylander herbarium number 35178, lectotype; BM, PC, UPS, isolectotypes)].
Parmelia cingalensis Stirton, 1876:159 [type collection: Galle, Ceylon (BM, lectotype); illegitimate name].
Parmelia leptophylla Müller Argoviensis, 1891:377 [type collection: Baziya, South Africa, *Baer* 714 (BM, lectotype; G, isolectotype)].
Parmelia tenuirima f. *sorediata* Müller Argoviensis, 1894:258 [type collection: Usambara (Tanganyika), Africa, *Holst* 787 pro parte (G, lectotype)].
Parmelia exoriens Stirton, 1899:76 [type collection: Brisbane, Australia, *Bailey* 215 (BM, lectotype; GLAM, isolectotype)].
Parmelia symmiga Hue, 1899:168 [type collection: Coonoor, Nilgherries Mountains, India, *Gray* (PC, lectotype)].
Parmelia subconfluescens Magnusson, 1942:5 [type collection: Puu Waawaa, north of Hualalai, Hawaii, *Selling* 5669 (S, holotype)].

Parmelia mangenotii des Abbayes, 1951:969 [type collection: Mankono, Cercle of Séguéla, Ivory Coast, *des Abbayes* (REN, lectotype; US, isolectotype)].
Parmelia pseudorutidota Asahina, 1952:17 [type collection: Nagachi, Shinshu, Japan, *Takahashi* (TNS, lectotype)].
Parmelia tanakae Asahina, 1954:371 [type collection: Kuzu-Mura, Buzen, Prov. Yamato, Japan, *Tanaka* (TNS, lectotype)].
Parmelia albaniensis Dodge, 1959:121 [type collection: forests of Albany, Cape of Good Hope, Union of South Africa, *Zeyher* 3 (FH-Tayl, holotype)].

DESCRIPTION.—Thallus closely adnate on trees or rocks, ashy white, 6–12 cm broad; lobes sublinear to subirregular, apically rotund, 3–5 mm wide; upper surface plane to rugulose, usually deeply rimose, sorediate, the soralia laminal, punctiform to capitate, in part initially pustulate with formation of soredia; lower surface black and moderately rhizinate except for a narrow naked brown zone along the margins. Apothecia rare, 2–5 mm in diameter; spores 8, 6–7 × 9–11 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC+ pale violet or KC−, P−; atranorin, divaricatic acid, and associated unknowns.

DISTRIBUTION.—Pantemperate outside of Europe and pantropical at higher elevations.

HABITAT.—On trees (*Acacia, Eucalyptus, Juniperus, Pinus, Quercus*) and more rarely on rocks in open or secondary forest and in parks and gardens at 50–2400 m elevation.

REMARKS.—This is one of the most widespread species in the genus and while not usually occurring in as great abundance, for example, as *P. caperata* (L.) Hale, it is well represented, if not frequently misidentified, in most large herbaria. The range of morphological variation is small and the chemistry uniform and distinctive. It is difficult to understand why so many lichenologists failed to recognize it. The nonsorediate progenitor may be represented by the African *P. nairobiensis* (Steiner and Zahlbruckner) Hale and the companion isidiate morph by *P. concrescens* (Vainio) Hale.

REPRESENTATIVE SPECIMENS EXAMINED.—United States: Wisconsin, *Thomson* 10921 (US, WIS); Tennessee, *Hale* 37032; West Virginia, *Hale* 10308; Illinois, *Skorepa* 934 (US); Virginia, *Hale* 12814 (US); South Carolina, *Culberson* 7515 (DUKE); Alabama, *Hale* 34057; Georgia, *Hale* in *Lichenes Selecti Exsiccati* 270 (US); Florida, *Hale* 36897; Arkansas, *Hale* 5567. Mexico: Chihuahua, *Matthews* 43794 (US); Hidalgo, *Chase* 7429 (F, US), *Weber et al.* 33690 (COLO); Michoacán, *Hale* 20849; Oaxaca, *Cain* 27578 (TRT, US), *Hale* 20621, 20630; Veracruz, *Hale* 19407; Chiapas, *Hale* 20278. Honduras: Morazán, *Standley* 4105, 11623 (F). Costa Rica: San José, *Quiros* 1246, 1474 (US). Panama: Chiriquí, *Hale* 38914, *Scholander* (US). Haiti: Ouest, *Imshaug* 22537 (MSC), *Wetmore* 2670 (MSC, US). Venezuela: Mérida, *Hale* 42121, 42920. Peru: Abancay, *Iltis* 2322 (WIS). Brazil: Minas Gerais, *Eiten* 6864, 6870 (US), *Mosén* 2309 (S, US): São Paulo, *Eiten* 2978, 8060 (US), *Milne* 32 (BM), *Osorio* 4919 (MVM); Santa Catarina, *Reitz and Klein* 15114 (US); Rio Grande do Sul, *Lima* 90 (US). Uruguay: Canelones, *Zorrón* 1929 (US); Montevideo, *Osorio* 1849, 6824 (MVM). Chile: Antofagasta, *Rundel* 7205 (US). Uganda: Busiro County, *Swinscow* 2U 24/4 (BM, US). Angola: Bié, *Degelius* (Degelius herbarium). Kenya: Rift Valley Province, *Maas Geesteranus* 4551 (L). Rhodesia: *Höeg* (TRH). Tanzania: Arusha Prov., *Santesson* 21338 (UPS); Kilimanjaro Prov., *Santesson* 20948 (UPS); Union of South Africa: Natal, *Höeg* (TRH); Transvaal, *Almborn* 6253 (LD); Cape Province, *Almborn* 10664 (LD). Madagascar: *des Abbayes* in *Lichenes Madagascarienses et Borbonici Selecti Exsiccati* 11 (LD, US). India: Tamil Nadu, *Foreau* 4092 (Awasthi herbarium), *Hale* 40167, 43708. Thailand: *Kurokawa* 1948 (TNS). Japan: Province Ohmi, *Hale* 29473. Indonesia: Java, *Groenhart* 1711 (L), *Kurokawa* in *Lichenes Rariores et Critici Exsiccati* 39 (TNS, US); Sumatra, *Groenhart* 957 (L). Australia: New South Wales, *Flockton* 724B (US).

Pseudoparmelia tortula

FIGURE 18*a*

Pseudoparmelia tortula (Kurokawa) Hale, 1974:191.
Parmelia tortula Kurokawa *in* Hale and Kurokawa, 1964:157 [type collection: Namaqualand, Cape Province, Union of South Africa, *Almborn* 4805 (LD, holotype; TNS, US, isotypes)].

DESCRIPTION.—Thallus closely adnate on rock, whitish mineral gray, 5–10 cm in diameter; lobes subirregular to sublinear, apically subrotund, crowded toward the center, 1.5–4 mm wide, often twisted and contorted when free from the substratum; upper surface plane to rugulose or undulate, continuous, sometimes faintly pruinose; lower surface pale brown, sparsely rhizinate, the rhizines brown. Apothecia adnate to substipitate, 1–5 mm in diameter; spores 5–6 × 7–9 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC− or KC+ faint rose, P−; atranorin, norlobaridone, and neoloxodic acid.

DISTRIBUTION.—Union of South Africa.

HABITAT.—On rocks in open treeless or sparsely vegetated areas up to 1000 m elevation.

REMARKS.—This rather undistinguished lichen is still known only from South Africa, where it seems to be quite common. The presumptive isidiate

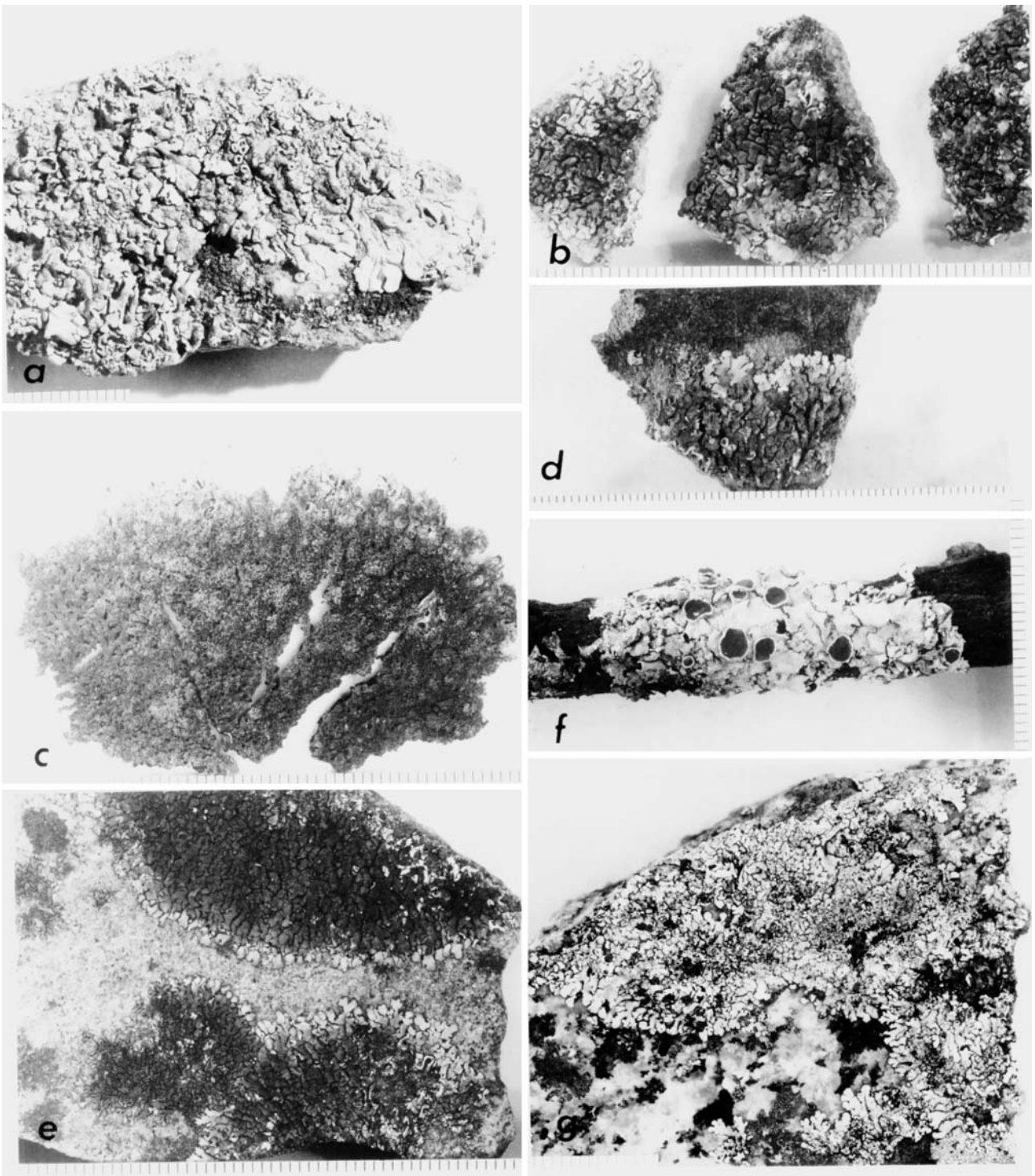

FIGURE 18.—Species of *Pseudoparmelia: a, P. tortula* (*Almborn* 4805, holotype in LD); *b, P. vanderbylii* (*Almborn* 5110 in US); *c, P. venezolana* (*Hale* 45526a, holotype in US); *d, P. violacea* (*Almborn* 1771, holotype in LD); *e, P. xanthomelaena* (*Maas Geesteranus* 12145 in US); *f, P. zambiensis* (*Jellicoe* 50, holotype in BM); *g, P. zimbabwensis* (*Höeg*, holotype in TRH). (Scale in mm.)

morph, *P. subtortula* (Hale) Hale, occurs farther north in Kenya and Uganda.

SPECIMENS EXAMINED.—See Hale and Kurokawa (1964:158) for records from the Union of South Africa.

Pseudoparmelia vanderbylii

FIGURE 18*b*

Pseudoparmelia vanderbylii (Zahlbruckner) Hale, 1974:191.
Parmelia vanderbylii Zahlbruckner, 1932a:252 [type collection: Union of South Africa, Van Rhynsdorp, Cape Province, *P. A. van der Byl* (W, lectotype)].

DESCRIPTION.—Thallus closely adnate on rocks, brownish or dark mineral gray, 3–6 cm broad; lobes subirregular, apically subrotund, contiguous, 1–2 mm wide; upper surface plane, shiny, rimose with age; lower surface pale brown, sparsely rhizinate, the rhizines pale brown. Apothecia common, sessile, 1–2 mm in diameter; spores 8, 6 × 8–10 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K− or K+ very faint orange, C−, KC−, P−; atranorin and two or more unidentified substances.

DISTRIBUTION.—Union of South Africa.

HABITAT.—On exposed rocks in open areas.

REMARKS.—This species falls near *P. molybdiza* (Nylander) Hale in general aspect and habitat but differs in chemistry. Two specimens (the lectotype and *Almborn* 4636) have identical chemistry (two spots in both the hexane and benzene solvent systems) and the third (*Almborn* 5110) has distinctly different but still unidentified higher spots. All three share the same two lowermost faint spots. None matched any of the usual KC− depsidones and depsides with which they were co-chromatographed.

SPECIMENS EXAMINED.—Union of South Africa: Cape Province, *Almborn* 4636, 5110 (LD, US).

Pseudoparmelia venezolana, new species

FIGURE 18*c*

DESCRIPTION.—Thallus adnatus, saxicola, cinereo-albus, 3–7 cm latus, lobis sublinearibus, congestis, 0.6–1.0 mm latis; superne planus, nitidus, dense isidiatus, isidiis cylindricis, simplicibus vel ramosis, 0.2–0.4 mm altis; cortex superior 15–18 μm crassus, epicorticatus, epicortice distincte perforato, stratum gonidiale ca 10 μm crassum, medulla alba, 100 μm crassa, cortex inferior paraplectenchymatus, 8–10 μm crassus; subtus pallide brunneolo-albus, sparse rhizinosus, rhizinis simplicibus, pallidis. Apothecia ignota.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC− or KC+ rose, P+ red; atranorin and protocetraric acid.

HOLOTYPE.—Venezuela: Táchira, Pico Banderas, Páramo de Tamá, elevation 3200 m, *M. E. Hale* 45526a, 27 March 1975 (US).

REMARKS.—This inconspicuous species is easily overlooked in the high paramo areas where it appears to be confined. This is the highest elevation at which the genus is found. There seem to be no close relatives. It would more likely be confused with *Parmeliopsis,* which is characterized by the presence of thamnolic acid.

SPECIMENS EXAMINED.—Venezuela: Táchira, *Hale* 45499a, 45523, 45528a.

Pseudoparmelia violacea

FIGURE 18*d*

Pseudoparmelia violacea (Kurokawa) Hale, 1974: 191.
Parmelia violacea Kurokawa *in* Hale and Kurokawa, 1964: 158 [type collection: Blinkwater Ravine, Table Mountain, Cape Province, Union of South Africa, *Almborn* 1771 (LD, holotype)].

DESCRIPTION.—Thallus closely adnate on rock, greenish mineral gray, 3–6 cm in diameter; lobes sublinear, 1–3 mm wide; upper surface plane to distinctly rugulose, continuous; medulla vinaceous purple; lower surface pale brown, moderately rhizinate, the rhizines pale. Apothecia adnate, 1–1.5 mm in diameter; spores not developed.

CHEMISTRY.—Cortex K+ yellowish, medulla K+ purple, P−; unidentified anthraquinones.

DISTRIBUTION.—Union of South Africa.

HABITAT.—On rocks in open forest.

REMARKS.—This remarkable species has been recollected once since the original description. It is another typical saxicolous African endemic verging close to *Xanthoparmelia*. The pigments are, in fact, very close to those of *X. endomiltoides* (Nylander) Hale, one being identical. No lichen substances are present in the cortex.

SPECIMENS EXAMINED.—Union of South Africa: Cape Province, *Degelius* SA–70 (Degelius herbarium, US).

Pseudoparmelia xanthomelaena

FIGURE 18*e*

Pseudoparmelia xanthomelaena (Müller Argoviensis) Hale, 1974:191.

Parmelia xanthomelaena Müller Argoviensis, 1883a:48 [type collection: Grampian Mountains, Australia, *Sullivan* 28 (G, lectotype)].

DESCRIPTION.—Thallus closely appressed on rock, buff mineral gray but darkening to brownish olive gray at the center, 3–5 cm broad; lobes sublinear, contiguous, lobulate, 0.5–1.5 mm wide; upper surface plane, shiny, transversely rimose with age; lower surface black, moderately rhizinate. Apothecia common, adnate, up to 1 mm in diameter; spores 8, 6 × 7–10 μm.

CHEMISTRY.—Cortex K+ yellow, medulla K+ yellow, C−, KC−, P+ orange; atranorin, stictic acid, and constictic acid.

DISTRIBUTION.—Union of South Africa and Australia.

HABITAT.—Exposed rocks from sea level to 250 m elevation.

REMARKS.—This is one of the smallest species of *Pseudoparmelia*. It is probably difficult to collect since it cannot be removed free of the rock substratum. There are no obviously related species in the genus, unless we consider *P. ischnoides* (Kurokawa) Hale as a possible isidiate morph.

SPECIMENS EXAMINED.—Union of South Africa: Basutoland, *Kofler* (LD); Cape Province, *Almborn* 127, 275, 1136a, 1444, 1546, 1703, 3023, *Degelius* SA-337 (Degelius herbarium), *Maas Geesteranus* 12145 (L).

Pseudoparmelia zambiensis

FIGURE 18*f*

Pseudoparmelia zambiensis (Hale) Hale, 1974:191.

Parmelia zambiensis Hale, 1972b:346 [type collection: Nyika Plateau, Zambia, *Jellicoe* 59 (BM, holotype; US, isotype)].

DESCRIPTION.—Thallus adnate on bark, greenish yellow, 4–6 cm broad; lobes subirregular, crowded, 2–3 mm wide, becoming lobulate toward the center; upper surface plane to rugulose, rimose with age; lower surface black, sparsely rhizinate, the rhizines thick, black. Apothecia common, adnate 2.5–3.0 mm in diameter; spores 8, 6 × 12 μm.

CHEMISTRY.—Cortex K−, medulla K−, C−, KC− or KC+ faint rose, P−; usnic acid and divaricatic acid with associated unknowns.

DISTRIBUTION.—Central Africa.

HABITAT.—On trees in open areas at 2300 m.

REMARKS.—This is another African species that will surely be collected more often as lichenologists visit the continent. It appears to be the nonisidiate progenitor of *P. ecaperata* (Müller Argoviensis) Hale, which has a wide range in Africa and Asia. It could also be considered as the usnic acid chemical counterpart of *P. nairobiensis,* which contains atranorin only in the cortex. A full understanding of the relations of these species can only be gained when more specimens are collected.

Pseudoparmelia zimbabwensis

FIGURE 18*g*

Pseudoparmelia zimbabwensis (Hale) Hale, 1974:191.

Parmelia zimbabwensis Hale, 1972b:346 [type collection: Zimbabwe, Rhodesia, *Höeg* (TRH, holotype; LD, US, isotypes)].

DESCRIPTION.—Thallus closely adnate on rock, fragile, light mineral gray, 2–5 cm broad; lobes sublinear, contiguous, black-marginate, 1.0–1.5 mm wide; upper surface plane to rugulose, in part pruinose, pustulate, the pustules thick, apically pruinose and finally erupting without soredial formation; lower surface black, moderately rhizinate, the rhizines black. Apothecia not seen.

CHEMISTRY.—Cortex K+ yellow, medulla K−, C−, KC−, P+ red; atranorin and protocetraric acid.

DISTRIBUTION.—Rhodesia and Union of South Africa.

HABITAT.—On boulders in open areas.

REMARKS.—The pustules of this species are similar to those of *P. pusutlescens* (Kurokawa) Hale, a somewhat larger species containing sekikaic acid (P−).

SPECIMENS EXAMINED.—Union of South Africa: Transvaal, *Almborn* 6108, 6491, 6496 (LD).

Doubtful and Rejected Names

Parmelia appressa Sprengel, 1987:58 [type collection: On *Cinchona,* tropical America].

The type collection could not be found. A specimen in Acharius' herbarium labeled "Parmelia appressa" appears to be identical with *Pseudoparmelia sphaerospora* (Nylander) Hale. How-

ever, Sprengel mentioned affinity with *Parmelia perforata* and *P. perlata,* both large *Parmotrema* species.

Parmelia caperata var. *coerulea* Bouly de Lesdain, 1954:222 [type collection: Rocamadour, France, *Duval*].

The type specimen is probably in PC but I was not able to locate it there.

Parmelia protorevoluta Gyelnik, 1931b:288.

Parmelio revoluta f. *nuda* Müller Argoviensis, 1891:378 [type collection: Santarem, Brazil, *Spruce* 135 (G, lectotype; BM, isolectotype)].

The fragmentary type collections contain divaricatic acid. This is almost certainly a *Pseudoparmelia,* perhaps *P. nairobiensis* (Steiner and Zahlbruckner) Hale, a presumed African endemic.

Parmelia rutidota var. *vestita* Zahlbruckner, 1941: 107.

This variety is based on two collections, one *Thomson* ZA217 from Southland, New Zealand, which is *Parmelia rudecta* Acharius, and the other *Cranwell* ZA242 from Coromandel Peninsula, New Zealand, which can be identified as *Parmotrema crinitum* (Acharius) Choisy. Both specimens are preserved in W.

Parmelia soredians f. *farinosa* (Vainio) Gyelnik, 1938a:27.

This is based on *Parmelia farinosa* Vainio (1890: 62) (*Lichenes Brasilienses Exsiccati* 551 in TUR). It is a species of *Xanthoparmelia* (Vainio) Hale.

Parmelia soredians f. *lobulata* Gyelnik, 1934:306 [type collection: La Calera Sud, Argentina, *Hosseus* 22 (BP, holotype)].

This is a species of *Xanthoparmelia* (Vainio) Hale.

Parmelia soredians f. *muscicola* Gyelnik, 1934:306 [type collection: Capilla del Monte, Argentina, *Hosseus* 23 (BP, holotype)].

This is also a *Xanthoparmelia.*

Pseudoparmelia aradensis Gyelnik, 1933:6.

Culberson and Culberson (1969:515) place this species in synonymy under *Cetrelia olivetorum* (Nylander) W. Culberson and C. Culberson.

Pseudoparmelia euplecta (Stirton) Hale, 1974:190.

I have tentatively placed this species as a synonym of *Pseudoparmelia caperata* in the "Taxonomic Treatment."

Pseudoparmelia leucopis (Krempelhuber) Hale, 1974:190.

Parmelia leucopis Krempelhuber, 1878:461 [type collection: *Lorentz and Hieronymus,* Argentina (M. lectotype)].

After reexamining the type collection, I found some cilia in the lobe axils. These would exclude the species from *Pseudoparmelia,* and I hesitate to reassign it to another genus until better material is available.

Pseudoparmelia meiosperma (Hue) Hale, 1974:190.

Parmelia internexa f. *meiosperma* Hue, 1899:185 [type collection: Mafate, Réunion, *Rodriguez* (PC, lectotype)].

The type-specimen has rather broad lobes with dense isidia. The rhizines are dense and more or less branched. The chemical constituents include atranorin, evernic acid, and traces of lecanoric acid, a combination that is known in several species of *Hypotrachyna* (Hale, 1975a) but in no *Pseudoparmeliae.* It does not fit well in *Pseudoparmelia* and until additional material is available it is impossible to settle its generic position.

Pseudoparmelia pseudofallax Gyelnik, 1933:6.

Culberson and Culberson (1968:459) consider this to be a species of *Cetrelia* but not having examined the type collection they could not decide which one.

Pseudoparmelia pseudofallax var. *cretaceoides* Gyelnik, 1933:7.

This taxon also belongs in the *Cetrelia cetrarioides* complex.

Pseudoparmelia pseudosorediosa (Gyelnik) Hale, 1974:191.

This has been reduced to synonymy under *Pseudoparmelia caperata* in the "Taxonomic Treatment" above.

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(Synonyms in italics)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—211-559/18