A REVISION OF THE SOUTH AMERICAN SPECIES OF PARMELIA DETERMINED BY LYNGE

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Introduction

Although the Norwegian lichenologist Bernt Lynge is remembered as the foremost authority on arctic lichens, early in his career he published several articles of fundamental importance on tropical lichens, especially in the genera *Anaptychia* and *Parmelia*. His major work (1914) involved the determination of the rich and well-prepared *Parmelia* collections, now preserved at Stockholm, of the various Regnell expeditions from 1892 to 1902 to Brazil and Paraguay. A second short paper (1917) merely added the descriptions of two new species, and a third paper (1925) summarized the determinations of miscellaneous Brazilian Parmelias at Uppsala, Stockholm, and Berlin.

Altogether Lynge identified a total of 110 taxa, 61 of them new to science, and gave exhaustive Latin descriptions of nearly all the species and excellent photographs of 30 taxa. It has been possible to reexamine 99 of these taxa; specimens of the remaining 11 were destroyed at Berlin or have otherwise not been located. The purpose of this report is to revise the determinations of these taxa with particular attention to adequate typification and analysis of chemical components. A full understanding of Lynge's species is essential before a monographic treatment of *Parmelia* in South America can be attempted.

The Regnell collections contained an extraordinarily large number of endemic species, many of which have never been collected again. Lynge, although on the whole he was a conservative taxonomist, wisely described these as new species instead of ascribing them to older names. At the same time the thoroughness of his work is attested by the fact that I have found it necessary to describe only one additional new species, *Parmelia microdactyla*. Most of my effort was expended in correcting misidentifications and synonymy stemming from Lynge's failure to typify the species correctly.

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Chemistry of the Species

The chemical components of each specimen were determined by means of the standard microchemical crystal tests of Asahina (1954), chromatography (Wachtmeister, 1956), and fluorescence analysis (Hale, 1956). Chromatography is required to separate the pigmented substances; fluorescence analysis at 3,600 A. is the easiest method of detecting the presence of alectoronic acid in the medulla (by a bright white fluorescence) and lichexanthone in the cortex (by a brilliant orange-yellow fluorescence). Color tests supplementing the microchemical tests were made under a low power binocular directly on the thallus and medulla with fresh reagents. Lynge made a number of faulty chemical color tests which resulted in some misidentifications and in some species being described as new unnecessarily.

Thirty lichen substances, including 17 positively identified and 13 unknown, were demonstrated. A list of the 17 positively identified acids and the species in which they occurred is given below. Changes in the nomenclature of Lynge's names should be checked in the list of synonyms and misidentifications on p. 39.

1. Alectoronic acid:
   - *P. bahiana* Nyl.
   - *P. laongii* Lynge
   - *P. latissima* f. *microspora* Lynge
   - *P. melanothrix* (Mont.) Vain.
   - *P. melanothrix* f. *microspora* Lynge
   - *P. rigida* Lynge
   - *P. subproboscidea* Lynge
   - *P. subrugata* var. *arcuata* Lynge
   - *P. wainii* A. L. Smith
2. Atranorine:
   Present in all taxa except:
   - *P. abstrusa* Vain.
   - *P. abstrusa* f. *laevigata* Lynge
   - *P. brasiliana* Nyl.
   - *P. brasiliana* var. *novella* (Vain.) Lynge
   - *P. chapadensis* Lynge
   - *P. crustacea* Lynge
   - *P. flava* var. *stellata* Lynge

2. Atranorine—Continued
   - *P. flava* var. *subdichotoma* Lynge
   - *P. malmei* Lynge
   - *P. minima* Lynge
   - *P. portoalegrensis* Lynge
   - *P. regis* Lynge
   - *P. regnellii* Lynge
   - *P. regnellii* f. *arida* Lynge
   - *P. rutidota* Hook. & Tayl.
   - *P. silvatica* Lynge
   - *P. silvatica* var. *pinnata* Lynge
   - *P. silvatica* var. *radiata* Lynge
   - *P. viridescens* Lynge
3. Barbatic acid:
   - *P. digitata* Lynge
   - *P. regnellii* Lynge
   - *P. uleana* Müll. Arg.
4. Divaricatic acid:
   - *P. rupicola* Lynge

5. Fumarprotocetraric acid:
   P. rutidota Hook. & Tayl.
   P. rutidota f. *filizans* Lynge
6. Gyrophoric acid:
   P. acariospora Zahlbr.
   P. coronata Fée
   P. marginalis Lynge
   P. minarum Vain.
   P. pluriformis Nyl.
   P. riograndensis Lynge
   P. rudecta Ach.
   P. sancti-angelii Lynge
   P. xanthina (Müll. Arg.) Vain.
7. Lecanoric acid:
   P. paraguariensis Lynge
   P. rissoensis Lynge
   P. tinctorum Nyl.
8. Lichexanthone:
   P. brasiliana Nyl.
   P. brasiliana var. *novella* (Vain.) Lynge
   P. crustacea Lynge
   P. malmei Lynge
   P. minima Lynge
   P. regis Lynge
   P. silvatica Lynge
   P. silvatica var. *pinnata* Lynge
   P. silvatica var. *radiata* Lynge
9. Norstictic acid:
   P. abstrusa Vain.
   P. abstrusa f. *laevigata* Lynge
10. Olivetoric acid:
   P. fragilis Lynge
   P. revoluta Floerke
11. Perlatolic acid:
   P. wainioana Lynge
12. Protocetraric acid:
   P. amazonica Nyl.
   P. consimilis Vain.
   P. crustacea Lynge
   P. cyliphora (Ach.) Vain.
   P. fatiscens Lynge
   P. fistulata Tayl.
   P. flava var. *stellata* Lynge
   P. flava var. *subdichotoma* Lynge
   P. latissima Fée
   P. latissima var. *corniculata* Krempllh.
   P. latissima var. *minima* Lynge
   P. leucoxantha Müll. Arg.
   P. malmei Lynge
   P. minima Lynge
   P. rutidota Hook. & Tayl.
12. Protocetraric acid—Continued
   P. saccatiloba Tayl.
   P. silvatica Lynge
   P. silvatica var. *pinnata* Lynge
   P. silvatica var. *radiata* Lynge
13. Protolichesteric acid:
   P. canaliculata Lynge
   P. microsticta Müll. Arg.
   P. riograndensis Lynge
   P. xanthina (Müll. Arg.) Vain.
14. Salacinic acid:
   P. cetrata Ach.
   P. cetrata var. *corniculata* Müll. Arg.
   P. cetrata ssp. *radiata* Lynge
   P. cinerascens Lynge
   P. continua Lynge
   P. cristifera Lynge
   P. kamtschadalis var. *americana* (Mey. & Flot.) Nyl.
   P. latissima Fée
   P. magna Lynge
   P. microdactyla Hale
   P. nylanderi Lynge
   P. radians Lynge
   P. rupta Lynge
15. Stictic acid:
   P. conspersa (Ach.) Ach.
   P. eciliata (Nyl.) Nyl.
   P. longiconida Lynge
   P. portoalegrensis Lynge
   P. regnellii Lynge
   P. scrobicularis Krempllh.
   P. uleana Müll. Arg.
16. Usnic acid:
   P. abstrusa Vain.
   P. abstrusa f. *laevigata* Lynge
   P. chapadensis Lynge
   P. conspersa (Ach.) Ach.
   P. cristifera Tayl.
   P. cyliphora (Ach.) Vain.
   P. fatiscens Lynge
   P. flava var. *stellata* Lynge
   P. flava var. *subdichotoma* Lynge
   P. leucoxantha Müll. Arg.
   P. magna Lynge
   P. microdactyla Hale
   P. nylanderi Lynge
   P. portoalegrensis Lynge
   P. radians Lynge
   P. regnellii Lynge
   P. regnellii f. *arida* Lynge
   P. rutidota Hook. & Tayl.

16. Usnic acid—Continued
P. rutidota f. *filizans* Lynge
P. uleana Müll. Arg.
P. xanthina (Müll. Arg.) Vain.

17. Vulpinic acid:
P. cornuta Lynge
P. persulphurata Nyl.
P. sulphurata Nees & Flot.

Unknown colorless substances were found in the following species:

P. annae Lynge
P. brasiliana var. *novella* (Vain.) Lynge
P. capitata Lynge
P. ceracea Lynge
P. chapadensis Lynge
P. digitata Lynge
P. gracilis (Müll. Arg.) Vain.
P. melanothrix (Mont.) Vain.
P. mesotropa Müll. Arg.
P. osseo-albida Lynge
P. palmarum Lynge
P. regis Lynge
P. regnellii Lynge
P. regnellii f. *arida* Lynge
P. riograndensis Lynge
P. saccatiloba Tayl.
P. saccatiloba f. *membranacea* Lynge
P. subregressa Lynge
P. zahlbruckneri Lynge

Unknown pigments were discovered in the following species:

P. chapadensis Lynge
P. cornuta var. *crocea* Lynge
P. crustacea Lynge
P. lindmanii Lynge
P. malmei Lynge
P. merrillii Lynge
P. minima Lynge
P. regnellii Lynge
P. regnellii f. *arida* Lynge
P. silvatica Lynge
P. silvatica var. *pinnata* Lynge
P. silvatica var. *radiata* Lynge
P. uleana Müll. Arg.

List of Species

Lynge originally arranged his lists of 110 taxa in phylogenetic order. I have, for convenience, rearranged the species in alphabetical order and have numbered them consecutively. No descriptions are repeated from Lynge since he described meticulously nearly all the species in his 1914 article in Arkiv för Botanik, which is readily available in most larger libraries. I have, however, included supplemental information on the nomenclatural types, synonymy, range, color reactions and chemical components, and pertinent comments on the status of the species and their relatives. I have not attempted to improve or expand Lynge's excellent, though outdated key, for our knowledge of the Parmelias of South America is so incomplete that no key can do justice to the genus now.

The Malme specimens from the Regnell collections, all of which are preserved at Stockholm, are cited only by number or date, since Lynge gives complete label data for these in his lists. Holotypes and lectotypes are cited in full. Specimens collected by Dusén, Henschen, or Regnell, mostly preserved at Uppsala, are also cited in full.

Lynge did not designate holotypes for his new taxa in his publications, but he did write "originaleksemplar" on one herbarium packet

if two or more specimens were included in the original concept. I have selected such packets as lectotypes except in the case of *P. zahlbruckneri* Lynge (see p. 38). A summary of the new taxa reduced to synonymy and corrected identifications is given at the end of this list (p. 39).

1. Parmelia abstrusa Vain. Acta Soc. Faun. & Fl. Fenn. 7:64. 1890.—Lynge, 1914, p. 145, *pl. 5, figs. 8, 9;* 1925, p. 84.

Lectotype: Caraça, Minas Gerais, Brazil, *Vainio* 1347 (TUR).

Range: Brazil, Colombia, West Indies, Japan.

Additional specimens examined: *Malme* 1481B, 1537, 1857, 1865B, 1884, 2745, 2749B.

Reactions: Thallus K−, medulla K+ red, C−, KC−, P+ orange-red, norstictic and usnic acids present.

The specimens seen by Lynge fall within the range of variation of Vainio's species, although the thickness of the thallus is quite variable. A very close relative with thinner lobes is *P. jamaicensis* Vain., which also contains norstictic acid and usnic acid, and probably intergrades with *P. abstrusa* in the West Indies. Both species appear to be common on soil and rocks as well as on tree bark. *Parmelia microblasta* Vain., judging from the poor type material, is in this same group of isidiate species with norstictic acid but differs in lacking usnic acid.

2. Parmelia abstrusa f. **laevigata** Lynge, Ark. Bot. 13, No. 13:147. 1914.
Parmelia subabstrusa Gyel. Repert. Sp. Nov. 29:288. 1931. Based on *P. abstrusa* f. *laevigata* Lynge.

Lectotype: Bocca da Serra, Serra da Chapada, Mato Grosso, Brazil, *Malme*, June 15, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K−, medulla K+ red, C−, KC−, P+ orange-red, norstictic and usnic acids present.

The lack of isidia and the conspicuous coronate apothecia set this entity quite apart from *P. abstrusa* f. *abstrusa*. In fact, we may well wonder why Lynge did not recognize it as a new species. The adoption of Gyelnik's name as a distinct species is recommended, although it does not clear up the confusion surrounding this difficult group. Two specimens seen by Lynge (*Malme* 2445 and March 7, 1894) react K− in the medulla and may be classified either as a chemical strain of *P. subabstrusa* or as an undescribed species more closely related to *P. relicina* Fr.

3. Parmelia acanthifolia Pers. *in* Gaudich. Voyage *Uranie*, Bot. 197. 1826.—Lynge, 1925, p. 84. PLATE 1

Type: Rio de Janeiro, Brazil, *Gaudichaud* 13 (P).

The specimen determined by Lynge in the Berlin Museum is presumably destroyed. Persoon's type is apparently an abnormal form

of *P. cetrata* Ach. The upper cortex is less reticulately rimose than expected, but the plant contains atranorine and salacinic acid and has spores (8–11×12–16 μ) comparable to *P. cetrata*. Vainio's determination of *P. acanthifolia* from Brazil (*Lich. Bras. Exs.* 737) is based on *P. subcaperata* Krempl h.

4. Parmelia acariospora Zahlbr. Denkschr. Akad. Wiss. Math. Naturw. Wien 83:169. 1909.—Lynge 1914, p. 105.

Type: Barra Mansa, Itapecirica, São Paulo, Brazil, *Schiffner & Wettstein* (BPI, isotype).

Range: Brazil.

Additional specimens examined: *Malme* 2509B, 2532B*, 2545.

Reactions: Thallus K+ yellow, medulla K−, C+ rose, KC+ red, P−, atranorine and gyrophoric acid present.

This uniform species is easily recognized by its thin fragile thallus and delicate isidia. *Parmelia minarum* Vain. is similar in chemistry and appearance but has a more ashy color and firmer lobes. *Parmelia granatensis* Nyl. and *P. chileana* Nyl. are also related to this species, but their exact status is unsettled.

5. Parmelia amazonica Nyl. Flora 68:611. 1885—Lynge, 1914, p. 101.

Type: Santarem, Amazon River, Bahia, Brazil, *Spruce* 111 (H).

Range: Florida, West Indies, Central America, Brazil.

Additional specimen examined: *Malme* 2408.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ rose, P+ orange-red, atranorine and protocetraric acid present (not proved microchemically in the type specimen).

Parmelia amazonica is distinguished by the presence of protocetraric acid. *Parmelia consimilis* Vain. of similar chemical constitution has thicker crowded isidia.

6. Parmelia annae Lynge, Ark. Bot. 13, No. 13:88, *pl. 2, fig. 6*. 1914.

Lectotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2368B (S).

Additional specimen examined: *Malme*, June 27, 1894.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine and two colorless unknowns, one forming tetragonal lamellae, the other needles in the reagent G.A.W.

The two specimens of *P. annae* and *P. ceracea* Lynge (see p. 9) agree chemically and morphologically with *P. recipienda* Nyl. (type: Brazil, Nylander Herbarium No. 35212, H), and both species are synonyms of *P. recipienda*. The medulla of *P. annae* was reported by Lynge to be K+ red. Evidently he obtained such a reaction from a single unpublished collection (Colonia Risso, Paraguay, *Malme* 1959, S), labeled *P. annae* but actually belonging to *P. subcaperata* Krempl h., which contains salacinic acid (K+ red).

7. Parmelia bahiana Nyl. Flora 68:612. 1885.—Lynge 1914, p. 134; 1925, p. 84.

Lectotype: Rio de Janeiro, *Glaziou* 1999 (H).

Range: Brazil.

Additional specimen examined: *Malme* 2545**.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine and alectoronic acid (in *Malme* 2545**) or an unidentified substance (in the lectotype), other specimens not tested.

The only diagnostic character of *P. bahiana* is the KC + medullary reaction attributable to two different substances, as far as I can determine. Since the chemically different specimens are so close morphologically, I dare not describe Lynge's material as a new species, for it belongs to the particularly difficult nonisidiate, esorediate group of the section *Hypotrachyna*. The specimens collected by Dusén and Warming (UPS) were too fragmentary for certain identification.

8. Parmelia balansae Müll. Arg. Rev. Mycol. 10:1. 1888.—Lynge, 1914, p. 51.

Lectotype: Asunción, Paraguay, *Balansa* 8 (G).

Lynge determined *Malme* 201B as this species; the specimen has not been made available for study, but there is little doubt but that Lynge's determination is correct. *Parmelia balansae* is closely related to *P. consors* (see p. 11).

9. Parmelia balansae var. **sorediata** Müll. Arg. Rev. Mycol. 10:2. 1888.—Lynge, 1914, p. 53, *pl. 1, fig. 6*; 1925, p. 84.

Parmelia subbalansae Gyel. Repert. Sp. Nov. 33:288. 1931. Based on *P. balansae* var. *sorediata* Müll. Arg.

Type: Montevideo, Uruguay, *Arechavaleta* in 1887 (G).

Range: Argentina, Brazil, Uruguay.

Additional specimen examined: *Malme*, September 7–9, 1894.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine present.

Lynge's specimen agrees perfectly with the holotype of the variety, which, following Gyelnik, should be recognized as a distinct species, *P. subbalansae* Gyel., which differs from *P. balansae* var. *balansae* in possessing laminal soredia. *Parmelia subbalansae* appears to be much more common than *P. balansae*.

10. Parmelia borreri (J. E. Smith) Turn. Trans. Linn. Soc. 9:148. 1808.—Lynge, 1925, p. 84.

Lichen borreri J. E. Smith, Eng. Bot. 25:1780. 1807.

The material of this species determined by Lynge was destroyed at Berlin. The citation as given above is the correct name for the currently accepted *P. dubia* (Wulf. in Jacq.) Schaer. non (Ach.) Floerke.

11. Parmelia brasiliana Nyl. Flora 68:611. 1885.—Lynge, 1914, p. 113.

Type: Organ Mountains, Rio de Janeiro, Brazil, *Weddell* (not seen).

Specimens examined: *Malme* 309, 312B. Reactions: Thallus K−, medulla K−, C−, KC−, P−, lichexanthone present.

Although the type has not been checked, the identity of this distinctive species has not been questioned by previous workers.

12. Parmelia brasiliana var. **glaziovii** (Müll. Arg.) Lynge, Nyt Mag. Naturv. 62:85. 1925.

Parmelia glaziovii Müll. Arg. Nuov. Giorn. Bot. Ital. 21:353. 1889.

The Henschen specimen cited by Lynge and preserved at Uppsala has not been available for study.

13. Parmelia brasiliana var. **novella** (Vain.) Lynge, Ark. Bot. 13, No. 13:115. 1914.—Lynge, 1925, p. 85.

Parmelia novella Vain. Acta Soc. Faun. & Fl. Fenn. 7:56. 1890.

Type: Minas Gerais, Brazil, *Vainio* 1028 (FH, isotype).

Range: Brazil.

Additional specimens examined: *Malme* 2246B; *Hemmensdorf* in 1898 (UPS).

Reactions: Thallus K−, medulla K+ dull reddish, C−, KC+ reddish, P+ faint orange-red, lichexanthone and unknown substances present.

The status of this entity is not clear at this time. It probably falls nearer *P. silvatica* Lynge (see p. 34) than *P. brasiliana* because of the small, adnate thallus.

14. Parmelia canaliculata Lynge, Ark. Bot. 13, No. 13:28, *pl. 1, fig. 1.* 1914.—Lynge, 1925, p. 85.

Holotype: Cachoeira, Rio Grande do Sul, Brazil, *Malme* 1055, February 17, 1893 (S).

Range: Brazil, Argentina, Uruguay.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and protolichesteric acid present.

This unique species appears superficially to be in the *P. melanothrix* group, but on closer inspection it is found to have pseudocyphellae and lack cilia. Most of the specimens determined by Lynge in 1925 were destroyed at Berlin.

15. Parmelia capitata Lynge, Ark. Bot. 13, No. 13:59, *pl. 1, figs. 4, 5.* 1914.

Holotype: Rio Vermelho, near Bahia, Bahia, Brazil, *Malme,* October 1894 (S).

Range: Brazil, West Indies.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and an unidentified fatty substance near caperatic acid.

The name *P. capitata* has appeared in the literature several times, but such reports are usually based on misidentifications. *Parmelia capitata* is a small plant—so small that one would question its inclusion in the section *Amphigymnia*. *Parmelia sanctae-crucis* Vain. (cf. Hale, 1959a, p. 22), a common tropical species with similar chemistry, is twice the size of *P. capitata*. One specimen from the West Indies (Roseau, Dominica, *Evans*, US, YU) can probably be referred here.

16. Parmelia ceracea Lynge, Ark. Bot. 13, No. 13:97. 1914.—Lynge, 1925, p. 85.

Lectotype: Pilcomayo, Gran Chaco, Paraguay, *Malme*, September 7, 1893 (S).

Additional specimens examined: Caldas, Minas Gerais, Brazil, *Henschen* in 1868 (UPS).

Reactions: As in *P. annae* Lynge.

The two specimens agree chemically and morphologically with *P. recipienda* Nyl. (see under *P. annae* Lynge, p. 6), a rare but widespread species in Brazil, Argentina, and Paraguay.

17. Parmelia cetrata Ach. Syn. Lich. 198. 1814.—Lynge, 1914, p. 90; 1925, p. 86.

Type: North America, *Muhlenburg* (PH, isotype).

Range: Cosmopolitan in temperate and tropical regions.

Additional specimens examined: *Malme* 463, June 25, 1894, October 14–16, 1902.

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine and salacinic acid present.

Du Rietz (1924, p. 330) correctly circumscribed *P. cetrata* as an esorediate species with a reticulately rimose cortex and a uniformly rhizinate underside. Although specimens determined by Lynge which I have been able to verify all lack soredia, his concept of the species included sorediate plants also, which should be referred to *P. reticulata* Tayl.

18. Parmelia cetrata f. ciliosa Viaud-Grand-Marais, Bull. Soc. Ouest France 2:156. 1892.—Lynge, 1925, p. 86.

Material of this form which Lynge examined was not available for study.

19. Parmelia cetrata var. **corniculata** (Krempih.) Müll. Arg. Hedwigia 32:228. 1891.—Lynge, 1914, p. 93; 1925, p. 86.

Parmelia perforata var. *corniculata* Krempih. Naturhist. For. Kjöbenhavn Vid. Medd. 1873:11.

Type: Rio de Janeiro, Brazil, *Warming* (not seen).

Range: North and South America.

Specimens examined: *Malme* 313, September 3, 1893, and January 25, 1893. Reactions as in *P. cetrata* var. *cetrata.*

The correctness of this identification is undoubted.

20. Parmelia cetrata subsp. **radiata** Lynge, Ark. Bot. 13, No. 13:94. 1914.

Lectotype: Colonia Risso, near Río Apa, Paraguay, *Malme* 1834, September 23, 1893 (S).

Range: Brazil and Paraguay.

Additional specimen examined: *Malme*, June 15, 1894.

Reactions: As in *P. cetrata* var. *cetrata.*

Lynge based this subspecies on the more or less radiating arrangement of the lobes and noted in addition that the upper cortex was not reticulately rimose to the margins, but merely white-maculate. It is not uncommon, however, to find a similar condition in specimens of both *P. cetrata* and *P. reticulata* Tayl.

21. Parmelia chapadensis Lynge, Ark. Bot. 13, No. 13:153. 1914.

Holotype: Near Bocca da Serra, Serra da Chapada, Mato Grosso, Brazil, *Malme* 2297B, January 21, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellowish, KC+ strong yellow, medulla K+ yellow, C−, KC+ orange-yellow, P+ orange-yellow, usnic acid, an unidentified pale yellow pigment (in the medulla), and a P+ substance, probably near protocetraric acid.

This saxicolous species at first seems like an oversized specimen of the crustose *Rinodina oreina* (Ach.) Mass. rather than a *Parmelia.* It is a unique species with no near relatives in the genus.

22. Parmelia cinerascens Lynge, Ark. Bot. 13, No. 13:104. 1914.

Holotype: Paraguari, Paraguay, *Malme* 1498, August 2, 1893 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine and salacinic acid present.

In gross appearance this species is near *P. minarum* Vain. but produces salacinic acid.

23. Parmelia coccinea Lynge, Ark. Bot. 15, No. 1:3. 1915.

Parmelia ochrococcinea Zahlbr. Cat. Lich. Univ. 8:562. 1932. A new name for *P. coccinea* Lynge non Clem.

Lynge (1925, p. 97) had already reduced this species to synonymy under *Pyxine coccifera* (Fée) Nyl., when Zahlbruckner made a new name.

24. Parmelia congruens Ach. Lich. Univ. 491. 1810—Lynge, 1925, p. 87.

Type: North America, *Swartz.* The identity of this species has long been a source of confusion to lichenologists. There is no specimen in the Acharian herbarium according to Mr. Teuvo Ahti (in litt.).

A presumed isotype at Uppsala is a pale yellow, nonisidiate plant of the section *Xanthoparmelia*, even though Acharius described it as "albo-pallescens . . . sordide albo." The chemistry of this fragmentary specimen is not clear.

Two specimens identified by Lynge have not been seen. A duplicate of one of them (Argentina, *Lorentz & Hieronymus*, M) is the type of *P. taractica* Kremplh., a recognized species in the section *Xanthoparmelia* not to be compared with *P. congruens*.

25. Parmelia consimilis Vain. Acta Soc. Faun. & Fl. Fenn. 7:58. 1890.—Lynge, 1925, p. 87.

Lectotype: Sitio, Minas Gerais, Brazil, *Vainio* 1133 (FH).

Range: Brazil, West Indies.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ rose, P+ orange-red, atranorine and protocetraric acid present.

The specimen of Henschen (UPS) examined by Lynge consists of an *Anaptychia* species and a fragment of a sorediate *Parmelia*, not *P. consimilis*, which is isidiate.

26. Parmelia consors Nyl. Flora 68:613. 1885.—Lynge, 1914, p. 95, *pl. 3, fig. 1*; 1925, p. 87.

Lectotype: Brazil, *Weddell* (H, Nylander Herbarium No. 35276).

Range: Brazil.

Additional specimen examined: *Malme* 1282.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine present.

Malme's specimen is well developed and typical. This species must be very near *P. balansae* Müll. Arg. Both have a rigid, finely white-maculate thallus and produce only atranorine. *Parmelia consors* has a dark underside, densely rhizinate to the margins, whereas *P. balansae* becomes lighter brown at the margins with a narrow papillate or almost bare zone below.

27. Parmelia conspersa (Ach.) Ach. Meth. Lich. 205. 1803.—Lynge, 1914, p. 142; 1925, p. 87.

Lichen conspersus Ach. Lich. Suec. Prod. 118. 1798.

Type: Europe (not seen). According to Gyelnik (1936, p. 120), the Acharian type is a mixture of nonisidiate *P. conspersa* and isidiate *P. isidiata* (Anzi) Gyel. I have advocated the acceptance of both species (Hale, 1955).

Range: Cosmopolitan.

Specimens examined: *Malme* 563, 1346. Reactions: Thallus K−, medulla K+ yellow, C−, KC−, P+ pale orange, stictic and usnic acids present.

The two Malme specimens are isidiate and should be classified as *P. isidiata*, an entity which Lynge recognized as a variety. A

third specimen (*Malme* 248) lacking isidia is *P. flavida* Zahlbr. (see under *P. flava* Kremplh., p. 15).

28. Parmelia conspersa var. hypoclysta Nyl. Syn. Meth. Lich. 1:391. 1860.—Lynge, 1925, p. 87.

The specimen seen by Lynge was destroyed at Berlin.

29. Parmelia continentalis Lynge, Ark. Bot. 13, No. 13:111. 1914.—Lynge, 1925, p. 87.

Holotype: Corumba, Mato Grosso, Brazil, *Malme* 48, August 1, 1894 (S).

Range: Brazil, Paraguay.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine present.

The only distinguishing feature of this *Hypotrachyna* species is the exceptionally rigid thallus.

30. Parmelia continua Lynge, Ark. Bot. 13, No. 13:109. 1914.

Holotype: Buriti, Serra da Chapada, Mato Grosso, Brazil, *Malme* June 19, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine and salacinic acid present.

This unusual member of the section *Hypotrachyna* lacks soredia and isidia and produces salacinic acid. It may be a nonisidiate variant of *P. cinerascens* Lynge.

31. Parmelia cornuta Lynge, Ark. Bot. 13, No. 13:76, *pl. 2, fig. 5.* 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2477, March 2, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and vulpinic acid present.

Parmelia cornuta has the same chemical composition as the better known *P. sulphurata* Nees & Flot. but lacks isidia and has longer cilia and a more rigid thallus.

32. Parmelia cornuta var. crocea Lynge, Ark. Bot. 13, No. 13:78. 1914.
Parmelia crocea (Lynge) Gyel. Repert. Sp. Nov. 29:287. 1931. This is a later homonym of *Parmelia crocea* (Ach.) Sprengl.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2477 bis, March 2, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla flava K+ yellowish, C−, KC+ yellowish, P−, medulla crocea K+ purple, atranorine, a pale yellow-orange pigment (also known in *P. lindmanii* Lynge and

P. merrillii Lynge (= *P. lyngeana* Zahlbr.)), and an unidentified anthraquinone.

Although Lynge relied on the orange-red lower medulla to differentiate this variety, it actually contains a yellow pigment entirely different from that in var. *cornuta* (vulpinic acid). On the basis of both spore size and chemistry, var. *crocea* is closer to *P. merrillii* Lynge (see p. 24) than to *P. cornuta*. We should continue to recognize it as a variety rather than coin another new species name, at least until additional material throws more light on the range of variation in this group.

33. Parmelia coronata Fée, Essai Crypt. Ecorces, 123, *pl. 31, fig. 2.* 1824.—Lynge 1914, p. 121; 1925, p. 88.

Type: American tropics (not seen); Fée's color plate permits almost certain identification of the species.

Range: Tropical America.

Specimens examined: *Malme* 2392, 2511Ba, 2522G, 2525a. Reactions: Thallus K+ yellow, medulla K−, C+ rose, KC+ red, P−, atranorine and gyrophoric acid present.

The Malme specimens are well developed and typical.

34. Parmelia cristifera Tayl. London Journ. Bot. 6:165. 1847.—Lynge, 1914, p. 46.

Lectotype: Calcutta, India, *Wallich* (FH).

Range: Tropical regions, especially in the Pacific area.

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine and salacinic acid present.

The single specimen cited by Lynge (*Malme*, June 16, 1894) contains atranorine, protocetraric acid, and usnic acid, and has the upper cortex more or less reticulately cracked. It is certainly not referable to *P. cristifera* but may be allied to *P. dominicana* Vain. The material, however, is too poor for satisfactory determination.

35. Parmelia crustacea Lynge, Ark. Bot. 13, No. 13:108, *pl. 3, fig. 4.* 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme*, February 21, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K−, medulla alba K−, C−, KC+ faint rose, P+ orange-red, medulla crocea K+ purple, lichexanthone, protocetraric acid, and an unidentified anthraquinone present.

This species is very closely related to *P. silvatica* Lynge (see p. 34), from which it is distinguished by a more adnate growth habit. Lynge's separation of the two species in his key (1914, pp. 20–21) into different groups (*Cyclocheila* and *Sublineares*) is entirely unsatisfactory.

36. Parmelia crystallorum Lynge, Ark. Bot. 13, No. 13:128. 1914.

Holotype: Corcovado, Rio de Janeiro, Brazil, *Malme* 59*, August 14, 1892 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine present.

Lynge characterized the species by the large colorless crystals which precipitated from the medulla in KOH; the identity of these crystals is unknown, and the type specimen is too small and fragile for adequate chemical analyses. The species resembles *P. zahlbruckneri* Lynge (see under *P. gracilis*, p. 17) in general appearance, especially with regard to the lobation and the ivory or ashy colored shiny surface.

37. Parmelia cyliphora (Ach.) Vain. Acta Soc. Faun. & Fl. Fenn. 13:7. 1896.—Lynge, 1914, p. 60.

Parmelia caperata (L.) Ach. var. *cyliphora* Ach. Syn. Lich. 196. 1814.

P. caperata auct.

Type: North America (UPS, isotype). The Acharian isotype is somewhat smaller than but otherwise identical with *P. caperata* var. *caperata*. The identity of *Lichen caperatus* L. was first questioned by Vainio (1886), who discovered a specimen of *Cetraria pinastri* (Scop.) S. F. Gray in the packet labeled *Lichen caperatus* in the Linnaean Herbarium. He assumed that this was the type specimen and therefore used the epithet *caperatus* for the *Cetraria* species, reduced *pinastri* to synonymy, and resurrected the Acharian var. *cyliphora* as the valid name for *P. caperata* auct. A study of Linnaeus' original diagnosis (Sp. Pl. 1147, 1753), however, indicates that the type of *Lichen caperatus* is probably not to be found in the Linnaean Herbarium. Linnaeus based his species on old phrase-names by Royen, Guettard, Dillenius, and Morison. The type of one of these pre-Linnaean species must be selected as the lectotype of *Lichen caperatus*, an action which has never been taken. Both Dillenius (Hist. Musc. *pl. 25, fig. 97A, B*, 1741) and Morison (Hist. ox. 633, *pl. 7, fig. 1*, 1699) illustrate a broad lobed Parmelia apparently identical with *P. caperata* auct., not a narrow lobes species such as *Cetraria pinastri*.

Specimen examined: *Malme* 2156.

. Reactions: Thallus K−, medulla K−, C−, KC+ rose, P+ orange-red, usnic and protocetraric acids present.

The specimen appears to be typical *P. caperata* except for the lack of soredia, a condition not unknown in North American plants.

38. Parmelia digitata Lynge, Ark. Bot. 13, No. 13:98, *pl. 3*, fig. 4. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2545, March 12, 1894 (S).

Range: Brazil, West Indies.

Reactions: Thallus K+ yellow, medulla K−, C+ light orange, KC+ deep orange, P−, atranorine and barbatic acid present.

Parmelia digitata belongs to the difficult and highly variable *P. laevigata* group. It has distinct marginal laciniae and lobules much as in *P. lobulifera* Degel. from North Carolina. A specimen from Jamaica (*Imshaug* 14910, MSC) is identical with Lynge's type.

39. Parmelia eciliata (Nyl.) Nyl. in Fournier, Mex. Pl. I:3. 1872.—Lynge, 1914, p. 72. PLATE 1

Parmelia crinita var. *eciliata* Nyl. Flora 52:291. 1869.

Type: Orizaba, Mexico, *Bourgeau* in 1865 (H).

Range: Argentina, Brazil, West Indies, Mexico.

Additional specimen examined: *Malme* 627.

Reactions: Thallus K+ yellow, medulla K+ yellow, C−, KC−, P+ pale orange, atranorine and stictic acid present.

The Malme collection compares well with Nylander's holotype in spore size and lobation, but has somewhat shorter cilia. The species is discussed more fully under *P. urceolata* Eschw. (see p. 37).

40. Parmelia fatiscens Lynge, Ark. Bot. 15, No. 1:1. 1917. PLATE 2

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme*, October 16, 1902 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ rose, P+ orange-red, atranorine, protocetraric acid, and traces of usnic acid in the cortex.

This species is characterized by large coralloid outgrowths which cannot properly be classified as isidia or soredia, although they sometimes become sorediate or pustular-isidiate. These peculiar growths also occur in *P. fasciculata* Vain. from Colombia, which contains atranorine and protocetraric acid, and in an undescribed species from Liberia, Africa. Certain forms of *P. robusta* Degel. have an atypical formation of tiny sorediate laciniae which coalesce into fasciculate coralloid growths resembling those of *P. fatiscens*.

41. Parmelia flava Kremplh. var. **stellata** Lynge, Ark. Bot. 13, No. 13:150, *pl. 5, figs. 5, 6*. 1914.

Parmelia flavida Zahlbr. var. *stellata* (Lynge) Zahlbr. Cat. Lich. Univ. 6:137. 1929. *Parmelia flavida* is a new name for *P. flava* Kremplh. non Rebent.

Type: São João d'el Rey, Minas Gerais, Brazil, *Malme* 311, September 1, 1894 (S).

Range: Brazil.

Reactions: Thallus K−, medulla K−, C−, KC+ rose, P+ orange-red, usnic and protocetraric acids present.

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The holotype of *P. flava* Kremplh. (Serra da Piedade, Minas Gerais, Brazil, *Warming* 294, M), which Lynge did not examine, has much broader, obtuse lobes (1.5–2.0 mm. wide) than the new variety (0.8–1.0 mm. wide), but is otherwise similar in chemistry and gross appearance.

42. Parmelia flava var. subdichotoma Lynge, Ark. Bot. 13, No. 13:149, *pl. 5, fig. 7.* 1914.—Lynge, 1925, p. 88.

Parmelia flavida Zahlbr. var. *subdichotoma* (Lynge) Zahlbr. Cat. Lich. Univ. 6:137. 1929.

Type: São João d'el Rey, Minas Gerais, Brazil, *Malme* 310, September 1, 1894 (S).

Range: Brazil.

Additional specimen examined: Caldas, Minas Gerais, Brazil, *Henschen* in 1868 (UPS).

Reactions: As in *P. flava* var. *stellata* Lynge.

This variety can hardly be distinguished from var. *stellata*. We have no choice but to maintain both varieties, which seem to be distinct from var. *flavida*, until the range of variation of the species is more completely known.

43. Parmelia fragilis Lynge, Ark. Bot. 13, No. 13:123. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2365*, February 19, 1894 (S).

Range: Brazil.

Reactions: Thallus K+ yellow, medulla K—, C+ orange-red, KC+ deep orange-red, P—, atranorine and olivetoric acid present.

This plant is identical in every respect with *P. intercalanda* Vain. (syntype: *Lich. Bras. Exs.* 899, FH). This species is apparently the first of the section *Hypotrachyna* in which olivetoric acid has been demonstrated. Lynge suggests a similarity with *P. microblasta* Vain., which does have the same gross appearance but which differs quite significantly in having isidia and norstictic acid (K+ red).

44. Parmelia fungicola Lynge, Ark. Bot. 13, No. 13:129. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2438B, February 27, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K—, C+ rose, KC+ red, P—, atranorine present, gyrophoric acid suspected but not proved microchemically because of the scarcity of material.

At first glance *P. fungicola* seems no more than a small isidiate form of *P. coronata* Fée. The contaminating fungus on the underside is a conspicuous feature. Lynge erroneously gave the medullary reaction as K+ yellow and C—, an understandable mistake in view of the small size of the thallus.

45. Parmelia gracilis (Müll. Arg.) Vain. Ann. Acad. Soc. Faun. & Fl. Fenn. 7:55. 1890.—Lynge, 1914, p. 124.

Parmelia laevigata var. *gracilis* Müll. Arg. Rev. Mycol. 1:169. 1879.

P. confusula Zahlbr. Cat. Lich. Univ. 6:162. 1929. A new name for *P. gracilis* (Müll. Arg.) Vain., non Sprengel nec Müll. Arg.

Type: Boqueron de Bogotá, Colombia, *André* 923 bis, December 21, 1875 (G, holotype; US, isotype).

Range: Colombia, Brazil.

Additional specimens examined: *Malme* 2241, 2749.

Reactions: Thallus K+ yellow, medulla K+ reddish, C−, KC+ red, P+ pale orange, atranorine and unidentified substances present; the acetone extract is a thick pale orange crust.

Parmelia confusula Zahlbr. is antedated by *P. zahlbruckneri* Lynge, which is identical with the type of *P. gracilis* (Müll. Arg.) Vain. (see p. 38). A noteworthy feature of this saxicolous lichen, other than the peculiar chemical reactions, is the shiny, whitish gray upper cortex, often transversely cracked and infested by a small black fungus.

46. Parmelia hieronymi Lynge, Nyt Mag. Naturv. 62:88. 1925.

The specimen on which this species was based was destroyed at Berlin. I have seen no herbarium specimens agreeing with the original description.

47. Parmelia isidiophora Zahlbr. Sitzungsb. Akad. Wiss. Math. Naturw. (Wien) 111:420, *pl. 1*. 1902.—Lynge, 1925, p. 89.

Type: Botanical Garden, Rio de Janeiro, Brazil, *Höhnel* 169 (not seen, but appears to be typical *P. caroliniana* Nyl. from Zahlbruckner's photograph).

Specimen examined: Caldas, Minas Gerais, Brazil, *Henschen* in 1868 (UPS).

The single Henschen collection, verified by Zahlbruckner, is typical *P. caroliniana* Nyl., a widespread corticolous species in North and South America (cf. Hale, 1959a, p. 17). The specimen contains atranorine and perlatolic acid.

48. Parmelia kamtschadalis (Ach.) Eschw. var. **americana** (Mey. & Flot.) Nyl. Ann. Sci. Nat. Bot., ser. 4. 11:215. 1859.—Lynge, 1925, p. 89.

Evernia americana Mey. & Flot. Verh. Kaiser Leopold Carol. Akad. Naturforsch. 19, suppl. 1:211. 1843.

Type: Tropical America (destroyed at Berlin).

Specimen examined: Serra da Itatiaia, Brazil, *Dusén*, May 1902 (UPS).

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine and salacinic acid present.

The material conforms with the accepted concept of *P. americana* (Mey. & Flot.) Mont., which differs from *P. cirrhata* Fr. in being isidiate. Both species are widespread in mountains of tropical regions.

Parmelia kamtschadalis (Ach.) Eschw. is a completely unrelated species in the section *Xanthoparmelia*.

49. Parmelia laceratula Nyl. Mem. Soc. Imp. Sci. Nat. Cherbourg 5:105. 1857.—Lynge, 1914, p. 100, *pl 3, fig. 3*.

Holotype: Burnet and Brisbane River, Australia, *Müller* (H).

Range: Australia.

Reactions: Thallus K+ yellow, medulla K−, C+ red, KC+ red, P−, atranorine and lecanoric acid present.

Parmelia laceratula is a synonym of *P. subflava* Tayl. (type: Van Diemen's Land, FH). The types of both species have peculiar coarse marginal isidia and no pseudocyphellae except on the receptacle of the apothecia. The Malme specimens (533 and 828) seen by Lynge have the same chemistry but are densely pseudocyphellate on the upper surface. They are closest to *P. riograndensis* Lynge (=*P.* cf. *bolliana* Müll. Arg. see p. 31), but the thallus is very fragile. Lynge gave an incorrect chemical test (C—) and failed to include the species with the other pseudocyphellate Amphigymnias.

50. Parmelia laongii Lynge, Ark. Bot. 13, No. 13:68, *pl. 1, fig. 3*. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2392*, February 21, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine and alectoronic acid present; cilia K+ violet.

Parmelia laongii is a member of the *P. melanothrix* group (see p. —), closest to *P. argentina* Krempelh. but with smaller spores (8–10×16–18μ vs. 10–13×19–23μ) and cilia K+ violet.

51. Parmelia latissima Fée, Ess. Crypt. Suppl. 119, *pl. 38, fig. 4*. 1837.—Lynge, 1914, p. 41.

Type: American tropics and Jamaica (not seen but well illustrated in color by Fée).

Range: Tropical regions.

Specimen examined: *Malme* 2742B. Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine and salacinic acid present.

Only this one Malme specimen seems to be typical *P. latissima*. Four other specimens examined by Lynge (*Malme* 2364, February 21, 1894, June 15 and June 25, 1894) contained atranorine and protocetraric acid and should be identified as *P. zollingeri* Hepp, a widespread tropical and subtropical species, apparently much more common than *P. latissima*. Aside from chemical differences, *P. zollingeri* seems to have slightly smaller spores than *P. latissima* (18–24μ vs. 28–32μ, both with the episporium 3–4μ wide).

52. Parmelia latissima var. corniculata Krempelh. Flora 61:463. 1878.—Lynge, 1914, p. 44.

Holotype: Argentina, *Lorentz & Hieronymus* (M).
Range: Argentina, Brazil.
Additional specimens examined: *Malme* 2738, 2743B, 2512Ba.
Reactions: Thallus K+ yellow, medulla K−, C−, KC+ rose, P+ orange-red, atranorine and protocetraric acid present.

The specimens seen by Lynge correspond perfectly to Krempelhuber's original type. The K− reaction was overlooked by Lynge. If we should follow a strict chemical criterion, var. *corniculata* should be transferred to *P. zollingeri*, which also contains protocetraric acid. However, a formal recombination of the varietal name would be premature at this time, when the differences between *P. latissima* and *P. zollingeri* are so poorly understood.

53. Parmelia latissima f. microspora Lynge, Ark. Bot. 13, No. 13:45. 1914.

Lectotype: Near Bocca da Serra, Serra da Chapada, Mato Grosso, Brazil, *Malme* 2244*, January 19, 1894 (S).
Additional specimen examined: *Malme* 2244.
Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine and alectoronic acid present.

Both of the specimens identified by Lynge are the same as *P. wainii* A. L. Smith (see p. 29, under *P. proboscidea*). He described the form in part on the basis of a faulty color test, the medulla supposedly K+ yellow changing to red but actually K−.

54. Parmelia latissima var. minima Lynge, Ark. Bot. 13, No. 13:45. 1914.

Holotype: Buriti, Serra da Chapada, Mato Grosso, Brazil, *Malme* 2243C**, January 20, 1894 (S).
Range: Known only from the type locality.
Reactions: Thallus K+ yellow, medulla K−, C−, KC+ rose, P+ orange-red, atranorine and protocetraric acid present.

Lynge at first described this plant as a new species, "*P. sublatissima*," in the herbarium. It is a much smaller plant than *P. latissima*, although otherwise comparable in morphology, and contains protocetraric acid, more characteristic of *P. zollingeri* Hepp. We cannot validly judge this new variety on the basis of a single small specimen.

55. Parmelia leucoxantha Müll. Arg. Flora 64:85. 1881.—Lynge, 1914, p. 82.

Type: Apiahy, Brazil, *Puiggari* 1050, March 1880 (G).
Range: Brazil.
Additional specimen examined: *Malme*, April 25, 1894.
Reactions: Thallus K+ yellow, medulla K−, C−, KC+ rose, P+ orange-red, atranorine, protocetraric acid, and usnic acid present.
Hillmann (1939) considered Lynge's determination to be incorrect.

Müller's type consists of four or five pieces of lichen pasted on a single card. The bulk of the material is identical with Malme's plant in chemistry and morphology, but the largest piece is a mixture of *P. leucoxantha* and another very similar species, apparently *P. nylanderi* Lynge (see p. 25), which has cilia and reacts K+ red (salacinic acid). It is probably this aberrant thallus on which Vainio (1900) based his K+ red reaction and report of sparse cilia. The K— eciliate material, equivalent to Lynge's concept, should be designated as the lectotype of *P. leucoxantha*.

56. Parmelia lindmanii Lynge, Ark. Bot. 13, No. 13:74. 1914. PLATE 3

Holotype: Porto Alegre, Rio Grande do Sul, Brazil, *Malme* 450, September 25, 1892 (S).

Range: Southern United States, Mexico, West Indies, Central and South America, Africa.

Reactions: Thallus K+ yellow, medulla K+ yellowish, C—, KC+ yellowish, P—, atranorine and an unidentified pale orange-yellow pigment (in the medulla) present.

This distinct species has a wide distribution in the tropics, yet it has almost always been misidentified in herbaria as *P. sulphurata* Nees & Flot. or *P. tinctorum* Nyl. (see Hale, 1959, p. 20). The pale yellowish pigment, also known in *P. merrillii* Lynge (p. 24) and *P. cornuta* var. *crocea* Lynge (p. 12), forms a long streak on chromatographic paper with butanol as a solvent. In contrast, vulpinic acid, which has a deeper lemon-yellow color, rises up the paper without any streaking. A chromatographic test is often necessary to separate the species from *P. sulphurata*.

57. Parmelia longiconida Lynge, Ark. Bot. 13, No. 13:130, *pl. 3, figs. 7, 8*. 1914.—Lynge, 1925, p. 89.

Holotype: Near Río Apa, Colonia Risso, Paraguay, *Malme* 1949, October 21, 1893 (S).

Range: Paraguay, Brazil.

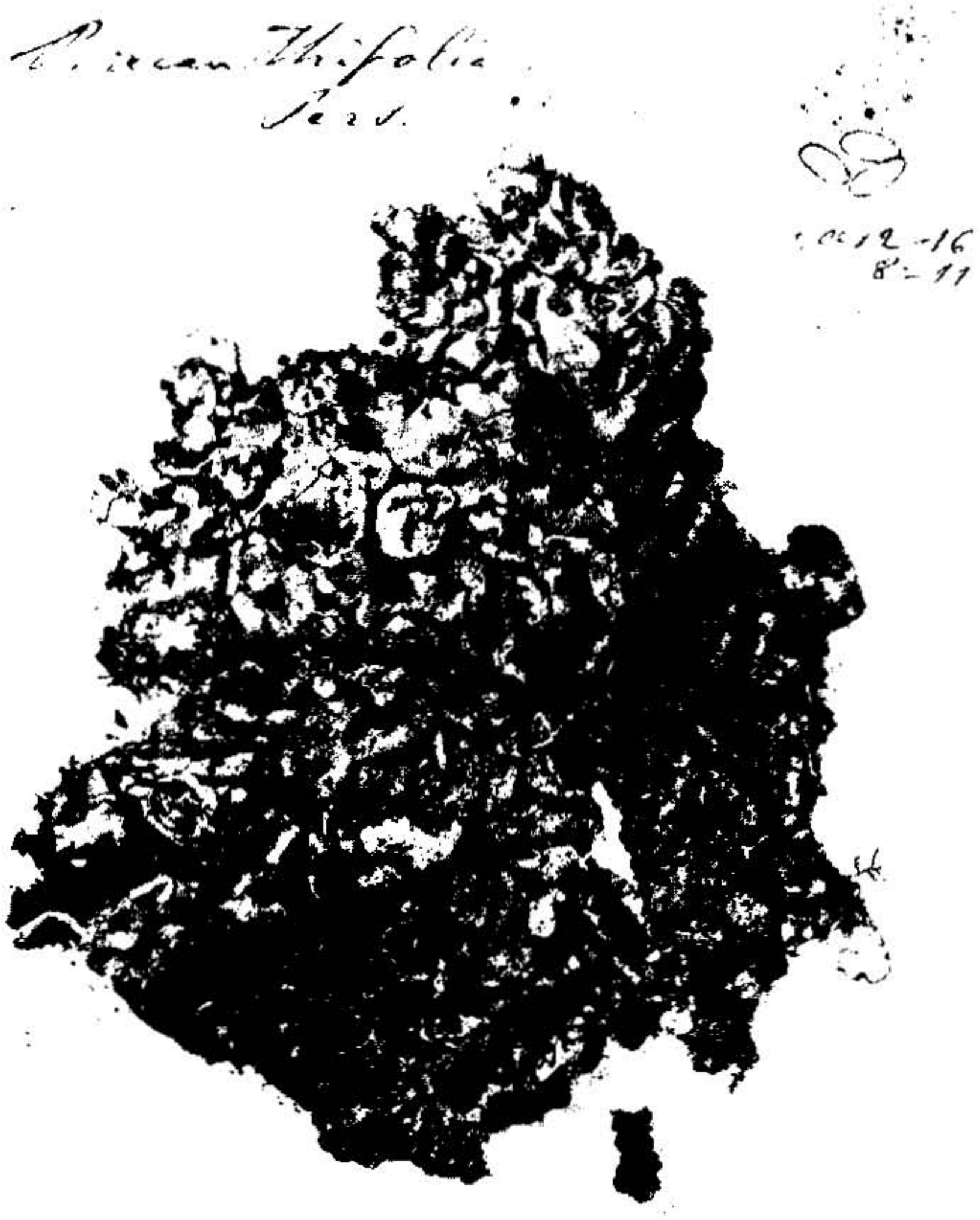
Reactions: Thallus K+ yellow, medulla K+ yellow, C—, KC—, P+ orange, atranorine and stictic acid present.

This species is conspecific with *P. scrobicularis* Kremplh. from Brazil (holotype: Lagoa Santa, *Warming*, M). Two unusual characters are the pruinose apothecia, very rare in *Parmelia*, and the strongly reticulately rugose upper cortex. *Parmelia sbarbaronis* B. de Lesd. (Hale, 1959a, p. 23) differs only in having soredia and shorter conidia.

58. Parmelia magna Lynge, Ark. Bot. 13, No. 13:83. 1914.—Lynge, 1925, p. 89.

Holotype: São João d'el Rey, Minas Gerais, Brazil, *Malme* 269, August 31, 1892 (S).

Range: Brazil.

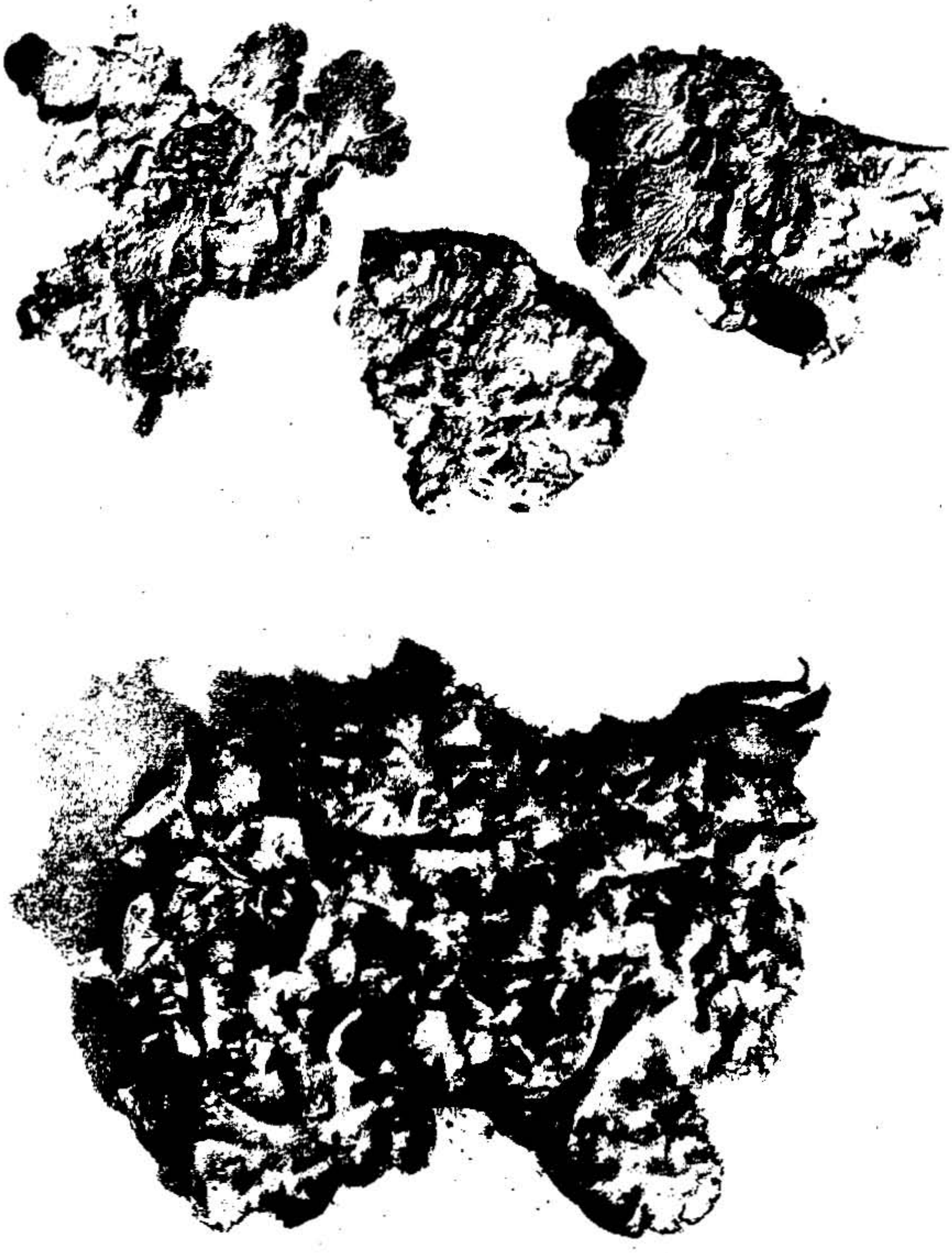


Parmelia **eciliata (Nyl.) Nyl.**
(Holotype)

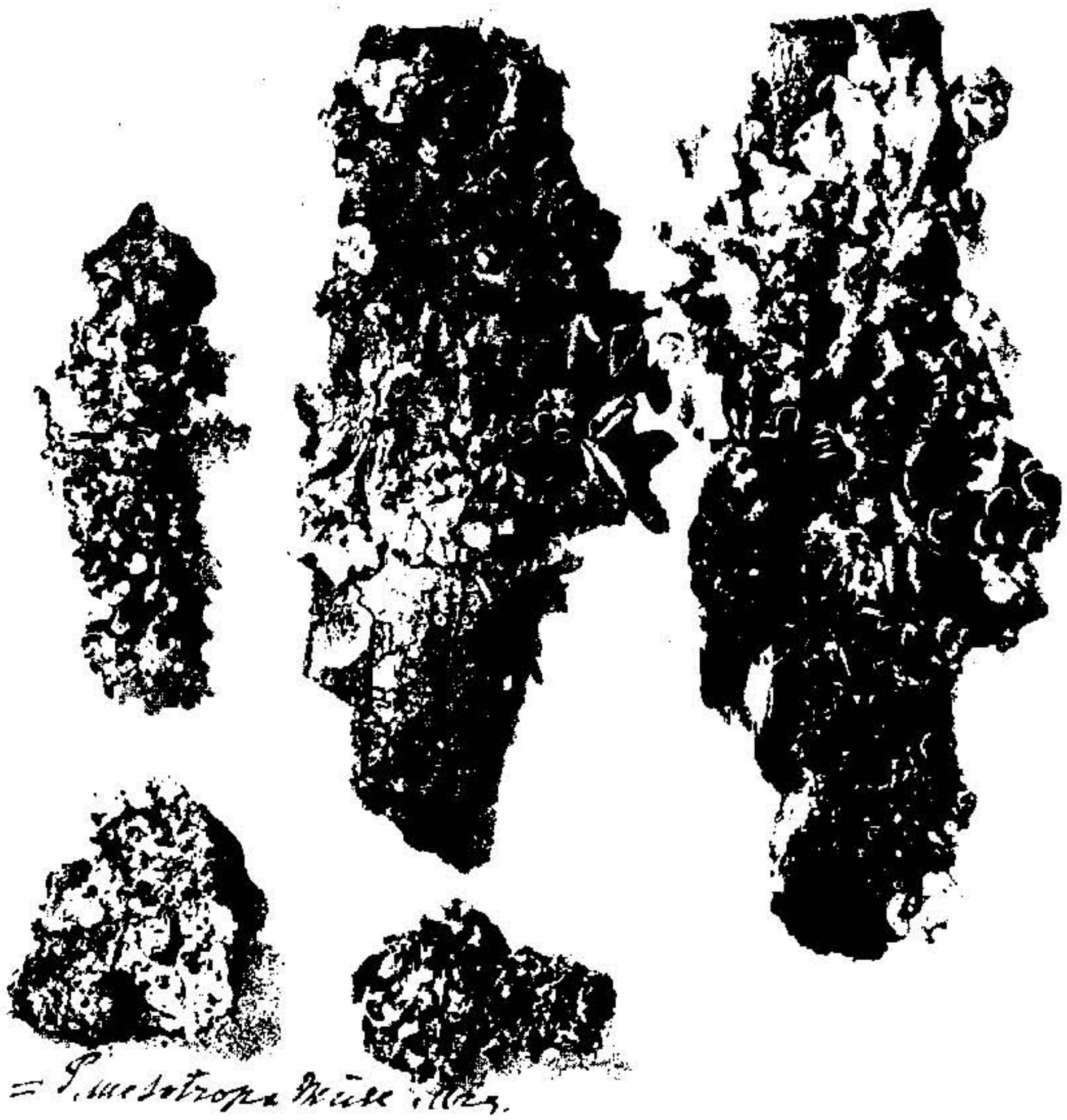
Mat. chim.: **Atranorine, stictic acid.**
Examined by Mason E. Hale, Jr., U. S. National Museum III.1958

Above: *Parmelia acanthifolia* Pers. (holotype, *Gaudichaud* 13. P). Below: *Parmelia eciliata* (Nyl.) Nyl. (holotype, *Bourgeau*, 11).

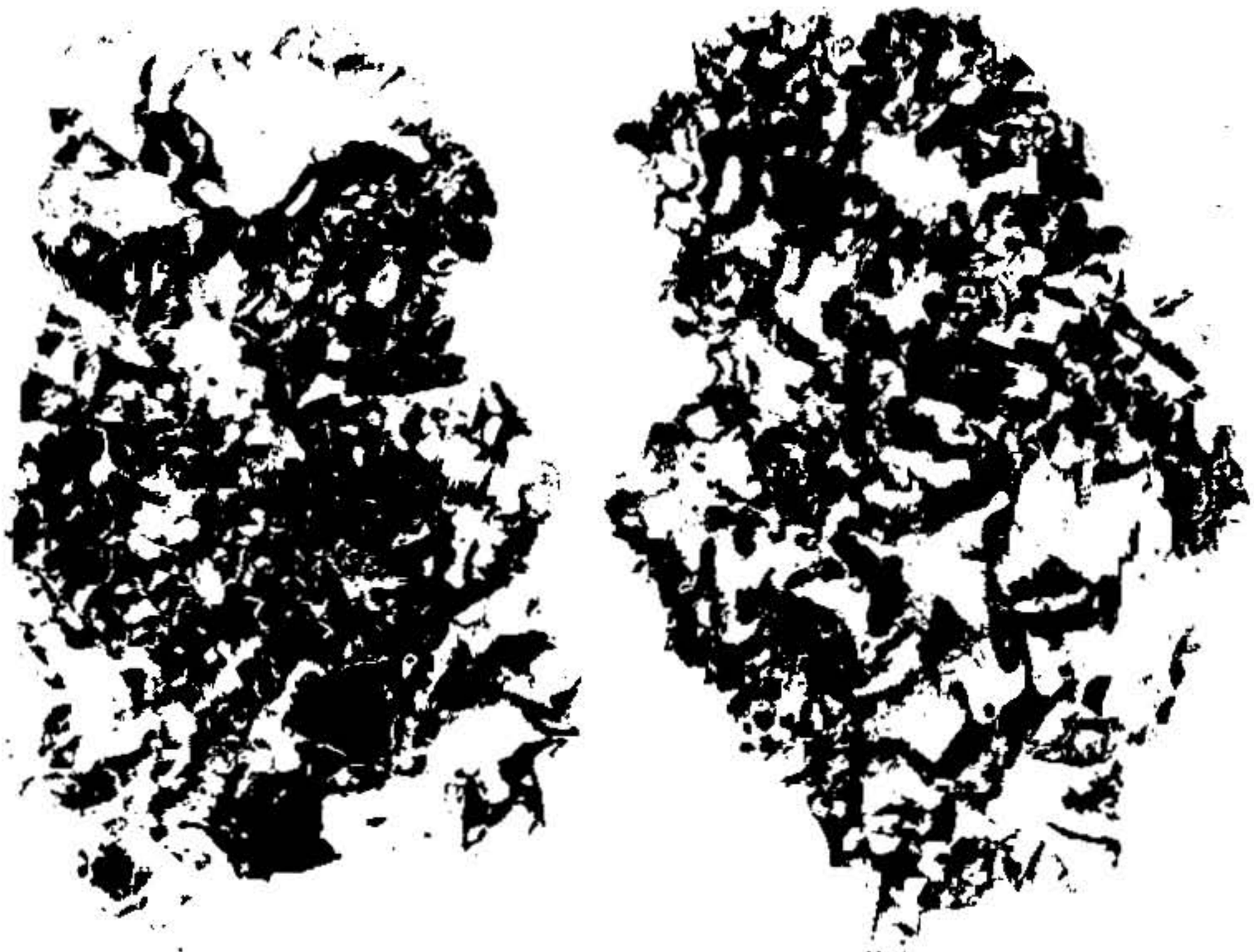
Parmelia fatiscens Lynge (holotype, *Malme*, S).



Above: *Parmelia lindmanii* Lynge (holotype, *Malme* 450, S). Below: *Parmelia proboscidea* var. *ornatula* Zahlbr. (holotype, *Damazio* 1090, G).



Parmelia mesotropa Müll. Arg. (lectotype, *Balansa*, G).



Above: *Parmelia sancti-angelii* Lynge (holotype, *Malme*, S). Below: *Parmelia bicornata* Müll. Arg. (holotype, *Leyland*, G).

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine, salacinic and usnic acids present.

Parmelia magna is a large lichen, lacking isidia and soredia, with wide rotund, monophyllous lobes that easily break away from the main thallus. It is distantly related to *P. flavescens* (Krempelh.) Nyl.; its relation to other species with usnic acid may be illustrated in the following key:

1. Thallus isidiate; medulla K+ red or K−.
   2. Medulla K+ red (salacinic acid) . . . . **P. flavescens** (Krempelh.) Nyl.
   2. Medulla K−.
      3. Medulla C−, KC+ rose . . . . **P. madagascariacea** (Hue) des Abb.
      3. Medulla C+ rose (gyrophoric acid) or C−, KC−.
         P. xanthina (Müll. Arg.) Vain. (see p. 38)
1. Thallus without isidia; medulla K+ red (salacinic acid).
   4. Thallus fragile; lobes breaking apart . . . . . **P. magna** Lynge
   4. Thallus not fragile; lobes intact.
      5. Lobes elongate, conspicuously ciliate.
         P. radians Lynge (=*P. delicatula* Vain., see p. 29)
      5. Lobes short, more or less imbricate, cilia very sparse.
         P. microdactyla Hale (see p. 21)

A second specimen identified by Lynge as *P. magna* (Rio de Janeiro, *Widgren*, UPS) is a different plant, here proposed as a new species:

Parmelia microdactyla sp. nov.

Thallus laxe adnatus, 8–10 cm. latus, dilute flavescens, irregulariter lobatus, lobis 8–12 mm. latis, 10–15 mm. longis, nonnihil imbricatus, superne planus, laevigatus, nec isidiatus, neque sorediatus, margine integro vel plus minusve dactyloideo-lobulato, lobulis discretis, seriatis, 0.2–0.4 mm. latis, 0.4–0.6 mm. longis, parce ciliato, ciliis usque ad 0.5 mm. longis, medulla alba, subtus niger et rhizinosus, ambitum versus castaneus, glaber. Apothecia ignota; pycnidia numerosa, conidiis 6 μ longis. Thallus KOH−, medulla KOH+ rubra, C−, KC−, P+ aurantiacus, acidum salacinicum et acidum usnicum continens.

Type in the Botanical Museum of the University of Uppsala, collected by Widgren, Rio de Janeiro, Brazil; isotype in the Riksmuseum, Stockholm.

This new species is closest to the isidiate *P. flavescens*, but the isidia are replaced by peculiar marginal lobules. Zahlbruckner unnecessarily complicated the nomenclature of this group when he was revising the South American collections of Schiffner and Wettstein. Krempelhuber had described *P. glaberrima β flavescens*, which Nylander raised to species rank in 1885. Although Nylander actually saw an isotype of *P. glaberrima β flavescens* when he made the new combination, Zahlbruckner followed Vainio (1896, p. 33) in the belief

that "*P. flavescens* Nyl." was based on a gray, not a yellow specimen. Of course it is immaterial whether Nylander applied the new combination to a correctly identified plant or not. The holotype of *P. glaberrima β flavescens*, while not as yellow as typical *P. xanthina* (Müll. Arg.) Vain., does contain usnic acid. Following his own peculiar rules of nomenclature, Zahlbruckner wanted to make the combination "*P. flavescens* Zahlbr.," but since this name was preoccupied by "*P. flavescens* Nyl.", he had to propose a new name, *P. protoflavescens*. For the supposedly gray plant seen by Nylander, he proposed the name *P. pseudoflavescens*, which is no more than a nomen nudum. The synonymy is summarized below:

Parmelia flavescens (Kremplh.) Nyl. Flora 68:607. 1885.

P. glaberrina β flavescens Kremplh. Flora 52:223. 1869. Type: Rio de Janeiro, Brazil, *Glaziou* (M).

P. protoflavescens Zahlbr. Denkschr. Akad. Wiss. Math. Naturw. Wien 83:176. 1909. Illegitimate name.

P. pseudoflavescens Zahlbr. Denkschr. Akad. Wiss. Math. Naturw. Wien 83:176. 1909. Nomen nudum.

59. Parmelia malmei Lynge, Ark. Bot. 13, No. 13:116, *pl. 2, figs. 3, 4.* 1914.

Holotype: Near Bocca da Serra, Serra da Chapada, Mato Grosso, Brazil, *Malme* 2750, June 5, 1894 (S).

Range: Brazil.

Reactions: Thallus K−, medulla alba K−, C−, KC+ rose, P+ orange-red, medulla crocea K+ purple, lichexanthone, protocetraric acid, and an unidentified anthraquinone present.

Differing only in the greater development of pustules, this species falls within the morphological and chemical range of *P. minima* Lynge (see p. 25) and should be considered synonymous with it. The species has some affinity with *P. formosana* Zahlbr. (Hale, 1958b, p. 89), a larger plant which also contains lichexanthone (but not protocetraric acid) and has similar pustular outgrowths.

60. Parmelia marginalis Lynge, Ark. Bot. 13, No. 13:112. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2393****, February 21, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C+ rose, KC+ red, P−, atranorine and gyrophoric acid present.

Parmelia marginalis adds yet another element of variability to the already large and difficult group of isidiate species in the section *Hypotrachyna*. It is characterized by an ashy white thallus (as opposed to the buff hue of the *P. minarum* group). It resembles *P.*

hookeri Tayl. (C+ red, lecanoric acid) rather closely, but it should not be classified merely as a chemical strain of that species.

61. Parmelia melanothrix (Mont.) Vain. Ann. Soc. Faun. & Fl. Fenn. 7:30. 1890.—Lynge, 1914, p. 54; 1925, p. 90.

Parmelia urceolata var. *melanothrix* Mont. Ann. Sci. Nat. Ser. II, Bot. 2:372. 1834.

Type: Brazil, *Gaudichaud* 89 bis (not seen); Vainio apparently saw the type in the Paris Museum and found it to react KC—.

Range: Tropical regions.

Specimens examined: *Malme* 201, 314, 967 (S); *Glaziou* 1835; Caldas, Minas Gerais, Brazil, *Henschen* in 1868; *Regnell*, s.d.; Brazil, *Guillemin* 127; and Rio de Janeiro, *Warming* (UPS). Reactions: Thallus K+ yellow, medulla K—, C—, KC—, P—, atranorine and an unknown fatty substance present.

Parmelia melanothrix belongs to a small, well-circumscribed group of primarily tropical species which have a white-maculate cortex, marginal cilia, and a pale zone below at the margin contrasting with the black rhizinate center. Its relationship to the other species of this group in the Western Hemisphere is shown in the following key:

1. Margins sorediate; apothecia unknown . . . . . **P. hypotropa** Nyl.
1. Soredia lacking; apothecia invariably present.
   2. Apothecia perforate.
      3. Salacinic acid present; spores 5–7 × 8–10 μ . **P. uruguensis** Krempl h.
      3. Norstictic acid present; spores 7–8 × 12–14 μ.
         P. perforata (Jacq.) Ach.
   2. Apothecia imperforate.
      4. Medulla KC–; spores 10–12 × 24–26 μ; episporium 3 μ.
         P. melanothrix (Mont.) Vain.
      4. Thallus KC+ red, alectoronic acid present; episporium less than 2 μ.
         5. Cilia K—.
            6. Thallus membranaceous; spores 6–7 × 17–19 μ.
               P. argentina Krempl h.
            6. Thallus rigid, covered with large apothecia; spores (after Lynge) 12–13 × 17–24 μ . . . . . **P. rigida** Lynge (see p. 31)
         5. Cilia K+ violet.
            7. Apothecia eciliate or at most sparsely ciliate, pale buff below at the margin; spores 6–8 × 11–14 μ.
               P. subproboscidea Lynge (see p. 35)
            7. Apothecia ciliate, tinged below pale reddish-orange; spores 8–10 × 16–18 μ . . . . . **P. laongii** Lynge (see p. 18)

Two additional specimens identified by Lynge as *P. melanothrix* (*Malme* 2522F* and February 19, 1894) reacting KC+ red (not KC— as reported by Lynge) are typical *P. argentina* Krempl h. (holotype: Argentina, *Lorentz & Hieronymus*, M).

62. Parmelia melanothrix f. microspora Lynge, ad int., Ark. Bot. 13, No. 13:56. 1914.

Lectotype: Villa Morra, Asunción, Paraguay, *Malme* 1585C, August 14, 1893 (S).

Additional specimens examined: *Malme*, September 3 and September 7 (two packets), 1893.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine and alectoronic acid present.

As a new form "ad interim," this entity has no taxonomic status. The spores are smaller than those of typical *P. melanothrix*, and the chemical reaction as given by Lynge (KC−) is incorrect. This combination of morphological and chemical characters is found in *P. subproboscidea* Lynge (see p. 35), with which the Malme specimens are identical. A fourth specimen (*Malme*, September 3, 1893) is too fragmentary for verification.

63. Parmelia merrillii Lynge, Ark. Bot. 13, No. 13:79. 1914.

Parmelia lyngeana Zahlbr. Cat. Lich. Univ. 6:243. 1929. A new name for *P. merrillii* Lynge, non Vainio, Phil. Journ. Sci. 4:658. 1909.

Holotype: Coxipó Igreja, near Cuyabá, Mato Grosso, Brazil, *Malme* 2198B, December 27, 1893 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ yellowish, P−, atranorine and an unidentified pale orange-yellow pigment (in the medulla) present.

The species is very close to *P. cornuta* var. *crocea* Lynge (see p. 12) in morphology and chemistry, but the type material (the only collection of the species) is in poor condition.

64. Parmelia microsticta Müll. Arg. Flora 62:164. 1879—Lynge, 1914, p. 24; 1925, p. 90.

Parmelia borreri var. *allophylla* Krempih. Flora 61:438. 1878. Type: Argentina, *Lorentz & Hieronymus* (M).

Type: Montevideo, Uruguay (not seen).

Additional specimens examined: *Malme* 940, January 25, 1893; June 1893; September 11 and 13, 1894.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and protolichesteric acid present.

This pseudocyphellate species is distinguished by a rigid thallus and a negative C reaction. It is otherwise similar to *P. bolliana* Müll. Arg.

64a. Parmelia microsticta var. riograndensis (Lynge) Lynge, Nyt Mag. Naturv. 62:90. 1925.

This combination was based on *P. riograndensis* Lynge, which is discussed on p. 31.

65. Parmelia minarum Vain. Ann. Soc. Faun. & Fl. Fenn. 7:48. 1890.—Lynge, 1914, p. 106.

Type: Sitio, Minas Gerais, Brazil, *Vainio* 1040 (FH, isotype).
Range: Central and South America, West Indies, Africa.
Reactions: Thallus K+ yellow, medulla K−, C+ rose, KC+ red, P−, atranorine and gyrophoric acid present.
The specimen identified by Lynge (*Malme* 2243) cannot be referred to *P. minarum*. It is a large plant with marginal cilia, twice the size of typical *P. minarum*, although both entities contain atranorine and gyrophoric acid. This is in all probability a new species, which I would hesitate to describe from the single collection.

66. Parmelia minima Lynge, Ark. Bot. 13, No. 13 : 139, *pl. 5, figs. 3, 4.* 1914.

Lectotype: Near Bocca da Serra, Mato Grosso, Brazil, *Malme* 2747 bis, June 15, 1894 (S).
Range: Brazil.
Additional specimens examined: *Malme* 2747, s.n.
Reactions: Thallus K−, medulla alba K−, C−, KC+ rose, P+ orange-red, medulla crocea K+ purple, lichexanthone, protocetraric acid, and an unidentified anthraquinone present.
Lynge's "originaleksemplar" is an intimate mixture of an ashy white plant with sorediate pustules and a yellowish one with isidia. His Latin description includes the morphological and chemical characters of the ashy plant and the external color of the yellowish plant. There is no doubt that the ashy plant should be the lectotype of *P. minima*, of which *P. malmei* Lynge is probably a synonym (see p. 22). The yellowish plant is too fragmentary for identification.

67. Parmelia nylanderi Lynge, Ark. Bot. 13, No. 13:82. 1914.

Holotype: Near São Jeronymo, Serra da Chapada, Mato Grosso, Brazil, *Malme* 2747, June 3, 1894 (S).
Range: Brazil.
Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine, salacinic acid, and usnic acid present.
This saxicolous species may be related to *P. leucoxantha* Müll. Arg. (see p. 19), which contains protocetraric acid and lacks cilia.

68. Parmelia olivaria Hue, Lich. Extra-Europ. 195. 1899.—Lynge, 1925, p. 91.

The specimen from Argentina so identified by Lynge was destroyed at Berlin.

69. Parmelia osseo-albida Lynge, ad int., Ark. Bot. 13, No. 13 : 133. 1914.

Lectotype: Porto Alegre, Rio Grande do Sul, Brazil, *Malme* 595, October 15, 1892 (S).
Additional specimen examined: *Malme* 1330B.

Reactions: Thallus K+ yellow, medulla K+ reddish, C−, KC+ red, P+ pale orange, atranorine and unidentified substances present; the acetone extract is a pale orange crust.

This species, which must be rejected since it was proposed provisionally, differs from *P. zahlbruckneri* Lynge (see under *P. gracilis*, p. 17) in having more irregular lobing and a looser attachment to the rock substratum. Considering that the plants share an unusual chemistry, I do not believe that the slight morphological variation constitutes a valid specific difference. As a matter of fact, in his key Lynge separated *P. osseo-albida* ("medulla KOH non coloratur") from both *P. gracilis* and *P. zahlbruckneri* ("medulla KOH rubescens") by a simple error: The medullary reaction of *P. osseo-albida* is given in the diagnosis (p. 134) as "intus e flavo rubescens."

70. Parmelia pachyderma Hue, Lich. Extra-Europ. 137, *pl. 4, figs. 1, 2.* 1899.—Lynge 1914, p. 137; 1925, p. 91.

Type: Montevideo, Uruguay, *Dr. Courbon* 536 (not seen).

The specimen identified by Lynge (*Malme* 1320) is identical with *Parmelia fistulata* Tayl. (syntypes: Argentina, *Tweedie*, and Montevideo, Uruguay, *Darwin*, FH). Zahlbruckner (1929, p. 60) inexplicably reduced it to a variety of *P. cirrhata* Fr. The two syntypes, however, differ significantly from *P. cirrhata* in having protocetraric acid and atranorine, rather than salacinic acid, and a beautifully effigurate white-maculate cortex. Judging from illustrations of the types, Hue's long-accepted name *P. pachyderma* and *P. felipponei* Lindau should be placed in synonymy under *P. fistulata.*

71. Parmelia palmarum Lynge, ad. int., Ark. Bot. 13, No. 13:136. 1914.

Holotype: Buriti, Serra da Chapada, Mato Grosso, Brazil, *Malme* 2243C*, January 20, 1894 (S).

Since Lynge proposed this new species "ad interim" and did not definitely accept it, it must be rejected. It is nevertheless a valid species, which may be characterized as follows, the description compiled from Lynge's original diagnosis of *P. palmarum:*

Parmelia palmarum Lynge

Parmelia palmarum Lynge, ad int., Ark. Bot. 13, No. 13:136, cf. *pl. 4, figs. 1, 2.* 1914.

Thallus laxe adpressus, mollis, cinereus vel vix flavescens, laciniis non bene radiantibus, 1–2 mm. latis, contiguis vel vulgo imbricatis, transversim rugosis, di- vel trichotomiter lobatis et crebre divergenter ramosis, lacinulis truncatis vel rotundatis et crenulatis, centrum versus lacinulis secundariis numerosis, parvis, digitatim vel coralliformiter ramosis, sorediis, isidiis et ciliis deficientibus, subtus niger, ad apicem anguste castaneus, usque ad ambitum rhiziniis nigris, ramosis, sat dense instructus. Cortex superior 20–25 μ altus, medulla

alba, 80–150 μ alta, cortex inferior fuscus vel fusconiger, 13–15 μ altus. Apothecia numerosa, diam. 5–6 mm., sessilia, non perforata, disco flavofuscente, subopaco, non pruinoso; hymenium superne fuscescens, ceterum decolor, 50–55 μ; sporae anguste limbatae, ovales, 9.5–11 μ longae, 5.3–6.6 μ crassae; conceptacula pycnoconidiorum subglobosa, 100–160 μ alta, 100–110 μ lata, conidiis 4–5 μ longis. Thallus K+ flavescens, medulla K−, C−, KC+ roseus, P−, atranorinum et materiam ignotam continens.

Type in the Naturhistoriska Riksmuseum, Stockholm, collected at Buriti, Serra da Chapada, Mato Grosso, Brazil, by G. A. Malme, No. 2243C*, January 20, 1894.

This species is a close relative of *P. livida* Tayl. (type: New Orleans, *Hook. Herb.*, FH), a common corticolous lichen in the southeastern United States with identical external appearance, although the thallus is more ashy white, and a similar KC+ reaction; *P. livida* differs principally in having smaller spores, 7–8 μ long, uniseriately arranged in the asci. *Parmelia bahiana* Nyl. could easily be confused with *P. palmarum*, except that it has a dense mat of rhizines projecting beyond the margins of the lobes. Lynge's "originaleksemplar" of *P. zahlbrukneri* (see p. 38) and one collection of *P. regis* Lynge (see p. 30) are both referable to *P. palmarum*.

72. Parmelia paraguariensis Lynge, Ark. Bot. 13, No. 13:71, *pl. 1, fig. 7.* 1914.

Holotype: Cierro Negro, Paraguari, Paraguay, *Malme* 1539, August 8, 1893 (S).

Reactions: Thallus K+ yellow, medulla K−, C+ red, KC+ red, P−, atranorine and lecanoric acid present.

This species is conspecific with *P. africana* Müll. Arg. (lectotype: Ghattas, Djur, Africa, *Schweinfurth* in 1877, G), a rather widespread species in Africa. A diagnostic character, aside from the unexpected occurrence of lecanoric acid, is the white-maculate upper cortex. *Parmelia rissoensis* Lynge (see p. 31) is merely a poorly developed specimen of this same species.

73. Parmelia perforata (Jacq.) Ach. Meth. Lich. 217. 1803.—Lynge, 1925, p. 91.
Lichen perforatus Jacq. Coll. Bot. 1:116, *pl. III.* 1786.

Type: Pennsylvania; not seen, but the original specimen is well illustrated in the color plate by Jacquin.

Range: Southeastern United States.

Lynge determined two packets as *P. perforata* (Caldas, Minas Gerais, Brazil, *Henschen* in 1868, UPS), but both are misidentified. One specimen is *P. subcaperata* Kremplh., and the other is *P. leucosemotheta* Hue, both of which contain atranorine and salacinic acid. *Parmelia perforata*, a species endemic to the United States, contains norstictic acid.

74. Parmelia persulphurata Nyl. *in* Cromb. Journ. Linn. Soc. London 16:219. 1877.—Lynge, 1914, p. 80.

Type: Not seen; the holotype was collected by Crombie in Bahia, Brazil. Nylander (Flora 68:606, 1885) later published the same diagnosis that he sent to Crombie in litt. and cited two specimens, from Cuba and Louisiana, which are the same as the holotype of *P. sulphurata* Nees & Flot. according to Hillmann (1939).

The Malme specimen (June 26, 1894) identified by Lynge lacks isidia and cannot therefore be *P. persulphurata* (if we are correct in assuming the latter species is synonymous with *P. sulphurata*). Actually it is closer to *P. cornuta* Lynge (see p. 12), but the material is far too poor for sound judgment.

75. Parmelia pluriformis Nyl. Synops. Lich. 381. 1858–60.—Lynge, 1925, p. 91.

Type: Minas Gerais, Brazil, *Weddell*, Nyl. Herb. No. 35585, (H).

Range: Brazil.

Additional specimen examined: São Paulo, Brazil, *Lindberg*, April 1854 (UPS).

Reactions: Thallus K+ yellow, medulla K−, C+ rose, KC+ red, P−, atranorine and gyrophoric acid present.

Lynge reported his determination with doubt, but the material is fully typical.

76. Parmelia portoalegrensis Lynge, Ark. Bot. 13, No. 13:147, *pl. 5, fig. 13.* 1914.

Lectotype: Porto Alegre, Rio Grande do Sul, Brazil, *Malme* 571, October 15, 1892 (S).

Additional specimen examined: *Malme* 560.

Reactions: Thallus K−, medulla K+ yellow, C−, KC−, P+ light orange, usnic and stictic acids present.

The tropics abound in minute isidiate species of the section *Xanthoparmelia* Vain. One of the first to be described, *P. adpressa* Kremplh., must be rejected as an orthographic variant and later homonym of *P. appressa* Mey. & Flot. The holotype of *P. adpressa* (Rio de Janeiro, *Glaziou* 3842, M) contains usnic acid and stictic acid and appears in other respects to be typical *P. isidiata* (Anzi) Gyel. Müller described a variety of this species, *P. adpressa* var. *stenophylloides* Müll. Arg., which Vainio raised to the rank of species as *P. stenophylloides* (Müll. Arg.) Vain. This entity also contains stictic acid but seems to be amply distinct from *P. isidiata* by reason of the very narrow lobes (to 0.5 mm wide). It has been suggested (cf. des Abbayes, 1958, p. 5) that *P. congensis* Stein., published in 1889, is identical with *P. stenophylloides* and should be the correct name for this entity. I have not checked the type of *P. congensis*, an African species, but the description seems to conform to *P. stenophylloides*.

Parmelia portoalegrensis is hardly distinguishable from this narrow lobed entity, whatever its correct name, except for the more crowded, contiguous lobes, and is perhaps merely a growth form on very smooth rock faces. It should be considered provisionally as a synonym of *P. congensis*.

77. Parmelia proboscidea Tayl. *in* Mack. Fl. Hibern. 2:143. 1836.—Lynge, 1914, p. 38; 1925, p. 91.

Type: Dunkerron Mountains, Ireland (FH); conspecific with the earlier *P. crinita* Ach. (cf. Hale, 1958a, p. 179).

Reactions: Thallus K+ yellow, medulla K+ yellow, C−, KC−, P+ pale orange, atranorine and stictic acid present.

Lynge followed Müller and Vainio in an incorrect interpretation of Taylor's species. A. L. Smith, who was familiar with *P. proboscidea* from Great Britain and knew that it was simply *P. crinita*, realized that the tropical plants so named were a different species. She gave them a new name, *P. wainii* A. L. Smith (Journ. Linn. Soc. London, Bot. 46:85, 1922), and cited as a basionym *P. proboscidea* (*sensu* Vainio, Acta Soc. Faun. & Fl. Fenn. 7:29, 1890). Vainio's *Lich. Bras. Exs.* Nos. 400 (FH), 582B, 973, and 1000 are therefore syntypes of *P. wainii*. Two packets labeled *P. proboscidea* by Lynge (*Malme* 314B and June 15, 1894) are identical with *Lich. Bras. Exs.* 400. Zahlbruckner (1904, p. 135) had actually described this entity earlier as *P. proboscidea* var. *ornatula* Zahlbr. (holotype: Serra do Ouro Preto, *Damazio* 1090, G; plate 3). *Parmelia wainii* is characterized by an ample thallus, marginally ciliate and without soredia or isidia; it produces atranorine and alectoronic acid (KC+ red). At the present time it is known from Brazil and Africa.

78. Parmelia prolixa var. **rosea** Lynge, Nyt Mag. Naturv. 62:91. 1925.

The specimen on which Lynge based this new variety was destroyed at Berlin.

79. Parmelia radians Lynge, ad int., Ark. Bot. 13, No. 13:85. 1914.

Holotype: São João d'el Rey, Minas Gerais, Brazil, *Malme* 203, August 30, 1892 (S).

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine, salacinic acid, and usnic acid present.

Parmelia radians should be rejected as a provisional new species "ad interim." The type specimen is identical with *P. delicatula* Vain. (type: *Lich. Bras. Exs.* 1256, FH), although Lynge thought that Vainio's plant had a deeper yellow color than his own. The relation of *P. delicatula* to other tropical species with usnic acid in the section *Amphigymnia* is given in the key on p. 21.

80. Parmelia regis Lynge, Ark. Bot. 13, No. 13:126. 1914.

Lectotype: São João d'el Rey, Minas Gerais, Brazil, *Malme* 178, August 30, 1892 (S).

Range: Known only from the type locality.

Reactions: Thallus K−, medulla K+ wine-red, C−, KC+ pale red, P+ pale orange, lichexanthone and unidentified substances present.

The type of *P. regis* cannot be told externally from *P. silvatica* Lynge (see p. 34); it differs chiefly in lacking an anthraquinone pigment in the lower medulla. The two species are separated in Lynge's key (p. 21) by: "1. Thallus KOH superne non coloratur" (*P. silvatica*), and "2. Thallus superne flavescens" (*P. regis*). Lynge apparently established a yellow K test for *P. regis* from the two misidentified syntypes discussed below, since the "originaleksemplar" is K−. While *P. regis* thus delimited differs only in chemical characters from *P. silvatica*, it should be retained as a separate species until we are more familiar with the range of chemical variation in this group.

The other two specimens cited by Lynge (*Malme* 941 and 2393****) differ from the lectotype in lacking lichexanthone and reacting K+ yellow on the cortex and K− in the medulla. One specimen (2393****) is identical with *P. palmarum* Lynge (see p. 26 under *P. palmarum* Lynge), while the other, which Lynge had first called a new species in manuscript, *P. cachoeirae*, is too fragmentary for proper study.

81. Parmelia regnellii Lynge, Ark. Bot. 13, No. 13:140, *pl. 5, figs. 1, 2.* 1914.

Lectotype: São João d'el Rey, Minas Gerais, Brazil, *Malme* 308, September 1, 1892 (S).

Range: Brazil.

Additional specimens examined: *Malme* 179, 2748B, 2745B, s.n.

Reactions: Thallus K−, medulla alba K+ yellowish, C+ yellowish, KC+ orange-yellow, P− (P+ in 2745B), medulla crocea K+ purple, usnic and barbatic acids (stictic in 2745B), an unidentified anthraquinone and other substances present.

Parmelia regnellii is a most remarkable lichen with a deep yellow thallus and in part a deep saffron medulla. Although Malme collected the species at three widely separated localities, it has not appeared in the literature or been seen in herbaria since Lynge's description.

82. Parmelia regnellii f. arida Lynge, Ark. Bot. 13, No. 13:141. 1914.

Holotype: Near Bocca da Serra, Serra da Chapada, Mato Grosso, Brazil *Malme* 2240, January 21, 1894 (S).

Range: Known only from the type locality.

Reactions: As in *P. regnellii* f. *regnellii*.

This form is much smaller than the typical form but has a similar chemistry.

83. Parmelia revoluta Floerke, Deutsch. Lich. 1:11. 1815—Lynge, 1925, p. 92.

Lynge based his record on two small fragments (*Henschen* in 1868, UPS), which in my opinion are not identifiable. Although *P. revoluta* has appeared in several lists of tropical American Parmelias, I doubt that the identifications are correct.

84. Parmelia rigida Lynge, Ark. Bot. 13, No. 13:50, *pl. 2, fig. 2.* 1914.

Holotype: Piratiny, Rio Grande do Sul, Brazil, *Malme* 827B, December 17, 1892 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine, and alectoronic acid present.

The exceedingly rigid thallus without soredia or isidia and the numerous large apothecia set this species apart from all other parmelias. It may be placed in the *P. melanothrix* group (see. p. 23) because of the white-maculate cortex and the presence of alectoronic acid. Lynge mistakenly gave the medullary reaction as KC−.

85. Parmelia riograndensis Lynge, Ark. Bot. 13, No.13:26, *pl. 1, fig. 2.* 1914.
Parmelia microsticta Müll. Arg. var. *riograndensis* (Lynge) Lynge, Nyt Mag. Naturv. 62:90. 1925.

Lectotype: Porto Alegre, Rio Grande do Sul, Brazil, *Malme* 461, September 25, 1892 (S).

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and protolichesteric acid present.

Additional specimen examined: *Malme* 1282B. Reactions: Thallus K+ yellow, medulla K−, C+ rose, KC+ red, P−, atranorine and gyrophoric acid present.

Lynge based his description on two packets, one labeled "original-eksemplar," reacting C+ rose, which was erroneously designated by me (1958a, p. 180) as the holotype, and another reacting C−, which is the legitimate lectotype since it agrees with Lynge's C test. The two chemical strains are morphologically indistinguishable and near, if not equal to, *P. bolliana* Müll. Arg., which has the same chemical strains in the southwestern United States (Culberson & Culberson, 1956). A fuller understanding of *P. riograndensis* will depend on further study of *P. microsticta* Müll. Arg. and *P. squamuligera* Sant., but provisionally it can be regarded as a synonym of *P. bolliana.*

86. Parmelia rissoensis Lynge, Ark. Bot. 13, No. 13:69. 1914.

Holotype: Near Río Apa, Colonia Risso, Paraguay, *Malme* 1895B, October 7, 1893 (S).

Reactions: Thallus K+ yellow, medulla K−, C+ red, KC+ red, P−, atranorine and lecanoric acid present.

This entity is conspecific with *P. africana* Müll. Arg. and a poorly developed state of its synonymous species, *P. paraguariensis* Lynge (see p. 27).

87. Parmelia rudecta Ach. Syn. Lich. 197. 1814.—Lynge, 1914, p. 29; 1925, p. 92.

Type: North America, *Muhlenberg* (PH, isotype).

Reactions: Thallus K+ yellow, medulla K−, C+ red, KC+ red, P−, atranorine and lecanoric acid present.

Additional specimens examined: *Malme*, July 9, 1894; *Glaziou* 1834 (UPS). Both of these specimens contain gyrophoric acid (C+ rose).

The specimens are identical in morphology with the typical North American *P. rudecta*, which produces lecanoric acid constantly (Culberson & Culberson, 1956). The significance of the chemical difference in South American specimens has not yet been evaluated.

88. Parmelia rupicola Lynge, Ark. Bot. 13, No. 13:132, *pl. 3, figs. 5, 6.* 1914.

Holotype: Porto Alegre, Rio Grande do Sul, Brazil, *Malme*1339, June 2, 1893 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and divaricatic acid present.

Parmelia rupicola mimics the crustose *Lecanora muralis* (Schreb.) Rabh. very closely in size and habit. Divaricatic acid is known in only one other *Parmelia* species, *P. texana* Tuck, a widely distributed corticolous species in temperate and tropical regions.

89. Parmelia rupta Lynge, Ark. Bot. 13, No. 13:40. 1914.

Holotype: Río Negro, Gran Chaco, Paraguay, *Malme*, September 14, 1893 (S).

Range: Known only from the type locality.

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC−, P+ orange-red, atranorine and salacinic acid present.

The single holotype collection has the appearance of *P. cetrata* Ach. with a reticulately rimose cortex. However, it has a rather distinct naked zone below at the margins. The species cannot be evaluated from this single rather poor specimen.

90. Parmelia rutidota Hook. & Tayl. Lond. Journ. Bot. 3:645. 1844.—Lynge, 1914, p. 151; 1925, p. 92.

Type: Van Dieman's Land (FH).

Range: Australia, South America.

Reactions: Thallus K−, medulla K−, C−, KC+ rose, P+ orange-red, usnic and protocetraric acids present.

Additional specimen examined: *Malme* 715.

The Malme specimen has the same morphology, habit, and spore size (13–16 × 7–10 μ) as Taylor's type, but it contains fumarprotocetraric acid. It is probably no more than a chemical strain of little significance, and does not warrant species rank at this time. *Parmelia rutidota* is a plant of the southern hemisphere. Asahina's report from Japan (1952, p. 142) is a misidentified species of the *P. texana* group.

91. Parmelia rutidota f. filizans Lynge, Ark. Bot. 13, No. 13:153. 1914.

Holotype: Quinta, near Rio Grande, Rio Grande do Sul, Brazil, *Malme* 727, December 3, 1892 (S).

Range: Known only from the type locality.

Reactions: Thallus K−, medulla K−, C−, KC− or brownish, P+ red, fumarprotocetraric acid and usnic acid present.

This is a well characterized form with conspicuous filiform marginal laciniae.

92. Parmelia saccatiloba Tayl. Lond. Journ. Bot. 6:174. 1847.—Lynge, 1914, p. 65.

Lectotype: Pitcairn's Island, *Beechey* (FH, cf. Hale, 1958, p. 180).

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ rose, P+ orange-red, atranorine and protocetraric acid present.

The five specimens thus identified by Lynge (*Malme* 1678**, 2156B, 2392**, s.n.) all contain atranorine and a fatty substance near caperatic acid, and lack the isidia characteristic of *P. saccatiloboa*. They may be identified as *P. mesotropa* Müll. Arg. (type: Asunción, Paraguay, *Balansa* in 1878, G, plate 4), a common species which Lynge failed to study.

93. Parmelia saccatiloba f. membranacea Lynge, ad int., Ark. Bot. 13, No. 13:67. 1914.

Holotype: Pilcomayo, Gran Chaco, Paraguay, *Malme*, September 2, 1893 (S).

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and an unknown fatty substance near caperatic acid present.

This form, which is not validly published, is also identical with *P. mesotropa* Müll. Arg. The smaller spores as reported by Lynge probably have no significance.

94. Parmelia sancti-angelii Lynge, Ark. Bot. 13, No. 13:35. 1914.—Lynge, 1925, p. 92. PLATE 5

Holotype: Colonia Santo Angelo, near Cachoeira, Rio Grande do Sul, Brazil, *Malme*, January 25, 1893 (S).

Range: Mexico, West Indies, South America, Africa, China.

Additional specimens examined: Caldas, Minas Gerais, Brazil, *Henschen* in 1868 (UPS).

Reactions: Thallus K+ yellow, medulla K−, C+ rose, KC+ red, P−, atranorine and gyrophoric acid present.

Parmelia sancti-angelii is a distinctive species now known to be widespread in tropical regions. In size and general morphology, it resembles *P. maxima* Hue (*P. claudelii* (Harm.) Vain.), which contains salacinic acid (K+ red). There is considerable variance in spore size, which is difficult to assess in a species so often collected sterile. Lynge reported spores 26–33 μ long with a wide episporium; other tropical collections which I have measured have much smaller spores, only up to 16 μ long, with a thin episporium. Differences of this magnitude are generally not expected.

95. Parmelia semilunata Lynge, Ark. Bot. 13, No. 13:23, *pl. 5, figs. 10–12.* 1914.

Holotype: Buriti, Serra da Chapada, Mato Grosso, Brazil, *Malme*, June 19, 1894 (S).

Range: Known only from the type locality.

Reactions: Specimens too fragmentary for testing; Lynge reported the thallus K+ yellow, medulla C−, K−.

Externally *P. semilunata* could be mistaken for a species in the *P. coronata* group because of the small steel-gray thallus with coronate apothecia. The spores, however, are distinctly two-horned, a peculiar character known only in *P. schiffneri* Zahlbr. and *P. bicornuta* Müll. Arg., the latter species a much larger plant (plate 5) with lecanoric acid (type: Rio de Janeiro, *Leyland*, G). In view of the great morphological diversity of the three species it seems doubtful whether they should be joined together in a separate section of the genus (Section *Bicornutae* Lynge, Ark. Bot. 13, No. 13:23, 1914) solely on the basis of the unique spores.

96. Parmelia silvatica Lynge, Ark. Bot. 13, No. 13:118, *pl. 5, fig. 14.* 1914.

Lectotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2393*, February 21, 1894 (S).

Range: Brazil.

Additional specimens examined: *Malme*, March 3, 1894, June 25, 1894.

Reactions: Thallus K−, medulla alba K−, C−, KC+ rose, P+ orange-red, medulla crocea K+ purple, lichexanthone, protocetraric acid, and an unidentified anthraquinone present.

This well-circumscribed species is characterized by an unusual combination of chemical components. It is very near *P. regis* Lynge

(see p. 30), which lacks the pigment, and not far removed from species in the *P. bahiana-P. palmarum* group (see p. 26 under *P. palmarum* Lynge).

97. Parmelia silvatica var. pinnata Lynge, Ark. Bot. 13, No. 13:120. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2393***, February 21, 1894 (S).

Range: Known only from the type locality.

Reactions: As in *P. silvatica* var. *silvatica.*

This variety is a broader-lobed plant than var. *silvatica.* I doubt that it could be told from the typical variety in a larger series of specimens, and I therefore do not believe it deserves any taxonomic rank.

98. Parmelia silvatica var. radiata Lynge, Ark. Bot. 13, No. 13:120. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2393**, February 21, 1894 (S).

Range: Known only from the type locality.

Reactions: As in *P. silvatica* var. *silvatica.*

This variety differs from var. *silvatica* only in being more closely adnate to the bark, and in this respect it approaches *P. crustacea* Lynge (see p. 13) closely. I do not believe it deserves taxonomic status.

99. Parmelia soredica Nyl. Flora 68:608. 1885.—Lynge, 1925, p. 92.

A single specimen collected by Fries in Argentina (S) and cited by Lynge has not been available for study.

100. Parmelia subproboscidea Lynge, Ark. Bot. 13, No. 13:36. 1914.

Holotype: Assuncion, Paraguay, *Malme* 1678 in 1893 (S).

Range: Paraguay.

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine and alectoronic acid present; cilia K+ violet.

Parmelia subproboscidea has no relationship at all with *P. proboscidea* Tayl. (= *P. crinita* Ach.) but is a member of the *P. melanothrix* group (see under *P. melanothrix*, p. 23). It differs from *P. laongii* Lynge in having slightly smaller spores and a paler underside. *Parmelia melanothrix* f. *microspora* Lynge (see p. 24) is referable to this species. The recognition of *P. subproboscidea* makes the typification of *P. urceolata* Eschw. (Icon. Pl. Crypt. 23, 1827) essential. Though Eschweiler's color plate is not as clear as we would like, there is a strong possibility that it is the same as *P. subproboscidea.* In any event, when the type of *P. urceolata* is located and studied, that name will doubtless replace one of those of the presently recognized members of the *P. melanothrix* group.

101. Parmelia subregressa Lynge, ad. int., Ark. Bot. 13, No. 13:58. 1914.
Parmelia subregressa, Lynge, Nyt. Mag. Naturv. 62:93. 1925.

Holotype: Paraguari, Paraguay, *Malme* 1525B, August 7, 1893 (S).

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and a fatty substance present.

Parmelia subregressa Lynge, "ad interim," dating from 1914, must be rejected as a provisional name. The holotype is identical morphologically and chemically with *P. mesotropa* Müll. Arg. (see p. 33, under *P. saccatiloba* Tayl.). In the second publication dating from 1925, Lynge listed the species without provisional status, so that this is the valid date of publication of *P. subregressa*. The specimen on which the second determination was based (Pampa Blanca, Argentina, *Fries*, S) has not been seen, but the type of the species would still be the Malme specimen.

102. Parmelia subrugata Krempth. var. **arcuata** Lynge, Ark. Bot. 13, No. 13:48. 1914.

Holotype: Porto Alegre, Rio Grande do Sul, *Malme* 440, September 25, 1892 (S).

Reactions: Thallus K+ yellow, medulla K−, C−, KC+ red, P−, atranorine and alectoronic acid present.

The holotype of *P. subrugata* Krempth. (Serra dos Orgãos, Minas Gerais, Brazil, *Helmreichen*, M) has more or less arcuate conidia such as Lynge described for his new variety. Since the two entities are completely similar in morphology and chemistry, var. *arcuata* may be regarded simply as a synonym of var. *subrugata*.

103. Parmelia sulphurata Nees & Flot. Linnaea 9:501. 1834.—Lynge, 1914, p. 75; 1925, p. 94.

Type: Destroyed at Berlin, but once examined by Hillmann (1939), who compared it with *P. persulphurata* Nyl. (see p. 28).

Range: Tropical regions.

Specimen examined: *Malme* 146. Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and vulpinic acid present.

Lynge's determination agrees with the present concept of the species. The density of isidia and marginal cilia varies widely.

104. Parmelia tinctorum Nyl. Flora 55:547. 1872.—Lynge, 1914, p. 32; 1925, p. 94.

Type: Nylander apparently based the species on a specimen from the Canary Islands collected by Despréaux (not seen).

Range: Cosmopolitan in tropical and subtropical regions.

Specimens examined: *Malme* 1889, 1895 Ac, 1480, 2369, 2243C, 196, and September 7, 1893. Reactions: Thallus K+ yellow, medulla K−, C+ red, KC+ red, P−, atranorine and lecanoric acid present.

Nylander should be cited as the author of this weedy tropical species, since Despréaux merely provided a specimen with an herbarium name.

105. Parmelia uleana Müll. Arg. Flora 72:506. 1889.—Lynge, 1914, p. 155, *pl. 4, fig. 6.*

Type: Nova Cintra, Rio de Janeiro, Brazil, *Ule* 10 (G).

Range: Southern United States, West Indies, Central and South America, and Africa.

Additional specimens examined: *Malme* 61 and August 16, 1894; *Malme* 91, 2366, 2418, 2435B, 2519, 2642, 2742, and June 16, 1894.

Reactions: Thallus K−, medulla K+ yellowish, C−, KC+ pale orange, P−, usnic and barbatic acids, and an unidentified yellowish pigment in the medulla present. The first two specimens cited contain stictic acid (P+ pale orange) instead of barbatic acid.

Parmelia uleana is a synonym of *P. sphaerospora* Nyl. (Hale, 1959a, p. 129), a very common tropical species distinguished by nearly spherical spores, a thick minutely rugulose cortex, and lack of soredia or isidia. The chemical composition is not perfectly clear at present.

106. Parmelia urceolata Eschw. Icon. Pl. Crypt. 23. 1827.—Lynge, 1914, p. 64; 1925, p. 95.

Type: Not seen, but illustrated by Eschweiler (see under *P. subproboscidea* Lynge, p. 35).

The two specimens determined by Lynge (*Malme* 827, and Zarati, Argentina, September 1894) contain atranorine and stictic acid and should be referred to *P. eciliata* (Nyl.) Nyl. (see p. 15).

107. Parmelia viridescens Lynge, Ark. Bot. 13, No. 13:117, *pl. 3, figs. 9, 10.* 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2453, February 28, 1894 (S).

Range: Known only from the type locality.

Reactions: Thallus K−, medulla K−, C−, KC−, P−, no lichen substances proved.

The type is a pale greenish plant without soredia or isidia. It resembles no other species known to me.

108. Parmelia wainioana Lynge, Ark. Bot. 13, No. 13:87. 1914.

Holotype: Santa Anna da Chapada, Mato Grosso, Brazil, *Malme* 2435C, February 27, 1894 (S).

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine and perlatolic acid present.

This species is synonymous with *P. caroliniana* Nyl., a common corticolous species from the southern United States southward to Brazil (Hale, 1959a, p. 17).

109. Parmelia xanthina (Müll. Arg.) Vain. Ann. Soc. Faun. & Fl. Fenn. 7:37. 1890.—Lynge, 1914, p. 85.

Parmelia proboscidea var. *xanthina* Müll. Arg. Flora 67:616. 1884.

P. perlata var. *xanthina* (Müll. Arg.) Stizb. Ber. St. Gall. Naturw. Gesell. 1888-1889:156.

Type: Central Madagascar, *Hildebrandt* (G).

Range: Brazil, Madagascar.

Reactions: Thallus K+ yellow, medulla K−, C−, KC−, P−, atranorine, and usnic and protolichesteric acids present.

Des Abbayes (1958, p. 21) gave considerable attention to the status of this species. Although he was unable to typify Müller's var. *xanthina* satisfactorily, he referrred plants reacting C− in the medulla to *P. aberrans* (Vain.) des Abb., and the plants reacting C+ rose to *P. xanthina* Vain. nec Müll. Arg. The latter citation is incorrect inasmuch as any new combination is based on the type of the basionym, regardless of whether the combining author saw it or not. A specimen labeled *P. perlata* var. *xanthina* Müll. Arg. which I received from Geneva and which I believe is the holotype of *P. proboscidea* var. *xanthina* reacts C−, as indicated above. Therefore, *P. aberrans* is only a synonym of *P. xanthina*. Plants reacting KC+ rose have been identified with *P. madagascariacea* (Hue) des Abb. (des Abbayes, 1958, p. 22), Plants reacting C+ rose, such as Vainio's *Lich. Bras. Exs.* 1181 and the two Malme specimens seen by Lynge (*Malme* 2748 and June 22, 1894) are indistinguishable from both *P. madagascariacea* and *P. xanthina* (C−) except for the C+ rose test caused by gyrophoric acid. I would prefer to rank the C+ plants as a chemical strain of *P. xanthina* for the present. It may be desirable to recognize them as a distinct species in the future when the whole *P. xanthina* group (see under *P. magna* Lynge, p. 20) has been more precisely delimited.

110. Parmelia zahlbruckneri Lynge, Ark. Bot. 13, No. 13:125, *pl. 4, figs. 1, 2.* 1914.

Lectotype: Near Bocca da Serra, Serra da Chapada, Mato Grosso, Brazil, *Malme*, June 15, 1894 (S).

Reactions: Thallus K+ yellow, medulla K+ red, C−, KC+ reddish, P+ pale orange, atranorine, and unknown substances present. The acetone extract is a pale orange crust.

Parmelia zahlbruckneri was based on two specimens. The one labeled "Originaleksemplar" and photographed (*pl. 4, figs. 1, 2*) by Lynge (*Malme*, same data as the lectotype above) reacts K−, C−, KC+ rose in the medulla and is best referred to *P. palmarum* Lynge (see under *P. palmarum* Lynge, p. 26). The other syntype,

here designated the lectotype since it conforms better with the original diagnosis, is identical in every respect with *P. gracilis* (Müll. Arg.) Vain. Since *P. gracilis* is a later homonym and *P. confusula* Zahlbr., a new name, was published in 1929, *P. zahlbruckneri* becomes the correct name for this entity (see under *P. gracilis*, p. 17).

Summary of Synonymy, Misidentifications, and Changes in Nomenclature

Lynge identified a total of 110 taxa, 99 of which I have been able to verify. Of the 61 new taxa proposed by Lynge, two (*P. hieronymi* and *P. prolixa* var. *rosea*) were destroyed at Berlin, and one (*P. coccinea*) was transferred by Lynge himself to *Pyxine coccifera* (Fée) Nyl. Lynge also made two new combinations, *P. brasiliana* var. *glaziovii* (Müll. Arg.) Lynge and var. *novella* (Vain.) Lynge. Two infraspecific taxa (*P. abstrusa* f. *laevigata* Lynge and *P. cornuta* var. *crocea* Lynge) have been raised to species rank by Gyelnik, and a later homonym (*P. merrillii* Lynge non Vain.) has received a new name. I have reduced 24 species, varieties, or forms to synonymy in the above list of species. A summary of these changes follows:

P. abstrusa f. *laevigata* Lynge = *P. subabstrusa* Gyel.
P. annae Lynge = *P. recipienda* Nyl.
P. ceracea Lynge = *P. recipienda* Nyl.
P. coccinea Lynge = *Pyxine coccifera* (Fée) Nyl.
P. cornuta var. *crocea* Lynge = *P. crocea* (Lynge) Gyel. non Sprengl.
P. fragilis Lynge = *P. intercalanda* Vain.
P. latissima f. *microspora* Lynge = *P. wainii* A. L. Smith
P. longiconida Lynge = *P. scrobicularis* Kremplh.
P. malmei Lynge = *P. minima* Lynge, probably
P. melanothrix f. *microspora* Lynge (invalid name) = *P. subproboscidea* Lynge
P. merrillii Lynge, non Vain. = *P. lyngeana* Zahlbr.
P. osseo-albida Lynge (invalid name) = *P. zahlbruckneri* Lynge
P. palmarum Lynge (invalid name) = *P. palmarum ex* Hale
P. paraguariensis Lynge = *P. africana* Müll. Arg.
P. portoalegrensis Lynge = *P. congensis* Stein. provisionally
P. radians Lynge (invalid name) = *P. delicatula* Vain.
P. riograndensis Lynge = *P. bolliana* Müll. Arg., probably
P. rissoensis Lynge = *P. africana* Müll. Arg.
P. saccatiloba f. *membranacea* Lynge (invalid name) = *P. mesotropa* Müll. Arg.
P. silvatica var. *pinnata* Lynge = *P. silvatica* var. *silvatica*
P. silvatica var. *radiata* Lynge = *P. silvatica* var. *silvatica*
P. subregressa Lynge = *P. mesotropa* Müll. Arg.
P. subrugata Kremplh. var. *arcuata* Lynge = *P. subrugata* var. *subrugata*
P. wainioana Lynge = *P. caroliniana* Nyl.

Misidentifications and changes in nomenclature include the following 20 taxa:

P. abstrusa f. *laevigata* Lynge pr. p.=*P.* cf. *relicina* Fr.
P. balansae var. *sorediata* Müll. Agr.=*P. subbalansae* Gyel.
P. conspersa (Ach.) Ach.=*P. isidiata* (Anzi) Gyel.+*P. flavida* Zahlbr.
P. cyliphora (Ach.) Vain.=*P. caperata* (L.) Ach.
P. flava Kremplh. var. *stellata* Lynge=*P. flavida* Zahlbr var. *stellata* (Lynge) Zahlbr.
P. flava var. *subdichotoma* Lynge=*P. flavida* Zahlbr. var. *subdichotoma* (Lynge) Zahlbr.
P. gracilis (Müll. Arg.) Vain.=*P. zahlbruckneri* Lynge
P. isidiophora Zahlbr.=*P. caroliniana* Nyl.
P. kamtschadalis var. *americana* (Mey. & Flot.) Nyl.=*P. americana* (Mey. Flot.) Mont.
P. laceratula Nyl.=*Parmelia* sp. near *P. riograndensis* Lynge and *P. squamuligera* Sant.
P. latissima Fée pr. p.=*P. zollingeri* Hepp
P. magna Lynge pr. p.=*P. microdactyla* Hale
P. melanothrix (Mont.) Vain. pr. p.=*P. argentina* Kremplh.
P. pachyderma Hue=*P. fistulata* Tayl.
P. perforata (Jacq.) Ach.=*P. leucosemotheta* Hue+*P. subcaperata* Kremplh.
P. persulphurata Nyl.=*P. cornuta* Lynge, probably.
P. proboscidea Tayl.=*P. wainii* A. L. Smith
P. saccatiloba Tayl.=*P. mesotropa* Müll. Arg.
P. uleana Müll. Arg.=*P. sphaerospora* Nyl.
P. urceolata Eschw.=*P. eciliata* (Nyl.) Nyl.

Four other species, *P. consimilis* Vain., *P. cristfera* Tayl., *P. minarum* Vain., and *P. revoluta* Floerke, were also misidentified, but it was impossible to correct the names because of the poor condition of the specimens.

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