JOURNAL
OF THE
ARNOLD ARBORETUM
HARVARD UNIVERSITY

VOLUME XXV

JAMAICA PLAIN, MASS.
1944

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Arnold Arboretum of Harvard University
KRAUS REPRINT CORPORATION
New York
1968

DATES OF ISSUE

No. 1 (pp. 1–131, 6 pl.) issued January 15, 1944.
No. 2 (pp. 133–270, 3 pl.) issued April 15, 1944.
No. 3 (pp. 271–405, 12 pl.) issued July 15, 1944.
No. 4 (pp. 407–521, 7 pl.) issued October 16, 1944.

Printed in U.S.A.

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ARNOLD ARBORETUM

VOL. XXV JANUARY, 1944 NUMBER 1

STUDIES IN THE MELASTOMATACEAE OF CHINA[1]

HUI-LIN LI

IN making identifications of recent collections of plants from southern and southwestern China, it was observed that much remained to be done in clarifying the classification of Chinese Melastomataceae. Consequently a review of the family as represented in China was undertaken, involving a study of all genera and species recorded from China and an examination of all available specimens and the published records. Many nomenclatural adjustments are made involving new synonyms and new combinations. A number of apparently hitherto undescribed species are noted. In some groups the generic limits appear to be sharply defined, while in others, especially the Oxysporeae and Sonerileae, difficulties are encountered because of certain rather complex characters normally used in attempts to delimit genera. In these genera, complete flowering and fruiting specimens are indispensable in ascertaining the correct generic disposition of certain entities, and not infrequently species have been placed in wrong genera because of lack of adequate material. The accumulated collections now available, assembled through recent extensive botanical explorations in China, have provided us with ample material representing some of the previously imperfectly known species, and it thus becomes possible to make more exact determinations.

This study is based on the collections of the Arnold Arboretum (A), the Gray Herbarium (G), and the New York Botanical Garden (N). While all the known Chinese species of the family are accounted for, this paper is not intended to be a complete revision, for the reason that types of certain species have not been available for consultation because of war conditions. To the curators of the above-mentioned herbaria, I am indebted for their kindness in furnishing the material for this study.

In addition to the several general monographic studies of the family published in the nineteenth century, there are several important papers

[1]Prepared with partial support of a grant from the Penrose Fund, American Philosophical Society, to Dr. E. D. Merrill to assist him in working up the accumulated collections of Chinese botanical material in the herbarium of the Arnold Arboretum.

treating various groups of the Melastomataceae of eastern Asia. In 1892, Stapf published a paper, "On the Sonerileae of Asia" (Ann. Bot. **6:** 291–320. 1892), in which he described two new genera from China, *Fordiophyton* and *Gymnagathis*. Guillaumin, in 1913, in a series of papers entitled "Contribution à l'étude des Mélastomacées d'Extrême-Orient" (in Lecomte, Not. Syst. **2:** 301–323. 1913, Bull. Soc. Bot. France **60:** 86–92, 273–276, 362–371, 401–406. 1913), treated various genera. He re-identified many of Léveillé's Chinese species that had erroneously been ascribed to the Melastomataceae and provided a complete list of the species of eastern Asia known at that time, with keys to the genera and species. Diels' "Beiträge zur Kenntnis der Melastomataceen Ostasiens" (Bot. Jahrb. **55:** 97–119. 1932) considered the species of Oxysporeae and Sonerileae, and he described many new species and one new genus, *Cypotheca,* from China. In these two tribes Diels' arrangement has here been accepted, with occasional new names and transfers. Keys to the species of the genera in these groups have been prepared only as the addition of new species indicates this as desirable.

KEY TO THE SUBFAMILIES AND GENERA OF CHINA

A. Ovary usually 4- or 5-celled; ovules very many; fruits many-seeded; embryo very small.
  B. Anthers opening by a single terminal pore; placentas axile. ..... I. MELASTOMATOIDEAE.
  BB. Anthers opening by slits; placentas parietal, nearly basal. ..... II. ASTRONIOIDEAE.
AA. Ovary 1-celled; ovules about 9; placentas free central; fruits 1-seeded; embryo large. ..... III. MEMECYLOIDEAE.

Subfamily I. MELASTOMATOIDEAE

A. Seeds curved through half a circle, minutely punctate (Tribe OSBECKIEAE).
  B. Stamens all alike; fruits dry, tardily dehiscent. ..... 1. *Osbeckia.*
  BB. Stamens very unequal; fruits somewhat fleshy, indehiscent. .... 2. *Melastoma.*
AA. Seeds straight, oblong, obovate, or cuneate, not curved.
  B. Fruits capsular, loculicidally dehiscent.
    C. Ovary with the top usually free and conical; inflorescences terminal or axillary, the flowers arranged in panicles, cymes, or fascicles, never scorpioid (Tribe OXYSPOREAE).
      D. Stamens 8, equal or unequal.
        E. Stamens equal or subequal.
          F. Inflorescences pseudo-umbellate; connectives at the base of the anther gibbose or subcalcarate behind; fruits not ridged. ..... 3. *Plagiopetalum.*
          FF. Inflorescences paniculate; connectives not appendaged behind; fruits strongly ridged. ..... 4. *Allomorphia.*
        EE. Stamens very unequal.
          F. Connectives at base slightly produced in front, not calcarate behind.
            G. Flowers pseudo-umbellate; connectives gibbose-thickened behind. ..... 5. *Cypotheca.*
            GG. Flowers in large elongated panicles; connectives not gibbose-thickened behind. ..... 6. *Oxyspora.*
          FF. Connectives at base bisetose in front, often calcarate behind. ..... 7. *Barthea.*

DD. Stamens 4, equal. .....8. *Blastus*.
CC. Ovary flattened or depressed at the top; inflorescences terminal, rarely axillary, usually in umbels or cymes, sometimes in panicles, in some cases scorpioid (Tribe SONERILEAE).
DD. Flowers 4-merous; stamens 8, rarely 4.
E. Inflorescences in umbels, cymes, or panicles, the branches not scorpioid.
F. Connectives at the base of the anthers 2-tuberculate in front, shortly calcarate behind. .....9. *Bredia*.
FF. Connectives at the base of anthers inappendiculate or only slightly calcarate behind.
G. Anthers not attenuate, the tips of the anther-cells free and slightly projecting; connectives at the base of anthers often calcarate behind. .....10. *Sarcopyramis*.
GG. Anthers usually attenuate, the anther-cells united to their very tips; connectives inappendiculate or shortly calcarate behind.
H. Stamens 8, very unequal, or sometimes 4; connectives not calcarate behind.
I. Anther-sacs produced at the base. ...11. *Fordiophyton*.
II. Anther-sacs not produced at the base. 12. *Stapfiophyton*.
HH. Stamens 8, equal or subequal; connectives usually short-calcarate behind. .....13. *Phyllagathis*.
EE. Inflorescences in large panicles, the ultimate branches scorpioid. .....14. *Scorpiothyrsus*.
DD. Flowers 3-merous; stamens 3 or sometimes 6; inflorescences in scorpioid cymes. .....15. *Sonerila*.
BB. Fruits baccate, indehiscent (Tribe DISSOCHAETEAE.)
C. Stamens unequal. .....16. *Anplectrum*.
CC. Stamens equal. .....17. *Medinilla*.

Subfamily II. ASTRONIOIDEAE

18. *Pternandra*.

Subfamily III. MEMECYLOIDEAE

19. *Memecylon*.

1. OSBECKIA

Osbeckia Linnaeus, Sp. Pl. 345. 1753.

Although nine species of *Osbeckia* are credited to China, I can recognize only five species with certainty. Two of Craib's new species are reduced to synonymy. Guillaumin (in Lecomte, Not. Syst. **2:** 307, 311. 1913, Bull. Soc. Bot. France **60:** 401, 402. 1913) records *Osbeckia rostrata* D. Don and *O. capitata* Benth., two Indian species, as occurring in Kweichow and Yunnan respectively. I have seen no Chinese specimens referable to these species and suspect that the plants designated as *O. capitata* Benth. by Guillaumin are included within the concept of *O. chinensis* L.

KEY TO THE CHINESE SPECIES

A. Hairs on the calyx-tube stellate, pectinate, or branching.
B. Anthers produced into a long beak; flowers 4-merous.
C. Leaves narrow, less than 1.5 cm. broad. .....1. *O. chinensis*.
CC. Leaves wider, more than 2 cm. broad.
D. Calyx covered with spreading stellate hairs. .....2. *O. crinita*.
DD. Calyx covered with appressed stellate or pectinate hairs. ..3. *O. stellata*.
BB. Anthers attenuate upward, not beaked; flowers 5-merous. ....4. *O. nepalensis*.
AA. Hairs on the calyx-tube simple. .....5. *O. melastomatoides*.

1. **Osbeckia chinensis** L. Sp. Pl. 345. 1753; Lour. Fl. Cochinch. 228. 1790, ed. Willd. 281. 1793; DC. Prodr. **3:** 141. 1828; Hook. Bot. Mag. **69:** *t. 4026*. 1843; Benth. Fl. Hongk. 115. 1861; Triana, Trans. Linn. Soc. **28:** 53. 1871; Franch. Pl. David. **1:** 132. 1884; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 515. 1879; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 298. 1887; Guillaum. in Lecomte, Not. Syst. **2:** 308. 1913, Bull. Soc. Bot. France **60:** 402. 1913, et in Lecomte, Fl Gén. Indo-Chine **2:** 874. 1921; Merr. Lingnan Sci. Jour. **5:** 138. 1927, Trans. Am. Philos. Soc. II. **24**(2)**:** 288. 1935; Hand.-Maz. Symb. Sin. **7:** 597. 1933.

HUPEH: I-chang, *A. Henry 2320* (G); western Hupeh, *E. H. Wilson 2483* (N); Wuchang, *S. C. Sun 878* (N). ANHWEI: Wu-yuan, *R. C. Ching 8926* (G). KWEICHOW: Tuhshan, *Y. Tsiang 6673* (A, G, N). SIKANG: Si-chang District, *T. T. Yü 1249* (G); Hui-li District, *T. T. Yü 1392* (G). YUNNAN: Mengtze, *A. Henry 9942* (N); Tengyueh, *C. Schneider 2612* (G); central Yunnan, *J. F. Rock 6402* (G, N); Tali, *C. Schneider 3058* (G), *J. F. Rock 6631* (N); Fo-hai, *C. W. Wang 77113* (A); Che-li Hsien, *C. W. Wang 78710* (A), *79568* (A), *79882* (A); Mienning, *T. T. Yü 17746* (A). KWANGSI: Hin Yen, Yeo Mar Shan, *R. C. Ching 7255* (N); Yung District, *Steward & Cheo 932* (G, N); Wait-sap District, *W. T. Tsang 22733* (G). KIANGSI: Kiukiang, *A. Allison 9* (G); Nanchang, *T. N. Hsiung 495* (G); between Ningtu and Ki-an, *Wang-Te-Hui 499* (A); Fengcheng, *Y. Tsiang 10254* (N); Anyi, *Y. Tsiang 10534* (N); Pai-shou District, *Y. W. Taam 65* (A); Kien-nan District, *S. K. Lau 4314* (G). KWANGTUNG: Hongkong, *C. Wright s. n.* (G, N); Canton, *C. O. Levine 1174* (G), *1422* (G), *3016* (A), *Y. Tsiang 1799* (N); Lin District, *C. O. Levine 3414* (G); Wung-yuen District, *S. K. Lau 2364* (G); Yang-shan District, *T. M. Tsui 730* (N); Kao-yao District, *S. Y. Lau 20173* (N); Ma Hou Ho, Shih Wan Tai Shan, *H. Y. Liang 69544* (A); Hwei-yang District, Lin Fa Shan, *W. T. Tsang 25688* (A). HAINAN: Fan Ta, *F. A. McClure 9147* (A); Ching-mai District, *C. I. Lei 639* (N), *807* (N); Dung Ka, *N. K. Chun & C. L. Tso 43344* (N); Fan Yah, *N. K. Chun & C. L. Tso 44005* (G, N); Yaichow, *H. Y. Liang 62350* (N), *F. C. How 70636* (N); Lam-ko District, *W. T. Tsang 15736* (N), *17021* (G). FUKIEN: Kuliang Hills, *J. B. Norton 1335* (G); Amoy, *H. H. Chung 6127* (A).

Tropical Asia and Malaysia.

A common species, readily distinguished by its narrow leaves.

2. **Osbeckia crinita** Benth. apud Wall. List no. 4066. 1829, nom. nud.; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 517. 1879; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 299. 1887; Cogn. in DC. Monogr. Phan. **7:** 323. 1891; Pritzel, Bot. Jahrb. **29:** 484. 1900; Dunn & Tutcher, Kew Bull. Add. Ser. **10:** 106. 1912; Guillaum. in Lecomte, Not. Syst. **2:** 308. 1913, Bull. Soc. Bot. France **60:** 402. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 871. 1921; Rehd. & Wils. in Sargent, Pl. Wils. **2:** 421. 1915; Chung, Mem. Sci. Soc. China **1:** 185. 1924; Hand.-Maz. Symb. Sin. **7:** 597. 1933; Rehd. Jour. Arnold Arb. **15:** 109. 1934.

Osbeckia stellata sensu Naud. Ann. Sci. Nat. III. Bot. **14:** 72. 1850; Hance, Jour. Bot. **16:** 107. 1878; non Wall.

Osbeckia crinita Benth. var. *yunnanensis* Cogn. in DC. Monogr. Phan. **7:** 324. 1891; Guillaum. in Lecomte, Not. Syst. **2:** 308. 1913; H. Lév. Fl. Kouy-Tchéou 277. 1914, Cat. Pl. Yun-Nan 176. 1916.

Osbeckia yunnanensis Franch. ex Cogn. in DC. Monogr. Phan. **7:** 324. 1891, pro syn.; Craib, Notes Bot. Gard. Edinb. **10:** 57. 1917.

Melastoma Mairei H. Lév. Repert. Sp. Nov. **11:** 300. 1912.

Osbeckia Mairei Craib, Notes Bot. Gard. Edinb. **10:** 54. 1917, syn. nov.

Osbeckia robusta Craib, l.c., syn. nov.

HUPEH: Western Hupeh, *E. H. Wilson 2558* (A, N). HUNAN: Sin-ning District, *C. S. Fan & Y. Y. Li 505* (A). KIANGSI: From Tsoongjen to Ihwang, *Y. Tsiang 10001* (N); Ihwang, *Y. Tsiang 10034* (N). SZECHUAN: Kiating, *E. H. Wilson 3260* (A); Mt. Omei, *W. P. Fang 2300* (A), *Y. S. Liu 1011* (A), *T. C. Peng 191* (A), *C. Y. Chiao & S. C. Fan 38* (A); Han-yuan District, *W. P. Fang 3766* (A). SIKANG:

Si-chang District, *T. T. Yü 1223* (G); Ya-an, *C. Y. Chiao 1208* (A). KWEICHOW: Kweiting, *Y. Tsiang 5358* (A, N); Tsung-yi District, *Steward, Chiao & Cheo 37* (N); Hsufeng, Lan-won-san, *S. W. Teng 90593* (A). YUNNAN: No precise locality, *F. Ducloux 475* (N), *J. C. Liu & C. Wang 81806* (A), *M. K. Li 2169* (A); Yungchang, *C. Schneider 2559* (G); Mengtze, *A. Henry 9978* (N); Szemao, *A. Henry 12458* (A, N); Tchouan-se-pa, *E. E. Maire s. n.* (holotype of *Melastoma Mairei* H. Lév. and *Osbeckia Mairei* Craib, photo. and merotype, A); west of Tali, *J. F. Rock 6366* (G); west of Mekong, *J. F. Rock 6972* (A); Pi-tsieh District, *H. T. Tsai 52761* (A); Tali, *H. T. Tsai 53889* (A); Ping-pien District, *H. T. Tsai 62422* (A); Shang-pa District, *H. T. Tsai 58936* (A); Kengma, *T. T. Yü 17279* (A). KWANGSI: Hin Yen, Tsin Hung Shan, *R. C. Ching 6930* (N); Yung District, *Steward & Cheo 919* (G, N); Wait-sap District, *W. T. Tsang 22825* (G), *23264* (A); Ling-chuan District, *W. T. Tsang 27864* (A); Kwei-lin District, *W. T. Tsang 28098* (A); Pai-shou District, *Y. W. Taam 28* (A). KWANGTUNG: Lienchow River, *C. Ford (Hongk. Herb.) 1782* (A); Lungtou Shan, Shaochow, *H. Handel-Mazzetti 704* (A); Canton, *C. O. Levine 1789* (G); Yang-shan District, *T. M. Tsui 663* (A, N); Wung-yuen District, *S. K. Lau 2239* (A); Loh-chang District, *W. T. Tsang 20756* (N); Shih Wan Tai Shan, *H. Y. Liang 69667* (A). FUKIEN: Northern Fukien, near the Chekiang border, *R. C. Ching 2261* (G).

India, Siam, Indo-China.

Guillaumin refers all the Chinese specimens to *Osbeckia crinita* var. *yunnanensis* Cogn., which Craib recognized as a species, *Osbeckia yunnanensis* Franch.; but I believe, with Handel-Mazzetti and Rehder, that there are no essential differences between the Indian and Chinese plants. Two of Craib's species are here reduced to synonymy, one, *Osbeckia Mairei* Craib, on the strength of a photograph and fragments of *E. E. Maire s. n.* from the Edinburgh herbarium, and another, *Osbeckia robusta* Craib, on the basis of the description alone. The latter was based on *G. Forrest 8561*, of which I have seen no specimen. Craib's description conforms to the characters of *Osbeckia crinita* Benth., which is widespread and more or less variable.

3. **Osbeckia stellata** Wall. List no. 4062. 1829, nom. nud.; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 517. 1879; Chung, Mem. Sci. Soc. China **1:** 185. 1924; Hand.-Maz. Symb. Sin. **7:** 597. 1933.

Osbeckia crinita sensu Naud. Ann. Sci. Nat. III. Bot. **14:** 72. 1850, non Benth.

YUNNAN: No data, *H. T. Tsai 59000* (A), *61397* (A); Shang-pa District, *H. T. Tsai 54607* (A), *58822* (A), *58884* (A); Salween-Kiukiang Divide, *T. T. Yü 20374* (A).

India, Siam.

Many authors, including Guillaumin (in Lecomte, Fl. Gén. Indo-Chine **2:** 871. 1921), consider this species as synonymous with *Osbeckia crinita* Benth., but if the above determinations are correct, it is certainly different from the latter. Clarke (l. c.) has clearly pointed out the confusion that has existed and the difference between the two species. *Osbeckia stellata* Wall., as I interpret it here, differs from *Osbeckia crinita* Benth. chiefly in the hairs covering the calyx-tubes being appressed, stellate, or pectinate in the former and spreading, long-stalked, and stellate in the latter.

4. **Osbeckia nepalensis** Hook. f. Exot. Fl. **1:** *t. 31.* 1823; DC. Prodr. **3:** 142. 1828; Triana, Trans. Linn. Soc. **28:** 55. 1871; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 521. 1879; Cogn. in DC. Monogr. Phan. **7:** 317. 1891; Guillaum. in Lecomte, Not. Syst. **2:** 307. 1913, Bull. Soc. Bot. France **60:** 401. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 868. 1921; Chung, Mem. Sci. Soc. China **1:** 185. 1924.

YUNNAN: Mengtze, *A. Henry 11026* (A, N); Szemao, *A. Henry 12309* (N); Luchang, *G. Forrest 874* (A); from Pingpo to Youngchang and Tengyueh, *J. F. Rock 7021* (N); between Tengyueh and Lungling, *J. F. Rock 7092* (A); Chi-tze-lo, *H. T. Tsai 54202* (A); Ping-pien District, *H. T. Tsai 61505* (A); Che-li District, *C. W. Wang 79451* (A); no data, *M. K. Li 1701* (A). KWANGSI: Lin-yen, *R. C. Ching 6762* (A).

India, Siam, Indo-China.

This is distinguished from the other Chinese species by its pentamerous flowers.

5. **Osbeckia melastomatoides** Merr. & Chun, Sunyatsenia **2:** 293. 1931.

HAINAN: Mo San Ling, *N. K. Chun & C. L. Tso 44310* (ISOTYPE, A); Po-ting, *F. C. How 72029* (A); no precise locality, *C. Wang 34643* (N), *35035* (N), *35861* (A, N), *H. Y. Liang 64180* (A, N), *64182* (A, N).

This is apparently an anomalous species. Merrill and Chun mention that "In general aspects this strongly resembles various species of *Melastoma*, but by its floral and fruit characters is an *Osbeckia*. It does not seem to be closely allied to any previously described form." The straight seeds and the concave 4-valved fruit suggest the tribe Sonerileae but I cannot refer it to any genus of that tribe. The general appearance of the plant is strongly indicative of the Melastomatoideae.

2. MELASTOMA

Melastoma Linnaeus, Sp. Pl. 389. 1753.

A. Calyx provided with simple appressed hairs.
  B. Young stems glabrous or with short appressed hairs; leaves small, generally less than 5 cm. long; calyx-hairs appressed.
    C. Leaves glabrous above or with a row of hairs along the margins only. ..... 1. *M. dodecandrum.*
    CC. Leaves covered with short patent hairs all over above.
      D. Calyx more or less densely covered with hairs, the teeth 9 × 1.5 mm. ..... 2. *M. intermedium.*
      DD. Calyx sparsely covered with hairs, the teeth 7 × 2.5 mm. ..... 3. *M. suffruticosum.*
  BB. Young stems densely or sparsely covered with long harsh hairs, their bases spreading; leaves large, 10–15 cm. long or more; calyx-hairs long, spreading.
    C. Hairs on young stems and calyx very dense; leaves densely hairy on both surfaces. ..... 4. *M. penicillatum.*
    CC. Hairs on young stems very sparse; leaves nearly glabrous beneath. ..... 5. *M. sanguineum.*
AA. Calyx provided with scales or long branching or denticulate hairs.
  B. Hairs on stems long, spreading; leaf-base narrow, rounded to acute, 3–5-nerved; calyx densely covered with long or scale-like denticulate hairs. ..... 6. *M. normale.*
  BB. Hairs on stems short, scaly, more or less appressed.
    C. Leaves densely long-pubescent beneath; leaf-base cordate, 5–7-nerved; calyx-hairs long, denticulate. ..... 7. *M. candidum.*
    CC. Leaves short-pubescent beneath; leaf-base narrow, acute to attenuate, 3–5-nerved; calyx-hairs long or scaly. ..... 8. *M. polyanthum.*

1. **Melastoma dodecandrum** Lour. Fl. Cochinch. 274. 1790, ed. Willd. 336. 1793; Hand.-Maz. Symb. Sin. **7:** 597. 1933; Merr. Trans. Am. Philos. Soc. II. **24**(2)**:** 287. 1935.

Melastoma repens Desr. in Lam. Encycl. **4:** 54. 1796; Hance, Jour. Bot. **7:** 296. 1869; Triana, Trans. Linn. Soc. **28:** 58. 1871; Benth. Fl. Hongk. 113. 1861; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 300. 1887; Cogn. in DC. Monogr.

Phan. **7:** 344. 1891; Guillaum. in Lecomte, Not. Syst. **2:** 317. 1913, Bull. Soc. Bot. France **60:** 402. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 886. 1921; Chung, Mem. Sci. Soc. China **1:** 185. 1924.

KIANGSI: Lingchuan, *Y. Tsiang 9856* (N); Kien-nan District, *S. K. Lau 3990* (A). KWEICHOW: Kweiting, *Y. Tsiang 5437* (N); Tuhshan, *Y. Tsiang 6594* (N). HUNAN: Chang-ning District, *C. S. Fan & Y. Y. Li 2* (G). KWANGSI: South of Nanning, Shih Wan Tai Shan, *R. C. Ching 8022* (N); Yung District, *Steward & Cheo 735* (A, N); Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 22331* (A, G), *22496* (A). KWANGTUNG: Hongkong, *O. Kuntze 3566* (N), *C. Wright s. n.* (G, N), *Hance 670* (G); Lofaushan, *C. Ford s. n.* (N); Honam Island, *C. O. Levine 723* (G); Kochow, *Y. Tsiang 2261* (N); Yang-shan District, *T. M. Tsui 549* (N); Lohchang, *C. L. Tso 21007* (A, N), *W. T. Tsang 20860* (N); Wung-yuen District, *S. K. Lau 2080* (G); Lingnan Campus, *W. T. Tsang 19065* (N); Tseng-shing District, *W. T. Tsang 20401* (N); Ta-pu District, *W. T. Tsang 21024* (A, N); Lung-men District, *W. T. Tsang 25346* (A); Hai-fung District, *W. T. Tsang 25591* (A). FUKIEN: Foochow, *Dunn (Herb. Hongk.) 2705* (A); Kushan, *H. H. Chung 3737* (A); Amoy, *H. H. Chung 1703* (A), *4958* (A); Yenping, *H. H. Chung 2824* (A), *3465* (A), *3621* (A); Kuliang, *H. H. Chung 6433* (A). CHEKIANG: Tientai Shan, *C. Y. Chiao 1492* (N).

Indo-China.

A common and distinct species, well characterized by its small ovate leaves, which are almost totally glabrous. In habit it is very unlike all of the other species, being a low spreading plant, while the others are all erect shrubs.

2. **Melastoma intermedium** Dunn, Jour. Linn. Soc. Bot. **38:** 360. 1908; Guillaum. in Lecomte, Not. Syst. **2:** 317. 1913, Bull. Soc. Bot. France **60:** 402. 1913; Chung, Mem. Sci. Soc. China **1:** 185. 1924.

FUKIEN: Yengping, *Dunn (Hongk. Herb.) 2706* (ISOTYPE, A); Foochow, Kuliang, *J. B. Norton 1333* (G, A), *H. H. Chung 6769* (A, N); Minchow, *H. H. Chung 2745* (A). Known only from Fukien Province.

3. **Melastoma suffruticosum** Merr. Lingnan Sci. Jour. **14:** 42. 1935.

KWANGSI: Nanning to Shang-sze, *R. C. Ching 7771* (A). HAINAN: Ngai District, *S. K. Lau 247* (ISOTYPE, A); Kumyun, *S. K. Lau 27841* (A); Yaichow, *H. Y. Liang 62880* (A, N), *N. K. Chun & C. L. Tso 44797* (A, N). As yet unrecorded from elsewhere.

4. **Melastoma penicillatum** Naud. Ann. Sci. Nat. III. Bot. **13:** 280. 1849; Cogn. in DC. Monogr. Phan. **7:** 346. 1891; Merr. Enum. Philip. Fl. Pl. **3:** 187. 1923; Merr. & Chun, Sunyatsenia **5:** 145. 1940.

HAINAN: No precise locality, *C. Wang 35716* (A, N), *H. Y. Liang 64392* (N), *64761* (N); Yai District, *S. K. Lau 6321* (A); Bak Sa, *S. K. Lau 25889* (A).

Philippines.

A distinct species, characterized by the dense, long, harsh, more or less purplish hairs covering the young branches and the calyces.

5. **Melastoma sanguineum** Sims, Bot. Mag. **48:** *t. 2241*. 1821; DC. Prodr. **3:** 145. 1828; Triana, Trans. Linn. Soc. **28:** 60. 1871; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 524. 1879; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 300. 1887; Chung, Mem. Sci. Soc. China **1:** 185. 1924.

Melastoma decemfidum Roxb. Hort. Beng. 90. 1814, nom. nud., Fl. Ind. **2:** 406. 1824; Jack, Trans. Linn. Soc. **14:** 6. 1823; DC. Prodr. **3:** 146. 1828; Benth. Fl. Hongk. 114. 1861; Cogn. in DC. Monogr. Phan. **7:** 345. 1891; Guillaum. in Lecomte, Not. Syst. **2:** 315. 1913, Bull. Soc. Bot. France **60:** 402. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 883. 1921; Merr. Lingnan Sci. Jour. **5:** 138. 1927.

KWANGSI: Shih Wan Tai Shan, *R. C. Ching 7820* (A, N), *8051* (A), *W. T. Tsang 22462* (A), *22522* (A), *23843* (A, N). KWANGTUNG: Hongkong, *C. Wright s. n.* (G), *E. Faber s. n.* (N), *C. S. Sargent s. n.* (A), *W. Y. Chun 5025* (A), *Y. Tsiang 277* (A); Kowlon, *T. N. Liou 705* (N); Canton, *E. Faber s. n.* (A, N), *C. O. Levine 1663* (G), *1937* (G, A); Ting-wu Shan, *C. O. Levine 90* (A), *W. Y. Chun 6393* (A), *H. T. Ho 60023* (N); Wong Lan To, *F. A. McClure 7189* (A); Kao-yao District, *S. Y. Lau 20197* (N); Luichow, Pon-tan, *Y. Tsiang 2565* (A); Hwei-yang District, *W. T. Tsang 25663* (A), *25811* (A). HAINAN: No precise locality, *C. Wang 32782* (N), *32799* (N), *34147* (N), *36117* (N), *36268* (N), *H. Y. Liang 63333* (A, N), *64467* (N), *65032* (N); Nodoa, *F. A. McClure 8042* (A); Tan District, *S. K. Lau 1077* (A, N); Changkiang District, *S. K. Lau 3106* (A); Kan-en District, *S. K. Lau 3427* (A), *5110* (A); Po-ting, *P. S. Lo 62405* (A, N); Ching-mai District, *C. I. Lei 178* (N), *710* (N); Yaichow, *H. Y. Liang 62005* (N), *62405* (N), *F. C. How & N. K. Chun 70267* (N); Dam-ka, *N. K. Chun & C. L. Tso 43420* (N); Lam-ko District, *W. T. Tsang 15670* (A, N); Lai Area, Hung Mo Shan, *Tsang, Tang & Fung 17588* (A, N).

Indo-China, Malay Peninsula, Java, Sumatra, Borneo.

6. **Melastoma normale** D. Don, Prodr. Fl. Nepal. 220. 1825; DC. Prodr. **3:** 145. 1828; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 524. 1879; Cogn. in DC. Monogr. Phan. **7:** 352. 1891; Guillaum. in Lecomte, Not. Syst. **2:** 319. 1913, Bull. Soc. Bot. France **60:** 402. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 889. 1921; H. Lév. Fl. Kouy-Tchéou 227. 1914, Cat. Pl. Yun-Nan 176. 1916; Rehd. & Wils. in Sargent, Pl. Wils. **2:** 241. 1915; Chung, Mem. Sci. Soc. China **1:** 185. 1924; Merr. Lingnan Sci. Jour. **5:** 138. 1927; Hand.-Maz. Symb. Sin. **7:** 596. 1933; Rehd. Jour. Arnold Arb. **15:** 109. 1934.

Melastoma Cavaleriei H. Lév. Repert. Nov. Sp. **3:** 21. 1906.

Melastoma Esquirolii H. Lév. Repert. Sp. Nov. **8:** 61. 1910.

SZECHUAN: No precise locality, *A. Henry 8976* (G); *E. H. Wilson 3259* (A, G), *4907* (A); banks of the Yangtze River, *E. H. Wilson 3648* (A); Ki-kiang District, *W. P. Fang 1292* (A), Lo-shan District, *W. P. Fang 2286* (A). YUNNAN: No precise locality, *G. Forrest 7510* (A), *9831* (A), *H. T. Tsai 55842* (A); Mengtze, *A. Henry 10954* (A, N); Manhao, *H. Handel-Mazzetti 5846* (A); Kien-shuei District, *H. T. Tsai 53059* (A); Shih-ping District, *H. T. Tsai 53358* (A); Ping-pien District, *H. T. Tsai 55123* (A), *62127* (A); Lung-ling District, *H. T. Tsai 55708* (A), *55781* (A); Mong-ka, *H. T. Tsai 56449* (A); Lu-se, *H. T. Tsai 56954* (A); Chen-kang District, *C. W. Wang 72546* (A). KWANGSI: I-shan, *R. C. Ching 5172* (A, N); Lin-yuin District, *A. N. Steward & C. C. Cheo 561* (N); Yao Shan, Pin Nan, *C. Wang 39175* (A); Sui-luk District, *W. T. Tsang 21898* (A); Shang-sze District, *W. T. Tsang 21993* (A), *22198* (A). KWANGTUNG: Ting-wu Shan, *W. Y. Chun 6294* (A); Tung-koon District, *S. Y. Lau 20008* (N); Tsing-yun District, *Y. F. Chun 30481* (N); Chung-shan District, *W. T. Tsang 19260* (N); Ho-yuen District, *W. T. Tsang 28714* (A), *58635* (A).

Formosa, Indo-China, Siam, Borneo, and the Philippines to the New Hebrides.

In the herbarium this species is sometimes confused with *Melastoma candidum* D. Don. It may be distinguished from the latter by its long, spreading hairs instead of short, scaly, more or less appressed ones on the stem, and the narrow, rounded to acute instead of cordate leaf-bases.

7. **Melastoma candidum** D. Don, Mem. Wern. Soc. **4:** 288. 1823; DC. Prodr. **3:** 145. 1828; Benth. in Hook. Kew Jour. Bot. **4:** 116. 1852; Triana, Trans. Linn. Soc. **28:** 60. 1871; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 299. 1887; Cogn. in DC. Monogr. Phan. **7:** 348. 1891; Guillaum. in Lecomte, Not. Syst. **2:** 313. 1913, Bull. Soc. Bot. France **60:** 402. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 880. 1921; Chung, Mem. Sci. Soc. China **1:** 184. 1924.

Melastoma septemnervium Lour. Fl. Cochinch. 273. 1790, ed. Willd. 335. 1793; Merr. Lingnan Sci. Jour. **5:** 138. 1927, Trans. Am. Philos. Soc. II. **24**(2): 287. 1935; non Jacq. (1760).

Melastoma macrocarpon sensu Benth. Fl. Hongk. 113. 1861, non D. Don.

KWANGTUNG: Hongkong, *C. Wright s. n.* (G, N), *Ford s. n.* (A), *C. S. Sargent s. n.* (A), *W. T. Brigham s. n.* (G); Kowlon, *T. N. Liou 727* (N); Whampoa, *S. Williams s. n.* (G); Canton, *C. O. Levine 783* (A, G); Ting-wu Shan, *Levine & Groff 38* (A); Heung Shan, *W. Y. Chun 12* (N); Kochow, *Y. Tsiang 2081* (N); Lofaushan, *S. P. Ko 50048* (N); Kao-yao District, *S. Y. Lau 20271* (A, N); Ma Hou Ho, *H. Y. Liang 69572* (A); Taai Ue Shan, *W. T. Tsang 16528* (A); Ta-pu District, *W. T. Tsang 21608* (A); Hwei-yang District, *W. T. Tsang 25852* (A). KWANGSI: Hin Yen, *R. C. Ching 6965* (A, N); Poseh, Bako Shan, *R. C. Ching 7417* (A); Nanning to Shang-sze, *R. C. Ching 7756* (A); Shang-sze District, *W. T. Tsang 23882* (A, N), *23965* (A, N), *24530* (A, N). HAINAN: No precise locality, *A. Henry s. n.* (G), *C. Wang 32831* (N), *35225* (N); southern slope of Five Fingers Mt., *F. A. McClure 9410* (A); Ling-shui District, *S. K. Lau 1* (A, N); Chang-kang District, *S. K. Lau 1907* (A, N), *C. I. Lei 665* (A, N), *676* (N), *879* (N); Yaichow, *F. C. How 70552* (A, N), *H. Y. Liang 62384* (N); Po-ting, *S. P. Ko 52158* (A, N), *F. C. How 71930* (A), *72840* (A); Dung Ka, *N. K. Chun & C. L. Tso 43428* (A, N); Taam-chau District, *W. T. Tsang 17172* (A); Lam-ko District, *W. T. Tsang 15826* (A, N); Ching-mai District, *C. I. Lei 636* (N). FUKIEN: No precise locality, *H. H. Chung 5091* (N), *7796* (N); Yengping, *Dunn (Hongk. Herb.) 2704* (A); Kuliang Hills, *J. B. Norton 1334* (A); Minchow, *H. H. Chung 2469* (A), *2744* (A).

Formosa, Indo-China.

The name *Melastoma septemnervium* Lour. is invalidated because of the earlier *M. septemnervium* Jacq. (1760) of the West Indies.

8. **Melastoma polyanthum** Blume, Flora **2**: 481. 1831, Mus. Bot. Lugd.-Bat. **1**: 55. *t. 6.* 1849; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2**: 523. 1879; Cogn. in DC. Monogr. Phan. **7**: 354. 1891; Guillaum. in Lecomte, Not. Syst. **2**: 322. 1913, Bull. Soc. Bot. France **60**: 403. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2**: 893. 1921; Chung, Mem. Sci. Soc. China **1**: 185. 1924.

SZECHUAN: Kiating, *S. S. Chien 5985* (A); Omei Shan, *Y. S. Liu 1025* (A). YUNNAN: Szemao, *A. Henry 11712* (A, N), *11712A* (A), *J. F. Rock 2701* (A), *2815* (A); Shung-kiang District, *C. W. Wang 72977* (A); Nan-chiao, *C. W. Wang 75023* (A); Fo-hai, *C. W. Wang 76099* (A); Shun-ning, *T. T. Yü 15937* (A). KWANGSI: Ling-yuin District, *Steward & Cheo 561* (A); south of Nanning, Shih Wan Tai Shan, *R. C. Ching 7909* (A, N); Ling-wun District, *S. K. Lau 28780* (A); Shing-an District, *Z. S. Chung 81831* (A). KWANGTUNG: Honam Island, *C. O. Levine 491* (A); Wat Shui Shan, *W. Y. Chun 7374* (A); San-on District, *T. M. Tsui 271* (A, N); Sin-fung District, *Y. W. Taam 848* (A); Ta-pu District, *W. T. Tsang 21173* (A, N), *21608* (N); Lung-men District, *W. T. Tsang 25338* (A), *25435* (A). HAINAN: Ching-mai District, *C. I. Lei 127* (N), *477* (N); Kan-en District, *S. K. Lau 3587* (A); Lam-ko District, *W. T. Tsang 15674* (A, N).

Indo-China, Siam, Malay Peninsula, Australia.

The Chinese specimens agree well with specimens representing Blume's species from tropical Asia and Malaysia, except that they have longer and more prominent calyx-lobes; they apparently represent a form of the species.

3. PLAGIOPETALUM

Plagiopetalum Rehder in Sargent, Pl. Wils. **3**: 452. 1917.

The genus *Plagiopetalum*, when described by Rehder, was placed in the Sonerileae with supposed relationships to *Fordiophyton* and *Sonerila*. Diels (Bot. Jahrb. **65**: 99–100. 1932) includes it in the Oxysporeae, which position I accept.

A. Leaves 3-nerved. .....1. *P. Esquirolii.*

AA. Leaves 5-nerved. ..... 2. *P. hainanense.*

1. **Plagiopetalum Esquirolii** (H. Lév.) Rehd. Jour. Arnold Arb. **15:** 110. 1934; Chun, Sunyatsenia **4:** 192. 1940; Merr. Brittonia **4:** 127. 1941.
Sonerila Esquirolii H. Lév. Bull. Soc. Bot. France **54:** 368. 1907, Repert. Sp. Nov. **11:** 494. 1913.
Barthea Cavaleriei H. Lév. Repert. Sp. Nov. **8:** 61. 1910, pro parte.
Barthea Blinii H. Lév. Repert Sp. Nov. **11:** 494. 1913.
Allomorphia Blinii Guillaum. Bull. Soc. Bot. France **60:** 87, 403. 1913; H. Lév. Fl. Kouy-Tchéou 276. 1914.
Plagiopetalum quadrangulum Rehd. in Sargent, Pl. Wils. **3:** 453. 1917; Chung, Mem. Sci. Soc. China **1:** 185. 1924.
Sonerila Henryi Kränzl. Viert. Nat. Ges. Zürich **76:** 152. 1931, syn. nov.
Plagiopetalum serratum Diels, Bot. Jahrb. **65:** 100. 1932.

SZECHUAN: Hung-ya District, *Wilson 3261* (A); Ma-pien District, *F. T. Wang 23602* (A). KWEICHOW: Nakan, Chengfeng, *Y. Tsiang 4581* (N); no precise locality, *Y. Tsiang 9344* (A). YUNNAN: Mengtze, *A. Henry 9077* (isotype of *Sonerila Henryi* Kränzl., A, N), *9077B* (A), *9077C* (A), *9077D* (N); south of Red River, *A. Henry 9721* (A, N); Szemao, *A. Henry 13520* (N); no locality, *G. Forrest 12006* (A); west of Tali, *J. F. Rock 6926* (A, N); Pingpo to Tengyueh, *J. F. Rock 7000* (A), *7015* (A); Champutong, *J. F. Rock 11514* (A), *C. W. Wang 67009* (A), *67337* (A); Cheng-kang District, *C. W. Wang 72176* (A); Keng-ma, *T. T. Yü 17282* (A); Kiukiang Valley (Taron), *T. T. Yü 19488* (A); Wen-shan District, *H. T. Tsai 51569* (A); Shang-pa District, *H. T. Tsai 56606* (A); Ping-pien District, *H. T. Tsai 62394* (A), *62559* (A). KWANGSI: Ching Sai Village, *S. P. Ko 55696* (A); Ling-wun District, *S. K. Lau 28650* (A).

Upper Burma.

This species has acquired a long list of synonyms over a period of only 25 years, to which another, *Sonerila Henryi* Kränzl., is now added. The species is quite variable and herbarium specimens are frequently misdetermined.

2. **Plagiopetalum hainanense** (Merr. & Chun) Merrill in herb. comb. nov.
Bredia hainanensis Merr. & Chun, Sunyatsenia **5:** 145. *t. 22.* 1940.

HAINAN: Po-ting, *F. C. How 72967* (HOLOTYPE, A); Bak Sa, *S. K. Lau 26587* (A).

This is the second species of the genus and also a new generic record for Hainan. The Hainan species is closely allied to *Plagiopetalum Esquirolii* (H. Lév.) Rehd., differing chiefly in the relatively broader, more or less distinctly 5-nerved instead of 3-nerved leaves.

4. ALLOMORPHIA

Allomorphia Blume, Flora **14:** 522. 1831.

1. **Allomorphia Balansaei** Cogn. in DC. Monogr. Phan. **7:** 1183. 1891; Guillaum. in Bull. Soc. Bot. France **60:** 87. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 901. 1921; Diels, Bot. Jahrb. **65:** 102. 1932.

KWANGSI: South of Nanning, Shih Wan Tai Shan, *R. C. Ching 7878* (N); Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 22673* (A), *23896* (A, N), *24315* (A, N); Yao Shan, *C. Wang 39927* (A); Ping-nan District, *C. Wang 40425* (A). KWANGTUNG: Tai Mien Shan, Shih Wan Tai Shan, *H. Y. Liang 69668* (A). HAINAN: No precise locality, *C. Wang 35614* (N); Yaichow, *H. Y. Liang 63063* (A, N); Loktung, *S. K. Lau 27308* (A), *26984* (A).

Indo-China.

2. **Allomorphia urophylla** Diels, Bot. Jahrb. **65:** 102. 1932.

YUNNAN: Mengtze, *A. Henry 9769* (A, N), *9769A* (ISOTYPE, A), *11448* (isopara-

type, A, N), *11448A* (A, N); Wen-shan District, *H. T. Tsai 51789* (A), Tsing-pien District, *H. T. Tsai 52453* (A), *52601* (A); Ping-pien District, *H. T. Tsai 61656* (A), *61118A* (A). Endemic.

3. **Allomorphia setosa** Craib, Kew Bull. **1913:** 68. 1913; Guillaum. Bull. Soc. Bot. France **60:** 403. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 900. 1921.
Oxyspora Howellii J. F. Jeffrey & W. W. Smith, Notes Bot. Gard. Edinb. **9:** 114. 1916, syn. nov.
Allomorphia Howellii Diels, Bot. Jahrb. **65:** 102. 1932, syn. nov.

YUNNAN: Szemao, *A. Henry 12993* (isosyntype, A); between Muang Hing and Maliping, *J. F. Rock 2741* (A); Kiukiang Valley (Taron), *T. T. Yü 20168* (A); Che-li District, *C. W. Wang 78331* (A), *79696* (A); Jenn-yeh District, *C. W. Wang 80132* (A), *80734* (A), *80832* (A).
Siam.

A species well characterized by the setose hairs present on the stems, petioles, and inflorescences.

Diels correctly transferred *Oxyspora Howellii* J. F. Jeffrey & W. W. Smith to *Allomorphia,* but he apparently overlooked *Allomorphia setosa* Craib of Siam and Yunnan. *Oxyspora Howellii,* on the basis of its original description, manifestly represents the same species as *A. setosa* Craib.

4. **Allomorphia flexuosa** Hand.-Maz. Sinensia **3:** 195. 1933.
Described from *R. C. Ching 7012* from Ling-yen, Kwangsi; no specimen seen.

5. **Allomorphia caudata** (Diels) comb. nov.
Anerincleistus ? caudatus Diels, Bot. Jahrb. **65:** 101. 1932.

YUNNAN: Mengtze, *A. Henry 10761* (ISOTYPE, A); Ping-pien District, *H. T. Tsai 60437* (A), *60563* (A), *61279* (A), *61591* (A). Endemic.

Diels doubtfully assigns this very striking plant to *Anerincleistus,* as fruits were lacking on his Henry specimens. Fruits are now known from *Tsai 61279* and *61591,* and, as they conform to those of *Allomorphia,* I therefore transfer the species to this genus. The long spicate inflorescences and the densely tomentose leaves are very characteristic. The somewhat immature fruits are globose to subglobose, about 2.5 mm. in diameter, hirsute, strongly 8-nerved, one-celled, many-seeded; seeds very minute, oblong, about 0.5 mm. long.

5. CYPOTHECA

Cypotheca Diels, Bot. Jahrb. **65:** 103. 1932.

1. **Cypotheca montana** Diels, Bot. Jahrb. **65:** 103. 1932.

YUNNAN: Mengtze, *A. Henry 10655* (ISOTYPE, A); Kien-shuei District, *H. T. Tsai 53115* (A); Tsang-yuan, *C. W. Wang 73206* (A); Shun-ning, *T. T. Yü 16241* (A), *16627* (A). Endemic.

In addition to the type, the four numbers from recent collections as listed above are referable to Diels' new genus. The fruit was unknown to him. *Yü 16627* is a specimen in young fruit. The fruit is completely enclosed by the calyx-tube, which is turbinate, about 6 mm. long and 5 mm. wide, and slightly furfuraceous on the outside. The capsule is 4-valved at the tip and slightly acute. The seeds are numerous and minute.

6. OXYSPORA

Oxyspora DeCandolle, Prodr. **3:** 123. 1828.

In addition to the well known species *Oxyspora paniculata* DC., two new ones are here added which may be differentiated by the following key:

A. Plants more or less hairy on the branches; leaf-bases broadly acute to rounded or cordate, with a tuft of hairs on the upper surface at the base where the petiole joins the leaf.
  B. Leaf-bases subcordate to cordate; leaves more or less stellate-pubescent beneath. ..... 1. *O. paniculata.*
 BB. Leaf-bases broadly acute to rounded; leaves glabrous beneath. .... 2. *O. yunnanensis.*
AA. Plants essentially glabrous; leaf-bases acute to subrounded, with a small basal tuft of hairs. ..... 3. *O. glabra.*

1. **Oxyspora paniculata** DC. Prodr. **3:** 123. 1828, Mém. Melást. 33. *t. 4.* 1828; Wall. Pl. As. Rar. **1:** *t. 88.* 1830; Triana, Trans. Linn. Soc. **28:** *t. 62a.* 1871; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 525. 1879; Cogn. in DC. Monogr. Phan. **7:** 471. 1891; H. Lév. Cat. Pl. Yun-Nan 176. 1916; Guillaum. Bull. Soc. Bot. France **60:** 404. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 907. 1921; Diels, Bot. Jahrb. **65:** 104. 1932; Hand.-Maz. Symb. Sin. **7:** 597. 1933; Rehd. Jour. Arnold Arb. **15:** 110. 1934; Chun, Sunyatsenia **4:** 192. 1940.

Bredia soneriloides H. Lév. Repert. Sp. Nov. **9:** 21. 1910.

Sonerila Cavaleriei H. Lév. l.c. pro syn. *Bredia soneriloidis;* op. cit. **11:** 494. 1913.

YUNNAN: Mengtze, *A. Henry 9010* (A, N), *9010B* (N), *11284* (A, N); Szemao, *A. Henry 12508* (A), *12508A* (A), *C. Schneider 2554* (A); Mopo, *J. F. Rock 2901* (A); no precise locality, *G. Forrest 7677* (A), *7680* (A); from Pingpo to Yung-chang, *J. F. Rock 7025* (A); Chugai, *J. F. Rock 2997* (A); Wen-shan District, *H. T. Tsai 51470* (A), *51600* (A); Chi-tze-lo, *H. T. Tsai 54260* (A); Shang-pa, *H. T. Tsai 54754* (A), *58905* (A), *58971* (A); Lung-ling District, *H. T. Tsai 55009* (A); Lu-se District, *H. T. Tsai 56929* (A); Ping-pien District, *H. T. Tsai 60937* (A), *61470* (A), *62287* (A); Shun-ning District, *C. W. Wang 71869* (A); Cheng-kang District, *C. W. Wang 72525* (A); Keng-ma, *C. W. Wang 72899* (A); Jenn-yeh District, *C. W. Wang 80381* (A), *80756* (A); Kiukiang Valley (Taron), *T. T. Yü 20196* (A); no precise locality, *J. C. Liu & C. Wang 82743* (A). KWEICHOW: No locality, *S. W. Teng 91064;* Chengfeng, *S. W. Teng 90935* (A); Lolu, *Y. Tsiang 7209* (A, N). KWANGSI: East of Lin-yen, Lau Lon, *R. C. Ching 6642* (A); Wei-chen, south of Hoo-chi, *R. C. Ching 6648* (A); Ching Sai, *S. P. Ko 55517* (A); Ling-yuin District, *S. K. Lau 28595* (A).

India, Indo-China.

Some of the specimens have been referred to as *Oxyspora cernua* Hook. f. & Thomson, but I fail to note any constant difference between these two supposedly distinct species; nor is there any clear distinction indicated in the published description of Hooker f. & Thomson's species.

2. **Oxyspora yunnanensis** sp. nov.

Frutex circiter 1–1.75 m. altus, ramulis brunneis teretibus hirsuto-ciliatis; foliis chartaceis petiolatis oppositis inaequalibus vel aequalibus, glabris laminae basi ciliata excepta, oblongo-ovatis, 6–11 cm. longis, 2.5–4.2 cm. latis, supra viridibus, subtus paulo pallidioribus, acuminatis, basi late acutis vel rotundatis, 5-plinerviis, margine minute denticulatis vel subintegris, venis transversis utrinque subconspicuis; petiolo 0.5–1.3 cm. longo glabro canaliculato; inflorescentiis terminalibus paniculatis, 11–21 cm. longis, 6–7 cm. latis, glabris vel rarius parce ciliatis, pedicellis circiter 5 mm. longis, bracteis minutis linearibus 1.5–2.5 cm. longis, acuminatis; calycibus cupuliformibus, circiter 6 mm. longis, glabris, margine 4-dentatis, dentibus late triangularibus, 1.5 mm. longis; petalis 4, ovatis, circiter 10 mm. longis et 6 mm. latis, apice longe ciliato-acuminatis; staminibus 8: 4 violaceis longi-

oribus, antheris 8–9 mm. longis, filamentis 4–5 mm. longis; 4 luteis brevioribus, antheris circiter 4 mm. longis, filamentis 3–4 mm. longis, connectivo haud appendiculato; ovario inferiore, 4-loculari, stylo 1 cm. longo, stigmate inconspicuo; capsulis ellipticis, circiter 1 cm. longis et 5 mm. latis, 8-costatis; seminibus numerosis minutis.

YUNNAN: Kiukiang Valley, Chiengen, *T. T. Yü 19913* (TYPE, A), Aug. 20, 1938, a shrub 4 ft. high, among thickets, casual, alt. 1700 m., flowers rosy pink; Kiukiang Divide, Sochieh, *T. T. Yü 20850* (A), Oct. 26, 1938, a shrub 5 ft. high, margin of woods, common, alt. 1600 m., capsules greenish brown; Champutong, Bar-ru-lah, Salween-Kiukiang Divide, *C. W. Wang 67488* (A), Oct. 1935, under forest, alt. 2800 m., fruit green.

A species well characterized by its relatively small, ovate-oblong, glabrous leaves and long, narrow, and almost totally glabrous inflorescences save a few ciliate hairs occasionally found on the main axis.

3. **Oxyspora glabra** sp. nov.

Frutex glaber, circiter 1.5 m. altus, ramulis gracilibus teretibus brunneis ultimis 1.5 mm. diametro; foliis membranaceis petiolatis oppositis inaequalibus lanceolato-oblongis, 7.5–14 cm. longis, 3–4.2 cm. latis, glabris basi leviter ciliata excepta, longe acuminatis, basi acutis vel subrotundatis, margine minute denticulatis vel subintegris, 5-nerviis, nervis transversis supra subconspicuis, subtus distinctis; petiolo gracili 1–2 cm. longo glabro canaliculato; floribus ignotis; infructescentiis terminalibus paniculatis circiter 12 cm. longis et 4 cm. latis, pedicellis circiter 1 cm. longis, recurvis, capsulis ovoideis, circiter 7 mm. longis et 4 mm. latis, 8-costatis; seminibus falcatis numerosis minutis.

YUNNAN: Shang-pa District, *H. T. Tsai 56640* (TYPE, A), Sept. 27, 1933, a small shrub 5 ft. high, on open slope, alt. 2100 m.

A species characterized by its totally glabrous habit except a small tuft of ciliated hairs at the base of the leaf-blade, the long narrow membranaceous leaves, and the rather small and narrow panicles of fruits.

7. BARTHEA

Barthea Hooker f. in Benth. & Hook. f. Gen. Pl. **1**: 751. 1867.

The genus *Barthea* is well characterized by its bisetose anthers and 4-angled fruits. There are two species in the genus, one in Formosa and one in southern China.

1. **Barthea Barthei** (Hance) Krasser in Engl. & Prantl, Nat. Pflanzenfam. **3**(7): 175. 1893.

   Dissochaeta Barthei Hance in Benth. Fl. Hongk. 115. 1861, Jour. Linn. Soc. Bot. **8**: 103. 1867.

   Barthea chinensis Hook. f. in Benth. & Hook. f. Gen. Pl. **1**: 751. 1867; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23**: 300. 1887; Guillaum. Bull. Soc. Bot. France **60**: 404. 1913; Chung, Mem. Sci. Soc. China **1**: 185. 1924; Metcalf, Lingnan Sci. Jour. **12**: 155. 1933; Diels, Bot. Jahrb. **65**: 104. 1932.

KWANGSI: Me-kon, Shih Wan Tai Shan, south of Nanning, *R. C. Ching 8436* (A, N); Yao Shan, Tseungyuen, *C. Wang 39448* (A); Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 22372* (A), *22566* (A), *24306* (A, N), *24379* (A, N), *24619* (A, N), *24746* (A, N). KWANGTUNG: Taimoshan, *Hongk. Herb. 7039* (A); Hongkong, *Wilford s. n.* (G), *Y. Tsiang 41* (A, N), *N. K. Chun 40153* (N); Lofaushan, *Herb. Bur. Sci. Manila 10992* (N); *Canton Christian Coll. 6890* (N); Pan Ling Tsze, *W. Y. Chun 5943* (A); Shih Wan Tai Shan, *C. L. Tso 23570* (N).

The accepted name is almost but not quite a duplicate binomial; under the International Code it is the valid one for the species.

8. BLASTUS

Blastus Loureiro, Fl. Cochinch. 526. 1790.

The genus *Blastus* is divided by Diels (Bot. Jahrb. **65:** 104–107. 1932) into two sections: *Desmoblastus* and *Thyrsoblastus*.

Section I. *Desmoblastus* Diels

This section is typified by *Blastus cochinchinensis* Lour. as consisting of species with axillary inflorescences, generally sessile or sometimes in pedunculate cymes as in *B. Cogniauxii* Stapf, a species extending from Borneo to Indo-China and Hainan. In addition to these two species, Diels describes two new ones, *B. tenuifolius* and *B. setulosus* from Yao Shan, Kwangsi, of which I have seen no specimens. Three species from Yunnan and one from Kwangsi are herein described as new. They all have axillary sessile inflorescences. Although complete material is not available in all cases, nevertheless, each has certain definite characteristics and they safely appear to represent distinct forms.

The section includes the species numbered 1–8 in this treatment.

Section II. *Thyrsoblastus* Diels

As Diels points out (Bot. Jahrb. **65:** 106–107. 1932), the characters of the species of the section *Thyrsoblastus* are uncertain and further study is needed. A careful examination of all available material, including certain type specimens, shows that the various species proposed in this group are for the most part difficult to distinguish except by certain details in the floral parts, and these parts are mostly inadequately described in various published diagnoses. It is obviously open to question whether or not the characters currently used for this section are strong enough for species segregation. One new species is proposed, distinguished from the others by its general appearance as well as in certain details. It is apparently nearer to *Oxyspora*, a closely related genus, than are the other species.

The section includes the species numbered 9–15 in this treatment.

1. **Blastus cochinchinensis** Lour. Fl. Cochinch. 526. 1790; Seem. Jour. Bot. **1:** 281. 1863; Hance, Jour. Linn. Soc. Bot. **8:** 103. 1867; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 528. 1879; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 301. 1887; Cogn. in DC. Monogr. Phan. **7:** 476. 1891; Guillaum. Bull. Soc. Bot. France **60:** 89, 403. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 896. 1921; H. Lév. Fl. Kouy-Tchéou 276. 1914; Chung, Mem. Sci. Soc. China **1:** 185. 1924; Merr. Lingnan Sci. Jour. **5:** 138. 1927, Trans. Am. Philos. Soc. II. **24**(2): 288. 1935; Diels, Bot. Jahrb. **65:** 105. 1932; Metcalf, Lingnan Sci. Jour. **12:** 155. 1933; Rehd. Jour. Arnold Arb. **15:** 111. 1934.

Anplectrum pauciflorum Benth. Fl. Hongk. 116. 1861.

Blastus parviflorus Triana, Trans. Linn. Soc. **28:** 74. *t. 6, f. 65.* 1871.

Blastus Marchandii H. Lév. Repert. Sp. Nov. **11:** 494. 1913.

KWANGSI: Tang Han, *R. C. Ching 6555* (A, N); Yung District, *Steward & Cheo 776* (A, N); Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 22463* (A), *24134* (A, N); Sun-to District, *W. T. Tsang 22970* (A). KWANGTUNG: Hongkong, *C. Wright s. n.* (N); Ting-wu Shan, *Sampson (Herb. Hance) 13762* (G), *Levine & Groff 93*

(A, G), *Levine 3090* (A), *W. Y. Chun 6330* (A), *6504* (A), *Y. Tsiang 739* (A), *1569* (A, N), *S. Y. Lau 20189* (N), *T. N. Liou 854* (N); Chung-yuen District, *C. O. Levine 2091* (A); Sun-yi, *Y. Tsiang 2759* (N); Loh-chang, *C. L. Tso 20380* (N); Shih Wan Tai Shan, *H. Y. Liang 69569* (A), *70037* (A); Ta-pu District, *W. T. Tsang 21099* (A, N); Hwei-yang District, *W. T. Tsang 25751* (A); Wung-yuen District, *S. K. Lau 2582* (A). HAINAN: No precise locality, *C. Ford s. n.* (A, N), *C. Wang 33230* (N), *34528* (N), *35285* (N), *36376* (A, N); Nodoa, *McClure 8134* (A); Loktung, *S. K. Lau 27355* (A); Chang-kiang District, *S. K. Lau 1621* (A, N); Kan-en District, *S. K. Lau 3863* (A); Ching-mai District, *C. I. Lei 235* (A, N), *671* (N); Dung Ka, *N. K. Chun & C. L. Tso 43907* (A, N); Yaichow, *H. Y. Liang 62067* (A), *62077* (N), *62664* (N); Lam-ko District, *W. T. Tsang 15782* (A, N); Lai Area, Hung Mo Shan, *Tsang & Fung 17850* (A, N); Taam-chau District, *W. T. Tsang 17263* (A). FUKIEN: Fong Kong Tze, *Dunn (Hongk. Herb.) 2708* (A); Eng-lok District, *H. H. Chung 1374* (A), *L. Chen 67* (A); Yenping, *H. H. Chung 2696* (A), *3317* (A); Kushan, near Fuchow, *H. H. Chung 3702* (A), *6865* (A); Shanghang, *J. L. Gressitt 1698* (A).

India, Indo-China, Formosa.

2. **Blastus tenuifolius** Diels, Bot. Jahrb. **65:** 105. 1932.
Based on *S. S. Sin 3742* from Yao Shan, Kwangsi; no specimen seen.

3. **Blastus setulosus** Diels, Bot. Jahrb. **65:** 106. 1932.
Based on *S. S. Sin & K. K. Whang 686* from Yao Shan, Kwangsi; no specimen seen.

4. **Blastus latifolius** sp. nov.

Frutex circiter 1.3 m. altus, ramulis junioribus plus minusve quadrangularibus, fulvo-pilosis; foliis membranaceis, longe petiolatis, oblongo-ovatis, 7–11 cm. longis, 3.5–5.5 cm. latis, longe acuminatis, basi rotundatis vel subcordatis, 5-nerviis, integris, supra minute squamuloso-glandulosis, disperse setosis, subtus squamuloso-glandulosis, nervis et margine pilosis, venulis secundariis supra subconspicuis, subtus elevatis; petiolo 2–3 cm. longo, villoso; floribus ex axillis foliorum delapsorum, cymis circiter 5-floris, pedunculo 2–3 mm. longo praeditis; calyce turbinato, circiter 3 mm. longo, squamuloso-glanduloso, margine 5-lobato, lobis semi-rotundatis, circiter 1 mm. longis.

YUNNAN: Mengtze, *A. Henry 9058A* (TYPE, A), a shrub 4 ft. high, in forests, alt. 5000 ft., flowers pink.

This species is apparently very close to *Blastus tenuifolius* Diels, from Kwangsi, differing from the latter, according to its description, by the slightly thicker leaves with scattered setose hairs above instead of being glabrous and with shorter peduncles. The flowers of Diels' species are white, according to the collector. No petals are present on the type specimen of this new species, although the field note states "flowers pink."

5. **Blastus yunnanensis** sp. nov.

Frutex circiter 2 m. altus, ramulis junioribus subteretibus squamuloso-glandulosis; foliis membranaceis, longe petiolatis, oblongo-lanceolatis, 8–11 cm. longis, 2.5–3 cm. latis, longe acuminatis, basi longe attenuatis, margine integris, supra glabris vel parce setosis, subtus squamuloso-glandulosis, nervis primariis 3, marginalibus 2 gracilioribus additis, venis transversis supra inconspicuis, subtus prominulis; petiolo 1.5–4 cm. longo, squamuloso-glanduloso; floribus ex axillis foliorum delapsorum infra ramis foliatis ortis, cymis 3- vel 4-floris, parvis, pedunculo circiter 1 mm. longo; calyce turbinato, squamuloso-glanduloso, circiter 1.5 mm. longo, margine subintegro; petalis ovatis longe acuminatis, circiter 2.5 mm. longis; filamentis 2 mm.

longis, antheris oblongis, 2 mm. longis, apice subtruncatis, connectivo sub theca elongato, 0.5 mm. longo, leviter incrassato.

YUNNAN: Ping-pien District, *H. T. Tsai 60813* (TYPE, A), July 14, 1934, a shrub 6 ft. high, in ravine, alt. 1300 m., flowers rose-purple.

This species is near *Blastus setulosus* Diels (from the description), but it differs in the margins of the leaves being non-setulose, in the smaller flower parts, and more distinctly in the structure of the stamens.

6. **Blastus mollissimus** sp. nov.

Frutex, ramulis junioribus dense villosis; foliis tenuiter membranaceis longe petiolatis ovato-oblongis, 10–18 cm. longis, 5–8.5 cm. latis, longe acuminatis, basi rotundatis vel leviter cordatis, 5-nerviis, margine setulosis, supra disperse setosis, subtus pallide squamuloso-glandulosis, praecipue in venis mollissime villosis, nervis transversis supra subconspicuis, subtus prominulis; petiolo 2.5–7 cm. longo, dense villoso; floribus axillaribus, cymis circiter 3-floris; pedunculo circiter 2 mm. longo, villoso; calyce turbinato-campanulato, dense villoso, margine 4-lobato, lobis anguste lanceolatis, 2–3 mm. longis, dense villosis.

KWANGSI: Yao Shan, *C. Wang 40050* (TYPE, A), Oct. 12, 1936, a small shrub along stream side, fruit green, tomentose.

A species distinctly characterized by the densely villose tomentum on the stems, underside of the leaves, and the calyx. It is probably related to *Blastus setulosus* Diels, but it is distinguished, among other characters, by the much broader leaves.

7. **Blastus hirsutus** sp. nov.

Herba circiter 1 m. alta, ramulis junioribus subquadrangularibus vel 4-sulcatis, glabris; foliis subchartaceis, longe petiolatis, ovato-oblongis, 9–15 cm. longis, 6–9 cm. latis, longe acuminatis, basi late acutis vel rotundatis, 5–7-nerviis, margine setulosis, supra glabris, subtus minute squamuloso-glandulosis, venis transversis supra subconspicuis, subtus distinctis; petiolo 3–7 cm. longo, glabro; floribus haud visis; fructibus ex axillis foliorum delapsorum infra ramis foliatis ortis, cymis 3- vel 4-carpis, pedunculo circiter 1 cm. longo, glabro; calycibus persistentibus turbinato-campanulatis, subhirsutis, 5 mm. longis, margine 4-lobatis, lobis persistentibus, ovatis, 2 mm. longis, tenuibus; capsulis inclusis, apice acute 4-lobatis.

YUNNAN: Shang-pa District, *H. T. Tsai 54257* (TYPE, A), Sept. 17, 1933, *58672*, Oct. 20, 1934, herb to 4 ft. high, in forests, alt. 2500–2800 m., flowers pink, fruit red.

This species, although only fruiting material is available, seems to be remote from other species of the section in its herbaceous habit and its nearly glabrous leaves, which are setulose only along the margins and have very minute scaly glands only on the lower surface. The somewhat softly hirsute calyx, in fruit, has no scaly glands.

8. **Blastus Cogniauxii** Stapf in Hook. Ic. Pl. **24:** *t. 2311.* 1894; Guillaum. Bull. Soc. Bot. France **60:** 90, 403. 1913, et in Lecomte, Fl. Gén. Indo-Chine **2:** 1896. 1921.
Ochtocharis parviflora Cogn. in DC. Monogr. Phan. **7:** 481. 1891, non *Blastus parviflorus* Triana.

HAINAN: Yaichow, *H. Y. Liang 62607* (N).

Borneo, Indo-China; new to Hainan; also recorded for Kweichow (Guillaumin, l.c.).

Cogniaux based his species on *Beccari 1403* from Sarawak, Borneo, but

his specific name is preoccupied in *Blastus* by *B. parviflorus* Triana (1871). Stapf mentions the very characteristic discoid glands on the lower surface of the leaves, petioles, young branches, and inflorescences. These glands are characteristic of all species of the genus, but as they are usually very minute and sometimes disappear in age, they are consequently overlooked by most authors.

Spare (Kew Bull. **1929:** 317–319. 1929) is of the opinion that *Blastus Cogniauxii* is strictly limited to Borneo and that the Indo-Chinese plant described by Guillaumin as *B. Cogniauxii* is *B. eglandulosus* Stapf. However, the Hainan plant is clearly glandular and agrees well with both the original description and illustration as well as authentic specimens from Borneo. It may be that both *Blastus Cogniauxii* and *B. eglandulosus* occur in Indo-China.

9. **Blastus Dunnianus** H. Lév. Repert. Sp. Nov. **9:** 449. 1911, Fl. Kouy-Tchéou 276. 1914; Guillaum. Bull. Soc. Bot. France **60:** 91, 403. 1913; Diels, Bot. Jahrb. **65:** 107. 1932; Merr. & Chun, Sunyatsenia **5:** 144. 1940.

KWEICHOW: Majo, *J. Cavalerie 2971* (ISOTYPE, A). KWANGSI: Hang-on-yuen, *Z. S. Chung 81771* (A). KWANGTUNG: Huangtung, *S. S. Sin 9954* (N); Loh-chang, *C. L. Tso 21030* (N); Shih Wan Tai Shan, *H. Y. Liang 69969* (A).

This species is characterized by the obtuse, more or less rounded calyx-lobes. The leaves are membranaceous, with or without a few small teeth, and with very minute glandular scales on the lower surface. The more or less densely arranged flowers are very short-pediceled. The anthers are obtuse at the base. Although Guillaumin describes the calyx-tube as 5 mm. long, I note that in both the isotype and the other collections cited it is only 2–3 mm. long; the fruit is scarcely 5 mm. long.

10. **Blastus Cavaleriei** H. Lév. & Vaniot, Mém. Soc. Sci. Nat. Cherbourg **35:** 395. 1906, Repert. Sp. Nov. **9:** 94. 1907.
Allomorphia Bodinieri H. Lév. Repert. Nov. Sp. **5:** 100. 1908.
Bredia Bodinieri H. Lév. l.c. (1908), pro syn.
Blastus pauciflorus sensu Guillaum. Bull. Soc. Bot. France **60:** 90. 1913, pro parte; H. Lév. Fl. Kouy-Tchéou 276. 1914; Metcalf, Lingnan Sci. Jour. **12:** 155. 1933, pro parte; Rehd. Jour. Arnold Arb. **15:** 111. 1934; non Benth.
Blastus spathulicalyx Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. **59:** 106. 1922, Symb. Sin. **7:** 598. 1933; syn. nov.

KWEICHOW: Tou Chan, *J. Cavalerie 2676* (HOLOTYPE, photo. and merotype, A), between Kutschou and Liping, *H. Handel-Mazzetti 10913* (isotype of *B. spathulicalyx* Hand.-Maz., A). KWANGSI: South of Nanning, Shih Wan Tai Shan, *R. C. Ching 8382* (A, N); north of Luchen, Chu Feng Shan, *R. C. Ching 5771* (A, N); Ling-wun, *S. K. Lau 28661* (A); Tzu Yuen, *Z. S. Chung 83552* (A).

Blastus Cavaleriei H. Lév. & Vaniot was first reduced to *B. pauciflorus* (Benth.) Guillaum. by Guillaumin, and Léveillé himself followed Guillaumin in his Flore du Kouy-Tchéou. Handel-Mazzetti's *B. spathulicalyx*, described later, evidently represents the same species. This species differs from *B. pauciflorus* (Benth.) Guillaum. in the long spatulate calyx-lobes, rounded at tip and attaining a length of 3 mm. in fruit. The leaves are denticulate to entire. The calyx-tube is about 4 mm. long. The anthers are obtuse at the base.

11. **Blastus tomentosus** sp. nov.

Frutex circiter 65 cm. altus, ramulis novellis teretibus dense brunneo-strigoso-tomentosis; foliis chartaceis, petiolatis, oblongo-ellipticis vel ovatis, 13–17 cm. longis, 5–10 cm. latis, acuminatis, basi leviter vel perspicue cordatis, margine integris vel obscure denticulatis, supra glabris, subtus squamuloso-glandulosis, nervis 5, supra leviter impressis, subtus elevatis distinctis parce tomentosis vel glabris, venis transversis supra obscuris, subtus elevatis; petiolo 1–2 cm. longo, plus minusve dense strigoso-tomentoso; inflorescentiis terminalibus paniculatis, 12–13 cm. longis, plus minusve tomentosis vel glabrescentibus, pedicellis 1–2 mm. longis; calycibus turbinato-campanulatis 2–3 mm. longis, leviter squamuloso-glandulosis, lobis linearibus vel subspathulatis, 1.5–2 mm. longis, 1 mm. latis, rotundatis; petalis late ovatis, 1.5 mm. longis, acutis, filamentis 3 mm. longis, antheris 4 mm. longis, basi incrassatis, haud attenuatis; stylis 7–8 mm. longis; fructibus capsularibus, circiter 6 mm. longis, quadrangularibus, calycis lobis persistentibus, ad 3 mm. longis.

KWANGSI: Wait-sap District, Tong Shan, near Sap-luk Po Village, *W. T. Tsang 22792* (TYPE, A), Sept. 15, 1933, a shrub 2 ft. high, fairly common, sandy soil, in swamp, flowers purplish red.

This species is characterized by the abundant strigose hairs on the young branches and petioles. The veins on the under surface of the leaves are also very slightly hairy. In its long, obtuse, more or less spatulate calyx-lobes, it is near *Blastus Cavaleriei* H. Lév. & Vaniot, but differs, in addition to the indumentum, in the anthers being thickened at the base but not attenuate, and also in the much smaller floral parts.

In addition to the type specimen, one specimen of *W. T. Tsang 20827* (N), clearly belongs to this same species. This may be due to a mixture of material, as two other sheets of *Tsang 20827* represent *Blastus Ernae* Hand.-Maz.

12. **Blastus Ernae** Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. **59:** 106. 1922; Merr. Lingnan Sci. Jour. **7:** 317. 1931; Metcalf, op. cit. **12:** 155. 1933.

KWANGTUNG: Mandse Shan, near the Hunan border, *R. Mell 473* (isosyntype, A); Tan Hsia Shan, *W. Y. Chun 5570* (A); Nip Doo to Changkiang, *W. Y. Chun 5751* (A); Loh-chang District, *W. T. Tsang 20827* (A, N). Endemic.

This species is distinguished by the stipitate glandular hairs on the calyx-tube, while in the remaining species the calyx-tube is scaly-glandular or subglabrous. It is also characterized by its anthers about 10 mm. long with long attenuate acute bases. The leaves are entire or obscurely crenulate. The calyx-tube is about 5 mm. long with short triangular acute lobes. The style is 14–20 mm. long.

13. **Blastus longiflorus** Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. **59:** 106. 1922; Merr. Lingnan Sci. Jour. **7:** 317. 1931; Metcalf, op. cit. **12:** 156. 1933.

KIANGSI: Kien-nan District, *S. K. Lau 3951* (A). KWANGSI: North of Lin-yen, Tsin Lung Shan, *R. C. Ching 6945* (A, N); Pai-shou District, *Y. W. Taam 23* (A); Ling-chuan District, *W. T. Tsang 27891* (A), *27946* (A); Kwei-lin District, *W. T. Tsang 28442* (A). KWANGTUNG: Lung Tan Shan, *Mell 703* (isosyntype, A); Yingtak, *Y. K. Wang 2864* (N); Wat Shui Shan, *W. Y. Chun 7381* (A); Sin-fung District, *Y. W. Taam 339* (A); Wung-yuen District, *S. K. Lau 1997* (A).

In the structure of the anther, with its attenuate-acute base, this species

is similar to *Blastus Ernae* Hand.-Maz., but it differs in the calyx-tube, which is lepidote-glandular instead of stipitate-glandular. The calyx-tube is about 4–5 mm. long, with short triangular acute lobes. The anther is about 8 mm. long and the styles 8–10 mm. long. The leaves vary from denticulate to entire.

14. **Blastus apricus** (Hand.-Maz.) comb. nov.

Blastus spathulicalyx Hand.-Maz. var. *apricus* Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. **59:** 106. 1922; Metcalf, Lingnan Sci. Jour. **12:** 156. 1933.

KWANGTUNG: Wung-yuen District, *S. K. Lau 803* (A, N); Sin-fung District, *Y. W. Taam 921* (A); Lienping, *R. Mell 638* (photo of ISOTYPE, A). Endemic.

The type of *Blastus spathulicalyx* Hand.-Maz. is from Kweichow. The type of Handel-Mazzetti's variety *apricus, Mell 638,* of which a photograph is available (A), is from Lienping, which is in northern Kwangtung, as are the other two specimens cited above. This differs from *Blastus spathulicalyx* Hand.-Maz. = *Blastus Cavaleriei* H. Lév. & Vaniot in that the calyx-lobes are not spatulate and rounded but are linear and acute and are only up to 2 mm. long. The leaves are slightly denticulate. It is probably close to *Blastus pauciflorus* (Benth.) Guillaum., but it has longer (about 4–5 mm.) calyx-tubes, while the anther-bases are attenuate.

15. **Blastus pauciflorus** (Benth.) Guillaum. Bull. Soc. Bot. France **60:** 90, 403. 1913; Merr. Philip. Jour. Sci. Bot. **13:** 151. 1918; Chung, Mem. Sci. Soc. China **1:** 185. 1924; Diels, Bot. Jahrb. **65:** 107. 1932, pro parte; Metcalf, Lingnan Sci. Jour. **12:** 155. 1933.

Allomorphia pauciflora Benth. in Hook. Lond. Jour. Bot. **1:** 485. 1842; Triana, Trans. Linn. Soc. **28:** 74. 1871; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 301. 1887.

Oxyspora ? pauciflora Benth. Fl. Hongk. 116. 1861.

Blastus Hindsii Hance, Jour. Linn. Soc. Bot. **13:** 103. 1873.

KIANGSI: Southern Kiangsi, Tai Au Hong, *J. L. Gressitt 1576* (A). KWANGTUNG: North River, *H. F. Hance 11352* (G); Canton, *C. O. Levine 1462* (G); Lofaushan, *E. D. Merrill 10743* (N); Taai Yeung Shan, *F. A. McClure 6642* (A, N); Ta-pu District, *W. T. Tsang 21567* (A, N); Hweiyang, *W. T. Tsang 25557* (A).

This species is characterized by its small flowers, with the calyx-tube about 2–3 mm. long. The calyx-lobes are small and triangular, and thus, in this respect, the species can be distinguished from the closely related ones like *Blastus Dunnianus* H. Lév. and *Blastus Cavaleriei* H. Lév. & Vaniot. The leaves are in general entire. The anthers are obtuse at their bases. This species seems to be confined to the eastern part of Kwangtung and adjacent southern Kiangsi, for the Kweichow and Kwangsi plants referred to this species by Guillaumin, Diels, Metcalf, etc., actually belong to *Blastus spathulicalyx* Hand.-Maz. = *B. Cavaleriei* H. Lév. & Vaniot.

9. BREDIA

Bredia Blume, Mus. Bot. Lugd.-Bat. **1:** 25. 1849; Diels, Bot. Jahrb. **65:** 108. 1932, ampl.

Tashiroea Matsum. ex Ito & Matsum. Jour. Coll. Sci. Univ. Tokyo **12:** 489. 1899, syn. nov.

The genus *Bredia* was established by Blume in 1849 for *Bredia hirsuta* Blume, a species of Formosa, the Liukiu Islands, and Japan. In 1871 Hooker f. described *B. Oldhami* from Formosa, a species rather distinctly

different from Blume's original generic type. This is accepted by Cogniaux and other authors as belonging in *Bredia*. Diels in 1924 described *B. amoena*, the first species of the genus known from China. He considerably amplified the concept of the genus in 1932 by describing several new species and transferring a number of entities originally described as representatives of other genera to *Bredia*. His concept is tentatively accepted here. In this broader sense, the genus includes species with eight stamens either subequal or distinctly unequal. The anthers are attenuate at their apices, and the connectives are either slightly elongated at the base of the anthers or not, usually gibbose in front and short-calcarate behind. The flowers are either solitary, umbellate, or cymose-paniculate. The fruit is usually flattened or slightly rounded at the top.

The genus *Tashiroea* Matsumura, described in 1899, was based on two species, *T. okinawensis* Matsum. and *T. yaeyamensis* Matsum., both from the Liukiu Islands. Diels added a Chinese species, *T. chinensis*, to the genus in 1924. It is found that all of these species are closely related to *Bredia Oldhami* Hook. f. and are, I believe, congeneric with it. *Tashiroea chinensis* Diels is also found to be identical with *Bredia glabra* Merr. Accepting the current concept as to the wider scope of the genus *Bredia*, *Tashiroea* is here included within its limits.

The type species, *Bredia hirsuta* Blume, and a closely related one, *B. scandens* Hayata, are both known from Formosa. Closely allied to them is *B. amoena* Diels from southeastern coastal China. These three species form a group with cymose-paniculate and hirsute inflorescences and with cordate, pubescent or glabrous leaves. However, the last one is also near the next group and appears to be transitional between the two groups. This group extends from Japan, the Liukiu Islands, and Formosa to the coastal regions of China.

A second group is represented by the three species of *Tashiroea*, as well as by *Bredia Oldhami* Hook. f. and *B. quadrangularis* Cogn. These species are characterized by attenuate, rarely rounded or subcordate leaves, which are glabrous or minutely stellate-pubescent. The inflorescences are cymose-paniculate as in the first group, rarely solitary, and usually glabrous. To this group one new species from China is added. These representatives occur in Formosa and the maritime districts of southern China.

A third group is found in western and southern China. These species have cordate, hirsute, or velutinous leaves and umbellate, rarely 1-flowered inflorescences. To this group are added three new species from China.

These three groups, although more or less different, nevertheless exhibit common characters and intergrading forms, and it is thought best for the time being to treat them as sections of the genus *Bredia*. Their differentiating characters are as follows.

I. Sectio **Eubredia** sect. nov.

Folia rotundata vel cordata, pubescentia vel glabrata. Inflorescentia cymoso-paniculata, plus minusve hirsuta; staminibus 8, inaequalibus, connectivo sub theca elongato vel haud elongato.

1. *Bredia hirsuta* Blume (Formosa, Liukiu, Japan?).
2. *Bredia scandens* Hayata (Formosa).
3. *Bredia amoena* Diels (China: Chekiang, Fukien, Kwangtung).

II. Sectio **Tashiroea** (Matsum.) sect. nov.

Folia attenuata, rarius rotundata vel subcordata, glabra vel minute stellato-pubescentia. Inflorescentia cymoso-paniculata, rarius solitaria, glabra; staminibus 8, inaequalibus, connectivo sub theca interdum elongato.

1. *Bredia Oldhami* Hook. f. (Formosa).
2. *Bredia quadrangularis* Cogn. (China: Fukien, Kiangsi).
3. **Bredia okinawensis** (Matsum.) comb. nov.
   Tashiroea okinawensis Matsum. ex Ito & Matsum. Jour. Coll. Sci. Univ. Tokyo **12**: 490. 1899, Ic. Pl. Koisikav. **1**: 153. *t. 77*. 1913.
   Liukiu Islands.
4. **Bredia yaeyamensis** (Matsum.) comb. nov.
   Tashiroea yaeyamensis Matsum. ex Ito & Matsum. Jour. Coll. Sci. Univ. Tokyo **12**: 489. 1899, Ic. Pl. Koisikav. **1**: 150. *t. 76*. 1913.
   Liukiu Islands.
5. *Bredia sinensis* (Diels) Li (China: Chekiang, Fukien, Kwangtung, Kwangsi).
6. *Bredia sessilifolia* Li (China: Kwangsi).

III. Sectio **Sinobredia** sect. nov.

Folia cordata, hirsuta vel velutina. Inflorescentia umbellata rarius uniflora; staminibus 8, subaequalibus vel inaequalibus, connectivo plerumque sub theca haud elongato.

1. *Bredia velutina* Diels (China: Yunnan).
2. *Bredia sepalosa* Diels (China: Kwangsi).
3. *Bredia microphylla* Li (China: Kwangsi).
4. *Bredia Fordii* (Hance) Diels (China: Szechuan, Kweichow, Kwangtung).
5. *Bredia Cavaleriei* (H. Lév.) Diels (China: Yunnan, Kweichow, Kwangtung).
6. *Bredia tuberculata* (Guillaum.) Diels (China: Kwangtung, Kwangsi, Kiangsi).
7. *Bredia longiloba* (Hand.-Maz.) Diels (China: Hunan, Kiangsi, Kwangtung).
8. *Bredia yunnanensis* (H. Lév.) Diels (China: Yunnan).
9. *Bredia omeiensis* Li (China: Szechuan).
10. *Bredia cordata* Li (China: Sikang, Szechuan).

The Chinese species are enumerated below.

1. **Bredia amoena** Diels, Notizbl. Bot. Gart. Berlin **9**: 197. 1924, Bot. Jahrb. **65**: 111. 1932; Metcalf, Jour. Arnold Arb. **12**: 271. 1931, Lingnan Sci. Jour. **12**: 154. 1933.
   Bredia chinensis Merr. Jour. Arnold Arb. **8**: 11. 1927.
   Bredia Pricei Metcalf, Lingnan Sci. Jour. **12**: 153. 1933, syn. nov.

CHEKIANG: Sia Chu, *R. C. Ching 1684* (A); North Yentang, *H. H. Hu 30* (HOLOTYPE, photo. in A); Ts'ing Tien, *Y. L. Keng 151* (A), *157* (A); Yentang Shan, *C. Y. Chiao 14691* (A). FUKIEN: Shou-ning, *R. C. Ching 2309* (A, N).

Bredia Pricei Metcalf was based on *W. R. Price 1200A*, this same number being cited by Diels in 1932 as representing *B. amoena*.

1a. **Bredia amoena** Diels var. **serrata** var. nov.

A typo speciei differt foliis distincte arcuato-serratis, dentibus acutis, apice rigidis.

CHEKIANG: Ts'ing Tien, *Y. L. Keng 187* (TYPE, A), July 28, 1926, a low shrub, growing by roadside, flowers purplish.

2. **Bredia quadrangularis** Cogn. in DC. Monogr. Phan. **7**: 473. 1891; Guillaum. Bull. Soc. Bot. France **60**: 403. 1913; Metcalf, Lingnan Sci. Jour. **12**: 155. 1933.

KIANGSI: Yuan-shan District, *H. H. Hu 1313* (A). FUKIEN: No precise locality, *Dunn (Hongk. Herb.) 2710* (A); Yenping, Pao-chu Shan, *H. H. Chung 2931* (A).

The type of Cogniaux, "in China australi, Seemann in herb. Hort. Petrop.", according to Diels (Bot. Jahrb. **65:** 111. 1932), cannot be found in the Leningrad herbarium. Guillaumin (l. c.) records that species from Kwangtung and Metcalf (l. c.) refers *Hu 1313* from Kiangsi to this species. The Chung specimen from Fukien cited above also agrees well with Cogniaux's description and is even more typical. This species is close to *Bredia sinensis* (Diels) Li, but is characterized by its terminal and axillary inflorescences and slender filiform peduncles, 3–4 cm. long.

3. **Bredia sinensis** (Diels) comb. nov.

Tashiroea sinensis Diels, Notizbl. Bot. Gart. Berlin **9:** 198. 1924.

Bredia glabra Merr. Jour. Arnold Arb. **8:** 12. 1927; Metcalf, Lingnan Sci. Jour. **12:** 155. 1933; syn. nov.

KWANGSI: Yao Shan, *C. Wang 40258* (A). KWANGTUNG: Mei District, Yam Na Shan, *J. L. Gressitt 1371* (A), *W. T. Tsang 21403* (A). FUKIEN: No precise locality, *Dunn (Hongk. Herb.) 2709* (A); Shaowu and vicinity, Fan Hsoh Niao, *Fukien Christ. Univ. 9152* (A); Chung-an District, *H. H. Hu 1343* (ISOTYPE, A). KIANGSI: Southern Kiangsi, Hong San, *J. L. Gressitt 1520* (A). CHEKIANG: Pang Young, *R. C. Ching 2029* (isotype of *Bredia glabra* Merr., A); Ts'ing Tien, *Y. L. Keng 152* (A), *156* (A); Tai Shun, *Y. L. Keng 263* (A).

Diels (l. c.) referred this species to *Tashiroea* with some doubt. An examination of the type shows that it is identical with that of *Bredia glabra* Merr. After studying Liukiu material representing *Tashiroea* Matsum., I consider that this genus should be reduced to *Bredia* Blume. The stamen characters, as originally described by Matsumura, but not clearly depicted in the two later drawings, are essentially the same as those of *Bredia*. Both of Matsumura's Liukiu species are rather closely related to *Bredia sinensis* (Diels) Li of the southeastern coastal provinces of China and *Bredia Oldhami* Hook. f. of Formosa in habit, vegetative characters, inflorescences, and especially in minute stellate indumentum on the leaves.

4. **Bredia sessilifolia** sp. nov.

Frutex circiter 30 cm. altus; foliis coriaceis sessilibus vel subsessilibus oblongo-ovatis, 6–10 cm. longis, 2–3 cm. latis, longe acuminatis, basi rotundatis vel subcordatis, distincte 3-nerviis, nervis marginalibus 2 gracilioribus additis, supra inconspicuis, subtus elevatis, margine integris revolutis rarius parce denticulatis, venulis utrinque inconspicuis; floribus ignotis; infructescentiis terminalibus cymoso-paniculatis, ad 6 cm. longis, pedicellis circiter 1 cm. longis; capsulis in calycibus inclusis, circiter 4.5 mm. longis, apice leviter rotundatis.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, Tang Lung Village, *W. T. Tsang 24346* (TYPE, A), Sept. 25, 1934, *24381* (A, N), Sept. 30, 1934, 1 ft. high, fairly common in thickets, fruits gray or purplish red.

A species apparently related to *Bredia sinensis* (Diels) Li, but readily distinguished by its sessile or subsessile leaves.

5. **Bredia velutina** Diels, Bot. Jahrb. **65:** 109. 1932.

YUNNAN: Mengtze, *A. Henry 13479* (ISOTYPE, A, N). Known from the original collection only.

6. **Bredia sepalosa** Diels, Bot. Jahrb. **65:** 109. 1932.
Described from Kwangsi, based on *S. S. Sin & K. K. Whang 648;* no specimen seen.

7. **Bredia microphylla** sp. nov.

Suffruticosa scandens 8–10 cm. alta ramosa, ramis rufo-brunneis pubescentibus gracilibus, nodis radicantibus; foliis inaequalibus vel aequalibus petiolatis subchartaceis ovato-orbicularibus, 1–2 cm. longis, 1–1.8 cm. latis, subacutis vel rotundatis, basi rotundatis vel cordatis 5-nerviis, margine integris, supra hirsutis, parce hispido-pilosis, subtus pubescentibus, nervis venulisque supra inconspicuis, subtus elevatis; petiolo 0.5–1.5 cm. longo, pubescente; floribus terminalibus solitariis rarius 3-umbellatis; pedicellis 1.3–1.5 cm. longis, pubescentibus; calycibus turbinatis, circiter 3 mm. longis glanduloso-setosis, lobis linearibus 2–3 mm. longis; petalis 4, roseis ovatis acutis circiter 11 × 6 mm.; staminibus 8, inaequalibus: 4 majoribus filamentis 3 mm. longis, antheris linearibus acutis, 3 mm. longis, connectivo basi sub theca leviter elongato antice tuberculato; 4 minoribus filamentis 2 mm. longis, antheris 2.5 mm. longis, connectivo basi tuberculato, postice haud calcarato; stylis 7 mm. longis, stigmate inconspicuo; capsulis 4-lobatis circiter 4.5 mm. longis, apice leviter rotundatis, in calycibus inclusis.

KWANGSI: Kwei-lin District, Chi-fen Shan, Hsi-chang Village and vicinity, *W. T. Tsang 28432* (TYPE, A), *28477* (A), Oct. 1–11, 1937, a climber, fairly common, 3–4 in. high, flowers purplish red, fruits white.

This distinct species is recognized by its slender scandent branches and small, more or less rounded leaves. In the large calyx-lobes, it is evidently related to *Bredia sepalosa* Diels.

8. **Bredia Fordii** (Hance) Diels, Bot. Jahrb. **65:** 110. 1932.
Otanthera Fordii Hance, Jour. Bot. **29:** 46. 1881; Cogn. in DC. Monogr. Phan. **7:** 342. 1891; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 299. 1887; Guillaum. Bull. Soc. Bot. France **60:** 402. 1913.

KWANGSI: Tuhshan, *Y. Tsiang 6908* (A), *6563* (N). KWANGTUNG: Hongkong, *C. Ford s. n.* (G). Also known from Szechuan.

9. **Bredia Cavaleriei** (H. Lév.) Diels, Bot. Jahrb. **65:** 110. 1932; Hand.-Maz. Symb. Sin. **7:** 599. 1933; Rehd. Jour. Arnold Arb. **15:** 112. 1934.
Barthea Cavaleriei H. Lév. Repert. Sp. Nov. **8:** 61. 1910.
Fordiophyton Cavaleriei Guillaum. Bull. Soc. Bot. France **60:** 275, 404. 1913; H. Lév. Fl. Kouy-Tchéou 276. 1914.
Fordiophyton Cavaleriei var. *violacea* H. Lév. Cat. Pl. Yun-Nan 176. 1916, nom. nud.

KWANGTUNG: Yao Shan, *S. S. Sin 9911* (N). The original specimens from Kweichow not seen.

10. **Bredia tuberculata** (Guillaum.) Diels, Bot. Jahrb. **65:** 110. 1932.
Fordiophyton tuberculatum Guillaum. in Lecomte, Not. Syst. **2:** 326. 1931, Bull. Soc. Bot. France **60:** 404. 1913.

KWANGSI: South of Nanning, Shih Wan Tai Shan, *R. C. Ching 8196* (N), *8309* (A, N); Yao Shan, *C. Wang 39973* (A), *40201* (A); Chen-pien District, *S. P. Ko 55878* (A); Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 22457* (A), *22563* (A); Wait-sap District, Tong Shan, *W. T. Tsang 22761* (A); Kwei-lin District, *W. T. Tsang 28114* (A). KWANGTUNG: Lofaushan, *C. Ford 314* (N); Loh-chang, *C. L. Tso 20999* (N); Sin-fang District, *Y. W. Taam 287* (A); Mai District, *W. T. Tsang 21515* (A, N). KIANGSI: Southern Kiangsi, Hong San, *J. L. Gressitt 1639* (A).

11. **Bredia longiloba** (Hand.-Maz.) Diels, Bot. Jahrb. **65:** 111. 1932; Hand.-Maz. Symb. Sin. **7:** 599. 1933.
Fordiophyton gracile Hand.-Maz. var. *longilobum* Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. **63:** 3: 1926.

HUNAN: Chang-ning District, *C. S. Fan & Y. Y. Li 314* (A). KWANGTUNG: Yang-shan District, *T. M. Tsui 746* (A). Also known from Kiangsi.

12. **Bredia yunnanensis** (H. Lév.) Diels, Bot. Jahrb. **65**: 111. 1932; Rehd. Jour. Arnold Arb. **15**: 112. 1934.

Bredia yunnanensis H. Lév. Repert. Sp. Nov. **11**: 300. 1912.

Blastus Mairei H. Lév. l.c.

Fordiophyton Cavaleriei (H. Lév.) Guillaum. Bull. Soc. Bot. France **60**: 275. 1913, pro parte.

YUNNAN: No specimen seen.

13. **Bredia omeiensis** sp. nov.

Herba suffruticosa erecta 15–30 cm. alta, ramis petiolisque rufo-brunneis pubescentibus patule hispido-pilosis; foliis subchartaceis oppositis aequalibus plerumque longe petiolatis ovatis, 3–6 cm. longis, 2–3.5 cm. latis, longe acuminatis, basi cordatis, 5-nerviis, margine serrulatis et dense setulosis, in sicco supra atro-olivaceis, subtus pallidioribus, utrinque plus minusve dense setulosis, venis transversis utrinque subconspicuis; petiolo 1–3.5 cm. longo; inflorescentiis terminalibus umbellatis, pedunculis pedicellis calycibus et bracteis rufo-brunneis pubescentibus parce setulosis, pedunculis 1–2 cm. longis, pedicellis 0.5–1 cm. longis, bracteis lanceolatis, circiter 5 mm. longis et 1 mm. latis, acuminatis, caducis; calycibus turbinatis, circiter 4 mm. longis, lobis linearibus, 2–2.5 mm. longis, 1 mm. latis; petalis 4 roseis, orbiculari-ovatis, 1–1.3 cm. longis, 0.6–0.8 cm. latis, apice acutis; staminibus 8, inaequalibus: 4 majoribus filamentis 1 cm. longis, antheris 5 mm. longis, leviter curvatis, connectivo basi leviter incrassato, haud appendiculato; 4 minoribus filamentis 5 mm. longis, antheris 3.5 mm. longis, erectis, connectivo basi antice tuberculato, postice breviter calcarato; stylis circiter 1.7 cm. longis, stigmate inconspicuo.

SZECHUAN: Mt. Omei, *Y. S. Liu 1080* (TYPE, A), Aug. 21, 1937, alt. 1100 m., *T. C. Peng 44* (A), July 23, 1938, herb. 0.2 m. high, hillside, alt. 900 m., flowers purplish red, *W. P. Fang 12614* (A), July 28, 1938, herb on grassy slopes, rare, alt. 1100 m., in fruit.

In its general habit as well as the shape of its leaves, this species is close to *Bredia tuberculata* (Guillaum.) Diels, differing in its smaller leaves and flowers, while the leaves are more or less densely setulose on both surfaces. It is further characterized by its very unequal stamens, the four larger ones having the connectives inappendiculate and but slightly enlarged at the base, while the four smaller ones have the connectives 2-tuberculate in the front and short-calcarate behind at the base.

14. **Bredia cordata** sp. nov.

Herba suffruticosa ramosa circiter 20 cm. alta, ramulis gracilibus parce setosis vel pubescentibus; foliis inaequalibus vel aequalibus petiolatis subchartaceis ovato-oblongis, 3–6 cm. longis, 1.7–3.5 cm. latis, acuminatis, basi cordatis, 5-nerviis, margine setoso-denticulatis, supra hirsutis, subtus leviter pubescentibus, venulis transversis, utrinque subconspicuis; petiolo 1.5–3.5 cm. longo, pubescente vel setoso; inflorescentiis terminalibus umbellatis, 2- vel 3-floris, pedunculis circiter 2 cm. longis, pedicellis circiter 1.5 cm. longis, bracteis oblongis, acuminatis, 5–7 mm. longis, 2–4 mm. latis, hirsutis, pedunculis pedicellis calycibusque pubescentibus vel glanduloso setosis; calycibus turbinatis, circiter 1.5 mm. longis; petalis 4, roseis ovatis acutis, circiter 1.1 cm. longis et 5 mm. latis; staminibus 8: 4 majori-

bus filamentis 9 mm. longis, antheris linearibus acutis 8 mm. longis, plus minusve curvatis, connectivo basi antice minute 2-tuberculato, postice haud calcarato; 4 minoribus filamentis 5 mm. longis, antheris linearibus acutis 5 mm. longis, plus minusve erectis, connectivo basi antice 2-tuberculato, postice distincte calcarato; stylis circiter 1.3 cm. longis, stigmate inconspicuo; capsulis 4-lobatis, circiter 5.5 mm. longis, apice depressis, in calycibus inclusis.

SIKANG: Ya-an, *C. Y. Chiao 1205* (TYPE, A), July 30, 1939, a low herb growing among dense forest shade, alt. 686 m., flowers pinkish. SZECHUAN: Sung-pan District, *W. P. Fang 6024* (A), 8 in. high, in thickets.

This species is manifestly close to the Formosan *Bredia hirsuta* Blume, differing in its smaller size and smaller leaves, with its inflorescences of simple umbels of 2 or 3 flowers. In *Bredia hirsuta* the flowers are born in lax panicled cymes 10–15 cm. long.

10. SARCOPYRAMIS

Sarcopyramis Wallich, Tent. Fl. Nepal. 32. *t. 23.* 1824.

The genus *Sarcopyramis* is quite distinct and well-characterized by its anther structure and foliaceous bracts. The type species, *S. nepalensis* Wall., is widely distributed in southern Asia and appears to be very variable in size. *Sarcopyramis delicata* C. B. Robinson was originally described from the Philippines, but it is also found in Formosa and China. Related to this species are two new ones herein described from China. Thus the total number of species of this genus is now four, and these may be differentiated by the following key.

KEY TO THE SPECIES

A. Flowers in small clusters; leaves about 5–10 cm. long. .....1. *S. nepalensis.*
AA. Flowers solitary; leaves scarcely over 1.5 cm. long.
  B. Leaves more or less setose above, the margins subentire or entire.
    C. Leaves about 2.5 cm. long and 1.5 cm. broad; calyx-teeth lanceolate, 1.5 mm. long; petals shallowly 3-lobed at the tip. .....2. *S. delicata.*
    CC. Leaves to 1.1 cm. long and 1 cm. broad; calyx-teeth minute; petals acute. .....3. *S. parviflora.*
  BB. Leaves glabrous, non-setose, the margins distinctly crenate. .....4. *S. crenata.*

1. **Sarcopyramis nepalensis** Wall. Tent. Fl. Nepal. 32. *t. 23.* 1826; Benn. Pl. Jav. Rar. 214. 1844; Cogn. in DC. Monogr. Phan. **7**: 517. 1891; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2**: 541. 1879; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23**: 302. 1887; Guillaum. Bull. Soc. Bot. France **60**: 343, 404. 1913; Diels, Bot. Jahrb. **65**: 111. 1932; Hand.-Maz. Symb. Sin. **7**: 600. 1933; Rehd. Jour. Arnold Arb. **18**: 227. 1937.

Sarcopyramis lanceolata Wall. List no. 6290. 1832, nom. nud.; Benn. l.c.; Kurz, Jour. Bot. **11**: 193. 1873, Jour. As. Soc. **46**(2): 77. 1877; Hance, Jour. Bot. **16**: 107. 1878.

Sarcopyramis grandiflora Griff. Notul. **4**: 678, Ic. Pl. Asiat. *t. 639.* 1854.

Sarcopyramis Bodinieri H. Lév. & Vaniot, Mém. Soc. Sci. Nat. Cherbourg **35**: 397. 1906, Repert. Nov. Sp. **4**: 95. 1907.

Phyllagathis chinensis Dunn, Jour. Linn. Soc. Bot. **38**: 360. 1908; Guillaum. Bull. Soc. Bot. France **60**: 404. 1913.

Sarcopyramis nepalensis var. *Bodinieri* H. Lév. Fl. Kouy-Tchéou 278. 1914.

Sarcopyramis Dielsii Hu, Bull. Fan. Mem. Inst. Biol. Bot. **7**: 26. 1936, syn. nov.

SZECHUAN: Kuan District, *W. P. Fang 2149* (G). SIKANG: Kanting, *C. Y. Chiao 2094* (A). YUNNAN: Mengtze, *A. Henry 9725* (N), *10298* (A), *10990* (N); Szemao, *A. Henry 13562B* (N), *13562C* (N); Champutong, *C. W. Wang 67119* (A), *67214* (A), *67346* (A); Shang-pa, *H. T. Tsai 54735* (A), *58729* (isotype of *Sarcopyramis Dielsii,* A), *59161* (A); Salween-Kiukiang Divide, Newahlung, *T. T. Yü 19241* (A), Kiukiang Valley (Taron), *T. T. Yü 19511* (A); Taron-Taru Divide, Valley of Bucahwang, *T. T. Yü 20143* (A). KWEICHOW: Ta Ho Yen, Fan Ching Shan, *Steward, Chiao & Cheo 636* (N); Tuhshan, *Y. Tsiang 6536* (N). KWANGSI: North of Luchen, *R. C. Ching 6221* (N); Ling-yuin District, *Steward & Cheo 353* (G, N); Yao Shan, Pin Nan, *C. Wang 39152* (A); Ling-chuan District, *W. T. Tsang 27859* (A). KWANGTUNG: Mei District, Yam Na Shan, *W. T. Tsang 21444* (G, N). KIANGSI: Lushan, *H. H. Chung & S. C. Sun 498* (N), *C. Y. Chiao 18626* (N). FUKIEN: No precise locality, *Dunn (Hongk. Herb.) 2711* (G).

A species of wide distribution in southern Asia from Malay Peninsula to northeastern India, Burma, and southern China. It is quite variable in size.

2. **Sarcopyramis delicata** C. B. Robinson, Bull. Torr. Bot. Club **35:** 72, 75. 1908; Merr. & Chun, Sunyatsenia **5:** 144. 1940.

SIKANG: Ya-an, Moon-ting Shan, *C. Y. Chiao 1034* (A). YUNNAN: Mengtze, *A. Henry 9030* (N). KWANGSI: Yao Shan, *C. Wang 39505* (A), *40307* (A). KWANGTUNG: Sun-yi, *S. P. Ko 51277* (N). HAINAN: Po-ting, *F. C. How 73687* (G).

A species found in the Philippines, Formosa, and Hainan. New to continental China.

3. **Sarcopyramis parvifolia** Merrill in herb. sp. nov.

Herba parva, circiter 5 cm. alta, erecta vel subprostrata, caulibus simplicibus teretibus glabris; foliis parvis, submembranaceis, ovatis vel orbicularibus, ad 1.1 cm. longis et 1 cm. latis, obtusis, basi rotundatis, margine serratis vel subintegris, indistincte 3-nerviis, supra parce setosis, subtus glabris, utrinque viridibus vel subtus subrufis; petiolo circiter 5 mm. longo, tenui, glabro; floribus terminalibus solitariis, pedicellis ad 1.5 mm. longis glabris, bracteis plurimis foliaceis membranaceis obovatis, ad 4 mm. longis latisque, apice rotundatis ciliatis; calycis tubo anguste infundibuliformi, circiter 3 mm. longo et 2.5 mm. lato, extus glabro, margine minute 4-dentato; petalis roseis obovatis, circiter 6 mm. longis et 3 mm. latis, apice mucronato-acutis; staminibus 8, aequalibus, filamentis 2 mm. longis, antheris elliptico-obovatis, 1 mm. longis, connectivo postice brevissime prolongato; stylis 2.5 mm. longis, stigmate indistincto.

KWANGSI: Shang-sze District, Shih Wan Tai Shan, near Iu Shan Village, *W. T. Tsang 22407* (TYPE, A), June 2–7, 1933, 2 in. high, fairly common in thickets on steep slopes, flowers light red.

This species is near *Sarcopyramis delicata* C. B. Robinson, but it is a smaller plant with smaller leaves and flowers. It differs technically in the very small calyx-teeth and the acute petals.

4. **Sarcopyramis crenata** sp. nov.

Herba delicata, ad 7 cm. alta, erecta vel subprostrata, caulibus simplicibus alatis; foliis parvis membranaceis utrinque glabris, haud setosis, orbicularibus, ad 1 cm. diametro, apice rotundatis, basi subcordatis, margine crenatis, petiolo 3–5 mm. longo, tenui, glabro; floribus ignotis; fructibus terminalibus vel axillaribus solitariis, pedicellis 0.5–1 cm. longis glabris, immaturis circiter 2.5 mm. longis et 5 mm. latis, calycis lobis foliaceis,

membranaceis, ovatis, ad 4 mm. longis, glabris, apice rotundatis, margine crenatis.

YUNNAN: Chen-kang District, *C. W. Wang 72396* (TYPE, A), herb in ravines, alt. 1950 m.

This species is related to *Sarcopyramis delicata* C. B. Robinson, but it can be distinguished by its more delicate habit, its rounded crenate leaves glabrous throughout, and by the large, broad, crenate calyx-lobes.

11. FORDIOPHYTON

Fordiophyton Stapf, Ann. Bot. **6**: 314. 1892.

Diels (Bot. Jahrb. **65**: 114. 1932) recognizes four species in *Fordiophyton*, one from Indo-China and three from southern China. *Fordiophyton gracile* Hand.-Maz., transferred by Diels to *Bredia*, appears to be a good species of the genus wherein it was described by Handel-Mazzetti. One new species is herein added, making the total number of Chinese species six.

1. **Fordiophyton Faberi** Stapf, Ann. Bot. **6**: 314. 1892; Guillaum. Bull. Soc. Bot. France **60**: 274, 404. 1913; H. Lév. Fl. Kouy-Tchéou 276. 1914; Diels, Bot. Jahrb. **65**: 114. 1932; Rehd. Jour. Arnold Arb. **15**: 112. 1934.
   Bredia Cavaleriei H. Lév. & Vaniot, Mém. Soc. Sci. Nat. Cherbourg **35**: 396. 1906, Repert. Nov. Sp. **4**: 94. 1907.
   Oxyspora Cavaleriei H. Lév. l.c. (1906 et 1907), pro syn. *Brediae Cavaleriei*.
   Bredia Mairei H. Lév. Repert. Sp. Nov. **11**: 300. 1912.
   Blastus Lyi H. Lév. Repert. Sp. Nov. **11**: 301. 1912.

   SIKANG: Ya-an, Moon-ting Shan, *C. Y. Chiao 1303* (N). SZECHUAN: Mt. Omei, *W. P. Fang 2391* (G), *2428* (G), *3025* (G, N), *3026* (G, N), *C. Y. Chiao & C. S. Fan 145* (A), *K. N. Yin 62* (A). Also reported from Yunnan and Kweichow.

2. **Fordiophyton Fordii** (Oliv.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. **3**(7): 175. 1893; Guillaum. Bull. Soc. Bot. France **60**: 404. 1913; Diels, Bot. Jahrb. **65**: 113. 1932; Hand.-Maz. Symb. Sin. **7**: 600. 1933.
   Sonerila Fordii Oliv. in Hook. Ic. Pl. **15**: *t. 1457*. 1884; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23**: 301. 1887; Cogn. in DC. Monogr. Phan. **7**: 516. 1891.
   Fordiophyton cantonense Stapf, Ann. Bot. **6**: 314. 1892.

   CHEKIANG: Lung-chang, *K. Ling 2997* (N); King-yuan, *R. C. Ching 2323* (G). KIANGSI: Hong San, *J. L. Gressitt 1656* (G). KWEICHOW: Tuhshan, *Y. Tsiang 6554* (N). KWANGTUNG: Canton, *C. O. Levine 1560* (G); Wung-yuen District, *S. K. Lau 2423* (G); Loh-chang District, *W. T. Tsang 20764* (A, N); Lofaushan, *E. D. Merrill 1032* (N); no precise locality, *C. Ford s. n.* (N); Hwei-yang District, *W. T. Tsang 25452* (A), *25575* (A); Shaochow, Lungtou-shan, *R. Mell 706* (A). FUKIEN: Yenping, *H. H. Chung 2962* (G), *3032* (G).

2a. **Fordiophyton Fordii** (Oliv.) Krasser var. **vernicium** Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. **59**: 1907. 1922; Merr. Lingnan Sci. Jour. **7**: 317. 1931.

   KWANGTUNG: Lienping, *R. Mell 636* (ISOTYPE, A).

3. **Fordiophyton gracile** Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. **63**: 10. 1926.
   Bredia gracilis Diels, Bot. Jahrb. **65**: 110. 1932; Hand.-Maz. Symb. Sin. **7**: 598. 1933.

   HUNAN: Heng Shan, *Handel-Mazzetti 12380* (ISOTYPE, A); Sin-ning District, *C. S. Fan & Y. Y. Li 600* (G).

This is a species of *Fordiophyton* and I see no reason for transferring it to *Bredia* as Diels did. *Fordiophyton gracile* var. *longilobum* Hand.-Maz. is a different plant, of which I have seen no specimen. Diels is apparently

right in treating the variety as a species of *Bredia, B. longiloba* (Hand.-Maz.) Diels. A Hunan specimen, *C. S. Fan & Y. Y. Li 314*, is referable to the latter species.

4. **Fordiophyton polystegium** Hand.-Maz. Sinensia **3**: 196. 1933.

KWANGSI: San-chiang District, *A. N. Steward & C. C. Cheo 1017* (G, N); Tzu-yuen District, *Z. S. Chung 83454* (N).

5. **Fordiophyton strictum** Diels, Bot. Jahrb. **65**: 113. 1932.

YUNNAN: Mengtze, *A. Henry 9037* (ISOTYPE, A, N), *9037A* (A); Ping-pien District, *H. T. Tsai 61694* (A), *61794* (A), *62964* (A).

6. **Fordiophyton begoniifolium** sp. nov.

Herba suffruticosa erecta simplex, caulibus superne parce glanduloso-setulosis; foliis membranaceis longe petiolatis inaequaliter ovatis, 6–8 cm. longis, 4–5 cm. latis, apice acuminatis, basi valde inaequaliter cordatis, margine obsolete setuloso-serrulatis, utrinque glabris, nervis principalibus 8–12, utrinque subelevatis, venulis indistinctis; petiolo 3–5.5 cm. longo, parce glanduloso-setoso; inflorescentiis terminalibus cymosis, pedunculis ad 3.5 cm. longis, parce glanduloso-setosis, circiter 4-floris, pedicellis ad 5 mm. longis, glanduloso-setosis; calycis tubo anguste infundibuliformi, 4-dentato, dentibus triangularibus, circiter 1.5 mm. longis; petalis roseis oblongo-ovatis, circiter 7 mm. longis et 4 mm. latis, apice acutis; staminibus inaequalibus, filamentis circiter 12 mm. longis; antheris majoribus linearibus 11 mm. longis basi bilobatis, minoribus oblongis 4 mm. longis basi haud bilobatis; stylis filiformibus, 12 mm. longis, stigmate inconspicuo.

YUNNAN: Chen-kang, Snow Range, Tapingchang, *T. T. Yü 17244* (TYPE, A), Aug. 6, 1938, a perennial herb, 1–2 ft. high, common in forests, alt. 2350 m., flowers pink; between Tengyueh and Lungling, *J. F. Rock 7188* (N), Oct.–Nov. 1922, in dense forest.

This species is well-characterized by its inequilateral *Begonia*-like leaves. *Rock 7188* is a sterile specimen.

12. STAPFIOPHYTON

Stapfiophyton nom. nov.

Gymnagathis Stapf, Ann. Bot. **4**: 315. 1892, non Schauer (1843).

The genus *Gymnagathis* was proposed by Stapf in 1892, its type being *Sonerila peperomiaefolia* Oliv. from Kwangtung. It is apparently in close relationship with *Phyllagathis* as the latter is currently interpreted, especially in the general habit and in the anther structure. It differs from *Phyllagathis*, however, in the acaulescent or subacaulescent habit, the cymose-subracemose instead of umbellate inflorescences, and in the eight stamens in two very unequal series. Diels (Bot. Jahrb. **65**: 112. 1932), although he accepts Stapf's genus, apparently saw no specimens representing the type species; at least he cites none. At the same time, he considerably amplified the scope of *Phyllagathis*, describing two new species, *P. elattandra* Diels and *P. tetrandra* Diels, one with eight very unequal stamens and the other with only four stamens and with cymose or racemose non-umbellate inflorescences, characters rather widely differing from those of other species of *Phyllagathis*. I believe that both of Diels' species belong in *Gymnagathis* Stapf rather than in *Phyllagathis* and accordingly transfer them.

Under the homonym rule *Gymnagathis* Stapf (1892) is an invalid generic name because of the earlier *Gymnagathis* Schauer, Linnaea **17:** 243. 1843, there fully described. Schauer's genus belongs in the Myrtaceae and is generally placed as a synonym of *Melaleuca* Linn. I therefore propose the new generic name *Stapfiophyton* to replace *Gymnagathis* Stapf (1892), non Schauer (1843).

A. Stamens 8, 4 long and 4 short.
  B. Petioles long, 6–8 cm. ..... 1. *S. peperomiaefolium.*
  BB. Petioles short, 0.5–1 cm. ..... 2. *S. elattandrum.*
AA. Stamens 4 only. ..... 3. *S. tetrandrum.*

1. **Stapfiophyton peperomiaefolium** (Oliv.) comb. nov.
Sonerila peperomiaefolia Oliv. in Hook. Ic. Pl. **19:** *t. 1814.* 1889.
Gymnagathis peperomiaefolia Stapf, Ann. Bot. **4:** 31. 1892; Cogn. in DC. Monogr. Phan. **7:** 516. 1891; Guillaum. Bull. Soc. Bot. France **60:** 404. 1913; Diels, Bot. Jahrb. **65:** 112. 1932.

KWANGTUNG: Hongkong, *C. Ford* (*Hongk. Herb.*) *336* (syntype of *Sonerila peperomiaefolia* Oliv., photo. N).

2. **Stapfiophyton elattandrum** (Diels) comb. nov.
Phyllagathis elattandra Diels, Bot. Jahrb. **65:** 117. 1932.

KWANGTUNG: Sin-fung District, Sha-lo Shan, *Y. W. Taam 266* (A). Endemic.

Diels' type is *S. S. Sin 5180* from Win-fu, Kwangtung.

3. **Stapfiophyton tetrandrum** (Diels) comb. nov.
Phyllagathis tetandra Diels, Bot. Jahrb. **65:** 117. 1932.

YUNNAN: Ho-kou, *H. T. Tsai 52628* (A). Endemic.

Diels' types are *A. Henry 10539* and *10539A* from Mengtze, Yunnan.

13. PHYLLAGATHIS

Phyllagathis Blume, Flora **14:** 507. 1831.

The genus *Phyllagathis* has been considerably amplified since it was established by Blume in 1831. The type species, *Phyllagathis rotundifolia* Blume, was from Sumatra. Guillaumin records the species as also found in Kwangtung (Bull. Soc. Bot. France **60:** 273, 404. 1913) but cites no specimen. As Diels notes (Bot. Jahrb. **65:** 114. 1932), this record is apparently an error. The species is definitely known from Sumatra and Borneo only.

Eliminating for the present the various Malaysian species of *Phyllagathis,* I note that those recorded from southeastern continental Asia evidently need clarification. Stapf described *Phyllagathis tonkinensis* in 1892 from Indo-China. *Phyllagathis chinensis* Dunn in a synonym of *Sarcopyramis nepalensis* Wall. Another species, *Phyllagathis Cavaleriei,* was added by Guillaumin in 1913 from China, considered by him to be closely related to *Phyllagathis tonkinensis* Stapf. He also described an additional species from Indo-China, *Phyllagathis hirsuta* Guillaum. in Lecomte, Not. Syst. **2:** 325. 1913, non Cogn. = **Phyllagathis Guillauminii** nom. nov. It differs from other species of the genus in its lanceolate leaves, solitary or glomerulate flowers, and distinctly calcarate connectives. Merrill in 1930 described an anomalous species, *Phyllagathis oligotricha,* from Kwangtung. In Diels' paper of 1932 (Bot. Jahrb. **65:** 114. 1932), because of lack of access to the specimens, he does not include these last two species in

his key. No specimen of either species has been available to me for examination.

Diels in 1932 added three new species from China and deliberately enlarged the concept of the genus to accommodate them. Two of his species, *Phyllagathis clattandra* and *P. tetrandra*, with 8 very unequal stamens and 4 stamens respectively, and with cymose-paniculate instead of umbellate inflorescences, I have transferred to *Stapfiophyton* (*Gymnagathis* Stapf). I judge from the description of *P. anisophylla* Diels, of which I have seen no specimens, that it too should probably be removed from *Phyllagathis*.

Merrill & Chun (Sunyatsenia **5:** 147–149. 1940) describe three other anomalous species of *Phyllagathis* from Hainan and note the differences from the other representatives of the genus in their cymose-paniculate, more or less scorpioid inflorescences. These three species are clearly congeneric, and in an attempt to clarify the now too broad concept of *Phyllagathis*, they have been segregated to form, with two others, a new genus which I call *Scorpiothyrsus*. Thus with several species now removed from *Phyllagathis*, there remains for southeastern Asia *Phyllagathis tonkinensis* and *P. Cavalerici*, which I believe should be retained in the genus. In addition, there are three more or less anomalous species, *P. Guillauminii*, *P. oligotricha*, and *P. anisophylla*, of which no specimens have been available to me for study.

Thus, in my opinion, the genus *Phyllagathis* is better delimited to include only those species with umbellate inflorescences, with equal or subequal stamens, and with inappendiculate or only slightly calcarate anthers. With this limitation the group can be differentiated from such allied genera as *Bredia*, *Stapfiophyton*, etc.

1. **Phyllagathis Cavaleriei** (H. Lév. & Vaniot) Guillaum. in Lecomte, Not. Syst. **2:** 325. 1913, Bull. Soc. Bot. France **60:** 273, 404. 1913; H. Lév. Fl. Kouy-Tchéou 227. 1914; Diels, Bot. Jahrb. **65:** 115. 1932; Hand. Maz. Beih. Bot. Centralbl. **52B:** 163. 1934; Rehd. Jour. Arnold Arb. **15:** 113. 1934, **18:** 227. 1937.

Allomorphia Cavaleriei H. Lév. & Vaniot, Mém. Soc. Sci. Nat. Cherbourg **35:** 394. 1906, Repert. Nov. Sp. **6:** 94. 1907.

Oxyspora Cavaleriei H. Lév. l.c. (1906) et (1907), pro syn. *Allomorphiae Cavaleriei*.

Phyllagathis Tankahkeei Merr. Lingnan Sci. Jour. **7:** 316. 1931.

KWEICHOW: Sanhoa, *Y. Tsiang 6389* (N). KIANGSI: Lung-nan District, *S. K. Lau 4544* (G). KWANGSI: No precise locality, *R. C. Ching 5740* (A); north of Luchen, Tang Gao, *R. C. Ching 5689* (N); Yung District, Ta Tse Shan, *Steward & Cheo 933* (N); Ling-wan Distr.ct, *S. K. Lau 28 '27* (A), *28429* (A), *28430* (A), *28740* (A), *28741* (A); Hang-on-yuen, *Z. S. Chung 81755* (A); Chuen Yuen, *Z. S. Chung 82001* (A); Yao Shan, *C. Wang 39150* (A), *39441* (A), *40033* (A); Shang sze District, Shih Wan Tai Shan, *W. T. Tsang 22647* (A); Kwei-lin District, Chin-kang Shan, *W. T. Tsang 22990* (A), *28317* (A). KWANGTUNG: Yao Shan, Yen Wang Chai, *S. S. Sin 9941* (N); Loh-chang, *C. L. Tso 20995* (N). FUKIEN: Yenping, *H. H. Chung 2862* (G).

Phyllagathis Cavaleriei var. *Wilsoniana* Guillaum. in Lecomte Not. Syst. **2:** 325. 1913, Bull. Soc. Bot. France **60:** 273, 404. 1913, based on *Wilson 3647* of western Szechuan, apparently belongs to a different species. Diels (Bot. Jahrb. **65:** 115. 1932) notes that it is beyond the range of the typical form of the species. Guillaumin's description is too short and incomplete

to permit further speculation as to the proper disposition of the variety; I have seen no material representing it. *Ching 5740*, a fruiting specimen which I have referred to the species, is almost glabrous and may possibly represent a form of *Phyllagathis Cavaleriei*.

2. **Phyllagathis ovalifolia** sp. nov.

Frutex parvus circiter 1 m. altus, caulibus dense hirsuto-setosis; foliis oppositis petiolatis subchartaceis, oblongo-ovatis, 10–13 cm. longis, 4–5.5 cm. latis, apice acutis, basi late acutis, margine integris, setosis, in sicco olivaceis, supra sparse hirsuto-setosis, subtus praecipue in venis venulisque setosis; petiolo 2–3.5 cm. longo, hirsuto-setoso; inflorescentiis umbellatis terminalibus, multifloris, pedunculis crassis circiter 1.5 cm. longis, dense hirsuto-setosis, apice valde dilatatis, pedicellis circiter 1.5 cm. longis, gracilibus, sparse pubescentibus; calyce infundibuliformi 5 mm. longo, membranaceo, subglabro, lobis triangularibus, 1.5 mm. longis, margine dense setosis; petalis ovatis, membranaceis, roseis, circiter 7.5 mm. longis et 4 mm. latis; staminibus 8, aequalibus, filamentis 5 mm. longis antheris linearibus, acuminatis, 6 mm. longis, basi productis, connectivo postice breviter calcarato; stylis 1.1 cm. longis, stigmate indistincto.

YUNNAN: Mengtze, *A. Henry 11035* (A, N); Ping-pien District, *H. T. Tsai 61456* (TYPE, A), Aug. 7, 1934, a shrub 3 ft. high, in woods, alt. 1400 m., flowers pink.

This species is characterized by its oblong-ovate leaves which are broadly acute at the base, short-pedunculate inflorescences, and slenderly pedicellate flowers with membranaceous calyx-tube and setose-margined calyx-lobes.

3. **Phyllagathis longipes** sp. nov.

Herba parva, rhizomate prostrato, caulibus ramulisque aereis 6–8 cm. longis, puberulis vel subglabris; foliis oppositis longe petiolatis plerumque inaequalibus, membranaceis ovatis, 7–14 cm. longis, 5–9.5 cm. latis, acuminatis, basi cordatis, 5–7-nerviis, margine setoso-denticulatis, in sicco olivaceis, supra sparse hirsuto-setosis, subtus praecipue in nervis venulisque puberulis, nervis venulisque transversis supra subconspicuis, subtus leviter elevatis; petiolo 8–20 cm. longo, gracili, puberulo; inflorescentiis umbellatis terminalibus, circiter 10-floris, pedunculis 12–15 cm. longis gracilibus puberulis, pedicellis 5–7 mm. longis, puberulis, basi minute bracteatis, bracteis caducis; calyce longe infundibuliformi, circiter 5 mm. longo, puberulo, margine minute 5-dentato; petalis roseis, ovatis, circiter 8 mm. longis et 5 mm. latis, acutis; staminibus 8, subaequalibus, filamentis circiter 5 mm. longis, aequalibus, antheris linearibus acutis haud appendiculatis, 4 majoribus 6 mm. longis, 4 minoribus 4 mm. longis, connectivo postice leviter calcarato; stylis 1 cm. longis, stigmate leviter capitato.

SZECHUAN: O-pien District, *Y. S. Liu 2241* (A), Sept. 1937, alt. 1300–1800 m. SIKANG: Kanting, Tá-kwan, Ta Hsiang Ling, *C. Y. Chiao 1625* (TYPE, A), Aug. 7, 1939, herb, growing under trees in dense shade near mountain stream, alt. 2900 m., flowers pinkish; Kanting, near Ta-kwan, *C. Y. Chiao 2047* (A), Aug. 28, 1939, herb, growing on rocky slopes, alt. 1610 m. YUNNAN: Liang Shan, I'cho, *H. T. Tsai 51295* (A), Aug. 13, 1932, herb, rare, in woodland, alt. 2100 m.

This species is characterized by its prostrate rooting stem and very long and slender petioles. The filaments are all of equal length, but four of the anthers are shorter than the others. The stigma is slightly capitate. *Tsai 51295* from Yunnan is a sterile specimen, but it undoubtedly represents this species.

4. **Phyllagathis setotheca** sp. nov.

Suffruticosa ad 1 m. alta, caulibus glabris vel valde minute stellato-pubescentibus; foliis aequalibus vel subaequalibus chartaceis petiolatis, oblongo-lanceolatis, 10–14 cm. longis, 2–4.5 cm. latis, acuminatis, basi acutis vel attenuatis, 3-nerviis marginalibus 2 gracilioribus additis, utrinque glabris vel minute stellato-pubescentibus, nervis transversis supra subconspicuis, subtus distinctis; petiolo 1–5 cm. longo; inflorescentiis terminalibus umbellatis glabris, pedunculis 3–4 cm. longis, multifloris, 4-bracteatis, bracteis subchartaceis, ovatis vel ovato-oblongis, 1.5–2 cm. longis, 1–1.5 cm. latis, glabris, late acutis vel acutis, pedicellis 1–1.8 cm. longis; calycibus turbinatis membranaceis glabris, 6–8 mm. longis, margine 4-lobatis, lobis triangularibus acutis, 3–5 mm. longis, 2–3 mm. latis; petalis 4, ovatis, distincte membranaceis, 12–14 mm. longis, 7–9 mm. latis, acutis; staminibus 8, aequalibus, filamentis 5–6 mm. longis, antheris linearibus, 5–6 mm. longis, basi leviter incrassatis, connectivo sub theca antice haud appendiculato, postice distincte setoso-calcarato; stylis circiter 1.2 cm. longis, stigmate indistincto; fructibus in calycibus inclusis, subquadrangularibus, 6–7 mm. longis, 3–4 mm. latis, glabris, capsulis 4-lobatis, apice valde concavis.

KWANTUNG: Shih Wan Tai Shan, *H. Y. Liang 69817* (TYPE, A), July 21, 1931, herb in the shade of trees along streams.

INDO-CHINA: Tonkin, northeast of Mon-cay, Pac-si and vicinity, *W. T. Tsang 26914* (A), Sept. 27–30, 1936, semi-woody, fairly common in thickets, fruit purplish red; Ha-Coi, Cha Uk Village near Chuk-phai, Taai Wong Mo Shan and vicinity, *W. T. Tsang 28999* (A), *29059* (A), *29354* (A), May–July 1939, woody or semi-woody, 1–2 ft. high, fairly common, growing in thickets, flowers lavender, fragrant; Dam-ha, Sai Wong Mo Shan, Lung Wun Village, *W. T. Tsang 30043* (A), *30349A* (A), July 18 – Sept. 9, 1940.

This species is very different from other species of southeastern continental Asia, being nearly glabrous or more or less distinctly but minutely stellate-pubescent, with oblong-lanceolate leaves, prominent membranaceous bracts, and distinctly setose connectives.

5. **Phyllagathis stenophylla** (Merr. & Chun) comb. nov.
Bredia? stenophylla Merr. & Chun, Sunyatsenia **5**: 146. 1940.

HAINAN: Yaichow, *H. Y. Liang 62530* (HOLOTYPE, A); Kum-yun District, *H. Y. Liang 63384* (A).

In the original description of the species, Merrill and Chun state, "In the absence of flowers we are not entirely sure as to the proper generic position of this rather strongly marked species, but believe it to belong in the genus *Bredia*." No new material is available, but as in its general appearance it approximates *Phyllogathis setotheca*, I feel safe in transferring it to this genus.

6. **Phyllagathis anisophylla** Diels, Bot. Jahrb. **65**: 115. 1932.
HUNAN; based on *Hunan Museum 60 & 170;* no specimen seen.

Diels describes this plant as being ligneous, with unequal pairs of leaves, and with the connectives at the base of the anthers slightly thickened in front and long-calcarate behind; these characters indicate that it is probably not a *Phyllagathis*. No decision can be made, however, until the original specimens are examined.

7. **Phyllagathis oligotricha** Merr. ex Merr. & Chun, Sunyatsenia **1**: 74. 1930.
KWANGTUNG; based on *C. L. Tso 21016;* no specimen seen.

Merrill states, "Because of its habit, the somewhat elongated stems being decumbent below and rooting at the nodes, its few branches (rather than being strictly simple), and its inflorescences consisting of three or five terminal umbels rather than a simple umbel, I am in some doubt as to the propriety of placing this species in *Phyllagathis*." The type specimen is not available for study.

14. Scorpiothyrsus

Scorpiothyrsus gen. nov.

Inflorescentia terminalis paniculata gracilis longe pedunculata, ramulis scorpioideis, floribus tetrameris, parvis, breviter pedicellatis, scorpioideis vel subscorpioideis, in ramulis ultimis biseriatim dispositis; calycibus parce pubescentibus, tubo longe turbinato-campanulato, lobis ovatis, rotundatis vel acuminatis; petalis albis subreniformi-ovatis, rotundatis vel obscure apiculatis; staminibus 8, aequalibus, antheris oblongis obtusis, haud appendiculatis, connectivo haud calcarato; ovario 4-loculari, plane inferiore, stylis filiformibus, stigmate incrassato; capsulis in calycibus inclusis, turbinatis, graciliter 8-costatis, apice rotundatis, haud depressis.

Suffruticosa, erecta, simplex vel ramosa, caulibus erectis, deorsum subteretibus, sursum sulcatis vel angularibus, glabris vel hirsuto-setosis; foliis oppositis, longe petiolatis, late ovatis, glabris vel pilosis vel ciliato-hirsutis, basi perspicue cordatis, 7-nerviis, margine denticulatis.

The generic name is from σκορπιος, scorpion, and θυρσος, thyrsus, referring to the paniculate inflorescence with scorpioid branches.

In 1940, Merrill & Chun described three species of *Phyllagathis* from Hainan, which are more or less anomalous in the genus, for they noted that, "Most of the other species have umbellate and pseudo-umbellate inflorescences, while in these Hainan forms, the inflorescences are cymose-paniculate." Two additional species from Hainan are manifestly congeneric with these three. A new genus is here proposed for this group of species as a segregate from *Phyllagathis*. These species represent a very homogenous group of suffruticose plants characterized by paniculate inflorescences with scorpioid branches. The flowers are arranged in two rows along one side of each branchlet; the lower flowers fall early, leaving only the pedicel-scars along the lower part of the branchlets. The flowers are small and rather densely arranged. The scorpioid character is very distinct in those species with long inflorescence-branches, but even in those species with short branchlets, a close examination will reveal the same character.

In the scorpioidly arranged flowers, this new genus is close to *Sonerila*, but the inflorescences are paniculate, the flowers being arranged in two ranks on the scorpioid branches. In *Sonerila* the flowers are usually in simple racemes or spikes. *Sonerila* has trimerous flowers, while in *Scorpiothyrsus* the flowers are tetramerous. In *Phyllagathis*, the inflorescences are umbellate or pseudo-umbellate and usually not branched, while that genus differs further from *Scorpiothyrsus* in the usually larger flowers with pink or violet petals, elongated linear and attenuate anthers, which are slightly gibbose in front at the base, and the connectives being shortly calcarate behind at the base of the anthers, while the fruits are somewhat exserted from the calyx-tube, 4-valved, and manifestly concave at the

center. In *Scorpiothyrsus,* the flowers are smaller and with white petals, the anthers short, oblong, obtuse and not gibbose in front at the base, the connectives not calcarate at the back, and the fruits more or less hemispherical, completely included in the calyx, rounded or subrounded at the top and not concave at the center. In the last characters it approaches more closely the Oxysporeae rather than most genera of the Sonerileae. Stapf describes a section *Scorpioides* (Ic. Pl. **25:** *t. 2414.* 1896) of the genus *Drissenia* Korth. from Borneo, as characterized by its scorpioid paniculate inflorescences. However, Korthals' genus, with 8 very unequal strikingly appendaged stamens, is very remote from this new genus.

Five species in Hainan. Type species: *Phyllagathis xanthosticta* Merr. & Chun.

KEY TO THE SPECIES

A. Inflorescences many-branched, the ultimate branches long, definitely scorpioid; leaves glabrous.
  B. Leaves large, 12–18 cm. × 15–20 cm., with 2–6 rows of yellow spots on the upper surface paralleling the longitudinal nerves. .....1. *S. xanthostictus.*
  BB. Leaves smaller, 10–13.5 cm. × 6–10 cm., without yellow spots. ....2. *S. glabrifolius.*
AA. Inflorescences few-branched, the ultimate branches short, scorpioid to subscorpioid; leaves strigose above, pubescent beneath.
  B. Leaves with very few hairs or glabrous on the upper surface. 3. *S. oligotrichus.*
  BB. Leaves densely covered with hairs on the upper surface.
    C. Hairs yellow, rather stiff. .....4. *S. xanthotrichus.*
    CC. Hairs reddish, rather soft. .....5. *S. erythrotrichus.*

1. **Scorpiothyrsus xanthostictus** (Merr. & Chun) comb. nov.
Phyllagathis xanthosticta Merr. & Chun, Sunyatsenia **5:** 148. 1940.

HAINAN: Po-ting, *F. C. How 73725* (HOLOTYPE, A).

2. **Scorpiothyrsus glabrifolius** sp. nov.

Suffruticosa erecta, caulibus erectis, ad 22 cm. longis, ramis deorsum subteretibus, sursum sulcatis vel angularibus, ramulis ultimis 3 mm. diametro, parce hirsuto-setosis; foliis subchartaceis vel membranaceis, utrinque glabris, late ovatis, 10–13.5 cm. longis, 6–10 cm. latis, late acutis, basi rotundatis vel cordatis, 5–7-nerviis, margine irregulariter denticulatis, nervis transversis utrinque 20–25, distinctis, subparallelis, supra olivaceis, subtus pallidioribus; petiolo 4–6 cm. longo, parce hirsuto-setoso vel glabro; floribus ignotis; infructescentiis terminalibus, 3–6 cm. longis, paniculatis, fructibus parvis, breviter pedicellatis, scorpioideis, in ramulis ultimis biseriatim dispositis, calycibus persistentibus, 1.5 mm. longis, indistincte 5-lobatis, fructibus in calycibus inclusis, capsulis 4-locularibus apice rotundatis vel subrotundatis, haud depressis.

HAINAN: Po-ting, *S. K. Lau 27966* (TYPE, A), Oct. 11, 1936, an erect herb, in dense woods, leaves green above, fruit pale yellow.

This species is close to *Scorpiothyrsus xanthostictus* in the long, distinctly scorpioid branches of the inflorescences, but it has smaller leaves, shorter petioles, smaller and shorter inflorescences, and smaller fruits, and it lacks the yellow spots on the leaves. It is a branching undershrub, while *S. xanthostictus* appears to be unbranched.

3. **Scorpiothyrsus oligotrichus** sp. nov.

Suffruticosa erecta simplex, caulibus brevibus ad 5 cm. longis, circiter 3 mm. diametro, consperse hirsuto-setosis; foliis membranaceis late ovatis, 8–13 cm. longis, 5.5–9.5 cm. latis, apice rotundatis vel late acutis, basi late cordatis, 7-nerviis, margine denticulatis, dentibus plerumque setosis, in sicco utrinque olivaceis, supra ad marginem pauce hirsuto-setosis, subtus consperse setosis, nervis transversis utrinque 18–22, perspicuis, reticulis laxis elevatis distinctis; floribus ignotis; infructescentiis terminalibus gracilibus, circiter 12 cm. longis, obscure hirsutis, paniculatis, ramulis ultimis circiter 5 mm. longis, subscorpioideis, fructibus subconfertis, in calycibus inclusis, pedicellis circiter 3 mm. longis, calycibus persistentibus, circiter 2 mm. longis, capsulis 4-locularibus, apice rotundatis vel subrotundatis, haud depressis.

HAINAN: Loktung, *S. K. Lau 26924* (TYPE, A), May 27, 1936, herb, in dense woods, leaves yellowish green, fruit yellowish white.

This species is closely related to *S. xanthostictus* and *S. erythrotrichus* in the short-branched inflorescences. It can be easily distinguished from these by the scattered setose hairs on the upper surface of the leaves.

4. **Scorpiothyrsus xanthotrichus** (Merr. & Chun) comb. nov.
Phyllagathis xanthotricha Merr. & Chun, Sunyatsenia **5**: 149. *t. 23*. 1940.

HAINAN: Po-ting, *F. C. How 72690* (HOLOTYPE, A); Ling-shui, *C. Wang* (paratype, A, N).

5. **Scorpiothyrsus erythrotrichus** (Merr. & Chun) comb. nov.
Phyllagathis erythrotricha Merr. & Chun, Sunyatsenia **5**: 147. *fig. 18*. 1940.

HAINAN: Po-ting, *F. C. How 72579* (HOLOTYPE, A).

15. SONERILA

Sonerila Roxburgh, Hort. Beng. 5. 1814, Fl. Ind. **1**: 176. 1832.

Although the name *Sonerila* appears to be of quite frequent occurrence in the botanical literature of China, as Diels (Bot. Jahrb. **65**: 117. 1932) notes, the actual number of species correctly referred to this genus as present in China is not many. He mentions only that *Sonerila tenera* Royle and *S. cantonensis* Stapf are found in the coastal regions of Kwangtung and describes a new species, *S. plagiocardia*, from Yunnan. It now seems that the genus is quite well-developed in southern as well as southwestern China, although not so numerous in species as in the regions farther south; nine Chinese species are now recognized. In addition, *Sonerila laeta* Stapf, Kew Bull. **1906**: 73. 1906, is described from plants raised from seeds collected by Wilson in China. No specimen is seen.

1. **Sonerila cantonensis** Stapf, Ann. Bot. **6**: 302. 1892; Guillaum. Bull. Soc. Bot. France **60**: 404. 1913; Merr. Lingnan Sci. Jour. **5**: 138. 1927; Hand.-Maz. Sinensia **3**: 196. 1933.

HAINAN: No precise locality, *C. Wang 34735* (N), *35830* (N); Fan Ya, *F. A. McClure 8409* (A, N); Tsing-leung Shan, *F. A. McClure 6764* (N); Tam District, Hung Mo Shan, *Tsang & Fung 561 = 18095* (A); Bak Sa, *S. K. Lau 25863* (A). KWANGTUNG: Ting-wu Shan, *H. T. Ho 60034* (N); Kao-yao District, *S. Y. Lau 20286* (A, N); Wung-yuen District, *S. K. Lau 1985* (G), *2186* (G), *2350* (G). KWANGSI: Ling-yün District, *Steward & Cheo 681* (G); Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 22646* (A), *23987* (A, N), *24462* (A, N), *24667* (A, N). FUKIEN: Gang Keu, *J. L. Gressitt 1723* (G).

2. **Sonerila rivularis** Cogn. in DC. Monogr. Phan. **7:** 1182. 1891; Stapf, Ann. Bot. **6:** 302. 1892; Guillaum. in Lecomte, Fl. Gén. Indo-Chine **2:** 913. 1921.

KWANGSI: North of Hin Yen, *R. C. Ching 6870* (N), *7049* (N). KWANGTUNG: Tai Mien Shan, Shih Wan Tai Shan, *H. Y. Liang 69666* (A).

Indo-China.

This species is very close to *Sonerila cantonensis* Stapf, differing chiefly in the indumentum. *Sonerila cantonensis* Stapf has long hairs on the stems, petioles, veins on the lower surfaces of the leaves, and the calyces. The indumentum of *Sonerila rivularis* Cogn. is puberulent. It seems that the stamens are also slightly shorter in the latter species.

3. **Sonerila picta** Korth. Verh. Nat. Ges. Bot. 249. *t. 52.* 1839–42; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 536. 1879; Stapf, Ann. Bot. **6:** 302. 1892.

YUNNAN: Mengtze, *A. Henry 9005* (A, N), *9005A* (A); Szemao, *A. Henry 12293A* (N), *12293B* (N); Che-li District, *C. W. Wang 78518* (A).

A species of the Indo-Malayan region.

4. **Sonerila yunnanensis** J. Jeffrey, Notes Bot. Gard. Edinb. **8:** 207. 1914.

YUNNAN: Szemao, *A. Henry 12337* (ISOTYPE, A); Che-li District, *C. W. Wang 75860* (A), *76387* (A), *78191* (A), *79456* (A); Jenn-yeh District, *C. W. Wang 80141* (A), *80417* (A), *80516* (A). Endemic.

5. **Sonerila plagiocardia** Diels, Bot. Jahrb. **65:** 117. 1932.

YUNNAN: Tengyueh, *G. Forrest 26665* (isoparatype, N); Lu-se, *H. T. Tsai 55923* (A).

6. **Sonerila epiloboides** Stapf & King ex King, Jour. As. Soc. Beng. **69:** 22. 1909.

YUNNAN: Ping-pien District, *H. T. Tsai 61381* (A), *61864* (A), *61817* (A).

Malay Peninsula.

7. **Sonerila hainanensis** Merr. Philip. Jour. Sci. **23:** 256. 1923, Lingnan Sci. Jour. **5:** 138. 1927.

HAINAN: Five Finger Mt., *F. A. McClure 9391* (ISOTYPE, A); Tingan, *S. P. Ko 52247* (A, G, N); Lai Mo Leng, *J. L. Gressitt 1122* (G). Endemic.

8. **Sonerila tenera** Royle, Ill. Bot. Himal. *t. 45.* 1834, 215. 1835;[1] Hance, Jour. Bot. **16:** 107. 1878; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 530. 1879; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 301. 1887; Stapf, Ann. Bot. **6:** 305. 1892; Guillaum. in Lecomte, Not. Syst. **2:** 328. 1913, Bull. Soc. Bot. France **60:** 404. 1913.

KWANGSI: Kwei-lin District, *W. T. Tsang 28151* (A). KWANGTUNG: Lofaushan, *C. Ford s. n.* (N); Wung-yuen District, *S. K. Lau 2311* (G). YUNNAN: Szemao, *A. Henry 12564* (N); Che-li District, *C. W. Wang 75961* (A), *79271* (A); Jenn-yeh District, *C. W. Wang 79966* (A), *80296* (A); Chengkang, *T. T. Yü 17535* (A).

India to southern China and the Philippines.

9. **Sonerila cheliensis** sp. nov.

Herba perennis erecta 6–12 cm. alta, caulibus plus minusve alatis, minute pubescentibus, superne pilis capitatis paucis instructis; foliis in jugis aequalibus vel subaequalibus dispositis, petiolatis membranaceis glabris ovatis, 1.5–3 cm. longis, 0.75–1.5 cm. latis, apice acutis, basi attenuatis, 3-nerviis, margine obscure ciliato-denticulatis vel subintegris, reticulis obscuris; petiolo 0.5–1 cm. longo; inflorescentiis terminalibus plerumque

[1]For publication dates of the parts of Royle's "Illustrations," see Stearn in Jour. Arnold Arb. **24:** 484–487. 1943.

5–7-floris, pedunculis circiter 1.5 cm. longis, pedicellis 1–2 mm. longis, pedunculis pedicellis calycibusque pubescentibus pilis capitatis insuper parce instructis; calycibus cylindricis, 5 mm. longis, dentibus triangularibus acutis minutis, 0.5 mm. longis; petalis 3, oblongo-ellipticis, breviter acuminatis, 3.5 mm. longis; staminibus 3, antheris ovoideis, 1 mm. longis, apice acutis, basi cordatis, filamentis 1.5 mm. longis; stylo 2.5 mm. longo, stigmate subcapitato; capsulis circiter 1.8 cm. longis.

YUNNAN: Che-li District, Sheau-meng-yeang, *C. W. Wang 75962* (TYPE, A), Sept. 1936, herb, on mountain slopes in woods, alt. 1000 m., flowers pinkish red; Che-li District, Ban-chiou-chian, *C. W. Wang 79709* (A), Oct. 1936, in mixed forest, alt. 840 m., flowers red; Che-li District, You-louh Shan, *C. W. Wang 78162* (A), Sept. 1936, in woods, alt. 1415 m., flowers red.

This species is related to *S. tenera* Royle, differing from it in the winged stem without long hairs and in the larger and much broader leaves, as well as in the larger flowers.

16. ANPLECTRUM

Anplectrum A. Gray, Bot. U. S. Expl. Exped. **1**: 597. 1854.

1. **Anplectrum glaucum** (Jack) Triana, Trans. Linn. Soc. **28**: 84. 1871; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2**: 545. 1879; Cogn. in DC. Monogr. Phan. **7**: 566. 1891; Guillaum. in Lecomte, Fl. Gén. Indo-Chine **2**: 918. 1921; Merr. & Chun, Sunyatsenia **5**: 144. 1940.
   Melastoma glaucum Jack, Trans. Linn. Soc. **14**: 15. 1823.
   Osbeckia tetrandra Roxb. Hort. Beng. 88. 1814, nom. nud., Fl. Ind. ed. 2, **2**: 224. 1832.
   Dissochaeta glauca Blume, Flora **14**: 501. 1831.

   HAINAN: No precise locality, *C. Wang 33290* (N); Loktung, *S. K. Lau 27156* (A). Tenasserim and Indo-China to Malay Peninsula, Sumatra, Borneo, and Java.

17. MEDINILLA

Medinilla Gaudichaud, Bot. Freycinet Voy. 484. *t. 106*. 1826.

Only two species of *Medinilla* have hitherto been referred to this genus as occurring in China, both from the Island of Hainan. The present study reveals that this tropical genus is fairly well-represented in southern China, especially in southern Yunnan. Seven species are here recorded, and a key to the Chinese species is given. In addition, *T. T. Yü 20456* from northeastern Yunnan and *H. T. Tsai 60315* from southern Yunnan apparently represent additional species in this genus, but the specimens are too incomplete for other than generic determination.

A. Flowers in terminal panicles or lateral cymes.
   B. Flowers in large terminal panicles only; leaves membranaceous, sessile, cordate. ..... 1. *M. Spirei.*
   BB. Flowers in small terminal cymose panicles and in lateral cymes.
      C. Leaves membranaceous, petiolate, long-acuminate; branches not fleshy. ..... 2. *M. septentrionalis.*
      CC. Leaves chartaceous, subsessile, acute; branches fleshy. ... 3. *M. himalayana.*
AA. Flowers in axillary cymes only.
   B. Young branches terete.
      C. Leaves sessile or subsessile. ..... 4. *M. hainanensis.*
      CC. Leaves distinctly petiolate.
         D. Leaves obovate, rounded to subacute. ..... 5. *M. radicans.*

DD. Leaves oblong-ovate to oblong-lanceolate, long-acuminate. .....
.....6. *M. erythrophylla.*

BB. Young branches 4-angled.

C. Leaves large, 15–20 cm. long; young branches winged. .....7. *M. Tsaii.*

CC. Leaves 9–13 cm. long; young branches not winged. .....8. *M. yunnanensis.*

1. **Medinilla Spirei** Guillaum. in Lecomte Fl. Gén. Indo-Chine **2:** 921. 1921.

YUNNAN: Ping-pien District, *H. T. Tsai 60888* (A). KWANGSI: Bako Shan, western Poseh, *R. C. Ching 7536* (N); Pin-lam, *S. P. Ko 55588* (A). HAINAN: Kan-en District, *S. K. Lau 3793* (A), *5240* (A).

Indo-China. New to China.

A distinct species, characterized by the membranaceous, cordate, sessile leaves and large terminal panicles.

2. **Medinilla septentrionalis** (W. W. Smith) comb. nov.

Oritrephes septentrionalis W. W. Smith, Jour. As. Soc. Beng. II. **7:** 69. 1911.

Medinilla caerulescens Guillaum. in Lecomte, Fl. Gén. Indo Chine **2:** 921. 1921, syn. nov.

Medinilla caerulescens var. *nuda* Craib, Fl. Siam. Enum. **1:** 699. 1931, syn. nov.

Anplectrum yunnanense Kränzl. Viert. Nat. Ges. Zürich **76:** 153. 1931, syn. nov.

YUNNAN: Szemao, *A. Henry 11705* (isotype of *Anplectrum yunnanense* Kränzl., A), *11705B* (A), *11705C* (A, N), *11705D* (A); no precise locality, *G. Forrest 26642* (A, N), *27163* (A, N); Fo-hai, *C. W. Wang 77199* (A); Che-li District, *C. W. Wang 78399* (A), *79515* (A); Jenn-yeh District, *C. W. Wang 80282* (A), *80830* (A); Lungling District, *H. T. Tsai 55666* (A); Lu-se District, *H. T. Tsai 56353* (A), *56796* (A), *56860* (A), *56910* (A), *56951* (A). KWANGSI: West of Poseh, Bako Shan, *R. C. Ching 7519* (N); Yao Shan, *C. Wang 39025* (A), *39936* (A); Tai Ching Shan, Nor Yut, *S. P. Ko 55362* (A).

Indo-China, Upper Burma, northern Siam.

A distinct species, characterized by the relatively small, membranaceous, long-acuminate leaves. The connectives are elongated below the anther and strongly 2-tuberculate in front and shortly calcarate behind. I follow Guillaumin in placing this species in *Medinilla,* although it is somewhat anomalous in the genus. *Oritrephes* is a small genus established by Ridley for certain Malayan species. It belongs to the Oxysporeae, while the present species clearly belongs in the Medinilleae. The equal or nearly equal stamens and the axillary as well as terminal inflorescences immediately remove it from *Anplectrum,* where Kränzlin placed it.

3. **Medinilla himalayana** Hook. f. ex Triana, Trans. Linn. Soc. **28:** 88. 1871; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 549. 1879.

YUNNAN: Che-li District, *C. W. Wang 7828* (A).

Himalayan region; new to China.

A species characterized by the presence of both terminal and lateral paniculate cymes.

4. **Medinilla hainanensis** Merr. & Chun, Sunyatsenia **2:** 292. *t. 64.* 1935.

HAINAN: Fan Yah, *N. K. Chun & C. L. Tso 44185* (ISOTYPE, A). Known from the original collection only.

5. **Medinilla radicans** Blume, Flora **14:** 509. 1831, Rumphia **1:** 15. *t. 3.* 1835; Cogn. in DC. Monogr. Phan. **7:** 573. 1891; Guillaum. in Lecomte, Fl. Gén. Indo-Chine **2:** 922. 1921; Merr. Lingnan Sci. Jour. **6:** 283. 1930.

HAINAN: No precise locality, *C. Wang 32296* (A, N), *34216* (A, N); Loktung,

S. K. Lau 27167 (A), *27346* (A); Ngai District, *S. K. Lau 138* (N), *15846* (A), *15847* (A), *H. Fung 20066* (A, N); Liamui, *J. L. Gressitt 1157* (A); Lam-ko District, *W. T. Tsang 348* (A, N); Yaichow, *F. C. How 70716* (A, N), *70968* (A, N), *H. Y. Liang 62056* (N); Po-ting, *F. C. How 72849* (A); Dung Ka to Wen Fa Shi, *N. K. Chun & C. L. Tso 43686* (A, N), *43696* (A, N); Seven Finger Mts., *H. Y. Liang 61773* (A, N).

Indo-China, Java.

Merrill (l. c.), in first crediting this species to Hainan on the basis of *Tsang 15847*, comments: "This appears safely to be the same species as the Indo-China form referred by Guillaumin to Blume's species although there is some doubt as to the correctness of his interpretation."

6. **Medinilla erythrophylla** Lindl. Bot. Reg. **24:** Misc. 85. 1838; Paxt. Mag. Bot. **10:** 79. *1 t.* 1843; Lemaire, Hort. Univ. **5:** 72. *1 t.* 1844; Merr. Brittonia **4:** 127. 1941.

Melastoma? erythrophyllum Wall. List no. 4085. 1830, nom. nud.

Medinilla rubicunda sensu C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 547. 1879; Cogn. in DC. Monogr. Phan. **7:** 581. 1891; non Blume.

YUNNAN: Kiukiang Valley (Taron), *T. T. Yü 19918* (A), *19925* (A).

Himalayan region, eastern Bengal, and Upper Burma; new to China.

Merrill has clarified the status of this species, which was previously confused with the distinctly different *Medinilla rubicunda* Blume (*M. Hasseltii* Blume). He says: "The species is allied to *Medinilla Hasseltii* Blume, but the geographical ranges of the two are very different. . . . It should be noted that the type of *Melastoma rubicundum* Jack = *Medinilla rubicunda* (Jack) Blume, came from Singapore, and that Ridley does not admit the species, as interpreted by Clarke and Cogniaux, in his flora of the Malay Peninsula. Jack's original description applies strictly to the common Malaysian form later characterized as *Medinilla Hasseltii* Blume . . ."

7. **Medinilla Tsaii** sp. nov.

Frutex scandens circiter 30 cm. altus, ramis junioribus quadrangularibus, alatis, alis crispis; foliis chartaceis, sessilibus vel subsessilibus, oblongo-ovatis, 13–20 cm. longis, 5.5–8 cm. latis, acutis vel acuminatis, basi acutis, 3-nerviis, marginalibus 2 gracilioribus additis, venis lateralibus tertiariisque obsoletis; inflorescentiis ignotis; infructescentiis lateralibus cymosis, 5–6 cm. longis, pedunculis 1–1.5 cm. longis, pedicellis 1–1.2 cm. longis; fructibus oblongo-turbinatis, 1 cm. longis, 6 mm. latis, 4-locularibus, calycis margine persistente, 2–3 mm. longo, membranaceo, integro.

YUNNAN: Ma-kwan District, *H. T. Tsai 51846* (TYPE, A), March 1, 1933, a prostrate undershrub 1 ft. high, on rocks in woods, alt. 1800 m., fruit reddish green.

A species characterized by the strongly winged branches, large sessile leaves, and oblong fruit with persistent calyx-margins.

8. **Medinilla yunnanensis** sp. nov.

Frutex ad 2 m. altus, ramis plus minusve carnosis, ramulis 4-angularibus; foliis subchartaceis, breviter petiolatis, oblongo-ovatis, 10–13 cm. longis, 3.5–4.5 cm. latis, breviter acuminatis, basi acutis, 3-nerviis, venis lateralibus utrinsecus circiter 10, subconspicuis vel obscuris, venis tertiariis obsoletis; petiolo circiter 5 mm. longo; inflorescentiis lateralibus cymosis sessilibus, 2–4-floris, pedicellis 4–5 mm. longis; calyce turbinato, circiter 4 mm. longo, margine integro; petalis 4, obovatis, membranaceis, 5–6 mm.

longis, 3 mm. latis; staminibus 8, aequalibus, filamentis 2–3 mm. longis, antheris linearibus, 5 6 mm. longis, connectivo sub theca haud elongato, antice leviter 2-tuberculato, postice breviter calcarato; stylo circiter 1.1 cm. longo; fructibus ovoideis vel subglobosis, 6–8 mm. diametro, 4-locularibus.

YUNNAN: Szemao, *A. Henry 10275* (TYPE, A, isotype, N), *10275A* (A, N), a shrub 2–6 ft. high, alt. 5000 ft., flowers pink; Tsang-yuan, *C. W. Wang 73270* (A), April, 1936, in oak woods, alt. 1550 m.

This species resembles *Medinilla hainanensis* Merr. but is distinguished by its sessile inflorescences.

18. PTERNANDRA

Pternandra Jack, Malay. Misc. **2**(7): 60. 1822.

1. **Pternandra caerulescens** Jack, Malay. Misc. **2**(7): 61. 1822; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2**: 551. 1879; Triana, Trans. Linn. Soc. **28**: 153. 1871; Guillaum. in Lecomte, Fl. Gén. Indo-Chine **2**: 924. 1921; Merr. Lingnan Sci. Jour. **13**: 65. 1934.

HAINAN: Hung Mo Shan, north of Fan Ta, *Tsang & Fung 18034* (A).

Merrill, in recording this specimen as a *Pternandra,* says, "The specimen is in fruit but probably represents Jack's species at least as it is interpreted by Guillaumin."

19. MEMECYLON

Memecylon Linnaeus, Sp. Pl. 349. 1753.

KEY TO THE CHINESE SPECIES

A. Leaves dark olivaceous or blackish, smooth and shining above.
  B. Leaves dark-brown-olivaceous, chartaceous, 3.5 cm. long or less; fruits yellowish. ..... 1. *M. pauciflorum.*
  BB. Leaves blackish, 3.5–6 cm. long; fruits blackish.
    C. Fruits smooth, several together. ..... 2. *M. nigrescens.*
    CC. Fruits 8-costate, usually single. ..... 3. *M. octocostatum.*
AA. Leaves yellowish to pale olivaceous when dry, usually glandular and not shining above.
  B. Flowers few (less than 15), peduncles long or very short.
    C. Leaves large, about 8.5 × 4.5 cm. or larger.
      D. Leaves 8.5 cm. or less long; inflorescences short(2–3 mm.)-pedunculate. ..... 4. *M. floribundum.*
      DD. Leaves 9–13 cm. long, inflorescences long(10–15 mm.)-pedunculate..... 5. *M. hainanense.*
    CC. Leaves about 5.5 × 2.5 cm. or less.
      D. Leaves ovate, 3 cm. or less long; fruits 8–9 mm. in diameter. ..... 6. *M. scutellatum.*
      DD. Leaves oblong-lanceolate, 7–8 cm. long; fruits 6–7 mm. in diameter. ..... 7. *M. ligustrifolium.*
  BB. Flowers numerous (15–50), glomerulate, very short(2–3 mm.)-pedunculate. .. .. 8. *M. polyanthum.*

1. **Memecylon pauciflorum** Blume, Mus. Bot. Lugd.-Bat. **1**: 356. 1851; C. B. Clarke in Hook. f. Fl. Brit. Ind. **2**: 555. 1879; Triana, Trans. Linn. Soc. **28**: 158. 1871; Cogn. in DC. Monogr. Phan. **7**: 1169. 1891; Guillaum. Bull. Soc. Bot. France **60**: 338, 405. 1913, in Lecomte, Fl. Gén. Indo-Chine **2**: 928. 1921; Merr. Lingnan Sci. Jour. **5**: 139. 1927.

HAINAN: No precise locality, *A. Henry 8349* (G); Wen-chang District, *H. Fung 20329* (A, N); Lan-ko District, *W. T. Tsang 17440* (A).

Indo-China, Siam, India, Malaysia and northern Australia.

2. **Memecylon nigrescens** Hook. & Arn. Bot. Beechey Voy. 186. 1833; Triana, Trans. Linn. Soc. **28:** 159. 1871; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 302. 1887; Chung, Mem. Sci. Soc. China **1:** 185. 1924; Merr. Lingnan Sci. Jour. **13:** 65. 1934.

KWANGTUNG: Hongkong, *Hongk. Herb. 1070* (A), *9561* (A); Tai-O, *W. Y. Chun 3150* (N); Luichow, *Y. Tsiang 2538 p. p.* (N). HAINAN: No precise locality, *H. Y. Liang 64158* (A, N), *C. Wang 33317* (A, N), *33660* (N); Lingshui, *F. C. How 73788* (A); Loktung, *S. K. Lau 27017* (A); Dung Ka to Wen Fa Shi, *N. K. Chun & C. L. Tso 43671* (A, N), *43767* (A, N).

3. **Memecylon octocostatum** Merr. & Chun, Sunyatsenia **2:** 294. 1935.

HAINAN: No precise locality, *H. Y. Liang 63312* (A, N), *66465* (N), *C. Wang 34456* (A, N); Loktung, *S. K. Lau 27133* (N), *27347* (N); Kan-en District, *S. K. Lau 3475* (A); Chank-kiang District, *S. K. Lau 1460* (A, N), *2981* (A); Yaichow, *N. K. Chun & C. L. Tso 44589* (ISOTYPE, A), *H. Y. Liang 63018* (N).

In its vegetative characters, this species closely resembles *M. pauciflorum* Blume, but it is strongly characterized by its 8-costate fruits.

4. **Memecylon floribundum** Blume, Mus. Bot. Lugd.-Bat. **1:** 361. 1851; Triana, Trans. Linn. Soc. **28:** 158. 1871; Guillaum. Bull. Soc. Bot. France **60:** 337, 405. 1913, in Lecomte, Fl. Gén. Indo-Chine **2:** 927. 1921.

HAINAN: Chang-kiang District, *S. K. Lau 1789* (A, N); Kumyun, *S. K. Lau 27621* (A); Yaichow, *N. K. Chun & C. L. Tso 44629* (A, N).

5. **Memecylon hainanense** Merr. & Chun, Sunyatsenia **2:** 44. 1934.

HAINAN: No precise locality, *C. Wang 34211* (A, N), *34514* (A, N), *34575* (A, N), *36241* (A, N); Chang-kiang District, *S. K. Lau 1797* (A, N); Bak-sa, *S. K. Lau 26546* (A); Po-ting, *S. K. Lau 28059* (A); Yaichow, *F. C. How 70619* (A, N); Seven Finger Mts., *H. Y. Liang 61782* (ISOTYPE, A).

6. **Memecylon scutellatum** (Lour.) Naud. Ann. Sci. Nat. III. Bot. **18:** 282. 1852; Cogn. in DC. Monogr. Phan. **7:** 1157. 1891; Merr. & Chun, Sunyatsenia **1:** 75. 1930; Merr. Lingnan Sci. Jour. **13:** 66. 1934, Trans. Am. Philos. Soc. II. **24**(2): 288. 1935.

Scutula scutellata Lour. Fl. Cochinch. 235. 1790.

Memecylon edule Roxb. var. *scutellata* C. B. Clarke in Hook. f. Fl. Brit. Ind. **2:** 564. 1879; Guillaum. Bull. Soc. Bot. France **60:** 339. 1913, in Lecomte, Fl. Gén. Indo-Chine **2:** 935. 1921.

KWANGTUNG: Hongkong, *C. Ford s. n.* (N); Kochow, *Y. Tsiang 230* (N), *898* (A, N), *2246* (N); Luichow, *Y. Tsiang 2358 p. p.* (N); Ho-po District, *H. Y. Liang 29353* (A). KWANGSI: Nanning to Shang-sze, *R. C. Ching 7757* (A, N). HAINAN: No precise locality, *H. Y. Liang 64543* (N), *65066* (N), *66153* (N), *66272* (A, N), *C. Wang 32755* (N), *32759* (N), *33202* (A, N), *34896* (A, N), *36487* (A, N); Tai Un, *F. A. McClure 7740* (A, N); Ching-mai District, *C. I. Lei 104* (A, N); Ling-shui District, *F. A. McClure 22120* (A, N); Kumyun, *S. K. Lau 27797* (A); Kan-en District, *S. K. Lau 3751* (A); Chang-kiang District, *S. K. Lau 2867* (A); Ngai District, *S. K. Lau 170* (A, N); Tan District, *S. K. Lau 1012* (A, N), *J. L. Gressitt 878* (A), *W. T. Tsang 15292* (A, N), *16797* (A); Po-ting, *F. C. How 72779* (A); Yaichow, *F. C. How 70866* (A, N), *N. K. Chun & C. L. Tso 44576* (A, N), *44791* (A, N), *H. Y. Liang 61915* (A, N), *61916* (A, N), *62488* (N); Seven Finger Mts., *H. Y. Liang 61758* (A, N).

Burma, Indo-China, and Malay Peninsula.

7. **Memecylon ligustrifolium** Champ. ex Benth. in Hook. Kew Jour. Bot. **4:** 117. 1852; Benth. Fl. Hongk. 117. 1861; Triana, Trans. Linn. Soc. **28:** 156. 1871; Forbes & Hemsl. Jour. Linn. Soc. Bot. **23:** 302. 1887; Guillaum. Bull. Soc. Bot. France **60:** 338, 405. 1913; Chung, Mem. Sci. Soc. China **1:** 185. 1924; Merr. Lingnan Sci. Jour. **5:** 139. 1927.

Memecylon scutellatum sensu Hook. & Arn. Bot. Beechey Voy. 186. 1833; Seem. Bot. Herald Voy. 378. 1857; non Naud.

YUNNAN: Fo hai, *C. W. Wang 74432* (A), *74755* (A), *74971* (A), *76177* (A). KWANGSI: South of Nanning, Shih Wan Tai Shan, *R. C. Ching 8109* (A, N), *8263* (A, N); Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 24572* (A, N). KWANG-TUNG: Hongkong, *C. Ford s. n.* (A), *Herb. Hongk. 5241* (A), *W. L. Brigham s. n.* (G), *Y. Tsiang 54* (A), *699* (A), *W. Y. Chun 5105* (A), *N. K. Chun 40266* (A); Canton, *C. O. Levine 388* (A, G), *1709* (A, G), *2078* (A), *2108* (A, G); Ting-wu Shan, *T. Sampson (Herb. Hance) 673* (G); *C. O. Levine 758* (A, G), *W. Y. Chun 6489* (A), *H. T. Ho 60027* (N); Wung-yuen District, *S. K. Lau 2392* (A); Kao-yao District, *S. Y. Lau 20192* (A, N); Hwei-yang District, *W. T. Tsang 25661* (A); Ying-tak District, *Y. F. Chun 30410* (N). HAINAN: No precise locality, *H. Y. Liang 62637* (N), *63625* (N), *64159* (N), *64369* (N), *C. Wang 34381* (N), *34721* (N), *35910* (A, N), *36061* (A, N); Po-ting, *F. C. How 72799* (A); Hung Mo Tung, *Ip Yuk Shing 18347* (N); Ngai District, *S. K. Lau 66* (A, N); Kan-en District, *S. K. Lau 3566* (A), *5085* (A); Bak Sa, *S. K. Lau 26594* (A); Loktung, *S. K. Lau 27521* (A); Kumyun, *S. K. Lau 27758* (A).

8. **Memecylon polyanthum** sp. nov.

Frutex 2–3.5 m. altus, ramis ramulisque teretibus, ramulis ultimis circiter 1 mm. diametro; foliis coriaceis elliptico-ovatis, 5–8 cm. longis, 2–3 cm. latis, haud nitidis vel subnitidis, longe acuminatis, basi acutis, in sicco supra subbrunneis, subtus pallidioribus, costa supra impressa, subtus perspicua elevata, nervis venulisque obscuris; petiolo 3–5 mm. longo; inflorescentiis axillaribus, multifloris (15–50), densis, subglobosis, circiter 1.5 cm. diametro, e cymis brevibus fasciculatis multifloris compositis; pedunculis vix 2–3 mm. longis; floribus breviter pedicellatis (2–3 mm.), 4-meris, altis, bracteolis minutis basilaribus; calycibus circiter 1.5 mm. longis, tubo 1–1.5 mm. diametro, breviter 4-denticulato; petalis late ovatis acutis, 1.5 mm. longis et latis; filamentis 8, 2 mm. longis; stylis 3–4 mm. longis.

YUNNAN: Che-li District, Sheau-meng-yeang, *C. W. Wang 75514* (A), *79634* (TYPE, A), *81021* (A), a shrub 6–10 ft. high, mountain slopes, in woods, alt. 900–1000 m., flowers white; Che-li District, Dah-meng-lung, *C. W. Wang 77707* (A), Aug. 1936, 2 m. high, in thickets, alt. 960 m.

A species characterized by its numerous flowers densely arranged in glomerulate inflorescences, remote from all the other known Chinese species.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

PLANTS OF COAHUILA, EASTERN CHIHUAHUA, AND ADJOINING ZACATECAS AND DURANGO, III

IVAN M. JOHNSTON

CYPERACEAE

by H. K. SVENSON

Cyperus (*Eucyperus*) **esculentus** L. Sp. Pl. 45 (1753).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh 748;* Sierra Cruces, near Santa Elena, in arroyo, not common, *Stewart 288, 2176.* CHIHUAHUA: 5 km. north of Escobillas, frequent on silty flat, *Stewart 2372;* Pirámide, moist heavy soil near ran h, *Johnston 8138;* 7½ mi. south of Pirámide, moist silty flat above labor, *Johnston 8105a;* 10 mi. southeast of Organos, locally common in low ground at foot of slope, *Stewart & Johnston 2035;* 12 mi. south of Camargo, *White 2226.*

Widely distributed in America and in the Old World.

Cyperus (*Eucyperus*) **acuminatus** Torr. & Hook. Ann. Lyc. N. Y. **3:** 435 (1836).

COAHUILA: Mesa Grande, about 40 km. northwest of Hac. Encantada, in water of tinaja, fairly common, *Stewart 1638;* along trail from southern extremity of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, *Marsh 1491.*

Widely distributed across southern parts of the United States. Marsh's material is referable to the var. *cyrtolepis* (Torr. & Hook.) Kükenth.

Cyperus (*Eucyperus*) **ochraceus** Vahl, Enum. **2:** 325 (1806).

COAHUILA: Muzquiz Swamp, 1936, *Marsh 889.*

Louisiana and eastern Texas south through eastern Mexico to Argentina.

Cyperus (*Eucyperus*) **amabilis** Vahl, Enum. **2:** 318 (1806).

CHIHUAHUA: Hills northwest of Chihuahua, damp gravelly places on ledges, *Pringle 911.*

The cited specimen belongs to the var. *macrostachyus* (Boeck.) Kükenth. The species is widespread in the tropics of both hemispheres.

Cyperus (*Eucyperus*) **seslerioides** H.B.K. Nov. Gen. et Sp. **1:** 209 (1815).

CHIHUAHUA: Hills northeast of Chihuahua, Sept. 16, 1885, *Pringle 554.*

Trans-Pecos Texas (Big Bend) and Arizona, south through Mexico to Venezuela.

Cyperus (*Juncellus*) **laevigatus** L. Mant. Pl. 179 (1771).

CHIHUAHUA: Lake Santa Maria, *Nelson 6417;* 3 mi. west of Camargo, *White 2267a.*

Ranging from Texas to California and southward; of world-wide distribution in the tropics, usually in saline or brackish situations.

Cyperus (*Pycreus*) **niger** R. & P. Fl. Peruv. **1:** 47 (1798).

COAHUILA: Saltillo, shallow muddy creek, 1898, *Palmer 177;* Jimulco, warm springs, May 13, 1885, *Pringle 124.* CHIHUAHUA: Valley near Chihuahua, wet places, Sept. 27, 1886, *Pringle 809;* Presa de Chihuahua, 1936, *LeSueur 1108;* 3 mi. west of Camargo, *White 2267.*

Ranging from Texas to California and south into South America. The

Chihuahua material cited is referable to the var. *castaneus* (Wats.) Kükenth.

Cyperus (*Pycreus*) **albomarginatus** Mart. & Schrad. ex Nees in Mart. Fl. Bras. **2**(1): 9 (1842).

CHIHUAHUA: Wet places in the mountains northwest of Chihuahua, Oct. 7, 1886, *Pringle 810*.

Widely distributed in the tropics of both hemispheres; extending north through Mexico into the southern parts of United States.

Cyperus (*Mariscus*) **tenuis** Swartz, Prodr. Veg. Ind. Occ. 20 (1788).

COAHUILA: Sierra del Carmen, Sept. 12, 1936, *Marsh 835;* Muzquiz Swamp, 1936, *Marsh 934;* Cañon Bocatoche, scattered along rocky arroyo on valley floor, *Muller 3109*.

Widely distributed in the tropics of America and west Africa. Muller's collection is immature and its identification is somewhat doubtful; it was originally identified as *C. uniflorus* var. *pseudothyrsiflorus* Kükenth., but it does not have the hardened scales characteristic of *C. uniflorus*. The Coahuilan collections cited possibly can be referred to *C. breviradiatus* Liebm.

Cyperus (*Mariscus*) **spectabilis** Link, Hort. Berol. **1**: 318 (1827).

COAHUILA: Sierra del Carmen, Cañon Sentenela, moist stream-side, *Wynd & Mueller 595;* Zacate, *Marsh 511;* Cañon Bocatoche, scattered on grassy valley floor, *Muller 3134;* Sierra del Pino, near La Noria, gravelly arroyo banks, *Stewart 1216, Johnston & Muller 455;* tableland north of Cañon del Cuervo Chico, base of low rounded limestone hills, gravelly places, *Johnston 8561*. CHIHUAHUA: Sierra R'ca, Cañon Madera, frequent in wet rocky arroyo, *Stewart 2494;* Pirámide, moist rocky place near hacienda, *Johnston 8130a;* canyon west of Organos, gravelly arroyo banks with *Acacia, Stewart & Johnston 2076;* rocky hills near Chihuahua, *Pringle 311;* western base of Sierra Santa Eulalia, south of Potosi Mill, about north-facing ledges, fairly common, *Stewart & Johnston 2115*. ZACATECAS: Valley 15 km. west of Concepcion del Oro, *Stanford et al. 523*.

Ranging from Oklahoma and Arizona south to southern Mexico.

Cyperus (*Mariscus*) **apiculatus** Liebm. Vidensk. Selsk. Skr. Kjobenh. V.**2**: 220 (1851).

CHIHUAHUA: Samalayuca, sand dunes, 1935, *LeSueur 1720*.

Known only from Mexico.

Cyperus (*Mariscus*) **Fendlerianus** Boeckl. Linnaea **35**: 520 (1868).

COAHUILA: Sierra del Carmen, Sept. 7, 1936, *Marsh 801;* Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 512, 580;* Hac. La Babia, open valley floor, *Wynd & Mueller 654;* Sierra del Pino, La Noria, flats in dry pine woods, *Johnston & Muller 540*. CHIHUAHUA: Pirámide, about rock masses, *Johnston 8127, 8130;* 7½ mi. south of Pirámide, moist silty flat above labor, *Johnston 8105;* Sierra Virulento, 2–3 mi. east of Rancho Virulento, rocky slopes and ridges, *Johnston 8072a, 8074;* sand dunes, Samalayuca, 1935, *LeSueur 1724;* rocky hills near Chihuahua, 1885, *Pringle 310;* western base of Sierra Santa Eulalia, south of Potosi Mill, about north-facing ledges, rare, *Stewart & Johnston 2116*.

Ranging from Texas to Arizona and south to southern Mexico. The cited collection from the Sierra del Pino is typical *C. Fendlerianus*. The other collections have conspicuously pedunculate clusters of spikelets and belong to the var. *debilis* (Britt.) Kükenth.

Cyperus (*Mariscus*) **Mutisii** (H.B.K.) Griseb. Fl. Brit. W. Ind. 567 (1864).

CHIHUAHUA: Rocky hills near Chihuahua, wet ledges, 1885, *Pringle 512.*

Arizona south through Mexico into South America. Pringle's collection no. *512* is cited as *C. tetragonus* var. *Pringlei* by Kükenthal, Pflanzenr. 101 (IV. **20**): 493 (1936). The above cited specimen, in the Gray Herbarium, seems identical with *C. Mutisii* (at least as to Mexican specimens) and is very different from *C. tetragonus.* Perhaps Pringle's number is a mixture. Horvat, Cathol. Univ. Amer. Biol. Series **33**: 78 (1941), refers the New York Botanical Garden specimen of *Pringle 512* to *C. Pringlei* Britt. but explicitly excludes the Philadelphia Academy specimen bearing the same number.

Cyperus (*Mariscus*) **inflexus** Muhl. Descr. Gram. **16**: 1817.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 516;* mountains 21 mi. northeast of Monclova, Sept. 1880, *Palmer 1330.* CHIHUAHUA: Pirámide, base of large rock-masses, *Johnston 8123;* Sierra Encinillas, 4 km. north of Fierro, damp sand arroyo, fairly common, *Stewart 783;* rocky flat just east of Organos, wet soil among grass, *Stewart & Johnston 2060.*

Widely distributed in temperate and tropical America.

Cyperus (*Mariscus*) **uniflorus** Torr. & Hook. Ann. Lyc. N. Y. **3**: 431 (1836).

COAHUILA: Don Martin Dam, *White 1390.* CHIHUAHUA: Sandhills south of Samalayuca, Sept. 23, 1886, *Pringle 808;* sand dunes, Samalayuca, 1935, *LeSueur 1723.*

Ranging from Arizona to Arkansas south into northern Mexico.

Cyperus (*Torulinium*) **ferax** L. C. Rich. Act. Soc. Hist. Nat. Paris **1**: 106 (1792).

COAHUILA: Don Martin Dam, *White 1378;* Sierra del Carmen, Sept. 5, 1936, *Marsh 809;* Muzquiz Swamp, 1936, *Marsh 933;* valley below Saltillo, abundant, 3 ft. tall, *Gregg 539;* Rancho La Botica, Valle de las Delicias, by water, *Stewart 2853, 2926.* CHIHUAHUA: By stream near Chihuahua, Oct. 30, 1885, *Pringle 588.*

Widely distributed in temperate and tropical parts of the world.

Scirpus acutus Muhl. ex Bigelow, Fl. Boston. 15 (1814); Beetle, Am. Jour. Bot. **28**: 693 (1941).

Scirpus lacustris var. *occidentalis* Wats. Bot. Calif. **2**: 218 (1880).

VERNACULAR NAME: Tule.

COAHUILA: Saltillo, rare in this locality, 1898, *Palmer 258.* CHIHUAHUA: Rio Conchos at Meoqui, *LeSueur 1099;* 3 mi. west of Camargo, *White 2262.*

The collection from Saltillo is immature and its identification is questionable. The collection from Meoqui is young but recognizable. White's material from Camargo is in prime condition. The achenes are 2.5 mm. long, the yellowish scales are smooth except for the whitened-scabrous midrib and mucro and the strongly fringed margin. The collection, which closely resembles the pale specimens characteristic of the southwestern United States, consists of two plants, one with lance-ovate spikelets (10 × 4 mm.), the other with elongate spikelets (up to 14 × 2.5 mm.). There does not seem to be any clear-cut difference between *S. acutus* and *S. validus,* either in character of the root-stocks and root, or in the shape, size, or microscopic details of the achenes.

Scirpus Olneyi Gray, Boston Jour. Nat. Hist. **5**: 238 (1845).

COAHUILA: Sierra del Carmen, Aug. 9, 1936, *Marsh 744;* Monclova, *Marsh 1695;* Cuatro Cienegas, *Marsh 2076.* CHIHUAHUA: Lake Santa Maria, *Nelson 6419.*

Widely distributed in United States and extending south into tropical America. The species differs from *S. americanus* in its very short involucral bract, usually blunter spikelet, much smaller style-branches, and more slender anthers.

Scirpus lineatus Michx. Fl. Bor. Am. **1**: 32 (1803).

COAHUILA: Sierra del Carmen, Cañon Sentenela, stream-side, *Wynd & Mueller 545*.

An abundant species of eastern United States, extending southwest to Texas. Apparently not previously reported from Coahuila.

Scirpus coahuilensis Svenson, sp. nov.

Rhizomate duro adscendente ad apicem in fasciculis grandis caespitosis terminato; fasciculis 3–20-foliatis, prominenter usque ad 8 cm. chartaceo-vaginatis; foliis firmis, glaucis, elongatis, 3–4 dm. longis, perangustis 0.5 mm. latis, planis vel concavis, margine serratis, ad apicem flexuoso-filiformibus; culmis strictis, basi foliatis, glaucis, filiformibus, 4–5 dm. altis, singulatim e fasciculis productis; foliis involucri filiformibus 1–10 cm. longis inflorescentiam plerumque superantibus; spiculis 12–20 lanceolatis, 7–10 mm. longis, 10–12-floris, laxe coarctatis sessilibusque vel in radiis 1–3 cm. longis glomerulatis; squamis membranaceis, albido-flavescentibus, ovatis, 4 mm. longis, glabris, frequenter scabrido-mucronatis; achaeniis late obovatis, plano-convexis vel obscure trigonis, 1.8–2 mm. longis, 1.4 mm. latis, nitide brunneis, leviter papillosis; setis 2–4, levibus, plerumque achaenio multo brevioribus; stylo 3-fido, sub ramis 2 mm. longo, minute fimbriato ad apicem, basi haud incrassato; staminibus 3, antheris 1.5 mm. longis.

COAHUILA: High western ridge of Sierra de la Fragua, north of Puerto Colorado, abundant, coarse tufts 1–3 ft. tall, on rocky slopes with scrub oaks and *Pinus Pinceana*, Sept. 2, 1941, *Johnston 8763* (TYPE, Gray Herb.).

The relationships of this curious plant are obscure. Its general appearance, at least in the herbarium, is that of a much-stiffened *Eriophorum* with somewhat branched immature inflorescence. However, the general texture of the spikelets and especially of the bristles is quite different from that found in *Eriophorum*. One might infer that it represented an unusual species of *Bulbostylis*, but the plant is perfectly glabrous, and, furthermore, has practically no swollen style-base. Though the achenes, in color and shape, are somewhat similar to those of *Fimbristylis spathacea*, the plant does not appear to be related to either the New World or the Old World species of *Fimbristylis*. When the plant was collected it was assumed to be a species of *Carex* of the general relationship of *C. praegracilis*, since its individual spikelets superficially resemble those of that species. The plant forms very coarse clumps becoming a decimeter or more thick at the base. Its extremely abundant stems and leaves are ascending or widely spreading or even lie along the ground and may cover an area nearly a meter broad. It is a xerophyte growing in well-drained rocky calcareous soil along a ridge clothed with scattered pines and oaks.

Eleocharis rostellata Torr. Fl. N. Y. **2**: 347 (1843).

COAHUILA: Bank of stream in cienega, 7 km. south of Cuatro Cienegas, *Harvey 1235*.

Saline or alkaline marshes from Nova Scotia and British Columbia south into northern Mexico; also in South America.

Eleocharis interstincta (Vahl) R. & S. Syst. **2:** 149 (1817).

COAHUILA: Muzquiz Swamp, 1936, *Marsh 932.*

Ranging from Texas to Florida and throughout the New World tropics.

Eleocharis cellulosa Torr. Ann. Lyc. N. Y. **3:** 298 (1836).

COAHUILA: Muzquiz Swamp, 1936, *Marsh 930*; Monclova, along Rio Monclova, *White 1770.*

Ranging, chiefly in brackish and coastal waters, in southern United States, West Indies, and Yucatan. Not previously reported from northern Mexico.

Eleocharis caribaea (Rottb.) Blake, Rhodora **20:** 24 (1918).

VERNACULAR NAME: Tulillo.

COAHUILA: Sabinas River, Muzquiz, *Marsh 403;* Monclova, *White 1722, 1749, 1763;* Rancho Coyote, Valle Acatita, about spring, *Stewart 2736.*

Widely distributed in temperate and tropical regions.

Eleocharis montevidensis Kunth, Enum. **2:** 144 (1837).

Eleocharis arenicola Torr. in Engelm. & Gray, Boston Jour. Nat. Hist. **5:** 237 (1847).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh 747;* Santa Anna Canyon, *Marsh 451;* Monclova, *Marsh 1700;* Saltillo, along shallow creek, 1898, *Palmer 255;* Saltillo, *Arsène 10628.* CHIHUAHUA: Chihuahua, low wet bottoms, 1908, *Palmer 30;* southwest of Chihuahua, *LeSueur 1098.*

Ranging from South Carolina to California and south to central Mexico; also in Argentina and Uruguay.

Eleocharis Parishii Britton, N. Y. Micros. Soc. Journ. **5:** 110 (1889).

CHIHUAHUA: Lake Santa Maria, *Nelson 6415;* 3 mi. west of Camargo, *White 2261.*

Western United States south into northern Mexico.

Eleocharis macrostachya Britton in Small, Fl. S. E. U. S. 184, 1327 (1903).

VERNACULAR NAME: Tule.

COAHUILA: High mesa in the Sierra Encantada 6 km. northwest of Buena Vista, erect in water of arroyo, fairly common, *Stewart 1423;* along trail from southern extremity of Hillcoat Mesa to Buena Vista headquarters, July 27, 1938, *Marsh 1505;* large charco in valley southeast of El Almagre, abundant in wet soil and standing water, *Johnston & Muller 1221.* CHIHUAHUA: Jimenez, Rio Florido, edge of water, *White 2102;* 37 mi. north of Escalon, by small pond, *White 2079.*

Widely distributed in Western United States and south into Mexico.

Eleocharis montana (Willd.) R. & S. var. **nodulosa** (Roth) Svenson, comb. nov.

Scirpus nodulosus Roth, Nov. Pl. Sp. 29 (1821).

COAHUILA: Cañon Indio Felipe, Sierra Hechiceros, in water along creek, 1 m. tall, *Stewart 143.*

Florida to Arizona and southward in tropical America. Typical *E. montana* is based upon plants from the high mountains of Colombia with thickened non-septate culms. Plants from lower altitudes have the culms more or less distinctly septate and may be distinguished as the var. *nodulosa.*

Fimbristylis spadicea (L.) Vahl, var. **puberula** Chapm. Fl. S. U. S. 549 (1860).

Fimbristylis puberula (Michx.) Vahl, Enum. **2:** 289 (1806).

COAHUILA: Cuatro Cienegas, 1939, *Marsh 2078.*

Representing the phase of the species with puberulent scales that is common in the interior of the continent.

Fimbristylis annua (All.) R. & S. Syst. **2**: 95 (1817).

CHIHUAHUA: Valley northeast of Chihuahua, Sept. 16, 1885, *Pringle 555*.

A very widely distributed plant, abundant in all tropical and temperate parts of the world.

Bulbostylis capillaris (L.) C. B. Clarke in Hook. Fl. Brit. Ind. **6**: 652 (1893).

CHIHUAHUA: Pirámide, along sheltered crevices in large rock-masses on plain, *Johnston 8145*.

The first collection of the species seen from Mexico. The pale-stramineous mature achenes average 1 mm. long. The spikelets are a trifle larger (up to 7 mm. long) and more arcuate-umbellate than in specimens from the United States. Ranging from Maine to Minnesota south to Texas; also on the Pacific coast from Oregon southward.

Bulbostylis juncoides (Vahl) Kükenth. ex Osten, Ann. Mus. Nac. Montevideo II. **3**: 188 (1931).

CHIHUAHUA: Sierra de los Organos, 1937, *LeSueur 1286;* hills northeast of Chihuahua, Aug. 20, 1885, *Pringle 529*.

Ranging from Texas to Arizona and south into Mexico; also in South America. Our plants have the loose inflorescence characteristic of var. *ampliceps* Kükenth.

Schoenus nigricans L. Sp. Pl. 64 (1753).

COAHUILA: Cuatro Cienegas, along irrigation ditch, *White 1921;* Cuatro Cienegas, *Marsh 2074*.

The material from Cuatro Cienegas has scales and bracts pale straw-colored rather than dark brown or black, as is usual in this species. *Schoenus nigricans* has a wide distribution in the Old World. It is known only from scattered stations in northern Mexico and southern parts of the United States.

Hemicarpha micrantha (Vahl) Pax in E. & P. Nat. Pflanzenfam. **2**^{2}: 105 (1887).

CHIHUAHUA: Hills northeast of Chihuahua, Oct. 7, 1885, *Pringle 524*.

Widely distributed in the United States and southward to South America.

Dichromena colorata (L.) Hitchc. Rep. Mo. Bot. Gard. **4**: 141 (1893).

COAHUILA: Sabinas River near Muzquiz, 1936, *Marsh 400;* Muzquiz, 1938, *Marsh 1168*.

An abundant species in tropical America.

Cladium jamaicense Crantz, Inst. **1**: 362 (1766).

COAHUILA: Santa Anna Canyon, 1936, *Marsh 439;* ponds at El Anteojo, 3 mi. west of Cuatro Cienegas, forming very coarse clumps in deep water with *Typha,* stems becoming 10–12 ft. tall, conspicuous, *Johnston 8871*.

The mature achene is 3 mm. long, dark-brown except for the acute yellowish tip, smooth and shiny, with a broad truncate base. The "saw-grass" of the tropical savannas.

Fuirena simplex Vahl, Ecol. Am. **2**: 8 (1798), Enum. **2**: 384 (1806).

Fuirena obtusiflora Vahl. Ecol. Am. **2**: 8 (1798).

Fuirena Schiedeana Kunth, Enum. **2**: 183 (1837).

Fuirena squarrosa var. *aristulata* Torr. Ann. Lyc. N. Y. **3**: 291 (1836).

COAHUILA: Muzquiz Swamp, 1936, *Marsh 929;* Hermanas, 1939, *Marsh 1573;*

Monclova, Aug. 1880, *Palmer 1336;* Monclova, *Marsh 1740;* El Anteojo, 3 mi. west of Cuatro Cienegas, edge of brackish lake, *Johnston 7124;* Rancho La Botica, by water, common, *Stewart 2941;* Cañon del Agua Grande, west of Las Delicias, on gypsum by water, common, 11 dm. tall, *Stewart 2798;* Rancho del Coyote, eastern margin of Valle de Acatita, edge of spring, common, *Stewart 2734;* Cañon del Indio Felipe, Sierra Hechiceros, in water along creek, 8 dm. tall, *Stewart 144.*

The specimens show the great variability in stature and conformation of perigonial bristles inherent in many species of *Fuirena.* From the closely related *F. squarrosa,* characteristic of the eastern United States, *F. simplex* is readily separated by the glabrous (sometimes minutely puberulent) style. Its relative has the style densely hispid. The scales vary from hispid to nearly smooth and the outer row of bristles is frequently longer than the ovate-tipped inner group. In one collection (*Marsh 929*) the outer series of bristles is conspicuously swollen in the middle. *Fuirena simplex* and *F. obtusiflora* (and *Rynchospora glauca*) were collected by von Rohr in South America, at "Baia Chico" on the northeastern coast of Venezuela. *Fuirena Schiedeana* was obtained by Schiede at Vera Cruz in 1829.

Carex Schiedeana Kunze, Suppl. Riedg. 119. *t. 30* (1842); Mack. No. Am. Fl. **18:** 225 (1935), No. Am. Carices *t. 261* (1940).

COAHUILA: Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1447;* Puerto San Lazaro, scattered on fine soil in shelter of shrubs on rocky slope, *Muller 3062;* Carneros Pass, hillsides, 1890, *Pringle 3218;* 4 km. east of Fraile, on mountain, *Stanford et al. 356;* Sierra del Pino, La Noria, on shale in deep shaded arroyo, *Johnston & Muller 494;* Sierra del Pino, La Noria, under shrubs on arroyo-bank, *Johnston & Muller 502;* Sierra del Pino, La Noria, shelter of oaks on flat, *Johnston & Muller 459;* west base of Picacho del Fuste, on north-facing mountain-side, base of *Yucca* on gypsum beds, *Johnston 8400;* west base of Picacho del Fuste, base of *Yucca* on Red Beds, *Johnston 8449;* tableland north of Cañon del Cuervo Chico, grassy rocky slope of low rounded limestone hill, *Johnston 8557;* Sierra Madera, Cañon Charretera, opening in oak thickets on rocky flats, *Johnston 9059, 9144;* high western ridge of Sierra Fragua, north of Puerto Colorado, under pines on east slope, one plant, *Johnston 8770;* Sierra Cruces, 7 mi. north of Santa Elena, dry limestone hillside, about the base of *Yucca* and *Dasylirion, Johnston & Muller 316;* Sierra Mojada, Cañon San Salvador, sparse in moist shaded upper canyon, *Muller 3305.* CHIHUAHUA: Sierra Almagre, sparse on open slope with brush and some grass, *Johnston & Muller 1190;* Sierra Almagre, moist base of cliff in shaded deep canyon, *Johnston & Muller 1194.*

Ranging from western Texas south to central Mexico.

Carex praegracilis W. Boott, Bot. Gaz. **9:** 87 (1884); Mack. No. Am. Fl. **18:** 35 (1931).

CHIHUAHUA: Chihuahua, forming large patches in low wet bottom land, 1908, *Palmer 31.*

Widely distributed in the western United States.

Carex potosina Hemsl. Biol. Centr. Am. Bot. **3:** 474 (1885).

COAHUILA: 10 mi. east of Fraile, low place on silty valley floor, *Johnston 7306.* ZACATECAS: Valley 15 km. west of Concepcion del Oro, *Stanford et al. 557.*

Known only from the states of Coahuila, Zacatecas, and San Luis Potosi.

Carex Frankii Kunth, Enum. Pl. **2:** 498 (1837).

COAHUILA: Sierra del Carmen, Cañon Sentenela, moist stream-side, *Wynd & Mueller 550.*

Widely distributed in United States and extending south to Texas. Not

previously reported from Mexico. The achenes are 2 × 1.5 mm. in dimensions, somewhat larger than those given by Mackenzie for the species.

Carex hystricina Muhl. ex Willd. Sp. Pl. **4:** 282 (1805).

COAHUILA: Sierra del Carmen, Cañon Sentenela, moist stream-side, *Wynd & Mueller 549*.

Widely distributed in United States. Not previously reported from Mexico. The perigynia are 7 mm. long, very firm, and of a glistening stramineous color. In these respects the collection is much like those seen from the southern United States. The perigynia thus reach the maximum size recorded by Mackenzie. The achenes are also a trifle larger than the common specimens from the northern United States.

Carex Emoryi Dewey, Torr. Bot. Mex. Bound. Surv. 230 (1859).

COAHUILA: Muzquiz, 1936, *Marsh 1081*.

Not previously reported from Mexico. The original collection was made on the Upper Rio Grande.

Carex filifolia Nutt. Gen. **2:** 204 (1818).

COAHUILA: 11 km. northeast of Jimulco, rolling hills, *Stanford et al. 35*.

This collection appears to represent *C. filifolia*, a species widely distributed in the western United States but heretofore unreported from Mexico. Perhaps an undescribed species may be represented. The perigynia, though very young, show a beaked oblique apex. From other herbarium specimens examined the Mexican collection differs in its elongate, many-flowered staminate inflorescence. This exceeds 2 cm. in length but falls within the measurements for the part given by Mackenzie.

PALMAE

Brahea bella Bailey, Gentes Herb. **6:** 194. *f. 99, 100* (1943).

COAHUILA: Muzquiz, Dec. 5, 1936, *Marsh 1061;* Sierra Gloria, 1939, *Marsh 1925, 2210*.

The type of *B. bella* was collected by Prof. L. H. Bailey "on Rancho San Geronimo (Mangum) about fifty miles northwest from the postoffice at Muzquiz near the upper waters of the Rio La Babia." Additional material was obtained further northward "at Rancho Agua Dulce (Persons)." He states that the palm grows "on plains and mountains at altitude of 2000–3000 feet, in clefts and seams of limerock and among separated boulders of it, growing as single trees in many sizes but often covering the valley floor as if in forests and abundant on cliffs and broken ranges at higher altitudes."

The collections I have cited above are fragmentary or juvenile and have been doubtfully identified as *B. bella* by Bailey. They suggest that the species ranges along the escarpment of the plateau in northern Coahuila and in the outlying sierras in middle-eastern portions of the state. Perhaps also belonging to the species are the palms observed about the high limestone cliffs in the Sierra Gavia at the north portal of Tres Rios Pass, about 70 km. south of Monclova.

The present species is most closely related to *B. Berlandieri* Bartlett,

known only from La Silla, the type station, La Mitra, and Cañon Huesteca, in the vicinity of Monterey. This species, which possibly may just enter Coahuila in the mountains between Monterey and Saltillo, is said to differ from *B. bella* in having the fronds, at least beneath, distinctly glaucous and blue-green, rather than bright green on both sides and somewhat glossy and shiny. Since many elements of the flora found on the mountains about Monterey range northwestward at least to the Sierra Gavia and Sierra Gloria, south and southeast of Monclova, it would not be surprising if the palms known from these latter ranges prove either referable to *B. Berlandieri* or intermediate between that species and *B. bella*.

LEMNACEAE

Lemna gibba L. Sp. Pl. 970 (1753).

CHIHUAHUA: Samalayuca, in springs, April 17, 1852, *Wright 1892*.

Nebraska to Texas and west to California; northern Mexico; Old World.

COMMELINACEAE

Tradescantia crassifolia Cav. Icones **1**: 54. *t. 75* (1791).

VERNACULAR NAME: Lino de Maiz.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 566;* Sierra del Carmen, Sept. 12, 1936, *Marsh 816;* Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1468;* Saltillo, July 16, 1848, *Gregg 253;* Carneros Pass area, 1880, *Palmer 2016;* highest peaks of the Sierra Cruces, rock crevices, fl. purple, *Stewart 1142.* CHIHUAHUA: Sierra Rica, Cañon Madera, crevices of cliffs, fl. purple, *Stewart 2491;* valley 4 km. south of Rancho Encinillas, clump of mesquites, fl. blue, *Stewart 722;* slopes about high valley at northwest end of Sierra Diablo, fl. purple, *Stewart 958;* Sierra Organos, *LeSueur;* El Pozo, Sierra Santa Eulalia, fl. lavender, *White 2416;* hills near Chihuahua, *Pringle 691, 1386.*

A variable but readily recognizable widely ranging species which reaches its northern limit in our area. The stems and lower leaf-surfaces are usually white-villous, but plants glabrescent in various degrees are frequent.

Tradescantia brachyphylla Greenm. Proc. Am. Acad. **33**: 471 (1898).

COAHUILA: Mountains 4 km. east of Fraile, moist place, fl. purple, *Stanford et al. 357a.* ZACATECAS: Concepcion del Oro, among thorny shrubs high up steep canyon-sides where moist and shady, fl. bright rose-color, rare, 1904, *Palmer 323;* 15 km. west of Concepcion del Oro, *Stanford et al. 554.*

Known from the Sierra Madre of Nuevo Leon and Tamaulipas and from Puebla.

Tradescantia Wrightii Rose & Bush, Trans. Acad. Sci. St. Louis **14**: 188 (1904).

COAHUILA: Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1479;* western base of Picacho del Fuste, gypsum beds on north slope, corolla purple, *Johnston 8396;* mountains 4 km. east of Fraile, moist place, *Stanford et al. 360;* Cañon del Agua Chica, west of Las Delicias, limestone slope, fl. purple, *Stewart 2828;* ? Rancho del Coyote, east side of Valle Acatita, on gypsum in arroyo, fl. white, *Stewart 2746.* CHIHUAHUA: Northwest end of Sierra Diablo, open hillside, fl. lavender, *Stewart 978.*

A species known only from our area and from trans-Pecos Texas (mountains near El Paso, *Wright 701,* type; Guadalupe Mts.; and near Alpine). In our area it is readily recognized by its simple stem, 15–25 cm. tall, which bears a single cauline leaf and is terminated by a sessile cluster of flowers.

The Texan material is completely glabrous, but the Mexican specimens have glanduliferous hairs on the pedicels.

Tradescantia pinetorum Greene, Erythea **1**: 247 (1893).

CHIHUAHUA: Cool slopes in the hills northwest of Chihuahua, *Pringle 804*.

A characteristic plant of the highlands of western Chihuahua and adjacent Sonora and Arizona. It is readily recognized by the very abundant minute retrorse hairs which usually clothe its slender stems.

Tradescantia Karwinskyana Schultes, Syst. Veg. **7**[2]: 1165 (1830).

COAHUILA: Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1416;* Sierra Gloria, *Marsh 1893;* Carneros Pass area, 1880, *Palmer 1325;* mountain 4 km. east of Fraile, moist place, fl. purple, *Stanford et al. 357*. ZACATECAS: 15 km. west of Concepcion del Oro, fl. purple, *Stanford et al. 499*.

Ranging from Hidalgo north along the eastern Sierra Madre into our area.

Tradescantia venustula Kunth, Enum. **4**: 87 (1843).

VERNACULAR NAME: Lino de Maiz.

COAHUILA: Near Santo Domingo, limestone hill, *Wynd & Mueller 458;* Santa Anna Canyon, *Marsh 485;* Mesa Grande, 4 km. northwest of Hac. Encantada, *Stewart 1670;* Hillcoast Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1415, 1418;* vicinity of Buena Vista Ranch headquarters, July 14, 1938, *Marsh 2288;* east of La Rosa, dry mountain slope, *Wynd & Mueller 39;* hills 20 mi. west of Saltillo, *Shreve & Tinkham 9825;* Saltillo, *Gregg 250;* Saltillo, 1898, *Palmer 319;* Sierra Madera, Cañon Charretera, *Johnston 9119;* Sierra del Pino, Cañon Ybarra, *Stewart 1245, 1808;* Sierra del Pino, La Noria, *Johnston & Muller 408, 609;* Sierra Cruces, Cañon Tinaja Blanca, *Johnston & Muller 260a;* Picacho de San José, *Stewart 1113;* Sierra Mojada, Cañon Hidalgo, below crest, *Stewart 1097*. CHIHUAHUA: Sierra Diablo, Cañon Rayo, *Stewart 923;* Sierra Diablo, high valley at northwestern end of sierra, *Stewart 979*.

An attractive plant with glabrous glaucescent stems and leaves and pale sky-blue corollas. It favors open rocky hillsides and, though widely distributed in northern Coahuila, is seldom common.

I refer the Coahuilan plant to *T. venustula* with some hesitation. That species was based upon plants grown at Berlin from seeds collected in Mexico by Karwinski. Plants indistinguishable from the Coahuilan plants have been collected by Purpus (no. *5019*) near Minas de San Rafael, S.L.P., and accordingly the species can be expected in northern Hidalgo where Karwinski made extensive collections. Kunth's description of *T. venustula*, except for the flower-color ("sepala . . . interiora in alabastro azurea"), fits equally well either the present plant or the one I have called *T. rhodantha*. The present species, however, has decidedly sky-blue petals, which show this color even in the bud and accordingly differ markedly from the reddish petals of *T. rhodantha*.

Tradescantia rhodantha Torr. Bot. Mex. Bound. 225 (1859).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 618;* Sierra del Carmen, Sept. 7, 1936, *Marsh 805*. CHIHUAHUA: Sierra Rica, Cañon Madera, cliff crevices, fl. purple, *Stewart 2515;* rocky hills just west of Chihuahua, *Pringle 698*.

This species has reddish or reddish pink flowers and usually glandular hairy pedicels and calyces. It is best known from western Chihuahua and from thence ranges southward at scattered stations to Durango, San Luis

Potosi, and Guerrero. Our plants clearly belong to *T. rhodantha* Torr.; that species, however, may have an earlier name in *T. linearis* Benth.

Commelina diffusa Burm. f. Fl. Ind. 18. *t. 7* (1768).

COAHUILA: Carneros Pass area, July 1880, *Palmer 1326.*

An Asiatic species introduced and now widely established in America.

Commelina dianthifolia Delile in Redout. Liliac. *7. t. 390* (1801).

COAHUILA: Sierra del Carmen, Sept. 7, 1936, *Marsh 796;* Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 2273.* CHIHUAHUA: Sierra Rica, Cañon Madera, sunny slopes, *Stewart 2536.*

Widely distributed in Mexico and extending northward along the western Sierra Madre to Arizona, New Mexico, and trans-Pecos Texas.

Commelina erecta L. Sp. Pl. 41 (1753).

VERNACULAR NAME: Espuelitas.

COAHUILA: Allende, *Marsh 2228;* 11 mi. south of Allende, *Johnston 7011;* Yerda Spring, *Marsh 354, 357, 951;* Muzquiz — La Mariposa, *Marsh 374;* 25 mi. southwest of Sabinas, *Wynd & Mueller 208;* Sierra del Carmen, 10 km. northeast of Hac. Encantada, *Stewart 1560;* Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1477, 1478;* Cañon San Enrique, Sierra Encantada, west of Buena Vista, *Stewart 1365;* Cañon Bocatoche, *Muller 3105;* hills near Mesillas, *Gregg 526;* Sierra del Pino, La Noria, *Johnston & Muller 619;* 12 mi. north of San Rafael, *Stewart 423;* Sierra Cruces, near Santa Elena, *Stewart, Johnston & Muller 246, Stewart 604;* Sierra Cruces, Cañon Tinaja Blanca, *Johnston & Muller 260;* northwest end of Sierra Planchada, *Stewart 1007;* east of Guimbalete, *Stewart 2637;* Tanque Toribio, 30–40 km. north of Colonias, *Stewart 2781.* CHIHUAHUA: 5 km. south of Rancho Encinillas, *Stewart 714;* Cañon Coyote, 20 km. northwest of Santa Fe, *Stewart 2608;* near Trinidad, *Stewart 2584;* near Chihuahua, *Pringle 531;* El Pozo, Sierra Santa Eulalia, *White 2417;* Meoqui, *LeSueur 487;* 12 mi. south of Camargo, *White 2195;* 5 mi. east of Jimenez, *White 2129.*

A plant frequent on flats and on hillsides, in clay or rocky places, commonly sheltered by bushes or cacti and more or less supported by them. A northern species which reaches south into Chihuahua, Coahuila, and Nuevo Leon. The common form in our area is the narrow-leaved var. *angustifolia* (Michx.) Fernald, Rhodora **42:** 439 (1940). Mr. Marsh has collected about Muzquiz, however, a form with broader, thinner, darker green leaves which appears to be referable to typical *C. erecta* L.

Setcreasea brevifolia (Torr.) Pilger in E. & P. Nat. Pflanzenfam. Erganzungsheft **2:** 42 (1906).

VERNACULAR NAME: Pollo.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 624;* Rancho Agua Dulce, Sierra San Manuel, *Wynd & Mueller 335;* Palm Canyon, Muzquiz, *Marsh 356;* Sierra Guajes, Cañon Milagro, shaded canyon-sides, *Stewart 1534a;* Sierra Encantada, high mesa 15 km. northwest of Buena Vista, rocky slopes, fl. orchid, *Stewart 1438;* Sierra Gloria, *Marsh 2220;* Soledad, fl. pink, 1880, *Palmer 2014;* Cuatro Cienegas, *Marsh 2049;* Sierra Hechiceros, Cañon Indio Felipe, cliff-face, fl. lavender, *Stewart 3;* Sierra del Pino, head of Cañon Ybarra, hillside, fl. light pink, *Stewart 1257;* western base of Picacho del Fuste, among loose rocks in deep arroyo, *Johnston 8450;* Picacho de San José, among rocks on open hillside, *Stewart 1109.*

Ranging from the Davis and Chisos Mountains and the lower Pecos River (type locality), in Texas, south into northern Coahuila. A low

plant with coarse rhizomes growing among loose rocks or in crevices, usually on sheltered cliffs or north-facing slopes. Usually locally common when present. The corollas are pinkish. In the literature this plant of desert mountains has been confused with **Setcreasea Buckleyi** nom. nov. (*Tradescantia speciosa* Buckley, Proc. Acad. Nat. Sci. Phila. **1862:** 9 [1863], not Linn.), a plant of the coastal area of southern Texas which has a paler corolla and loosely branched elongate trailing stems.

Setcreasea leiandra (Torr.) Pilger almost certainly grows along our northern boundary. It is a trans-Pecos Texan plant known from such stations as the Davis Mts., Chinati Mts., and (at the type-locality in Paysano Pass) near Alpine.

Tinantia erecta (Jacq.) Schlecht. Linnaea **25:** 185 (1852).

CHIHUAHUA: Near Chihuahua, *LeSueur 248;* shade of cliff in mountains southwest of Mapula station, *Pringle 805.*

A tropical species extending northward along the Sierra Madre into Chihuahua.

Commelinantia Pringlei (Wats.) Tharp, Torreya **24:** 52 (1924), Bull. Torr. Bot. Cl. **54:** 337. *t. 26, 27* (1927).

COAHUILA: Sierra del Carmen, Cañon Sentenela, moist stream-side, *Wynd & Mueller 619;* Yerda Spring, *Marsh 950;* Sierra Gloria, *Marsh 1957;* Sierra Guajes, Cañon Milagro, shaded places in deep canyon, *Stewart 1534;* Sierra Hechiceros, Cañon Indio Felipe, shaded crevices on cliffs and along stream, *Stewart 4, 112.*

A very distinct species known only from the mountains of Nuevo Leon and northern Coahuila.

PONTEDERIACEAE

Eichornia crassipes (Mart.) Solms in DC. Monogr. Phan. **4:** 527 (1883).

COAHUILA: Monclova, 1939, *Marsh 2201, 2243.*

A floating aquatic from South America now widely established in the warmer parts of the world.

Heteranthera dubia (Jacq.) MacMill. Metasp. Minn. Valley 138 (1892).

CHIHUAHUA: Rio Conchos at Rosatilla, *LeSueur 564;* Rio Conchos at Camargo, *White 2242.*

A floating aquatic widely distributed in temperate and tropical America.

Heteranthera mexicana Wats. Proc. Am. Acad. **18:** 166 (1883).

COAHUILA: Villa Juarez, on Sabinas River, 1880, *Palmer 1324* (TYPE).

Known only from northeastern Coahuila and adjacent Texas.

Heteranthera limosa (Sw.) Willd. Ges. Nat. Freunde Berlin Neue Schr. **3:** 439 (1801).

COAHUILA: Tanque La Palma, south base of Sierra Hechiceros, in wet mud and standing water, *Johnston & Muller 1281.* CHIHUAHUA: Sierra Hechiceros, near Rancho Encampanada, along stream, *Stewart 193.*

Widely distributed in temperate and tropical America.

BROMELIACEAE

Hechtia texensis Wats. Proc. Am. Acad. **20:** 374 (1885).

Hechtia scariosa L. B. Smith, Contr. Gray Herb. **117:** 20 (1937).

VERNACULAR NAMES: Guapilla; Aguapie.

COAHUILA: Hermanas, *Marsh 1608;* Sierra San Vicente, Cañon Espantosa, *Schroeder 146;* La Pistola, eastern margin of Llano de Guaje, arid limestone hills, *Johnston & Muller 770;* Sierra del Pino, ledges at mouth of southern canyon, *Johnston & Muller 733;* Tanque Jerico, limestone hillside, *Johnston 8337;* western base of Picacho del Fuste, cemented gravels, *Johnston 8447;* Potrero del Cuervo Chico near Tanque Bandido, limestone ledges, *Johnston 8578;* Aguaje Pajarito, west end of Sierra Fragua, rocky slopes and ledges, *Johnston 8716;* Parras, March 1905, *Purpus 1101;* eastern foothills of Sierra Cruces north of Santa Elena, limestone ledges, *Johnston & Muller 324;* Sierra Jimulco, 11 km. northeast of Jimulco, *Stanford et al. 88;* near Jimulco, limestone ledges, *Pringle 72* (type of *H. scariosa*). CHIHUAHUA: Sierra San Carlos, lime-shale ridge near mines, *Johnston & Muller 62.*

The type-locality of this species was given by its discoverer (Havard, Proc. U. S. Nat. Mus. **8:** 478. 1885) as follows: "On the bluffs of the Rio Grande, south of the Chisos Mountains, mixed with Lechuguilla and nearly as forbidding, was collected a new species of a genus not before observed in the United States — *Hechtia texensis,* Watson." Subsequently the plant has been found in various parts of the Big Bend area, apparently always on limestones. The plant is common and widely distributed on sunny limestone ledges and on banks of cemented gravels over most of Coahuila, usually in the company of *Agave lechuguilla* and frequently of *Agave falcata.* The heads of armed leaves grow in crowded clumps. In some old colonies the clumps die out at the center and the heads become arranged in a ring up to a meter or more in diameter. Although the margins of the leaves have very sharp recurved thorns, the tissue of the blade is very juicy and can be chewed for quenching thirst when no other source of water is available.

The species is characterized by its scarious, usually pinkish sepals and bracts, and by its loosely branched inflorescence. It is probably most closely related to *H. elliptica,* of southeastern Coahuila and northern Zacatecas, which differs in its subsimple female inflorescence and firmer stramineous sepals and bracts.

Hechtia elliptica L. B. Smith, Contr. Gray Herb. **117:** 20 (1937).
Hechtia zacatecae L. B. Smith, Contr. Gray Herb. **117:** 21 (1937).

COAHUILA: Saltillo, June 1898, *Palmer 205* (TYPE). ZACATECAS: Cedros, high ridges, *Kirkwood 5* (type of *H. zacatecae*); without locality, 1908, *Lloyd 125.*

This species probably ranges widely along the western base of the Sierra Madre and on the small ranges of the plateau, in southeastern Coahuila, western Nuevo Leon, and northern Zacatecas. It is closely related to the more easterly *H. glomerata* Zucc. and appears to replace that species on the plateau. *Hechtia glomerata,* which has a synonym in *H. Ghiesbreghtii* Lehm. (and probably others in *H. capituligera* Mez, *H. gamapetala* Mez, and *H. mexicana* Smith), ranges from Zapala County, Texas, south in Tamaulipas and Nuevo Leon to Hidalgo. It differs from *H. elliptica* in having smaller capsules and smaller firmer brownish sepals and floral bracts scantily clothed with trichomes. Like *H. elliptica,* and hence differing from *H. texensis,* its female inflorescence consists of a spicate arrangement of dense capitate glomerules. *Hechtia glomerata* may possibly enter our borders in northeastern Coahuila.

Tillandsia recurvata L. Sp. Pl. ed. 2. 410 (1862).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 589;* Yerda Springs, *Marsh 323;* Sierra Gloria, *Marsh 2007;* Puerto San Lazaro, *Wynd & Mueller 119, Muller 3101;* San Lorenzo Canyon, 6 mi. southeast of Saltillo, shady rock-face, 1904, *Palmer 428;* Sierra Cruces, Cañon Tinaja Blanca, local, *Johnston & Muller 262;* Sierra Cruces, Cañon Encinal, local, *Stewart 2276;* Sierra Jimulco, 11 km. northeast of Jimulco, *Stanford et al. 6.* CHIHUAHUA: Sierra Almagre, local in deep canyon, *Johnston & Muller 1184.* ZACATECAS: Higher canyons, Santa Rosa and Cedros, *Kirkwood 42;* without locality, 1908, *Lloyd 55.*

An epiphyte growing on rocks, cliffs, and trees in canyons and sheltered places. Commonly occurring in great abundance when present, but colonies usually very localized and very widely scattered, and in some areas uncommon or even rare.

JUNCACEAE

by F. J. HERMANN

Juncus mexicanus Willd. in R. & S. Syst. Veg. **7:** 178 (1829).

COAHUILA: Saltillo, large masses in wet bottoms, 1898, *Palmer 201.* CHIHUAHUA: 3 mi. west of Camargo, *White 2278.*

Texas to California and south in Mexico; Chile and Patagonia.

Juncus bufonius L. Sp. Pl. 328 (1753).

COAHUILA: Saltillo, in a ditch, 1898, *Palmer 263.*

Nearly throughout North America; cosmopolitan.

Juncus tenuis Willd. Sp. Pl. **2:** 214 (1799).
Juncus dichotomus Ell. Bot. S. Carolina 406 (1821).
Juncus albicans Fernald, Proc. Am. Acad. **45:** 415 (1910).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh 750.* CHIHUAHUA: Outskirts of Chihuahua, a few plants in corn-field, 1908, *Palmer 161* (type of *J. albicans*).

Typical *J. tenuis* is found from Massachusetts and Florida to Texas and Mexico; also in South America from Brazil to Argentina. The type of *J. albicans* is a form intermediate between typical *J. tenuis* and the var. *multicornis* (i.e. *J. macer* S. F. Gray). Such transitional forms are comparatively infrequent in the eastern United States but become more plentiful in the southwest. The auricles in *J. albicans* are intermediate in texture between those of typical *J. tenuis* and the var. *Dudleyi*; the seeds are nearer those of the var. *multicornis* (the shallowly margined areolae averaging four times as broad as long, and about 40 to a vertical row) than to those of true *J. tenuis* (the conspicuously ridged areolae averaging only twice as broad as long, and less than 20 to a vertical row) and are not appreciably longer nor more prominently white-caudate than the average in either typical *J. tenuis* or its var. *multicornis*.

Juncus tenuis var. **Dudleyi** (Wiegand) Hermann, comb. nov.
Juncus Dudleyi Wiegand, Bull. Torr. Bot. Cl. **27:** 524 (1900).

COAHUILA: Sierra del Carmen, Cañon Sentenela, 1936, *Wynd & Mueller 561.*

The cited collection is slightly atypical but may be referred to this variety, which ranges from Newfoundland to Washington and south through central and western United States into Mexico. Although *J. tenuis,* as it occurs in its typical form on the coastal plain of the eastern United States,

is readily distinguishable from allied forms, the characters setting it off from those currently separated as *J. Dudleyi* tend to become obscure to imperceptible where the ranges of the two plants merge. This is doubtless the explanation of many of the recurrent reports of *"J. tenuis"* from stations far inland. Specimens from the upper Mississippi Valley, in particular, may frequently have as much in common with *J. tenuis* as they do with *J. Dudleyi;* examples of such intermediates from Indiana are *Deam 54009,* White County; *Kriebel 3451,* Lawrence County; and *Friesner 6038,* Hancock County. Such transitional forms appear sporadically in the east (*Hermann 4344,* Delaware County, Pa., having some auricles almost those of typical *Dudleyi,* some of *tenuis,* and some approaching those of *macer,* and leaf-blades from flat to involute to terete), but become progressively more common westward.

Juncus tenuis var. **multicornis** E. Mey. Linnaea **3:** 371 (1828).
Juncus macer S. F. Gray, Nat. Arr. Brit. Fl. **2:** 164 (1821).
Juncus tenuis of authors, not Willd.

COAHUILA: Sierra Hechiceros, Cañon Indio Felipe, edge of creek, *Stewart 111;* Sierra del Pino, La Noria, moist sand in arroyo, *Johnston & Muller 481, Stewart 1202.*

Ranging almost throughout North America; also in Chile, Argentina, and Brazil. Among the collections cited, *Stewart 1202* is a transitional form approaching typical *J. tenuis.*

Recent study of an extensive series of southwestern collections in §*Poiophylli* shows that the disintegration of the specific line between *J. tenuis* and *J. macer* is as pronounced as that between *J. tenuis* and *J. Dudleyi.* Again illustrations of this may be found in the eastern United States, such as *Nils 8,* from the mouth of the Patuxent River, Md., having some auricles of *tenuis* and some of *macer* and most of the mature seeds those of *macer,* and *True 313,* from Chester County, Pa., having auricles intermediate between *tenuis* and *macer.* The much more numerous intermediates in the western United States appear in various forms. Infrequently one may show the prolonged, scarious auricles of *macer* in combination with the dark olive to brownish green inflorescence and mahogany-brown capsules of *tenuis* (*Demaree 14946,* Drew County, Ark.); but much more common are forms having the inflorescence and capsules of *macer* but the auricles imperceptibly, if at all, prolonged and the sheaths strongly tinted with red at the base. Such transitional forms seem to be the basis of the anomalous *J. dichotomus* var. *platyphyllus* Wiegand, Bull. Torr. Bot. Cl. **30:** 448 (1903).

The unreliability of the characters employed to maintain these plants as specifically distinct from one another becomes patent upon study of a comprehensive series of collections representing the full extent of their known geographic ranges. Thus the leaf-blades in a large proportion of the collections of typical *J. Dudleyi* are terete, either altogether (*Howell 12775,* Trinity County, Calif.) or in part (*Hermann 7944,* Keweenaw County, Mich.), whereas the leaf-blades of "typical" *tenuis* may be absolutely terete throughout, or flat at the base to terete towards the apex, or

convolute, or involute, several types being frequently found on a single plant. Likewise the ridges marking off the areolae on the seeds in *J. tenuis,* although very pronounced up to the time of full maturity, tend to become eventually almost as inconspicuous as those in the seeds of *J. macer;* and the differences between the two in relative width and length of the areolae are equally unstable.

For the reasons given, it has seemed desirable to regard both *J. Dudleyi* and *J. macer* as varieties of *J. tenuis.* It is unfortunate that, according to the rules of nomenclature, Meyer's *J. tenuis* var. *multicornis* must be taken up as the proper name for so widespread and common a plant as *J. macer.* Originally applied to a minor ecological or physiological form, it was poorly chosen for the form Meyer had in hand, and it becomes entirely meaningless as an epithet for the broader application in which it must now be used.

Juncus nodosus L. var. **meridianus** Hermann, var. nov.

Planta a varietate typica recedit fructus rostro breviore, 0.5–0.75 mm. longo, valvulis apice non cohaerentibus.

COAHUILA: Saltillo, 1898, *Palmer 264* (US). CHIHUAHUA: Ojo Almagre, Sierra Almagre, wet sand in canyon, locally abundant, tuberous, *Johnston & Muller 1203;* Chihuahua, a few plants in large bunches in moist shady place under overhanging rocks of river bank, 1908, *Palmer 360* (TYPE, U. S. Nat. Herb.); 3 mi. west of Camargo, *White 2268;* Jimenez, wet sandy soil along Rio Florido, *White 2088;* El Cima, June 29, 1936, *LeSueur 1112.* TEXAS: Glenn Springs, Chisos Mts., *Warnock 770* (US); Lower Oak Canyon, Chisos Mts., *Sperry 329* (US); Gano Springs, west of Chisos Mts., *Sperry 401* (US).

Known only from Coahuila, Chihuahua, and the Chisos area in Texas. In typical *J. nodosus,* which ranges across the northern United States and south to Virginia, Illinois, New Mexico, and southern Nevada, the narrowly oblong capsules generally equal the perianth in length, only the long beak, 0.75–1.5 mm. long, being exserted. In the var. *meridianus* the broadly oblong capsules conspicuously exceed the perianth, the short, abrupt beak, 0.5–0.75 mm. long, having its base raised about 1 mm. above the tips of the perianth-segments. The capsule-valves in the var. *meridianus* are less firm in texture than those of typical *nodosus,* are usually pale stramineous in color rather than dark brown, and apparently separate completely immediately upon dehiscence instead of cohering at the apex. The stamens are very frequently reduced to three in the variety, and the rhizomes tend to be more generally and prominently tuberiferous.

Juncus Torreyi Coville, Bull. Torr. Bot. Cl. **22:** 303 (1895).

COAHUILA: Sierra del Carmen, Aug. 9, 1936, *Marsh 647, 745;* Monclova, *Marsh 1648.*

Widely distributed in the United States and south into Coahuila.

Juncus saximontanus Nels. Bull. Torr. Bot. Cl. **29:** 401 (1902).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 509;* Sierra Hechiceros, Cañon Indio Felipe, water along creek, *Stewart 145.*

Colorado to British Columbia, south to Oregon, Arizona, and New Mexico; extending south in Mexico to Durango and east into northern Coahuila. Of the two collections cited, that from the Sierra del Carmen

belongs to the forma *brunnescens* (Rydb.) Hermann, differing from the typical form in having relatively smaller, more numerous, and fewer-flowered heads in the inflorescence.

LILIACEAE

Smilax bona-nox L. Sp. Pl. 1030 (1753).

COAHUILA: Yerda Spring, near Muzquiz, *Marsh 266;* Sierra Gloria, *Marsh 1995.*

A plant of eastern Mexico and eastern United States. Entering our area from adjoining Nuevo Leon.

Asphodelus fistulosus L. Sp. Pl. 309 (1753).

Glyphosperma Palmeri Wats. Proc. Am. Acad. **18:** 164 (1883).

COAHUILA: Saltillo, sandy valleys, 1880, *Palmer 1320* (type of *G. Palmeri*); Saltillo, in roadside ditch, juncoid, dense clumps 1–2½ ft. tall, flowers pinkish, *Johnston 7246.* ZACATECAS: Near Concepcion del Oro, 1902, *Palmer 385.*

Introduced from southern Europe and widely established in central Mexico.

Anthericum Torreyi Baker, Jour. Linn. Soc. **15:** 317 (1876).

COAHUILA: Hillcoat Canyon west of Buena Vista Ranch, July 13, 1938, *Marsh 2285;* Valle de los Guajes, 25 km. south of Buena Vista, grassy flat, not common, erect, fl. orange, *Stewart 1327;* basal slope of low limestone hill on plateau north of Cañon de Cuervo Chico, gravelly places, erect, fl. orange, *Johnston 8566;* limestone hills near La Rosa, *Shreve & Tinkham 9574.* CHIHUAHUA: 16 km. south of Escobillas, silty flat, frequent, erect, fl. yellowish, *Stewart 2362;* Chihuahua, *LeSueur 471, Pringle 666;* 11 mi. northeast of Camargo, silty soil along draw, one plant, fl. orange, *Johnston 7922;* high valley at northwestern end of Sierra Diablo, open hillside and grassy meadows, not common, erect, fl. orange, *Stewart 971.* ZACATECAS: 18 km. west of Concepcion del Oro, on mountain, 18 in. tall, fl. yellow, *Stanford et al. 600.*

The plants referred here have fruits less than 12 mm. (commonly not surpassing 10 mm.) long. The leaves in *Stanford et al. 600* and *Johnston 7922* are 4–6 mm. wide and flat, but the other collections have them conspicuously narrower, usually revolute, and with veins more prominent and crowded. This latter form is typical *A. Torreyi* and is found in western Chihuahua, New Mexico, and western Texas. The material from Arizona and adjacent Mexico, passing as *A. Torreyi,* differs in having the filaments nearly smooth and not conspicuously vesicular-roughened as in typical *A. Torreyi.*

Anthericum stenocarpum Baker, Jour. Linn. Soc. **15:** 317 (1876).

COAHUILA: Sierra del Pino, head of Cañon Ybarra, dry hillside, *Stewart 1259a;* Sierra del Pino, saddle north of high eastern ridge, frequent, crevices, open slopes, fl. orange, *Stewart 2283;* Sierra del Pino, near La Noria, meadows and on terrace along arroyo, *Johnston & Muller 482, Stewart 1220;* escarpment on west side of Potrero de la Mula, rocky places under oaks, fl. yellow, *Johnston 9231;* crest of escarpment west of Potrero de la Mula, moist gravelly places along seepage, *Johnston 9253;* Sierra Gloria, *Marsh 2217;* mountain valley 26 km. northwest of Fraile, 18 in. tall, fl. yellow, *Stanford et al. 423;* San Antonio de las Alanzanas, yellow, 2 ft. tall, frequent, *Gregg 393* (ISOTYPE).

A plant of the oak and pine belts characterized by its coarse habit, large strict capsules (13–20 mm. long), and broad flat leaves. It is also known from the Sierra Madre of Nuevo Leon and Tamaulipas. Watson, Proc. Am.

Acad. **18:** 164 (1883), reports the species from Lirios, Coahuila (*Palmer 2012*).

Anthericum leptophyllum (Benth.) Baker, Jour. Linn. Soc. **15:** 317 (1876).

COAHUILA: Near Saltillo, Sept. 1898, *Palmer 327*.

The above collection may be only a phase of *A. Torreyi,* but it very much resembles the type collection of *A. lepidophyllum,* from Aguas Calientes. This latter species is close to the more northern *A. Torreyi,* differing in its shorter, somewhat firmer, scabridulous leaves, which at anthesis seem to be less well developed than in *A. Torreyi.*

Hemiphylacus latifolius Wats. Proc. Am. Acad. **18:** 164 (1883).

COAHUILA: Mountains 6 mi. east of Saltillo, 1880, *Palmer 1319* (TYPE); Chojo Grande, 27 mi. southeast of Saltillo, gravelly openings in canyon, leaves quite fleshy, Aug. 1904, *Palmer 367;* rolling hills 11 km. northeast of Jimulco, fl. white, tubers 1–2½ in. long, *Stanford et al. 79*.

Known also from San Luis Potosi and Oaxaca. A very coarse broad-leaved herb with unusual sausage-shaped tubers.

Zigadenus virescens (H.B.K.) Macbr. Contr. Gray Herb. **53:** 4 (1918).

COAHUILA: Carneros Pass area, 1880, *Palmer 1321;* Carneros Pass, *Pringle 2827;* ? Hillcoat Mesa west of Encantada Ranch, July 25, 1938, *Marsh 1473*.

Widely distributed in the mountains of Mexico.

Schoenocaulon Coulteri Baker, Jour. Linn. Soc. **17:** 477 (1879).

Schoenocaulon intermedium Baker, Jour. Linn. Soc. **17:** 477 (1879), as to *Coulter 1568*.

Schoenocaulon macrocarpum Brinker, Ann. Mo. Bot. Gard. **29:** 300 (1942).

COAHUILA: Mountain-border near Saltillo, frequent, 2 ft. tall, root used for snuff, June 25, 1848, *Gregg 214;* high western end of Sierra Fragua north of Puerto Colorado, rocky soil under pines on east slopes, frequent, 12–30 in. tall, corolla yellowish green, *Johnston 8754;* Sierra del Pino, dry rocky slope at lower edge of pine-oak belt below La Noria, local, *Johnston & Muller 421;* Sierra Mojada, Cañon Hidalgo, about cliffs in shady canyon below the crest, not common, erect, fl. white, *Stewart 1070*. CHIHUAHUA: Sierra Santa Eulalia, 1885, *Pringle 40;* 14 km. up Cañon Rayo, northeast end of Sierra Diablo, shade of bushes on arroyo bank, not common, fl. white, *Stewart 925*.

Ranging in our area and in the mountains of eastern Mexico south at least to Hidalgo (type from Zimapan); apparently also in the Guadalupe Mts. of western Texas and adjoining southeastern New Mexico. The species much resembles and is closely related to *S. Drummondii* and especially *S. texanum* of Texas, differing from them in its more southern range and extremely fibrous bulb-coats. The bulbs of the Texan plants have friable papery coats and are persistently fibrous only at the neck where they project from the soil. The usually more elongate and deeply buried bulbs of *S. Coulteri* have extremely fibrous coats. The outer coats disintegrate in age and the older bulbs become thickly invested by very abundant coarse dark-colored fibers. Though *S. intermedium* Baker has page priority over *S. Coulteri* Baker, I am taking up the latter name since it was based entirely on *Coulter 1569,* which clearly represents the present concept. *Schoenocaulon intermedium* is founded on *Coulter 1568,* representative of our

concept, and *Coulter 1570,* representative of *S. caricifolium* (Schlecht.) Gray.

I have been unable to follow the classification of *Schoenocaulon* recently proposed by Brinker, Ann. Mo. Bot. Gard. **29:** 283–316 (1942). His classification is decidedly unconvincing. His key is short, artificial, and not successful. Though he proposes many new species, his descriptions are cursory and the individual species have no discussion or explanation. Suspicion is immediately aroused by the lack of geographical segregation among the very obviously closely related species he recognizes, as also by their lack of conformity to the familiar patterns of geographical distribution followed by most groups of Mexican plants. This is well exemplified by his classification of the species of the Pacific Coast of Mexico, probably all conspecific and properly called *S. calcicola* Greenm., which he has broken up into *S. calcicola* Greenm., *S. jaliscense* Greenm., *S. megarrhiza* Jones, *S. regulare* n. sp., *S. tenue* n. sp., and *S. Mortonii* n. sp. Material of *S. Coulteri,* as I have defined it, Brinker classifies under *S. Coulteri, S. Drummondii* Gray, *S. macrocarpum* n. sp., and *S. texanum* Scheele. The bulb coats quickly distinguish *S. Coulteri* from *S. Drummondii* and *S. texanum.* Brinker's *S. macrocarpum* is a synonym of *S. Coulteri. Schoenocaulon caricifolium* (Schlecht.) Gray, which has a synonym in *S. comatum* Brinker, is a plant of east-central Mexico, more closely related to the plant of western Mexico than to *S. Coulteri.* From *S. Coulteri* it is readily distinguished by its more slender spike of smaller flowers and its stouter usually longer pedicellate spreading capsules.

Milla biflora Cav. Icon. Pl. **2:** 76 (1793).

VERNACULAR NAMES: Mayo blanco; Flor de Mayo; Estrellas.

COAHUILA: Sierra Hechiceros, gravelly flat at head of Cañon Madera, locally common, *Johnston & Muller 1298.* CHIHUAHUA: Sierra Hechiceros, Rancho Encampanada, abundant on sunny hillside, white, 4 dm. tall, *Stewart 199;* near Rancho El Pino, 10 km. southeast of Sierra Rica, open sunny slope, frequent, fl. white, *Stewart 2562;* 4 km. east of Tepopote, silty flat, scarce, erect, fl. white, *Stewart 2365;* Pirámide, base of rock-masses, *Johnston 8150;* high valley at northwestern end of Sierra Diablo, sunny open hillsides, not common, erect, fl. white, *Stewart 965;* 31 mi. southeast of Jimenez, scattered on grassy desert valley, fl. white with green stripe down outside of each lobe, *Muller 3338;* plains near Chihuahua, *Pringle 660.*

Ranging from central Mexico northward along the western Sierra Madre to Sonora, Chihuahua, and southeastern Arizona.

Milla Bryani Johnston, Jour. Arnold Arb. **24:** 90 (1943).

VERNACULAR NAME: Sebollin.

COAHUILA: West base of Picacho del Fuste, north-facing slope about limestone rocks, common, fl. white with green lines, *Johnston 8364;* near head of Cañon del Cuervo Chico, rocky slopes and crests of limestone, 1–3 ft. tall, perianth white with green stripe, *Johnston 8529* (TYPE); Sierra Madera, Cañon Charretera near La Cueva, grassy openings in oak thickets, rocky flat, fl. white, *Johnston 9123;* Sierra Madera, mouth of Cañon del Agua, abundant among desert shrubs in foothills, fl. white, *Muller 3203;* high western end of Sierra Fragua north of Puerto Colorado, opening among brush and pines on ridge, 2–3 ft. tall, not common, corolla white with greenish stripe, *Johnston 8777;* Rancho La Botica, Valle Delicias, open slopes, erect, 3 dm. tall, fl. white, *Stewart 2848, 2898.*

An endemic species closely related to *M. biflora* and replacing it in the limestone mountains of central Coahuila. Differing from its relative in its more elongate and slender corolla and exserted filaments.

Nothoscordum bivalve (L.) Britt. in Britt. & Br. Ill. Fl. N. U. S. **1**: 415 (1896).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 589;* Sierra Gloria, *Marsh 1929;* Monclova, 1880, *Palmer;* Sierra Hechiceros, El Tule, damp soil in arroyo, fairly common, erect, fl. white, *Stewart 499;* dry steep canyon 5 km. northeast of Jimulco, *Stanford et al. 121.* CHIHUAHUA: Sierra Hechiceros, Rancho Encampanada, 1940, *Stewart.* ZACATECAS: Concepcion del Oro, exposed mesas among thorny and scrubby plants, 1904, *Palmer 270.*

Widely distributed in Mexico and eastern United States.

Muilla Purpusii Brandeg. Univ. Calif. Publ. Bot. **4**: 177 (1911).

Bloomeria Purpusii (Brandeg.) Macbr. Contr. Gray Herb. **56**: 9 (1918).

COAHUILA: Sierra de la Paila, Oct. 1910, *Purpus 4859* (ISOTYPE).

A bulbous plant bearing a slender scape terminating in an umbel of small blue flowers. The species is known only from the type collection. Its generic position is uncertain.

Allium cernuum Roth in Roem. Arch. **1**^{3}: 40 (1798).

COAHUILA: Sierra del Carmen, Aug. 26, 1936, *Marsh 609.*

Widely distributed in United States and extending south into northern Mexico. Our material belongs to the southwestern variant which has been called *A. neomexicanum* Rydb.

I am indebted to Prof. Marion Ownbey for identification of the specimens of *Allium* cited in the present paper.

Allium Drummondii Regel, Act. Hort. Petrop. **3**^{2}: 112 (1875).

COAHUILA: Valley of the Rio Grande near Piedras Negras, April 20, 1900, *Pringle 9185;* Burro Mts., *G. Jermy 170.*

Kansas south through Texas and southeastern New Mexico to Coahuila.

Allium glandulosum Link & Otto, Icon. Rar. **1**: 33. *t. 17* (1828).

CHIHUAHUA: Cañon Madera, southeastern flank of Sierra Rica, frequent on talus slope 5 km. up canyon, oak-pinyon belt, *Stewart 2532.*

Widely distributed in Mexico. Prof. Ownbey states that the species differs from *A. Kunthii* in having slender fleshy rhizomes produced from the base of the bulbs, and adds that perhaps *A. rhizomatum* Woot. & Standl., from New Mexico, may be a synonym of the species.

Allium Kunthii Don, Mem. Wern. Soc. **6**: 82 (1827).

VERNACULAR NAME: Cebolla cimarron.

COAHUILA: Western slope of Sierra del Carmen, 10 km. east of Hac. Encantada, open hillside, *Stewart 1690;* Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1456;* Cañon Madera, Sierra Guajes, east of Rancho Buena Vista, hillside, *Stewart 1790;* high mesa in the Sierra Encantada, 16 km. northwest of Rancho Buena Vista, rocky hillside, *Stewart 1441;* Sierra Gloria, *Marsh 1930;* Soledad, 1880, *Palmer 2010;* 24 km. northwest of Fraile, burnt-off south slope, *Stanford et al. 411;* west base of Picacho del Fuste, north-facing limestone slope, *Johnston 8376;* Cañon del Cuervo Chico, rocky bank in open canyon, *Johnston 8522A;* Sierra Madera, Cañon Charretera, stony open place on canyon floor, *Johnston 9151;* Sierra Madera, Cañon del Agua, abundant among desert shrubs in foothills at canyon-mouth, *Muller 3204;* high western

ridge of Sierra Fragua, north of Puerto Colorado, gravelly places along crest, *Johnston 8743;* limestone ridge in foothills of Sierra Cruces, west of Santa Elena, *Johnston 8194;* Picacho de San José, dry open hillside, *Stewart 1107.* CHIHUAHUA: Cañon del Rayo, northeastern side of Sierra Diablo, silty slope, *Stewart 858;* Portrero Mts., east of Mapula station, summit, Sept. 10, 1886, *Pringle 803.* ZACATECAS: Cedros, Aug. 1908, *Lloyd 198.*

Western Texas and New Mexico south to southern Mexico. Growing in rocky soil in sunny places in canyons and on ridges, usually in local colonies. Corolla white to pink.

Calochortus barbatus (H.B.K.) Painter, Contr. U. S. Nat. Herb. **13:** 348 (1911).

Calochortus barbatus subsp. *chihuahuanus* Painter, Contr. U. S. Nat. Herb. **13:** 349 (1911).

Calochortus barbatus var. *chihuahuanus* Macbr. Contr. Gray Herb. **59:** 28 (1919).

CHIHUAHUA: Sierra Santa Eulalia, summits, 1885, *Pringle 328* (isotype of var. *chihuahuanus*).

The species usually has yellow petals. The plant from Santa Eulalia has purplish petals and has been distinguished as var. *chihuahuanus*.

Nolina cespitifera Trel. Proc. Am. Philos. Soc. **50:** 419 (1911).

COAHUILA: Valle de los Guajes, 20 km. south of Buena Vista, grassy flat, *Stewart 1338;* western base of Sierra Guajes, 8 km. east of Buena Vista, igneous hillside, *Stewart 1456;* Sierra del Pino, near La Noria, rocky slopes and arroyo bottom in pine-forest, *Johnston & Muller 595;* Sierra Madera, Cañon Charretera, openings in oak-thickets on flats and in broad arroyos, *Johnston 8956;* western end of Sierra Fragua, north of Puerto Colorado, high ridge with pines on steep rocky brushy slopes, *Johnston 8771;* Buena Vista battlefield, May 21, 1847, *Wislizenus 308* (Mo, TYPE); near Saltillo, high dry lands, Dec. 25, 1847, *Gregg 81;* Carneros Pass area, July 1880, *Palmer;* 3 km. southwest of Fraile, in arroyo, stalks 18 inches tall, *Stanford et al. 343.* CHIHUAHUA: Sierra Rica, Cañon Madera, dry open slopes, *Stewart 2533.*

Known only from our area and from the vicinity of Galeana in the Sierra Madre of Nuevo Leon. The inflorescence becomes 4–9 dm. tall and commonly does not much surpass the large rosette of leaves. The axis and branches of the panicle, especially in the more southern material, may be very much roughened by epidermal protuberances. The capsule, in size, shape, and dehiscence, is much like that of *N. texana* and, as in that species, is soon ruptured, exposing the maturing seeds. The lobes of the ruptured capsule are conspicuously stained with red.

The species is to be confused only with *N. erumpens,* from which it may be readily distinguished by its somewhat yellowish, rather than grayish, green leaves, usually roughened branches of the inflorescence, and smaller soon-dehiscent capsules conspicuously reddish at the base. Its broad leaves quickly separate it from *N. texana* and *N. micrantha.*

Nolina erumpens (Torr.) Wats. Proc. Am. Acad. **14:** 248 (1879).

COAHUILA: Sierra del Carmen, Sept. 7, 1936, *Marsh 810;* near Santo Domingo, limestone hill, *Wynd & Mueller 462;* Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1291.* CHIHUAHUA: Rocky slope of mountains 2–3 mi. east of Virulento, inflorescence 4 ft. tall, *Johnston 8064.*

Known only from trans-Pecos Texas (western Terrell to southern Hudspeth Counties) and south into our area. Torrey appears to have based the species on *Wright 1918,* a collection apparently composed of material

from southern Hudspeth Co. and from eastern Jeff Davis Co., Texas. Torrey's description calls for leaves 6 mm. wide and rounded (semiterete) beneath and seeds bursting the capsules and long persistent. These details, and the specific name, apply to *N. texana*. The material of *Wright 1918* at St. Louis and Cambridge, however, is characteristic *N. erumpens* as currently accepted, with broad flat leaves and seeds filling but not bursting the somewhat angulate and inflated pods. Possibly Torrey's species has been misinterpreted. Because of war conditions, however, I have been unable to examine the type of *N. erumpens*.

Nolina microcarpa Wats. Proc. Am. Acad. **14:** 247 (1879).
Nolina durangensis Trel. Proc. Am. Philos. Soc. **50:** 421 (1911).

CHIHUAHUA: Rocky hills near Chihuahua, 1885, *Pringle 159;* vicinity of Chihuahua, stony bluffs and hills, flowering stems 5–6 ft. tall, 1908, *Palmer 355*.

Ranging from southern Arizona and New Mexico south into Durango. One of the broad-leaved species having a large elongate inflorescence with internodes 4–8 cm. long. The papery long-pedicellate fruits open along the sutures and are not disrupted by the growing seeds.

Nolina texana Wats. var. **compacta** (Trel.) Johnston, Jour. Arnold Arb. **24:** 90 (1943).
Nolina affinis Trel. Proc. Am. Philos. Soc. **50:** 417 (1911).
Nolina caudata Trel. Proc. Am. Philos. Soc. **50:** 417 (1911).
Nolina erumpens compacta Trel. Proc. Am. Philos. Soc. **50:** 418 (1911).

CHIHUAHUA: Below the Sandhills [betw. Candelaria and Lucero] on the El Paso-Chihuahua City road, Aug. 17, 1846, *Wislizenus 219* (Mo, excluding the leaf ?); rocky hills near Chihuahua, "fruit and leaves, May," 1885, *Pringle 2* in pt. (GH); rocky hills near Chihuahua, April–May, 1885, *Pringle 1 & 2* (Mo, type of *N. affinis*).

Ranging from trans-Pecos Texas west to southeastern Arizona and south into Chihuahua. A sheet at St. Louis, labeled as composed of *Pringle* no. *1* and no. *2*, bears Trelease's designation as type of his *N. affinis*. Although Trelease cited some collections of *N. micrantha* when he published his *N. affinis*, his designated type-specimen entirely represents *N. texana* var. *compacta*. As is very unusual in Pringle's superb collections, his specimens of *Nolina* numbered *1* and *2* (the first numbers in his famous set of Mexican exsiccatae) seem to be mixtures of two species. In his published diary he mentions collecting material for his no. *1* in Bachimba Canyon (i.e. between Mapula and Horcasitas stations, 20–35 km. southeast of Chihuahua) on April 2, 1885, and again on April 4, "on ledges northeast of house" on the northeastern outskirts of Chihuahua. He mentions collecting *Nolina* no. *2* in Bachimba Canyon on May 22. I suspect that the material obtained on the outskirts of Chihuahua and that obtained in Bachimba Canyon were different species, one being *N. texana* var. *compacta* and the other *N. micrantha*. Flowering and fruiting material of both species were distributed mixed under the two numbers.

Nolina micrantha Johnston, Jour. Arnold Arb. **24:** 91 (1943).

COAHUILA: Sierra Hechiceros, vicinity of Rancho El Tule, rocky slopes and flats, *Johnston & Muller 1326* (TYPE), *Stewart 490*. CHIHUAHUA: Sierra Hechiceros, Rancho Encampanada, sunny hillside, *Stewart 193;* Organos, base of grassy oak-clad

hills, *Stewart & Johnston 2072;* rocky hills near Chihuahua, May 1885, *Pringle 2* in pt.; vicinity of Santa Eulalia, common on stony hills and mesas, 1908, *Palmer 139.*

An endemic species with thick narrow leaves resembling those of *N. texana.* It is probably most closely related to *N. texana,* but differs in its distinctly smaller flowers, larger looser inflorescence with less rigid, less twiggy, more slender and elongate branches, purpurascent capsules, and minute less lacerate bractlets.

Dasylirion cedrosanum Trel. ex Lloyd, Publ. Carnegie Inst. **139:** 23 (July 1911); Trel. Proc. Am. Philos. Soc. **50:** 431 (Aug. 1911).
Dasylirion Palmeri Trel. Proc. Am. Philos. Soc. **50:** 432 (1911).
? Dasylirion texanum aberrans Trel. Proc. Am. Philos. Soc. **50:** 434 (1911).

VERNACULAR NAMES: Sotol; Cortadilla; Sotol cenizo.

COAHUILA: Mouth of Cañon de la Cruz, 20 km. south of Ocampo, common, *Johnston 9182;* vicinity of Aguaje Pajarito at west end of Sierra Fragua north of Puerto Colorado, common, *Johnston 8720;* Monclova, 1880, *Palmer 1315* (Mo, photo of type of *D. texanum aberrans*); Puerto San Lazaro, 1936, *Wynd & Mueller 165;* Rancho La Luz, Sierra de la Paila, April 22, 1905, *Endlich 7* (Mo); San Lorenzo Canyon, southeast of Saltillo, 1905, *Palmer 696* (type of *D. Palmeri*); near Saltillo, Dec. 25, 1847, *Gregg 78.* ZACATECAS: Near Cedros, foothills, June 1908, *Lloyd 118* (Mo, TYPE); Cedros, June 1908, *Kirkwood 96* (Mo, GH), *Lloyd 82* (Mo).

A coarse plant with large, dull, rarely glaucescent leaves 20–25 mm. wide bearing stout antrorsely curved marginal thorns. The species is known only from our area.

Dasylirion Stewartii Johnston, Jour. Arnold Arb. **24:** 92 (1943).
Dasylirion Stewartii var. *glaucum* Johnston, Jour. Arnold Arb. **24:** 93 (1943).

VERNACULAR NAME: Sotol.

COAHUILA: Vicinity of Santa Elena, eastern foothills of Sierra Cruces, common, *Stewart 823* (TYPE), *841;* 7 mi. north of Santa Elena, *Johnston & Muller 331;* 3 mi. northwest of El Oro on road to Esmeralda, *White 1970.* CHIHUAHUA: Mouth of Cañon del Rayo, Sierra Diablo, *Stewart 957* (type of var. *glaucum*).

A coarse plant much resembling the more southern and eastern *D. cedrosanum,* from which it differs by having the stout curved marginal thorns of the leaves retrorse rather than antrorse. The typical form of the species in the Sierra de las Cruces has dull green leaves. Collections from the Sierra Mojada and Sierra Diablo, further south, have very pale glaucous leaves and have been described as var. *glaucum.*

Dasylirion texanum Scheele, Linnaea **23:** 140 (1850).

VERNACULAR NAME: Sotol.

COAHUILA: Monclova, Aug. 1880, *Palmer 1315;* Sierra del Pino, abundant on dry rocky slopes and crests along high eastern ridge east of La Noria, scape 8–15 ft. tall, *Johnston & Muller 657.*

A species with narrow (up to 15 mm. wide) lustrous green leaves with sharp antrorse marginal thorns. This is a plant centering on the Edwards Plateau and probably entering Coahuila from the northeast.

Dasylirion heteracanthum Johnston, Jour. Arnold Arb. **24:** 92 (1943).

VERNACULAR NAME: Sotol.

COAHUILA: Western base of Picacho del Fuste, frequent on rocky slopes and flats, *Johnston 8428* (TYPE).

This species is closely related to both *D. texanum* and *D. leiophyllum* and grows in an area between these two species; possibly it intergrades with both of them. It is known from the Big Bend area of Texas and the area eastward to the lower Pecos. It differs from its relatives in its somewhat broader, usually non-lustrous leaves with usually straight divaricate marginal thorns. Occasional thorns on the leaf-margins may be weakly curved, but the thorns are not like cats-claws and neither antrorse as in *D. texanum* nor retrorse as in *D. leiophyllum*.

Dasylirion leiophyllum Engelm. ex Trel. Proc. Am. Philos. Soc. **50:** 433 (1911).

CHIHUAHUA: Sierra Santa Eulalia, 1885, *Pringle 149;* northwest of Chihuahua, *LeSueur 565;* vicinity of Chihuahua, 1908, *Rose 11682* in pt. (Mo).

A plant with narrow lustrous green leaves 14–19 mm. wide, armed with stout recurved marginal thorns. The type was collected at Presidio by Havard in 1880. In Texas the species ranges from Presidio and Jeff Davis Counties westward along the mountains near the Rio Grande and is reported as extending into the mountains of southeastern New Mexico. Information regarding its distribution in Chihuahua is fragmentary. I have observed the plant on limestone slopes near Charca de Peña, about 120 km. east of Chihuahua. I saw no plants of *Dasylirion* during my journey by railroad from Chihuahua to Ojinaga, although numerous limestone mountains were seen on which it might be expected. Most of central eastern Chihuahua being composed of volcanic rocks, it is not surprising that *Dasylirion* is absent in that area.

Dasylirion Wheeleri Wats.; Rothrock in Wheeler, Rep. U. S. Surv. 100th Meridian **6:** 378 (1878).

Dasylirion durangensis Trel. Proc. Am. Philos. Soc. **50:** 438 (1911).

Dasylirion Wheeleri Wislizeni Trel. Proc. Am. Philos. Soc. **50:** 439 (1911).

CHIHUAHUA: Near Lake Santa Maria, 1899, *Nelson 6392.*

Ranging from southern Arizona and New Mexico south in the highlands of Chihuahua and Sonora to Durango. Trelease reports his *D. Wheeleri Wislizeni* from the mountains near El Paso and adjoining Chihuahua to the south. The species has leaves usually 15–20 mm. wide armed with stout antrorse marginal thorns. The typical Arizona plant has pale foliage. The New Mexican material appears to be usually green. The large, broadly winged, usually deeply notched fruits have a conspicuous pedicel. The staminate clusters are usually evidently pedunculate. The evident pedicels and peduncles are useful characters in distinguishing the species.

Dasylirion Berlandieri Wats. Proc. Am. Acad. **14:** 249 (1879).

COAHUILA: Angostura, south of Saltillo, May 21, 1847, *Wislizenus 307* (Mo).

The cited specimen is a poor one, but it may represent *D. Berlandieri,* or possibly juvenile *D. cedrosanum. Dasylirion Berlandieri* ranges in the Sierra Madre of Nuevo Leon from near Monterey south at least to the Galeana area and can be expected within the Coahuilan borders. It has dull green leaves, 15–30 mm. wide, with numerous small relatively weak antrorse marginal thorns. Its broadly winged deeply notched fruit tends to be broader than long.

Hesperaloe funifera (Koch) Trel. Rep. Mo. Bot. Gard. **14:** 36. *t. 3–4* (1902).

VERNACULAR NAME: Samandoque.

COAHUILA: Allende, 1939, *Marsh 1751;* Valle de los Guajes, 14 km. south of Rancho Buena Vista, colony on grassy flat, *Stewart 1345;* near Rancho Santa Teresa, south of Castaños, *Wynd & Mueller 187;* Monte de San Vicente, below Cañon Espantosa, southeast of Cuatro Cienegas, *Schroeder 167;* several miles west of Buena Vista [west of Puerto Caballo], silty grassy flat, clumps scattered, *Johnston 8313;* about 15 km. east of San Antonio de los Alamos, brushy flats, local colony, *Johnston 8294;* Cerro del Cypriano, near Mohovano, June 1910, *Purpus 4508.*

A yucca-like plant growing on clay and stony flats and on gentle slopes along the base of sierras. It appears to favor moderately gypsiferous soils and possibly because of this fact usually grows on Upper Cretaceous beds or on outwash near them. Though the species occurs over a large area, its distribution is discontinuous and seemingly erratic. It may be present, scantily or in local abundance, and then absent for considerable distances. In addition to stations represented by specimens cited, it has been observed also in the area south of Peyotes, south of Laguna de Leche, north of Puerto Colorado, near Matrimonio, and on the Atravasada between El Oro and Esmeralda. South of our area it has been collected about 150 km. east of San Luis Potosi, at Hacienda de Angostura, a distant area sharing a large number of peculiar plants with the area about Cuatro Cienegas. It has been reported in cultivation, for its fibers, at Bustamente in the mountains of southwestern Tamaulipas. Various stations for the species are known in northern Nuevo Leon.

It is a plant of distinctive appearance. It is acaulescent and its large, erect, usually clustered rosettes are composed of relatively few, strictly ascending, stiff, elongate leaves 1–1.8 m. long. The leaf-blades are concavo-convex, lustrous and beautifully lineate-grooved beneath and very stiffly and coarsely fibrous on the margins. The slender-stemmed inflorescence becomes 3 m. tall, with the upper two-fifths bearing a few slender divaricate branches 3–12 dm. long. The small nearly rotate corolla is greenish yellow or slightly stained with purple.

Yucca Torreyi Shafer in Britton & Shafer, No. Am. Trees 157 (1908); McKelvey, Yuccas of S.W. U. S. **1:** 104–117. *t. 52–58* (1938).

Yucca baccata var. *macrocarpa* Torr. Bot. Mex. Bound. 221 (1859).

Yucca macrocarpa (Torr.) Merriam, No. Am. Fauna **7:** 358 (1893); Trel. Rep. Mo. Bot. Gard. **13:** 110. *t. 70–71* (1902); not *Y. macrocarpa* Engelm. (1881).

VERNACULAR NAMES: Palma China; Palma de San Juan; Palma de Pita; Palma criolla; Palma cenisa; Palma loca.

COAHUILA: Muzquiz, *Marsh 1162;* 20 mi. north of Hipolito, on desert, *Wynd & Mueller 67;* flats of La Vega, about 15 km. southeast of Cuatro Cienegas, *Schroeder 84;* foothills of Sierra Cruces, near Santa Elena, frequent, *Johnston & Muller 332.*

This species centers in our area and extends north across the Rio Grande into western Texas and adjoining New Mexico. It has been reported as far south as San Juan de Guadalupe, in the easternmost corner of Durango. The plant grows in limestone as well as igneous areas, and is found among desert scrub in the broad valleys, scattered in grasslands, occasional on rough basaltic slopes, but best developed in the foothills of limestone mountains, where, in the company of *Yucca carnerosana* and *Dasylirion,*

it is frequently rather common. It occurs at much lower altitudes than *Y. carnerosana* and does not ascend as high in the mountains. It usually grows singly or in small groups and scattered, and it never forms great congregations, the so-called "Palmares," as does *Y. carnerosana*.

It is usually an unkempt plant, commonly 3–5 m. tall, normally with several simple trunks. These trunks, thatched with reflexed dead leaves, bear an elongate, rather untidy head of stiff sword-like grayish leaves. The leaves of *Y. carnerosana* radiate from a hemispherical axis, forming a tidy symmetrical globose cluster. The axis of *Y. Torreyi* is elongate, and the head of leaves is distinctly longer than broad. Its leaves do not spread regularly and the leaf-cluster is usually confused and untidy because of seemingly crossed leaves and lack of perfect symmetry. Compared with the trim dignified plants of the aristocratic *Y. carnerosana,* those of *Y. Torreyi* seem disheveled and somewhat ill-nourished, though individually more interesting because their form of growth is less stereotyped.

Exploration has shown that *Y. Torreyi,* formerly known only from western Texas (the type came from the Davis Mts.), is generally distributed in Coahuila and eastern Chihuahua south into northeastern Durango and northern Zacatecas. Southern plants of *Y. Torreyi* have the appearance and behavior of the plants along the Rio Grande and are obviously conspecific with them. Trelease, however, while maintaining *Y. Torreyi* (under the name *Y. macrocarpa*) as a valid species in trans-Pecos Texas and adjoining Mexico, failed to recognize that the species extends into the southern and eastern portions of our area. Plants from these latter portions of our area Trelease identified as typical *Y. Treculeana*. Mrs. McKelvey, l.c., p. 75, has shown that true *Y. Treculeana* is the plant of southern Texas, Tamaulipas, and eastern Nuevo Leon which Trelease called *Y. Treculeana* var. *canaliculata*. She has also shown that the plants of Texas, in the area between Uvalde and the mouth of the Rio Pecos, adjoining northeastern Coahuila, which Trelease included in the typical variety of "*Y. Treculeana,*" are also referable to *Y. Torreyi*. *Yucca Treculeana* possibly may enter Coahuila on the Rio Grande Plain in the very extreme northeastern portions of the state. The Coahuilan plants, however, which Trelease and others have called "*Y. Treculeana*" probably all belong to *Y. Torreyi*.

Yucca carnerosana (Trel.) McKelvey, Yuccas of S.W. U. S. **1:** 24 (1938).
Samuela carnerosana Trel. Rep. Mo. Bot. Gard. **13:** 118. *t. 76–81* (1902).

VERNACULAR NAMES: Palma de San José; Palma de San Pedro; Palma barreta; Zamandoque.

COAHUILA: Sierra del Pino, abundant on hillsides and valleys, *Johnston & Muller 712;* eastern foothills of Sierra Cruces near Santa Elena, common, *Johnston & Muller 1013;* near Saltillo, 1898, *Palmer 197;* mouth of San Lorenzo Canyon, southeast of Saltillo, 1903, *Dewey 578* (US); Carneros Pass, limestone hillsides, *Pringle 3912* (ISOTYPE); Carneros Pass, 1900 and 1905, *Trelease 58, 167* (Mo). ZACATECAS: Cedros, hills and foothills, *Lloyd 35* (US); Mazapil, *Lloyd 35* (Mo).

A common and characteristic plant of rocky limestone soils on the plateau from the Big Bend area in Texas south into San Luis Potosi, and a familiar

feature on mountain-sides and in open mountain valleys up into the lower parts of the Oak Belt. It may occur, sometimes abundantly, on rocky pediment slopes along the mountains, but probably it rarely descends below 4000 ft. altitude. It is the most conspicuous element in that characteristic zone of vegetation on limestone sierras of western Coahuila, appropriately called the "Palma Belt."

The trunk becomes 2–4 m. tall and rarely even taller, and, though several may spring from the ground together, they are seldom branched. The stout trunk is commonly clothed with reflexed dead foliage and above bears a large trim globose cluster of rigid radiating sword-like leaves. It is said to flower in April and May.

The species is probably present on most limestone mountains of Coahuila except some in the eastern portions of the state. Its exact eastern limit has not been determined. Mr. Stewart reports that it is abundant on the western slopes of the Sierra del Carmen near Hacienda Encantada. Farther south I have seen it near La Mula and in the foothills of the Sierra Madera south of Ocampo. It is said to be abundant in the Sierra de la Paila. The large yuccas growing in oak-thickets along the crest of the high ridge just east of Saltillo, along the steep grade to Diamante, probably belong to the species. It is to be expected elsewhere along the western flank of the Sierra Madre. In southern Coahuila it is present, frequently in great abundance, in the east-west mountain ranges from Carneros Pass (the type locality) west to the extremity of the Sierra de Parras southwest of Parras. It is reported as common in extreme northeastern Zacatecas, at least as far west as Cedros, and Endlich, Beiheft z. Tropenpflanzer **9:** 248 (1908), reports it from the Sierra de Ramires, farther west, within the extreme eastern corner of Durango. Farther north in northeastern Durango I know it from the area about Mapimi, and westward, along the road to Palmito Dam, on the mountains about Cadena and some miles beyond.

Information regarding the distribution of the species in Chihuahua is very incomplete. Near the Coahuilan border in extreme southeastern Chihuahua the plant is known from the Sierra Almagre and the Sierra Diablo. The middle portion of eastern Chihuahua is largely composed of igneous rocks on which *Y. carnerosana* is absent. Farther north, however, there are limestones. I have seen the plant in the Sierra San Carlos, in the hills 10 miles south of Mula, and along the road northwest from Castillon, Coah., as far west as Tascate. Along the railroad between Chihuahua City and Ojinaga a yucca with the familiar habit of the Coahuilan plant is common on all limestone mountains northeast of Las Trancas. The limestone mountains in this portion of Chihuahua have a north-south orientation and extend in broken chains north to the Rio Grande. The large yucca seen on the various sierras northeast of Las Trancas, accordingly, can be expected to range north to the Rio Grande and should therefore approach the range of *Y. Faxoniana,* an extremely close relative of *Y. carnerosana,* which is common in the limestone mountains along the Rio Grande south of Sierra Blanca and Van Horne, Texas. The plants seen along the

Chihuahua-Ojinaga railroad possibly may represent *Y. Faxoniana* or forms connecting it with *Y. carnerosana*.

Yucca filifera Chabaud, Rev. Hort. **48:** 432. *f. 97* (1876); Carrière, Rev. Hort. **52:** 376. *f. 75–77* (1880), op. cit. **56:** 53. *f. 12, 13* (1884); Baker, Garden and Forest **1:** 78. *f. 13, 14* (1888).

Yucca baccata var. *australis* Engelm. Trans. Acad. Sci. St. Louis **3:** 44 (1873).

Yucca australis (Engelm.) Trel. Rep. Mo. Bot. Gard. **3:** 162. *t. 3, 4* (1892), op. cit. **13:** 103. *t. 60, 61* (1902).

VERNACULAR NAMES: Palma china; Palma loca; Palma grande.

COAHUILA: Saltillo, tree yucca, 1898, *Palmer 197;* Parras, etc., sterile plain, largest specimens seen 15–25 ft. high, trunks often 2–3 ft. thick, Nov. 1852, *Thurber 857*.

A large *Yucca*, with pendulous inflorescence and baccate fruits, which becomes much branched and arborescent. It is reported to become 15 m. in height and to develop a trunk over 2 m. thick. In our area, trees 8–12 m. high are not uncommon. It is a plant of the broad valleys in the southern parts of our area, where it is frequently found in large colonies. From north of Monterey, N. L., it ranges on the east side of the Sierra Madre south into western Tamaulipas. It enters our area via the valleys northwest and west of Monterey. It grows in the valley near Saltillo and in the plain south of the Sierra Gavia, about 100 km. to the northward. West of Saltillo it is known from between General Cepeda and Seguin and about Parras. It appears to be widely distributed in northern Zacatecas. Kirkwood, Pop. Sci. Monthly **75:** 442 (1909), states that in this latter area it often occurs with *Y. carnerosana* but has lower altitudinal limits and is primarily "a native of the wide valley lands, where it often occurs in great profusion as at Palmas Grandes, a few miles west of Mazapil, and again on the footslopes some twenty miles east of Camacho." In extreme eastern Durango, Trelease reports the species as present along the railroad "in varying quantity, about La Mancha and thence south to about Symon." According to Trelease the species extends south through San Luis Potosi to Queretaro.

The name *Yucca filifera* is based upon a plant flowering under cultivation in France and said to have been introduced from Mexico by Roezl. The descriptions and illustrations of the plant clearly apply to the present species and antedate by over twenty years the name *Yucca australis*, coined and given currency by Trelease. Trelease's binomial is based upon *Yucca baccata* var. *australis* Engelm., a name founded upon material of the present species collected by Thurber near Parras and by Gregg near Saltillo. It is possible that our species may have earlier names, antedating even *Y. filifera*, in *Yucca scabrifolia* Baker and *Yucca polyphylla* Baker, Gard. Chron. **1870:** 1088 (1870). These latter species were named by Baker upon the basis of small sterile plants of unknown origin cultivated in England. While it is possible that they may represent *Y. filifera*, the descriptions of them published are brief, incomplete, and ambiguous, and, in addition, the names are probably to be rejected as provisional names, since, when publishing them, Baker remarked that "I give now a provisional name for each of them, and an epitome of the notes which I have

already made, reserving diagnosis and full description for our intended monograph . . ." Baker failed to amplify his original remarks and later, Jour. Linn. Soc. **18:** 228 (1880), indicated, without actually making trinomials, that they were only varieties of *Y. baccata.*

Yucca Endlichiana Trel. Rep. Mo. Bot. Gard. **18:** 229. *t. 15–17* (1907); Endlich, Beiheft z. Tropenflanzer **9:** 260 (1908).

VERNACULAR NAME: Pitilla.

This remarkable acaulescent fleshy-fruited yucca was apparently based upon material collected south of the Sierra Paila near Marte Station. It spreads by rhizomes and its rosettes of few strictly ascending or erect leaves (2.5–5 dm. long) are crowded to form dense clumps of moderate size. The inflorescence is shorter than the leaves. The small, cream to brownish or purplish flowers are described as 15 mm. long and borne on slender elongate pedicels over 25 cm. in length. The fruit is said to be 25–30 mm. long, subglobose to broadly ellipsoid, and not very fleshy. Endlich reports that it is usually found in very dense, sharply defined, usually not very extensive clumps among the desert scrub in the area between the Sierra de Parras, the Sierra del Rosario, and the Sierra de la Paila, where, especially in the Valle de Rosario, it is common. The smooth dark green or bluish green leaves have a brown margin bearing stiffish recurving fibers.

Yucca elata Engelm. Bot. Gaz. **7:** 17 (1882).

VERNACULAR NAMES: Palmito; Sollate.

COAHUILA: Rancho El Pino, fairly common on sandy flat, *Stewart 1781;* 1 mi. south of Las Norias, 20 mi. north of Esmeralda, silty soil especially about sabanetas, trunk 1–6 ft. tall, inflorescence 4–8 ft., fibers detaching and curling up at leaf-bases, *Johnson & Muller 348;* 1 km. south of Las Norias, colony on silty flat, *Stewart 362;* east of Laguna de Jaco, confined to gypsum ridges, common, trunk to 5 ft., *Johnston & Muller 1077;* 4 km. southeast of Laguna del Rey, sandy slope, common, 2 m. tall, *Stewart 2655.* CHIHUAHUA: Hills around Juarez, 1912, *Stravus* (Mo); international boundary near White Water, June 18, 1892, *Mearns 363* (US); between Casas Grandes and Sabinal, *Nelson 6371;* Moctezuma, 1900, *Trelease 400* (Mo); Chihuahua, 1900, *Trelease 399* (Mo); 10 mi. west of Julimes, frequent on sandy plain, *Stewart & Johnston 2097;* southeast of San Pablo, April 30, 1847, *Gregg* (NY).

Ranging from Arizona east into Brewster County, in trans-Pecos Texas, and south into our area, where it is restricted to finely divided, usually valley soils. In our area it grows on silts, sandy soils, and gypsum in locations where there is evidence of moderate amounts of subterranean water, or in places where the storm waters collect and the soil beneath the surface remains moist during the growing season. In Coahuila and Chihuahua it is found in the open valleys and on rolling country dominated by grass or desert scrub. The species is uncommon in Coahuila and apparently is restricted to the western portions of the state. In addition to the Coahuilan stations from which I have cited specimens, I know it only near Castillon, where occasional plants grow about sabanetas. It probably grows in the northwest corner of the state, for it has been collected near the Rio Grande near the tip of the Big Bend at San Vicente, Texas. In northeastern Chihuahua I have seen the species, usually represented by only a few plants, at various places between Ojinaga and Chilicote, near Trincheras,

along the road between Pirámide and Castillon, between San Francisco and Mesteñas, and between Organos and Charca de Peña.

Yucca rostrata Engelm. ex Trel. Rep. Mo. Bot. Gard. **13**: 68, *t. 40–42* (1902).
Yucca rostrata var. *linearis* Trel. Rep. Mo. Bot. Gard. **18**: 226 (1907).
Yucca rostrata forma *integra* Trel. Rep. Mo. Bot. Gard. **22**: 102 (1911).

VERNACULAR NAMES: Soyate; Amole.

COAHUILA: Peyotes, April 27, 1900, *Trelease* (Mo); Allende, *Marsh 1757;* Sabinas, May 21, 1902, *Nelson 6231* (US, Mo), *6831* (NY); Hac. Mariposa at Puerto Santa Anna, *Wynd & Mueller 257;* abundant in Hac. La Babia, northwest of Sabinas, March 10, 1906, *Endlich 1161* (Mo; type of forma *integra*); Sierra del Carmen, 3 km. northeast of Hac. Encantada, common on hillsides, 2 m. tall, *Stewart 1582;* Berrendo, 3 m. tall, flower stalk 7 m. high, fruit with offensive odor, *White 1861;* Monclova, Aug. 1880, *Palmer;* Monclova, tree 8–10 ft., panicle 2.5–3 ft. long, much branched, Aug. 1880, *Palmer* (Mo, TYPE); east of La Rosa, dry mountain slope, *Wynd & Mueller 47;* Sierra Pata Galana, March, *Purpus 5586* (UC); Sierra Parras, rocky canyons, April 1905, *Purpus 1132* (UC); Parras, April 9, 1905, *Purpus* (Mo); Parras, March 1905, *Purpus 1103* (UC); two plants from canyons of Sierra Parras received at Mo. Bot. Garden June 5, 1905, *Purpus* (Mo, type of var. *linearis*).

Extending from just within Texas (Boquillas area, and 6 mi. above mouth of Maravillas Canyon) in the Big Bend Region, south through eastern Coahuila to west of Saltillo and then west across southern Coahuila. It is known only from areas of limestone rock. It grows in rocky places on hillsides and along arroyos. Reports of the species from Chihuahua are almost certainly erroneous. Among our three species with flexible pallid leaves with a horny yellow margin, *Y. rostrata* is readily distinguished by its remarkable rostrate capsules. The fruit is ovoid with the upper third gradually contracted into a coarse stout beak 2–3 cm. long. The type of the species was collected near Monclova. The species usually has the leaf-margins denticulate, but plants with smooth or nearly smooth margins appear to be not uncommon. One of these latter forms, from Hacienda La Babia, was described as forma *integra* Trel.

The material cited from southern Coahuila has narrow leaves. The northern typical plants have leaf-blades 7–13 (usually 8–12) mm. wide and 3–6 dm. long. Trelease based his var. *linearis* upon material collected by Purpus in the Sierra de Pata Galana and Sierra Parras which has narrowly linear blades 3–4 mm. wide and 4 dm. long. Some collections from Parras (*Purpus 1132*) are less extreme. Mrs. McKelvey, who had made a detailed study of all available material of *Y. rostrata* and *Y. rigida,* tells me that she suspects there are one or more undescribed species of *Yucca* in southern Coahuila and that one of these may be represented among the not very satisfactory collections of Purpus which I have cited above. She is particularly suspicious of *Purpus 1103* from Parras, *Purpus 5583* from Sierra Pata Galana, and *Purpus 7717* from Viesca, in which the associated flowers are smaller in size and different in form from any known in indubitable *Y. rostrata* and its allies. Some of Trelease's original suite, other than the type, of var. *linearis* may also represent this aberrant plant. Obviously, until there are good new collections of this group of yuccas of southern Coahuila, showing mature foliage, flowers, and fruit, their classification must remain doubtful and tentative.

Yucca Thompsoniana Trel. Rep. Mo. Bot. Gard. **22:** 101. *t. 104–107* (1911).

VERNACULAR NAME: Palmilla.

COAHUILA: Santa Elena, eastern foothills of Sierra Cruces, rocky hillsides and slopes, trunk 1–4 m., frequent, *Stewart 2279;* near Santa Elena, frequent, especially on limestone ledges, stems usually about 6 ft. tall, *Johnston & Muller 329;* arid hills near La Pistola, eastern border of Llano de Guaje, stems to 10 ft., locally common on limestone ledges, *Johnston & Muller 771;* western base of Picacho del Fuste, along arroyos and along terraces of cemented gravels, frequent in colonies, *Johnston 8458;* just east of Laguna de Leche, along steep rocky arroyo, colonies, stems 8–12 ft. tall, leaf-margins smooth, *Johnston 8603, 8604, 8605;* east of Rosario station, large local colony on gravelly outwash from canyon, trunks to 8 ft., leaf-margins smooth, *Johnston 8831.*

A species of western Texas, from Presidio to Val Verde County, and ranging south into our area. Apparently restricted to limestone. The type specimen was collected by Bigelow from mountains at "Bufatello near Presidio del Norte," Aug. 10, 1852, presumably along the Rio Grande in Presidio Co., Texas, or across the river in adjoining Chihuahua. In northeastern Chihuahua I have seen the species on the pass about 10 miles south of Mula and on the hillsides 5–10 miles northwest of San Carlos. The plant is apparently widely distributed in western Coahuila on limestone hillsides, frequently about ledges, or along terraces of limy conglomerate along arroyos, and rarely in gravels of alluvial fans about the mouths of canyons. It commonly occurs with *Yucca carnerosana* but has somewhat lower altitudinal limits. Frequently locally common but usually scattered. I have observed the species, without collecting it, in the Sierra Almagre, between Esmeralda and El Oro, on the Sierra Aplanchada, west of San Antonio de los Alamos, in the southern canyon of the Sierra del Pino, in canyons southeast of Puertecito, and in hills north of Tanque Colorado. The yuccas observed on the steep canyon-sides of Cañon del Agua, just north of Cuatro Cienegas, probably were of this species, though possibly they may represent *Y. rostrata.*

Yucca Thompsoniana is one of the three species in our area having flexible elongate pallid leaves with horny yellow margins. It ranges in western Coahuila and adjoining Chihuahua, whereas *Y. rostrata* occupies the limestones in eastern (and apparently southern) Coahuila, and *Y. rigida* occupies the limestone areas from northeastern Chihuahua south into northeastern Durango.

Yucca rigida (Engelm.) Trel. Rep. Mo. Bot. Gard. **13:** 65. *t. 35, 36* (1902).
Yucca rupicola var. *rigida* Engelm. Trans. Acad. Sci. St. Louis **3:** 49 (1873).
Yucca rigida inermis Trel. Rep. Mo. Bot. Gard. **22:** 102 (1912).

VERNACULAR NAMES: Palma San José; Palmito.

CHIHUAHUA: Sierra Santa Eulalia, 1885, *Wilkinson* (US, UC); rocky hills near Ch'huahua, flowers April 17, 1885, fruit May 17, 1885, *Pringle 165;* Picachos station, 1941, *Johnston;* dry valley between Mapimi and Jimenez, rather common, 5–10 ft. tall, with seed-pods, April 18, 1847, *Gregg 477* (Mo, TYPE). DURANGO: South of Picardias, in box-canyon, Aug. 20, 1900, *Trelease 396* (Mo). ZACATECAS: Mountains near Symon, June 1908, *Lloyd 128;* Sierra del Chivo, near Symon, June 1908, *Lloyd 77* (Mo, type of forma *inermis;* UC, leaf-margins denticulate).

Under the present species are grouped plants of Chihuahua, north-

eastern Durango, and adjoining Zacatecas which have pallid flexible leaves with horny yellow margins. Information regarding them is fragmentary and the collections representing them are few and incomplete. Possibly more than one species is involved. These western plants are most closely related to *Y. Thompsoniana* but appear to differ from that more easterly ranging species in having somewhat broader and longer leaves and tougher capsules said to have the valves flattened on the back. Until more collections are available for study, the species must remain puzzling, obscure, and somewhat questionable.

The type of *Y. rigida,* a specimen consisting of leaves and capsules, was collected by Gregg on April 18, 1847 between Mapimi and Jimenez, while traveling rapidly with a small group of mounted soldiers carrying an urgent message from Saltillo to Chihuahua City. On April 18th the party traveled from Arroyo del Cerro Gordo, on the Durango-Chihuahua border (80 mi. northwest of Mapimi), to a point in the desert about 25 mi. southeast of Jimenez. Traveling rapidly, Gregg must have had little time to collect plants. Possibly he may have been able to collect the yucca on the mountain-side or in the canyon at San Bernardo (30 mi. southwest of Escalon), where the party rested at mid-day.

With Gregg's specimen, Trelease associated material he collected at the southeastern end of the Sierra Hispaña, not far from Picardias, a station in the valley of the Rio Aguanaval. He reports that the plant "is abundant on or near rocky hillsides" near Picardias and along the railroad to about Jalisco, a station 10 km. farther southeast. The same species has been collected in the Sierra del Chivo, near Symon, along the same railroad about 100 km. still farther to the southeast. Collections from the latter locality (*Lloyd 77*) with smooth leaf-margins have been described as *Y. rigida inermis*. The type of this form at St. Louis does have smooth entire leaf-margins. However, a duplicate of the same collection at Berkeley has the leaf-margins denticulate.

In addition to the plants of Durango, Trelease also associates with Gregg's collection a yucca that has been collected in the general vicinity of Chihuahua City. Trelease mentions the Sierra Santa Eulalia. Wilkinson's material is labeled as from that range of mountains. Pringle's collection, no. *165,* is given as from "rocky hills near Chihuahua" and as made up of flowers collected April 17, 1885, and fruit collected May 17, 1885. According to Pringle's published diary he was in Bachimba Canyon, 25–35 km. southeast of Chihuahua, on April 17th, and on that date he particularly mentions collecting "flowers of 165." On May 17, 1885, the date on which the fruit of the yucca is given as collected, Pringle was botanizing in a large canyon (in the Sierra Guadalupe?) southwest of Jimulco, just inside the Durango boundary about 25 km. southeast of Picardias, where Trelease found *Y. rigida*. Unless there is an error in the printed date appearing on Pringle's label, one must conclude that the fruit associated with *Pringle 165* did not grow on the "rocky hills near Chihuahua."

Probably to be associated with the plant collected about Chihuahua is

the yucca with pale yellow-margined leaves which is frequent on limestone hills along the Chihuahua City-Ojinaga railroad from near Trancas to near the Rio Conchos. This plant suggests *Y. Thompsoniana* but is coarser, with a larger head of leaves. Plants examined near Picachos Station had leaves 25–30 mm. wide and 5–6 dm. long.

AMARYLLIDACEAE

Cooperia Drummondii Herb. Bot. Reg. **22**: *t. 1835* (1836).

VERNACULAR NAME: Cebollita.

COAHUILA: Santa Anna Canyon, *Marsh 535;* Hac. Encantada, hillside, fl. white, *Stewart 1738;* Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1450;* battlefield near Buena Vista, fl. white, *Gregg 84;* 7 km. west of Santa Elena, Sierra Cruces, black loam on hillside, *Stewart 1738*.

Northeastern Mexico (? and Oaxaca) north to New Mexico, Kansas, and Louisiana.

Cooperia pedunculata Herb. Amaryll. 179. *t. 42* (1837).

VERNACULAR NAME: Flor de Mayo.

COAHUILA: Sierra San Vicente, Cañon Espantosa, April 27, 1941, *Schroeder 1;* near Saltillo, stony hillsides, fl. white, sweet scented, April 1898, *Palmer 70*.

Northeastern Mexico and eastern half of Texas.

Zephyranthes Lindleyana Herb. Amaryll. 174. *t. 35* (1837).

ZACATECAS: Cedros, *Lloyd 40*.

Ranging from Hidalgo northward into Nuevo Leon and westward onto the plateau to San Luis Potosi, Charcas, and Cedros. To be expected in southern Coahuila. The corolla is pink.

Zephyranthes longifolia Hemsl. Diag. Pl. Nov. **3**: 55 (1880).

VERNACULAR NAME: Cebollita.

COAHUILA: 2 mi. west of San Rafael, tobosa flat, *Stewart 657a;* valley west of Bufido, silty soil, *Johnston & Muller 845B;* La Azufrosa, fl. yellow, *Gregg 491;* Saltillo, stony hill-slope, fl. lemon-yellow, 1898, *Palmer 219*. CHIHUAHUA: Valley 30 km. northwest of Jaco, silty flat, fl. yellow, *Stewart 683*. ZACATECAS: Cedros, hills, *Lloyd 124*.

From San Luis Potosi north to western Texas and Arizona, usually on valley silts.

Agave (*Manfreda*) **brunnea** Wats. Proc. Am. Acad. **26**: 156 (1891).

VERNACULAR NAME: Huaco.

COAHUILA: 10 km. east of La Palma, gravelly hills north of Sierra Cruces, 5–6 dm. tall, *Stewart 655;* eastern foothills of Sierra Cruces, 7 mi. north of Santa Elena, rocky bank among bushes, leaves succulent-herbaceous, dark green mottled with terra-cotta, somewhat glaucous, *Johnston & Muller 1012;* west base of Picacho de San José, dry hillside, 8–10 dm. tall, not common, *Stewart 643;* Saltillo, 1880, *Palmer 1307;* battlefield of Buena Vista, 1888, *Pringle 2218* (TYPE). CHIHUAHUA: 6 mi. south of Camargo, leaves with reddish markings, corolla brownish inside, *White 2190*.

The plant has the underground stem erect and much shortened and surrounded by the crowded leaf-bases to form a tunicate bulb. The roots are fleshy tubercles. The leaves are very juicy and neither rigid nor sclerified. They form a flattened basal rosette and have conspicuously mottled blades 1–2 dm. long and 2–3(–4) cm. wide. The flowers are brownish. The cited

material from Chihuahua differs in having a less well developed bulb in which the old leaf-bases become fibrous, but otherwise it is much like the Coahuilan material.

Agave (*Manfreda*) **planifolia** Wats. Proc. Am. Acad. **22**: 479 (1887).

CHIHUAHUA: Canyon in mountains southwest of Mapula station, warm sandy banks of stream, *Pringle 1141* (TYPE).

The type of this species, cited above, is in fruit. Watson describes the corolla as 18 mm. long with the segments 3–4 times the length of the tube. The leaves are very large and the base of the stem is not bulb-like, but rather is a coarse rhizome clothed with fibrous remnants of old leaves.

Agave (*Manfreda*) **singuliflora** (Wats.) Berger, Die Agaven 31 (1915).
Bravoa singuliflora Wats. Proc. Am. Acad. **22**: 479 (1887).

CHIHUAHUA: Cool slopes in mountains just south of Chihuahua, *Pringle 1142* (TYPE).

A plant with a loose tunicate bulb, fleshy roots, and linear leaves. Ranging widely in western Chihuahua.

Agave (*Littaea*) **Lecheguilla** Torr. Bot. Mex. Bound. 213 (April 1859).
Agave Poselgeri Salm-Dyke, Bonplandia **7**: 92 (April 1859).
Agave lophantha var. *Poselgeri* Berger, Die Agaven 93 (1915).
Agave lophantha var. *pallida* Berger, Die Agaven 93 (1915).

VERNACULAR NAME: Lechuguilla.

COAHUILA: Sierra del Pino, *Johnston & Muller 658;* Potrero del Cuervo Chico, *Johnston 8571;* Saltillo, 1898, *Palmer 227;* east of Cienega Grande, May 18, 1847, *Gregg 699;* Jimulco, *Pringle 28.* CHIHUAHUA: Sierra Santa Eulalia, *Pringle 157;* 8 mi. west of Escalon, *White 2064.* ZACATECAS: Cedros, *Kirkwood 8.*

A common and characteristic plant in the limestone areas from western Texas south through our area at least to San Luis Potosi. There is some doubt as to the correct name for this well known species. The two earliest names assigned the species, *A. Lecheguilla* and *A. Poselgeri,* both appear to have been published in April, 1859. Since I have been unable to establish their precise dates, I have accepted the more familiar of the two. *Agave Lecheguilla* was based chiefly upon material collected by Charles Wright near Del Rio and along Devils River, in southern Val Verde County, Texas. *Agave Poselgeri,* given as from the "mexicanischen Hochebene," probably came from near Saltillo or San Luis Potosi, where Poselger is known to have collected cacti and other succulents. *Agave lophantha* var. *pallida* is based upon material from Parras collected by Purpus.

The plant is well known as "Lechuguilla" and is all too common on sunny open mountain-slopes and in the valleys near the mountains. It occurs on clay, but it is most abundant in rocky soils and appears to favor limestone areas. It multiplies by stolons, and a single plant may have its numerous clusters of dagger-like leaves scattered abundantly over as much as 50 square meters. The leaves in especially favorable locations may become 4–5 dm. long, but commonly they are 15–30 cm. in length. Rigid and dagger-like, the leaves are terminated by a formidable spine. Anyone who has been jabbed in the ankle by Lechuguilla and suffered the first sharp pain and, worse, the aching in the ankle-joint which may continue

afterwards for over a week, knows why the plant is a constant hazard to man and beast in the extensive tracts of country where it abounds. It is a much cursed distraction in the peaceful pursuits of plant-collecting; I have suffered more from the spines of Lechuguilla than from all the other spiny plants, mosquitoes, and poison "varmin" lumped together. A less human botanist might marvel at the vigor and adaptations which have permitted it to have become such a widespread and successful plant in the deserts of Coahuila, but I can only rank it as a pest and a curse on the country.

Agave (*Littaea*) **univittata** Haw. Philos. Mag. **10**: 415 (1831).
Agave heteracantha Zucc. Act. Acad. Caes. Leop.-Carol. **16²**: 675 (1833).
Agave lophantha Schiede ex Kunth, Enum. **5**: 838 (1850).

COAHUILA: Rancho Agua Dulce, eastern slope of Sierra San Manuel, *Wynd & Mueller 380.*

A plant of the eastern slopes of the Sierra Madre, from Nuevo Leon southward to the arid portions of the plateau in east-central Mexico. It is closely related to *A. Lecheguilla,* which replaces it in the arid plateau of northern Mexico, differing in its thinner, less rigid, flat, more strap-like, and more elongate leaves, which commonly have an evident median white stripe.

Agave (*Littaea*) **glomeruliflora** (Engelm.) Berger, Hort. Martol. 12 (1912), Die Agaven 93 (1915).
Agave heteracantha forma *glomeruliflora* Engelm. Gard. Chron. II. **19¹**: 48 (1883).
Agave chisosensis Muller, Am. Midl. Nat. **21**: 763 (1939).

VERNACULAR NAME: Maguey de Garcia.

COAHUILA: Sierra de los Guajes, fairly common on hillside, *Stewart 1502;* Sierra del Pino, single colony of 20–25 plants on rocky hill just below oak-belt, rosettes solitary, 12 in. tall and 15 in. broad, stem 12 ft. tall, less than upper 3 ft. floriferous, *Johnston & Muller 711.*

This species was based upon material from the Guadalupe Mts. in western Texas. It is evidently allied to *A. Lecheguilla* but differs in its narrowly paniculate rather than spicate inflorescence, the flower-clusters being borne on branches several centimeters long. The leaves appear to average larger and to have coarser lateral thorns than is common in its relative. Possibly it is only a phase of that species.

Agave (*Littaea*) **falcata** Engelm. Trans. Acad. Sci. St. Louis **3**: 304 (1875).

VERNACULAR NAMES: Guapilla, Espadín, Palmita.

COAHUILA: Sierra Guajes, Cañon Madera, east of Buena Vista, hillsides, *Stewart 1499;* western base of Picacho del Fuste, mountain-side, *Johnston 8370;* 20 mi. north of Hipolito, dry rocky ridge, *Wynd & Mueller 69;* Chojo Grande, 27 mi. southeast of Saltillo, 1905, *Palmer 716;* Buena Vista, 1848, *Gregg 299;* Gomez Farias, stony slopes, *Shreve & Tinkham 9605;* Parras, 1880, *Palmer 1314;* Jimulco, dry hills, *Pringle 7.* ZACATECAS: Cedros, low ridges, *Kirkwood 4.*

This species appears to be endemic to our area. It was based upon collections of Wislizenus and Gregg, obtained near Saltillo. It is closely related to *A. striata* Zucc., of Nuevo Leon, San Luis Potosi, and Hidalgo, a plant with very much longer and much more slender leaves, and apparently it replaces that species on the plateau. The leaves of *A. falcata* have a stiff linear falcately curved blade 15–25 cm. long. The dense rosettes grow

in very crowded masses, usually on banks of cemented gravels or limestone ledges. The species seems to be restricted to the eastern parts of the plateau in northern Coahuila. It has not been noted in the Sierra del Pino. It is present on the slopes about Potrero de la Mula, north of Ocampo, and in Charretera Canyon, Sierra Madera, from the mouth of the canyon up to sunny ledges in the oak-belt. Berger, Die Agaven 79–80 (1915), reports collections from Hac. Tortuga near Sauceda (*Endlich 879a*), southern slopes of Sierra de la Paila near Marte Station (*Endlich 879*), and Sierra de Parras (*Purpus*).

Agave (*Littaea*) **potrerana** Trel. in Standley, Contr. U. S. Nat. Herb. **23:** 138 (1920).

CHIHUAHUA: Portrero Peak, summit of the southern Sierra Santa Eulalia east of Mapula station, *Pringle 802* (TYPE), *584*.

A well-marked species, known only from the type locality. The type collection is *Pringle 802*, not no. *"302"* as originally cited by Trelease.

Agave (*Littaea*) **parviflora** Torr. Bot. Mex. Bound. 214 (1859).

CHIHUAHUA: Dry porphyritic hills 6–12 mi. northwest of Chihuahua, *Pringle 1995*.

A rare species, known only from a few stations in southern Arizona, Sonora, and northern Chihuahua.

Agave (*Littaea*) **Victoriae-reginae** Moore, Gard. Chron. II. **4:** 484 (1875).

This species is reported from "Coahuila" by Trelease, Contr. U. S. Nat. Herb. **23:** 139 (1920). It is well known from northern Nuevo Leon and is to be expected within Coahuila east of Saltillo and Monclova.

Agave (*Euagave*) **scabra** Salm-Dyck, Bonplandia **7:** 86 (1839); Berger, Die Agaven 176 (1915).

Agave Wislizeni Engelm. Trans. Acad. Sci. St. Louis **3:** 320 (1875); Trel. Rep. Mo. Bot. Gard. **22:** 89. *t. 75–79* (1912).

Agave chihuahuana Trel. Rep. Mo. Bot. Gard. **22:** 90. *t. 82, 83* (1912).

Agave Havardiana Trel. Rep. Mo. Bot. Gard. **22:** 91. *t. 84–86* (1912).

COAHUILA: Caracol Mts. near Monclova, 1880, *Palmer 1310;* Sierra del Pino, along dry ridge crest, *Johnston & Muller 656*. CHIHUAHUA: Sierra Santa Eulalia, north canyon, *Pringle 22;* vicinity of Santa Eulalia, very common, forming large patches on stony mesas and ridges, stems averaging 15 ft. tall, 1908, *Palmer 138*.

Ranging from Coahuila and Chihuahua north to the mountains of western Texas. The type material of *A. scabra* and *A. Wislizeni* is given as from San Sebastian, on the Rio Nazas about 10 km. northeast of Torreon. Trelease refers to the species garden material said to have been distributed from Lampazos, N.L. He cites under *A. chihuahuana* collections from the hills near Chihuahua (*Pringle 958*), from Cusihuiriachic (*Rose 11654*), and from the Sierra Madre of southwestern Chihuahua (*Endlich 1201*). In the United States (under the name *A. Havardiana*) the species is known from the Guadalupe, Davis, Chinati, and Chisos Mountains, Texas. It is a plant of rocky hills and mountain ridges, usually forming colonies. Herbarium material may be difficult to separate from that of *A. asperrima*. The latter, however, has larger, more elongate leaves and larger, more branched inflorescences, and is characteristically a plant of the valleys and mountain-bases, where it grows singly or in small colonies. San Sebastian, the type locality given for *A. scabra* and *A. Wislizeni,* is in an area where

A. asperrima is to be expected, rather than the present species. However, since the type material of *A. Wislizeni* does appear really to belong to the present concept, one may wonder if it originated, not at San Sebastian, but rather at Cusihuiriachic, where Wislizenus lived for a number of months and where Rose is reported as having found the species.

Agave (*Euagave*) **parrasana** Berger, Notizbl. Bot. Gart. Berlin **4:** 250 (1906), Die Agaven 176. *fig. 58* (1915); Trel. Rep. Mo. Bot. Garden **22:** 90. *t. 80, 81* (1912).

A species based upon garden material originally collected in 1905 in the Sierra de Parras by Purpus. A plant with short very broad leaves, conspicuous elongate terminal spine, and very coarse sparse marginal teeth. Illustrations of it suggest plants growing in crowded colonies in dry open pine forests along the highest ridges of the Sierra Madera.

Agave (*Euagave*) **asperrima** Jacobi, Hamb. Gartenzeit. 561 (1864); Mulford, Rep. Mo. Bot. Gard. **7:** 89. *t. 53* (1896); Berger, Die Agaven 146 (1915).

Agave Caeciliana Berger, Die Agaven 147 (1915).

VERNACULAR NAMES: Maguey; Maguey cenizo.

COAHUILA: Sierra del Pino, ledges near mouth of southern canyon, *Johnston & Muller 725;* San Lorenzo de la Laguna, 1880, *Palmer 1309;* Jimulco, *Pringle 158.* ZACATECAS: Cedros, *Kirkwood 9.*

This is the widely distributed large gray *Agave* scattered among the desert scrub on valley slopes, usually on somewhat stony soils. It also grows in the mountains, where it is occasional on sunny open brushy flats and slopes in the yucca belt. It appears to be restricted to limestone areas. The large gray rosettes may be solitary or, less frequently, in especially favorable places, grouped to form patches of the plant several meters in extent. The flowering shoots commonly reach about 5 m. in height.

The species was based upon garden material said to have been collected by Lindheimer in Texas. In Texas it has been collected near El Paso, in the Big Bend, and along the southern escarpment of the Edwards Plateau. Berger, l.c., reports collections from the Sierra de la Paila, and from San Pedro, Viesca, and Jimulco.

IRIDACEAE

Sisyrinchium Shaffneri Wats. Proc. Am. Acad. **18:** 160 (1883).

Hydrastylus parvus Bicknell, Bull. Torr. Bot. Cl. **27:** 384 (1900).

COAHUILA: Saltillo, along water-courses, fl. yellow, 1898, *Palmer 157;* Saltillo, low valley, 1847, *Gregg 340* (isotype of *H. parvus*).

Ranging from central Mexico north into Coahuila and Chihuahua. The plant tends to stain collecting papers purplish. It has a loosely forking rhizome.

Sisyrinchium tenuifolium H. & B. ex Willd. Hort. Berol. *t. 92* (1809).

COAHUILA: Tableland north of Cañon del Cuervo Chico, thin soil at base of low rounded limestone hills, common, *Johnston 8568;* Lirios, 1880, *Palmer 1301.*

Ranging from Guatemala north to Coahuila and Chihuahua.

Sisyrinchium aff. **arizonicum** Rothr. Bot. Gaz. **2:** 125 (1877).

CHIHUAHUA: Sunny open hillsides about the high valleys at the northwest end of the Sierra Diablo, not common, *Stewart 966.*

The plant cited differs from *S. arizonicum* in having much more slender glaucescent stems and leaves, inconspicuously ribbed leaves, and much smaller spathes. Perhaps it may be more closely related to *S. tenuifolium* or may even be a vigorous form of it.

Sisyrinchium sp.

VERNACULAR NAME: Purole.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 528;* Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1316;* Sierra Encantada west of Rancho Buena Vista, crest of high ridge, *Stewart 1456;* Muzquiz, *Marsh 1071, 2130;* Sierra Gloria, *Marsh 1942;* battlefield near Buena Vista, *Gregg 70;* Lirios, 1880, *Palmer 2007;* Carneros Pass, *Pringle 5074;* 22 km. northwest of Fraile, mountain valley, *Stanford et al. 465;* 26 km. northwest of Fraile, top of mountain, *Stanford et al. 446;* Sierra Hechiceros, Cañon Indio Felipe, wet sand near stream, *Stewart 115;* Sierra del Pino, near La Noria, gravelly bench along arroyo, *Johnston & Muller 499;* Sierra Madera, main ridge east of Picacho de Zozaya, high open ridge crest, *Johnston 9016.* CHIHUAHUA: San Pablo, Rio San Pedro, marsh, April 29, 1847, *Gregg 539;* Sierra Diablo, in meadow in high valleys at northwest end of range, *Stewart 1005.*

Cited above is material of blue-flowered perennial species belonging to the complex which in Mexico is generally called *S. scabrum* C. & S. Several species may be represented. Some of the specimens closely resemble named forms from western Texas and others resemble in varying degrees plants from central Mexico.

Nemastylis Pringlei Wats. Proc. Am. Acad. **24:** 85 (1889).

CHIHUAHUA: Southern foothills of the Sierra Hechiceros near El Tule, wet rocky hillside, *Stewart 498.*

Ranging along the western Sierra Madre from Durango north into Arizona. The species of *Nemastylis* here mentioned were identified by Dr. R. C. Foster.

Nemastylis tenuis (Baker) Benth. ex Baker, Handb. Irid. 112 (1892).

COAHUILA: Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 1467.*

Trans-Pecos Texas south to central Mexico.

Iris missouriensis Nutt. Jour. Acad. Nat. Sci. Phila. **7:** 58 (1834).

COAHUILA: Lirios, 1880, *Palmer 1302.*

This species ranges widely in the western United States east to Montana, Colorado, and New Mexico and approaches the Mexican boundary only in southeastern Arizona. If Palmer found the plant growing wild at Lirios, in the Sierra Madre near the Nuevo Leon boundary about 40 km. east of Saltillo, then his specimens represent a remarkable outlying station for the species. It has not since been discovered in Mexico nor at such an easterly point. At Lirios, however, Palmer collected another *Iris* (no. *2009*) representing one of the showy European species which must have come from a garden or from plants escaped from cultivation. Possibly Palmer's material of *I. missouriensis* may have also come from plants either in a garden or escaped from it. It is difficult, however, to imagine the circumstance under which this *Iris* of the western United States could have reached a garden in the remote valley in the Sierra Madre where Palmer collected it.

ORCHIDACEAE

(Identifications by L. O. WILLIAMS)

Govenia sp.

COAHUILA: Sierra de la Gloria, Aug. 6, 1939, *Marsh 2204*.

The specimen from the Sierra Gloria is sterile but is probably conspecific with the material obtained by Pringle (no. *2794*) in cool rich canyons in the Sierra Madre near Monterey. Pringle's collection is the type of *G. elliptica* Wats., a species now considered a synonym of *G. pauciflora* Lindley. A *Govenia*, probably the same species, is also present in the Sierra Madera. The coarse rosettes of broad leaves, assumed to be this orchid, are frequent on the moist shady slopes in the conifer forests, below the highest crests, in Charretera Canyon. No flowers nor even weathered old fruiting stems were observed in September.

Corallorrhiza elliptica Schlechter, Beih. Bot. Centralbl. **36**[2]**:** 410 (1918).

COAHUILA: Muzquiz, 1936, *Marsh 1062*.

A poorly understood species known also from Chihuahua. Perhaps also referable here are *Corallorrhizae* collected in the Sierra del Carmen, Sept. 12, 1936, *Marsh 635*, and in the Sierra Madera in damp shaded coniferous forests in Cañon Charretera, *Johnston 9008* and *9051*.

Hexalectris grandiflora (Rich. & Gal.) L. O. Williams, comb. nov.

Corallorrhiza grandiflora Richard & Gal. Ann. Sci. Nat. III. **3:** 19 (1845).
Hexalectris mexicana Greenm. Proc. Am. Acad. **39:** 77 (1903).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 530;* Hillcoat Mesa, west of Encantada Ranch, July 25, 1938, *Marsh 2274;* Sierra del Pino, occasional in pine forest, *Johnston & Muller 529;* Sierra Madera, Cañon Charretera, deep leaf mulch in moist shaded canyon in pine forests, *Johnston 8989;* Carneros Pass area, July 1880, *Palmer 2006;* mountains northwest of Fraile, *Stanford et al. 460*.

Known from the Big Bend area in Texas, and from Chihuahua, Coahuila, Nuevo Leon, San Luis Potosi, Michoacan, Puebla, and Oaxaca.

Hexalectris nitida L. O. Williams, sp. nov.

Herbae saprophyticae simplices erectae efoliosae usque ad 3 dm. altae; sepalum dorsale elliptico-oblongum; sepala lateralia elliptico-oblonga obtusa arcuata; petala elliptico-oblanceolata obtusa arcuata; labellum elliptico-ovatum trilobatum; columna generis.

Stems slender, with several short cauline bracts; inflorescence several-flowered, the flowers opening one at a time, the bracts 3–6 mm. long, elliptic-ovate, cucullate; dorsal sepal ca. 11 mm. long and 3.5–4 mm. broad, obtuse; lateral sepals 9–10 mm. long and 3.5–4 mm. broad; petals ca. 10 mm. long and 3.5 mm. broad, 3-nerved with the nerves branched; lip 8–9 mm. long and 6–6.5 mm. broad; lateral lobes of lip ca. 6 mm. long from base of lip, not reaching to apex of the mid-lobe, subovate, obtuse; mid-lobe 3–4 mm. long and 3–3.5 mm. broad, obovate to suborbicular or subquadrate, truncate; lamina of lip with several carinate ridges extending down center and onto the lobes; column ca. 6.5–7 mm. long; pollinia 8, 4 in each cell of anther.

COAHUILA: Sierra Mojada, Cañon de Hidalgo, shaded canyon below crest at top of canyon, erect, among rocks, not common, Aug. 4, 1941, *R. M. Stewart 1068* (TYPE, Gray Herb.).

A species to be associated with *H. parviflora* L. O. Williams and sharing with it the distinction of having the smallest flowers known in the genus. From that species it is readily distinguished by the shape of its petals and lip.

Spiranthes rubricallosa Robins. & Greenm. Am. Jour. Sci. **50:** 165 (1895).

COAHUILA: Sierra Madera, moist shaded pine forest, among moss, along the high crest east of Picacho Zozaya, rare, *Johnston 9024*.

Otherwise known from single collections from Chihuahua, Nuevo Leon, and Puebla.

Spiranthes michuacana (Llav. & Lex.) Hemsl. Biol. Centr. Am. Bot. **3:** 301 (1884).

CHIHUAHUA: Hills near Chihuahua, Oct. 1885, *Pringle 521*.

Ranging from Chiapas north through Durango, Sonora, and Chihuahua to southeastern Arizona; also in the Chinati Mts. of trans-Pecos Texas.

Spiranthes durangensis Ames & Schweinf. Bot. Mus. Leafl. Harvard **3:** 128 (1935).

Spiranthes saltensis Ames, Orchid. **2:** 258 (1908); non Griseb. (1879).

This species has been collected on cliffs near the Rio Grande in the Big Bend area of Texas and may be expected in our area. It is otherwise known only from Nuevo Leon, Durango, San Luis Potosi, and Federal District.

Spiranthes cinnabarina (Llav. & Lex.) Hemsl. Biol. Centr. Am. Bot. **3:** 300 (1884).

VERNACULAR NAME: Lirio.

COAHUILA: Sierra del Carmen, Sept. 1, 1936, *Marsh 623;* Hillcoat Mesa west of Encantada Ranch, July 25, 1938, *Marsh 2268;* Sierra Guajes, Cañon Milagro, west of Encantada Ranch, common on hillsides about mouth of canyon, *Stewart 1541;* Caracol Mt., Aug. 1880, *Palmer;* Sierra Gavia, 5 mi. north of Saucillo, hillside, *Johnston 7221;* Puerto San Lazaro, rare on rocky shrubby slopes, *Muller 3054;* Chojo Grande, 27 mi. southeast of Saltillo, gravelly openings in canyon, scarce, 1904, *Palmer 370;* Sierra del Pino, among rocks at head of great western escarpment, about 10 mi. north of La Noria, *Johnston & Muller 545;* Cañon del Cuervo Chico, among Lechuguilla on limestone ridge at head of canyon, not common, *Johnston 8524;* Picacho de San José, dry limestone hillside, *Stewart 1105;* Sierra Mojada, Cañon Hidalgo, canyon below crest, *Stewart 1064;* Sierra de Parras, south of Parras, *Shreve & Tinkham 9871;* Sierra de Parras, Oct. 1910, *Purpus 4690*. CHIHUAHUA: Sierra Santa Eulalia, 1885, *Pringle 632;* Sierra Diablo, canyons and high valley at northern end of range, *Stewart 893, 976*.

Ranging from the Big Bend area in Texas south through our area, San Luis Potosi, and Hidalgo to the drier parts of central and southern Mexico and adjoining Guatemala. An attractive plant, with a conspicuous orange-red flower-cluster, which, though seldom common, is widely distributed in our area on open slopes and ridges in arid rocky limestone soils, commonly in the company of Lechuguilla. Its habit may be an unconventional one for an orchid, but anyone who has tried to dry specimens of the plant without continued artificial heat can appreciate its ability to retain its moisture under desert conditions.

Habenaria limosa (Lindl.) Hemsl. Biol. Centr. Am. Bot. **3:** 305 (1884).

COAHUILA: Carneros Pass area, Aug. 1880, *Palmer;* mountains near Carneros Pass, Sept. 15, 1889, *Pringle 2828*.

Known from Arizona and New Mexico and from Sonora, Coahuila, and Nuevo Leon; south to Guatemala.

Habenaria brevifolia Greene, Bot. Gaz. **6**: 218 (1881).

COAHUILA: Sierra Madera, Cañon del Agua, leaf-mold in moist oak-maple forest, *Muller 3224;* Sierra Madera, La Pipa fork of Charretera Canyon, moist shady conifer forest, *Johnston 9007, 9007a;* Sierra Madera, rocky open pine forest of high crest east of Picacho de Zozaya, *Johnston 9025.*

Known from New Mexico, Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, and south to Oaxaca.

Malaxis fastigiata (Reichenb. f.) Kuntze, Rev. Gen. **2**: 673 (1891).

COAHUILA: Caracol Mt., Aug. 1880, *Palmer 1300.*

Known from Arizona and New Mexico, and from Chihuahua, Coahuila, and Nuevo Leon; south to Costa Rica.

Malaxis Ehrenbergii (Reichenb. f.) Kuntze, Rev. Gen. **2**: 673 (1891).

COAHUILA: Sierra del Carmen, Sept. 15, 1936, *Marsh 560a;* Sierra del Pino, high eastern ridge, one plant in rich shady soil, fl. purple, *Stewart 2290;* Sierra Madera, Cañon del Agua, dense pine-oak forest on steep slope, sparse, *Muller 3211;* Sierra Madera, Corte Blanco fork of Charretera Canyon, local in deep leaf-mulch under oaks in deep moist shaded ravine at lower edge of pine-belt, *Johnston 8982;* mountains northwest of Fraile, *Stanford et al. 407.*

Ranging from New Mexico and Arizona south through Coahuila and Chihuahua to Guatemala.

Malaxis Soulei L. O. Williams, Ann. Mo. Bot. Gard. **21**: 343 (1934).

COAHUILA: Sierra Madera, Corte Blanco fork of Charretera Canyon, local in deep leaf-mulch under oaks in deep moist shaded ravine at lower edge of pine belt, growing with *M. Ehrenbergii, Johnston 8981.* CHIHUAHUA: Canyon in Mapula Mts., cool slopes, Nov. 4, 1886, *Pringle.*

Western Texas (Davis Mts.) to Arizona south through Nuevo Leon, Coahuila, and Chihuahua to Panama.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

A NEW COMBINATION IN ASIMINA

ALFRED REHDER AND WILLIAM A. DAYTON

Asimina pulchella (Small) comb. nov.
Deeringothamnus pulchellus Small in Bull. Torrey Bot. Club **51:** 390 (1924).
Asimina pulchella (Small) G. A. Zimmermann in Jour. Hered. **32:** 89 (1941) *"A. pulchellus"*; nomen. — Kelsey & Dayton, Standard. Pl. Names, ed. 2, 24, 257, 468 (1942), nomen.

The genus *Deeringothamnus,* typified by his *D. pulchellus,* was proposed by the late Dr. John K. Small in 1924, being separated from *Asimina* by "the dimorphous stems, the flat or depressed receptacle, and the narrow nearly uniform unsculptured petals." Later (in Addisonia **15:** 17. 1930), Small transferred *Asimina Rugelii* Robins. to *Deeringothamnus.* Both species are shrubs of the Florida flatwoods, not over 2 ft. high, with fusiform roots, persistent aromatic leaves, very fragrant flowers, and linear petals.

It seems probable that the majority of botanists, as well as horticulturists and other workers with plants, will prefer to regard these two dwarf pawpaws as belonging to the genus *Asimina,* since the characters by which Small separated *Deeringothamnus* do not seem to be important enough for generic distinction. They were treated as species of *Asimina* in the Journal of Heredity (l.c.) by the late Dr. G. A. Zimmermann of Harrisburg, Pennsylvania, probably the outstanding American authority on the horticulture and genetics of this genus, as well as by Kelsey and Dayton in their Standardized Plant Names (l.c.). Miss Doris W. Hayes, of the U. S. Forest Service, who has in manuscript a proposed publication on the records of the Edison Botanic Research Corporation, informs us that the late Thomas A. Edison, in his researches on native United States plants as possible sources of emergency rubber, made three routine chemical tests of *Asimina pulchella* but with negative results. Unfortunately, use of the combination *Asimina pulchella* has hitherto been illegitimate, the requirements of Art. 44(2) of the International Rules not having previously been met.

Small's type of *Deeringothamnus pulchellus* was collected by him in 1923 "in the uninhabited wilderness between Punta Gorda and Fort Myers," De Soto County, Florida. This would appear to be in what is now known either as Charlotte or Lee Counties. Harold N. Moldenke collected the species (*Moldenke 930*) on Big Pine Island, Lee County, Florida, in 1930. Miss Hayes advises us that the Edison collection above referred to was made in the spring of 1928 near Fort Myers, Lee County, Florida, by unspecified collector(s) of the Edison Botanic Research Corporation.

ARNOLD ARBORETUM, HARVARD UNIVERSITY,
AND
UNITED STATES FOREST SERVICE.

THE PHILIPPINE, CHINESE, AND INDO-CHINESE SPECIES OF THE GRASS GENUS GARNOTIA BRONGNIART[1]

JOSÉ VERA SANTOS

With two plates and one text-figure

THE original plan of the writer was to make a critical study of all the species of *Garnotia* and to prepare a monograph of the genus. The presence of several polymorphic species, however, demands a more intensive investigation of a larger number of collections than available at present and, especially, a careful study of the type specimens. The species are so extremely variable that it is impossible to define them accurately without access to additional material. The variations include primarily the great diversity in the size and pubescence of the leaves and in the length and insertion of the awns of the spikelets. Thirty-eight species and seven varieties have been described. The type specimens of 11 of these are in the segregated type collections of the U. S. National Herbarium, which are not accessible for the duration of the war. Since it is impossible to borrow specimens from foreign herbaria or to visit them, it is necessary to confine the present work to the species of the Philippines, China, and Indo-China, from whence there is sufficient material available for study. All accessible types, duplicate types, or topotypes of the species treated in this paper were examined. In all cases the original descriptions were consulted. The present treatment includes eight species and two varieties, of which three species and one variety are described as new.

This study is based on the collections in the U. S. National Herbarium, supplemented by specimens borrowed from other institutions. The following abbreviations are used in designating the herbaria in which the cited specimens are deposited: (NH) United States National Herbarium, (NY) Britton Herbarium of New York Botanical Garden, (G) Gray Herbarium of Harvard University, (UM) Herbarium of the University of Michigan, (UC) Herbarium of the University of California, and (AS) Herbarium of the National Research Institute of Biology, Academia Sinica, Nanking, China.

The author expresses his gratitude to Agnes Chase for her encouragement and guidance during the course of this study. Grateful acknowledgement is also due Jason R. Swallen for his assistance, and to Dr. William R. Maxon for his kind coöperation in extending to the writer the facilities of the U. S. National Herbarium and for borrowing specimens from other herbaria.

SYNONYMY AND RELATIONSHIPS

Garnotia Brongn. in Duperrey, M. L. I., Voyage Autour du Monde

[1]Papers from the Department of Botany of the University of Michigan, no. 732.

2(2): 133. *pl. 21.* 1830. The genus and a single species, *G. stricta* Brongn., are described and figured with a full-page illustration showing the habit of a flowering plant and the structure of the spikelet.

Miquelia W.-Arn. & Nees, Nov. Act. Acad. Caes. Leop. Carol. Nat. Cur. **19:** Suppl. 1: 177. 1841. A generic description is given and three species are included: *M. barbulata* Nees (p. 178), *M. Emodi* W.-Arn. & Nees (p. 178), and *M. courtallensis* W.-Arn. & Nees (p. 179). The incomplete diagnosis of *M. barbulata* must have been based on fragmentary material, for in presenting the structure of the spikelet, the first glume was described, then it was stated that "Reliquas partes fructificationis explicare non potui." Since no collection was cited, it seems best to consider this as a *species dubia* until it is interpreted by an adequate specimen. In *M. Emodi,* the straight, erect awn of the lemma is a deviation from the generic description which specifies that the short-bidentate apex of the lemma "emittens aristam (setam) infra medium geniculatam et tortilem." *M. courtallensis,* the last species, agrees well with the generic description, hence it is taken as the type species.

There is no indication that Walker-Arnott and Nees were aware of *Garnotia* Brongn. when they described *Miquelia,* for no reference was made to it. An analysis of the description of *Miquelia* W.-Arn. & Nees shows that its characters agree with those of *Garnotia* Brongn. The transfer to *Garnotia* of the three species originally described under *Miquelia* is clearly justified: *G. barbulata* (Nees) Merr. Philip. Jour. Sci. Bot. **13:** 130. 1918, *G. Emodi* (W.-Arn. & Nees) Janowski in Mez, Repert. Sp. Nov. **17:** 86. 1921, and *G. courtallensis* (W.-Arn. & Nees) Thwaites, Enum. Pl. Zeyl. 363. 1864. *Garnotia barbulata,* however, must be considered temporarily as a *species dubia.* Dr. Keng refers it doubtfully to *Arundinella setosa* Trin. as a synonym.[2]

Berghausia Endl. Gen. Pl. Suppl. **3:** 57. 1843. "Miquelia Nees in Plant. Meyen. 177," the only citation, refers to a specimen, not to a publication. The generic description agrees well with that of *Miquelia* W.-Arn. & Nees. No species were here transferred by Endlicher. Probably unaware of *Garnotia* Brongn., Endlicher must have proposed the genus *Berghausia* on the ground that the name *Miquelia* had been previously applied to two other genera, *Miquelia* Meissn. Gen. 152. 1838, and *Miquelia* Blume, Bull. Neerl. **1:** 94. 1838. Since the publication of *Berghausia* Endl. involves only a change in nomenclature, maintaining the generic concept of *Miquelia* W.-Arn. & Nees, the type species of *Miquelia, M. courtallensis* W.-Arn. & Nees, is retained for *Berghausia* Endl. Following the concept of Endlicher, Miquel[3] published six species of *Berghausia,* each of which was based on a species of *Miquelia.* Endlicher is given as the author of *B. barbulata, B. Emodi,* and *B. courtallensis.* All the species published under *Berghausia* have been transferred to *Garnotia* Brongn.

[2]Keng, Y. L., Nat. Cent. Univ. Science Reports, Biology **2:** 56. 1936.

[3]Miquel, F. A. G., Verh. Nederl. Inst. III. **4:** 32. 1851.

In 1855 Steudel[4] recognized *Garnotia*, but at the same time he considered *Miquelia* W.-Arn. & Nees as a separate genus with *Berghausia* Endl. as a synonym. The first treatment of *Garnotia* as it is now accepted is that of Bentham,[5] who considered it as a valid genus with both *Miquelia* W.-Arn. & Nees and *Berghausia* Endl. as synonyms. Following Bentham's treatment, the genus was similarly recognized in the floristic studies of Asia, among the most prominent of which are those by Thwaites,[6] Hooker,[7] Trimen and Hooker,[8] Cook,[9] Merrill,[10] and Ridley.[11]

The 1-flowered spikelets, subterete to dorsally compressed, and disarticulating below the glumes, misled the earlier authors as to the taxonomic position of the genus. Brongniart states that it is near *Paspalum;* Walker-Arnott and Nees place it in Tristegineae, and Endlicher in Paniceae. Steudel places both *Garnotia* and *Miquelia* in Paniceae. Bentham places *Garnotia* in Tristegineae. Thwaites does not indicate the tribes but places *Garnotia* next after *Arundinella* Raddi. Hooker was the first to recognize the affinity of *Garnotia,* in spite of its anomalous characters, placing it in Agrostideae, and he has been followed by subsequent authors.

Garnotia Brongn.

Spikelets 1-flowered, lanceolate to narrow-lanceolate, subterete to dorsally compressed, disarticulating below the glumes, pubescent at the base, solitary or in pairs, the members of each pair with unequal (usually short) pedicels; rachilla not produced behind the palea; glumes often rigid, unequal, acute to acuminate, awned or awnless, 3-nerved, the nerves scaberulous to scabrous; lemma firm or membranous, 1- or 3-nerved, awned (rarely awnless) from the entire, notched, or bidentate apex, the awn slender, erect, straight, flexuous, bent, or geniculate and twisted toward the base, or tortuous toward the tip; palea membranous, enclosing a bisexual flower, faintly 2-nerved, keeled along the nerves, the margins auricled below the middle; lodicules 2, minute, glabrous or fimbriate.

Annual or perennial grasses with simple or branched culms, flat or involute blades, and open to contracted panicles.

Type species: *G. stricta* Brongn. Described from Tahiti.

This species has been repeatedly reported in floras of several regions in Asia and the islands of the Pacific. During the preparation of this paper, an intensive study was made of the numerous specimens from the regions mentioned which had been determined as *G. stricta.* The writer, guided by the original description and plate of Brongniart, came to the conclusion that the only collections which represent the species are those of Peter

[4]Steudel, E. G., Syn. Pl. Gram. 119. 1854, Add. et Emend. 417. 1855.

[5]Bentham, G., Fl. Hongk. 416. 1861.

[6]Thwaites, G., Enum. Pl. Zeyl. 363. 1864.

[7]Hooker, J. D., Fl. Brit. Ind. **7**: 241. 1896.

[8]Trimen and Hooker, Handb. Fl. Ceyl. **5**: 253. 1900.

[9]Cook, T., Fl. Pres. Bomb. **2**: 1012. 1908.

[10]Merrill, E. D., Enum. Philip. Fl. Pl. **1**: 81. 1925.

[11]Ridley, H., Fl. Malay Pen. **5**: 242. 1925.

Nelson (*359* and *430*) from the island of Guam. Of the six collections from the Philippines cited by Merrill[12] as belonging to *G. stricta*, the following duplicates were examined: *Elmer 6210* and *6989; Merrill 3903, 4716*, and *5484*. Careful study of the specimens shows that none of them can be identified as *G. stricta*. Merrill[12] himself stated that, "The Philippine form of *Garnotia* may represent a distinct species, characterized specially by the long-awned flowering glume."

Garnotia is distributed from eastern and southern Asia to the Pacific Islands, at low to high altitudes. There are about 30 species, three from the Philippines, five from China, three from Indo-China, and the rest from the other localities of its range.

KEY TO THE SPECIES AND VARIETIES

A. Lemma long-awned.
  B. Awn of lemma geniculate, twisted below the bend.
    C. Glumes papillose-pilose .....1. *G. ciliata.*
  CC. Glumes glabrous.
    D. Mature blades conduplicate, falcate to subarcuate. .....
      .....1a. *G. ciliata* var. *conduplicata.*
    DD. Mature blades flat. .....2. *G. fragilis.*
  BB. Awn of lemma erect, not twisted.
    C. Branches of mature panicles stiffly spreading. .....3. *G. patula.*
  CC. Branches of mature panicles loosely appressed or sometimes strict.
    D. Both glumes long-awned, the awn 3–5 mm. long.
      E. Culms erect, 20–40 cm. tall. .....4. *G. triseta.*
      EE. Culms decumbent, rooting at the lower nodes, 45–90 cm. tall. .....
        .....4a. *G. triseta* var. *decumbens.*
    DD. Both glumes short-awned to awnless, rarely one glume long-awned.
      E. Awn of lemma stiff, straight to weakly flexuous from the base to the tip. .....5. *G. caespitosa.*
      EE. Awn of lemma stiff, straight to weakly flexuous to above the middle, capillary, strongly flexuous or tortuous, usually drooping toward the tip, the tortuous part sometimes deciduous at maturity. .....
        .....6. *G. mindanaensis.*
AA. Lemma awnless.
  B. Branches of mature panicles spreading, the pairs of spikelets distant. .....
    .....7. *G. mutica.*
  BB. Branches of mature panicles loosely appressed, the pairs of spikelets approximate. .....8. *G. philippinensis.*

1. **Garnotia ciliata** Merr. Philip. Jour. Sci. Bot. **13:** 130. 1918.

Perennial, 25–40 cm. tall; culms usually ascending from a decumbent base, sometimes rooting at the lower nodes, glabrous, the nodes pubescent; sheaths papillose-pilose, mostly longer than the internodes; collar glabrous or nearly so; ligule about 0.5 mm. long, the margin minutely erose, ciliolate; blades 8–11 cm. long, 5–8 mm. wide, flat, narrow-lanceolate, acuminate, tuberculate-pilose with long hairs on both surfaces, the margins wavy, scaberulous and tuberculate-ciliate; panicles to 13 cm. long, occasionally longer; branches strict, up to 6 cm. long, in fascicles or those near the summit paired to solitary; spikelets dorsally compressed, about 6 mm. long and 1 mm. wide, narrow-lanceolate, bearded around the base, in pairs, the short, unequal pedicels angular, scaberulous; glumes equal or subequal,

[12]Merrill, E. D., Philip. Jour. Sci. Bot. **1:** Suppl. 374. 1906.

acuminate, short-awned, sparsely pilose with long, soft hairs; lemma slightly shorter than the glumes, narrow-lanceolate, hyaline, glabrous, faintly 1- to 3-nerved, awned from the bidentate apex, the awn about twice as long as the spikelet, geniculate near the base, twisted, smooth, brown below the bend, the rest straight, scaberulous, pale; palea shorter than the lemma, narrow, the margins auricled toward the base, sparsely puberulent from the auricles to the tip; lodicules membranous, cuneate, glabrous.

TYPE AND LOCALITY: "Loh Fau Mountain (Lofaushan), *Merrill 10701*, August 25, 1917, on thin earth over boulders along streams, altitude 900 to 1,000 meters."

CHINA: Kwangtung: Loh Fau Mountain, roadside, *McClure & Levine* (Cant. Christ. Coll. no. *6928*), Aug. 31 – Sept. 4, 1921 (NH; G, photograph only); moist place on rocks near summit, *Hitchcock 19009*, Oct. 26–29, 1921, taller plant with broader and longer leaves (NH).

1a. **Garnotia ciliata** Merr. var. **conduplicata** var. nov.

Annua; vaginae papilloso-pilosae; laminae ad maturitatem conduplicatae, falcatae vel subarcuatae; paniculae usque ad 15 cm. longae; spiculae eis speciei similes sed glabrae.

Annual; culms erect or ascending; sheaths papillose-pilose, the hairs mostly deciduous; blades at maturity conduplicate, falcate to subarcuate, with hairs similar to those of the sheaths; panicles up to 15 cm. long, the branches strict; spikelets about 5 mm. long, similar to those of the species but glabrous.

TYPE in the U. S. National Herbarium, no. 1106724, collected on moist place on rocks near the summit of Loh Fau Mountain, Kwangtung, China, Oct. 26–29, 1921, by A. S. Hitchcock, no. *19009½*. Another specimen from Kwangtung is Cant. Christ. Coll. no. *10547*, Oct. 28, 1921 (NH). No collector nor particular locality is indicated.

The habit is identical with that of the species but the variety differs in that most of the hairs of the leaves are deciduous, leaving the papillae only; the mature blades are conduplicate, falcate to subarcuate, and the spikelets are glabrous.

2. **Garnotia fragilis** sp. nov. PLATE I.

Annua; culmi simplices vel pauciramosi, nodis pubescentibus; vaginae compressae, carinatae, non crebrae; laminae 6–15 cm. longae, 5–12 mm. latae, planae, utrinque papilloso-pilosae; paniculae laxae, saepe fragiles, infirme flexuosae; spiculae e dorso compressae, 3–4 mm. longae, 0.5–0.6 mm. latae; lemma pallidum, anguste lanceolatum, glabrum, 1-nerve, inter lobos aristatum, arista lemmate 2–3-plo longiore, geniculata, infra geniculum torta.

Annual; culms up to 36 cm. tall, sparingly branched, erect or sometimes ascending and rooting at the lower nodes, glabrous, the nodes pubescent; sheaths compressed, keeled, sometimes sparsely ciliate along the margins, otherwise glabrous; collar glabrous; ligule about 0.5 mm. long, membranous, ciliolate; blades of the basal leaves much reduced, those of the upper 6–15 cm. long, 5–12 mm. wide, flat, narrow-lanceolate, acute to acuminate, sparsely papillose-pilose on both surfaces, the hairs on the upper surface near the ligule about 4 mm. long, the nerves and the wavy margins weakly scaberulous, the bases usually narrow; panicles lax, partly included in the uppermost sheaths, interrupted toward the base; main axis angled, scabrous; branches up to 7 cm. long, often fragile, weakly flexuous, ascending or loosely appressed, fascicled at the lower nodes, paired to solitary toward

the tip; spikelets dorsally compressed, 3–4 mm. long, 0.5–0.6 mm. wide, narrow-lanceolate, pubescent at the base, in pairs, the unequal pedicels about ¼ and ½–¾ as long as the spikelets respectively; first glume slightly shorter than the second, both scaberulous on the nerves, sparsely so on the internerves, awned from the notched or shortly bidentate apices, the awns up to ⅘ as long as the glumes, the awn of the first glume usually slightly shorter than that of the second; lemma pale, equaling the second glume, narrow-lanceolate, glabrous, faintly 1-nerved, the margins hyaline, awned from the bilobed apex, the lobes narrow, obtuse, the awn 2–3 times as long as the lemma, sometimes longer, geniculate toward the base, brown and twisted below the bend, the rest lighter in color, straight to weakly flexuous, antrorsely scaberulous; palea much shorter than the lemma, membranous, the margins auricled toward the base, sparsely soft-pubescent from the auricles to the tip; lodicules cuneate, glabrous.

TYPE in the U. S. National Herbarium, no. 1610035, collected along a path through humid forest at an elevation of about 2000 meters, in the vicinity of Chapa, Lo Qui Ho, Indo-China, September, 1933, by A. Pételot, no. *4745*. A duplicate type is in the Britton Herbarium, New York Botanical Garden, and another is in the possession of the writer, to be deposited in the herbarium of the University of the Philippines, Manila. *A. Pételot 5058* (NH) and *5068* (NH, NY), collected from the type locality and its vicinity, also belong to this species.

The specific epithet alludes to the characteristic fragility of the branches of the panicles, which break off easily.

While this species shows affinity to the Indian *Garnotia polypogonoides* Munro,[13] it is distinguished from that by the following characters: culms sparingly branched; basal sheaths not crowded and overlapping, the blades papillose-pilose on both surfaces; panicles lax, partly included in the uppermost sheaths, the branches often fragile, weakly flexuous; mature lemma pale.

3. **Garnotia patula** (Munro) Benth. Fl. Hongk. 416. 1861.
Berghausia patula Munro, Proc. Amer. Acad. **4**: 362. 1860.
Garnotia drymeia Hance, Ann. Sci. Nat. IV, Bot. **18**: 233. 1862. Described from Hongkong (Hance Herb. propr. no. 8668), collector not given.
Garnotia Poilanei A. Camus, Bull. Mus. Hist. Nat. Paris **27**: 456. 1921. Described from Cambodia, *Poilane 271*.

Perennial; culms 30–80 cm. tall, tufted, erect, simple, glabrous, the nodes glabrous to short-pubescent; leaves mostly basal; sheaths glabrous to sparsely pilose; collar densely pubescent; ligule membranous, 0.2–0.5 mm. long, ciliate to pilose; blades 15–40 cm. long, 4–12 mm. wide, linear-lanceolate, acute to acuminate, glabrous to sparsely tuberculate-pilose, the margins weakly scabrous; panicles compound, 15–40 cm. long, the branches stiff, widely spreading, as much as 11 cm. long, fascicled toward the base, paired to solitary toward the summit; spikelets dorsally compressed, 4–4.5 mm. long, lanceolate to narrow-lanceolate, pubescent around the base, in pairs, one pedicel short, the other up to about as long as the spikelet; glumes equaling the spikelets, acute to acuminate, short-awned or sometimes long-awned, the nerves scaberulous; lemma as long as the glumes, glabrous, 3-nerved, acuminate, awned, the awn 7–13 mm. long, weakly scabrous, straight or slightly wavy; palea membranous, the margins auricled toward

[13]Munro ex Oliver in Hook. Icon. Pl. **5**: 64. *pl. 1484*. 1885.

the base, soft-pubescent from above the auricles to the tip; lodicules spatulate-cuneate, glabrous.

TYPE AND LOCALITY: "Hong Kong." Collected by Charles Wright (U. S. North Pac. Expl. Exped. 1853–56). No collector's number given.

CHINA: Kwangsi: Po Yam Shan (along Kwangtung border), near Tai Chung village (Sun-to District), *Tsang 22968,* Oct. 12, 1933 (G); Tou Ngok Shan (along Kwangtung border), near Tung Chung village (Waitsap District), *Tsang 23271,* Nov. 24, 1923 (G); Se Tze Shan (along Kwangtung border), near Tung Chung village (Waitsap District), *Tsang 23326,* Dec. 4–6, 1933 (G); Kwangtung: Loh Fau Mountain, 20 miles north of Sheklung, in moist place on rock slide above monastery, *Hitchcock 19049,* Oct. 26–29, 1921 (NH); Canton, White Cloud Mountain and vicinity, along small stream, *Hitchcock 18909,* Oct. 24, 1921 (NH); above Canton, at summit of Pakwan Mountain, Hance Herb. no. *9668,* Oct. 8, 1869, collector not indicated (G); Hainan, *Chow 73545,* 1935, an exceptionally tall and robust plant (G); opening in woods on Kachek River 25 miles above Kachek, *Hitchcock 19628,* Oct. 13, 1921 (NH); Hongkong: *Wright* (U. S. North Pac. Expl. Exped.), 1853–56 (G, ISOTYPE); Hance Herb. no. *1009,* Oct. 1859, no collector given (G); Road to Victoria Peak, shady slope below hotel, *Hitchcock 19133,* Nov. 5, 1921 (NH). INDO-CHINA: Tonkin: "Bord des chemins en forêt, Massif du Tom Dao," alt. 1000 m., *Pételot 3839,* Nov. 1930 (NH, NY).

4. **Garnotia triseta** Hitchc. Lingn. Sci. Jour. **7**: 200. 1931.

Perennial; culms 20–40 cm. tall, tufted, erect, simple, glabrous, the nodes pubescent; leaves mostly basal; sheaths glabrous or the throat sparsely pilose; collar short-pubescent to pilose; ligule membranous, 0.2–0.3 mm. long, minutely erose, ciliolate; blades 5–13 cm. long, 2–4 mm. wide, linear-lanceolate, acute to acuminate, sparsely pilose on the upper surface, glabrous on the lower, the margins weakly scaberulous; panicles narrow, 10–15 cm. long (rarely much longer), the main axis and branches scabrous, the latter appressed or slightly ascending, in fascicles of 3's at the lower nodes, paired to solitary toward the summit; spikelets dorsally compressed, 3–4 mm. long, about 0.8 mm. wide, narrow-lanceolate, pubescent around the base, in pairs, one pedicel short, the other about as long as the spikelet; glumes equal or subequal, the nerves scabrous, the tips acute, extending into an awn 3–5 mm. long; lemma as long as the glumes, glabrous, acute to acuminate, terminating in a slender, scaberulous, straight or slightly wavy awn 8–15 mm. long; palea membranous, the margins auricled below the middle, sparsely soft-pubescent from above the auricles to the tip; lodicules membranous, spatulate-cuneate, glabrous.

TYPE AND LOCALITY: "Type in the U. S. National Herbarium, no. 1106729, collected in moist shady place along stream on Lohfau Mountain, Kwangtung Province, China, Oct. 28, 1921, by A. S. Hitchcock (no. *19003*)."

CHINA: Kwangtung: Loh Fau, *Levine* (Lingn. Univ. Herb. no. *10234*), Oct. 28, 1921 (NH); Loh Fau Mountain, 20 miles north of Sheklung, moist shady place along stream, *Hitchcock 19003,* Oct. 28, 1921 (NH, ISOTYPE); Teng Woo Mountain, *Levine* (Cant. Christ. Coll. no. *69*), Nov. 19, 1916 (NH, paratype); Kwangsi: Tonghan (along Kwangtung border), near Sap-luk Po village (Waitsap District), *Tsang 22775,* Sept. 14, 1933 (G).

4a. **Garnotia triseta** Hitchc. var. **decumbens** Keng, Sunyatsenia **3**: 18. 1935.

Culms 45–90 cm. tall, 2–3 mm. thick, ascending from a decumbent base, rooting at the lower nodes; blades as much as 35 cm. long and 8 mm. wide; panicles 20–40 cm. long, the branches erect-ascending, as much as 15 cm. long; spikelets about 4 mm. long, similar to those of the type.

The foregoing description is a translation from the original Latin diagnosis, no specimen being available for examination.

TYPE AND LOCALITY: ". . . collected by the side of a stream, Sunyi, Kwangtung, China, August 12, 1931, by C. Wang (no. *31157*)" (AS).

5. **Garnotia caespitosa** sp. nov. PLATE II.

Perennis; culmi usque ad 40 cm. alti, caespitosi, nodis pubescentibus; vaginae glabrae, marginibus in parte superiore ciliatis, collari pubescente; laminae 5–12 cm. longae, circa 2 mm. latae, utrinque papilloso-pilosae; paniculae 10–20 cm. longae, angustae; spiculae 3–4.5 mm. longae, circa 0.5 mm. latae; glumae subaequales, breviter aristatae; lemma anguste lanceolatum, 3-nerve, apice acuminatum, integrum, arista tenui, erecta, rigida, recta vel paullum flexuosa ad apicem non tortuosa, 10–15 mm. longa.

Perennial; culms up to 40 cm. tall, caespitose, slender, erect, or sometimes slightly ascending from the base, simple, or occasionally branching and rooting at the pubescent nodes; internodes glabrous; sheaths with prominent veins, ciliate along the upper part of the margins, otherwise glabrous; collar pubescent; ligule membranous, about 0.3 mm. long, ciliolate; blades 5–12 cm. long, about 2 mm. wide, flat, sometimes becoming involute at maturity, papillose-pilose on both surfaces except for the glabrous base of the upper surface, the margins weakly scaberulous, gradually becoming smooth toward the base, the tips acuminate; panicles 10–20 cm. long, narrow, the main axis and branches smooth or nearly so, the latter in fascicles of not more than 3 at the lower nodes, paired to solitary toward the apex; spikelets dorsally compressed, 3–3.5 mm. long, about 0.5 mm. wide, lanceolate to narrow-lanceolate, pubescent at the base, the hairs 0.5 mm. long, in pairs, the strongly unequal pedicels angular, glabrous; glumes subequal, the nerves scaberulous, gradually becoming smooth from middle to base, the internerves glabrous, the tips acute to acuminate, short-awned; lemma as long as the second glume, narrow-lanceolate, narrowed toward the base, thinly coriaceous, rounded on the back, faintly 3-nerved, glabrous, acuminate, entire, awned, the awn scaberulous, slender, stiff, straight or weakly flexuous from the base to the tip, 10–15 mm. long; palea shorter than the lemma, narrow-lanceolate, membranous, the margins auricled below the middle, sparsely soft-pubescent from above the auricles to the tip; lodicules spatulate-cuneate, glabrous.

TYPE in the U. S. National Herbarium, no. 1238135, collected at Los Baños, Laguna Province, Luzon Island, Philippines, March 6, 1913, by F. C. Gates (no. *6237*) (NH).

PHILIPPINES: *Philip. Bur. Sci. 14209* (no collector nor locality given) (NH); Luzon: Isabela Province, San Mariano, *Ramos & Edaño* (Philip. Bur. Sci. *47127*), Feb.–Mar. 1926 (NH, NY); Mountain Province, Benguet, Sablan, *Elmer 6210*, April 1904 (NH, NY); Benguet, Baguio, *Elmer 8898*, Mar. 1907 (NH, NY); Bulacan Province, Angat, *Ramos & Edaño* (Philip. Bur. Sci. *34069*), Feb. 1919 (UC); Laguna Province, *Catalan* (Philip. Bur. For. *26465*), Feb.–Mar. 1917 (NH); San Antonio, *Ramos* (Philip. Bur. Sci. *20403*), Feb. 1913 (NH); Mt. Banajao, *Robinson* (Philip. Bur. Sci. *9763*), Mar. 5–7, 1910 (NH, NY); Mindanao: Zamboanga Province, Malangas, *Ramos & Edaño* (Philip. Bur. Sci. *36776*), Oct.–Nov. 1919 (NH); Isabela de Basilan, *Ebalo 907*, Jan. 5–18, 1941 (UM). CHINA: Kwangtung: Canton, Ting-u Shan, at the base of running water, *Sampson* (Herb. Hance no. *8135*[?]), Oct. 1867 (G). INDO-CHINA: Tonkin: Chapa, on rocks by the side of stream, alt. 1500 m., *Pételot 3253*, Jan. 1928 (NH, NY).

This species is closely related to *Garnotia mindanaensis* Santos, differing

chiefly in the erect, rigid, straight or weakly flexuous awn of the lemma, and in the plainly evident hairs at the base of the spikelets.

6. **Garnotia mindanaensis** Santos, Jour. Wash. Acad. Sci. **33:** 135. *f. 1.* 1943.
Garnotia stricta Brongn. var. *longiseta* Hack. in Kneucker, Allgem. Bot. Zeitschr. **15:** 141. 1909. Described from Mt. Mariveles, Bataan Province, Luzon, Philippines.

Perennial, 45–55 cm. tall; culms simple, tufted, erect or slightly geniculate toward the base, glabrous, the nodes pubescent; sheaths glabrous to short-pilose, the veins prominent; collar pubescent; ligule about 0.2 mm. long, glabrous to ciliolate; blades 8–25 cm. long, 3–10 mm. wide, linear-lanceolate, flat, glabrous to short-pilose, the margins scaberulous; panicles 10–28 cm. long, narrow, interrupted, the branches loosely appressed; spikelets dorsally compressed, 4–4.5 mm. long, 0.5–0.6 mm. wide, narrowly lanceolate, with very short hairs at the base, in pairs, the pedicels short, unequal; glumes subequal, the nerves scaberulous to scabrous, the internerves glabrous, the tips short-awned (sometimes awnless); lemma at maturity equaling the glumes, lanceolate, glabrous, 3-nerved, acute, awned, the awn 1–2.5 times as long as the lemma, erect, rigid, straight or weakly flexuous to above the middle, capillary, strongly flexuous to tortuous toward the tip, the tortuous part sometimes drooping or deciduous at maturity; palea narrowly lanceolate, the margins auricled toward the base, soft-pubescent from above the auricles to the tip; lodicules spatulate, glabrous.

Since the publication of the original description of this species, numerous specimens of *Garnotia* from the Philippines have been studied. After examining about 25 collections which were determined as belonging to this species, it became evident that an important character had been overlooked. Most of the mature spikelets of the type specimen did not show the capillary, tortuous upper part of the awn of the lemma. A detailed description of this awn is therefore included in the preceding paragraph.

TYPE AND LOCALITY: "Type in the herbarium of the University of Michigan, duplicate type in the U. S. National Herbarium, collected by H. H. Bartlett, no. *17235*, Dec. 6, 1940, grassland at Del Monte, Bukidnon, Mindanao Island, Philippines."

PHILIPPINES: (Philip. Bur. Sci. Herb. *13983*, no collector nor locality given) (NH); *Loher 7185*, no locality (NH); Luzon: Ilocos Norte Province, *Merritt & Darling* (Philip. Bur. For. *15517*), Nov. 1908 (NH, NY); Cagayan Province, *Ramos* (Philip. Bur. Sci. *13983*), Feb. 1912 (NH); *Curran* (Philip. Bur. For. *16842*), Mar. 1909 (NH); Mountain Province, Bontoc, Bauco, *Vanoverbergh 4005*, Dec. 1915 (NH); Benguet, *Ramos* (Philip. Bur. Sci. *5319*), Dec. 1908 (NH, NY); Zambales Province, Mt. Tapolao, *Ramos & Edaño* (Philip. Bur. Sci. *44721*), Nov.–Dec. 1924 (NH, NY); Pampanga Province, Mt. Arayat, *Clemens 16211*, Oct. 31, 1925 (NY); *Merrill 3903*, Oct. 1904 (NH, NY); Bulacan Province, *Ramos 1933*, Dec. 1914 (NY, G); Bataan Province, Mt. Mariveles, *Merrill* (Kneucker, Gram. Exsic. *744*), Dec. 12, 1908 (G); *Elmer 6989*, Nov. 1904 (NY); *Williams 236*, Nov. 27, 1903 (NH, NY); Rizal Province, *Ramos 596*, Nov. 1910 (NH); *Ramos* (Philip. Bur. Sci. *24081*), Dec. 1915 (NH, NY, G); Mt. Irid, *Ramos & Edaño* (Philip. Bur. Sci. *48501*), Nov. 1926 (NH, NY); San Andales, *Edaño* (Philip. Bur. Sci. *48733*), Dec. 1926 (NY); Montalban, *Merrill 6237*, Nov. 1908 (NH, NY); Tayabas Province, Guinayanan, *Escritor* (Philip. Bur. Sci. *20904*), Mar.–Apr. 1913 (NH, NY); Albay Province, Mayon volcano, *Ramos & Edaño* (Philip. Bur. Sci. *75748*), Sept. 1928 (NY); Catanduanes Island, *Ramos & Edaño* (Philip. Bur. Sci. *75257*), Jul.–Sept. 1928 (NY); Sorsogon Province, Mt. Bulusan, Irosin, in soil among rocks of light shaded woods along upper edge of Sibulan River falls, alt. 2750 ft., *Elmer 16633*, July 1916 (NH, NY, G); Visayan Islands:

Island of Leyte, *Menzel 1519,* July 28, 1915 (NY, G); Island of Bohol, *Ramos* (Phil'p. Bur. Sci. *42880*), Aug.–Oct. 1923 (NH); Mindanao: Bukidnon Province, grassland at Del Monte, *Bartlett 17235,* Dec. 6, 1940 (UM, TYPE; NH, isotype); Davao Province, Mt. Apo, Todaya, *Elmer 11773,* Sept. 1909 (NH); Todaya, in dry rather stony soil of a wooded ridge, alt. 2000 ft., near Sibulan River, *Elmer 11298,* Aug. 1909 (NH, NY); Zamboanga Province, *Merrill 5484,* Oct. 10, 1906 (NH).

7. **Garnotia mutica** (Munro) Druce, Rep. Bot. Soc. Exch. Club **1916:** 624. 1917. Later combination with the same basis, *G. mutica* (Munro) Janowski in Mez, Repert. Sp. Nov. **17:** 86. 1921.

Berghausia mutica Munro, Proc. Amer. Acad. **4:** 362. 1860.

Garnotia tectorum Hook. f. Fl. Brit. Ind. **7:** 242. 1896. Described from Ceylon.

Garnotia patula Munro var. *mutica* Rendle ex Forbes & Hemsley, Jour. Linn. Soc. Bot. **36:** 387. 1904. Based on *Berghausia mutica* Munro.

Perennial; culms 30–40 cm. tall, erect, simple, glabrous, the nodes pubescent; blades mostly basal; sheaths glabrous, longer than the internodes; collar pubescent; ligule membranous, the margins minutely erose, ciliolate; blades elongate, 25–50 cm. long, 4–6 mm. wide, flat, glabrous or the upper surface with a few, long, widely distributed, papillose-base hairs, the base of the blade densely pubescent with short and long hairs intermixed, the nerves and margins scaberulous; panicles about 32 cm. long, the branches slender, up to 11 cm. long, ascending to spreading, in distant fascicles of 3's, or those toward the summit paired to solitary; spikelets dorsally compressed, 4.5–5.5 mm. long, about 0.8 mm. wide, lanceolate to narrow-lanceolate, bearded around the base, in distant pairs, one pedicel short, the other about as long as the spikelet; glumes equal to subequal, the nerves scaberulous, the tips acuminate, awnless or the first glume mucronate; mature lemma equaling the glumes, short-stipitate, acuminate, awnless, glabrous, 3-nerved; palea shorter than the lemma, the margins auricled toward the base, sparsely soft-pubescent from above the auricles to the tip; lodicules cuneate, glabrous.

TYPE AND LOCALITY: "Hong Kong." Collected by Charles Wright (U. S. North Pac. Expl. Exped. 1853–56). Collector's number not indicated.

CHINA: Kwangtung: Hongkong, *C. Wright* (U. S. North Pac. Expl. Exped. 1853–56) (NH, G, ISOTYPES).

8. **Garnotia philippinensis** sp. nov. FIG. 1.

Perennis; culmi 35–55 cm. alti, erecti, simplices, nodis pubescentibus; vaginae glabrae vel sparse pilosae, collari dense pubescente; laminae 10–30 cm. longae, 3–8 mm. latae; paniculae circa 20 cm. longae, angustae; spiculae 4–5 mm. longae, 0.5–0.7 mm. latae, basi breviter pubescentes; glumae acuminatae, muticae; lemma 1-nerve, acuminatum, muticum.

Perennial; culms 35–55 cm. tall, erect, simple, glabrous, the nodes pubescent; sheaths longer than the internodes, those near the base sometimes sparsely pilose, the upper glabrous or the throat with few long hairs; collar densely pubescent; ligule about 0.2 mm. long, minutely erose, ciliolate; blades of the basal leaves reduced, those of the upper 10–30 cm. long, 3–8 mm. wide, linear-lanceolate, acuminate, the upper surface with short, sparse pubescence toward the tip, the base densely pubescent with short hairs mixed with a few long ones, the rest of the blade glabrous, the nerves and margins scaberulous; panicles about 20 cm. long, narrow, conspicuously interrupted toward the base, the branches weakly scabrous, usually appressed, up to 4 cm. long; spikelets dorsally compressed, 4–5 mm. long,

0.5–0.7 mm. wide, narrow-lanceolate, short-pubescent at the base, in pairs, the pedicels short, unequal; first glume as long as the spikelet, acuminate; second glume usually shorter than the first, acute to acuminate, the mid-nerve running along a prominent, longitudinal, median depression, both glumes awnless, scaberulous on the nerves, sparsely puberulent on the inter-nerves; lemma narrow-lanceolate, glabrous, 1-nerved, acuminate, awnless; palea shorter than the lemma, the margins auricled toward the base, sparsely pubescent from the auricles to the tip; lodicules spatulate-cuneate, glabrous.

TYPE in the U. S. National Herbarium (Philip. Bur. Sci. no. *42963*), collected from the Island of Bohol, Visayan Islands, Philippines, Aug.–Oct., 1923, by Maximo Ramos.

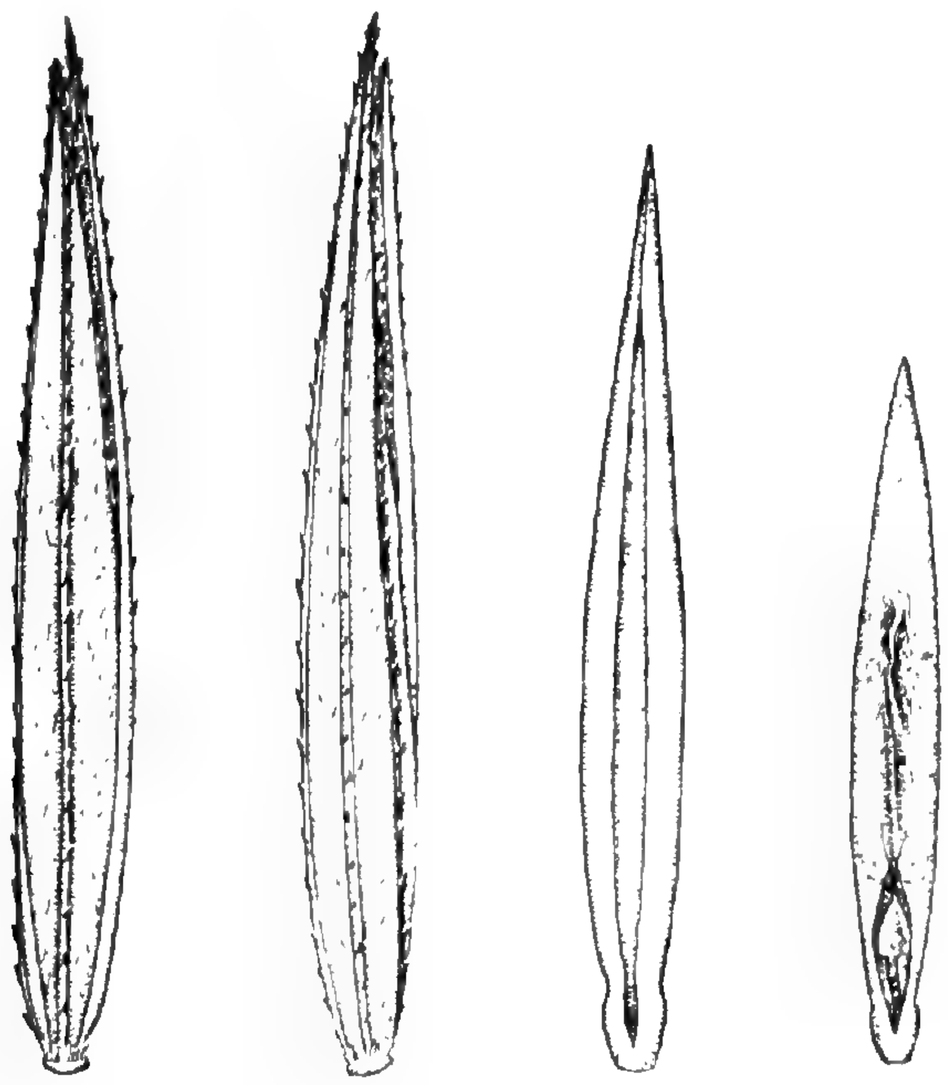

FIG. 1. *Garnotia philippinensis* Santos, drawn from the type deposited in the U. S. National Herbarium (Philip. Bur. Sci. no. *42963*): *a*. and *b*. ventral and dorsal views of the spikelet respectively; *c*. lemma; *d*. palea (*a-d*, × 14).

This species is distinguished from all Philippine forms of *Garnotia* in having awnless spikelets. The habit of the plant and the structure of the spikelet suggest *Garnotia mutica* (Munro) Druce, of Hongkong, from which the new species differs in the absence of long, tuberculate-base hairs, which are very sparsely distributed along the entire length of the blades in *G. mutica,* and in having a narrow panicle with branches not more than 4 cm. long, the spikelets approximate, as many as 10 pairs along the appressed branches.

EXPLANATION OF PLATES

All figures are drawn from types deposited in the U. S. National Herbarium.

PLATE I

Garnotia fragilis Santos (*Pételot 4745*): *a*. habit, × ½; *b*. inflorescence, × ½; *c*. spikelets, × 14; *d*. lemma, × 14.

PLATE II

Garnotia caespitosa Santos (*Gates 6237*): *a*. habit, × ½; *b*. ligule and adjacent parts, × 5; *c*. and *d*. dorsal and ventral views of the spikelet respectively; *e*. lemma (*c-e*, × 14).

BOTANY DEPARTMENT AND BOTANICAL GARDEN,
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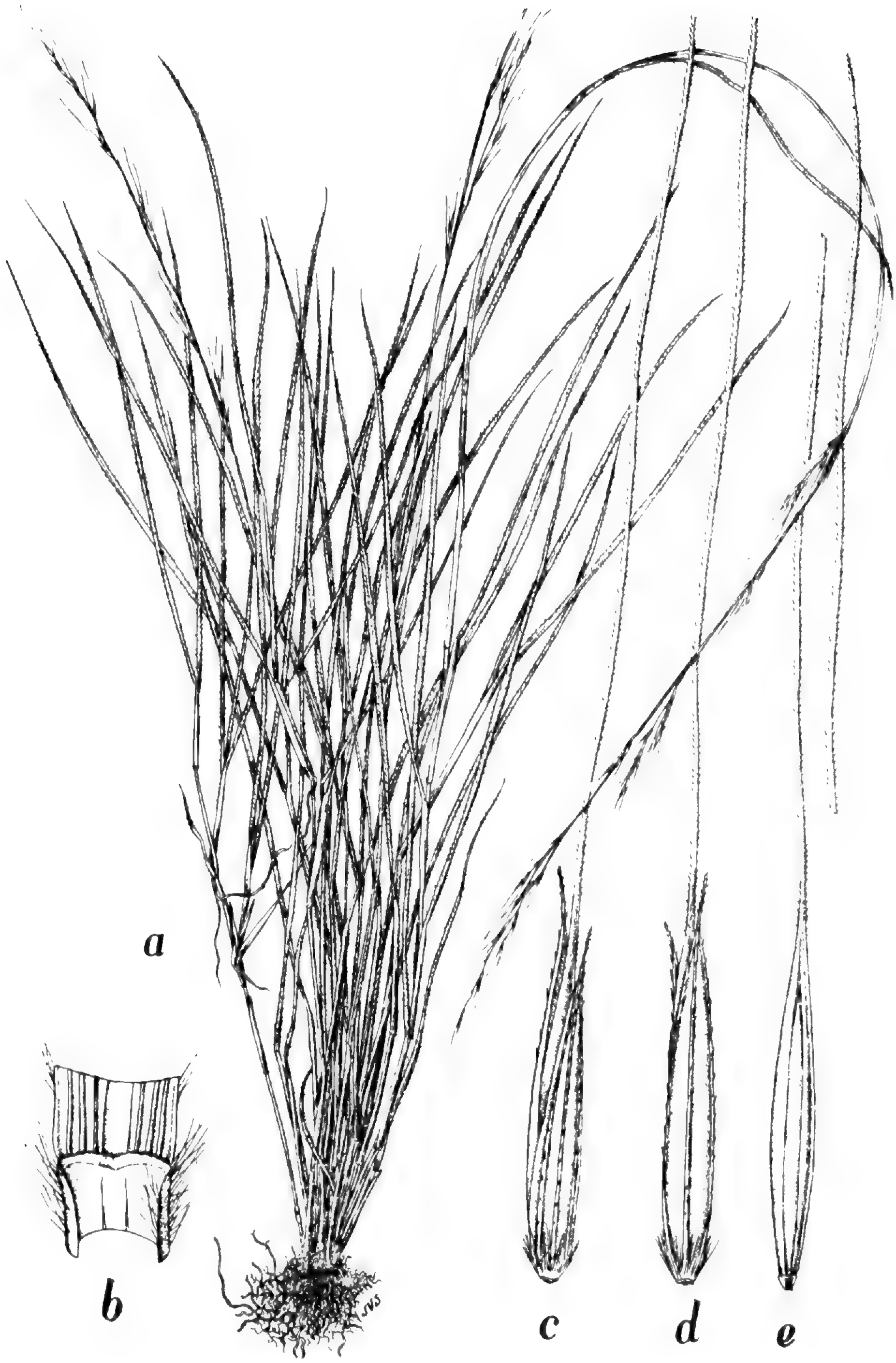
GARNOTIA FRAGILIS SANTOS



GARNOTIA CAESPITOSA SANTOS

THE COMPARATIVE MORPHOLOGY OF THE WINTERACEAE
III. WOOD

I. W. Bailey

With four plates

Göppert (22) in 1842 noted the absence of vessels in the wood of *Drimys Winteri* J. R. and G. Forst. His observations have been verified by Eichler (18), Möller (29), De Bary (17), Solereder (34, 35), Strasburger (36), Groppler (23), and many other anatomists and taxonomists. That *Trochodendron* has a similar vesselless type of wood was reported by Eichler (18) in 1864. *Tetracentron* was subsequently added to the list by Harms (24) in 1897. It was upon the basis of their vesselless wood that van Tieghem (38) segregated the genera *Drimys, Pseudowintera,*[1] *Bubbia, Belliolum, Exospermum, Zygogynum, Trochodendron,* and *Tetracentron* in three families of a distinct order, the Homoxylées. Thompson and Bailey (37) and Bailey and Thompson (9) studied all organs and parts of *Drimys Winteri* J. R. & G. Forst., *Pseudowintera axillaris* var. *colorata* (Raoul) A. C. Sm., *Trochodendron,* and *Tetracentron,* and demonstrated that vessels and vessel-like structures are absent throughout both the primary and secondary bodies of these plants.

In assembling all available collections of Winteraceae for taxonomic revision, my colleague Dr. Smith (32, 33) has provided me with the unusual opportunity of studying the anatomy of a wide range of accurately identified representatives of the family. Vessels are invariably absent from both the primary and the secondary xylem. Parmentier (30) obviously erred in reporting the presence of vessels in two putative species of *Drimys*. As van Tieghem (38) and others have shown, Parmentier's observations were based upon incorrectly determined material. Thus, increasing evidence accumulated by many investigators during the last 100 years indicates that the Winteraceae (excluding *Illicium*), *Trochodendron,* and *Tetracentron* are the only known living representatives of the dicotyledons that have a primitive vesselless type of secondary xylem. This is not indicative necessarily of close genetic relationship between the Winteraceae, *Trochodendron,* and *Tetracentron,* as assumed by van Tieghem, but rather the occurrences are to be regarded as retentions of a primitive ranalian type of wood by three families which exhibit diverse trends of specialization in their other vegetative characters and in their reproductive organs.

During the last 25 years, the study of the comparative anatomy of the cambium and xylem has progressed rapidly to a stage where it is possible to visualize the salient trends of evolutionary specialization of these tissues

[1] *Pseudowintera* Dandy, i.e. *Wintera* sensu v. Tiegh., non Murray.

in the gymnosperms and angiosperms. Particularly in the case of the cambium (2, 3, 4), vessels (6, 10, 16, 19, 20, 21), imperforate tracheary cells (7, 10), and rays (8, 12, 13, 14, 27) of dicotyledons, the irreversible trends of structural specializations are so obvious and clearly defined that they may be utilized, even statistically, in evaluating the levels of morphological specialization that have been attained within specific groups of plants (6, 7, 8, 25, 26, 39, 40).

The cambium of the Winteraceae, as of *Trochodendron* and *Tetracentron,* is of the same cytological and histological type as that which occurs so characteristically in the lower vascular plants which form vesselless secondary xylem. The fusiform initials of the non-stratified cambium periodically divide diagonally, elongate extensively, and commonly attain lengths of as much as 5000 microns in the outer parts of old stems. Since the changes in length and tangential diameter of the tracheary derivatives are relatively slight during tissue differentiation, the tracheids of the Winteraceae resemble the fusiform initials in length and tangential outline and tend to be arranged in relatively undisturbed radial seriations, *Figs. 1–3* and *7–9.* The primitive character of the cambium and xylem in the Winteraceae, *Trochodendron,* and *Tetracentron* rules out any possibility of these plants having developed vessels and subsequently having lost them. Wherever vessels have originated (primary body of *Selaginella, Pteridium,* and monocotyledons, secondary body of Gnetales and dicotyledons), their development is closely correlated with fundamentally significant cytological, histological, and ontogenetic changes in the xylem. In the case of the dicotyledons, which have now been very comprehensively investigated, the development and the specialization of vessels is closely synchronized with significant changes in the cambium and xylem. Furthermore, it should be emphasized in this connection that in those dicotyledons (e.g. Cactaceae, Crassulaceae, aquatics, and other super-specialized forms) where there is a tendency towards the reduction or elimination of vessels, the tissues are obviously profoundly modified and highly specialized. There is no evidence of reversible transitions leading toward a reversion to the primitive type of cambium and xylem that characterizes the Winteraceae, *Trochodendron, Tetracentron,* and the lower vascular plants.

In the past, many investigators have referred to the wood of *Drimys* as having a coniferous type of structure. Such comparisons between the Winteraceae and the Coniferae are misleading, since they overlook outstanding structural differences. The wood rays of the Winteraceae, *Trochodendron,* and *Tetracentron* are of the primitive heterogeneous type I (Barghoorn, 12) that characterizes the secondary xylem of anatomically less specialized dicotyledons. Two widths of rays occur typically in this form of ray structure: (a) uniseriates and (b) multiseriates. The uniseriate rays which extend outward from the fascicular parts of the stele are composed of vertically much elongated cells, whereas the multiseriate rays which extend outward from the gaps in the stele are constituted of more nearly isodiametric or radially elongated cells, *Figs. 1–6.* Both

types of rays increase in number in enlarging stems by appropriate cytological changes in the cambium (Barghoorn, 12); both are much extended longitudinally in the first formed secondary xylem and are dissected into lower rays during subsequent enlargement of the stem. In the Cordaitales, Ginkgoales, and Coniferae, not only are there no multiseriate rays comparable to those of the dicotyledons, but also the characteristically uniseriate (occasionally bi- or tri-seriate) rays are of a basically different type. The coniferous uniseriate ray is very low in the first-formed secondary xylem and commonly increases in height during subsequent enlargement of the stem (Barghoorn, 11). Furthermore, it is composed usually of radially rather than vertically elongated cells. Mixtures of narrow and wide rays do occur, however, in the wood of the Pteridospermae, Bennettitales, and Cycadales, and the wood of Pteridospermae frequently exhibits a heterogeneous type of ray structure (Andrews, 1).

The tracheary pitting in the primary xylem of *Ginkgo,* the Coniferae, and the Gnetales is of a highly modified type (Bailey, 5) and is entirely unlike that which characterizes the lower vascular plants and the angiosperms. Furthermore, the scalariform and transitional types of tracheary pitting in the secondary xylem of the Winteraceae, *Trochodendron,* and *Tetracentron* have no counterparts among the Cordaitales, Ginkgoales, Coniferae, or Gnetales, but closely resemble those types that occur in the secondary xylem of certain Bennettitales and *Protopitys.* Thus, if the vesselless wood of the Winteraceae is to be compared with that of the gymnosperms, it should be with the secondary xylem of Pteridospermae and Bennettitales rather than with that of the Coniferae, Ginkgoales, or Cordaitales.

The wood parenchyma, tracheids, and rays of the Winteraceae fluctuate considerably in available samples of the wood of different representatives of the family, *Figs. 1–8, 10,* and *11.* Thus the woods of the New Caledonian *Zygogynum Vieillardi* Baill., *Figs. 1* and *4,* the Solomon Island *Belliolum haplopus* (Burtt) A. C. Sm., *Figs. 3* and *6,* and the Chilean *Drimys Winteri* J. R. and G. Forst., *Figs. 2* and *5,* are composed of much larger tracheids than those of the Australian *Drimys lanceolata* (Poir.) Baill., *Figs. 7* and *10,* and the New Zealand *Pseudowintera axillaris* var. *colorata* (Raoul) A. C. Sm., *Figs. 8* and *11.* Growth rings, *Fig. 7,* are well developed in the sample of *Drimys lanceolata* but are not detectable in the other illustrated specimens. Wood parenchyma, which is absent or of infrequent occurrence in *Drimys Winteri, Fig. 2,* is more or less abundantly developed in the other woods and exhibits diffuse, diffuse-in-aggregates, and tangentially banded distributions. The multiseriate rays vary in height and width, in the size and form of their constituent cells, and in their number within a unit area, *Figs. 1–8, 10,* and *11.* The uniseriate rays fluctuate in height and in the vertical extension of their constituent cells. The character of the tracheary pitting also varies considerably, the ratios of scalariform to multiseriate-circular to uniseriate-circular fluctuating from specimen to specimen.

It has been customary in the past to utilize such differences in the construction of keys for differentiating the woods of genera and species. There is, however, a very considerable element of uncertainty in so doing, unless unusually extensive collections of each species are available. This is due to the fact that the structural characters enumerated in the preceding paragraph commonly fluctuate more or less markedly, not only within different parts of the same tree, but also in trees grown under different environmental conditions. Furthermore, it is difficult at present to determine from herbarium specimens (twigs) what the expression of diagnostic characters in the outer parts of large stems will be. Therefore, any deductions regarding generic differences between the woods of the Winteraceae are tentative and subject to future verification. Available material suggests that there are at least two significant trends of structural specialization within the Winteraceae, one leading toward a marked reduction in the amount of wood parenchyma in the New World *Wintera* section of *Drimys*, and the other toward a reduction in cell size and a striking enlargement of the multiseriate rays in *Pseudowintera*.

The vesselless woods of *Trochodendron* (Japan and Formosa) and *Tetracentron* (Central China) are characterized by their conspicuous annual growth rings, *Fig. 9*. In fact, the growth rings are as contrastedly developed as those of *Keteleeria, Larix,* and other conifers of the northern hemisphere. The tracheids of the earlywood are large, thin-walled, and provided with scalariform bordered pitting such as occurs so generally in the tracheids of ferns. On the contrary, those of the latewood are smaller, thick-walled, and have scattered small circular bordered pits. The tracheids of the transitional region exhibit transitions between scalariform and multiseriate-opposite, multiseriate-alternate, and uniseriate-circular types of pitting, such as occur in the Winteraceae and certain Bennettitales (Bailey and Thompson, 9). The ray structure is conspicuously heterogeneous as in the Winteraceae, but the multiseriate rays (in wood from large stems) are lower, are composed of smaller cells, and have a fusiform outline in tangential sections, *Fig. 12*. Diffuse parenchyma is confined largely to the latewood, *Fig. 9*. Thus, the vesselless wood of *Trochodendron* and *Tetracentron* differs from that of the Winteraceae in its conspicuous growth layers, in the dominantly scalariform pitting of its earlywood, and in its specialized form of heterogeneous ray structure. The question arises how significant are such structural differences in considering possible relationships within the Ranales.

Growth rings in trees are commonly interpreted as being conditioned by environmental influences. There are, however, two distinct types of zonation phenomena in wood: (1) facultative and (2) obligate. Many tropical and subtropical plants as well as plants of the southern hemisphere form growth rings or not, depending upon the environment in which they are grown. The growth rings of certain Winteraceae, *Fig. 7*, as of many Podocarpaceae and Araucariaceae appear to be of this facultative type. On the contrary, many plants of the northern hemisphere form zonate wood

under all conditions of survival, both natural and experimental. The growth rings of *Trochodendron* and *Tetracentron,* with their associated characteristic type of tracheary pitting, appear to be of the obligate type. Thus, fossilized representatives of these genera from the Jurassic (?) of India (Sahne, 31), the Tertiary of northwestern United States (Beck, 15), and the Eocene of Greenland (Mathiesen, 28) have wood that is indistinguishable structurally from that of the postglacial living representatives.

From the point of view of the comparative anatomy of the vascular plants as a whole, the obligate growth layers of *Trochodendron* and *Tetracentron* and the segregation of scalariform pitting in excessively thin-walled earlywood tracheids are evidence of structural specialization. The type of ray structure illustrated in *Fig. 12* arises in other dicotyledonous families as specializations from such ray forms as occur in the Winteraceae. This suggests that the wood of the Winteraceae is of a more primitive and plastic ranalian type, resembling that from which the modified and stereotyped wood of *Trochodendron* and *Tetracentron* has been derived. It should be noted in this connection that in young stems of Winteraceae (Bailey and Thompson, 9), as in the wood of certain Bennettitales, the scalariform tracheids tend to be segregated in the earlywood when unusually conspicuous growth layers are developed.

It is unlikely that the dicotyledonous type of vessel could have originated in a specialized vesselless wood of the trochodendraceous type, since the more primitive types of vessels in dicotyledons are diffused throughout the wood and are not in zonal arrangements. Although the plastic vesselless wood of the Winteraceae more closely approximates the type in which vessels originated, the actual ancestral forms must have contained a higher ratio of scalariform pitting than occurs in most living representatives of the Winteraceae, which exhibit evidences of reduction in the amount of such pitting. When the summation of evidence from all organs and parts of the plants is taken into consideration, there are no convincing arguments for deriving the Trochodendraceae from the Winteraceae or vice versa or even for inferring that these families are closely related genetically. Nor can one assume that other ranalian families were derived from these specific vesselless families. Each of the latter exhibits a combination of more or less primitive and specialized characters, indicative of reticulate rather than linear relationships and of common origin from an ancestral ranalian stock. Until essential fossilized material is discovered, the composite structure of such ancestors can be synthesized only by combining the more primitive features of a number of diverse families.

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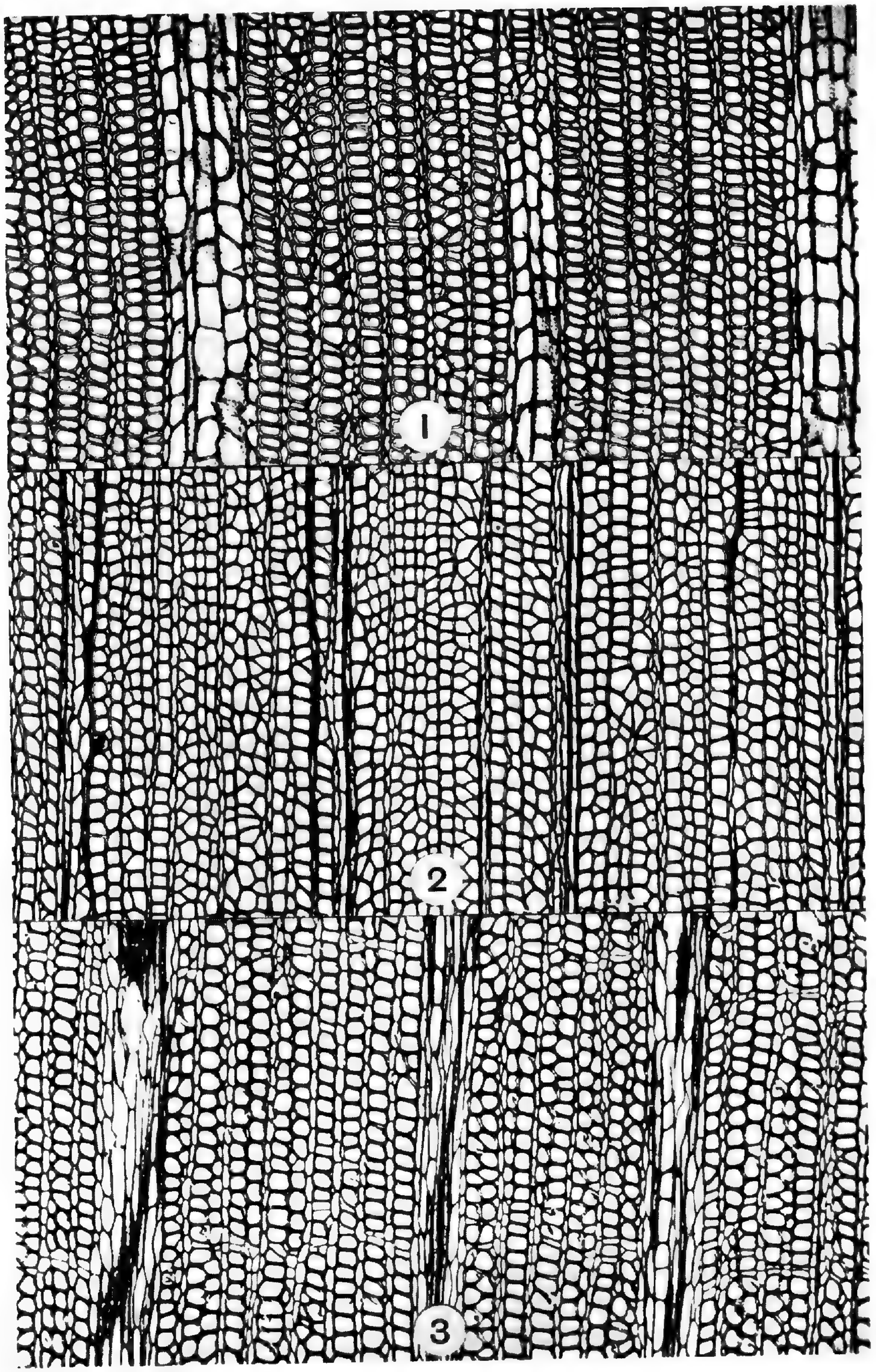
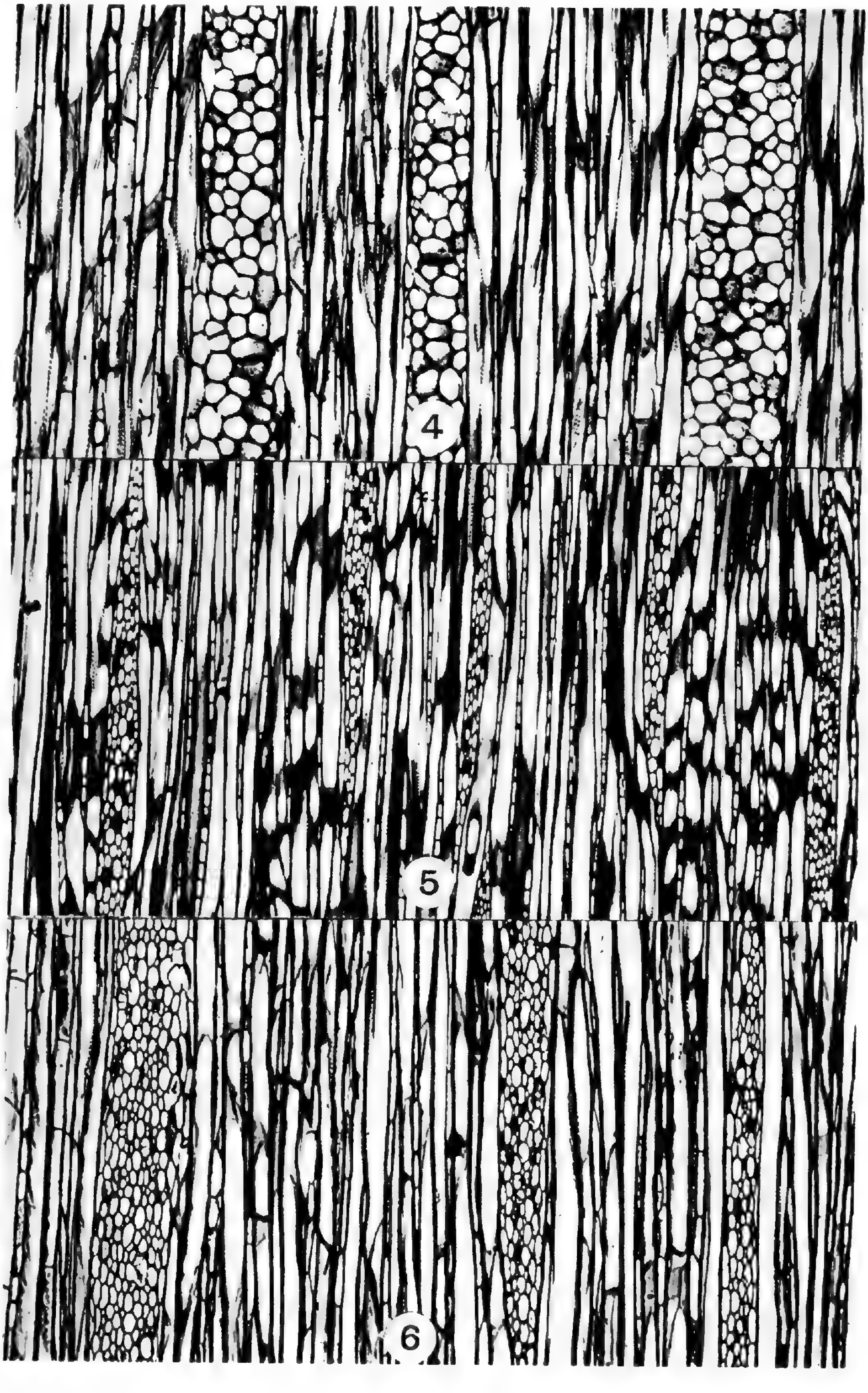


COMPARATIVE MORPHOLOGY OF THE WINTERACEAE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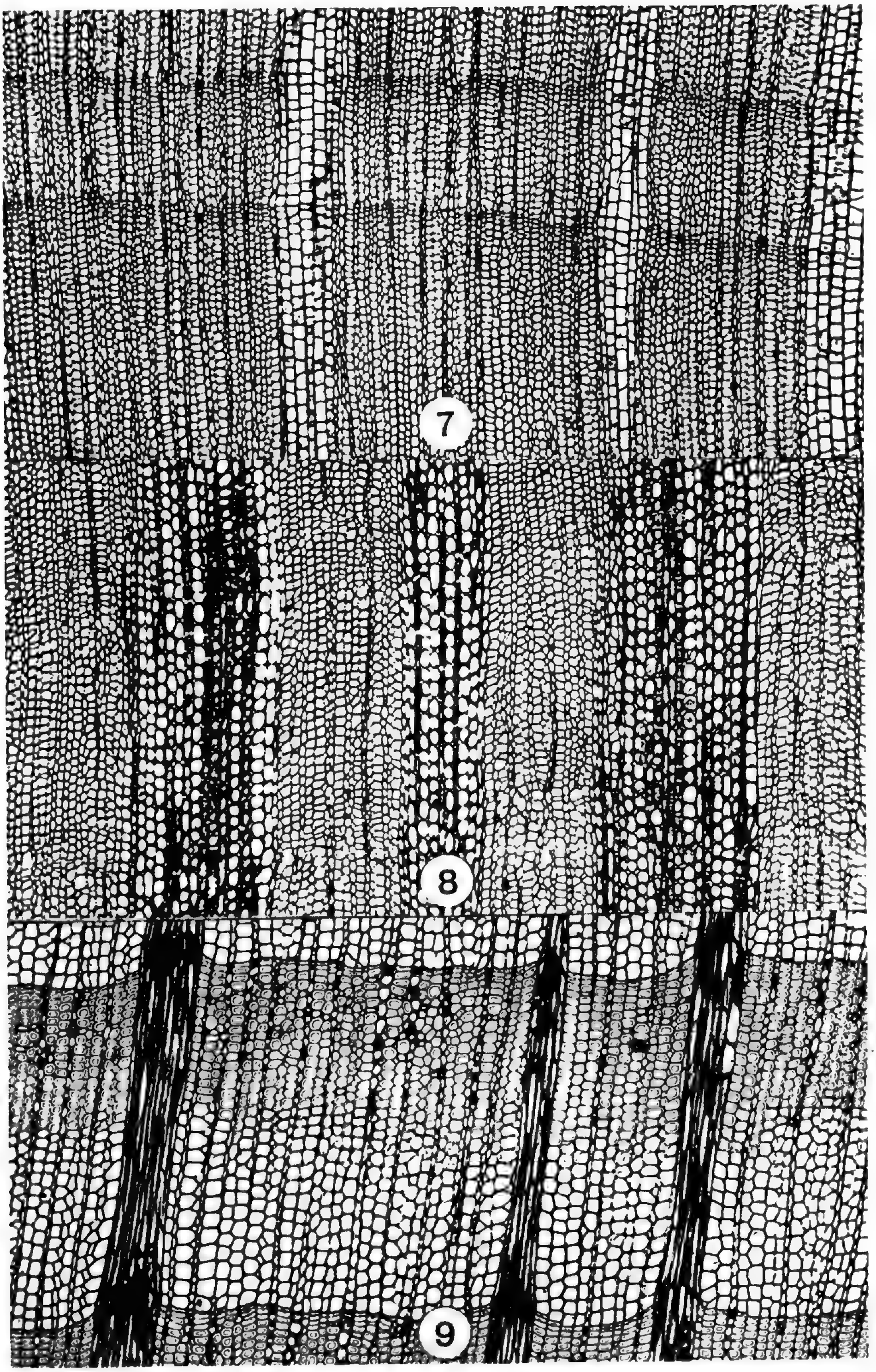

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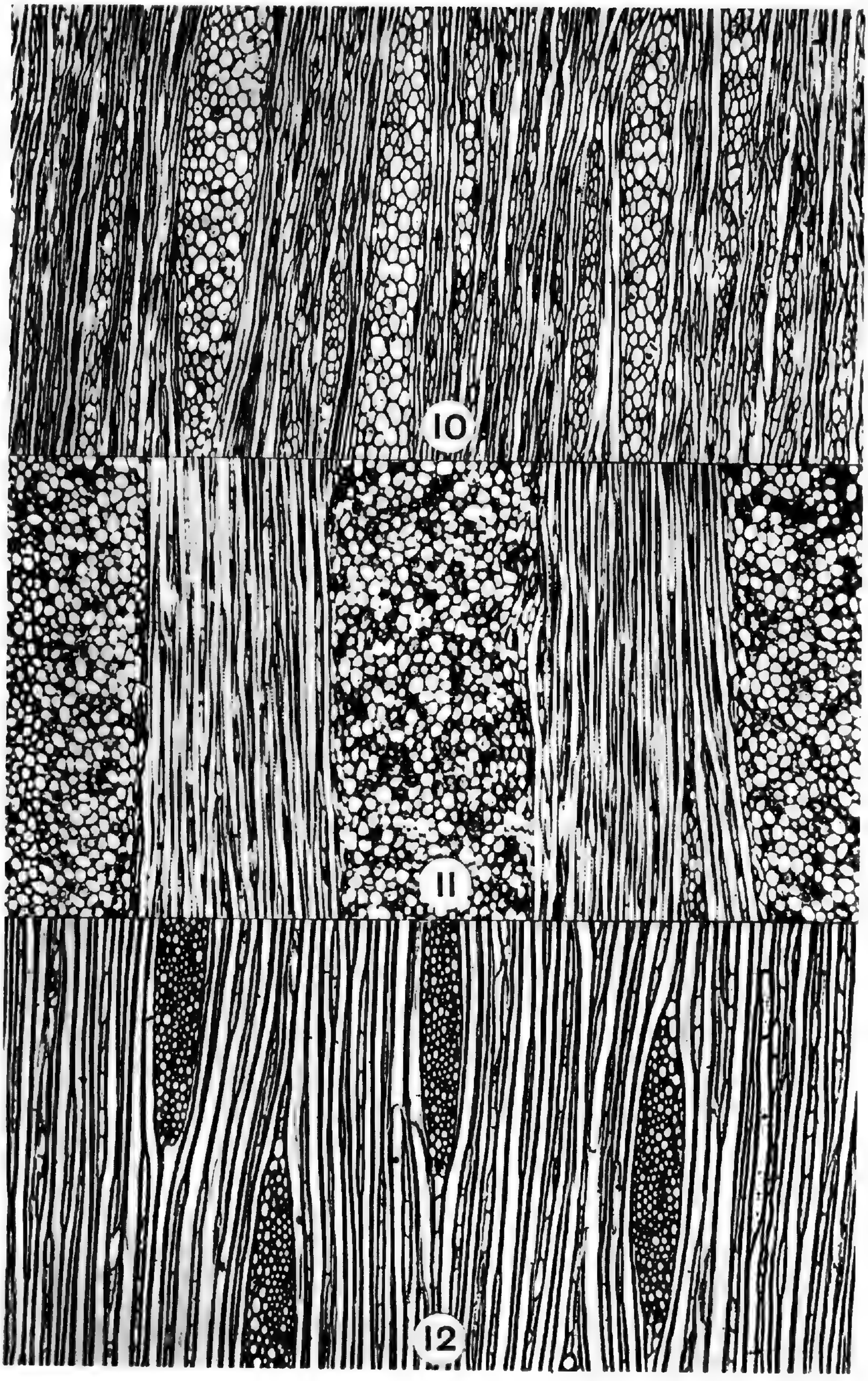

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EXPLANATION OF PLATES

PLATE I

FIG. 1. *Zygogynum Vieillardi* Baill., *Y. U. 14295*. Transverse section of the wood, × 50. FIG. 2. *Drimys Winteri* J. R. and G. Forst., *H. U. 17320*. Transverse section of the wood, × 50. FIG. 3. *Belliolum haplopus* (Burtt) A. C. Sm., *Y. U. 22694*. Transverse section of the wood, × 50.

PLATE II

FIG. 4. *Zygogynum Vieillardi, Y. U. 14295*. Tangential section of the wood, × 50. FIG. 5. *Drimys Winteri, H. U. 8949*. Tangential section of the wood, × 50. FIG. 6. *Belliolum haplopus, Y. U. 22694*. Tangential section of the wood, × 50.

PLATE III

FIG. 7. *Drimys lanceolata* (Poir.) Baill., *Y. U. 16121*. Transverse section of the wood, × 50. FIG. 8. *Pseudowintera axillaris* var. *colorata* (Raoul) A. C. Sm., *H. U. 15776*. Transverse section of the wood, × 50. FIG. 9. *Trochodendron aralioides* Sieb. & Zucc., *H. U. 18074*. Transverse section of the wood, × 50.

PLATE IV

FIG. 10. *Drimys lanceolata, Y. U. 16121*. Tangential section of the wood, × 50. FIG. 11. *Pseudowintera axillaris* var. *colorata, H. U. 15776*. Tangential section of the wood, × 50. FIG. 12. *Trochodendron aralioides, H. U. 18070*. Tangential section of the wood, × 50.

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STUDIES OF PAPUASIAN PLANTS, VI*

A. C. SMITH

ELAEOCARPACEAE

THE only comprehensive discussion of the Papuasian species of Elaeocarpaceae is that published by R. Schlechter (in Bot. Jahrb. **54:** 92–155. *f. 1–9.* 1916), recognizing six genera and about 90 species in the group. Although numerous species have been described since 1916 by several writers, Schlechter's treatment remains a fairly adequate and highly useful summary; the general pattern of the family proposed by him is followed in the present paper. Fortunately, many of the species described by Schlechter and other students are represented by isotypes in American herbaria, and in the remaining cases the descriptions are in general adequate.

In connection with this treatment, herbarium specimens have been seen from the Arnold Arboretum (A), the New York Botanical Garden (NY), and the University of California (UC). In the absence of parenthetical letters indicating the place of deposit, cited specimens are deposited only at the Arnold Arboretum.

Sericolea Schlechter

Originally founded by Schlechter (in Bot. Jahrb. **54:** 95. Apr. 1916) to include six New Guinean species, *Sericolea* was subsequently amplified by the same author (in Rep. Sp. Nov. **16:** 29–32. 1919) to take in 14 species. Most of the later species were transfers from the following genera, which are synonyms of *Sericolea*: *Mischopleura* Wernham (in Hook. Ic. Pl. **31:** *pl. 3059.* June, 1916, and in Trans. Linn. Soc. II. Bot. **9:** 99. Aug. 1916), with two species, originally placed in the Ericaceae; *Pyrsonota* Ridley (in Trans. Linn. Soc. II. Bot. **9:** 40. Aug. 1916), with one species, originally placed in the Saxifragaceae; and *Hormopetalum* Lauterb. (in Bot. Jahrb. **55:** 257. 1918), with three species, originally placed in the Rutaceae. The last genus was not described by Lauterbach, who referred to an unpublished volume of Nova Guinea for the generic description and for descriptions of two species; a third species, *Hormopetalum Werneri,* was described, and one may accept the genus as adequately published for this reason, and also since it was keyed in the discussion of the genera. Since Schlechter's second discussion of *Sericolea,* in 1919, two additional species have been described by O. C. Schmidt (in Nova Guin. Bot. **14:** 151–153. 1924) and in the same publication Lauterbach's undescribed species were validated by descriptions. The genus thus now consists of 16 species;

*Botanical Results of the Richard Archbold Expeditions. See Jour. Arnold Arb. **23:** 417–443. 1942.

from the descriptions it seems that most, if not all, of these are maintainable. In the present treatment five new species are proposed.

Sericolea elegans Schlechter in Bot. Jahrb. **54:** 98. 1916, in Rep. Sp. Nov. **16:** 31. 1919; Van Steenis in Nova Guin. Bot. **14:** 305. 1927.

NETHERLANDS NEW GUINEA: 15–18 km. southwest of Bernhard Camp, Idenburg River, alt. 1800–2150 m., *Brass 12418* (common epiphyte, 2–3 m. high, on tall trees in mossy-forest; leaves glaucous beneath; flowers white), *Brass 12637* (slender tree 2–3 m. high, abundant in low scrub on an exposed summit; leaves gray beneath; flowers white).

The species has previously been known only from the type collection, made in the Waria region of the Morobe District, Northeastern New Guinea, and from the Hellwig Mts. of Netherlands New Guinea. Our specimens precisely match the type collection (*Schlechter 19756*, UC).

Sericolea Werneri (Lauterb.) Schlechter in Rep. Sp. Nov. **16:** 32. 1919; Van Steenis in Nova Guin. Bot. **14:** 304. 1927.

Hormopetalum Werneri Lauterb. in Bot. Jahrb. **55:** 257. 1918.

NORTHEASTERN NEW GUINEA: Morobe District, Ogeramnang, alt. about 1800 m., *Clemens 5518*.

The cited specimen agrees very well with the original description, based on *Werner 95*, from the nearby Finisterre Mts. at 1700 m. The species appears to be very close to *S. elegans* Schlechter, being distinguished by its shorter pedicels and its leaf-blades being revolute ("involuta" in the description) at base. The stamens are said to be 10, but the Clemens specimen is in fruit and this point cannot be checked. Another fruiting specimen which possibly belongs here is *Clemens 11212*, from Matap, Morobe District, alt. 1500–1800 m. This specimen has leaves somewhat larger, up to 10.5 × 1.8 cm., but otherwise it agrees with *Clemens 5518* and the original description.

Sericolea decandra sp. nov.

Frutex vel arbor 2–4 m. alta ut videtur multiramosa et dense foliata, ramis ramulisque gracilibus, juventute complanatis et dense aureo-sericeis mox subteretibus purpurascentibus glabrisque; foliis oppositis vel subo-ppositis, petiolis gracilibus 2–4 mm. longis primo ut ramulis sericeis demum glabrescentibus, laminis subcoriaceis oblongo-lanceolatis, 5–6.8 cm. longis, 1–1.6 cm. latis, basi obtusis, apice in acuminem gracilem calloso-mucronulatum 10–15 mm. longum gradatim attenuatis, margine basim versus saepe conspicue revolutis superne recurvatis, dentibus 3–7 per centimetrum spinulosis circiter 1 mm. longis praeditis, supra glabris vel costa puberulis, subtus densissime argenteo- vel juventute aureo-sericeis, costa supra elevata subtus prominente, nervis lateralibus multis obliquis cum rete venularum copioso anastomosantibus et venulis supra conspicue prominulis subtus indumento plus minusve obscuratis; inflorescentiis axillaribus racemosis floribus et fructibus inclusis 1–1.5 cm. longis, ubique floribus exceptis sericeo-puberulis demum subglabrescentibus, pedunculo 3–10 mm. longo complanato, rhachi brevi, bracteis minutis dentes 2 laterales subulatos circiter 1 mm. longos gerentibus; floribus 2–8 saepe 4 per inflorescentiam, pedicellis subcurvatis 4–6 mm. longis; sepalis 5 papyraceis ovato-lanceolatis, 2.2–2.5 mm. longis, 1–1.2 mm. latis, acutis, intus puberulis et leviter carinatis, extus sericeis; petalis 5 membranaceis obovatis longitudine sepala

subaequantibus, 1.3–1.6 mm. latis, apice plerumque emarginatis et bilobatis interdum irregulariter crenulatis; disco glabro 5-lobato, lobis carnosis profunde bilobatis circiter 0.5 mm. altis et latis; staminibus 10 alternatim leviter inaequalibus, brevioribus (circiter 0.7 mm. longis) lobis disci alternatis, longioribus (circiter 0.8 mm. longis) lobis disci oppositis, filamentis gracilibus glabris, antheris oblongis circiter 0.4 mm. longis apicem versus obscure setulosis; ovario glabro subgloboso sub anthesi circiter 1 mm. diametro, loculis 2 biovulatis, stylo crasso 0.5–0.7 mm. longo obscure bifido; fructibus subcarnosis maturitate circiter 3 mm. diametro, disco et stylo persistentibus, seminibus 4 subfalcato-oblongis 1–1.4 mm. longis.

NETHERLANDS NEW GUINEA: Vicinity of Lake Habbema, alt. 3345 m., *Brass 9267* (TYPE), Aug. 1938 (shrub or tree 2–4 m. high, common in mossy thickets of ridge crests; branches erect; leaf-blades brownish above, argenteous beneath; flowers cream-colored; fruits black).

Sericolea decandra seems most closely allied to *S. Werneri* (Lauterb.) Schlechter, which is also described as having 10 stamens. The new species differs from *S. Werneri* in its rigid and subcoriaceous rather than papyraceous leaf-blades, which have less conspicuously attenuate tips, more obvious marginal teeth, and more conspicuous venation. The new species is further characterized by its more compact inflorescence and short pedicels; its sepals and petals are larger than those described for *S. Werneri*, but those were immature.

Other species with 10 rather than 15 stamens (the usual number for the genus) are *S. Ridleyana* (Wernh.) Schlechter and *S. Lamii* O. C. Schmidt, but these are quite unlike *S. decandra* in other respects. The staminal arrangement described above has been verified by many dissections, and the same arrangement is illustrated for *S. Ridleyana* and *S. Lamii*.

Sericolea venusta sp. nov.

Arbor gracilis circiter 10 m. alta, ramulis elongatis gracilibus dense breviterque aureo-crispato-pilosis demum glabris purpurascentibus; foliis oppositis vel suboppositis, petiolis gracilibus circiter 1 mm. longis ut ramulis pilosis, laminis subcoriaceis ovatis, 15–25 mm. longis, 7–12 mm. latis, basi rotundatis vel obtusis, apice obtusis et calloso-apiculatis, margine utrinsecus dentibus 5–9 inconspicuis spinulosis praeditis, supra glabris, subtus densissime aureo-sericeis demum cano-puberulis, costa supra prominula subtus valde elevata, nervis secundariis utrinsecus 6–10 cum aliis interspersis et rete venularum intricato utrinque prominulis sed subtus indumento saepe obscuratis; inflorescentiis compactis axillaribus vel e ramulis defoliatis orientibus breviter racemosis 2–6-floris, rhachi et pedunculo minuto 2–6 mm. longis et pedicellis gracilibus 4–6 mm. longis aureo-puberulis; bracteis sericeis tripartitis, lamina oblonga acuta 0.5–1 mm. longa caduca, dentibus lateralibus basalibus inconspicuis persistentibus; sepalis 5 submembranaceis lanceolatis circiter 2 × 0.8 mm. acutis, extus minute sericeis, intus puberulis; petalis 5 membranaceis glabris obovatis, 1.8–2.3 mm. longis, 1.2–1.5 mm. latis, apice rotundatis vel truncatis et obscure crenulatis; disco 5-lobato, lobis carnosis oblongis 0.3–0.4 mm. diametro; staminibus 10–12, 1–1.2 mm. longis, filamentis glabris, antheris oblongis circiter 0.5 mm. longis ubique puberulo-setulosis; gynaecio glabro sub anthesi circiter 1.7 mm. longo, ovario subgloboso, stylo gracili 0.7–0.8 mm. longo obscure bifido, loculis 2 biovulatis.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt. 2300 m., *Brass 11056* (TYPE), Nov. 1938 (slender tree about 10 m. high, common in low substage of ridge-crest forests; flowers white).

Like *S. Ridleyana* (Wernh.) Schlechter and *S. Lamii* O. C. Schmidt, the new species has the combination of small leaves and a reduced number of stamens, although flowers of the present species appear to have 10, 11, or 12 stamens rather than a fixed number. When only 10 stamens are present, they are arranged opposite to and alternate with the disk-lobes, as described above for my new species *S. decandra*. When 11 or 12 stamens are present the arrangement is less regular, and apparently 1 or 2 of the disk-lobes subtend 3 stamens each — the more usual arrangement in the genus. *Sericolea Ridleyana* has foliage quite unlike that of the new species, but *S. Lamii* seems closer; from the latter *S. venusta* differs in its densely sericeous rather than glabrous lower leaf-surfaces and its more compact inflorescences with shorter pedicels. Species with foliage suggesting that of *S. venusta* but with 15 stamens are *S. novo-guineensis* Gibbs, *S. Gjellerupii* O. C. Schmidt, and *S. Pullei* (Lauterb.) Schlechter, all of which also differ from the new species in minor details of foliage and inflorescence.

Sericolea floribunda sp. nov.

Frutex epiphyticus 3–4 m. altus copiose ramosus et foliatus, ramulis fuscis gracilibus, juventute parce argenteo-sericeis complanatis mox glabris et teretibus; foliis oppositis vel suboppositis, petiolis gracilibus 2–4 mm. longis inconspicue sericeis, laminis chartaceis subrigidis oblongo-lanceolatis, 4.5–7 cm. longis, 8–16 mm. latis, basi obtusis vel subacutis, apice in acuminem gracilem calloso-mucronulatum 1–2 cm. longum attenuatis, margine obscure spinuloso-serrulatis et anguste recurvatis, siccitate concoloribus, supra glabris subnitidis, subtus inconspicue et sparsim sericeo-puberulis, costa supra paullo subtus valde elevata, nervis secundariis obliquis utrinsecus 10–15 cum aliis interspersis et rete venularum utrinque prominulis; inflorescentiis axillaribus ubique floribus exceptis sericeo-puberulis demum subglabris, plerumque paniculatis, interdum racemosis, 1–2.5 cm. longis et latis 5–20-floris, pedunculo brevi ad 8 mm. longo paullo complanato, ramulis lateralibus plerumque 1–4, 1–6 mm. longis, 2–4-floris; bracteis tripartitis, lamina lanceolata ad 3 mm. longa paucidentata ubique sericea mox caduca, dentibus 2 basalibus subulatis subpersistentibus 0.5–0.8 mm. longis, bracteolis minutis; pedicellis gracilibus 3–7 mm. longis, floribus saepe nutantibus; sepalis 5 concavis oblongo-lanceolatis, 2.1–2.3 mm. longis, 0.8–1 mm. latis, acutis, extus sparse sericeis, intus obscure puberulis; petalis 5 submembranaceis glabris cuneato-obovatis, 2.5–3 mm. longis, 1.5–1.8 mm. latis, apice truncato-crenulatis, margine apicem versus saepe anguste involutis; disci lobis 5 distinctis glabris oblongo-subglobosis circiter 0.4 mm. diametro; staminibus modo vulgari generis 15, 1.3–1.5 mm. longis, filamentis gracilibus minute puberulis, antheris oblongis circiter 0.7 mm. longis ubique puberulo-setulosis; gynaecio glabro circiter 2 mm. longo, ovario ellipsoideo, stylo gracili ovarium subaequante obscure bifido, loculis 2 biovulatis; fructibus ellipsoideis maturitate circiter 5 × 3 mm., disco et stylo persistentibus, seminibus magnis ad 1 vel 2 saepe reductis.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1200 m., *Brass 12862* (TYPE), Feb. 1939 (common epiphytic "tree" 3–4 m. high; leaf-blades glaucous beneath; flowers yellow-green).

Sericolea floribunda is the only species of the genus thus far described as having a paniculate inflorescence, with lateral few-flowered branches toward the base; for all other species a simple raceme is indicated. The relationship of the new species appears to be with *S. glabra* Schlechter and *S. salicina* Schlechter, both rather inadequately described species, which are said to have 4-ovulate ovary-locules and few-flowered racemose inflorescences.

Sericolea Brassii sp. nov.

Arbor gracilis 5–7 m. alta, ramulis gracilibus purpurascentibus vel cinereis, juventute complanatis, novellis aureo-sericeo-puberulis; foliis oppositis vel subopppositis, petiolis mox glabris gracilibus canaliculatis 4–6 mm. longis, laminis chartaceis oblongis, 5.5–10 cm. longis, 1.5–3 cm. latis, basi obtusis, apice in acuminem calloso-subulatum 1–2 cm. longum gradatim angustatis, margine dentibus spinulosis 2 vel 3 per centimetrum praeditis, supra glabris, subtus pallidioribus inconspicue pallido-sericeis mox glabrescentibus, costa supra elevata subtus prominente, nervis secundariis rectis obliquis utrinsecus circiter 20 cum aliis debilioribus interspersis et rete venularum intricato utrinque valde prominulis; inflorescentiis axillaribus breviter racemosis 4–7-floris, rhachi pedicellisque sericeo-puberulis, pedunculo brevi 1–2 mm. longo, rhachi 2–6 mm. longa, pedicellis gracilibus 7–9 mm. longis; bracteis papyraceis utrinque sericeis lanceolatis 2–3 mm. longis mox caducis, dentibus 2 basalibus subulatis circiter 0.5 mm. longis subpersistentibus; sepalis 5 papyraceis oblongo-lanceolatis, 3–3.5 mm. longis, 1.2–1.3 mm. latis, acutis, utrinque obscure sericeo-puberulis, intus leviter carinatis; petalis 5 glabris submembranaceis obovatis, sepala longitudine subaequantibus, 1.7–2 mm. latis, apice truncatis et irregulariter 3- vel 4-crenulatis; disco annulari-pulvinato continuo circiter 0.4 mm. alto leviter crenulato; staminibus 15 (5 quam aliis paullo longioribus) 0.8–1 mm. longis, filamentis gracilibus glabris, antheris oblongis 0.5–0.6 mm. longis ubique obscure puberulo-setulosis; gynaecio glabro sub anthesi circiter 2.5 mm. longo, ovario subgloboso, stylo crasso circiter 1 mm. longo obscure bifido, loculis 2 biovulatis.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, alt. 2150 m., *Brass 12709* (TYPE), Feb. 1939 (slender tree 5–7 m. high, common in open situations in mossy-forest; leaf-blades very glaucous beneath; flowers white).

Sericolea Brassii is apparently closely related only to *S. calophylla* (Ridley) Schlechter, with which it has in common oblong leaves which are thinly pubescent beneath and comparatively broad for the genus. The original description of that species (as *Pyrsonota calophylla* Ridley, in Trans. Linn. Soc. II. Bot. **9:** 40. 1916) and the illustration (loc. cit. *pl. 3, f. 48–54*) do not agree in all details, but from them one can obtain a fairly accurate idea of Ridley's plant. The new species appears to differ from *S. calophylla* in its larger bracts, longer pedicels, broader petals, continuous rather than 5-lobed disk, shorter stamens, and glabrous rather than pilose gynaecium. The leaves of *S. calophylla* are portrayed as up to 7.3 × 2.3 cm., somewhat larger than described; those of *S. Brassii* are often still larger.

Sericolea lanata sp. nov.

Arbor 7 m. alta, ramulis juventute complanatis dense aureo-sericeis mox subteretibus glabris purpurascentibus; foliis oppositis vel suboppositis, petiolis primo sericeis mox glabris canaliculatis 3–5 mm. longis, laminis rigidis coriaceis ovato-ellipticis, (3–)5–7.5 cm. longis, (1.5–)2–3.5 cm. latis, basi late obtusis vel subrotundatis, apice in acuminem callosum ad 1 cm. longum abrupte angustatis, margine dentibus spinulosis inconspicue crenulato-serratis, supra glabris siccitate olivaceis, subtus tomento aureo-arachnoideo-lanato densissime indutis, costa supra impressa subtus prominente, nervis secundariis utrinsecus 15–25 patentibus supra obscuris vel paullo prominulis subtus elevatis, rete venularum intricato supra leviter prominulo subtus tomento occulto; inflorescentiis in axillis foliorum solitariis vel binis racemosis 2–6-floris, rhachi pedicellisque crispato-pilosis, pedunculo brevi et rhachi 1–10 (raro sub fructu ad 20) mm. longis, pedicellis gracilibus sub anthesi 4–6 mm. sub fructu ad 14 mm. longis; bracteis lanceolatis circiter 2.5 mm. longis sericeo-puberulis caducis, dentes 2 breves subulatos basales subpersistentes gerentibus; sepalis 5 submembranaceis oblongo-lanceolatis, circiter 2.5 mm. longis, 0.8–1.2 mm. latis, acutis, extus dense tomentellis, intus obscure puberulis et carinatis; petalis 5 membranaceis glabris late cuneatis, 2.5–3 mm. longis, 1.7–2.5 mm. latis, plerumque apice profunde 3-lobatis; disco 5-lobato, lobis carnosis oblongis circiter 0.4 mm. altis et 0.5–0.6 mm. latis emarginatis, sub fructu in pulvino crenulato persistente subcontinuis; staminibus 10 vel 11 ubique minute puberulo-setulosis, 0.8–1.2 mm. longis, filamentis gracilibus, antheris oblongis circiter 0.5 mm. longis; gynaecio glabro sub anthesi circiter 2 mm. longo, ovario subgloboso, stylo gracili ovarium subaequante obscure bifido, loculis 2 quadriovulatis; fructibus subglobosis carnosis maturitate circiter 5 mm. diametro, seminibus magnis ad 1 vel 2 saepe reductis obovoideis levibus.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, alt. 2150 m., *Brass 12676* (TYPE), Feb. 1939 (tree 7 m. high, uncommon in mossy-forest substage; leaves stiff, convex; flowers white; fruit fleshy, black).

Sericolea lanata, in its beautifully golden-arachnoid-lanate lower leaf-surfaces, suggests *S. chrysotricha* Schlechter, which has much narrower, lanceolate, long-acuminate leaf-blades and flowers with 15 stamens. *Sericolea calophylla* (Ridley) Schlechter agrees with the new species in general leaf-shape and size but has the leaf-blades less densely pilose, with longer tips and coarser denticulation, while its stamens are also 15. The broad and deeply lobed petals further characterize *S. lanata.* From all other described species of *Sericolea* the new species differs in numerous and obvious characters of leaf-size, shape, and pubescence. As only a few flowers are available, the variation in number of stamens of *S. lanata* needs to be checked; apparently 10 is the normal number, but sometimes an extra one is found.

A fruiting specimen which is very probably conspecific with *S. lanata* is *Clemens 6277,* from the Busu River, Morobe District, Northeastern New Guinea, alt. 2100–2400 m.

Sericolea Gaultheria (F. v. Muell.) Schlechter in Bot. Jahrb. **54:** 100. 1916, in Rep. Sp. Nov. **16:** 31. 1919.

Aristotelia Gaultheria F. v. Muell. in Jour. Bot. **29:** 176. 1891.

BRITISH NEW GUINEA: Wharton Range, Central Division: Neon Basin, alt. 3200 m., *Brass 4501* (A, NY) (compact tree 4–5 m. high, very common in forest patches; leaf-blades dark green and shining above, glaucous beneath; petals yellow; disk red; fruit pale green, flecked with red, about 6 mm. diam.); Murray Pass, alt. 2840 m., *Brass 4504* (A, NY), *4665* (A, NY) (compact trees 5–8 m. high, very common in forest; leaf-blades dark green above, silver-gray beneath, the petiole red; flowers yellow or cream-colored; fruit reddish brown to black, 4–7 mm. diam.).

The cited specimens appear almost certainly to represent *S. Gaultheria*, the type of which was collected on the summit of Mt. Yule, not far from the above localities. This is the only species of *Sericolea* thus far described from British New Guinea; Mueller has also mentioned *Aristotelia papuana* F. v. Muell. (in Southern Science Record **1:** 150, nomen. 1881, Pap. Pl. **2:** 5, nomen. 1885), which Schlechter (in Bot. Jahrb. **54:** 155. 1916) suggests may possibly be identical with *S. Gaultheria*. While this may be true, Mueller's two names are based on different types.

The Brass specimens may be confidently excluded from all other species of *Sericolea* except *S. Gaultheria*, the original description of which is too generalized to permit absolute identification. The leaves of Mueller's species are said to be "½–2 in. long," while the Brass specimens have leaf-blades 2.5–4 cm. long and 7–15 mm. broad. The pedicels of *S. Gaultheria* are said to be double or triple the length of the sepals, which are "hardly ⅛ in. long." On *Brass 4501*, which probably best agrees with the description in this respect as well as in its "leaves . . . gradually much contracted into an acute apex," the pedicels are 5–7 mm. long and the sepals 2.5–3 mm. long. Numbers *4504* and *4665* have the pedicels 10–16 mm. long and the sepals 3.5–4 mm. long. In spite of these and other minor differences among the three collections cited, I am confident that only one species, of reasonable variability, is represented.

Aceratium DC.

In his discussion of *Aceratium*, Schlechter (in Bot. Jahrb. **54:** 100–107. 1916) recognized 13 species, of which 11 are from New Guinea, one from the New Hebrides, and one from Amboina; in 1918 (in Bot. Jahrb. **55:** 194) he transferred one of Ridley's New Guinean species of *Elaeocarpus* to *Aceratium*. To this number, C. T. White (in Kew Bull. **1932:** 42–43. 1932) added three species from Queensland, so that the genus is now composed of 17 species. In Schlechter's original treatment, three of the New Guinean species are listed as "ined." and references are given to an unpublished number of Nova Guinea. In these three cases types are cited and brief notes are given, the species also being placed in a key; therefore one may consider them validly published. Since type material of these three species is available to me, I give more detailed descriptions of them below. Seven species from New Guinea, one from the Kai Islands, and one from the Solomon Islands are here proposed as new.

Although Schlechter states that the ovary of *Aceratium* is usually 4-locular and only rarely 3-locular, considerable latitude in this character is found. *Aceratium Branderhorstii*, for instance, may have the ovary-locules 3, 4, or 5 on the same plant; *A. sericeum* has only 2 or 3 ovary-locules, while

several other species have 3 locules more or less consistently. In fruit some species, such as *A. erythrocarpum* and *A. Archboldianum*, appear to have unilocular pyrenes.

Aceratium parvifolium Schlechter in Bot. Jahrb. **54:** 102. 1916.

NETHERLANDS NEW GUINEA: Parameles Mountains, alt. about 1100 m., *Pulle 561* (TYPE COLL.), Dec. 1912 (tree 4 m. high, in primary forest).

Since Schlechter's original publication of this binomial is accompanied by only a few preliminary notes, a description based on an isotype is herewith offered. Mature flowers are not available to me, but the species is very distinct from others of the genus on the basis of its small leaf-blades with fine and copious serrulations; the inflorescence is very slender, and apparently the flowers will prove to be small for the genus.

Arbor gracilis ad 4 m. alta, ramulis subteretibus primo dense cinereo-sericeo-strigosis demum glabratis; foliis oppositis, petiolis gracilibus 2–3 mm. longis evanescenter pilosis, laminis papyraceis in sicco fuscescentibus anguste ovato-lanceolatis, 5–6.5 cm. longis, 1.3–1.7 cm. latis, basi late obtusis, apice in acuminem ad 1 cm. longum obtusum calloso-apiculatum serrulatum gradatim attenuatis, margine copiose mucronulato-serrulatis (dentibus 8–10 per centimetrum), supra costa sericeo-puberula excepta mox glabratis, subtus plus minusve persistenter brunneo-strigosis, costa nervisque lateralibus utrinsecus 10–15 leviter arcuatis supra paullo subtus valde elevatis, rete venularum intricato utrinque prominulo vel supra subplano; inflorescentiis breviter racemosis 3–6-floris, pedunculo et rhachi gracillimis ad 16 mm. longis cum pedicellis puberulis glabratis, bracteis lanceolatis acutis ad 2 mm. longis mox caducis, pedicellis gracilibus ad 25 mm. longis; floribus maturis non visis; sepalis 5 submembranaceis oblongo-lanceolatis alabastro ad 15 × 1.5 mm., apice subacutis, utrinque puberulis glabratisque, intus basim versus sericeis et carinatis; petalis 5 membranaceis anguste oblongo-cuneatis (ad 2 cm. longis ex Schlecht.), apice 5–7-lobatis (dentibus saepe emarginatis, segmentis obtusis), intus basim versus et margine copiose pallido-tomentellis; disco pulvinato stramineo-hispidulo; staminibus 15 quam gynaecio brevioribus, filamentis filiformibus hispidulis, antheris oblongis alabastro 2–2.5 mm. longis copiose setulosis et apice pilis stramineis 0.5–0.7 mm. longis hispidis; gynaecio quam petalis breviore, ovario pallide sericeo-hispidulo 3-loculari (unico dissecto), ovulis 6 in quoque loculo, stylo subulato inferne hispidulo superne glabro.

Aceratium erythrocarpum sp. nov.

Arbor ad 25 m. alta, ramulis gracillimis teretibus primo inconspicue strigosis cito glabris cinereisque; foliis oppositis vel suboppositis raro subalternatis, petiolis gracilibus semiteretibus 2–4 mm. longis breviter strigosis demum glabrescentibus, laminis chartaceis oblongo-lanceolatis, (4–)5–8.5 cm. longis, 1.2–2.2 cm. latis, basi subacutis vel obtusis, apicem versus gradatim angustatis, apice ipso obtusis et mucronulatis, margine integris et paullo incrassatis vel anguste revolutis, supra viridibus praeter costam et marginem interdum strigosos glabris, subtus glaucis costa nervisque pilis ad 1 mm. longis laxe strigosis alibi glabris, costa utrinque elevata, nervis lateralibus utrinsecus 6–10 arcuato-adscendentibus supra paullo subtus valde prominulis, venulis transversis numerosis anastomosantibus utrinque leviter prominulis; inflorescentiis sub fructu ut videtur breviter racemosis,

rhachi pedicellisque pilis brunneis 0.5–1 mm. longis persistenter strigosis, rhachi brevi, bracteis minutis, pedicellis gracilibus sub fructu 8–12 mm. longis; calyce sub fructu subpersistente, sepalis 5 lanceolatis circiter 8 mm. longis et 1 mm. latis extus copiose strigosis intus puberulis; fructibus ut videtur subglobosis, maturitate ad 2.3 cm. diametro, basi et apice rotundatis, apice stylo gracili basim versus minute hirtello circiter 8 mm. longo subpersistenter coronatis; pericarpio crasso fibroso demum profunde et copiose fisso, endocarpio osseo 2–3 mm. crasso, pyrena uniloculari (dissolutione dissepimentorum?).

BRITISH NEW GUINEA: Fly River region, Palmer River, 2 miles below junction with Black River, alt. 100 m., *Brass 7141* (TYPE), June 1936 (common sub-canopy tree of lower ridges, attaining 25 m. in height; trunk spurred or with prop-roots; leaf-blades gray beneath; fruit red, fleshy).

Among described species, *A. erythrocarpum* is close only to *A. parvifolium* Schlechter, from which it differs in its entire leaf-blades, which are distinctly glaucous beneath, essentially glabrous except on the veins, and have only 6–10 lateral nerves. Although the new species bears fruits, its inflorescence seems more compact than that of *A. parvifolium* and has shorter pedicels.

Aceratium Branderhorstii Schlechter in Bot. Jahrb. **54**: 102. 1916.

NETHERLANDS NEW GUINEA: Kampong Kabatiel [near Okaba, south coast near boundary of British New Guinea], *Branderhorst 269* (TYPE COLL.). BRITISH NEW GUINEA: Western Division: Gaima, lower Fly River (east bank), *Brass 8341* [det. R. Knuth] (attractive virgate tree to 10 m. high, in light rain-forest; fruit red, acidulous, eaten by natives; native name: *posesi*); Lake Daviumbu, middle Fly River, *Brass 7466* [det. R. Knuth] (profusely flowering virgate tree 7–8 m. high, common in rain-forest substage; leaf-blades silky brown-pubescent beneath; flowers pale yellow); Wuroi, Oriomo River, alt. 20 m., *Brass 5886* (NY) (twiggy tree 3 m. high, rare in savanna forest; leaf-blades gray beneath; fruit pale yellow, with a glaucous bloom).

This is one of the species which Schlechter published with only preliminary notes. In view of the fact that ample material is now available, a complete description is herewith offered. *Brass 7466* is in flower, while *Brass 5886* and *8341* and the type collection are in fruit.

Arbor ad 10 m. alta, ramulis gracilibus teretibus juventute ferrugineo- vel cano-tomentellis demum glabris; foliis oppositis vel suboppositis, petiolis gracilibus ut ramulis juvenilibus tomentellis vel pilosis 3–5 mm. longis, laminis chartaceis oblongo-ellipticis, 5–7.5 cm. longis, (1.5–)2–4 cm. latis, basi late obtusis vel subrotundatis, apice cuspidatis vel acuminatis et calloso-apiculatis, margine subintegris apicem versus obscure mucronato-serrulatis, supra viridibus costa interdum strigoso-puberula excepta glabris, subtus pallidioribus primo dense sericeis demum pilis canescentibus laxe pilosis, costa supra prominula subtus valde elevata, nervis lateralibus utrinsecus 7–10 arcuatis cum rete venularum inconspicuo supra subplanis subtus leviter prominulis; inflorescentiis breviter racemosis 2–6-floris, rhachi gracili 5–10 mm. longa et pedicellis pilis 0.5–0.8 mm. longis canescentibus pilosis, bracteis anguste oblongis pilosis 2–3 mm. longis, pedicellis gracillimis 8–12 mm. longis; sepalis 5 oblongo-lanceolatis, 9–10 mm. longis, 2–2.5 mm. latis, apicem subacutum gradatim angustatis, extus ut pedicellis pallide et dense pilosis, intus obscure puberulis et basim versus carinatis; petalis 5 membranaceis oblongo-cuneatis, 11–15 mm. longis, 5–6 mm. latis,

apice dentibus 4 vel 5 inaequalibus 1–2 mm. longis saepe 2–4-lobatis laciniatis, intus basim versus et margine copiose tomentellis; disco annulari-pulvinato circiter 0.7 mm. alto et crasso dense hispidulo-piloso; staminibus 15 quam gynaecio brevioribus, filamentis gracilibus filiformibus glabris 6–7 mm. longis, antheris oblongis 2.7–3 mm. longis ubique minute setoso-puberulis et apice pilis 0.3–0.5 mm. longis ciliato-hispidis; gynaecio sub anthesi 11–12 mm. longo, ovario ovoideo dense stramineo-piloso 3–5-loculari, ovulis plerumque 10 pendulis biseriatis in quoque loculo, stylo subulato apicem minute 3–5-fidum attenuato basim versus puberulo distaliter glabro 8–9 mm. longo; fructibus elongato-ovoideis maturitate glabris 20–30 mm. longis et 9–15 mm. latis, inconspicue 3–5-angulatis, basi rotundatis, apicem versus angustatis et basi styli puberulo saepe coronatis; pericarpio (mesocarpio fibroso et endocarpio osseo inclusis) 1–4 mm. crasso, pyrena 3–5-loculari.

Aceratium sericeum sp. nov.

Arbor ad 23 m. alta, ramulis juventute subcomplanatis ferrugineo-sericeis demum teretibus glabris; foliis oppositis vel suboppositis, petiolis gracilibus leviter canaliculatis sericeis 3–5 mm. longis, laminis chartaceis in sicco subrigidis fuscescentibus elliptico- vel lanceolato-oblongis, 5–8.5 cm. longis, 1.5–3 cm. latis, basi late obtusis vel subrotundatis, apice gradatim acuminatis (acumine circiter 1 cm. longo calloso-mucronulato), margine apiculato-serrulatis (dentibus 3–5 per centimetrum), supra costa interdum breviter strigosa excepta glabris, subtus dense et persistenter aureo-sericeis, costa supra leviter subtus valde prominente, nervis lateralibus utrinsecus 10–14 leviter curvatis utrinque cum rete venularum intricato prominulis (venulis tomento subtus interdum obscuris); inflorescentiis racemosis 2–7-floris, pedunculo et rhachi ad 32 mm. longis pedicellisque pilis 0.5–0.8 mm. longis sericeis demum subglabrescentibus, bracteis parvis mox caducis, pedicellis gracilibus sub anthesi 5–12 mm. longis; sepalis 5 raro 4 lanceolatis, 11–13 mm. longis, 1.5–2.5 mm. latis, apicem acuminatum gradatim angustatis, extus dense sericeis, intus sericeo-puberulis et obscure carinatis; petalis 5 raro 4 membranaceis anguste cuneatis, 15–20 mm. longis, 5–6.5 mm. latis, apice dentibus 4–7 inaequalibus 1.5–3 mm. longis et saepe 2- vel 3-lobatis laciniatis, intus basim versus et margine involuto dense tomentellis; disco pulvinato 0.5–1 mm. alto dense aureo-hispido; staminibus 15 (12 in floribus 4-meris) quam gynaecio brevioribus, filamentis filiformibus ubique breviter setulosis 6–7 mm. longis, antheris oblongis 2.7–3 mm. longis ubique setuloso-puberulis et apice pilis 0.3–0.5 mm. longis ciliato-hispidis; gynaecio sub anthesi 12–13 mm. longo, ovario dense sericeo 2- vel 3-loculari, ovulis plerumque 6 in quoque loculo, stylo subulato 9–10 mm. longo basim versus sericeo distaliter glabro apice minute 2- vel 3-fido; fructibus anguste ovoideis immaturis ad 15 mm. longis et 6 mm. latis, plus minusve pilosis, inconspicue angulatis, basi obtusis vel subrotundatis, apice stylo piloso coronatis; pericarpio plus minusve tenui, mesocarpio haud fibroso, endocarpio osseo, pyrena 2- vel 3-loculari, dissepimentis mox evanescentibus.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1150–1200 m., *Brass 12539* (TYPE), Feb. 18, 1939 (frequent tree of primary forest, 23 m. high, on a ridge; trunk 43 cm. diam.; bark 8 mm. thick, gray; wood light brown; crown small; flowers red), *Brass 12539A* (frequent tree of secondary forest, on the slope of a ridge; fruiting material of no. *12539*), *Brass 12810* (rain-forest substage tree 12 m. high, with immature fruit).

Aceratium sericeum is most closely related, among described species, to *A. Branderhorstii* Schlechter, but the two are readily separated by several important characters which may best be summarized in a key:

Leaf-blades at length spreading-pilose with grayish hairs, the margin entire, obscurely mucronulate-serrulate only toward apex; peduncle and rachis 5–10 mm. long; pedicels, sepals, and ovary spreading-pilose with pale nearly colorless hairs; sepals 9–10 mm. long, subacute at apex; petals 11–15 mm. long; filaments glabrous; ovary-locules 3–5, the ovules usually 10 per locule. .....*A. Branderhorstii.*

Leaf-blades persistently golden-sericeous beneath, the margin apiculate-serrulate throughout; peduncle and rachis up to 32 mm. long; pedicels, sepals, and ovary sericeous with appressed golden-brown hairs; sepals 11–13 mm. long, acuminate at apex; petals 15–20 mm. long; filaments short-setulose; ovary-locules 2 or 3, the ovules usually 6 per locule. .....*A. sericeum.*

Although *A. sericeum* resembles *A. parvifolium* Schlechter in leaf-shape and margins, it differs markedly in pubescence and in its much larger flowers, to such a degree that the relationship appears only distant.

Aceratium Brassii sp. nov.

Arbor ad 20 m. alta ut videtur copiose ramulosa, ramulis validis juventute brunneo-strigoso-puberulis cito glabris cinereisque; foliis oppositis vel subopppositis, petiolis gracilibus canaliculatis puberulis 6–10 mm. longis, laminis chartaceo-coriaceis in sicco fusco-olivaceis oblongo-ellipticis, 5–8.5 (–10) cm. longis, 2–3.5 cm. latis, basi obtusis, apice cuspidatis et calloso-mucronulatis, margine integris apicem versus interdum obscure crenulatis, supra costa strigosa excepta glabris, subtus glaucis ut videtur farinoso-ceriferis et pilis 0.5–0.8 mm. longis laxe pilosis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 6–9 curvatis marginem versus anastomosantibus supra prominulis subtus valde elevatis, rete venularum copioso intricato utrinque prominulo; inflorescentiis axillaribus breviter racemosis 2–7-floris, pedunculo brevi et rhachi crassis leviter angulatis ad 2 cm. longis cum pedicello bracteisque dense pallide brunneo-tomentellis, bracteis oblongis obtusis 1.5–3 mm. longis mox caducis, pedicellis crassis circiter 1.5 mm. diametro sub anthesi 7–12 mm. longis; sepalis 5 carnosis oblongo-lanceolatis, 12–16 mm. longis, 3–5 mm. latis, apice subacutis vel obtusis, extus puberulis, intus sericeo-puberulis et carinatis; petalis 5 tenuiter carnosis anguste obovato-cuneatis, 20–26 mm. longis, 8–10 mm. latis, apice irregulariter 2–5-lobatis (dentibus obtusis 1.5–3 mm. longis saepe sinuato-lobulatis), intus basim versus et margine copiose aureo-sericeo-tomentellis; disco inconspicue pulvinato circiter 1 mm. alto hispido-setoso; staminibus 15 quam gynaecio brevioribus, filamentis validis teretibus 7.5–10 mm. longis conspicue setulosis, antheris oblongis 4–6 mm. longis ubique setulosis et apice pilis circiter 0.8 mm. longis hispido-ciliatis; gynaecio sub anthesi 17–21 mm. longo, ovario subgloboso pilis stramineis 1.5–2 mm. longis copiose hispido-strigoso 4- vel 5-loculari, ovulis 8–10 in quoque loculo pendulis biseriatis; stylo 13–17 mm. longo basim versus setoso et crasso superne glabro et angustato apice obscure 4- vel 5-fido.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1250–1300 m., *Brass 13016* (subsidiary tree 20 m. high, in rain-forest; leaf-blades glaucous beneath; petals pink, tinged with red), *Brass 13024* (TYPE), March 1939 (profusely flowering subsidiary tree 15 m. high, in rain-forest of slopes; leaf-blades gray beneath; flowers red).

Closely related only to *A. Branderhorstii* Schlechter and *A. sericeum* (above-described), *A. Brassii* sharply differs from both in many characters, most obvious of which are its longer petioles, thicker leaf-blades with more pronounced veinlets, stouter inflorescences, much broader and thicker sepals, larger petals, longer filaments and anthers, and more copiously hispid ovary.

Aceratium gracile sp. nov.

Arbor ad 15 m. alta, ramis gracilibus pendulis, ramulis dense foliatis apicem versus leviter complanatis cinereo-tomentellis demum teretibus glabrisque; foliis oppositis vel subopppositis, petiolis gracilibus semiteretibus cano-sericeo-puberulis 2–4 mm. longis, laminis chartaceis oblongo-lanceolatis, 6–11 cm. longis, (1.5–)2–3.5 cm. latis, basi late obtusis, apice cuspidatis vel gradatim acuminatis et calloso-mucronulatis, margine apiculato-serrulatis (dentibus 4 vel 5 per centimetrum), supra costa strigoso-puberula excepta glabris, subtus pallidioribus et dense stramineo-sericeis, costa utrinque valde elevata, nervis lateralibus utrinsecus 7–10 adscendentibus leviter curvatis supra subplanis subtus elevatis, rete venularum inconspicue laxo utrinque plano vel leviter prominulo; inflorescentiis breviter racemosis 2–7-floris, pedunculo brevi et rhachi gracilibus 2–8 mm. longis pedicellisque pilis 0.3–0.5 mm. longis laxe pilosis, bracteis oblongis minutis caducis, pedicellis gracillimis sub anthesi 5–12 mm. longis; sepalis 5 submembranaceis oblongo-lanceolatis, 10–11 mm. longis, 2–2.5 mm. latis, apice subacutis, utrinque pallide sericeo-puberulis, intus carinatis; petalis 5 membranaceis anguste oblongo-cuneatis, 13–17 mm. longis, 3.5–5 mm. latis, apice dentibus 4–6 obtusis interdum bilobatis 1–2 mm. longis laciniatis, intus basim versus et margine copiose puberulis; disco pulvinato circiter 0.7 mm. alto dense setuloso-puberulo; staminibus 15 quam gynaecio brevioribus, filamentis filiformibus sparsissime setulosis 5–6 mm. longis, antheris anguste oblongis 2–2.3 mm. longis ubique setulosis et apice pilis 0.3–0.4 mm. longis copiose hispidis; gynaecio sub anthesi 12–15 mm. longo, ovario anguste ovoideo pallide hispidulo 4-loculari, ovulis 8 in quoque loculo, stylo subulato 9–11 mm. longo infra medium hispidulo-puberulo superne glabro ut videtur obscure 4-fido.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, alt. 850 m., *Brass 13208* (TYPE), March 1939 (tree 15 m. high, on bank of a rain-forest stream; trunk 30 cm. diam.; branches slender, long, drooping; flowers profuse, the petals brownish pink).

Aceratium gracile is most closely related to *A. Branderhorstii* Schlechter and the two new species described above, differing from all of these in several minor characters of pubescence and dimensions. It has more slender flowers, with narrower petals and shorter anthers, than any of its immediate allies. In its serrulate leaf-margin, *A. gracile* is suggestive of *A. sericeum*, the leaves of which have more conspicuous veinlets and a brighter tomentum beneath. Compared with *A. sericeum*, the new species has a shorter rachis, brownish pink rather than red petals, a more closely pilose disk, and an ovary which is hispid rather than sericeous.

Aceratium angustifolium sp. nov.

Frutex robustus virgatus vel arbor parva, ramulis juvenilibus complanatis

inconspicue et pallide strigoso-puberulis demum teretibus glabrescentibus; foliis oppositis, petiolis gracilibus semiteretibus 2–4 mm. longis sericeo-strigulosis, laminis papyraceis in sicco brunnescentibus anguste oblongo-ellipticis, 6–9 cm. longis, 1.5–3 cm. latis, basi subacutis vel obtusis, apice gradatim breviter acuminatis et calloso-apiculatis, margine subintegris sub lente mucronulato-crenulatis (dentibus circiter 4 per centimetrum), supra costa puberula excepta glabris, subtus pallidioribus pilis 0.7–1 mm. longis cano-albidis sericeo-pilosis, costa supra leviter subtus valde elevata, nervis lateralibus utrinsecus 6–11 erecto-patentibus supra subplanis subtus prominulis, rete venularum inconspicuo; inflorescentiis compactis breviter racemosis ut videtur circiter 4-floris, pedunculo et rhachi sub fructu ad 6 mm. longis pallide aureo-sericeis, bracteis minutis, floribus non visis; pedicellis sub fructu gracilibus 7–12 mm. longis puberulis; fructibus obscure sericeo-puberulis cito glabratis conico-ovoideis, ut videtur maturitate 15–20 mm. longis et 9 13 mm. latis, inconspicue angulatis, basi latioribus et truncato-rotundatis, deinde ad apicem acutum basi styli coronatum gradatim angustatis; pericarpio (mesocarpio fibroso et endocarpio osseo inclusis) in sicco 1–2 mm. crasso, in vivo carnoso crassiore, pyrena 3-loculari, dissepimentis validis persistentibus.

BRITISH NEW GUINEA: Eastern Division, U-uma River, alt. 300 m., *Brass 1518* (TYPE), May 20, 1926 (large virgate bush or small tree, on river bank; leaf-blades thin, soft, paler beneath; fruit fleshy, solitary in leaf-axils).

Aceratium angustifolium, belonging to the group of *A. Branderhorstii* Schlechter, differs from that species in its proportionately narrower and shorter-petiolate leaf-blades and its shorter, more distinctly conical fruit, of which the base is more definitely truncate. The relationship of *A. angustifolium* to the other relatives of *A. Branderhorstii* described above is more remote. It is to be expected that floral characters will serve further to differentiate *A. angustifolium*.

The only other species of *Aceratium* thus far described from the eastern part of British New Guinea is *A. Muellerianum* Schlechter (*Elaeocarpus edulis* sensu F. v. Muell. in Jour. Bot. **31:** 321. 1893, non Teys. & Binn.), based on *Forbes 295, 705*, and *896*, from Sogere. *Aceratium Muellerianum* is said to have leaf-blades up to 15 × 6.5 cm. (6 × 2½ inches), indicating that it is not close to *A. angustifolium*. It should be noted that *A. ochraceum* (Ridley) Schlechter (based on *Elaeocarpus ochraceus* Ridley) has even larger leaves; this is probably distinct from *A. Muellerianum*, in spite of Ridley's statement (in Trans. Linn. Soc. II. Bot. **9:** 22. 1916) that "Forbes's nos. 295 and 580, from British New Guinea, seem to be the same species."

Aceratium Clemensiae sp. nov.

Frutex vel arbor parva, ramulis gracilibus apicem versus subcomplanatis sparse brunneo-sericeo-puberulis demum teretibus glabratis; foliis oppositis vel subopppositis, petiolis gracilibus circiter 2 mm. longis hispidulo-puberulis, laminis chartaceis anguste ovato-oblongis, 4–6.2 cm. longis, 1.5–2.2 cm. latis, basi rotundatis et minute cordatis, apice obtuse cuspidatis et calloso-apiculatis, margine mucronulato-serrulatis (dentibus 4 vel 5 per centimetrum), supra costa obscure puberula excepta glabris, subtus molliter et pallide sericeo-tomentellis, costa supra leviter subtus valde elevata, nervis

lateralibus utrinsecus 8–12 erecto-patentibus supra cum rete venularum prominulis subtus elevatis, venulis subtus indumento obscuratis vel paullo prominulis; inflorescentiis racemosis ut videtur 4–6-floris, pedunculo et rhachi sub fructu 8–15 mm. longis cum pedicellis pallide puberulis, pedicellis sub fructu gracilibus 10–17 mm. longis; fructibus glabratis oblongo-ellipsoideis, ut videtur maturitate 15–18 mm. longis et 8–12 mm. latis, inconspicue angulatis, basi obtusis, apice basi styli coronatis et subacutis (stylo subpersistente subulato 9–11 mm. longo inferne copiose puberulo superne glabro); pericarpio in sicco 2–4 mm. crasso, mesocarpio fibroso, endocarpio osseo, pyrena 3-loculari, dissepimentis validis persistentibus.

NORTHEASTERN NEW GUINEA: Morobe District, vicinity of Bulung River, alt. 900–1500 m., *Clemens 5192* (TYPE), Jan. 28, 1937 (shrub or small tree, in open woods; fruit red when mature).

Like the several species described above, the new species is a member of the small-leaved group composed of *A. Branderhorstii* Schlechter and its allies. *Aceratium Clemensiae* differs from its relatives in its rounded and faintly cordate leaf-bases. The only other species of this alliance with such conspicuously serrulate leaf-margins are *A. parvifolium* Schlechter, *A. sericeum,* and *A. gracile,* but these all have obtuse leaf-bases and other differentiating characters of foliage and pubescence. The fruits of *A. Clemensiae,* apparently mature, are small for the genus and oblong-ellipsoid rather than ovoid or subconical, the more usual shape in *Aceratium.*

Aceratium dasyphyllum sp. nov.

Arbor ut videtur gracilis, ramulis gracillimis juvenilibus subcomplanatis aureo-sericeo-puberulis demum teretibus glabratis; foliis oppositis vel suboppositis, petiolis gracilibus subteretibus 3–5 mm. longis ut ramulis subsericeis, laminis chartaceis vel papyraceis in sicco fuscescentibus oblongo-ellipticis, 6–10 cm. longis, 2.5–4 cm. latis, basi obtusis vel subacutis, apice cuspidatis vel in acuminem ad 1 cm. longum calloso-apiculatum abrupte angustatis, margine subintegris interdum apicem versus obscurissime apiculato-crenulatis, supra glabris vel costa puberulis, subtus inconspicue pallido-sericeis, costa supra leviter subtus valde elevata, nervis lateralibus utrinsecus 7 vel 8 subrectis adscendentibus cum rete venularum supra paullo subtus valde prominulis; inflorescentiis breviter racemosis paucifloris, pedunculo et rhachi gracilibus ad 5 mm. longis (vel longioribus?) pedicellisque hirsuto-puberulis glabratis, pedicellis gracillimis sub anthesi 10–15 mm. longis; sepalis 5 tenuiter carnosis anguste oblongo-lanceolatis, 14–18 mm. longis, 2.5–3 mm. latis, apice subacutis, utrinque inconspicue puberulis, intus carinatis; petalis 5 submembranaceis anguste oblongo-cuneatis, 17–21 mm. longis, 5–9 mm. latis, apice copiose irregulariter laciniatis (dentibus 12–16 angustis obtusis 1.5–3 mm. longis saepe crenulato-emarginatis), intus basim versus et margine stramineo-tomentellis; disco pulvinato circiter 1 mm. alto pilis pallidis circiter 0.3 mm. longis hispidulo; staminibus 15 quam gynaecio brevioribus, filamentis filiformibus pallide setulosis vel glabratis, antheris oblongis 3–4 mm. longis ubique minute setulosis apice pilis 0.2–0.3 mm. longis stramineo-hispidis; gynaecio sub anthesi 13–15 mm. longo, ovario dense pallido-sericeo 4-loculari, ovulis in quoque loculo 10–12, stylo subulato 10–12 mm. longo basim versus hispidulo-puberulo superne glabro apice obscure 4-fido.

KAI ISLANDS: *Collector unknown* (TYPE), cultivated in Buitenzorg Botanical Garden as "Ins. Kai–Kamp. Ewoe." The Arnold Arboretum specimen was obtained from the Museum d'Histoire Naturelle, Paris, and bears the inscription "Reçu le 1 février 1927."

This is probably the plant recorded as *Elaeocarpus dasyphyllus* Scheff. by Dakkus in Bull. Jard. Bot. Buitenz. III. Suppl. **1**: 122. 1930, without description. The specimen here designated as the type bears this binomial on the label, but apparently Scheffer never published it.

Aceratium dasyphyllum appears to be most closely related to *A. Versteegii* Schlechter, of southern Netherlands New Guinea, differing in its shorter-petiolate and smaller leaf-blades, which are subentire rather than "distincte crenato-dentata vel grosse dentata" at margins and apparently more persistently pilose beneath. Complete flowers of *A. Versteegii* have not been described, but the gynaecium is said to be about 17 mm. long. No other specimens of *Aceratium* have been recorded from the Kai Islands.

Aceratium insulare sp. nov.

Arbor 8–20 m. alta, ramis teretibus cinereis, ramulis oppositis brevibus apicem versus complanatis breviter brunneo-strigosis mox teretibus glabratisque; foliis oppositis vel suboppositis, petiolis gracilibus 2–4 mm. longis breviter hispidulo-puberulis, laminis in sicco papyraceis fuscescentibus oblongo-ellipticis, 5–12 cm. longis, 2–5.5 cm. latis, basi late obtusis vel anguste rotundatis, apice cuspidatis vel breviter acuminatis et calloso-apiculatis, margine inconspicue spinuloso-serrulatis (dentibus 3 vel 4 per centimetrum), supra costa puberula excepta glabris vel glabratis, subtus breviter et pallide sericeo-puberulis subglabrescentibus, costa supra paullo subtus valde elevata, nervis lateralibus utrinsecus 7–10 erecto-patentibus supra planis vel insculptis subtus elevatis, rete venularum inconspicuo utrinque prominulo vel supra plano; inflorescentiis laxe racemosis 2–4-floris, pedunculo et rhachi gracilibus 4–13 mm. longis cum pedicellis sparse puberulis vel sub anthesi glabratis, bracteis minutis caducis, pedicellis gracillimis sub anthesi 1–2 cm. longis; sepalis 5 tenuiter carnosis oblongo-lanceolatis, 7–8 mm. longis, 2–2.5 mm. latis, apice subacutis, utrinque inconspicue puberulis, intus carinatis; petalis 5 submembranaceis anguste cuneatis, 9–11 mm. longis, 4–5 mm. latis, apice emarginatis (quoque lobo dentibus 2 vel 3 circiter 1 mm. longis irregulariter crenulato-lobulatis laciniato), intus basim versus et margine copiose puberulo-tomentellis; disco annulari-pulvinato circiter 0.5 mm. alto inconspicue pallido-setuloso; staminibus 15 quam gynaecio brevioribus, filamentis filiformibus circiter 5 mm. longis glabris, antheris oblongis circiter 2 mm. longis ubique setulosis et apice pilis 0.4–0.7 mm. longis hispidis; gynaecio sub anthesi 7–9 mm. longo, ovario et styli basi copiose stramineo-setuloso-puberulis (pilis 0.1–0.15 mm. longis), loculis 3 vel 4, 8-ovulato, stylo 5–7 mm. longo sub-ulato basi crasso superne glabro apice obscure 3- vel 4-fido; pedicellis sub fructu plerumque solitario ad 3 cm. longis; fructibus elongato-ovoideis glabris, maturitate 3–4.5 cm. longis et 1.5–2.5 cm. latis, inconspicue angulatis, basi rotundatis, apice subacutis et basi styli saepe apiculatis; pericarpio (mesocarpio fibroso conspicue fisso et endocarpio lignoso inclusis) 5–6 mm. crasso, pyrena 3- vel 4-loculari, seminibus ut videtur solitariis.

SOLOMON ISLANDS: Bougainville: Marmaromino, Buin, alt. 50 m., *Kajewski 2189* (TYPE), Sept. 28, 1930 (common tree up to 10 m. high, in rain-forest; petals cream-colored; native name: *marangi kegitor* [fruit of the devil]); Kugimaru, Buin,

alt. 150 m., *Kajewski 1807* (common tree up to 20 m. high, in rain-forest; fruit red when ripe; native name: *marangi kegitor*); Malaita: Quoimonapu, sea-level, *Kajewski 2326* (common spreading tree up to 8 m. high, in swampy places in rain-forest; fruit red when ripe; leaves said to have been used as a poultice for spear- and arrow-wounds); Guadalcanal: Ululolo, Tutuve Mt., alt. 1200 m., *Kajewski 2616* (tree up to 20 m. high, common in rain-forest; fruit red, insect-stung and deformed).

Aceratium has not previously been reported from the Solomons, but its presence there has been indicated by the occurrence of *A. Braithwaitei* (F. v. Muell.) Schlechter[1] in the New Hebrides. The new species is more closely allied to *A. Braithwaitei* than to any of the New Guinean species, but it differs from the New Hebrides plant in its substantially smaller flowers. *Aceratium Braithwaitei* has the sepals about 12 mm. long, the petals 14–16 mm. long, the anthers about 3 mm. long, and the other parts proportionately large. The rachis and pedicels of the New Hebrides plant are stouter and more densely pilose than those of *A. insulare*. Although I have not seen mature fruits of *A. Braithwaitei*, Mueller's original description indicates that they are very similar to those described above.

Aceratium Archboldianum sp. nov.

Arbor ad 10 m. alta (vel ultra?), ramulis hornotinis gracilibus brevibus subteretibus dense ferrugineo-tomentellis, vetustioribus glabratis cinereis; foliis oppositis vel subopppositis, petiolis validis subteretibus 2–8 mm. longis ut ramulis tomentellis, laminis chartaceis oblongis, 7–14 cm. longis, 3–5.5 cm. latis, basi rotundatis, apice acutis vel cuspidatis et calloso-apiculatis, margine integris apicem versus haud undulatis, utrinque pallide sericeo-puberulis demum costa excepta glabratis, costa supra valde elevata subtus prominente, nervis lateralibus utrinsecus 7–9 arcuatis supra subplanis subtus elevatis, rete venularum intricato supra obscuro subtus leviter prominulo; inflorescentiis breviter racemosis ut videtur circiter 4-floris, pedunculo et rhachi gracilibus ad 25 mm. longis cum pedicellis pilis 0.2–0.4 mm. longis dense ferrugineo-hispidulo-tomentellis, pedicellis 18–25 mm. (sub fructu ad 30 mm.) longis superne gradatim incrassatis; sepalis 5 tenuiter carnosis oblongo-lanceolatis, 19–21 mm. longis, 4–4.5 mm. latis, apice subacutis, extus breviter tomentellis, intus puberulis et carinatis; petalis 5 submembranaceis anguste cuneato-oblongis, 21–24 mm. longis, superne 4.5–5.5 mm. latis, apice 3–5-lobatis (dentibus 2–3 mm. longis emarginatis vel bilobulatis, segmentis obtusis), intus dimidio inferiore et margine stramineo-hispidulo-puberulis; disco crasso pulvinato circiter 1.5 mm. alto pilis circiter 0.3 mm. longis stramineis hispidulo; staminibus 15 quam gynaecio brevioribus, filamentis filiformibus 7–9 mm. longis glabris, antheris anguste oblongis 4.5–5 mm. longis ubique setulosis et apice pilis 0.5–0.8 mm. longis pallido-hispidis; gynaecio sub anthesi 15–16 mm. longo quam petalis multo breviore, ovario pallide sericeo-hispidulo 3-loculari,

[1]**Aceratium Braithwaitei** (F. v. Muell.) Schlechter in Bot. Jahrb. **54**: 103. 1916.
Aristotelia Braithwaitei F. v. Muell. in Southern Science Record **1**(10): 149. 1881.
Elaeocarpus Kajewskii Guillaumin in Jour. Arnold Arb. **12**: 232. 1931; syn. nov.

New Hebrides: Aneityum: Anelgauhat Bay, sea-level, *Kajewski 710* (type coll. of *Elaeocarpus Kajewskii*); Eromanga: Dillon Bay, alt. 300 m., *Kajewski 297*.

The cited specimens agree with Mueller's description in all respects except the larger leaves; the type was collected on Tanna.

ovulis in quoque loculo 8, stylo subulato 11–12 mm. longo basim versus hispidulo-puberulo superne glabro apice obscure 3-fido; fructibus ovoideo-ellipsoideis demum glabratis maturitate ad 4 cm. longis et 2 cm. latis, haud angulatis, basi obtuse rotundatis, apice subacutis stylo plus minusve persistente coronatis; pericarpio ad 7 mm. crasso demum fisso, mesocarpio fibroso, endocarpio duro tenui, pyrena uniloculari, semine ut videtur solitario.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt. 2300–2350 m., *Brass 11066* (tree 10 m. high, in forest substage), *Brass 11526* (TYPE), Nov. 1938 (common in forest substage; flowers yellow-green).

Aceratium Archboldianum seems closely related only to *A. Ledermannii* Schlechter, from which it differs in its proportionately slightly narrower leaf-blades, its longer pedicels, sepals, and anthers, its less copiously laciniate petals, and its shorter gynaecium, of which the ovary is pale sericeous-hispidulous rather than densely rufo-tomentulose. Closely related to *A. Archboldianum* are two specimens from Northeastern New Guinea (Morobe District, *Clemens 6436a, 41710*) with very immature flowers and mature fruits. The fruits have consistently 3-locular pyrenes, and flowers should be examined before the status of these two collections can be decided. In some characters they suggest *A. obtusidens* Schlechter, a species which differs from *A. Archboldianum* in its much smaller flowers and dentate leaf-blades.

Aceratium pachypetalum Schlechter in Bot. Jahrb. **54**: 107. 1916.

NETHERLANDS NEW GUINEA: Humboldt Bay, alt. about 50 m., *Gjellerup 985* (TYPE COLL.), Feb. 1912 (tree 5 m. high, in woods); Hollandia, alt. 100 m., *Brass 8977* (tree 4 m. high, in older secondary rain-forest; branches long, drooping).

This is one of the species proposed by Schlechter with only a few inadequate notes, but nevertheless I believe that his name should be accepted as valid. Since ample material is now available from essentially the type locality, a full description is herewith added. The type is in flower, while the Brass specimen bears both flowers and fruits. Although the leaf-blades of this species are not as broad as implied in Schlechter's key, it is presumably properly placed as a relative of his *A. pittosporoides* and *A. molle*. The essentially globose fruit, as found in both *A. pachypetalum* and *A. pittosporoides*, is not usual for the genus.

Arbor parva, ramulis hornotinis gracilibus subteretibus densissime pallido-brunneo-tomentellis, vetustioribus cinereis glabratis; foliis oppositis, petiolis subteretibus 4–9 mm. longis ut ramulis tomentellis, laminis chartaceis in sicco brunnescentibus ovato-ellipticis, (9)11 16 cm. longis, (4–)5–8 cm. latis, basi obtusis vel subrotundatis, apice cuspidato-acuminatis (acumine ad 1 cm. longo), margine conspicue et remote mucronulato-dentatis, supra primo puberulis demum costa nervisque tomentellis exceptis glabris, subtus pallidioribus arcte cinereo-tomentello-puberulis, costa supra paullo elevata subtus prominente, nervis lateralibus utrinsecus 5–7 distantibus leviter curvatis anastomosantibus supra prominulis subtus valde elevatis, rete venularum intricato copioso utrinque prominulo; inflorescentiis breviter racemosis 4–6-floris, pedunculo et rhachi validis 6–10 mm. longis cum pedicellis 10–15 mm. longis dense brunneo-hispidulo-tomentellis;

sepalis 5 carnosis oblongo-lanceolatis, 11–13 mm. longis, 2.5–3.5 mm. latis, apice subacutis, extus ut pedicello tomentellis, intus puberulis et valde carinatis; petalis 5 tenuiter carnosis vel submembranaceis oblongo-cuneatis, 14–16 mm. longis, 4–5 mm. latis, apice 4–6-lobatis (dentibus 1–1.5 mm. longis saepe emarginatis, segmentis obtusis), intus basim versus et margine pallide hispidulo-puberulis; disco pulvinato circiter 1 mm. alto pilis circiter 0.2 mm. longis pallidis hispidulo-puberulo; staminibus ut videtur circiter 19 quam gynaecio brevioribus, filamentis filiformibus 4–6 mm. longis glabris, antheris oblongis 3–3.5 mm. longis setulosis apice breviter stramineo-hispidis; gynaecio sub anthesi 11–12 mm. longo, ovario subgloboso copiose pallido-hispidulo-tomentello 3- vel 4-loculari, ovulis 8 in quoque loculo, stylo subulato crasso 7–8 mm. longo basi hispidulo superne glabro; fructibus ellipsoideo-subglobosis puberulis demum glabratis, ad 17 × 15 mm., haud angulatis, basi et apice rotundatis, stylo subpersistente coronatis; pericarpio (mesocarpio fibroso et endocarpio duro osseo inclusis) 3–4 mm. crasso, pyrena plerumque 4- interdum forsan 3-loculari, dissepimentis validis persistentibus.

(*To be continued*)

STUDIES IN THE SIMAROUBACEAE, I
THE GENUS CASTELA

ARTHUR CRONQUIST

EXTENSIVE chemical studies now in progress in the laboratories of Merck & Co., at Rahway, New Jersey, have rendered desirable systematic reviews of several genera of the Simaroubaceae. In the course of this work I intend to revise the New World representatives of the family. A comprehensive delimitation of the genera will be presented in due time.

The genus *Castela* was proposed by Turpin in 1806, with *C. depressa,* from the present Dominican Republic, as the type species. A second species, *C. erecta,* from Antigua, was described at the same time. Turpin wrote, and his figure clearly indicates, that *C. depressa* has a long slender style and a capitate slightly lobed stigma. He did not illustrate the flowers of *C. erecta,* but said that they "ne m'ont paru avoir aucune difference remarquable."

Castela erecta has been identified beyond doubt, and it has a short style column with divergent stigmas, as do all subsequently described species of the genus. Small[1] seized upon the supposed difference in styles and segregated all the species except *C. depressa* as a new genus, *Castelaria.* He apparently had no material of *C. depressa,* but took its character from Turpin's description. Material now available from the Dominican Republic has a short style column and long, recurved, almost circinately rolled stigmas, but is otherwise rather similar to Turpin's figure. No other species of *Castela* is known from the Dominican Republic, and *C. erecta,* which it most nearly resembles, approaches no nearer than St. Croix. The probability is that Turpin's description and figure are in error, and I am treating the recently collected plants from the Dominican Republic as *C. depressa.*

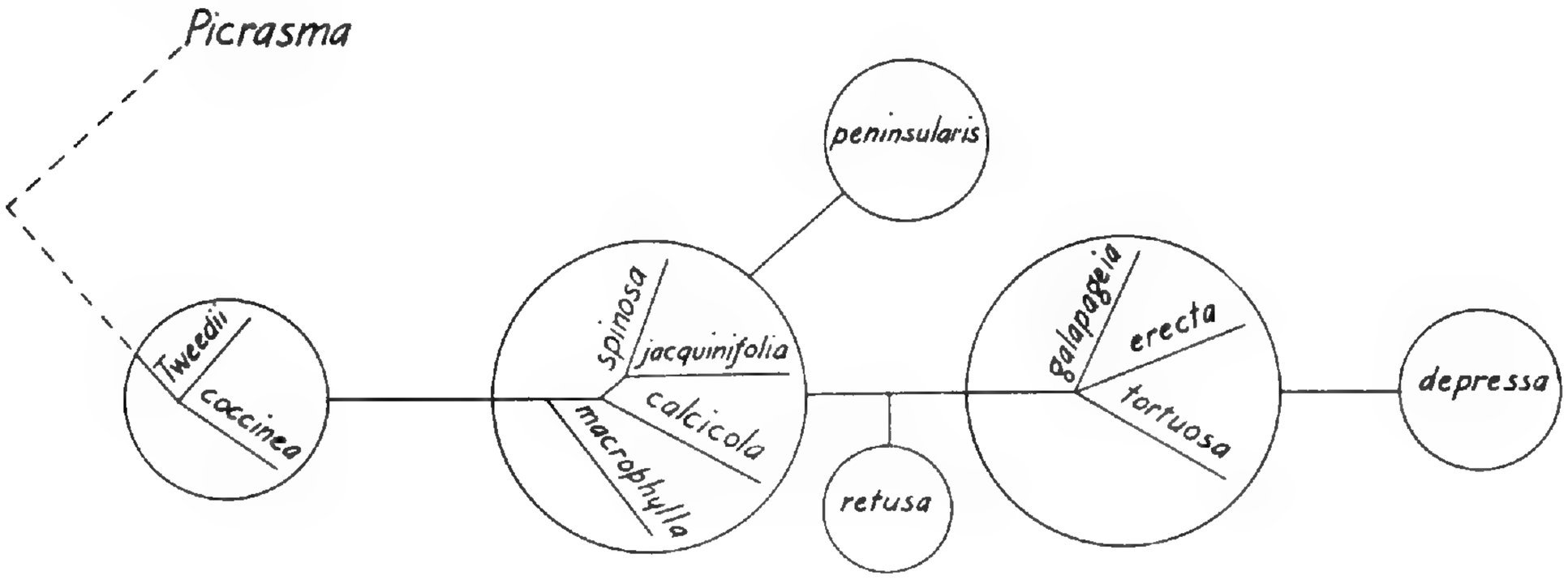
At the time he segregated the genus *Castelaria,* Small replaced the name *Castela* Turp. with *Neocastela* Small, rejecting the former because of its similarity to *Castelia* Cav., 1801, which is generally regarded as a synonym of *Priva.* However, *Castela* Turp. has recently been conserved (Kew Bull. **1940:** 108. 1940).

Aside from the ditypic *Holacantha,* which appears to be a specialized offshoot of *Castela,* the latter seems most closely related to *Picrasma* (*sens. lat.,* including *Aeschrion*), some species of which show a tendency toward reduction in size and number of leaflets, the leaflets resembling the leaves of *Castela.* The chief difference in flowers is that *Castela* has 8 stamens, whereas *Picrasma* has only 4.

There are several obvious species-groups in the genus *Castela. Castela erecta, C. galapageia,* and *C. tortuosa* are closely related and only doubt-

[1]Small, J. K. Simaroubaceae. N. Am. Fl. **25:** 227–239. 1911.

fully distinct. Presumably they had a common ancestor in relatively recent time. Three Cuban and one Jamaican species form another closely knit group: *C. spinosa, C. jacquinifolia, C. calcicola,* and *C. macrophylla.* The characters on which these are separated are minor, and they too would seem to have had a recent common ancestor. A third group is formed by *C. Tweedii* and *C. coccinea,* of South America. Though obviously related, these two species are amply distinct. Of the three remaining species, *C. peninsularis* seems to be an offshoot of the *C. macrophylla* group, *C. retusa* forms a connecting link between the *C. macrophylla* and *C. erecta* groups, and *C. depressa* is evidently related to *C. erecta.* A tentative phylogenetic arrangement is given below.



The geographic distribution of the species of *Castela* suggests that formerly continuous ranges have been broken up and are being progressively restricted. Even within the area of a single species, such as *C. tortuosa,* observations by collectors indicate that, while individuals are found in abundance in a given patch, it may be many miles between patches. Similarly, *C. erecta* is apparently found on relatively few of the West Indian islands, although more collecting will presumably increase the number of known stations.

I wish to thank Dr. R. T. Major, Director of the Research Laboratory of Merck & Co., Inc., who made this study possible, Dr. H. A. Gleason and Mr. B. A. Krukoff, of the New York Botanical Garden, who have given helpful advice and criticism and aided in obtaining necessary material, and the curators of the following herbaria (designated hereinafter by the letters at the left), who have loaned specimens for study:

A — Arnold Arboretum, Harvard University,
F — Field Museum of Natural History, Chicago,
G — Gray Herbarium, Harvard University,
Mich — University of Michigan, Ann Arbor,
Mo — Missouri Botanical Garden, St. Louis,
NY — New York Botanical Garden,
US — United States National Herbarium, Washington, D. C.,
Y — Yale University School of Forestry, New Haven, Conn.

Specimens cited as Kr. Herb. are mostly vouchers received by Mr.

Krukoff in connection with samples for chemical analysis. Most of the Gray Herbarium material was examined at Harvard, and only critical specimens are cited.

KEY TO THE SPECIES

1. Filaments very conspicuously thickened toward the base; plants of northern Argentina and adjacent area.
   2. Flowers delicate, the petals mostly 3–3.5 mm. long, the anthers mostly 1.2–1.5 mm. long; leaves downy-pubescent with spreading hairs to essentially glabrous beneath, essentially glabrous above except for some fine hairs along the midrib; spines slender, mostly unbranched and not more than 2 cm. long. . .2. *C. Tweedii.*
      3. Leaves essentially glabrous beneath. . . . . 2a. *C. Tweedii* var. *typica.*
      3. Leaves downy-pubescent beneath. . . . . 2b. *C. Tweedii* var. *macrophylla.*
   2. Flowers larger and coarser, the petals mostly 4.5–5 mm. long, the anthers mostly 2–2.5 mm. long; leaves with a fine and closely appressed yellowish and somewhat glutinous-appearing pubescence beneath (occasionally becoming subglabrate at maturity), glabrous above, or slightly pubescent like the lower surface; spines coarse, commonly branched, often well over 2 cm. long. . . . . 1. *C. coccinea.*
1. Filaments only slightly or moderately thickened toward the base; plants of the Galapagos Islands, Colombia, Venezuela, the West Indies, Mexico, and southern U. S. A. (Texas).
   2. Leaves white-tomentose beneath, shining and glabrous or nearly so above; young twigs conspicuously white- or gray-tomentose except in *C. retusa,* where merely puberulent.
      3. Leaves mostly well over 1 cm. long and more than half as wide, rounded to retuse and sometimes mucronulate at the apex; tomentum thin and sparse; young twigs densely puberulent, but not tomentose; plant of Oaxaca, Mexico. . . . . 8. *C. retusa.*
      3. Leaves when over 1 cm. long not more than half as wide, acute to obtuse or sometimes rounded at the apex, often mucronulate, but not retuse; tomentum dense; young twigs tomentose.
         4. Trailing or ascending shrub of the Dominican Republic; style branches recurved, almost circinately rolled; leaves rounded to subcordate at the base. . . . . 12. *C. depressa.*
         4. Erect shrubs, not of the Dominican Republic; style branches stiffly spreading; leaves acute to rounded at the base, but scarcely subcordate.
            5. Network of veins on the lower surface of the leaves raised and conspicuous to the naked eye; veins glabrous, or less densely pubescent than the areolae; plant of the Galapagos Islands. . . . .10. *C. galapageia.*
            5. Network of veins on the lower surface of the leaves usually inconspicuous when viewed with the naked eye; veins equally as pubescent as the areolae.
               6. Leaves mostly over 1.5 cm. long; network of veins on the lower surface of the leaves readily evident when viewed with a lens; plant of northern Colombia and Venezuela and the West Indies. . . . . 11. *C. erecta.*
               6. Leaves mostly 1.5 cm. long or less; network of veins on the lower surface of the leaves usually relatively obscure even when viewed with a lens; plant of southern Texas, U. S. A., to Oaxaca, Mexico. . . . . 9. *C. tortuosa.*
   2. Leaves glabrous or pubescent above and beneath, but not white-tomentose; young twigs variously pubescent, but not tomentose.
      3. Leaves appearing dull, copiously pubescent with spreading hairs beneath, similarly but less densely pubescent above; twigs pubescent like the lower surfaces of the leaves; plant of Baja California, Mexico. . .7. *C. peninsularis.*
      3. Leaves shining, glabrous or hispidulous to puberulous on one or both surfaces; twigs variously pubescent; plants of the West Indies.

4. Leaves glabrous, except sometimes for a few small hairs on the midrib; petals glabrous, 3–4 mm. long; plant of Oriente, Cuba. 5. *C. jacquinifolia.*
4. Leaves sparsely to moderately hispidulous or hirtellous at least beneath, also above except sometimes in *C. macrophylla;* plants of Jamaica and western Cuba.
5. Plant very thorny, the thorns long, stout, and branched; petals hispidulous, 4–4.5 mm. long; plant of western Cuba. .....6. *C. spinosa.*
5. Plant only slightly or moderately thorny, the thorns mostly simple and short, or wanting.
6. Leaves rounded or retuse at the apex, sparsely to moderately hispidulous on both sides; petals hispidulous, 3.5–4 mm. long; plant of western Cuba. .....4. *C. calcicola.*
6. Leaves acute at the apex, except on vigorous young shoots, sparsely to moderately hirtellous or hispidulous beneath, often glabrous above; petals slightly hispidulous or glabrous, 2.5–3 mm. long; plant of Jamaica. .....3. *C. macrophylla.*

Catalogue and Comments

1. **Castela coccinea** Griseb. Abh. Ges. Wiss. Goett. **19:** 107. 1874.

Type: *Lorentz & Hieronymus 514,* "in fruticetis Sierra Cordoba occidentalibus." Cordoba, Argentina (F-photo, NY-photo).

Distribution: Known only from northern Argentina and adjacent Paraguay.

Argentina: *Lorentz & Hieronymus 40* (F, US), *570* (NY); Jujuy: *Eyerdam & Beetle 22498* (Mo); Salta: *Eyerdam & Beetle 22892* (Mo); *Venturi 9497* (A, Mo, US); Tucumán: *Venturi 1391* (A, US); Santiago del Estero: *Venturi 9731* (A, Mo, US); Chaco: *Jorgensen 1951* (Mo, US); *Schulz s.n.* (Kr. Herb. #16378A). Paraguay: *Rojas 2450* (US).

Collectors' notes indicate that this species is a shrub up to about 3 meters high. The pubescence on the lower surface of the leaves is sometimes so fine as to escape notice except under very careful observation with a good lens. There is a noticeable though scarcely tangible difference in the texture of the leaves of this and *C. Tweedii,* and these two may likewise be separated from other species of the genus by intangibles of leaf character and venation, after a little experience with the group.

2. **Castela Tweedii** Planch. Lond. Jour. Bot. **5:** 569. 1846.

2a. **Castela Tweedii** var. **typica** nom. nov.
Castela Tweedii Planch. Lond. Jour. Bot. **5:** 569. 1846.
? Castela alaternifolia Planch. loc. cit. "Chili absque loco proprio." No members of the Simaroubaceae are known to occur in Chile, and the description suggests a broad-leaved form of *C. Tweedii.*
Castela Tweedii var. *dentata* Engl. Nat. Pfl. **3**[4]**:** 219. 1896.

Type: *Tweedie s.n.,* "Parana et Banda oriental," Brazil.

Distribution: Known from Uruguay to Paraguay and adjacent Brazil.

Uruguay: *Ball s.n.,* in 1882 (NY); *Lorentz s.n.,* October 30, 1875 (F-photo). Argentina: Entre Rios: *Baez s.n.* (Kr. Herb. #16371); Corrientes: *Bonpland 1205* (NY), *1207* (NY). Paraguay: *Hassler 11042* (A), *11063* (A).

2b. **Castela Tweedii** var. **macrophylla** Chod. & Hass. Bull. Herb. Boiss. II. **3:** 800. 1903.

Type: *Hassler 736,* "in dumetis Cordillera de Altos," Paraguay (NY, isotype).

Distribution: Known only from Paraguay.

Paraguay: *Fiebrig 7* (A, F, US); *Hassler 3025* (A), *11792* (A, F, Mo), *11792a* (A, Mo), *12801* (A, Mo).

This species is reported to reach tree size, but the type of var. *macrophylla* was described as a shrub 3–4 meters high. The variety *macrophylla* was founded on the size of the leaves, which is of no taxonomic significance in this case, but the type happens to belong to the pubescent-leaved phase of the species, so that the inappropriate name must be preserved.

3. **Castela macrophylla** Urb. Symb. Ant. **5**: 377. 1908.
Castelaria macrophylla Small, N. Am. Fl. **25**: 232. 1911.

TYPE: *Harris 9219*, Great Goat Island, Jamaica (F, NY, isotypes).

DISTRIBUTION: Confined to Jamaica.

JAMAICA: *Britton 1295* (NY), *2825* (NY); *Britton & Hollick 1843* (NY, US); *Harris 9347* (A, NY, US), *9348* (A, NY), *10047* (NY), *12471* (Mo, NY, US); *Lorter s.n.* (Kr. Herb. #16317).

4. **Castela calcicola** (Britton & Small) Ekman ex Urb. Repert. Sp. Nov. **20**: 304. 1924.
Castelaria calcicola Britton & Small, Bull. Torrey Club **44**: 34. 1917.

TYPE: *Shafer 13434*, limestone hills, vicinity of Sumidero, Pinar del Rio, Cuba (NY); isotype (Mo).

DISTRIBUTION: Known only from Pinar del Rio, Cuba.

CUBA: Pinar del Rio: *Britton & Cowell 9981* (NY); *Shafer 13386* (NY, US).

5. **Castela jacquinifolia** (Small) Ekman ex Urb. Repert. Sp. Nov. **20**: 304. 1924.
Castelaria jacquinifolia Small, N. Am. Fl. **25**: 232. 1911.

TYPE: *Britton 2198*, Leeward Point, Guantanamo Bay, Oriente, Cuba (NY).

DISTRIBUTION: Known only from Oriente, Cuba.

CUBA: Oriente: *Clement 107* (NY), *155* (NY).

6. **Castela spinosa** sp. nov.

Frutex spinosissimus, spinis longis ramosis, ramulis hirtellis; foliis nitidis utrinque hirtellis ex late lanceolatis oblongisve ellipticis vel subrotundis, obtusis vel acutis, perspicue reticulato-venosis, circa 1–2 cm. longis et 4–10 mm. latis; petalis coccineis hispidulis 4–4.5 mm. longis; antheris circa 2–2.5 mm. longis; drupis coccineis circa 1 cm. longis.

TYPE: *Shafer 11082*, rocky places, Las Martinas to the Coast, Pinar del Rio, Cuba, December 19, 1911 (NY); isotype (US).

DISTRIBUTION: Pinar del Rio and Habana, Cuba.

CUBA: *Hioram 2186* (NY); *Wright 2193* (Mo, NY, US); Habana: *Leon 7219* (NY); Pinar del Rio: *Acuna s.n.* (Kr. Herb. #16467); *Roig 3931* (NY).

This species was first recognized by Percy Wilson, who assigned it the same epithet here used, in an unpublished combination under *Castelaria*. It is the *C. erecta*, in large part, of Small's treatment in North American Flora, but it is not closely related to the original *Castela erecta* Turp.

7. **Castela peninsularis** Rose, Contr. U. S. Nat. Herb. **12**: 278. 1909.
Castelaria peninsularis Small, N. Am. Fl. **25**: 231. 1911.

TYPE: *Purpus 244*, San José del Cabo, Baja California, Mexico.

DISTRIBUTION: Baja California, Mexico, especially near the coast, from Magdalena Bay around the cape to Santa Catalina Island.

MEXICO: Baja California: *Brandegee s.n.*, October 29, 1893 (NY), January, 1889 (A); *Collins, Kearney, & Kempton 124* (US); *Johnston 3918* (US), *3928* (A, Mo, NY), *3983* (US); *Rose 16295* (NY, US), *16399* (NY, US), *16547* (US), *16850* (NY, US), *16865* (US), *16909* (US).

8. **Castela retusa** Liebm. Vidensk. Meddel. **1853:** 108. 1854.

TYPE: *Liebmann s.n.*, between Tehuantepec and Oaxaca, Oaxaca, Mexico (F-photo).

DISTRIBUTION: Known only from Oaxaca, Mexico.

MEXICO: Oaxaca: *Seler 1749* (G).

This species connects the *C. erecta* group with the *C. macrophylla* group. The tomentum on the lower surface of the leaves is sparser and much less conspicuous than in *C. erecta* and its allies, and the leaves are otherwise suggestive of the *C. macrophylla* group. It is apparently rare, being known from only one collection besides the type.

9. **Castela tortuosa** Liebm. Vidensk. Meddel. **1853:** 108. 1854.
Castela Nicholsoni β texana Torr. & Gray, Fl. N. Am. **1:** 680. 1840.
Castela texana Rose, Contr. U. S. Nat. Herb. **12:** 278. 1909.
Castelaria texana Small, N. Am. Fl. **25:** 231. 1911.
Castelaria tortuosa Small, *loc. cit.*
? Castela salubris Boas, Beih. Bot. Centr. **29**[1]**:** 342. 1913. If the statement in the original description that the petals of *C. salubris* are only 1.5 mm. long applies to boiled flowers, the plant deserves some sort of segregation from typical *C. tortuosa*.
Castela salubris var. *Endlichiana* Boas, Repert. Sp. Nov. **12:** 224. 1913.

TYPE: *Liebmann 4252*, Tehuacan de las granadas, Puebla, Mexico (US, isotype).

DISTRIBUTION: Oaxaca, Mexico, to southern Texas, U. S. A.

MEXICO: *Gregg s.n.*, May, 1847 (NY); Oaxaca: *Gonzalez 984* (US); *Liebmann 4252* (but data not as the type) (F); *Nelson 1885* (US); Puebla: *Liebmann 15053* (F); *Rose, Painter, & Rose 10007* (NY, US); San Luis Potosi: *Salazar s.n.*, February 22, 1913 (US); Tamaulipas: *Bartlett 10720* (A, F, US), *11015* (F, US), *11173* (F); *LeSueur 236* (F); *Nelson 6614* (US); *Palmer 121* (Mo, US), *129* (US); *Parry et al. 160* (NY, US); *Sours s.n.* (Kr. Herb. #16001); *von Rozynski 743* (F, NY); *Wizlizenus 366* (Mo); *Wooton s.n.*, June 21, 1919 (US); Nuevo Leon: *Edwards 391* (F); *Taylor 391* (Mo); *Thurber 863* (NY); *Wizlizenus 323* (Mo); Coahuila: *Kenoyer 28* (F); *Parry & Palmer 107* (Mo, US); Chihuahua: *Wizlizenus 254* (Mo). UNITED STATES: Texas: *Ferris & Duncan 3061* (Mo, NY); *Heller 1402* (Mo, NY, US); *Howard s.n.*, 1892 (Mich, NY); *Jermy s.n.*, in 1904 (Mo, US); *Mackenzie 44* (Mo, NY); *Palmer 152* (Mich, Mo); *Palmer 12951* (A, Mo); *Wright 85* (NY, US).

Collections from Texas are so numerous that I have cited only a small proportion of them.

The difference between *C. tortuosa* and *C. erecta* in prominence of the veins of the leaves is neither very great nor entirely constant, yet it is helpful after one has established some standards by comparison of specimens of each.

10. **Castela galapageia** Hook. f. Trans. Linn. Soc. **20:** 229. 1851.
Castelaria galapageia Moldenke, Phytologia **1:** 8. 1933.

TYPE: *Darwin s.n.*, Chatham Island, Galapagos Islands.

DISTRIBUTION: Galapagos Islands.

GALAPAGOS ISLANDS: *Stewart 1750* (US), *1754* (US), *1759* (US), *1761* (US); *Wheeler, Rose, & Beebe 43* (NY), *50* (NY, US).

This species seems to have retained wide variability in leaf size, whereas *C. tortuosa* has become relatively small-leaved and *C. erecta* has become relatively large-leaved in most cases. Several forms have been described,

but intensive study by Stewart[2] has shown that these have no taxonomic value.

11. **Castela erecta** Turp. Ann. Mus. Par. **7**: 80. *t. 5B*. 1806.
Castela Nicholsoni Hook. Bot. Misc. **1**: 271. 1830.
Castelaria Nicholsoni Small, N. Am. Fl. **25**: 231. 1911.
Castelaria erecta Small (as to name), *loc. cit.* 232.

TYPE: *Richard s.n.*, Antigua, West Indies.

DISTRIBUTION: Known from northern Colombia and Venezuela, and Margarita, Cubagua, Antigua, and St. Croix Islands; to be expected on some of the other islands of the West Indies.

COLOMBIA: *Dawe 517* (US). VENEZUELA: *Curran & Haman 429* (US); Sucre: *Curran & Haman 1249* (A, NY, US); Lara: *Saer 23* (US); Zulia: *Pittier 10546* (NY, US); Nueva Esparta: Cubagua: *Cooper 216* (NY, US, Y); Margarita: *Johnston 118* (NY, US); *Miller & Johnston 236* (F, Mo, NY, US). ST. CROIX: *Britton, Britton, & Kemp 55* (NY, US); *Haunien s.n.* (NY); *Ricksecker 377* (Mo, NY, US); *Rose, Fitch, & Russell 3529* (NY, US); *Thompson 176* (NY). ANTIGUA: *Box 738* (US); *Nicholson s.n.*, September 26, 1850 (NY); *Warneford s.n.* (Kr. Herb. #16434).

Some specimens from Venezuela have the leaves no longer than is usual for *C. tortuosa*, though they are generally somewhat broader. *C. erecta*, *C. galapageia*, and *C. tortuosa* are very closely related, and accumulation of more material may force their combination into one species. Until then, in view of their geographic segregation, I think it best to continue the traditional treatment of regarding them as distinct, although I realize that the lines between them are very tenuous.

12. **Castela depressa** Turp. Ann. Mus. Par. **7**: 79. *t. 5A*. 1806.
Neocastela depressa Small, N. Am. Fl. **25**: 230. 1911.

TYPE: *Turpin s.n.*, "Ile de Saint-Domingue, entre Mont-Christ et Saint-Yague," Dominican Republic.

DISTRIBUTION: Known only from the Dominican Republic.

DOMINICAN REPUBLIC: *Jimenez 6018* (Herb. Jimenez); *Jimenez s.n.* (Kr. Herb. #16134).

DOUBTFUL OR EXCLUDED SPECIES

Castela lychnophoroides Liebm. Vidensk. Meddel. **1853**: 111. 1854. Described without flowers or fruit, and probably not a *Castela*.

Castelaria Brittonii Small, N. Am. Fl. **25**: 232. 1911 = **Henoonia Brittonii** (Small) Monachino.

Castela Brittonii (Small) Engl. Nat. Pfl. II. **19a**: 385. 1931 = praec.

NEW YORK BOTANICAL GARDEN,
NEW YORK.

[2]Stewart, A. Am. Jour. Bot. **2**: 279–288. 1915.

SCHISANDRA MICHAUX, NOMEN GENERICUM CONSERVANDUM

ALFRED REHDER

THE validity of the name *Schisandra* Michaux seems never to have been questioned. Neither de Candolle, in 1817 and 1824, nor Bentham and Hooker, in 1862, cite *Stellandria* Brickell of 1803 as a synonym. Brickell's name was published the same year as *Schisandra* Michaux, but evidently several weeks earlier than Michaux's name.

Brickell's paper containing the generic and specific description of *Stellandria* and its only species, *S. glabra*, was published in number 3 of vol. 6 of the Medical Repository of New York. This volume was the last of the first hexade; of this hexade each volume starts in the middle of the year and was published in quarterly numbers, the third number appearing at the beginning of the following year. The numbers probably had covers which may have borne the exact date of publication, but none of the libraries I consulted had a copy with the covers preserved. Fortunately each number has several dated communications which allow a conclusion as to the approximate date of issue. Of number 3 (pp. 237–352) in volume 6, the latest dated communication is of February 22, appearing on p. 342 near the end of the number,[1] which shows that the number was published either at the very end of February or early in March. The latest date in number 4 is March 31 (p. 442), which indicates that the number came out sometime in April. The numbers being issued quarterly, number 3 should have appeared about three months before number 4, which apparently is not the case here, but it strengthens the assumption that number 3 must have appeared early in March.

Michaux's Flora Boreali-Americana apparently did not appear before March, 1803. The earliest notice of this work appeared in the Allgemeine Literatur-Zeitung in the number of March 19 of its Intelligenzblatt, where Michaux's Flora Boreali-Americana is enumerated as being for sale in Paris and Strasburg: "bei den Gebrüdern Levrault, Buchhändlern in Paris und Strasburg, sind folgende Bücher in Menge zu haben . . . Flora Boreali-Americana . . . par Michaux . . . " (See Bernice G. Schubert in Rhodora **44:** 149. 1942). There is also a later note on the publication of Michaux's Flora Boreali-Americana in Journal Géneral de la Litterature de la France **6** (no. 5): 133 (an XI, Floréal [= April–May, 1803]). The dates of Michaux's Flora and Brickell's article are certainly very close, but there is no reason to assume that Michaux's work came out earlier than number 3 of volume 6 of the Medical Repository.

[1]In this communication the establishment of the American Board of Agriculture is announced with a list of the members of the Board. The Constitution of the Board is reprinted in the following number of the Medical Repository on pp. 465–469.

Though *Schisandra* is not a large genus, containing about 15 species in eastern and southern Asia and one in North America, and is of neither economic nor horticultural importance, it is the type of a distinct group of the Ranales including the genus *Kadsura* Juss., with its name derived from *Schisandra,* the type of the group. By most authors this group is considered a tribe or subfamily of Magnoliaceae, called by Gray (in Gen. Pl. U. S. **1:** 54. 1849) tribe Schizandreae, and by Harms (in Ber. Deutsch. Bot. Ges. **15:** 358. 1897) subfam. Schizandroideae. By some older authors the group has been placed under the Menispermaceae, as by de Candolle (Prodr. **1:** 104. 1824) designated as Menispermeae trib. Schizandreae, and by Spach (Hist. Nat. Vég. Phan. **8:** 6. 1839) as Menispermaceae trib. Schizandreae. Other authors consider it a distinct family, as Guillemin (in Dict. Class. Hist. Nat. **15:** 239. 1829) under the name Schizandreae, G. Don (Gen. Hist. Dichlam. Pl. **1:** 101. 1831) as Schizandriaceae, Blume & Fischer, Fl. Java **3:** 1. 1836) as Schizandraceae.

Michaux's original spelling, *Schisandra,* was used by all authors up to 1818, as by Willdenow, Sp. Pl. **4:** 372 (1805), Poiret, Encyc. Méth. Bot. **6:** 729 (1805), Sims in Bot. Mag. **34:** *t. 1413* (1811), Aiton f., Hort. Kew., ed. 2, **5:** 268 (1811), Pursh, Fl. Bor.-Am. **1:** 212 (1814), Nuttall, Gen. N. Am. Pl. **2:** 209 (1818), except Desfontaines, Hist. Arb. Arbriss. **2:** 25 (1809), who spells the name *Schizandra.*

After the publication, however, in 1817 of the first volume of de Candolle's Regni Vegetabilis Systema Naturale, in which he used the spelling *Schizandra* without explanation of its derivation, most authors, except some more recent authors, one of the earliest being Schneider (Ill. Handb. Laubholzk. **1:** 340. 1905), accepted his spelling, considering it apparently a correction, since almost all generic names of similar derivation begin with Schiz . . . , the first part of the compound name being derived from σχιζειν, to split. Also, in works like Wittstein, Ethymodogisch-Botanisches Handwörterbuch, p. 792 (1852), and Backer, Verklarend Woordenboek, p. 517 (1936), the name is said to be derived from σχιζειν and ανηρ and this derivation is found in all books in which the derivations of the botanical names are given, though Michaux states explicitly that *Schisandra* is derived from "Σχισις, Ανηρ: fissurae antheris interjectae"; σχισις or more correctly written σχίσις, division, splitting, and ἀνήο, man. Therefore the spelling *Schisandra* is correct according to its derivation, and, being the original spelling, it should be maintained.

Chiefly for the reason that *Schisandra* is the type of a distinct group of the Ranales with its name or names based on this genus, and because *Stellandria* has never been used by any subsequent author and seems not to have been listed even as a synonym until cited in 1895 by Jackson, Ind. Kew. **2:** 826, under *Schizandra,* the name *Schisandra* is here proposed for conservation.

Schisandra Michaux, Fl. Bor.-Am. **2**: 218, *t. 47* (March, 1803)

versus

Stellandria Brickell in Med. Repos. New York **6** (no. 3): 327 (end of Feb. or early in March, 1803).

Schizandra Desfontaines, Hist. Arb. Arbriss. **2**: 25 (1809). — De Candolle, Reg. Veg. Syst. **1**: 544 [1817]; Prodr. **1**: 104 (1824).

Sphaerostema Blume, Bijdr. Fl. Nederl. Ind. 22 (1825). — G. Don, Gen. Hist. Dichlam. Pl. **1**: 101 (1831) *"Sphaerostemma."*

Cosbaea Hort. ex Lemaire in Ill. Hortic. **2** (Misc.): 71, *fig.* (1855).

Maximowiczia Ruprecht in Bull. Phys.-Math. Acad. Sci. St. Pétersb. **15**: 142, *t. 2* (in Mél. Biol. **2**: 439, *t. 2.* 1857) (1856) *"Maximowitschia"* sub tab.

TYPUS: *Schisandra coccinea* Michx. = *S. glabra* (Brickell) Rehder.

Schisandra glabra (Brickell) comb. nov.

Stellandria glabra Brickell in Med. Repos. New York **6** (no. 3): 327 (end of Feb. or early in March, 1803).

Schisandra coccinea Michaux, Fl. Bor.-Am. **2**: 219, *t. 47* (March, 1803). — Desfontaines, Hist. Arb. Arbriss. **2**: 25 (1809), *"Schizandra."* — De Candolle, Reg. Veg. Syst. **1**: 544 [1817], *"Schizandra."*

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XXV APRIL, 1944 NUMBER 2

PLANTS OF COAHUILA, EASTERN CHIHUAHUA, AND ADJOINING ZACATECAS AND DURANGO, V[1]

IVAN M. JOHNSTON

LORANTHACEAE

Phoradendron lanceolatum Engelm. Mem. Am. Acad. 4: 54 (1849).

COAHUILA: Sierra Gloria, *Marsh 1872;* Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1332;* Sierra Madera, Cañon Pajarito, on white oaks, *Muller 3201.*

Known only from eastern Coahuila and northern Nuevo Leon. The type was collected on *Quercus* by Gregg (no. *255*), Feb. 11, 1847, at Rinconada, just east of the Coahuila-Nuevo Leon boundary along the road between Saltillo and Monterrey. The species is readily recognized by its very elongate glabrous leaves 5–9 cm. long.

Phoradendron tomentosum (DC.) Engelm. in Gray, Jour. Boston Soc. Nat. Hist. 6: 212 (1850).

Viscum tomentosum DC. Prodr. 4: 670 (1830).

Phoradendron Greggii Trel. Monog. Phorad. 36. *t. 32* (1916).

VERNACULAR NAME: Injerto.

COAHUILA: Rancho Falcon, 12 mi. west of Berrendo, *Wynd 732;* Sierra Madera, Cañon Pajarito, on *Acacia* and other legumes, *Muller 3202;* Puerto San Lazaro, *Wynd & Mueller 133;* Cañon de Jara, on *Acacia, Johnston 8838;* 60 mi. west of Cuatro Cienegas, on *Prosopis, White 1957;* 5 mi. west of Americanos, on *Prosopis, Muller 3292;* east of San Antonio de los Alamos, on *Prosopis, Johnston 8278;* near Santa Elena, Sierra Cruces, on *Forestiera, Johnston & Muller 229;* 6 mi. northwest of El Oro, road to Sierra Mojada, *White 1976;* 30 mi. south of Sierra Mojada, *Wynd 770.* ZACATECAS: Cedros, *Lloyd & Kirkwood 15.*

This is the common *Phoradendron,* usually found on *Prosopis* and *Acacia,* in the broad valleys and in the lower canyons on the plateau of northern Mexico, ranging from northern San Luis Potosi and Zacatecas north into trans-Pecos Texas. The type was collected in Dec. 1827 "supra Mimoseas" by Berlandier (no. *1364*) near Catorce in northern San Luis Potosi. *Phoradendron Greggii,* based upon collections from *Prosopis* and other

[1]The third paper in this series, in which the treatment of the monocotyledons was completed, appeared in Jour. Arnold Arb. 25: 43–83 (Jan. 1944). The fourth part, covering the families Saururaceae to Urticaceae, will appear later this year.

legumes at Rinconada, just east of the Coahuila boundary on the road between Saltillo and Monterrey, appears to be a synonym.

In our area the species seems readily recognizable by its thickish orbicular-ovate to ovate-oblong leaves and the grayish velvety indument on the spikes and younger leaves and branches. In trans-Pecos Texas it is difficult, if not impossible, to separate it from plants collected on *Juglans*, *Celtis*, *Quercus*, and *Prosopis*, which appear to be pubescent phases of *P. Engelmanni*. Most of the typical *P. tomentosum* from Texas comes from the Big Bend area, and grows on *Prosopis* and *Acacia*.

Trelease, Monog. Phorad. 36, reports material of *P. Greggii* from Jimulco (*Pringle 845*) and Peña (*Purpus 1106*). The collection from Gomez Farias (*Palmer 291*) which he refers to *P. thyrsoideum* probably also belongs to *P. tomentosum* as here accepted.

Phoradendron Engelmanni Trel. Monog. Phorad. 35 (1916).

COAHUILA: Rancho Babia, *Marsh 1216;* along arroyo southwest of Sierra Azul, Rancho Buena Vista, July 8, 1938, *Marsh 1262, 1263.*

The above collections have the green, inconspicuously pubescent stems and thin leaves of typical *P. Engelmanni*, a plant growing on *Ulmus*, *Prosopis*, and *Quercus* about the eastern and southern escarpments of the Edwards Plateau in Texas.

Phoradendron macrophyllum (Engelm.) Cockerell, Am. Nat. **34**: 293 (1900).
Phoradendron Cockerellii Trel. Monog. Phorad. 38. *t. 36* (1916).

Under the name *P. Cockerellii*, Trelease, l. c., reports a collection of the species from Juarez, Chihuahua. A completely glabrous form of the species occurs on *Populus*, *Salix*, and *Fraxinus* along the Rio Grande in southern New Mexico and along the southern boundary of Texas as far down the river as Presidio. The large broad bright green usually completely glabrous leaves, glabrous spikes, and its favoritism for trees growing in river-bottoms usually permit its recognition. It grows from trans-Pecos Texas to Arizona and in adjoining Mexico.

Phoradendron Coryae Trel. Monog. Phorad. 43. *t. 44* (1916).
Phoradendron Wilkinsoni Trel. Monog. Phorad. 44. *t. 45* (1916).

VERNACULAR NAME: Injerto.

COAHUILA: Sierra Gloria, *Marsh 1896;* Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1334;* Hillcoat Mesa lying west of Encantada Ranch, July 25, 1938, *Marsh 1469;* Sierra Madera, Cañon Pajarito, on white oaks, *Muller 3173A & B.* CHIHUAHUA: Sierra Organos, *LeSueur 1307.*

A well marked species, readily recognizable by its dense close persistent indument of very numerous minute stellate hairs which form a crustose covering on its branches and thick leaves. It ranges from trans-Pecos to Arizona and northern Mexico, almost exclusively on oaks. The type of *P. Wilkonsoni* was collected in the Sierra Santa Eulalia, April 3, 1885, by Wilkinson.

Phoradendron flavum Johnston, Jour. Arnold Arb. **24**: 93 (1943).

COAHUILA: Sierras Negras, 9 km. south of Parras, on *Quercus, Stanford et al. 210;* hills 11 km. northeast of Jimulco, on *Quercus, Stanford et al. 71.*

This species is otherwise known only from the type, which was collected

on oaks near Durango City by Palmer (no. *777*). A plant with a tawny indument and thick dark green leaves.

Phoradendron pauciflorum Torr. Pac. R. R. Rep. 4: 134 (1857).
Phoradendron saltillense Trel. Monog. Phorad. 27. *t. 16* (1916).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 625;* Sierra del Carmen, Aug. 21, 1936, *Marsh 567, 569;* Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1292;* Sierra Madera, Cañon del Agua, on *Cupressus, Muller 3220;* San Antonio de las Alanzanas, on cedars, Aug. 31, 1848, *Gregg 399* (isotype of *P. saltillense*) ; Sierra Negras, 9 km. south of Parras, on *Juniperus, Stanford et al. 149.*

I am unable to distinguish the plant of eastern Coahuila from *P. pauciflorum,* a species of western North America ranging from Oregon to Baja California and Arizona. The species is not known from Texas, New Mexico, or Chihuahua. In our area it parasitizes *Juniperus* and *Cupressus.* These same genera, and also *Abies,* are the hosts of the plant in the western United States.

Phoradendron Bolleanum (Seem.) Eichl. in Mart. Fl. Bras. 5^2: 134 (1868).

CHIHUAHUA: Sierra Santa Eulalia, on *Juniperus,* April 1885, *Pringle 256.*

A species of the Sierra Madre Occidental, ranging from Durango north into Arizona and western Texas. The species has been repeatedly collected on *Juniperus* and *Arbutus.*

Arceuthobium vaginatum (H.B.K.) Eichl. in Mart. Fl. Bras. 5^2: 105 (1868).

COAHUILA: Sierra del Pino, on *Pinus arizonica, Johnston & Muller 591;* General Cepeda, *Nelson 6730.*

A Mexican species extending north into the United States to Arizona, Colorado, and trans-Pecos Texas. In northern Mexico and the United States it is usually confined to yellow pines.

SANTALACEAE

Comandra pallida A. DC. in DC. Prodr. 14: 636 (1857).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 543;* Sierra del Carmen, Aug. 26, 1936, *Marsh 599.* CHIHUAHUA: Road between Samalayuca and El Paso, April 17, 1852, *Wright 1784.*

A parasitic herb widely distributed in the United States reaching its southern limit in our area.

RAFFLESIACEAE

Pilostyles Thurberi Gray, Mem. Am. Acad. II. 5: 326 (1854).
Apodanthes Pringlei Wats. ex Robinson, Bot. Gaz. 16: 83 (1891).
Pilostyles Pringlei Rose, Contr. U. S. Nat. Herb. 12: 264 (1909).

COAHUILA: Hac. Mariposa, east slope of Sierra de Puerto Santa Anna, on *Dalea, Wynd & Mueller 256;* Sierra Fragua, high western ridge north of Puerto Colorado, on *Dalea, Johnston 8783.*

The collection from the Sierra Fragua is a female plant and is very similar to the type of *P. Thurberi* from *Dalea* in southwestern Arizona. The material from Hacienda Mariposa is a male plant. Its flowers are more elongate and lighter than are the female flowers. It seems probable that only a single species of this remarkable stem-parasite infects shrubs of the genus *Dalea* and that in all probability *P. Covillei* Rose (from Texas),

P. glomerata Rose (Puebla), *P. Palmeri* Rose (San Luis Potosi), and *P. sessilis* Rose (Hidalgo) are all phases of *P. Thurberi*. These species are known only from shrubby species of *Dalea*. A well-marked species, *P. globosa* (Wats.) Solms-Laub., a parasite on *Bauhinia*, is known from Monterrey. It should be looked for in Coahuila.

ARISTOLOCHIACEAE

Aristolochia longiflora Engelm. & Gray, Jour. Boston Soc. Nat. Hist. 5: 259 (1845).

COAHUILA: Muzquiz, 1935, *Marsh 11*.

A plant of south-central and southern Texas, reaching its southern limit in eastern Coahuila.

Aristolochia Marshii Standl. Field Mus. Publ. Bot. 17: 238 (1937).

COAHUILA: Muzquiz, April 1938, *Marsh 1143*.

The type of this species was collected near Muzquiz, by Marsh (no. *10*) in the spring of 1935. It is known only from near Muzquiz and in the vicinity of Monterrey. The stems are elongate, slender, and apparently twining.

Aristolochia lassa Johnston, Jour. Arnold Arb. 21: 255 (1940).

COAHUILA: Saltillo, common on bottom-lands, 1898, *Palmer 187* (TYPE); Saltillo, 1909, *Nil 10* (US); Carneros area, 1880, *Palmer 1183*.

A well-marked species known only from the collections cited above. This species is probably most closely related to the Texan *A. Coryi*, from which it differs in its abruptly bent rather than nearly straight perianth-tube, its lance-ovate rather than elliptic limb, and the somewhat retrorsely ascending or appressed hairs on the stem.

Aristolochia Coryi Johnston, Jour. Arnold Arb. 21: 256 (1940).

This species ranges from west-central Texas (Mitchell, Tom Green, Edwards, and Kinney Counties) west to Brewster County, Texas, where it has been collected at various stations in and around the Chisos Mts. In 1928 E. J. Palmer (no. *34225*) collected it in clefts of rocky cliffs in the Grand Canyon of the Rio Grande near Castellan. At this station, now usually known as Santa Helena Canyon, *A. Coryi* makes its closest known approach to the range of *A. Wrightii*, for that more western and southern species has been collected on Mesa de Anguila, the mass of limestone through which the Rio Grande has cut Santa Helena Canyon.

Aristolochia Wrightii Seem. Bot. Voy. Herald 331. *t. 72* (1856).

Aristolochia Wrightii var. *texana* Johnston, Jour. Arnold Arb. 21: 254 (1940).

VERNACULAR NAMES: Yerba del Indio; Pimpinela.

COAHUILA: Sierra Hechiceros, Cañon Indio Felipe, *Stewart 150;* Sierra Moreno, southeast of Castillon, *Johnston & Muller 1262;* vicinity of Santa Elena, east base of Sierra Cruces, *Johnston & Muller 232, Stewart 228, 1925;* Sierra Cruces, Cañon Tinaja Blanca, *Johnston & Muller 292, Stewart 325, 574, 633;* near San José, southeast base of Sierra Cruces, *Johnston & Muller 1001;* Sierra Planchada, Cañon Gringo, *Stewart 1045;* Sierra Mojada, April 19, 1892, *Jones 52* (US); San Antonio de los Alamos, *Johnston & Muller 902;* Puerto San Lazaro, *Muller 3044;* Rancho Las Uvas, east side of Valle Acatita, *Stewart 2689;* Torreon, Feb. 1905, *Purpus 1057;* 6 mi. west of Viesca, *Johnston 7746*. CHIHUAHUA: Rancho San José del Progreso, south end of Sierra Seca, *Stewart*

2329; Rancho El Pino, southeast of Sierra Rica, *Stewart 2385;* 8 miles northwest of Cruces, *Johnston 7986* (type of var. *texana*) ; 3 mi. south of Pirámide, *Johnston 8114;* 7½ miles south of Pirámide, *Johnston 8099;* 2 miles east of El Coyote, *Johnston & Muller 1407;* Sierra Encinillas, near Fierro, *Stewart 800;* rocky hills near Chihuahua, April 1885, *Pringle 9;* west base of Sierra Santa Eulalia, *Stewart & Johnston 2107;* northwest of Chihuahua, Aug. 1, 1936, *LeSueur 601;* Rosatilla Dam east of Meoqui, *LeSueur 602;* Parral, Oct. 4, 1936, *Collins & Kempton* (US). DURANGO: Mapimi, 1898, *Palmer 540.*

I am accepting *A. Wrightii* Seem. as typified by the plant illustrated by Seemann, that is, apparently *Seemann 2175* from near Durango. This form of the species is exemplified by *Palmer 314* and *328* from central Durango, a fact I previously did not fully recognize, since I failed to realize that Seemann's illustration of his plant is several times natural size. The typical form of *A. Wrightii* from central Durango strongly suggests *A. brevipes* Benth., from Aguascalientes, but differs from true *A. brevipes,* which has uniformly cordate leaves, and from the plants of San Luis Potosi, Hidalgo, and central Mexico with lobed leaves, which possibly are forms of it, in having more elongate flowers and in having the ovary at anthesis not covered with abundant soft slender more or less reflexed hairs but with less quickly evanescent rather rigid spreading ones. The stems of *A. Wrightii* have usually rather rigid spreading hairs; the stems of *A. brevipes* and immediately related forms have the hairs more or less retrorsely ascending or appressed. The range of *A. Wrightii* is to the north and west of the area occupied by *A. brevipes.*

I have seen typical *A. Wrightii* only from central Durango. The material of *A. Wrightii* from our area and adjoining United States differs from the typical Durango plant in being distinctly more robust, having larger flowers, and, most conspicuously, having an evidently tawny usually somewhat velvety indument of hairs that are longer, more slender, and more abundant. In 1940, on the basis of inadequate material, I attempted to distinguish the material of northern Chihuahua and Texas as var. *texana.* Subsequent collecting has shown that the extreme northern plants are indistinguishable from those found elsewhere in the area of the present report. The name *A. Wrightii* var. *texana,* accordingly, can be amplified and redefined and used for all forms of *A. Wrightii* found in our area, thus permitting them to be distinguished from the typical form of *A. Wrightii* found in central Durango.

Plants representative of the amplified var. *texana* are known from northeastern Durango, eastern Chihuahua, and western Coahuila. Similar plants are known in eastern Coahuila only at Puerto San Lazaro and in the Sierra Gavia, about 75 km. south of Monclova. In Texas the plant is known from Mesa Anguila and the Chinati, Vieja, Wyile, Eagle, and Davis Mountains. It has been recently collected in the Florida Mts., in Luna County, New Mexico (*Ripley & Barneby 2486*). In our area it is commonly found about the base of cliffs or in sheltered places at the base of rocky slopes. Occasionally, however, it occurs in silty soils in the shelter of bushes on flats subject to flooding after storms. In these latter conditions

it becomes relatively luxuriant and develops leaves over 8 cm. wide. The plant is highly esteemed as a medicinal herb, and in the areas where I have seen it, it is well-known under the name "Yerba del Indio." I have seen it for sale in the market at Chihuahua and have been told that it is also for sale at Torreon.

POLYGONACEAE

Eriogonum atrorubens Engelm. in Wislizenus, Mem. Tour. No. Mex. 108 (1848).

COAHUILA: Carneros Pass area, July 1880, *Palmer 1175*.

Ranging in the mountains, pine and juniper belts, of Nuevo Leon and adjacent Coahuila, and in northern Durango and western Chihuahua north to extreme southwestern New Mexico. The type was collected near Cusihuiriachic, Chihuahua.

This and the following three species have dark-colored, purple or maroon flowers. The remaining species have pale yellow to whitish corollas frequently more or less stained with red or purple.

Eriogonum hemipterum Torr. ex Stokes, Gen. Eriogonum 21 (1936).

Eriogonum hieracifolium var. *hemipterum* Torr. & Gray, Proc. Am. Acad. 8: 154 (1870).

Eriogonum hieracifolium f. *atropurpureum* Standl. Field Mus. Publ. Bot. 11: 149 (1936); Mueller, Trans. Texas Acad. 20: 16 (1937).

COAHUILA: Sierra del Carmen, Aug. 14, 1936, *Marsh 660*.

Known only from the Chisos Mts., Texas, and, to the southeast, in adjoining Coahuila, in the northern Sierra del Carmen. The type was collected by Parry on "Hillsides, along the cañons of the Rio Grande, above the mouth of the Pecos," probably near Boquillas Canyon.

Eriogonum hemipterum Torr. var. **griseum** var. nov.

A varietate typica differt foliis subtus dense et abundanter tomentosis.

COAHUILA: Central parts of the Sierra del Pino, near the old log-slide, dry margins of pine forests, erect, 1–3 ft. tall, fl. maroon, 1940, *Johnston & Muller 547* (TYPE, Gray Herb.); near Cañon Ybarra, central Sierra del Pino, dry slopes, fl. red, *Stewart 1249*; Sierra de los Pinos, Dec. 1937, *LeSueur 1533*. CHIHUAHUA: Valley on high northwest end of Sierra Diablo, grassy meadow, not common, erect, fl. dark red, 1941, *Stewart 968*.

This plant, known only from the cited material, differs from typical *E. hemipterum* only in the very abundant grayish felt-like indument on the lower surfaces of its leaves and in the slightly more copious indument of more slender hairs on other parts of the plant.

Eriogonum rupestre Stokes, Gen. Eriogonum 21 (1936).

VERNACULAR NAME: Yerba colorado.

CHIHUAHUA: Sierra Encinillas, 8 km. east of Fierro, rocky hillside, not common, fl. red, *Stewart 760*.

The type and only other known collection of this species was obtained by Pringle (no. *285*) on Sept. 28, 1885, in the hills northeast of Chihuahua. I have not seen authentic material, but Mr. Stewart's plant agrees well with the original description. The species is related to *E. atrorubens*, from which it differs only in its hairy perianth. It may be only a variety of that species ranging on the volcanic hills of eastern Chihuahua.

Eriogonum ciliatum Torr. Bot. Mex. Bound. 175 (1859).

COAHUILA: Buena Vista, fl. dark purple, May 19, 1849, *Gregg 83;* mountains 6 mi. east of Saltillo, July 1880, *Palmer 2088;* San Lorenzo Canyon, southeast of Saltillo, scattered on grassy mesas, not common, fl. bright maroon, Sept. 1904, *Palmer 385;* Carneros Pass, Sept. 4, 1889, *Pringle 2379;* north end of Carneros Pass, 1–3 ft. tall, fl. brownish purple, *Johnston 7287;* 4 km. east of Fraile, mountain-side, fl. purple, *Stanford et al. 359.*

Ranging from southeastern Coahuila and northern Nuevo Leon south to northern San Luis Potosi and southern Tamaulipas. The original material of the species was collected on "sandy soil near Buena Vista" by Edwards and "near Monterey" by Gregg.

Eriogonum Greggii Torr. & Gray, Proc. Am. Acad. 8: 187 (1870).

Eriogonum ciliatum var. *foliosum* Torr. Bot. Mex. Bound. 175 (1859).

COAHUILA: Rancho Santa Teresa, south of Castaños, *Wynd & Mueller 181;* Puerto San Lazaro, open grassy slopes, *Muller 3073;* Saltillo, stony hillside, May 1898, *Palmer 166;* Carneros Pass area, March 1880, *Palmer 1176;* high plain near San Juan de la Vaqueria, fl. purplish, May 20, 1847, *Gregg 719* (TYPE); Sierra Pata Galana, March 1905, *Purpus 1151.*

Known elsewhere about Monterrey and near the Rio Grande in extreme southern Texas.

Eriogonum Abertianum Torr. in Emory, Notes Military Recon. 151 (1848).

Eriogonum pinetorum Greene, Muhl. 6: 3 (1910).

Eriogonum Abertianum var. *neomexicanum* Gand. Compt. Rend. Soc. Bot. Belg. 42: 196 (1906).

Eriogonum Abertianum var. *ruberrimum* Gand. l. c.

CHIHUAHUA: Near Lake Santa Maria, 1899, *Nelson 6395.*

This is a species ranging in northwestern Chihuahua (Casa Grandes, Col. Juarez, and Carretas), Sonora, Arizona, and western New Mexico. It is a slender erect plant, usually simple below but with forking cymose-paniculate branches above the middle. Its range approaches that of the more eastern and southern *E. cyclosepalum,* a species confused with it, only in northwestern Chihuahua and in the Rio Grande Valley near El Paso.

Eriogonum Abertianum var. **villosum** Fosb. Madroño 4: 191 (1938).

This plant has been collected near El Paso, Texas (Jones, Thurber). Doubtless it occurs in adjacent Chihuahua. The collection distributed by Gray as *Wright 1762* is a mixture of typical *E. cyclosepalum* and *E. Abertianum* var. *villosum* and is composed of material collected by Charles Wright on March 21, 1852, in the Rio Grande Valley south of the Quitman Mts., and on April 19, 1852, on the "foothills towards Lake Santa Maria." Of this mixture I suspect that the latter Chihuahuan material is that representing *E. Abertianum* var. *villosum.*

I am unable to determine whether var. *villosum* is merely a vernal phase of *E. Abertianum* or perhaps even a distinct species. It has roughly the same distribution as *E. Abertianum,* but it appears to be a much coarser, more hairy, and more spreading plant with coarser more-flowered involucres and more elongate peduncles. It rarely shows the forking open branching of true *E. Abertianum,* and its leaves are thicker and never so strongly reduced up the stem. Var. *villosum* strongly suggests the vernal forms

of *E. cyclosepalum* but is quickly distinguished by its very elongate peduncles, smaller paler flowers, and short involucre-lobes.

Eriogonum cyclosepalum Greene, Muhl. 6: 1 (1910).
Eriogonum lappulaceum Greene, Muhl. 6: 2 (1910).
Eriogonum Abertianum subsp. *lappulaceum* Stokes, Gen. Eriogonum 37 (1936).
Eriogonum Abertianum var. *cyclosepalum* Fosb. Madroño 4: 192 (1938).
Eriogonum Abertianum var. *lappulaceum* Fosb. Madroño 4: 193 (1938).
Eriogonum Abertianum var. *bracteatum* Fosb. Madroño 4: 192 (1938).

COAHUILA: Between Santo Domingo and Piedra Blanca, *Wynd & Mueller 495;* Picachos Colorados, *Johnston & Muller 126;* south base of Sierra Hechiceros, near El Tule, *Stewart 538;* Castillon, *Stewart 386;* near Santa Elena, *Stewart 309;* Cañon Tinaja Blanca, Sierra Cruces, *Stewart 580, 2258;* near Norias, 24 mi. north of Esmeralda, *Johnston & Muller 333;* valley west of Bufido, *Johnston & Muller 845a;* 3 mi. west of San Antonio de los Alamos, *Johnston & Muller 860.* CHIHUAHUA: 5 mi. southeast of San Carlos, *Johnston & Muller 85;* 4 km. south of Rancho Hechiceros, *Stewart 213;* road to Chihuahua, south of Carrizal, Aug. 21, 1846, *Wislizenus 127;* near Chihuahua, 1908, *Palmer 25;* plain near silver mill, Chihuahua, Aug. 4, 1885, *Pringle 681;* 11 mi. northeast of Camargo, *Johnston 7891;* 3 mi. west of Piloncillo, *Johnston 7859.*

Frequent in valleys and foothills, in silty or sandy soils. Growing among grass, under bushes, or in bare open places. The plant ranges from trans-Pecos Texas south through Coahuila and eastern Chihuahua to San Luis Potosi. In the past it has been confused with the more northerly and western *E. Abertianum,* but it may be readily distinguished by its more compact lower growth-habit, its strict usually rather numerous stems bearing racemosely disposed involucres, its elongate involucre-lobes, and its slightly larger yellow or yellowish more or less conspicuously red-tinged perianth-lobes.

In his recent study of this group Fosberg treated our plants as varieties of *E. Abertianum,* referring the vernal forms to var. *cyclosepalum* and the summer phases to var. *bracteatum.* I do not believe such seasonal forms merit nomenclatorial recognition. Fosberg's *E. Abertianum* var. *Gillespiei* is a plant of Maricopa and Pinal Counties, Arizona, which appears to be an outlying isolated population related much more closely to *E. cyclosepalum* than to *E. Abertianum* and which I believe should be called **E. cyclosepalum** var. **Gillespiei** (Fosb.) comb. nov.

Eriogonum annuum Nutt. Trans. Am. Philos. Soc. 5: 164 (1837).

CHIHUAHUA: Dunes south of Salamayuca, Sept. 20, 1886, *Pringle 798;* Los Medanos, 1935, *LeSueur 414;* near Carrizal, sandhills, Aug. 18, 1846, *Wislizenus 104;* sandhills near Cantarrecio, Oct. 1852, *Thurber 819.*

A plant of sandy soils, ranging from northern Chihuahua north to the central United States.

Eriogonum polycladon Benth. in DC. Prodr. 14: 16 (1856).

CHIHUAHUA: 5 km. north of Escobillas, rocky slopes, frequent, fl. reddish, *Stewart 2373;* Chihuahua, ex herb. Scheer [*Potts*].

Arizona to trans-Pecos Texas (Davis Mts.) and south into Chihuahua and Sonora. The species has been collected repeatedly in the highlands of western Chihuahua and northern Sonora. Pringle is listed as having collected the species near Chihuahua (no. *644*). Potts' material may have come from near Chihuahua City or from the mountains to the west. Mr.

Stewart's collection comes from the extreme northeastern part of the state.

Eriogonum rotundifolium Benth. in DC. Prodr. 14: 21 (1856).

VERNACULAR NAME: Chuchaca.

COAHUILA: 10 km. west of San Guillermo, tobosa flat, fl. white, *Stewart 1762;* 9 km. south of El Tule, south base of Sierra Hechiceros, dry hillside, fl. white, *Stewart 451;* Picacho Noche Buena, lava-strewn slope, *Johnston & Muller 166;* Castillon, silty arroyo at margin of gypsum flat, *Johnston & Muller 1274;* south of Laguna Leche, silty flat in somewhat saline and gypseous soil, *Johnston 8623;* near La Rosa, northwest of Saltillo, *Shreve & Tinkham 9906.* CHIHUAHUA: 3 mi. south of Providencia, silty slope, *Johnston & Muller 108;* 11 mi. west of Providencia, silty desert plain, *Johnston & Muller 104;* Rancho El Pino, about 10 km. southeast of Sierra Rica, dry sandy flat, fl. white, *Stewart 2560;* dry hills and mesas near Juarez, May 5, 1901 and Sept. 26, 1902, *Pringle 9444, 11155.*

An associate of *Larrea* on valley slopes and one showing a preference for silty, frequently somewhat gypseous soils. From our area ranging north into Arizona, New Mexico, and trans-Pecos Texas.

Eriogonum Wrightii Benth. in DC. Prodr. 14: 15 (1856).

COAHUILA: Sierra del Carmen, Sept. 7, 1936, *Marsh 806;* Puerto Colorado, crevices in sandstone, globose bush 12–18 inches tall, *Johnston 8696;* Sierra Hechiceros, Cañon Indio Felipe, creek-banks, *Stewart 110;* northern foothills of Sierra Cruces, gravelly open arroyo, bush 1 ft. tall, 2–3 ft. broad, fl. white, *Johnston & Muller 1053;* Cañon Tinaja Blanca, Sierra Cruces, sunny open slopes in upper canyon, erect, shrubby, 1–2 ft. tall, *Johnston & Muller 295.* CHIHUAHUA: 8 km. south of Rancho Hechiceros, in arroyo, fl. white, *Stewart 216;* along Sierra Seca, 20 km. north of Rancho San José del Progreso, rocky slopes, fl. white, *Stewart 2350;* 3 mi. north of Mesteñas, dry rocky slope in canyon, *Johnston 7950;* low ridge a mile southwest of Mesteñas, rocky slope, fl. white, *Stewart & Johnston 2031.* ZACATECAS: Concepcion del Oro, 1902, *Palmer 381.*

Ranging from San Luis Potosi and Zacatecas northward and northwestward into trans-Pecos Texas, New Mexico, and Arizona. The type came from extreme western Pecos County, Texas. The plant usually grows in gravelly or rocky soils and forms an erect bushy mass a foot or more tall.

Eriogonum tenellum Torr. Ann. N. Y. Lyceum 2: 241 (1827).

Eriogonum tenellum var. *leptocladon* Benth. in DC. Prodr. 14: 20 (1856).

VERNACULAR NAMES: Chuchaca; Chacate.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 615;* Piedra Blanca, igneous hills, *Wynd & Mueller 499;* Parras, 1880, *Palmer 1173;* Cañon Indio Felipe, Sierra Hechiceros, sides of arroyo, *Stewart 159;* Sierra Cruces, Cañon Tinaja Blanca, rocky side of narrow canyon, *Johnston & Muller 267;* near Santa Elena, rocky hillside, fl. white, *Stewart 570;* San Antonio de los Alamos, crevices in volcanic tuff, *Johnston & Muller 891.* CHIHUAHUA: 14 mi. west of San Carlos, gravelly bed of arroyo, *Johnston & Muller 29;* 4 km. north of Rancho El Pino, southeast of Sierra Rica, rocky slope, fl. white, *Stewart 2424;* Sierra Virulento, rocky bench at base of sierra, *Johnston 8086;* Sierra Encinillas, near Fierro, rocky hillside, fl. white, *Stewart 766;* Los Organos, local on rocky flat, fl. white, *Stewart & Johnston 2056;* Los Organos, 1937, *LeSueur 1310;* rocky hills west of Chihuahua, April 24, 1885, *Pringle 169;* Chihuahua, stony mesas, fl. white, 1908, *Palmer 80.*

Ranging from our area northward through trans-Pecos Texas to western Oklahoma and thence westward in northern New Mexico and southern Colorado. A plant of well-drained, usually rocky or gravelly soil in exposed situations, with a rather compact multicipital caudex, basal clusters of petiolate ovate to broadly orbicular white-tomentose leaves, and naked flowering branches.

Eriogonum tenellum Torr. var. **ramosissimum** Benth. in DC. Prodr. 14: 20 (1856).

CHIHUAHUA: Sierra de los Organos, Sept. 1937, *LeSueur 2006*.

This variety has been previously known only from the igneous area of central Texas (Llano and Gillespie Counties), east of the area from which typical *E. tenellum* is known. From typical *E. tenellum* it differs in having a very much looser caudex with the small acutish ovate leaves scattered along the lower 5–15 cm. of the flowering stem. Its low usually sprawling slender growth-habit, small acutish leaves, and smaller flowers quickly distinguish it from *E. platyphyllum*. Although from far to the southwest of previously known stations of var. *ramosissimum*, LeSueur's collection from the Sierra Organos seems indistinguishable from it, as well as conspicuously different from the material of typical *E. tenellum* which has been collected in the same sierras. The variety may deserve specific rank.

Eriogonum platyphyllum Torr. ex Benth. in DC. Prodr. 14: 20 (1856).

Eriogonum tenellum var. *platyphyllum* Torr. Bot. Mex. Bound. 176 (1859).

COAHUILA: Rancho Agua Dulce, shrub-covered valley floor, 1936, *Wynd & Mueller 412;* Rancho Babia, 1938, *Marsh 1208;* Santa Anna Canyon, July 15, 1936, *Marsh 489;* Soledad, Sept. 1880, *Palmer 1174;* Sierra Guajes, Cañon Milagro, in arroyo, fl. yellowish white, *Stewart 1537;* several miles below Palos Blancos, road between Ocampo and Cuesta Zozaya, gravelly bench on open canyon-floor, *Johnston 9264*.

Ranging from our area north into the Big Bend and along the south escarpments of the Edwards Plateau (mouth of Terlingua Creek, *Havard 114;* southwest of Langtry, *Cory 19414;* 10 mi. west of Laguna, Kinney Co., *Cory 29317;* and Nueces River west of Uvalde, *Wright 618*, type). Although obviously related to *E. tenellum*, its elongate erect shrubby very leafy stems and larger flowers readily distinguish it from that more westerly ranging species.

Eriogonum Jamesii Benth. in DC. Prodr. 14: 7 (1856).

Eriogonum undulatum Benth. in DC. Prodr. 14: 7 (1856).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 616;* Sierra del Carmen, Aug. 9, 1936, *Marsh 688;* Mesa Grande, northwest of Hac. Encantada, fl. whitish, *Stewart 1650;* crest of Sierra Encantada, fl. reddish, *Stewart 1460;* betw. south end of Hillcoat Mesa and Buena Vista headquarters, July 27, 1938, *Marsh 1495;* Sierra Gloria, 1939, *Marsh 1918;* Lerios, July 1880, *Palmer 1172;* 3 km. southwest of Fraile, in arroyo, fl. white, *Stanford et al. 335;* Sierra del Pino, rocky places along high arid crest, *Johnston & Muller 554;* western escarpment of Potrero de la Mula, sunny ridge below crest, *Johnston 9242;* Sierra Madera, Cañon Pajarito, dry arroyo banks, fl. greenish white tinged with red, *Muller 3186;* Sierra Madera, Cañon Charretera, opening in oak-chaparral, rocky canyon floor, *Johnston 9004;* Sierra Hechiceros, Cañon Indio Felipe, crevices of cliffs, *Stewart 82;* Sierra Hechiceros, Cañon Madera, sunny ledges on cliffs, *Johnston & Muller 1296;* Picacho Noche Buena, lava cliffs, *Johnston & Muller 181;* Sierra Cruces, near Santa Elena, sandy arroyo, fl. white, *Stewart 311;* highest peaks of Sierra Cruces, rocky slopes, *Stewart 1143;* San Antonio de los Alamos, crevices about summit of tuff cliffs, *Johnston & Muller 951;* Sierra Parras, July 1910, *Purpus 4606;* Sierras Negras, 9 km. south of Parras, fl. white, *Stanford et al. 162;* Picacho de Jimulco, summit, *Stanford et al. 95*. CHIHUAHUA: Cañon Madera, Sierra Rica, rocky arroyo and sunny slopes, fl. white, *Stewart 2489, 2541;* Los Organos, 1937, *LeSueur 1309;* Cerro Coronel, Chihuahua, Aug. 5, 1885, *Pringle 680*. ZACATECAS: Mountains 18 km. west of Concepcion del Oro, fl. white, *Stanford et al. 568*.

Ranging from Hidalgo along the eastern Sierra Madre into our area and from thence northward to Kansas, Colorado, and Arizona. Growing in well-drained places, along arroyos, in openings in oak-chaparral, and on exposed ledges and cliffs, and varying in habit accordingly. In sheltered places it becomes 3–5 dm. tall and has large leaves frequently grayish with a thin indument on the upper surface. On exposed ledges and about cliffs it is commonly only 1–2 dm. tall and usually has a well-developed trailing woody caudex with russet shreddy bark and crowded small leaves quickly glabrous and bright green above. The various forms of this widely ranging species vary greatly in appearance but the variants are not geographically correlated and seem best dismissed as ecological forms.

Rumex hymenosepalus Torr. Bot. Mex. Bound. 177 (1859).

VERNACULAR NAME: Lengua de Vaca.

CHIHUAHUA: Near Chihuahua, rich moist soil on river bank, 1908, *Palmer 27*.

Ranging from California east to southwestern Wyoming and western Texas, and south into northern Mexico. The species was originally based upon two specimens, *Thurber 140*, from Hueco Tanks northeast of El Paso, and *Wright 1782*, from the western side of the Rio Grande in Dona Ana County, New Mexico, a short distance north of the international boundary.

Rumex altissimus Wood, Class Book ed. 2. 477 (1847).

CHIHUAHUA: Near Chihuahua, by stream, May 28, 1888, *Pringle 5540*.

Ranging in the eastern United States west to the base of the Rockies and south through Texas, New Mexico, and Arizona into northern Mexico.

Rumex mexicanus Meisn. in DC. Prodr. 14: 45 (1856).

COAHUILA: Fraile, common in valley, *Stanford et al. 275;* 3 km. southwest of Fraile, in arroyo, *Stanford et al. 329*. CHIHUAHUA: Presa de Chihuahua, 1936, *LeSueur 608*.

Widely distributed in the United States, south through Arizona and New Mexico, and along the Sierra Madre Occidental into central Mexico. I am unable to distinguish Mexican material from northern plants segregated recently as *R. triangulivalvis* (Dans.) Rech. The Coahuilan specimens cited above are in flower and lack fruit. They may possibly represent *R. Berlandieri* Meisn. of eastern Texas and eastern Mexico.

Rumex violascens Rech. Repert. Sp. Nov. 39: 171 (1936), Field Mus. Publ. Bot. 17: 131. *f. 23* (1937).

COAHUILA: Don Martin Dam, *White 1376;* San Lorenzo de la Laguna, 1880, *Palmer 1182*.

Valley of the Rio Grande along our northern limits west, in southern New Mexico and Arizona, into California, and south in Coahuila. The species was described from a large and representative suite of specimens, but no type was designated.

Rumex crispus L. Sp. Pl. 335 (1753).

VERNACULAR NAME: Lengua de Vaca.

COAHUILA: Monclova, *Marsh 1678;* Saltillo, Feb. 20, 1847, *Gregg;* Parras, 1880, *Palmer 1181*. CHIHUAHUA: Presa de Chihuahua, *LeSueur 605;* Chihuahua, common along river and ditches and in low ground, 1908, *Palmer 97, 223*.

A European plant widely established in wet soils in America. It has been repeatedly collected in the Rio Grande Valley below El Paso.

Polygonum coccineum Muhl. ex Willd. Enum. Pl. 1: 428 (1809).

CHIHUAHUA: 3 miles west of Camargo, fl. pink, *White 2269*.

Widely distributed in the United States and ranging south to Central America. The cited collection represents the forma *terrestre* Stanford, Rhodora 27: 169 (1925).

Polygonum lapathifolium L. Sp. Pl. 360 (1753).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh 761;* Sabinas River near Muzquiz, *Marsh 402*. CHIHUAHUA: Near Chihuahua, moist shady place along river, 1908, *Palmer 332*.

Widely distributed in America; apparently introduced from Europe. It appears to be generally distributed along the Rio Grande at our northern limit.

Polygonum persicarioides H.B.K. Nov. Gen. et Sp. 2: 179 (1818).

Polygonum hydropiperoides Michx. var. *persicarioides* Stanford, Rhodora 28: 27 (1926).

COAHUILA: Monclova, *Marsh 1681;* Monclova, edge of river, *White 1769;* Cañon Indio Felipe, Sierra Hechiceros, bank of creek, *Stewart 95;* south base of Sierra Hechiceros, mud at Tanque La Palma, *Johnston & Muller 1282*.

Ranging from southern California to Texas and south through Mexico to South America. The species has been collected in the Rio Grande Valley in the Big Bend.

Polygonum pensylvanicum L. Sp. Pl. 362 (1753).

CHIHUAHUA: Pond just east of Organos, growing in standing water, *Stewart & Johnston 2049*.

Widely distributed in eastern United States and south in Mexico.

Polygonum punctatum Elliot, Bot. S. Car. and Georgia 1: 455 (1817).

COAHUILA: Muzquiz Swamp, Sept. 15, 1936, *Marsh 931*. CHIHUAHUA: Rio Concho at Camargo, *White 2245*.

Widely distributed in America.

Polygonum aviculare L. Sp. Pl. 362 (1753).

COAHUILA: Saltillo, in river bottom, rare, 1898, *Palmer 570*. CHIHUAHUA: Vicinity of Chihuahua, low moist river bottom, prostrate, 1908, *Palmer 185*.

Widely distributed in America as a weed along roads and in gardens.

Polygonum ramosissimum Michx. Fl. Bor. Am. 1: 237 (1803).

Collected in the bottom-lands along the Rio Grande in El Paso (*Wright 1775*) and Hudspeth (*Waterfall 3968* and *4598*) Counties and hence, doubtless, occurring in adjacent Chihuahua. Widely distributed in the United States.

CHENOPODIACEAE

Chenopodium ambrosioides L. Sp. Pl. 219 (1753).

VERNACULAR NAMES: Hipazote; Istafiate.

COAHUILA: Sierra del Carmen, Aug. 9, 1936, *Marsh 681;* Rancho Babia, *Marsh 1213;* La Azufrosa, 3 ft. tall, scarce, 1848, *Gregg 515;* Parras, 1898, *Palmer 445;* San Lorenzo de la Laguna, 1880, *Palmer 1153*.

Widely distributed in America as a weed and a medicinal herb.

Chenopodium dissectum (Moq.) Standl. No. Am. Fl. **21**: 26 (1916).

COAHUILA: Saltillo, low places and on top of a stony mountain, odor strong, 1898, *Palmer 353.*

Ranging from Coahuila south to central Mexico.

Chenopodium graveolens Lag. & Rodr. Anal. Cien. Nat. **5**: 70 (1802).
Chenopodium incisum Poir. in Lam. Encyc. Suppl. **1**: 392 (1811).

VERNACULAR NAMES: Yerba del Zorillo; Colo de Zorillo.

COAHUILA: San Antonio de las Alanzanas, 1–2 ft. tall, scarce, Aug. 31, 1848, *Gregg 390;* Carneros Pass area, Aug. 1880, *Palmer 1150.* CHIHUAHUA: Cañon Madera, Sierra Rica, open sunny slopes, *Stewart 2459, 2502;* canyon west of Organos, along arroyo and under liveoaks, *Stewart & Johnston 2077;* Sierra Santa Eulalia, Oct. 9, 1885, *Pringle 552.*

A native species ranging from trans-Pecos Texas to Arizona and south to Central America. It is sold as a medicinal plant in the market at Chihuahua.

Chenopodium murale L. Sp. Pl. 219 (1753).

COAHUILA: Monclova, 1939, *Marsh 1728, 1842.*

A European weed widely established in America. It has been collected in the bottoms of the Rio Grande near Boquillas, Texas.

Chenopodium Fremontii Wats. Bot. King's Exped. 287 (1871).

COAHUILA: Cañon Indio Felipe, Sierra Hechiceros, abundant at base of talus-slope, *Stewart 40;* Cañon Indio Felipe, dry sandy arroyo, *Stewart 58;* north base of Sierra Cruces, dry open bed of arroyo, *Johnston & Muller 1051;* Tinaja Blanca, Sierra Cruces, sandy arroyo, not common, *Stewart 317;* Carneros Pass, shaded ravines, Sept. 11, 1889, *Pringle 2308.* CHIHUAHUA: Rio Grande, Oct. 1852, *Thurber 817.*

Widely distributed in the western United States and south into northern Mexico. Among the collections cited *Stewart 40, Pringle 2308,* and *Thurber 817* are very similar and clearly conspecific. They represent the loosely branched slender-stemmed plant with thin, green, practically glabrous leaves. Aellen, in Repert. Sp. Nov. **26**: 141 (1929), cites *Pringle 2308* and the very similar *Wright 570* (from the Rio Grande bottoms below El Paso) as *C. Fremontii.* The other collections which I have cited are much less mature, less branched, somewhat farinose, and lack mature fruit. Their difference may be caused by their immaturity. They may, possibly, be forms transitional to *C. incanum.*

In my identifications of this and the following four species I have tried to follow Aellen, using his "Beitrag zur Systematik der *Chenopodium*-Arten Amerikas," in Repert. Sp. Nov. **26**: 31–64, 119–160 (1929), and the "Key and Synopsis of the American Species of Chenopodium" by Aellen & Just, in Am. Midl. Nat. **30**: 47–76 (1943). The material from the area is scanty and much of it without mature fruits, and very many specimens must be collected and studied before our species can be satisfactorily identified, if, indeed, that will ever be possible in this complex genus.

Chenopodium incanum (Wats.) Heller, Pl. World **1**: 23 (1897).

CHIHUAHUA: Vicinity of Chihuahua, old fields and waste places, 1908, *Palmer 342.*

According to Aellen, Repert. Sp. Nov. **26**: 144 (1929), the species

ranges in the western United States and south to Zacatecas. He cites the collection of Palmer listed above, as well as a collection of Mearns from White Water on the international boundary in northwestern Chihuahua.

Chenopodium arizonicum Standl. No. Am. Fl. 21: 19 (1916).

COAHUILA: San José, southeast base of Sierra Cruces, basalt hill, rocky slope, *Johnston & Muller 982a;* San Antonio de los Alamos, flats on summit of tuff cliffs, *Johnston 8260;* Parras, 1880, *Palmer 1151.*

Aellen, Repert. Sp. Nov. 26: 120 (1929), cites material of this species from Utah, Arizona, and northern Mexico. He cites *Palmer 310* (1902), from Saltillo, and *Palmer 1151,* which I have cited above. The other collections from Coahuila which I have listed are similar to *Palmer 1151.* The plant suggests a xerophytic form of *C. incanum* with small scarcely angular leaves.

Chenopodium pratericola Rydb. Bull. Torr. Bot. Cl. 39: 310 (1912); Aellen, Ostenia 99 (1933).

Chenopodium petiolare var. *leptophylloides* Murr, Bull. Herb. Boiss. II. 4: 994 (1904).

CHIHUAHUA: Near Ortiz, May 26, 1888, *Pringle 1992* (isotype of *C. petiolare* var. *leptophylloides*).

Widely distributed in the western United States according to Aellen, Repert. Sp. Nov. 23: 134 (1929).

Chenopodium leptophyllum Nutt. ex Wats. Proc. Am. Acad. 9: 94 (1874); Aellen, Ostenia 99 (1933).

Chenopodium inamoenum Standl. No. Am. Fl. 21: 15 (1916), Bull. Torr. Bot. Cl. 44: 413 (1917).

The type of *C. inamoenum,* which Aellen identifies with the true *C. leptophyllum,* was collected by Mearns near White Water, near the international boundary, in northwestern Chihuahua. Similar plants have been collected in the bottom-lands of the Rio Grande below El Paso.

Meiomeria stellata (Wats.) Standl. No. Am. Fl. 21: 7 (1916).

Chenopodium stellatum Wats. Proc. Am. Acad. 18: 146 (1883).

COAHUILA: Mountains 21 mi. northeast by north of Monclova, Sept. 1880, *Palmer 1155* (TYPE); saline soil on flats 4 mi. west of Cuatro Cienegas, *Johnston 7134;* saline gypsum flat on slope east of Lag. Jaco, *Stewart & Johnston 1956.*

An endemic genus known only from the collections cited. It is a small erect annual herb 1–10 cm. tall, extremely succulent, and abundantly floriferous from the base upward. The plant is simple or, more commonly, with few to many ascending or rarely somewhat decumbent branches from the base. At the two localities where I have seen this plant it grew most abundantly on Upper Cretaceous beds along the contact of gypsum and saline clays. It appears to be a halophytic gypsophile. From the distance and directions given on Palmer's label (data frequently very inaccurate), the type may have been collected near Hermanas, an area where this plant can very well be expected.

Cycloloma atriplicifolium (Spreng.) Coulter, Mem. Torr. Bot. Cl. 5: 143 (1894).

CHIHUAHUA: Los Medanos, Oct. 1935, *LeSueur 383.*

Sandy places in the middle United States south to Arizona and Texas and

into adjoining Mexico. The plant has been collected on the Texan side of the Rio Grande at Santa Helena Canyon.

Atriplex canescens (Pursh) Nutt. Gen. Pl. 1: 197 (1818).

VERNACULAR NAMES: Costilla de Vaca; Saladillo; Chamizo; Cenizo; Huele de Noche.

COAHUILA: Rio Grande Valley near Piedras Negras, April 24, 1900, *Pringle 8298;* vicinity of Encantada Ranch and eastward to the escarpment, July 30, 1938, *Marsh 2263*; west slopes of Sierra del Carmen northeast of Hac. Encantada, arroyo-bank, shrub 15 dm. tall, *Stewart 1557;* Valle de los Guajes, common on grassy flat, shrub 15 dm. tall, *Stewart 1326;* valley near Flores, north of Cuatro Cienegas, in mesquite forest, rare, *Johnston 8876;* Cuatro Cienegas, *Marsh 2025, 2051, 2067;* salt-lands 3 mi. south of Cuatro Cienegas, shrub 2 m. tall, *White 1918;* valley near Mesillas, 2–5 ft., abundant, *Gregg 522;* Saltillo, three plants only, 2½ ft. tall, Sept. 1898, *Palmer 298, 303;* south of Fraile, shrub 3–6 ft., slopes, *Johnston 7319;* La Ventura, *Nelson 3905, 3924;* Cañon Ybarra, Sierra del Pino, arroyo-banks, *Stewart 1915;* east base of Sierra Cruces, 10 km. north of Santa Elena, shrub 10–15 dm. tall, fairly common, *Stewart 395;* 15 km. south of Puerto de San José, rocky hillside, 1–2 m. tall, *Stewart 842;* northwestern end of Sierra Planchada, common on tobosa-flat, shrub 15 dm. tall, *Stewart 1015;* Laguna de Leche, shrub 2 ft. tall, *Muller 3286;* Noria de San Juan, southeast of Laguna Rey, saline flat, 1 m. tall, *Stewart 3007;* 30 mi. south of Sierra Mojada, *Wynd 762, 772;* Parras, June 1880, *Palmer 1163;* plains east of Parras, April 11, 1847, *Gregg;* San Lorenzo de la Laguna, May 1880, *Palmer*. CHIHUAHUA: South end of Sierra Seca, 5 km. south of Rancho San José del Progreso, shrub 1 m. tall, *Stewart 2308;* near Lake Santa Maria, shrub 2–3 ft. tall, *Nelson 6410;* north of the Sand Dunes, *LeSueur 282;* road to Camargo, 33 mi. north of Jimenez, shrub 15 dm., *White 2183;* 9 mi. north of Escalon, shrub 1 m. tall, *White 2071*. DURANGO: Andabazo Creek, May 7, 1847, *Gregg;* plains near Pasaje, *Shreve 9121*. ZACATECAS: Cedros, near cultivated ground, *Kirkwood 37, 39, 50*.

A widely distributed shrub in the western United States; in all parts of trans-Pecos Texas, but in central Texas extending south to the escarpments of the Edwards Plateau. Ranging south through our area to San Luis Potosi. I have seen no material from Tamaulipas or Nuevo Leon. An unobtrusive but widely distributed shrub in Coahuila. It is most common in silty soils, particularly about mogotes, on valley slopes, but it is also frequent along arroyo banks in the lower canyons. In the volcanic grassy areas of eastern Chihuahua it is much less common.

Atriplex prosopidum Johnston, Jour. Arnold Arb. 24: 227 (1943).

COAHUILA: 10 mi. north of Cuatro Cienegas, *Wynd 742, 744;* south of El Oso, rounded bush 2–3 ft. tall, *Johnston 8877* (TYPE); near Flores, globose bush 1–4 ft. tall, abundant, with *Suaeda,* in mesquite forest, *Johnston 8875;* 12 mi. north of Monclova, bush 3–4 ft. tall, mesquite-covered valley floor, *Johnston 7187*.

Known only from the collections cited above. A plant of silty, somewhat saline and gypseous valley soils. Growing with *Prosopis glandulosa* and usually in company with *Suaeda*. A relative of *A. canescens,* from which it differs in selection of habitat, indument, form of growth, color of herbage, shape of leaves, and size and shape of fruiting bracts.

Atriplex obovata Moq. Chenop. Enum. 61 (1840).

Atriplex Greggii Wats. Proc. Am. Acad. 9: 118 (1874).

COAHUILA: Perros Bravos, 1 ft. tall, abundant, Sept. 20, 1848, *Gregg 462* (type of *A. Greggii*); valley 8 mi. north of Avalos, saline flats, common, shrub 6–15 inches tall, *Johnston 7341;* 12 mi. north of La Ventura, local, alkaline flat, shrub 12–18 in. tall, *Johnston 7649;* Llano de Guaje, flats near Tanque La India, common, erect globose

bush 6–18 in. tall, *Johnston & Muller 779;* valley floor 3–4 mi. east of Puerto Caballo, frequent, *Johnston 8318;* Laguna de Leche, flats about lake, globose bush 1–2½ ft. tall, *Johnston 8598;* bottom of large valley southeast of Zacatosa, frequent, erect globose bush 10–18 inches tall, *Johnston 8645;* bottom of valley between La Vibora and Matrimonio, common, globose bush 6–24 inches tall, *Johnston 9331;* 2 mi. west of San Vicente, saline gypseous slopes east of Laguna de Jaco, bush 2–4 dm. tall, fairly common, *Stewart & Johnston 1967;* saline flats at southeastern end of Laguna de Jaco, common bush, globose, up to 16 inches tall, *Johnston & Muller 1083, 1084, 1086.* CHIHUAHUA: Barreal, north of Jaco, saline flats, 2–3 dm. tall, *Stewart 669;* north of Sand Dunes, 1935, *LeSueur 281.* ZACATECAS: Cedros, *Lloyd 83, 132.* DURANGO: 3 mi. northeast of Bermejillo, somewhat saline soil on flats, shrub 6–30 inches tall, *Johnston 7784.* SAN LUIS POTOSI: 2 mi. northwest of Cedral, saline flats, 6–12 inches tall, *Johnston 7598, 7599;* San Vicente, *Shreve 9351;* Hacienda del Salada, about 55 km. north-northwest of Cedral, Dec. 24–25, 1827, *Berlandier 1346* (ISOTYPE).

Ranging from northern San Luis Potosi north through Coahuila and eastern Chihuahua to the valley of the Rio Grande. The type was collected in extreme northern San Luis Potosi. I have listed all the collections of this species which I have seen from Mexico. In Texas the plant has been collected on Tornillo Creek, Chisos Area (*Havard 103*), and near old Fort Quitman (*Cory 31039*). The plant from the vicinity of El Paso and west to southeastern Arizona, usually referred to *A. obovata,* is a greener more slender plant and at least varietally distinct from our Mexican species.

This species grows on evidently saline and gypseous soils, in the company of marked halophytes such as *Suaeda* and *Allenrolfea,* and also on the periodically flooded and desiccated flats on valley-bottoms, where marked halophytes and surface signs of high gypsum and salt contents are absent. In Coahuila *A. obovata* frequently associates with either *A. acanthocarpa* or *A. Stewartii.* It is usually a small rounded bush 2–5 dm. tall. Rarely it reaches a meter in height.

Atriplex acanthocarpa (Torr.) Wats. Proc. Am. Acad. 9: 117 (1894).

VERNACULAR NAME: Quelito.

COAHUILA: Perros Bravos, 3 ft. tall, abundant, Sept. 20, 1848, *Gregg 459;* valley 8 mi. north of Avalos, saline flats, slender shrub 1–3 ft. tall, common, *Johnston 7334, 7335, 7342;* silty plain 20 mi. west of Saltillo, common, decumbent or sprawling, 6–30 inches high, *Johnston 7666;* desert 48 mi. west of Saltillo, saline flats, decumbent, 6–24 inches high, common, *Johnston 7695;* 5 mi. north of Parras, saline flat, *Johnston 7702;* San Lorenzo de la Laguna, May 1880, *Palmer 473;* near Horizonte, *Wynd 773;* Torreon, alkaline areas on plains, about 2 ft. tall, 1898, *Palmer 473;* Bolson de Mapimi [near the Nazas between San Sebastian and San Lorenzo], dry valleys, common, May 11, 1847, *Gregg;* 5 mi. west of Viesca, moderately saline slope, decumbent or clambering, *Johnston 7738.* CHIHUAHUA: Lake Santa Maria, *Nelson 6409;* 8–14 mi. south of Ojinaga, saline and gypseous flats, globose bush 1–3 ft. tall, common, *Johnston & Muller 1447.*

A plant becoming 1–3 ft. tall with usually sprawling or loosely decumbent stems. Frequently clambering in bushes. Usually associated with *A. obovata* and commonly frequenting obviously saline as well as gypseous soils. Frequently associated with *Suaeda.* Included in the species are a group of more or less geographical races which have not been named. These range in southeastern Arizona, southern New Mexico, along the Rio Grande Valley in trans-Pecos Texas, and southern Texas, and thence south into Tamaulipas and through our area into northern Zacatecas and

northeastern Durango. *Atriplex Pringlei* Standl., of northern and eastern San Luis Potosi, is the southernmost member of this complex. The typical forms of *A. acanthocarpa,* growing in the valley of the Rio Grande above the Big Bend, are more shrubby and apparently more erect and have firmer broader less lobed paler leaves than the plant of southern Coahuila. The plant of southern Texas has very slender stems and narrower, thinner, greener, nearly entire leaves. In the middle western parts of Coahuila *A. acanthocarpa* appears to be replaced by the closely related *A. Stewartii.* The northern limit of *A. acanthocarpa* has not been established in Durango and southern Coahuila. The species will doubtless be found in the saline valleys of northeastern Chihuahua north of the Conchos, when that area is explored.

Atriplex Stewartii Johnston, Jour. Arnold Arb. 22: 110 (1941).

COAHUILA: Llano de Guaje near Tanque La India, common about margin of flats, erect bush up to 18 inches tall, *Johnston & Muller 781;* Llano de Guaje, near Tanque La India, growing among low bushes and partially supported by them, stems 3 ft. long, *Johnston & Muller 785;* Llano de Guaje, edge of flats 10 km. east of Tanque La India, erect bush, common, *Stewart 1174, 1175;* margin of Llano de Guaje at base of Lomas del Aparejo about 3 mi. south of Tanque Aparejo, abundant, erect, 10–16 inches tall, *Johnston & Muller 777* (TYPE); Laguna de Leche, flats about lake, 1–3 ft. tall, frequent, much browsed, *Johnston 8592, 8594;* near Tanque La Palma, several miles south of Laguna Leche, common on silty flats, 6-12 inches tall, *Johnston 9331;* bottom of large valley southeast of Zacatosa, common on silty flats, *Johnston 8646, 8647, 8648;* silty flats in valley between La Vibora and Matrimonio, erect or somewhat sprawling, 6–12 inches tall, *Johnston 9332;* flats west of Americanos, common, *Johnston 9387A–D.*

Endemic to our area. A plant of heavy silty valley soils subject to periodic floodings and droughts, and usually associated with *A. obovata.* I have not observed the plant in the company of marked halophytes, such as *Suaeda,* nor in soils that are evidently saline. It is frequently erect but commonly is decumbent or sprawling or scrambling in low bushes, and is rarely more than 3–4 dm. tall. It is usually much more browsed than its companion species, *A. obovata.*

The plant has the growth-habit and vegetative characters of *A. acanthocarpa,* but differs from that related species in having the fruit regularly 4-winged rather than covered with irregularly arranged appendages. It replaces *A. acanthocarpa* in western middle Coahuila. How the species behaves as it approaches the area in which *A. acanthocarpa* grows is unknown. Unfortunately I have no good fruiting material of these plants from such strategic areas as Cuatro Cienegas, Laguna del Rey, Laguna Palomas, Valle Acatita, or Valle de las Delicias. I have one fruiting specimen from the saline flats 4 miles west of Cuatro Cienegas (*Johnston 7136*), which possibly may be referable to *A. Stewartii,* though this seems doubtful. The habitat near Cuatro Cienegas is very saline and more in accord with the known soil preference of *A. acanthocarpa.*

Atriplex reptans Johnston, Jour. Arnold Arb. 22: 111 (1941).

COAHUILA: Saline gypseous flat east of Laguna del Jaco, locally abundant, *Johnston & Muller 1080, 1081* (TYPE), *Stewart & Johnston 1975.* SAN LUIS POTOSI: Santo Domingo, 1934, *Lundell 5584.*

A species known only from the two localities cited above. A creeping perennial with very small crowded opposite leaves. At the type locality, on the slope east of Lake Jaco, 3 miles west of San Vicente, the plant is locally abundant on a gypsum flat which catches the drainage flowing down the slope over extensive exposures of saline and gypseous clays.

Atriplex monilifera Wats. Proc. Am. Acad. 9: 111 (1874).
Endolepis monilifera Standl. No. Am. Fl. 21: 73 (1916).

VERNACULAR NAME: Quelito.

COAHUILA: Dried up lake-bed in Bolson de Mapimi, April 13, 1847, *Gregg* (TYPE); Laguna de Viesca, alkaline soil about lake-bed, *Johnston 7732*.

A very distinct endemic annual species. The type was collected about the south margin of Laguna de Mayran.

Atriplex abata Johnston, Jour. Arnold Arb. 21: 67 (1940).

COAHUILA: 11 miles north of La Ventura, common locally on alkaline flat, prostrate, *Johnston 7648*. SAN LUIS POTOSI: San Miguel, alkaline flat, prostrate, *Johnston 7617* (TYPE).

A prostrate annual species related to *A. elegans*. It is known only from the stations cited above in southern Coahuila and adjoining northern San Luis Potosi.

Atriplex argentea Nutt. Gen. Pl. 1: 198 (1818).
Atriplex expansa Wats. Proc. Am. Acad. 9: 116 (1874).

CHIHUAHUA: Juarez, valley of the Rio Grande, Sept. 8, 1888, *Pringle 1996*.

A weedy annual species widely distributed in the western United States.

Atriplex elegans (Moq.) Dietr. Synop. 5: 537 (1852).
Obione elegans var. *radiata* Torr. Bot. Mex. Bound. 183 (1859).

CHIHUAHUA: Plains near Chihuahua, Aug. 28, 1885, *Pringle 670;* Rio Santa Maria east of Corralitos, Aug. 1852, *Thurber 715*.

Ranging from western Texas to California and south into Sonora and Chihuahua. It has been repeatedly collected on the Texan bank of the river in the Rio Grande Valley below El Paso.

Atriplex texana Wats. Proc. Am. Acad. 9: 113 (1874).
Obione elegans var. *tuberculosa* Torr. Bot. Mex. Bound. 133 (1859).

COAHUILA: 4 mi. southwest of Hermanas, saline flats south of Rio Salado, *Johnston 7075;* Cuatro Cienegas, 1939, *Marsh 2040;* 9 mi. east of Cuatro Cienegas, saline soil near road, *Johnston 7106*.

Extending westward into our area from southern Texas.

Atriplex muricata Humb. & Bonpl. ex Willd. Sp. Pl. 4: 959 (1806).
Atriplex glomerata Wats. ex Standl. No. Am. Fl. 21: 54 (1916), Bull. Torr. Bot. Cl. 44: 424 (1917).

VERNACULAR NAME: Quelitillo.

COAHUILA: Castillon, prostrate mats about corrals, *Johnston & Muller 1272;* Cuatro Cienegas, 1939, *Marsh 2015;* 7 mi. south of Hipolito, heavy soil on desert plain, *Johnston 7244;* Saltillo, Sept. 1898, *Palmer 290;* Parras, April 1880, *Palmer 1156* (isotype of *A. glomerata*); La Punta, 6 mi. south of Fraile, silty valley bottom, *Johnston 7321*. ZACATECAS: Between San Tiburcio and Cardona, valley floor, *Johnston 7369*.

Extending north into our area from central Mexico. A prostrate plant with dentate oblanceolate leaves.

Atriplex semibaccata R. Br. Prodr. 406 (1810).

COAHUILA: Saltillo, roadside, 1939, *Frye & Frye 2496.*

An Australian species, first introduced as a forage plant and now widely established from California to Texas.

Eurotia lanata (Pursh) Moq. Chenop. Enum. 81 (1840).

COAHUILA: Carneros Pass area, July 1880, *Palmer 1164;* valley just southwest of Carneros Pass, frequent bush 1–3 ft. tall, valley floor, *Johnston 7300;* 10 mi. south of Carneros Pass, common bush in valley, 2–3 ft. tall, *Johnston 7652;* between Agua Nueva and Encarnacion, shrub 5 ft. tall, Dec. 15, 1848, *Gregg 560.*

This shrub has been collected in the high country of northern Chihuahua but otherwise is known from Mexico only in the valleys just south of Carneros Pass. Our plants belong to var. *subspinosa* (Rydb.) Kearney. It is widely distributed in the western United States.

Bassia hyssopifolia (Pallas) Kuntze, Rev. Gen. 1: 547 (1891).

An Asiatic herb now widely established in trans-Pecos Texas and southern New Mexico. It has been collected along the Rio Grande above and below El Paso and is most certainly to be expected in adjoining northern Chihuahua.

Corispermum nitidum Kit. in Schultes, Oesterr. Fl. ed. 2. 1: 7 (1814).

CHIHUAHUA: Los Medanos, 1935, *LeSueur 285;* Cantarrecio, Oct. 1852, sand hills, *Thurber 811.*

Widely distributed in sandy places in the middle United States and south to Texas and Arizona.

Allenrolfea occidentalis (Wats.) Kuntze, Rev. Gen. 2: 546 (1891).

COAHUILA: Cuatro Cienegas, *Marsh 2077;* 3 mi. south of Cuatro Cienegas, low shrub on salt-lands, *White 1915;* 4 mi. west of Cuatro Cienegas, abundant bush 1–4 ft. tall on saline flats, *Johnston 7139;* Laguna de Jaco, succulent usually decumbent bush becoming 4 ft. tall, salt flats at south end of lake, *Johnston & Muller 1084;* Laguna del Rey, common on saline flats, 1 dm. tall, *Stewart 3024;* Parras, 1880, *Palmer 1166;* Laguna Viesca, 7 mi. northeast of Viesca, shrub 4–7 ft. tall on saline flat, *Johnston 7733;* just west of Viesca, saline soil, decumbent, 12–16 inches tall, locally abundant, *Johnston 7737.*

A leafless very succulent bush growing only in very saline soils with a perennial source of subsurface water. Widely distributed in the western United States. The plant has been collected in the Rio Grande Valley below El Paso and is doubtless present also in northern Chihuahua.

Suaeda mexicana Standl. Field Mus. Publ. Bot. 4: 203 (1929).

COAHUILA: 3 mi. west of Cuatro Cienegas, saline flat, 1–4 ft. tall, *Johnston 7127;* 1 mi. west of Anteojo, west of Cuatro Cienegas, gypsiferous saline clays near foot of gentle slope, plant erect, pale green, 1–3 ft. tall, *Johnston 8870;* Cuatro Cienegas, 1937, *Marsh 2071;* salt-lands 3 mi. south of Cuatro Cienegas, 1939, *White 1917.* SAN LUIS POTOSI: Hacienda Angostura, alkaline plain near San Bartolo Station, July 15, 1891, *Pringle 3788* (ISOTYPE).

A glabrous pale green plant 1–4 ft. tall, mostly branched at the base and with numerous erect elongate stems. It appears to be a halophytic gypsophile. It is one of a number of species known from the saline gypseous plains near Cuatro Cienegas and elsewhere only from the similar habitats on Hacienda Angostura in eastern San Luis Potosi.

Suaeda jacoensis Johnston, Jour. Arnold Arb. 24: 228 (1943).

COAHUILA: Salt-flats at southeast end of Laguna de Jaco, frequent, light green, erect, none seen over 1 ft. tall, *Johnston & Muller 1087;* Laguna de Jaco, salt flats at southeast end of lake, fairly common, erect, 1–3 dm. tall, *Stewart & Johnston 1975* (TYPE), *1976*.

A plant less than 1 ft. tall, with numerous subsimple slender stems arising from a branched base. The root may become coarse, woody, and obviously long-persistent, but most of the plants seen appeared to be annuals. The species is related to *S. mexicana,* from which it differs in shorter more slender usually purplish and somewhat verrucose stems and irregularly cristate and keeled mature calyx-lobes. It grows in somewhat gypseous very saline soil and is known only from the type-locality.

Suaeda Palmeri (Standl.) Standl. Field Mus. Publ. Bot. 8: 10 (1930).

Dondia Palmeri Standl. No. Am. Fl. 21: 91 (1916).

VERNACULAR NAMES: Saladillo; Jaboncillo.

COAHUILA: Hermanas, 1939, *Marsh 1641;* 4 mi. west of Cuatro Cienegas, common bush on saline flats, erect, 1–3 ft. tall, *Johnston 7138;* Divisadero, about 11 mi. west of Cuatro Cienegas, a common bush on flats and on the long gentle slopes nearly up to the base of the mountains, confined to saline gypseous clays, *Johnston 8864;* near Cienega Grande, May 18, 1847, *Gregg;* 3 km. southeast of Las Margaritas, Valle Delicias, common on flats, 1 m. tall, *Stewart 2950;* Parras, June 1880, *Palmer 1168* (ISOTYPE); 4 mi. north of Peña, alkaline valley-slope, dense bush, 2–4 ft. tall, *Johnston 7719;* valley 8 mi. north of Avalos, saline flats, common bush, 3–5 ft. tall, *Johnston 7339*. ZACATECAS: Cedros, 1908, *Lloyd 133*.

A bush 1–5 ft. tall, with a woody base and at times a small trunk and distinctly ligneous twiggy ascending branches. It is frequently a common shrub over large areas, and where it has been seen it is characteristic of silty saline and gypsiferous soils. It is not an ordinary halophyte and is not confined to flats where soil moisture is readily available. It is frequently very common on dry silty slopes and in dry valleys below exposures of Upper Cretaceous shales and clays.

Suaeda nigrescens Johnston, Jour. Arnold Arb. 24: 228 (1943).

COAHUILA: 4 mi. southwest of Hermanas, saline flats south of the Rio Salado, *Johnston 7074;* valley 8 mi. north of Avalos, saline flats, *Johnston 7340;* 12 mi. north of La Ventura, common on saline flats, bush 1–2 ft. tall, *Johnston 7650* (TYPE).

Saline flats of eastern Coahuila south to northern San Luis Potosi. A dark green plant with slender much branched decumbent or ascending stems. The branchlets are covered with a minute brownish pubescence.

Suaeda nigrescens var. **glabra** Johnston, Jour. Arnold Arb. 24: 229 (1943).

COAHUILA: Laguna del Rey, saline flats, common, *Stewart 3023;* about 30 mi. south of Sierra Mojada, 1937, *Wynd 771*. CHIHUAHUA: Meoqui, 1935, *LeSueur 197*.

Ranging from western Coahuila and eastern Chihuahua north into trans-Pecos Texas (Rio Grande Valley) and southern New Mexico, and apparently also in southeastern Texas. Differing from typical *S. nigrescens* in having glabrous and more or less glaucous branchlets.

Suaeda suffrutescens Wats. Proc. Am. Acad. 9: 88 (1874).

COAHUILA: Saline gently sloping plain between San Vicente and Laguna de Jaco, decumbent perennial, *Johnston & Muller 1071;* south end of Laguna Jaco, saline flats,

decumbent, *Johnston & Muller 1082;* Americanos, apparently saline flat at base of gypsum beds, 1–2 ft. tall, branches numerous, at first ascending but in old age more or less sprawling, cortex of perennial root black, *Johnston 9386;* south of Laguna Leche, saline gypseous soil, erect or ascending, 1–3 ft. tall, grayish, *Johnston 8269.* CHIHUAHUA: Near Juarez, Aug. 28, 1886, *Pringle 1144;* 5–8 mi. south of Ojinaga, outwash from saline and gypseous clay-banks, *Johnston & Muller 1449, Johnston 8001.*

The common and widely distributed *Suaeda* in trans-Pecos Texas, ranging north along the Pecos and Rio Grande into southern New Mexico, and extending south into eastern Chihuahua and western Coahuila. If not restricted to saline gypseous soils it at least appears to favor that substratum.

Suaeda suffrutescens var. **detonsa** Johnston, Jour. Arnold Arb. 24: 230 (1943).

VERNACULAR NAME: Saladillo.

COAHUILA: 3 mi. west of Cuatro Cienegas, saline gypseous flat, loosely and widely branched, 1–5 ft. tall, *Johnston 7128* (TYPE); 3 mi. south of Cuatro Cienegas, saltlands, low shrub, *White 1913;* Cuatro Cienegas, *Marsh 2042;* Perros Bravos, shrubby, 3 ft. tall, abundant, Sept. 20, 1848, *Gregg 458;* Saltillo, July 1880, *Palmer 1167;* 5 mi. west of Viesca, saline and probably gypseous slope, erect, *Johnston 7739.* DURANGO: Bolson de Mapimi (Rio Nazas to Mapimi), April 15, 1847, *Gregg 449.*

Known only from our area. Differing from typical *S. suffrutescens* in having the leaves green and glabrous, rather than pubescent and gray. It appears to be a larger and more widely branched bush, growing in the area to the south and southeast of that occupied by typical *S. suffrutescens.* Gregg reports that its ashes are rich in alkali and are used in soap-making.

Salsola Kali L. var. **tenuifolia** Tausch, Flora 11: 326 (1828).

Loesener, Repert. Sp. Nov. 16: 201 (1919), reports that Endlich, no. *241,* collected this plant between Mapimi and Ojuela, Durango, sometime during the period 1903–1906. I have seen no specimens from the area. The plant is such a common weed along roadsides and in fields in southern New Mexico and in the Rio Grande valleys below El Paso that it must also be present in adjoining Chihuahua.

AMARANTHACEAE

Celosia Palmeri Wats. Proc. Am. Acad. 18: 143 (1883).

COAHUILA: Santa Anna Canyon, July 15, 1936, *Marsh;* 12 mi. north of Monclova, under bushes on silty valley soil in mesquite-thicket, stems straight, spreading or nearly erect, *Johnston 7191;* Monclova, Aug. 1880, *Palmer 1148* (TYPE).

Known only from eastern Coahuila.

Amaranthus Berlandieri (Moq.) Uline & Bray, Bot. Gaz. 19: 268 (1894).

COAHUILA: On plain a mile southeast of Ocampo, one plant near a mogote, *Johnston 8886A.*

Ranging in central and southern Texas south into adjacent northeastern Mexico.

Amaranthus Warnockii sp. nov.

Herba parva glabra viridis 5–20 (raro ad 30) cm. alta basi ramosa; ramis 1–5 decumbentibus ascendentibus vel erectis pallidis 1–4 mm. crassis simplicibus vel ascendenter ramosis; foliis numerosis oblanceolatis longe petiolatis, lamina haud crassa 1–3.5 cm. longa 5–10 mm. lata medium versus vel

paullo supra medium latiore deinde basim versus in petiolum (lamina breviorem vel subaequilongum) 1–3 cm. longum gradatim attenuata, subtus pallidiore minute albo-tuberculata, nervis pinnatis utrinque 5 vel 6 pallidis ascendentibus prominulis margines laminae haud attingentibus donata, margine plana vel perinconspicue crispa et albo-marginata; cymis bisexualis densis parvis 2–8 mm. longis subsessilibus, imam ad basim caulium conspicue aggregatis, alibi 1 vel 2 in axillis foliorum enatis, ramis cymae congestis rigidis flexuosis strictis bracteosis cartilagineo-incrassatis cum fructibus persistentibus tarde deciduis; floribus masculis paucis basi cymae gestis sessilibus mox deciduis, lobis 5 oblanceolatis ad 1.5 mm. longis haud induratis, filamentis 3 vel 4 ad 1.4 mm. longis, antheris 0.9 mm. longis oblongis; floribus femineis sessilibus pluribus, lobis perianthii 5 spathulato-oblanceolatis 1–1.5 mm. longis infra medium incrassatis pallidis supra medium in lamina ca. 0.5 mm. lata viridi margine conspicue albo-scariosa dilatatis; utriculis maturis compressis indehiscentibus persistentibus 1–1.2 mm. longis 0.8–0.9 mm. latis tuberculatis vel raro sublevibus in ambitu ovato-orbiculatis, stylis 2 raro 3 ca. 1 mm. longis infra medium incrassatis; seminibus brunneis sublevibus.

COAHUILA: 12 mi. north of Monclova, silty valley floor in mesquite thicket, *Johnston 7076;* 1 mi. southeast of Ocampo, silty plain near mogote, *Johnston 8886* (TYPE, Gray Herb.); valley floor east of Puerto Caballo, dried bed of ephemeral charco, *Johnston 8329;* a mile west of Bufido, silty valley slope, *Johnston & Muller 844;* west of San Rafael, north base of Sierra Cruces, silty valley flat, *Johnston & Muller 1039A;* 10 mi. south of Jaco, silty flat by mogote, *Johnston & Muller 1124.* DURANGO: Near Coahuilan boundary, 31 mi. north of Zaragoza, silty valley soil, *Shreve 8828.* TEXAS: Baldy Peak, Glass Mts., Brewster Co., abundant locally in a sheep-pen tract on lower slopes, July 4, 1940, *Warnock 14.*

Known only from our area and from a single collection in trans-Pecos Texas. A small decumbent or sprawling annual herb of silty valley soils and particularly of those places temporarily flooded after rains. It usually is locally common in open places, frequently near mogotes but not in their shade. I noted but did not collect the species just north of Zenzontle, Coahuila.

The species is evidently a close relative of *A. crassipes* Schlechtend. of Florida and the West Indies. The present plant of northern Mexico and trans-Pecos Texas differs from *A. crassipes* in its elongate somewhat thinner leaves, oblanceolate rather than ovate leaf-blades, less elongate and more slender (never long and trailing) stems, and smaller more compact cymes conspicuously crowded at the base of the stems. Among the Texan and Mexican species *A. Warnockii* can be confused only with *A. scleropoides* Uline & Bray, of central parts of Texas east of the Pecos. That latter species has leaves similar to those of *A. Warnockii* in form, texture, and size, but it differs in having regularly 3 styles, a circumscissile rather than indehiscent utricle, more obese cyme-branches, and cymes that are rarely conspicuously aggregated at the stem-bases. Furthermore, *A. scleropoides* is usually an erect herb, while *A. Warnockii* is decumbent or nearly prostrate or rarely with only the primary stem erect.

With this species it is a pleasure to associate the name of Barton H. Warnock of Alpine, Texas. His many collections from Brewster County,

Texas, deposited at the Gray Herbarium, have been very useful in the preparation of this series of papers. Especially interesting are his numerous collections from the Glass Mts., which have revealed that area as the northern limit of many characteristic plants of western Coahuila.

Amaranthus Torreyi (Gray) Benth. ex Wats. Bot. Calif. **2**: 42 (1880).
Amblogyne Torreyi Gray, Proc. Am. Acad. 5: 167 (1861).
Sarratia Berlandieri var. *emarginata* Torr. Bot. Mex. Bound. 179 (1859).
Amaranthus Pringlei Wats. Proc. Am. Acad. 22: 476 (1887).
Amaranthus Bigelovii Uline & Bray, Bot. Gaz. 19: 271 (1894).
Amaranthus Bigelovii var. *emarginata* (Torr.) Uline & Bray, Bot. Gaz. 19: 271 (1894).

COAHUILA: Igneous hill near Santo Domingo, *Wynd & Mueller 478;* San Antonio de los Alamos, arroyo at base of cliffs, *Johnston & Muller 847;* north base of Sierra Cruces, arroyo-bank, *Johnston & Muller 1045;* Sierra Cruces, Cañon Tinaja Blanca, under ledge in canyon, *Johnston & Muller 233;* San José, southeast of Sierra Cruces, slope of basalt hill, *Johnston & Muller 982.* CHIHUAHUA: 11 mi. south of Ojinaga, limestone ledge in deep arroyo, *Johnston 8038;* llano 7 mi. northeast of La Morita, grassy plain, *Johnston 7972;* hills northwest of Chihuahua, Sept. 26, 1886, *Pringle 795* (TYPE).

Ranging from trans-Pecos Texas west to southern Arizona and south into our area. In all recent works this species has been called *A. Pringlei,* but that is properly a synonym of *A. Torreyi,* a name almost universally misapplied to a very different species of sandy soil on the high plains of the middle United States, but actually belonging to our present species. The history of *Amaranthus Torreyi* begins with Gray's enumeration of the plants collected by Xantus in southern Baja California, where the following is published, "100. AMBLOGYNE (SARRATIA) TORREYI. *Sarratia Berlandieri* & var. *emarginata,* Torr. l. c. non Moq.*" The asterisk refers to a footnote on page 169, where the additional notes are given, "4. A. TORREYI (*Sarratia Berlandieri,* cum var. *emarginata,* Torr. l. c., non Moq.): dioica; foliis ovato-oblongis seu oblongo-lanceolatis; glomerulis paniculato-spicatis et axillaribus; bracteis sepalisque masculis cuspidato-acuminatis; sepalis ♀ ima basi coalitis subaequalibus obovato-spathulatis uninerviis, nervo simplici seu leviter pinnatim ramoso, apice rotundato integerrimo retuso vel emarginato. — On the Mexican border from the Rio Grande (Dr. Bigelow, Dr. Parry, etc.) to Lower California, Xantus, supra, no. 100. A variety with linear or oblong-linear leaves and virgate spikes was collected near the sources of the Nebraska, by Mr. Henry Engelmann." Gray seems to be correct in treating *Sarratia Berlandieri* and *S. Berlandieri* var. *emarginata* of Torrey (1859) as conspecific. The first is based upon a collection by Bigelow from Cibolo Creek, at the east end of the Chinati Mts., Texas, and the latter upon material from "Camp Green" collected by Parry, apparently in the Rio Grande Valley somewhere between Lajitas and Boquillas Canyon. Upon these same collections of Bigelow and Parry, Uline & Bray (1894) established *A. Bigelovii* and *A. Bigelovii* var. *emarginata.* In his treatment of the genus, Standley, No. Am. Fl. **21**: 109 (1917), recognized *A. Bigelovii* and treated var. *emarginata* as a synonym of it. The Baja California material, *Xantus 100,* mentioned by Gray when

he published the name *Amblogyne Torreyi*, was subsequently described as *Amaranthus Torreyi* var. *suffruticosus* by Uline & Bray, Bot. Gaz. 19: 272 (1894). This trinomial Standley, No. Am. Fl. 21: 106 (1917), later cited as a synonym of *A. Watsoni* Standl. The collection by Engelmann, mentioned by Gray, is the plant of the middle United States which authors, following Uline & Bray, Bot. Gaz. 19: 272 (1894), and later Standley, No. Am. Fl. 21: 107 (1917), have accepted as true *A. Torreyi*. This seems obviously incorrect, for Gray's comments on Engelmann's collections, as well as his annotations of the collection itself, show he did not consider the specimen typical of his species. The fact that Gray named the species for Torrey and gave great prominence to the Bigelow and Parry specimens treated in Torrey's Botany of the Mexican Boundary shows clearly what he considered the nucleus of his species. Standley, No. Am. Fl. 21: 107 (1917), evidently recognized this fact, for although he applied the name *A. Torreyi* to the plant of the high plains of the middle United States, he cites "*Sarratia Berlandieri* Torr. Bot. Mex. Bound. Survey 179. 1859" as a synonym of *Amaranthus Torreyi* and even gives Cibolo Creek as the type locality of the species.

When Gray published *Amblogyne Torreyi* he gave an ambiguous description and mentioned four collections, one from the Great Plains, one from Baja California, and two from the Rio Grande. The specimen from the Great Plains he obviously considered as atypical of his species. The name he chose for the species, his bibliographic references, and half the total specimens mentioned refer to our present plant, later described as *A. Pringlei* Wats. and *A. Bigelovii* Uline & Bray. Unless these facts are to be ignored and the name applied to the plant of Sonora and Lower California now called *A. Watsoni* Standl., the name *Amaranthus Torreyi* must be applied in the sense here accepted.

Amaranthus Palmeri Wats. Proc. Am. Acad. 12: 274 (1877).

VERNACULAR NAME: Quileto.

COAHUILA: North end of Sierra Cruces, dry open bed of arroyo, erect, up to 6 ft. tall, *Johnston & Muller 1050;* Bolson de Lipanes, between El Almagre and Sierra de Leja, edge of mogote, erect, becoming 5 ft. tall, *Johnston & Muller 1252.* CHIHUAHUA: Grassy plain 7 mi. northeast of La Morita, *Johnston 7972A;* Lake Santa Maria, 1899, *Nelson 6420;* 26 mi. north of Camargo, road to Las Delicias, *White 2288.*

Texas to California and south through Sonora, Chihuahua, and western Coahuila into central Mexico. The only dioecious species of *Amaranthus* known from our area.

Amaranthus hybridus L. Sp. Pl. 990 (1753).

VERNACULAR NAME: Quelito de Cochino.

COAHUILA: Saltillo, common plant in cultivated ground, 1898, *Palmer 421;* Buenavista, south of Saltillo, frequent, 3 ft. tall, July 24, 1848, *Gregg 283.*

Widely distributed in central Mexico and northward in eastern Mexico into the eastern United States. Usually a coarse plant, a half meter or more in height, and commonly a weed in disturbed ground. The dense, very floriferous, frequently nodding inflorescence is somewhat tawny in color.

Amaranthus Powellii Wats. Proc. Am. Acad. 10: 347 (1875).

COAHUILA: Sierras Negras 9 km. south of Parras, *Stanford et al. 173*. ZACATECAS: Valley 15 km. west of Concepcion del Oro, *Stanford et al. 505*.

Native in the western United States east to Wyoming, Colorado, and trans-Pecos Texas and extending south into northern Mexico, where it has been most frequently collected in the highlands of Chihuahua and Sonora. Closely related to *A. hybridus* and apparently in former times replacing that species in western parts of the continent. At times it is separated from *A. hybridus* with difficulty, but commonly it may be distinguished by being a more slender and lower plant with much simpler less floriferous inflorescences, having stiffer somewhat longer bracts, and a green rather than tawny color.

Amaranthus retroflexus L. var. **salicifolius** var. nov.

A varietate typica differt habitu graciliore, planta saepe 2–6 dm. alta, laminae foliis lanceolatis saepe 3–4-plo latioribus quam latis.

COAHUILA: Parras, 1880, *Palmer 2043* (TYPE, Gray Herb.); Tanque Jerico, north of Potrero del Fuste, under bushes by tank, *Johnston 8342A*. TEXAS: Chisos Mts., The Basin, common, *Warnock C647;* 7 mi. southwest of Marfa, Presidio Co., 1927, *Cory 26310;* Davis Mts., near Observatory, 1936, *Hinckley;* Glass Mts., infrequent, 1940, *Warnock 17;* 10 mi. northeast of Ft. Stockton, Pecos Co., 1934, *Cory 9717;* 21 mi. north of Ozona, Crockett Co., 1939, *Cory 32737, 33353;* 19 mi. west of Sonora, Sutton Co., *Cory 37937;* 29 mi. southeast of Midland, Midland Co., 1942, *Cory 40598*. ARIZONA: Fort Apache, 1890, *Palmer 587*.

Typical *A. retroflexus* appears to be native in the eastern and southeastern United States, but as an introduced weed it now grows in the western United States as well as in various places in the Old World. In agreement with Standley, Bull. Torr. Bot. Cl. 41: 510 (1914), I have seen no true *A. retroflexus* from Mexico. To the west of what was probably the original range of true *A. retroflexus,* there is found an endemic variety, here called var. *salicifolius,* which occurs in west-central and trans-Pecos Texas and apparently also in eastern Arizona, which does range south into the Mexican state of Coahuila. I have seen no specimens of typical *A. retroflexus* from the parts of western Texas in which var. *salicifolius* has been collected. The variety does not grow as tall or become such a coarse plant as typical *A. retroflexus*. Its chief difference, however, is in the shape of the leaf-blades, which are lanceolate rather than ovate. These are minor differences, but since plants referable to the variety come from a natural geographic area, in which typical *A. retroflexus* appears to be absent, I believe it deserves a name. At times var. *salicifolius* resembles *A. Powellii,* but it may be readily separated from that species by its pallid inflorescence and obtuse or retuse, rather than acute, perianth-lobes.

Amaranthus blitoides Wats. Proc. Am. Acad. 12: 273 (1877).

VERNACULAR NAME: Quelito.

COAHUILA: Sierra del Carmen, Aug. 21, 1936, *Marsh 559;* Hermanas, *Marsh 2258;* La Azufrosa, frequent, Sept. 22, 1848, *Gregg 516;* Perros Bravos, frequent, Sept. 20, 1848, *Gregg 469;* Rancho Gallinas, 6 mi. east of Puertecito, disturbed soil in abandoned labor, prostrate, *Johnston 8583;* 5 mi. west of El Oro, beside railroad on road to Guimbalete, *White 1999*.

A prostrate plant widely distributed in the western United States and northern Mexico.

Acanthochiton Wrightii Torr. in Sitgr. Rep. Explor. 170. *t. 13* (1853).

CHIHUAHUA: Cantarrecio, sands, Oct. 1852, *Thurber 806, 809;* Samalayuca, sand-dunes, *LeSueur 278, 280;* sandhills south of Samalayuca, Sept. 20, 1886, *Pringle 796;* Candelaria, sand-dunes, *Shreve 9033.*

A plant of sandy places ranging from El Paso County, Texas, west to Arizona and south into Chihuahua. The plant is dioecious and the male plants are frequently misidentified as representing an *Amaranthus.*

Brayulinea densa (Willd.) Small, Fl. S. E. U. S. 394 (1903).

VERNACULAR NAME: Bola de Hilo.

COAHUILA: Sierra del Carmen, Aug. 9 and 29, 1936, *Marsh 682, 695;* Sierra Hechiceros, Cañon Indio Felipe, sandy soil in arroyo, *Stewart 48;* Sierra Hechiceros, sandy flat east of El Tule, *Stewart 492.* CHIHUAHUA: Near Coahuilan boundary a mile east of Poza de Villa, silty plain, *Johnston 8178;* 20 mi. north of San José del Progreso, sandy slopes, *Stewart 2351;* Sierra Encinillas, near Fierro, sandy hillside, *Stewart 732;* near Mesteñas, open rock slope, *Stewart & Johnston 2030;* near Chihuahua, mesas and arroyos, 1908, *Palmer 196.* ZACATECAS: Concepcion del Oro, stony mesas, 1904, *Palmer 312.*

Western Texas to Arizona and south into tropical America.

Froelichia gracilis (Hook.) Moq. in DC. Prodr. 13^2: 420 (1849).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 647;* Muzquiz, *Marsh 524.* CHIHUAHUA: Llano 7 mi. northeast of La Morita, grassy plain, *Johnston 7973;* Chihuahua, 1935, *LeSueur.*

Ranging from Texas to Arizona and south into our area. An annual species with a firm slender root and tuberculate fruit.

Froelichia interrupta (L.) Moq. in DC. Prodr. 13^2: 421 (1849).

CHIHUAHUA: Chihuahua, 1935, *LeSueur 55;* Meoqui, 1936, *LeSueur 1050.*

The above collections, lacking the base of the stem and the root, appear to represent a phase of *F. interrupta* with elongate tomentose leaves. The mature fruit is not armed laterally. The species ranges from western Texas south through Mexico to South America.

Froelichia arizonica Thornber ex Standl. No. Am. Fl. **21**: 128 (1917).

COAHUILA: Sierra del Carmen, Aug. 22, 1936, *Marsh 580;* Yerda Springs, *Marsh 285;* Caracol Mt., Aug. 1880, *Palmer 1142;* Puerto San Lazaro, *Muller 30491;* La Azufrosa, frequent, Sept. 22, 1848, *Gregg 510;* Saltillo, 1898, *Palmer 572;* hills 20 mi. west of Saltillo, *Shreve & Tinkham 9832;* Carneros Pass area, July 1880, *Palmer 1141;* Sierra Encantada, Cañon San Enrique, *Stewart 1368;* Sierra del Pino, Cañon Ybarra, *Stewart 1878;* Sierra del Pino, La Noria, *Johnston & Muller 475, Stewart 1239;* Sierra Hechiceros, Cañon Indio Felipe, *Stewart 51;* Picacho de Noche Buena, *Johnston & Muller 175;* Sierra Cruces, 5 km. northeast of Santa Elena, *Stewart 610;* near San José, southeast of Sierra Cruces, *Johnston & Muller 988;* San Antonio de los Alamos, *Johnston & Muller 929;* Sierra Planchada, Cañon Gringo, *Stewart 1037;* Aguaje Pajarito, west end of Sierra Fragua, *Johnston 8803;* 4 mi. west of Cuatro Cienegas, *Johnston 7154;* Puerto Ventanillas, *Stewart 2788;* 2 km. south of Las Delicias, *Stewart 2961.* CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, *Stewart 2412;* 12 km. north of San José del Progreso, *Stewart 2340;* Sierra Encinillas, Fierro, *Stewart 744;* Sierra Virulento, east base of sierra, *Johnston 8079;* near Mesteñas, *Stewart & Johnston 2029;* 11 mi. northeast of Camargo, *Johnston 7919.*

Dry rocky places on hillsides and along arroyos, in calcareous and volcanic areas. A perennial with a rather fleshy tap-root and one to several strict erect subsimple stems becoming 4–12 dm. tall. The persistent base of the stems becomes somewhat woody and forms a small sparsely and strictly branched caudex. The bracts of the inflorescence are usually black. The stone-like fruiting perianth bears spines or conic protuberances on each side. Ranging from trans-Pecos Texas to Arizona and south into our area.

Tidestromia lanuginosa (Nutt.) Standl. Jour. Wash. Acad. **6**: 70 (1916).

COAHUILA: Sierra del Carmen, Sept. 12, 1936, *Marsh 843;* Monclova, *Marsh 1818;* Cuatro Cienegas, *Marsh 2026;* Mesillas, Sept. 19, 1838, *Gregg 450;* 6 mi. north of La Ventura, *Johnston 7635;* 5 mi. east of Penquitas, road between Santa Elena and Tanque La India, *Johnston & Muller 797;* 2 km. east of San Juan, southwest base of Sierra Cruces, *Stewart 816;* valley-floor east of Puerto Caballo, *Johnston 8334;* Potrero del Cuervo Chico, *Johnston 8577;* 25 mi. east of Americanos, *Wynd 752;* Americanos, *Johnston 9377;* San Lorenzo de la Laguna, 1880, *Palmer;* Torreon, 1898, *Palmer 469.* CHIHUAHUA: 5 mi. south of Ojinaga, *Johnston 8002;* Samalayuca, *LeSueur 279;* sandhills near Laguna Guzman, *Hartman 727;* Chihuahua, Sept. 27, 1902, *Pringle 11144;* 10 mi. west of El Pozo on road to Santa Eulalia, *White 2446.* ZACATECAS: Cedros, *Kirkwood 114.*

Widely distributed in the southwestern United States and extending south into Tamaulipas, Zacatecas, and Sinaloa. A generally distributed herb in our area, in sandy places, valley silts, and on gypsum, becoming most abundant in disturbed soils.

Tidestromia tenella Johnston, Jour. Arnold Arb. **20**: 234 (1939).

COAHUILA: 1 mi. north of Noria San Juan, south of Laguna del Rey, desert flat, plant succulent, yellowish green, *Johnston 7822* (TYPE).

Known only from the type collection. Most closely related to *T. carnosa,* but a smaller and more slender plant with barbellate rather than coarsely branched trichomes. The plant is probably gypsophilous.

Tidestromia carnosa (Steyerm.) Johnston, Jour. Arnold Arb. **24**: 232 (1943).
Cladothrix lanuginosa var. *carnosa* Steyerm. Ann. Mo. Bot. Gard. **19**: 389 (1932).

CHIHUAHUA: 8 mi. south of Ojinaga, slopes and flats with *Suaeda,* fleshy yellowish green prostrate plant, *Johnston & Muller 1447;* 5½ mi. south of Ojinaga, outwash from saline shales, *Johnston 8003.*

South of Ojinaga confined to outwash from Upper Cretaceous gypseous saline shales and clays. Otherwise known only from Brewster County, Texas, where it grows in geologically similar formations about the base of the Chisos Mts.

Tidestromia suffruticosa (Torr.) Standl. var. **coahuilana** Johnston, Jour. Arnold Arb. **24**: 232. 1943.

COAHUILA: Sierra Cruces, 5 mi. north of Santa Elena, *Johnston & Muller 1014* (TYPE); Sierra Cruces, 5 km. west of Picacho San José, *Stewart 820;* Sierra del Pino, Cañon Ybarra, *Stewart 1855;* Lomas del Aparejo, east side of Llano de Guaje, *Johnston & Muller 773;* south end of Sierra del Pino, northeast of Armendais, *Johnston & Muller 362;* west base of the grade over Cuesta Zozaya, *Muller 3287, Johnston 9300;* Aguaje Pajarito, west end of Sierra Fragua, *Johnston 8677;* Cañon de Jara, 3 mi. west of Socorro, *Johnston 8844;* Sierra de la Paila, Oct. 1910, *Purpus 4927.*

Growing in dry, rocky, usually moderately gypseous soils along the base

of limestone sierras. Although found in various parts of Coahuila, chiefly western, the plant has a disrupted distribution, perhaps because of special soil requirements. When present the plant is rather common locally. The variety *coahuilana* is known only from Coahuila and is closely related to typical *T. suffruticosa* (Torr.) Standl., of southeastern New Mexico and trans-Pecos Texas, from which it is distinguished by its denser indument, more shrubby stems, and glabrate flowers. Typical *T. suffruticosa* has been collected near Boquillas and Terlingua in the Big Bend area of Texas and can be expected in adjacent northern Coahuila.

Tidestromia gemmata Johnston, Jour. Arnold Arb. **24**: 233 (1943).

COAHUILA: South of Matrimonio Viejo, gypsiferous shales, *Johnston 9363* (TYPE); just east of Americanos, cemented gravels capping gypsum, *Johnston 9379;* 20 km. southeast of Rancho Alegre, road to Acatita, common, *Stewart 2668.* TEXAS: Boquillas, Brewster Co., Sept. 4, 1937, *Marsh 310.*

A perennial species strongly simulating the widespread *T. lanuginosa* in general appearance, but quickly distinguished from that annual herb by its coarse root and the conspicuous white woolly buds on its caudex. Known only from the collections listed above. The species is probably gypsophilous.

Tidestromia rhizomatosa Johnston, Jour. Arnold Arb. **24**: 233 (1943).

COAHUILA: Saline gypseous flats just east of El Anteojo, west of Cuatro Cienegas, *Johnston 8873* (TYPE).

A prostrate perennial with fleshy more or less reflexed leaves which spreads by slender smooth rhizomes. Known only from the type locality, where it is locally very common.

Gossypianthus lanuginosus (Poir.) Moq. in DC. Prodr. 12^2: 337 (1849).

COAHUILA: 12 mi. north of Monclova, silty soil in mesquite thicket, *Johnston 7188.* CHIHUAHUA: Plains near Chihuahua, about railroad shops, Aug. 22, 1885, *Pringle 689.*

Ranging in central and southern Texas south into Tamaulipas, Coahuila, and Chihuahua; West Indies. Frequently confused with *Brayulinea,* but quickly distinguished by its persistent basal rosette of leaves and the bristly upper leaf-surfaces.

Alternanthera repens (L.) Kuntze, Rev. Gen. 2: 536 (1891).

VERNACULAR NAME: Ojo de Pollo.

COAHUILA: Don Martin Dam, *White 1377;* Sierra del Carmen, Aug. 9, 1936, *Marsh 683;* Hac. Encantada, *Stewart 1734;* Saltillo, 1898, *Palmer 562;* Fraile, *Stanford et al. 270.* CHIHUAHUA: Chihuahua, waste-places, river-banks and roadsides, common, 1908, *Palmer 175;* northwest of Chihuahua, Oct. 21, 1885, *Pringle 295;* Bachimba, Nov. 1852, *Thurber 848.* ZACATECAS: Valley 18 km. west of Concepcion del Oro, *Stanford et al. 579.*

A creeping plant frequenting wet soils and disturbed moist places. Ranging from North Carolina to Arizona and south into tropical America.

Gomphrena Haageana Klotzsch, Allg. Gartenz. **21**: 297 (1853).

COAHUILA: Muzquiz, *Marsh 14;* Palm Canyon, Muzquiz, *Marsh 371;* Soledad, 1880, *Palmer;* Cañon Bocatoche, common on open grassy valley floor, bracts orange to red, *Muller 3118.*

Ranging in eastern Coahuila and adjacent Texas (Val Verde to Brewster Counties); reported from Nuevo Leon.

Gomphrena decumbens Jacq. Hort. Schoenbr. 4: 41 (1804).

COAHUILA: San Lorenzo Canyon, 6 mi. southeast of Saltillo, prostrate on grassy areas, showy, bracts bright rose-color with white base, 1904, *Palmer 389*. CHIHUAHUA: Chihuahua, edge of river, a few plants only, bracts showy, rose-colored, 1908, *Palmer 189*.

Nuevo Leon and southeastern Coahuila south into central Mexico and South America. Extending north in Durango and Chihuahua, but apparently as an introduced weed.

Gomphrena nitida Rothr. Bot. Wheeler Survey 233 (1878).

COAHUILA: Sierra del Carmen, Sept. 9, 1936, *Marsh 714;* Sierra Hechiceros, Cañon Indio Felipe, dry sandy arroyo, *Stewart 65;* Sierra Cruces, about Tinaja Blanca, sandy arroyo, bracts white to pink, *Stewart 336, 1132, 1948*. CHIHUAHUA: Sierra Hechiceros, Rancho Encampanada, edge of creek, not abundant, pink, *Stewart 198;* 5 mi. north of Escobillas, rocky slopes, frequent, pinkish, *Stewart 2374A;* east base of Sierra Virulento, arroyo bottom, *Johnston 8092;* Sierra de Enmedia, 1890, plains, *Nelson 6471;* Majalca, 1935, *LeSueur 19, 20;* west base of Sierra Santa Eulalia, common on rocky slope, mostly white, *Stewart & Johnston 2109;* rocky hills near Chihuahua, Sept. 1885, *Pringle 315;* Jimenez, Rio Florido, *White 2083;* Parral, 1898, *Goldman 114*.

Trans-Pecos Texas (Chisos and Davis Mts.) through southern New Mexico to southeastern Arizona, and south to central Mexico. The range of this species appears to center in the uplands along the western Sierra Madre.

Dicraurus leptocladus Hook. f. in Benth. & Hook. Gen. Pl. 3: 43 (1880).

COAHUILA: Sierra del Carmen, Sept. 8, 1936, *Marsh 797;* Saltillo, 1898, *Palmer 297;* near Saltillo, Oct. 4, 1905, *Pringle 13604;* Sierra del Pino, Cañon Ybarra, dry hillside, *Stewart 1876;* Sierra Cruces, near Santa Elena, clambering up through bushes to 6 ft., *Johnston & Muller 239, Stewart 278;* Sierra Parras, Aug. 1910, *Purpus 4979*. CHIHUAHUA: Rancho El Pino, southeast of Sierra Rica, sunny slope, *Stewart 2569;* 7 mi. northwest of Temporales de Honorato, supported by bushes in mogote, reaching 25 dm. in height, *Stewart & Johnston 1991;* hills near Chihuahua, Sept. 30 and Oct. 24, 1885, *Pringle 345;* Jimenez, Nov. 1852, *Thurber 840*. DURANGO: Mapimi, Oct. 1898, *Palmer 529*.

A shrubby plant of silty valley soils and of rocky soils on the lower slopes and canyons. Commonly growing up through shrubs and supported by them, attaining one or two meters in height. Ranging from trans-Pecos Texas, chiefly in the Rio Grande Valley, south through our area to Zacatecas and San Luis Potosi.

Iresine heterophylla Standl. Contr. U. S. Nat. Herb. 18: 95 (1916).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 526;* Yerda Springs, *Marsh 352;* volcanic hill 2 km. east of Cañon Milagro, east of the Sierra Guajes, hillside, erect, not common, *Stewart 1511;* Saltillo, 1898, *Palmer 288;* Sierra Hechiceros, Cañon Indio Felipe, *Stewart 29, 70, 83;* Sierra Cruces, Cañon Tinaja Blanca, clambering in shrubbery, common, *Stewart 1139;* San Antonio de los Alamos, base of tuff cliffs, *Johnston 8271*. CHIHUAHUA: Sierra Rica, Cañon Madera, shade in canyon, frequent, *Stewart 2521;* rocky hills near Chihuahua, shade of cliffs, Sept. 22, 1885, *Pringle 348;* Bachimba, Nov. 1852, *Thurber 838*.

Western Texas to Arizona and south to central Mexico.

Iresine Calea (Ibánez) Standl. Contr. U. S. Nat. Herb. 18: 94 (1916).

Iresine laxa Wats. Proc. Am. Acad. 21: 454 (1886).

DURANGO: Sierra Guadalupe canyon about 4 mi. west across the valley of the Aguanaval from Jimulco, April 27, 1885, *Pringle 141* (type of *I. laxa*).

Ranging from northeastern Durango, Sonora, and Baja California south to Costa Rica. Pringle's collection cited above, the type of *I. laxa,* is labeled as from "mountains, Jimulco, Coahuila, April 27, 1885." Pringle's published diaries, however, clearly show that the collection was obtained at the locality I have recorded above.

NYCTAGINACEAE

Selinocarpus chenopodioides Gray, Am. Jour. Sci. II. 15: 262 (1863).
Ammocodon chenopodioides Standl. Jour. Wash. Acad. 6: 631 (1916).

CHIHUAHUA: Pass 10 mi. south of Mula, one plant on alluvial terrace, erect, *Johnston 8044;* Juarez, dry calcareous bluffs, Sept. 26, 1902, *Pringle 11143;* foothills towards Lake Santa Maria, fl. purple, April 9, 1852, *Wright 1707* in pt.; northwest of Chihuahua, 1935, *LeSueur 394;* Santa Eulalia plains, Aug. 18, 1885, *Wilkinson* (US); plains near Chihuahua, Aug. 15, 1885, *Pringle 652.*

Trans-Pecos Texas (Brewster Co. west) to southern Arizona and south into Chihuahua. An erectly branched herb with tuberous roots.

Another herbaceous *Selinocarpus, S. diffusus* Gray, may be found in northern Chihuahua or Coahuila. At the Gray Herbarium there is a collection labeled "Bluffs of Rio Grande, 1881, *Havard 90.*" In his published report, Havard, Proc. U. S. Nat. Mus. 8: 478 (1885), mentions the species as growing on bluffs along the Rio Grande, presumably in either Presidio or Brewster County, Texas. The species is otherwise known only from Central Texas, northern trans-Pecos Texas, and northwestward through New Mexico.

Selinocarpus angustifolius Torr. Bot. Mex. Bound. 170. *t. 47* (1859).

COAHUILA: 2 mi. west of Sacramento, road to Cuatro Cienegas, rocky hillside, erect shrub 3 ft. tall, *Johnston 7100;* 4 mi. west of Cuatro Cienegas, mouth of canyon, *Johnston 7159;* hills near Mesillas, shrub 1 ft. tall, Sept. 23, 1848, *Gregg 535;* road to Torreon, 55 mi. west of Saltillo (23 mi. east of Paila), steep rocky sandstone slope, plant strict, erect, 6–24 inches tall, *Johnston 7699;* 14 mi. east of Paila, *Shreve & Tinkham 9900;* Picachos Colorados, rocky soil at base of cliffs, *Johnston & Muller 136;* northwestern foothills of Sierra Cruces, limy mine-dump, shrubby, up to 3 ft. tall, *Johnston & Muller 1059;* Cañon Tinaja Blanca, Sierra Cruces, dry hillsides and cliffs, 1–3 ft. tall, *Stewart 579, Johnston & Muller 277;* vicinity of Santa Elena, sides of arroyos, *Stewart 252, 281;* limestone ledges on very arid hills near La Pistola, east side of Llano de Guaje, shrub 1–2 ft. tall, *Johnston & Muller 769;* canyon at San Antonio de los Alamos, crevices of basalt and at base of tuff cliffs, 1–4 ft. tall, *Johnston 8269, Johnston & Muller 931;* 14 km. southeast of Rancho Alegre on road south to Valle Acatita, gypsum slopes, *Stewart 2682;* Rancho Las Uvas, shales on slopes, 5 dm. tall, *Stewart 2716;* San Lorenzo de la Laguna, 1880, *Palmer 1119;* Viesca, Feb. 1905, *Purpus 1054.* CHIHUAHUA: Presidio del Norte [Ojinaga], *Bigelow, Parry* (ISOTYPES).

Known only from our area and adjacent Texas; ranging north in Texas to the Chinati Mts., Presidio Co., and central Brewster Co. A shrub 1–3 ft. tall with slender usually rather strict branches, growing in dry well-drained places on hillsides and on and about cliffs and banks. Though centering in a calcareous region, it shows no marked soil preferences. I have found it on basalt, volcanic tuff, igneous intrusives, limestones, caliche, and gypsum. It is rarely common. It fruits freely but most of the fruit appears to develop from cleistogamic flowers. The species usually has narrow lanceolate or linear-lanceolate leaves. There are, however, three

collections from eastern Coahuila (*Gregg 535, Johnston 7159,* and *Shreve & Tinkham 9900*) which have oblong or oblong-elliptic, perhaps thinner, leaf-blades that are folded and have crisped-undulate margins.

Selinocarpus parvifolius (Torr.) Standl. Contr. U. S. Nat. Herb. 12: 388 (1909).

Selinocarpus diffusus var. *parvifolius* Torr. Bot. Mex. Bound. 168 (1859).

CHIHUAHUA: 10 mi. south of Ojinaga, base of low hills on outwash from gypseous and saline clays and shales, globose bush 1–2 ft. tall, *Johnston & Muller 12, 1446;* Presidio del Norte [Ojinaga], August, *Bigelow.*

Known only from the valley of the Rio Grande in Presidio and Brewster Counties, Texas, and in adjoining Chihuahua. The type was collected by Parry in "Cañons of the Rio Grande," presumably those between Ojinaga and the Big Bend. The species is probably a gypsophile and appears to be confined to areas of Upper Cretaceous shales and clays.

Selinocarpus Palmeri Hemsl. Biol. Centr. Am. Bot. 3: 6. *t. 70* (1882).

COAHUILA: San Lorenzo de la Laguna, flowers bright pink with whitish base, May 1880, *Palmer 1118* (ISOTYPE).

Known only from the type collection. Nothing is recorded regarding the growth habit of this plant. The specimens suggest that it is a bush as large as or even larger than its relative, *S. Purpusianus,* but much more loosely branched. Like its relative it is probably a gypsophile.

Selinocarpus Purpusianus Heimerl, Oesterr. Bot. Zeits. 63: 353 (1913).

COAHUILA: Near Mohovano on road 16 mi. south of Laguna del Rey, confined to gypsum flat, frequent, rounded gray intricate bush 1–3 ft. tall, fl. yellowish, *Johnston 7807;* Laguna del Rey, fl. yellow, *Stewart 2652;* Sierra del Rey, June 1910, *Purpus 4505* (ISOTYPE); valley between La Vibora and Matrimonio Viejo, confined to gypsum-beds, frequent bush 1–3 ft. tall, *Johnston 9337.*

This gypsophilous species is known only from the collections cited. It is a grayish bush 1–3 ft. tall with gnarled woody branches and abundant dichotomous intricately interlocked twigs. The perianth has a bright yellow limb.

Selinocarpus Marshii sp. nov.

Frutex lignosus intricate et dichotome ramosissimus; ramulis foliatis simplice vel sparse et dichotome ramosis 2–4 cm. longis pilis minutis abundantis cinereis retrorsis obtectis; ramulis vetustioribus glabrescentibus sublente multistriatis; foliis oppositis 9–13 mm. longis ca. 2 mm. latis, lanceolatis vel oblanceolatis, costatis sed enervatis, carnosulis bifacialibus viridibus, pilis pallidis retrorsis et pilis inconspicuis glanduliferis vestitis, basi gradatim attenuatis, apice acutis; floribus in axillis foliorum solitariis; pedicellis 0.5–2 mm. longis paullo infra apicem bracteis duobus ad 2 mm. longis oppositis lanceolatis inconspicuis gestis; perianthio 3–4 cm. longo elongate infundibuliformi extus cinereo pilis minutis pallidis reflexis vestito, parte ovariali ad 5 mm. longo 5-angulato, deinde sursum in tubo ca. 1 mm. crasso et 2 cm. longo transmutato, apice tubi (in alabastro) sursum in fauces 0.5–0.7 mm. longas et ca. 3 mm. diametro et lobos ca. 0.8 mm. longos ampliato; anthocarpio 4-alato, corpore 9 mm. longo quadrangulari, faciebus ad 2 mm. latis bisulcatis sparse et retrorse strigulosis, alis ad 4 mm. latis.

COAHUILA: Hermanas, April 20, 1937, *Marsh 1579* (TYPE, Gray Herb.).

A close relative of *S. Purpusianus,* from which it differs in having the

branchlets, leaves, and perianth clothed in a gray indument of abundant minute appressed flattened white hairs, its leaf-bearing branchlets only very obscurely sulcate, and its perianth without glandular hairs. The type collection lacks data on habit and habitat and has flowers in mature bud but lacks perianths at anthesis. The species, however, probably agrees with *S. Purpusianus* in habit of growth, soil preference, and in the size and shape of perianth. That latter species, however, differs from *S. Marshii* in having the leaf-bearing branchlets very strongly sulcate and roughened with stipitate glands and some scattered stiffish erect hairs. Its green, evidently more succulent leaves are also roughened with stipitate glands. The two species differ strikingly in abundance and quality of indument.

Allionia incarnata L. Syst. ed. 10. 890 (1759).

Wedeliella incarnata (L.) Cockerell, Torreya 9: 167 (1909).

VERNACULAR NAMES: Yerba de la Hormiga; Yerba de la Mosca; Yerba del Hormigero.

COAHUILA: Allende, *Marsh 2234;* Cañon de Cienegas, Cuatro Cienegas, fl. red, *White 1890;* Monclova, *Marsh 1825;* desert near Rancho Santa Teresa, south of Castaños, *Wynd & Mueller 189;* between Hipólito and Sacramento, dry arroyos, *Wynd & Mueller 72;* 2 mi. west of Saltillo, road tc Torreon, fl. reddish lavender, *White 1666;* Saltillo, waste places and bottom lands, prostrate, fl. damask-colored, 1898, *Palmer 81;* Saltillo, scarce, fl. purplish, July 16, 1848, *Gregg 251;* Sierra del Carmen, Sept. 2, 1936, *Marsh 735, 867;* 7 km. north of Agritos, east of Sierra del Pino, prostrate, dry flats, fl. orchid, *Stewart 1276;* 25 km. west of San Guillermo (northeast of Sierra del Pino), common on flats, fl. orchid, *Stewart 1772,* 6 km. east of El Tule, southern Sierra Hechiceros, sandy arroyo, fl. orchid, *Stewart 486;* 9 km. north of San Rafael, road to Castillon, hillsides, spreading, fl. lavender, *Stewart 420;* vicinity of Santa Elena, arroyos and hillsides, *Stewart 258, 603;* Tinaja Blanca, Sierra Cruces, creeping, arroyos and hillsides, abundant, fl. purple, *Stewart 341;* 5 mi. west of El Oro, road to Guimbalete, *White 1992;* near Noria San Juan, southeast of Laguna del Rey, saline flats, fl. purplish, *Stewart 3011;* flats west of Las Uvas, Valle Acatita, prostrate, fl. purple, *Stewart 2694, 2709;* 13 km. south of Rancho Acatita, sandy plain, prostrate, fl. purplish, *Stewart 2986;* Cañon del Agua Grande, west of Las Delicias, dry slopes, fl. purple, *Stewart 2793.* CHIHUAHUA: Chihuahua, about mesas and arroyos, prostrate, fl. rose-colored, 1908, *Palmer 194;* Chihuahua, 1935, *LeSueur 123;* 25 mi. south of Chihuahua, 1936, *LeSueur;* 12 mi. south of Camargo, *White 2191;* northeast end of Sierra Diablo, rocky arroyo high in canyon, prostrate, fl. orchid, *Stewart 993.*

Southern California to trans-Pecos and southern Texas and south into Durango, Zacatecas, and middle-eastern Tamaulipas; also in western South America. A trailing herb which is widespread and frequently common in open places on silty flats and valley slopes and in rocky soils on hillsides and in arroyos. As is so common among the herbaceous members of the Nyctaginaceae, this plant is extremely variable in indument. This and other variations of the species have been discussed in detail by Heimerl, Repert. Sp. Nov. 31: 91–98 (1932). The fruit has firm usually incurved wing-margins which are either entire or coarsely and broadly toothed. Except for a few plants from the Big Bend and the lower Rio Grande Valley, which have more spreading and more deeply toothed margins on the fruit than common in *A. incarnata,* I have seen no plants whose fruit could be considered transitional between *A. incarnata* and *A. Choisyi.* Standley reports the species from hills about Tlahualilo, Durango (*Pittier 486*),

and Heimerl lists a collection from between Mapimi and Ojuelo, Durango (*Endlich 255*).

Allionia Choisyi Standl. Field Mus. Publ. Bot. 8: 310 (1931).
Allionia incarnata L. var. *glabra* Choisy in DC. Prodr. 13²: 435 (1849).
Wedeliella glabra (Choisy) Cockerell, Torreya 9: 167 (1909).
Allionia incarnata f. *multiserrata* Heimerl in Urban, Symb. Ant. 7: 212 (1912).

VERNACULAR NAME: Yerba de la Hormiga.

COAHUILA: Monclova, *Marsh 1655;* Perros Bravos, fl. purple, frequent, Sept. 20, 1848, *Gregg 466.* CHIHUAHUA: 25 km. northwest of Jaco, prostrate on silty flats, fl. orchid, fairly common, *Stewart 680;* 4 km. northeast of Santa Fe, common on flats, prostrate, fl. purplish, *Stewart 2596.* ZACATECAS: Cedros, garden, 1908, *Kirkwood 115.*

Eastern Arizona to trans-Pecos and southern Texas and south through Coahuila, Nuevo Leon, Tamaulipas, and San Luis Potosi into central and southern Mexico; also in the West Indies. Distinguished from *A. incarnata* by having the margin of the fruit pectinately lobed. Each margin is divided into 5–7 slender linear-subulate ascending or more commonly incurving lobes. In *A. incarnata* the margin is subentire or is coarsely and frequently irregularly dentate with 2–6 broadly triangular teeth. The forms of *A. Choisyi* found in the United States are usually glabrous and annual and have the medial crest on the outer face of the fruit bearing sessile or subsessile glands. In eastern Mexico the plants are mostly perennial, frequently hairy and glandular, and in central Mexico and the West Indies they may have the medial keels toothed or even with very slender appendages half to nearly as long as the lobes of the lateral margins. The type of *A. Choisyi* Standl. and *A. incarnata* var. *glabra* Choisy, upon which it is based, came from near Mexico City. In our area some plants are annual, others are perennial, and some are nearly glabrous and others show various amounts of viscid indument. The species appears to be almost as variable as *A. incarnata.*

Nyctaginia capitata Choisy in DC. Prodr. 13²: 429 (1849).

VERNACULAR NAMES: Immortal; (root) Yerba Blanca.

COAHUILA: Sierra del Carmen, Sept. 13, 1936, *Marsh 902;* Allende, 1939, *Marsh 1786;* Sabinas, 1902, *Nelson 6761;* 2 mi. northwest of Frontera, road to Natadores, silty desert plain, *Johnston 7175;* Cuatro Cienegas, 1939, *Marsh 2019;* flats of La Vega, 15 mi. southeast of Cuatro Cienegas, *Schroeder 176;* desert near Rancho Santa Teresa, south of Castaños, *Wynd & Mueller 179;* Saltillo, frequent, fl. bright red, July 16, 1848, *Gregg 264;* Saltillo, clay soil, plains and waste places, fl. vermilion, 1898, *Palmer 202;* Saltillo, 1930, *Fisher 30033;* Cienega Grande, fl. scarlet, May 18, 1847, *Gregg;* Valle de los Guajes, 25 km. south of Rancho Buena Vista, grassy flat, *Stewart 1328;* 10 km. north of Agritos, silty flat, fl. red, *Stewart 1278;* 20 km. south of Castillon, along arroyo, fl. red, *Stewart 427;* 8 km. east of La Palma, valley north of Sierra Cruces, tobosa flat, fl. red, *Stewart 656;* 5 mi. northwest of Zenzontle, flat, corolla dark red, filaments magenta, *Johnston & Muller 973;* silty plain 2 mi. east of Bufido, oily and succulent, *Johnston & Muller 854;* valley west of Bufido, silty soil, *Johnston & Muller 845;* northwest end of Sierra Planchada, tobosa flat, fl. red, *Stewart 1012;* Jimulco, May 16, 1885, *Pringle.* CHIHUAHUA: Near Trinidad, flats, fl. red, *Stewart 2592, 2593;* 25 mi. south of Chihuahua, 1936, *LeSueur;* Ojo El Gallego, between Chihuahua and El Paso, 1846, *Wislizenus* (St. Louis). DURANGO: Mapimi, edge of cornfield, 1898, *Palmer 545.*

Trans-Pecos Texas and southeastern New Mexico to southern Texas and south into our area and adjacent Nuevo Leon. Reaching its southern limit

in central Durango. A plant with viscid-glandular rather succulent herbage and umbellate clusters of trumpet-shaped red or vermilion flowers, characteristic of clay valley soils and particularly of flats where water temporarily accumulates after storms. The stems are prostrate or trailing, commonly nearly a meter long, and arise from a coarse fleshy deeply descending root. Palmer reports that the dried root, because of its color called Yerba Blanca, is sold in the market at Saltillo and is said to be a popular remedy for stomach-ache. In some localities the plants appear to be prevailingly cleistogamic. Such plants have short stems, less than a decimeter in length, and some of them have only a basal rosette of leaves and the dense cluster of cleistogamic flowers borne at the level of the soil or even partially covered by it.

Acleisanthes longiflora Gray, Am. Jour. Sci. II. 15: 261 (1853).

Acleisanthes longiflora subsp. *hirtella* Standl. Contr. U. S. Nat. Herb. 12: 371 (1909).

Acleisanthes longiflora var. *hirtella* Standl. ex Heimerl, Notizbl. Bot. Gart. Berlin 11: 459 (1932).

VERNACULAR NAMES: Yerba Santa; Yerba de la rabia; Platiada; Trompetilla.

COAHUILA: Allende, 1939, *Marsh 1802;* Santa Anna Canyon, 1936, *Marsh 536;* Puerto San Lazaro, rocky slopes, *Wynd & Mueller 158;* Perros Bravos, fl. white, Sept. 20, 1848, *Gregg 463* (isotype of var. *hirtella*); Saltillo, fl. white, night bloomer, 1898, *Palmer 181;* battlefield near Buena Vista, frequent, May 19, 1848, *Gregg 88;* Cañon Ybarra, Sierra del Pino, dry hillside, fl. white, *Stewart 1847;* Sierra del Pino, limestone ledges at mouth of south canyon, fl. white, opening at dusk, *Johnston & Muller 729;* valley northeast of Tanque Armendais, stony slope, *Johnston & Muller 374;* vicinity of Santa Elena, fl. white, *Stewart 233, 244, 369, 1927;* Cañon Tinaja Blanca, Sierra Cruces, hillside, fl. white, *Stewart 589;* Bolson de los Lipanes, between El Almagre and Cerros de Leja, silty plain, fl. white, *Johnston & Muller 1250;* La Botica, Valle Delicias, flats, fl. white, *Stewart 2847;* Parras, 1880, *Palmer 1116;* Jimulco, May 12, 1885, *Pringle 122.* CHIHUAHUA: Ojinaga, edge of field, *Shreve 8103;* Sierra San Carlos, road to mines, silty soil in canyon, *Johnston & Muller 56;* north of El Pino, about 10 km. southeast of Sierra Rica, rocky slope, fl. white, *Stewart 2418;* Cantarrecio, sands, Oct. 1852, *Thurber 808;* Aldama, prostrate, covering quite a space on mesquite bottoms, fl. white with a violet shading to tube, 1908, *Palmer 243;* rocky hills near Chihuahua, June 5, 1885, *Pringle 101.*

Central and southern Texas west into trans-Pecos Texas and southeastern New Mexico and south into northeastern Mexico; also in Arizona and southeastern California. A prostrate or very laxly decumbent plant of silty or rocky soils, frequently forming mats up to a meter in diameter. It appears to be confined to calcareous soils and is particularly common on loose rocky soils, such as talus, about the base of limestone mountains. The unusually slender and elongate white flowers, with tubes 10–15 cm. long and an abruptly spreading lobe about 15 mm. wide, stand erect from the prostrate herbage. The sight of a plant in full flower, with a score or more of these slender graceful elongate white trumpets arising from the gray carpet of the herbage, is a pleasure which can be enjoyed only for a brief period at dusk or for a few hours during an overcast morning, for the flowers usually open at dusk and close at or before sunrise. During the day the tubes of the closed flowers stand like quills or, withering, arch over or lie across the herbage. The plant has a very coarse fleshy taproot which becomes somewhat enlarged a decimeter or so below the surface of

the soil. Gregg reports that a decoction of the root was used for cholera, fevers, etc. The species commonly has foliage which is smooth and glabrous, or practically so. Rarely it is roughened by stiffish hairs. This minor form was described as subsp. *hirtella*. Heimerl has reported collections of it from the Sierra de la Paila (*Endlich 844*).

Acleisanthes crassifolia Gray, Am. Jour. Sci. II. 15: 260 (1853).

COAHUILA: Muzquiz, 1938, *Marsh 1105*.

Known otherwise only from Val Verde County, Texas; the type was collected near Del Rio. The cited collection has mature fruit developed from cleistogamic flowers.

Acleisanthes acutifolia Standl. Contr. U. S. Nat. Herb. 12: 370 (1909).

COAHUILA: Saltillo, base of stony ridge, fl. cream-colored, 1898, *Palmer 282;* Carneros Pass, fl. pale lilac, Sept. 9, 1889, *Pringle 2843;* Sierra del Pino, mouth of south canyon, gravelly bench at base of limestone slope, fl. white, *Johnston & Muller 728;* west base of Picacho del Fuste, rocky flats, prostrate, fl. white, *Johnston 8416;* near Aguaje Pajarito, west end of Sierra Fragua, decumbent, fl. white with yellowish ribs, *Johnston 8791;* south base of Picacho San José, sunny rocky terrace, fl. flesh-colored, *Johnston & Muller 819;* Carrizo, south base of Sierra Cruz, dry open hillside, fl. white, *Stewart 2168;* Rancho Parritas, east side Valle Acatita, gypsum mesa, fl. white, *Stewart 2765;* Sierra Parras, Oct. 1910, *Purpus 4753*. CHIHUAHUA: Sierra Santa Eulalia, Aug. 25, 1885, *Pringle 671*. ZACATECAS: Cardona, rocky hillside, decumbent, fl. whitish, *Johnston 7376*.

Ranging from our area north into trans-Pecos Texas (Brewster and Pecos Counties). A perennial, with numerous leafy prostrate or laxly ascending stems 1–2 dm. long. It appears to be confined to rocky limestone soil and is not common.

Acleisanthes nana sp. nov.

Planta parva perennis humilis grisea e radice palari crassa profunda oriens; caulibus pluribus decumbentibus vel ascendentibus foliosis 2–5 cm. longis gracilibus breviter ramosis pilis hispidulis et glanduliferis et pilis albidis appressis plus minusve ornatis; foliis oppositis crassiusculis inconspicue et sparse nervatis; foliis infimis mox deciduis modice majoribus obtusis plus minusve glabris conspicue petiolatis; foliis caulinis numerosis quam internodiis saepe duplo longioribus, setis subulatis rigidis erectis glanduliferis conspicue obsitis, pilis albidis appressis plus minusve ornatis, lamina lanceolata 8–14 mm. longa 3–7 mm. lata, infra medium latiore, deinde basim versus in petiolum 2–4 mm. longum contracta, apice acuta, margine plus minusve crispata; floribus in axillis foliorum subsessilibus; bracteis involucralibus 3 lanceolatis 2–3 mm. longis quam anthocarpio duplo brevioribus; perianthio infundibuliformi 12–15 mm. longo extus hispidulo-puberulente, limbo ad 13 mm. diametro, staminibus 5 exsertis; anthocarpio 5–6 mm. longo 1–1.5 mm. crasso prismatico glandulari-puberulente, lateraliter sulcis duobus approximatis lineatis profundis basim versus ornato, sub apice abrupte contracto, apice supra costas principales glandulas magnas hemisphaericas gerente.

COAHUILA: Fraile, valley, July 10, 1941, *Stanford et al. 291*. SAN LUIS POTOSI: Los Charcos, May 15, 1891, *Pringle 5081* (TYPE, Gray Herb.).

A very well-marked species related to *A. Wrightii* and *A. acutifolia*, from which it is readily distinguished by its dwarf habit, small glandular hispid

lanceolate leaves, small flowers, short involucral bracts, and small prismatic glandular-puberulent 10-ribbed anthocarp. The anthocarp is distinctive. It is slightly the thickest above the middle, several times longer than broad, and prismatic in general form. Down each side there is a pair of parallel grooves which obviously deepen and broaden towards the base and apex. These grooves evidently delimit five lateral ribs which have been crowded and narrowed by the lateral outgrowth and expansion of the five broad principal ribs forming the angles of the fruit. This condition is different from that in *A. Wrightii* and *A. acutifolia*, in which the lateral ribs are not evident, being apparently completely covered by the overgrowth of the principal ribs. At the summit of the fruit in *A. nana* the principal ribs are replaced by five hemispherical glands which do not protrude above the level of the ribs.

The species is known only from Fraile and Charcos. No information is available as to the exact habitat selected by the plant. However, judging from the behavior of other rare plants known from these two general localities, I suspect that *A. nana* may be gypsophilous.

Boerhavia linearifolia Gray, Am. Jour. Sci. II. **15**: 322 (1853).
Boerhavia linearifolia var. *glabrata* Gray, Am. Jour. Sci. II. **15**: 322 (1853).
Boerhavia tenuifolia Gray ex Coult. Contr. U. S. Nat. Herb. **2**: 355 (1894).
Boerhavia linearifolia subsp. *glandulosa* Standl. Contr. U. S. Nat. Herb. **12**: 387 (1909).
Boerhavia Lindheimeri Standl. No. Am. Fl. **21**: 208 (1918).

COAHUILA: Rancho Agua Dulce, lower slopes of Sierra San Manuel, *Wynd & Mueller 356;* Puerto Santa Anna, July 21, 1936, *Marsh 941;* mountains 24 mi. northeast of Monclova, 1880, *Palmer 1122;* Sierra de la Paila, Oct. 1910, *Purpus 4958;* Saltillo, stony hill-slope under bushes, fl. damask-color, 1898, *Palmer 155;* Saltillo, highlands, scarce, fl. purple, June 2, 1848, *Gregg 110;* Buena Vista, south of Saltillo, frequent, fl. purplish red, July 24, 1848, *Gregg 281;* Carneros area, 1880, *Palmer 1121;* slopes of Sierra del Carmen 10 km. northeast of Hac. Encantada, arroyo banks, fairly common, *Stewart 1563;* Mesa Grande, 40 km. northwest of Hac. Encantada, open hillside, fairly common, fl. purple, *Stewart 1610;* base of Sierra Guajes 7 km. east of Rancho Buena Vista, limestone hillside, fairly common, fl. orchid, *Stewart 1478;* high mesa 12 km. northwest of Rancho Buena Vista, hillside, fl. purple, *Stewart 1431;* 20 km. northwest of Puerto del Aire, grassy hills, fl. purple, *Stewart 1284;* Sierra del Pino, ridge west of La Noria, on ledges, prostrate, fl. magenta, *Johnston & Muller 620;* Sierra Madera, Cañon Pajarito, dry rocky arroyo, fl. lavender, *Muller 3151;* Sierra Madera, Cañon Charretera, rocky open flats, stems spreading, fl. pink, *Johnston 9138;* near Santa Elena, eastern foothills of Sierra Cruces, along arroyos and on limestone slopes, prostrate or ascending, *Stewart 262, Johnston & Muller 212;* Cañon Tinaja Blanca, Sierra Cruces, dry open hillsides, fl. purple, *Stewart 593;* La Botica, Valle Delicias, in arroyos, ascending, fl. purple, *Stewart 2884.* CHIHUAHUA: Sierra San Carlos, road to mines, rocky ridge crest, *Johnston & Muller 66;* 1 km. southeast of Rancho Madera, southeast base of Sierra Rica, dry arroyo, ascending, fl. purple, *Stewart 2442;* south end of Sierra Seca, 5 km. south of San José del Progreso, dry rocky slope, frequent, ascending, fl. purple, *Stewart 2306.*

Central and trans-Pecos Texas and adjoining New Mexico south into our area. A plant of hillsides and stabilized alluvial terraces in limestone areas. It has a strong deep woody tap-root and usually very numerous prostrate or ascending slender wiry stems 1–2 dm. long. Its narrowly to broadly lanceolate, frequently revolute-margined leaves, usually 2–3 cm. long,

readily distinguish this species. As with other congeners it is variable in indument, being smooth and glabrous or minutely glandular and more or less hispidulous or even shaggy-hispid on the stems. Plants varying widely in indument and in leaf-size and -shape may usually be found in any locality. The type of the species, the only specimen upon which Gray wrote "*Boerhaavia linearifolia* n. sp.," is that part of *Wright 608* which was collected on a "high rocky limestone prairie" between Turkey and Elm creeks, in eastern Kinney Co., Texas. It is a form with the leaves hispid and the stems glandular and shaggy-hispid. The type of var. *glabrata,* also part of *Wright 608,* was collected in the "pebbly bed of a small creek beyond Zacate Creek," i.e. in eastern Val Verde Co., Texas. It consists of two branches, one completely glabrous and smooth, the other with scattered minute glands and (towards the base) sparsely minute-hispidulous.

Boerhavia anisophylla Torr. Bot. Mex. Bound. 171 (1859).
Boerhavia Palmeri Wats. Proc. Am. Acad. 18: 142 (1883).
Boerhavia anisophylla f. *polytricha* Heimerl, Repert. Sp. Nov. 12: 220 (1913).

VERNACULAR NAME: Yerba de la mosca.

COAHUILA: Hills near Mesillas, frequent, 1–2 ft., fl. purple, Sept. 23, 1848, *Gregg 533;* Saltillo, 1880, *Palmer 1120* (type of *B. Palmeri*); Saltillo, base of stony hills and in ravines, fl. crimson-purple, 1898, *Palmer 156;* 2 mi. west of Saltillo, road to Torreon, fl. pinkish, *White 1683;* southern foothills of Sierra Hechiceros, 6 km. east of El Tule, fairly common on hillsides, fl. orchid, *Stewart 467;* 9 mi. south of El Tule, south base of Sierra Hechiceros, exposed gravelly ridge, stems erect or ascending, fl. purple, *Johnston & Muller 1373;* Tanque Jerico, with *Hechtia* on limestone hillside, *Johnston 8336;* Cerro de Cypriano, crevices of rocks, June 1910, *Purpus 4544.* CHIHUAHUA: Chihuahua, 1935, *LeSueur 37;* Sierra Santa Eulalia, limestone hills, Aug. 12, 1885, *Pringle 685;* Los Reyes, about 8 mi. south of Jimenez, fl. reddish purple, *White 2114.* DURANGO: Yerbanis, *Shreve 9135.*

Brewster County, Texas, south in Chihuahua, Coahuila, and Tamaulipas to San Luis Potosi and Durango. Apparently confined to calcareous rocks. A perennial with a thick woody tap-root. The stems are few, rather coarse and stiff and sparsely branched. The plant is decumbent and leafy below the middle and above erect and strongly ascending. The type was collected at the "Entrance of the Grand Cañon of the Rio Grande" and is an unusual form with the stems and leaves practically glabrous. Most collections of the species have the stems, and frequently the leaves, densely and minutely glandular, and commonly also hispidulous. Coarse hairs, in varying abundance, are frequently present on the basal stem-internodes. The forma *polytricha,* representing the common form in our area, is based upon *Endlich 175b* from near Yerbanis, Durango.

Boerhavia gracillima Heimerl, Bot. Jahrb. 11: 86 (1889).
Boerhavia anisophylla var. *paniculata* Coult. Contr. U. S. Nat. Herb. 2: 356 (1894).
Boerhavia organensis Standl. Contr. U. S. Nat. Herb. 12: 385 (1909).
Boerhavia gracillima subsp. *decalvata* Standl. Contr. U. S. Nat. Herb. 12: 386 (1909).

COAHUILA: Sierra del Carmen, Aug. 22, 1936, *Marsh 577;* Santa Anna Canyon, 1936, *Marsh 552;* Puerto San Lazaro, rocky slopes, *Wynd & Mueller 125;* Picacho Noche Buena, basalt ledges, prostrate, widely spreading, fl. red, *Johnston & Muller 178;* Cañon Indio Felipe, Sierra Hechiceros, cliffs, fl. purple, *Stewart 148;* Cañon Tinaja Blanca, Sierra Cruces, bed of sandy arroyo, prostrate, fl. red, *Stewart 627;* 8 km. northeast of Santa Elena, dry limestone hillside, prostrate, fl. red, *Stewart 1123;* near

San José, southeast of Sierra Cruces, about cliffs of limy conglomerate, prostrate, stems becoming 12 dm. long, fl. reddish, *Johnston & Muller 999*. CHIHUAHUA: Sierra San Carlos, road to mine, canyon-bottom, prostrate, fl. red, *Johnston & Muller 51;* Cañon Madera, Sierra Rica, dry rocky arroyo, fl. reddish, *Stewart 2526;* 10 km. north of Escobillas, open rocky slope, prostrate, fl. reddish, *Stewart 2378;* 3 mi. south of Pirámide, gravelly terrace along arroyo, prostrate, *Johnston 8109;* hills southeast of Chihuahua, Aug. 15, 1885, *Pringle 665;* Chihuahua, in arroyos, fl. maroon, 1908, *Palmer 199*.

Trans-Pecos Texas (Brewster Co. west) to Arizona and south to southern Mexico. A perennial with a strong woody deep tap-root. The stems become 10–15 dm. long. A plant may cover an area a meter or more in diameter, its repeatedly branched slender branches and branchlets bearing myriads of small wine-colored flowers. The species appears to be widely distributed but is only locally common, and then seemingly in disturbed rocky soils. Because of its lack of glandularity and the very elongate slender pedicels, the plant seems cleaner and more openly branched than usual in this genus.

Boerhavia coccinea Mill. Gard. Dict. ed. 8. no. 4 (1768).
Boerhavia hirsuta Jacq. Hort. Bot. Vind. 1: 3. *t. 7* (1770); L. Mant. 2: 170 (1771); Willd. Phytogr. 1: 1 (1794), Sp. Pl. 1: 20 (1797).
Boerhavia caribaea Jacq. Obs. Bot. 4: 5. *t. 84* (1771).
Boerhavia polymorpha Rich. Act. Soc. Hist. Nat. Paris 1: 185 (1792); Heimerl, Ann. Cons. et Jard. Bot. Genève 5: 188 (1901).
Boerhavia viscosa Lag. & Rodr. Anal. Cienc. Nat. Hist. 4: 256 (1801).
Boerhavia ramulosa Jones, Contr. W. Bot. 10: 40 (1902).
Boerhavia ixodes Standl. Contr. U. S. Nat. Herb. 13: 423 (1911).

COAHUILA: Monclova, 1939, *Marsh 1727;* San Antonio de los Alamos, shaded gravelly canyon-floor, stems widely spreading, *Johnston & Muller 882;* Cañon Tinaja Blanca, Sierra Cruces, banks of arroyo, not common, fl. dark red, *Stewart 1136;* north end of Bolson de los Lipanes, between El Almagre and Cerros de Leja, margin of mogote on plain, prostrate-spreading, *Johnston & Muller 1254;* Rancho La Botica, Valle Delicias, common in arroyos, prostrate, fl. purplish, *Stewart 2881;* Horizonte, 1937, *Wynd 775;* Torreon, ditch-bank, very widely spreading, fl. crimson, 1898, *Palmer 487*. CHIHUAHUA: Rancho El Pino, 10 km. southeast of Sierra Rica, rocky slope, fl. reddish, *Stewart 2387;* 8 km. south of Rancho Encinillas, sandy flat, prostrate, fl. red, *Stewart 711;* 7 mi. east of Victoria, sprawling in bushes on arroyo-bank, *Stewart & Johnston 2001;* Chihuahua, stony arroyos, not common, fl. crimson, 1908, *Palmer 193;* Presa de Chihuahua, 1936, *LeSueur 617;* valley near San Pablo, fl. red, April 29, 1847, *Gregg;* 3 mi. north of San Lucas on road to Chihuahua, fl. red, *White 2319;* 3 mi. west of Camargo, fl. dark red, *White 2273*. ZACATECAS: Concepcion del Oro, widely spreading, fl. maroon, 1904, *Palmer 290*.

Florida to southeastern California and south in the warmer parts of America. For the present plant Standley, No. Am. Fl. 21: 206 (1918), took up and gave currency to the name *B. caribaea* Jacq. (1771). Unfortunately, however, that name undoubtedly has earlier valid synonyms in *B. coccinea* Miller (1768) and *B. hirsuta* Jacq. (1770). If our American plant is to be distinguished from the Old World *B. diffusa* L. it must be called *B. coccinea* Miller. By some mischance Standley applied Miller's name to another tropical species which previously had been generally known as *B. paniculata* Rich. (1792). The name "*B. paniculata*" of L. C. Richard, however, is antedated by *B. paniculata* Lam. (1791) and the

tropical species known as "*B. paniculata*" appears to have its earliest name in *B. adscendens* Willd. (1797), cf. Heimerl, Bot. Jahrb. 21: 619 (1896).

This is a perennial species with elongate prostrate or widely spreading stems. Like most members of the group it is variable as to indument, being glandular throughout or only towards the base, and having the stems with or without conspicuous elongate hairs. Its dense umbellate clusters of glandular fruits readily distinguish the species from *B. gracillima*.

Boerhavia erecta L. Sp. Pl. 3 (1753).

COAHUILA: 2 km. west of Santa Elena, foothills of the Sierra Cruces, flats, not common, erect, 5–10 dm. tall, fl. light pink, *Stewart 837;* Bolson de los Lipanes, between El Almagre and Cerros de Leja, margin of mogote on plain, erect with ascending branches, *Johnston & Muller 1255*. CHIHUAHUA: Pass 10 mi. south of Mula, alluvial terrace, erect, *Johnston 8046;* 13 mi. west of Chihuahua, road to Santa Isabel, fl. pink, *White 2459;* 8 mi. north of San Lucas, road to Chihuahua, fl. white, *White 2322;* 12 mi. south of Camargo, fl. pinkish, *White 2205;* 31 mi. southeast of Jimenez, abundant on grassy slopes, fl. pink, *Muller 3328;* Cañon del Coyote, southern end of Sierra Diablo, frequent in dry arroyos, fl. white, *Stewart 2615*.

Widely distributed in the warmer parts of America, extending north to southern Arizona and New Mexico and along the coastal plain through eastern Texas and Florida north to South Carolina. An upright annual herb becoming 5–10 dm. tall. The plant has one or a very few erect or nearly erect stems which are ascendingly branched above. Standley, Contr. U. S. Nat. Herb. 13: 427 (1911), cites a collection (*Pittier 487*) from "barren hills about Tlahualilo," Durango.

Boerhavia intermedia Jones, Contr. W. Bot. 10: 41. *t. 16* (1902).

Boerhavia universitatis Standl. Contr. U. S. Nat. Herb. 12: 380 (1909).

Boerhavia erecta var. *intermedia* Kearney & Peebles, Jour. Wash. Acad. 29: 475 (1939).

COAHUILA: 12 mi. north of Monclova, silty valley soil in mesquite thicket, *Johnston 7189;* Monclova, 1880, *Palmer 1123;* 2 km. west of Santa Elena, foothills of the Sierra Cruces, flats, *Stewart 837A;* Zenzontle, stony sunny slope, prostrate, *Johnston & Muller 965;* 2–3 mi. north of San Antonio de los Alamos, gravelly plain, plant spreading, *Johnston 8231;* San Antonio de los Alamos, dry gravelly slope below tuff cliffs, stems ascending, *Johnston & Muller 888;* Cañon del Agua Chica, west of Las Delicias, common on flats, stems ascending, fl. white, *Stewart 2832;* Torreon, in shade of mesquites on plain, 1898, *Palmer 468*. CHIHUAHUA: Pass 10 mi. south of Mula, alluvial terrace, diffuse, *Johnston 8045;* low ridge a mile southwest of Mesteñas, rocky slope, not common, prostrate, *Stewart & Johnston 2025;* Meoqui, 1936–37, *LeSueur;* 8 mi. north of San Lucas, road to Chihuahua, fl. pink, *White 2320;* 15 mi. west of Las Delicias, road to San Lucas, fl. pink, *White 2296*. DURANGO: Cerro de San Ignacio, July 1910, *Purpus 4619*.

Trans-Pecos Texas to southeastern California and south into northern Mexico. Reaching its southern limit in our area. The species is probably most closely related to *B. erecta,* but differs in size, habit, inflorescence, and distribution. It has been collected growing near *B. erecta* but is known only from areas in the northwest portions of the range of that species, and in trans-Pecos Texas and adjoining New Mexico it is a frequently collected plant in an area from which *B. erecta* is unknown. The plants of *B. intermedia* are seldom 5 dm. tall and are usually lower and much branched near the base, with the elongate branches loosely ascending. Young plants are

erect; old ones tend to become decumbent. The fruits are borne on subequal pedicels forming tidy long-peduncled umbels, readily distinguished from the looser imperfectly umbellate inflorescences of *B. erecta*. The inflorescence of *B. erecta* is a cymose panicle in which many of the branchlets become more or less crowded and bear their fruits in a subumbellate arrangement. Associated with the subumbellate clusters in the inflorescence of *B. erecta* are branched, irregular, and more open groupings of fruit that are evidently cymose. Even the subumbellate clusters have the fruits borne on pedicels of unequal length that are produced at different levels below the apex of the common axis. Furthermore, in these subumbellate clusters 2 or 3 fruits may be borne on a single "pedicel." The compact neat umbels of *B. intermedia* are stable units in a fixed type of inflorescence and readily serve to distinguish that species from *B. erecta*.

Boerhavia spicata Choisy in DC. Prodr. 13^2: 456 (1849).
Boerhavia spicata var. *Torreyana* Wats. Proc. Am. Acad. 24: 70 (1889).
Boerhavia Torreyana (Wats.) Standl. Contr. U. S. Nat. Herb. 12: 385 (1909).
Boerhavia Coulteri (Hook.) Wats. Proc. Am. Acad. 24: 70 (1889).
Boerhavia Rosei Standl. Contr. U. S. Nat. Herb. 13: 424 (1911).
Boerhavia Watsoni Standl. Contr. U. S. Nat. Herb. 12: 384 (1909).

COAHUILA: Red dunes at Tanque Colorado, stems ascending, *Johnston 8657;* Torreon, sandy places along Rio Nazas, 1898, *Palmer 488*. CHIHUAHUA: 10 km. south of Escobillas, frequent on sandy slope, stems ascending, fl. purple, *Stewart 2355;* Chihuahua, 1935, *LeSueur 388*.

Central Texas to southeastern California and south into our area and along the Pacific Coast to Sinaloa. An annual growing in sandy places. A species readily recognized by its racemose fruiting inflorescences, its minute corollas, and the inconspicuous bracts subtending the fruit.

Boerhavia Wrightii Gray, Am. Jour. Sci. II. 15: 322 (1853).
Boerhavia bracteosa Wats. Proc. Am. Acad. 20: 370 (1885).

COAHUILA: Las Margaritas, west side of Valle Delicias, frequent in sandy arroyo, ascending, *Stewart 2947*. CHIHUAHUA: 5 mi. southeast of San Carlos, gravelly bank of small arroyo, erect, corolla white, pink outside towards the base, *Johnston & Muller 80;* 8 mi. north of San Lucas, road to Chihuahua, fl. white, *White 2323;* 3 mi. north of Charca Piedra (21 mi. northeast of Camargo), erect, under bushes on silty plain, *Johnston 7930*.

Trans-Pecos Texas to southeastern California and adjoining northern Mexico, reaching its southern limit in our area. An annual herb, readily recognized by its prevailingly 4-angulate fruits and the conspicuous bracts on the elongating racemose inflorescence.

Boerhavia purpurascens Gray, Am. Jour. Sci. II. 15: 321 (1853).

Reported from "Near Chihuahua, 1887, *Palmer 1582*" by Standley, Contr. U. S. Nat. Herb. 13: 425 (1911). Otherwise known only from Arizona and western New Mexico. A well-marked species related to *B. Wrightii*, from which it is distinguished by its usually 5-angulate fruits and non-elongating dense glomerate clusters of flowers and fruit, which are interspersed with evident persistent glandular-villous bracts.

Cyphomeris crassifolia Standl. Contr. U. S. Nat. Herb. 13: 428 (1911).

COAHUILA: 2 mi. northwest of Frontera, road to Natadores, silty desert plain,

6–12 inches tall, *Johnston 7178;* Saltillo, one plant, near river, 2 ft. tall, 1898, *Palmer 172* (ISOTYPE).

Known only from eastern Coahuila and Nuevo Leon. Very closely related to *C. gypsophiloides* but apparently distinguishable by its triangular-ovate sinuate or sinuately lobed leaf-blades and densely puberulent stems and leaves.

Cyphomeris gypsophiloides (M. & G.) Standl. Contr. U. S. Nat. Herb. 13: 428 (1911).

VERNACULAR NAME: Pega mosca.

COAHUILA: Sierra del Carmen, Aug. 22, 1936, *Marsh 578;* La Azufrosa, 3 ft. tall, abundant, Sept. 22, 1848, *Gregg 513;* Saltillo, three plants under bushes on shady embankment, stems sticky, 1898, *Palmer 171;* Rancho El Pino, northwest of Sierra del Pino, in mogote, *Stewart 1783;* Cañon Ybarra, Sierra del Pino, arroyo bank, *Stewart 1894;* La Noria, Sierra del Pino, sprawling, shaly arroyo-bank, *Johnston & Muller 508;* Sierra del Pino, mouth of southern Canyon, hillside, *Stewart 1192;* San Antonio de los Alamos, gravelly shaded canyon floor, *Johnston & Muller 884;* Sierra Hechiceros, Cañon Indio Felipe, *Stewart 50, 67, Johnston & Muller 1333;* Sierra Almagre, rocky places in deep shaded canyon, *Johnston & Muller 1185;* Sierra Mojada, Cañon Hidalgo, hillside below crest, *Stewart 1086;* La Botica, Valle Delicias, *Stewart 2854, 2944;* Sierra Parras, Oct. 1910, *Purpus 4956, 4957;* San Lorenzo de la Laguna, 1880, *Palmer 1125.* CHIHUAHUA: Sierra Rica, Cañon Madera, dry arroyo bank, *Stewart 2443;* Santa Eulalia Hills, 1885, *Wilkinson;* rocky hills near Chihuahua, limestone ledges, Aug. 1885, *Pringle 693.*

Southeastern New Mexico, trans-Pecos, central, and southern Texas, and south in Chihuahua, Coahuila, Tamaulipas, and Hidalgo to Oaxaca. A perennial with slender brittle stems that are sprawling, ascending, or erect. It is rarely common. Usually growing in rocky soil and frequently scrambling in low bushes. The perianth is purplish, magenta, pink, and, not uncommonly, even white. The foliage varies from lance-linear to lanceolate and from completely glabrous and lustrous to somewhat puberulent and even sparsely glandular, especially when young. The type was collected in Tehuacan, Puebla. The specific name is inappropriate.

Cyphomeris gypsophiloides var. **Stewartii** var. nov.

A varietate typica differt caulibus et foliis glandulosis, pilis minutis glanduliferis abundanter obsitis.

CHIHUAHUA: Sierra Diablo, 3 km. east of Cañon Rayo, open hillside, not common, 1 m. tall, fl. white, *Stewart 941;* Sierra Diablo, mouth of Cañon Rayo, arroyo bank, not common, 12 dm. tall, fl. violet, *Stewart 941;* large canyon near northeast end of Sierra Diablo, 1 m. tall, July 29, 1941, *Stewart 1943* (TYPE, Gray Herb.); Cañon Coyote, south end of Sierra Diablo, 20 km. northwest of Santa Fe, dry arroyo, ascending, fl. purple, *Stewart 2612.*

This robust very glandular variety is known only from the Sierra Diablo in extreme southeastern Chihuahua. It may deserve specific rank. However, some plants of *C. gypsophiloides* from southwestern Coahuila appear to be transitional to the variety, having a robust habit and scattered glands on the foliage.

Commicarpus scandens (L.) Standl. Contr. U. S. Nat. Herb. 12: 373 (1909).

Boerhavia scandens L. Sp. Pl. 3 (1753).

COAHUILA: Sierra Hechiceros, Cañon Indio Felipe, along creek banks, *Stewart 25, 108;* San Antonio de los Alamos, sprawling among rocks at base of cliffs, *Johnston &*

Muller 881; Cañon del Agua Grande, Sierra Sobaco west of Las Delicias, on gypsum near water, 1 m. tall, *Stewart 2811.* CHIHUAHUA: Sierra Organos, 1937, *LeSueur 1396;* Aldama, shady woods along water ditch, scarce, stems long, fl. greenish yellow, 1908, *Palmer 241.*

From trans-Pecos Texas (Presidio County, in canyons along the Rio Grande) and southern Arizona south through Mexico; West Indies; northwestern South America. In Mexico best known from the western and southern parts of the country. Standley reports that it behaves as an introduced ruderal weed on the west coast of Mexico. In our area, however, the plant is seemingly native, rare, and not at all aggressive.

Anulocaulis eriosolenus (Gray) Standl. Contr. U. S. Nat. Herb. **12**: 375 (1909).
Boerhavia eriosolena Gray, Am. Jour. Sci. II. 15: 322 (1853).

VERNACULAR NAMES: Pegajosa; "Pea monte."

COAHUILA: 4 mi. west of Cuatro Cienegas, stony slope, fl. pink, *Johnston 7155;* near Azufrosa, 3 ft. tall, fl. pale red, Sept. 22, 1848, *Gregg 512* (TYPE); 55 mi. west of Saltillo (23 mi. east of Paila), about rocks on steep sandstone slope, *Johnston 7701;* 14 mi. east of Paila, *Shreve & Tinkham 9894;* south end of Cañada Oscuro near Tanque La Luz, confined to gypsum beds on escarpment, 1–4 ft. tall, fl. purple, not common, *Johnston 8493;* ascent to Sierra Fragua east of Tanque Colorado, local on banks of cemented gravel, fl. red, 3–6 ft., *Johnston 8810;* valley between La Vibora and Matrimonio Viejo, confined to gypsum beds, 1–4 ft. tall, frequent, fl. pink, *Johnston 9344;* 2 km. southeast of Noria San Juan (southeast of Laguna del Rey), plains, common, fl. purple, *Stewart 2658;* 16 mi. south of Laguna del Rey, gypsum plains, 1–4 ft., *Johnston 7813;* Rancho Las Uvas, gypsum slopes on east side of Valle Acatita, scarce, fl. purple, *Stewart 2727;* San Lorenzo de la Laguna, 1880, *Palmer 1124;* Viesca, March 1905, *Purpus 1053.*

Known to me only from Coahuila and Brewster County, Texas. Standley, Contr. U. S. Nat. Herb. 13: 430 (1911), reports a collection from Torreon made by Purpus in 1903. Torrey, Bot. Mex. Bound. 172 (1859), reports collections from "gravelly plains near Presidio del Norte [Ojinaga], and below the Great Cañon of the Rio Grande." The latter station may be the canyons in the Big Bend. The report from Ojinaga I have been unable to verify. The only member of the genus I have seen from about Ojinaga is *A. reflexus.*

The species appears to be a gypsophile and confined to pure gypsum or mixed gypseous soils. It is very distinct, differing from its congeners in the conspicuously villous tube of its pink perianth and in the calyx-like involucre of 4–6 tardily deciduous subscarious bracts which subtends each flower. The root is apparently biennial and never forms a gnarled and woody caudex. The fruit is turbinate with the summit broadly obtuse or retuse. The glutinous bands at the middle of the stem-internodes are conspicuously developed. The stems and leaves are usually flushed with pink or rose.

Anulocaulis leiosolenus (Torr.) Standl. Contr. U. S. Nat. Herb. **12**: 375 (1909).
Boerhavia leiosolena Torr. Bot. Mex. Bound. 172 (1859).

TEXAS (Hudspeth Co.): Gypsum quarry east of Finlay, weathered gypsum, *Waterfall 5026;* Great Canyon of the Rio Grande, *Bigelow.*

The type of this species was collected "In gypseous soil, Great Cañon of the Rio Grande, 70 miles below El Paso, June; *Parry,*" or, in other

words, at the canyon of the Rio Grande a mile or so below Indian Hot Springs in southern Hudspeth Co., Texas. The species is naturally to be expected in adjoining portions of Chihuahua.

Anulocaulis leiosolenus var. **lasianthus** var. nov.

A varietate typica differt perianthiis praesertim in alabastro extus distincte puberulentibus vel villosulis, haud glabris.

TEXAS (Brewster Co.): Hot Springs, 1937, *Warnock 701A;* 5¼ mi. east of Terlingua, Sept. 24, 1938, *Cory 30251* (TYPE, Gray Herb.).

Known only from the Big Bend, but occurring near the Rio Grande at Hot Springs and consequently to be expected in adjoining Coahuila. Apparently an isolated eastern race of *A. leiosolenus* distinguishable only by its hairy perianths. It is separated from typical *A. leiosolenus* by the whole of Presidio County, Texas, an area in which the genus is represented only by *A. reflexus*. As with the species, the variety is probably also gypsophilous.

Anulocaulis reflexus sp. nov.

Planta perennis erecta 3–10 dm. alta e caudice lignoso erecto erumpens; caulibus pluribus glaberrimis pallidis rigide ascendenterque ramosis nullo modo glutinosis; foliis e partibus inferioribus caulis et ramorum infimorum in jugis 2–4 et 5–15 cm. longe distantibus gestis, oppositis coriaceis in sicco rigidis et fragilibus; lamina cordata vel cordato-reniformi 4.5–9 cm. lata 4–11 cm. longa, apice acuta vel obtusa vel rotunda, basi sinu 4–11 mm. profundo donata, margine plus minusve irregulariter sinuata obtuse denticulata brunnea glandulari-incrassata, pagina utraque plus minusve abundanter glanduloso-tuberculata (tuberculis brunneis praesertim eis paginae superioris laminae minute et sparse villosulis); floribus nodis inflorescentiae laxe dispositis haud congestis; perianthio rosaceo, tubo non raro plus minusve curvato ca. 1 cm. longo basim versus ca. 1 mm. crasso, deinde sursum gradatim ampliato apice ca. 2.5 mm. crasso, lobis 5 oblongis 5–10 mm. longis ca. 2.5 mm. latis deflexis; perianthiis post anthesi subtubulosis rectis 10–14 mm. longis persistentibus; staminibus inaequalibus 3 ca. 1 cm. longe exsertis; anthocarpio turbinato 6 mm. longo ad 4.5 mm. diametro, medio annulo incrassato anguste alato circumcincto, parte inferiore conico 5-costato, parte superiore majore conico-hemisphaerico 10-costato.

CHIHUAHUA: 10 mi. south of Ojinaga, silty soil along base of low hills, outwash from saline and gypsiferous clays and shales, frequent, erect, 1–3 ft. tall, Aug. 8, 1940, *Johnston & Muller 10* (TYPE, Gray Herb.); 10 mi. south of Ojinaga, base of low hills in gypseous saline soil, fl. pink, Aug. 9, 1941, *Johnston 8023;* 3 mi. north of Chapo, frequent along outcrops of shales, 1–3 ft. tall, fl. purple, Sept. 23, 1940, *Johnston & Muller 1440*. TEXAS: South end of Van Horn Mts., about 11 mi. southwest of Chispa, gypseous shale ridge, Jeff Davis Co., July 26, 1943, *Waterfall 5296;* Old Newman Spring, just east of San Carlos Creek one mile north of Weatherford's, shrubby at base, fl. fresh pink, filaments long-protruding and showy, Presidio Co., June 11, 1941, *Hinckley 1665*.

A well-marked species, probably most closely related to *A. leiosolenus*. Readily distinguished from all its congeners by having the limb and lobes of its perianth reflexed. In previously described species of this genus the limb of the perianth is funnel-form and its lobes are ascending. In *A. reflexus* the throat is exvaginate, being inside out and reflexed and sheathing the upper 1–3 mm. of the perianth-tube. The lobes, short to elongate,

are strongly reflexed and parallel the commonly somewhat curved tube. The stamens consequently are very long-exserted and conspicuous. After anthesis the limb and its lobes shrink to form a tumid margin to the subtubular perianth-tube, which remains attached and erect for some time on the ripening fruit.

It is a curious fact that the known stations for *A. reflexus* lie in an area along the Rio Grande between the districts in which *A. leiosolenus* and its var. *lasianthus* are known. The species probably ranges southwest into Chihuahua, for while traveling by railroad from Chihuahua to Ojinaga in 1941 I observed an *Anulocaulis,* most likely this species, on the extensive gypsum beds just west of the Rio Conchos.

Mirabilis linearis (Pursh) Heimerl, Ann. Cons. et Jard. Bot. Genève 5: 186 (1901).
Allionia linearis Pursh, Fl. Am. Sept. 728 (1814).
Oxybaphus linearis Robins. Rhodora 10: 31 (1908).
Allionia petrophila Standl. Contr. U. S. Nat. Herb. 12: 340 (1909).

COAHUILA: Sierra Encantada, mouth of Cañon San Enrique, bank of dry arroyo, erect, fl. lavender, *Stewart 1377;* base of Sierra Guajes, 7 km. east of Rancho Buena Vista, limestone hillside, erect, fl. reddish white, *Stewart 1477;* Valle de los Guajes, 10 km. south of Rancho Buena Vista, grassy hillside, erect, 1 m. tall, fl. purplish white, *Stewart 1362;* Valle de los Guajes, 20 km. south of Rancho Buena Vista, grassy flat, erect, fl. orchid, *Stewart 1335;* Sierra del Pino, ridge west of La Noria, erect, fl. burnt-orange or red, *Johnston & Muller 611, 617;* Sierra del Pino, flats at La Noria, fl. whitish, *Johnston & Muller 426;* tableland north of Cañon Cuervo Chico, slopes of low limestone hill, decumbent on grassy slope, *Johnston 8555;* south base of Sierra Hechiceros, 6 km. east of El Tule, open flat, fl. orchid, *Stewart 483.* CHIHUAHUA: High valley on northwest end of Sierra Diablo, hillsides and meadows, fl. purple, *Stewart 964;* rocky hills northwest of Chihuahua, Sept. 1886, *Pringle 840* (isotype of *A. petrophila*).

Widely distributed in central parts of the United States and south through Arizona, New Mexico, and western Texas into our area.

A plant with the leaves linear or narrowly lanceolate and very gradually attenuate below into a more or less well-developed petiole. The stems and leaves are usually whitish and glabrous or practically so. The inflorescence and the involucres are usually viscid-villous with fulvous hairs. Over most of its range this species has narrow leaves rarely more than 6 mm. wide. In Texas, however, forms with the blade wider (up to 12 mm.) are not uncommon. Among the collections cited above, three are atypical, *Stewart 1377* and *Johnston & Muller 426* having green sparsely hairy involucres and the uppermost leaves broadened at the base, and *Stewart 483* having the leaves above the middle of the stem thin, green, rather broad, and with the base rounded and subsessile.

Mirabilis pseudaggregata Heimerl, Ann. Cons. et Jard. Bot. Genève 5: 183 (1901).
Mirabilis pseudaggregata f. *subhirsuta* Heimerl, l.c. 184.
Mirabilis pseudaggregata f. *eglandulosa* Heimerl, l.c. 184.
Allionia pseudaggregata Standl. Contr. U. S. Nat. Herb. 12: 356 (1909).
Allionia pseudaggregata subhirsuta Standl. Contr. U. S. Nat. Herb. 12: 356 (1909).
Oxybaphus pseudaggretatus Weatherby, Proc. Am. Acad. 45: 425 (1910).

COAHUILA: Sierra Hechiceros, Cañon Indio Felipe, base of talus slope, *Stewart 34;* 7 mi. south of Jaco, in shade inside mogote, *Johnston & Muller 1117.* CHIHUAHUA: Hills northeast of Chihuahua, cool slopes, Aug. 30, 1886, *Pringle 793* (ISOTYPE).

A light green, sprawling, much-branched plant with very scanty and inconspicuous pubescence and abundant narrowly lanceolate leaves, which are gradually attenuated below into a distinct petiole. The leaves in form, size, texture, and color are similar to broad-leaved forms of *M. linearis* found in trans-Pecos Texas. It is possible that *M. pseudaggregata* may be merely a shade form of *M. linearis*. Most of its flowers are cleistogamic. It differs from *M. linearis* in its leafy elongate slender much branched sprawling stems and its scantily pubescent inflorescence and involucres. From *M. attenuata,* of central Mexico, it differs in its thinner more attenuate and more distinctly petiolate leaves and scanty pubescence. I know *M. pseudaggregata* only from the collections cited above.

Mirabilis glabra (Wats.) Standl. Field Mus. Publ. Bot. 8: 304 (1931).
Oxybaphus glaber Wats. Am. Nat. 7: 301 (1873).
Allionia glabra Kuntze, Rev. Gen. 2: 533 (1891).
Oxybaphus glaber var. *recedens* Weatherby, Proc. Am. Acad. 45: 425 (1910).
Allionia glabra recedens Standl. Contr. U. S. Nat. Herb. 13: 406 (1911).

CHIHUAHUA: Sandhills south of Samalayuca, Sept. 20, 1886, *Pringle 1126;* dunes near Samalayuca, 1935, *LeSueur 390;* between Casas Grandes and Sabinal, 1899, *Nelson 6351* (type of var. *recedens*).

Southern Utah to northern Chihuahua. A relative of *M. linearis,* differing in its glabrous or nearly glabrous stems, leaves, and fruit. The involucre is rather small, single-flowered, glabrous or nearly so, and more deeply lobed and less spreading than in *M. linearis*. In recognizing the species I am emphasizing the characters of the involucre and the associated glabrous fruit. Standley seems to have admitted to this species some plants which I would classify as glabrous-fruited *M. linearis*.

Mirabilis coahuilensis (Standl.) Standl. Field Mus. Publ. Bot. 8: 305 (1931).
Allionia coahuilensis Standl. Contr. U. S. Nat. Herb. 12: 347 (1909).
Oxybaphus coahuilensis Weatherby, Proc. Am. Acad. 45: 425 (1910).

COAHUILA: Sierra Gloria, *Marsh 1908;* Saltillo, 1898, *Palmer 158* in pt. (ISOTYPE); Sierra Madera, Cañon del Agua, open oak woods, *Muller 3246A;* Sierra Madera, Cañon Charretera, in oak thicket, erect, *Johnston 8942, 9137;* central Sierra del Pino, head of Cañon Ybarra, dry hillside, erect, *Stewart 1259;* Cañon del Cuervo Chico, among bushes, *Johnston 8509;* Parras, 1880, *Palmer 1113.* CHIHUAHUA: Sierra Rica, Cañon Madera, *Stewart 2460, 2498, 2498A;* 12 km. north of Escobillas, rocky slope in bushes, *Stewart 2379;* mountains northwest of Chihuahua, 1936, *LeSueur 615.* DURANGO: Near Pasaje, fl. purple, *Shreve 9125.* NUEVO LEON: Arroyo Hondo, Hac. San José de Raices, *Mueller 2287A;* between Cieneguillas and Puerto Santa Ana, 15 mi. southwest of Galeana, *Mueller 914;* between Encinal and Pablillo, about 15 mi. southwest of Galeana, *Mueller 1049.* TEXAS: High rocky hills of the Pecos (western Crocket Co.?), June 1, 1851, *Wright s. n.;* Chisos Mts., Aug. 1883, *Havard 67;* Mt. Emory, Chisos Mts., *Cory 7132;* near Boot Springs, Chisos Mts., *Cory 7305, Mueller 7995, Moore & Steyermark 3180;* Mt. Livermore, Davis Mts., Aug. 1935, *Hinckley.*

Western Texas south through our area into Durango and Nuevo Leon. An erect plant with lanceolate leaves which are abruptly contracted into distinct petioles. Even the uppermost leaves have short petioles. The leaves of the middle stem commonly have petioles a centimeter long, sharply set off from the obtuse, rounded, or broadly acute base of the blade. Most plants are glandular and pubescent in the inflorescence and inconspicuously hairy or glabrous below. The type collection is unusual

in being conspicuously viscid-villous and tawny down to below the middle of the plant. Fosberg, Lloydia 4: 281 (1941), reports, sub *M. aggregata*, some excessively hairy plants similar to the type of *M. coahuilensis*, among Muller's collection (no. *3246*) from Cañon del Agua in the Sierra Madera. Most of Muller's collection represented the common nearly glabrous form of the species.

Mirabilis oblongifolia (Gray) Heimerl, Ann. Cons. et Jard. Bot. Genève 5: 183 (1901).
Oxybaphus nyctagineus var. *oblongifolius* Gray in Torr. Bot. Mex. Bound. 174 (1859).
Allionia oblongifolia Small, Fl. S. E. U. S. 407 (1903).
Allionia Greggii Standl. Contr. U. S. Nat. Herb. 12: 347 (1909).

COAHUILA: Sierra del Carmen, Sept. 1, 1936, *Marsh 882;* Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 622;* San Antonio de las Alanzanas, frequent, 2 ft. tall, fl. red, *Gregg 348;* Carneros area, 1880, *Palmer 111;* mountains 24–26 km. northwest of Fraile, *Stanford et al. 400, 448.* CHIHUAHUA: Sierra Almagre, decumbent in leaf-mould in deep shaded canyon, *Johnston & Muller 1180.* NUEVO LEON: Near Monterrey, 1933, *Mueller 283.* TEXAS: Near Del Rio, "prairies of the San Felipe," Val Verde Co., July 11, 1849, *Wright 604* (TYPE); Del Rio, along San Felipe Creek, *Cory 8968;* Altuda Mt., upper canyons, Ord Mts., Brewster Co., limestone, 1940, *Warnock 32;* Blue Creek, Chisos Mts., *Cory 6989, Moore & Steyermark 3342;* "Mountains of Cibola" (Chinati Mts.), Presidio Co., *Bigelow;* Chinati Mts., 1881, *Havard 98.*

I have associated under the present species a group of plants ranging from western Texas south through our area into Nuevo Leon. The plants are loosely branched, with ascending or decumbent stems, and are usually dusky and glandular throughout. The distinctly petiolate leaves are ovate or broadly oblong and have a broadly obtuse or cordate base. Most plants have at least a few distinctly cordate leaf-bases. Most of them appear to come from sheltered canyons and slopes and their characteristic glandularity is not readily explained away as a xerophytic modification. Their loose habit and rather thin broadish leaves are suggestive of a shaded habitat.

Perhaps also to be included in *M. oblongifolia* is the type of *Allionia comata* Small, Fl. S. E. U. S. 407 (1903), which was collected by Wright (no. *1718*), Aug. 20, 1851, on the stony hills near the Coppermines, in Grant Co., New Mexico. This has the loose habit, dark color and glandularity, and rather thin leaves of the Coahuilan plants, but the leaves, though broadly ovate and petiolate, are not distinctly cordate at the base. I suspect, however, that it is only an aberrant shade form of the distinctive Arizonan and New Mexican plant described by Standley as *Allionia pratensis* and *A. melanotricha*, which Wright also collected about the Coppermines.

Mirabilis sp.

COAHUILA: San Antonio de los Alamos, base of the tuff cliffs on talus, *Johnston 8274;* highest peaks of the Sierra Cruces, open rocky hillside, *Stewart 1146;* north end of the Bolson de los Lipanes, west of Rancho Leja, among cacti, *Johnston & Muller 1256.*

The three collections cited form a uniform series and probably represent an undescribed species allied to *M. oblongifolia* and *M. coahuilensis*. They are pale green plants with a very inconspicuous pubescence and scarcely any glandularity. They have ovate cordate long-pediceled leaf-blades. Super-

ficially they are most suggestive of *M. glabrifolia* in habit, but upon close inspection differ in having hairy strongly ribbed non-tuberculate fruit, more sparsely pubescent inflorescence, the stem leafy up to the inflorescence, and rather large perianths.

Mirabilis glabrifolia (Ort.) comb. nov.

Calyxhymenia glabrifolia Ortega, Nov. Pl. Dec. 1: 5. *t. 1* (1797).
Mirabilis corymbosa Cav. Icones 4: 55. *t. 379* (1798).
Allionis corymbosa var. *texensis* Coulter, Contr. U. S. Nat. Herb. 2: 351 (1894).
Allionia texensis Small, Fl. S. E. U. S. 406 (1903).
? *Allionia deltoidea* Standl. Contr. U. S. Nat. Herb. 13: 405 (1911).

COAHUILA: Saltillo, summit of stony mountain, fl. pink, *Palmer 326;* valley north of Saltillo, frequent, 1–2 ft., fl. reddish purple, Sept. 19, 1848, *Gregg 445;* Cañon Milagro, Sierra Guajes, 12 km. west of Hac. Encantada, shade in canyon, fairly common, fl. orchid, *Stewart 1732;* Cañon Ybarra, Sierra del Pino, arroyo, erect, fl. lavender or purplish, *Stewart 1831, 1913;* Sierra del Pino, mouth of main south canyon, hillside, erect, fl. orchid, *Stewart 1190;* west base of Picacho del Fuste, gravelly flat, erect, among bushes, *Johnston 8350;* Sierra Mojada, Cañon Hidalgo, open slope below crest, erect, fl. purple, *Stewart 1089;* mouth of Cañon Blanco, north end of Valle Delicias, arroyo banks, erect, fl. purple, *Stewart 2903;* Parras, 1880, *Palmer 1112;* Sierra Parras, Oct. 1910, *Purpus 4688;* Sierras Negras, 9 km. south of Parras, *Stanford et al. 207;* summit of Picacho de Jimulco, *Stanford et al. 97.* CHIHUAHUA: 10 km. south of San José del Progreso, south end of Sierra Seca, silty slope, frequent, *Stewart 2298;* Sierra Santa Eulalia, Sept. 19, 1885, *Pringle 542.* ZACATECAS: Mountain 18 km. west of Concepcion del Oro, *Stanford et al. 567, 567A.* TEXAS: North base of the Eagle Mts., Hudspeth Co., Sept. 3, 1849, *Wright 605* (isotype of var. *texensis*).

From trans-Pecos Texas south through our area to southern Mexico. A perennial with a few erect slender stems, commonly supported by bushes. The leaves are borne below the middle of the stem and are frequently crowded at the base. They are long-petiolate and have an ovate or oblong blade which is usually glabrous and has a truncate, rounded, or strongly cordate base. The fruit is tuberculate and glabrous.

Past writers have consistently accepted the name "*corymbosa*" for this species and as consistently cited Ortega's *Calyxhymenia glabrifolia* as a synonym. However, in the paragraph preceding that in which he published *M. corymbosa,* Cavanilles states that Ortega's work was already published. *Calyxhymenia glabrifolia* Ort. undoubtedly has priority over *Mirabilis corymbosa* Cav. Both were based on plants growing in the Royal Botanic Garden at Madrid during the summer of 1797.

I have not seen any authentic material of *Allionia deltoidea* Standl., a species based upon *Nelson 3823,* collected in Aug. 1898, at La Ventura, Coah. The original description fits the present species reasonably well. Standley, No. Am. Fl. **21**: 229 (1918), in a later work, treated *A. deltoidea* as a synonym of *A. ciliata.* Unless the original description is grossly inaccurate this must be a mistake.

Mirabilis rotata (Standl.) comb. nov.

Allionia rotata Standl. Contr. U. S. Nat. Herb. 12: 347 (1909).
Oxybaphus rotatus Weatherby, Proc. Am. Acad. 49: 492 (1913).

COAHUILA: La Azufrosa, scarce, 2 ft. tall, Sept. 22, 1848, *Gregg 511* (ISOTYPE); San Antonio de los Alamos, shelter of tuff-cliffs, erect, *Johnston & Muller 890;* Picacho de San José, dry arroyo bank, erect, *Johnston & Muller 815;* Laguna del Rey, gypsum

on plain, scarce, erect, *Stewart 3016;* north of Puerto Ventanillas, south of Las Delicias, in arroyo, scarce, erect, fl. purple, 45 cm. tall, *Stewart 2791.* CHIHUAHUA: Sierra Diablo, near mouth of Cañon Rayo, dry open hillside, 7 dm. tall, not common, fl. purplish, *Stewart 934.* TEXAS: Fresno Canyon, 4–5 mi. above Arroyo Segundo, southeastern Presidio Co., a few plants sheltered by shrubs on flat, *Hinckley 2277.*

Known only from Coahuila and adjoining Chihuahua and Texas. Closely related to *M. glabrifolia* but a more herbaceous somewhat succulent plant, glandular-pubescent throughout and with a glandular-puberulent fruit roughened by very prominent dorsiventrally flattened tuberculations. The tuberculations on the angles of the fruit are very suggestive of diminutive shelf-fungi. In his latest work on the genus, Standley, No. Am. Fl. **21**: 219 (1918), cited the present species as a synonym of *M. viscosa* Cav. *Mirabilis rotata* might possibly be dismissed as a variety of *M. glabrifolia,* but it can not be identified with *M. viscosa,* for that is a coarse bushy annual with a paniculate inflorescence that consists of a straight indeterminate axis bearing numerous opposite floral branches. The present species has the habit of *M. glabrifolia,* producing from a perennial root a few subsimple slender stems terminated by a forking somewhat corymbose inflorescence.

Mirabilis Jalapa L. Sp. Pl. 177 (1753).

VERNACULAR NAME: Maravilla.

COAHUILA: Palm Canyon, Mariposa Ranch, Sept. 19, 1936, *Marsh 977A;* San Antonio de las Alanzanas, 2 ft. tall, frequent, fl. red, Aug. 31, 1848, *Gregg 344.*

Warmer regions of America, a Mexican species now widely dispersed as a garden plant and as an escape from cultivation. The cited specimens seem to agree with the commonly cultivated form of the species and probably are escapes from cultivation. Gregg, however, notes on his collection that it was "evidently a wild plant." In any case the Texan var. *Lindheimeri* (Standl.) Cory, native along the escarpments of the Edwards Plateau and readily recognized by its broad leaves, can be expected indigenous in northern Coahuila.

Mirabilis longiflora L. Sv. Vet.-Akad. Handl. 1755: 176 (1755).

Mirabilis Wrightiana Gray ex Britt. & Kearney, Trans. N. Y. Acad. **14**: 28 (1894).

Mirabilis Wrightiana var. *tubiflora* Heimerl, Notizbl. Bot. Gart. Berlin **11**: 450 (1932).

Mirabilis longiflora var. *Wrightiana* Kearney & Peebles, Jour. Wash. Acad. **29**: 475 (1939).

VERNACULAR NAME: Maravilla.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 585;* canyon above Palomas, northeast of Saltillo, vine-like, 3 ft. tall, scarce, fl. white, Aug. 31, 1848, *Gregg 331;* escarpment above mines on west side of Potrero de la Mula, one colony on sunny ledge just below crest, *Johnston 9246;* Sierra Hechiceros, Cañon Indio Felipe, shady places, 4–10 dm. tall, fl. white, *Stewart 68, 114;* Sierra Mojada, Cañon Calabasa, shade in deep canyon 100 m. below crest, erect, *Stewart 2208.* CHIHUAHUA: Sierra Rica, Cañon Madera, shade on slope, fl. white, *Stewart 2501;* 7 mi. northwest of Temporales de Honorato, in mogote, loosely branched, up to 2 m. tall, perianth white, anthers magenta, *Stewart & Johnston 1986;* high valley on northwest end of Sierra Diablo, slopes, 4–11 dm. tall, fl. white, *Stewart 960.*

Arizona to trans-Pecos Texas south into our area and along the eastern and western Sierra Madre to southwestern Chihuahua and southwestern

Tamaulipas; reappearing in central and southern Mexico. Standley, Contr. U. S. Nat. Herb. 13: 416–17 (1911), reports the plant from Gallejo Spring, between Chihuahua and El Paso (*Wislizenus 122*), and from the "Santa Eulalia Plains" (*Wilkinson*). A leafy much-branched herb with elongate ascending stems, usually found in thickets. The elongate trumpet-shaped perianth is white. It appears to be an uncommon plant in our area. Our collections are referable to var. *Wrightiana,* the northern form, differing from the typical plant of central Mexico in its smaller much less glandular more distinctly petiolate leaves and somewhat smaller perianths with a more slender and less glandular tube.

Mirabilis multiflora (Torr.) Gray in Torr. Bot. Mex. Bound. 173 (1859).
Quamoclidion multiflorum Torr. ex Gray, Am. Jour. Sci. II. 15: 321 (1853).

COAHUILA: Hillcoat Mesa lying west of Encantada Ranch, July 25, 1938, *Marsh 1464A;* west slopes of the Sierra del Carmen, 8 km. northeast of Hac. Encantada, common on grassy flats, erect, fl. lavender, *Stewart 1573;* high mesa 4 km. north of Rancho Buena Vista, grassy flat, prostrate, not common, fl. orchid, *Stewart 1448.* CHIHUAHUA: Samalayuca, 1935, *LeSueur 396;* hills northeast of Chihuahua, Aug. 13, 1885, *Pringle 547.*

Utah and Arizona east to Colorado and trans-Pecos Texas, and south in Chihuahua, Coahuila, and Nuevo Leon.

Mirabilis oxybaphoides Gray in Torr. Bot. Mex. Bound. 173 (1859).
Allioniella oxybaphoides Rydb. Bull. Torr. Bot. Cl. 29: 687 (1902).
Mirabilis oxybaphoides f. *glabrata* Heimerl, Ann. Cons. et Jard. Bot. Genève 5: 180 (1902).

COAHUILA: Sierra del Pino, crest of high ridge west of La Noria, among low bushes, very glutinous, fl. pink, *Johnston & Muller 603;* Sierra Mojada, Cañon Calabasa, shaded places in deep canyon 100 m. below crest, prostrate, fl. white, *Stewart 2209.*

From Arizona, southern Colorado, and trans-Pecos Texas south into Coahuila. The plant from the Sierra del Pino, growing on an exposed ridge, is distinctly hairy and glandular and has thickish grayish leaves 15–30 mm. wide. The material from Sierra Mojada, growing in a shaded canyon, is practically glabrous and has thin green leaves 40–60 mm. wide. The two collections represent the extremes in this variable species. The species was based on *Wright 596* and *1721,* consisting of material collected Sept. 12, 1849, on mountains near El Paso, on Oct. 14, 1849 about large rocks apparently near Hueco Tanks, El Paso Co., Texas, and on Oct. 5, 1851, in mountain-ravines on apparently the east side of Guadalupe Pass in Hidalgo Co., southwestern New Mexico. All represent the form of the species with large green thin very sparsely pubescent leaves. Heimerl's var. *glabrata,* accordingly, represents the typical form of the species.

Abronia carnea Greene, Pittonia 3: 343 (1898).
Abronia cycloptera sensu Standley.
CHIHUAHUA: Near Juarez, sandhills, May 5, 1885, *Pringle 75.*

Southern New Mexico, adjacent Texas, and adjoining Chihuahua; sandy places. The name "*Abronia cycloptera* Gray," currently applied to the present species, is merely a renaming of *A. micrantha* Torr. Standley, Contr. U. S. Nat. Herb. 12: 329 (1909), recognized this fact, but, because Gray's binomial was familiar to him, he deliberately retained it for our

present plant, citing it as follows: "*Abronia cycloptera* A. Gray, Am. Jour. Sci. II. 15: 319. 1853, excluding synonyms." If this procedure is followed, the binomial, expressedly given by Gray as a substitute for *A. micrantha* Torr., is left as a *nomen nudum*, for Gray gave no description of the species. Obviously, Standley's application of the name *A. cycloptera* is improper. The name belongs in the synonymy of *A. micrantha* as a non-valid illegitimate synonym.

Abronia angustifolia Greene, Pittonia 3: 344 (1898).
Abronia Torreyi Standl. Contr. U. S. Nat. Herb. 12: 319. *t. 38* (1909).

CHIHUAHUA: Juarez, sandy soil, Rio Grande Valley, May 5, 1901, *Pringle 9465;* Los Medanos, 1935, *LeSueur 169, 393.*

Trans-Pecos Texas (Brewster and Davis Counties) west to Arizona and south into northern Chihuahua, usually in sand. Flowers pinkish red.

Abronia fragrans Nutt. ex Hook. Jour. Bot. & Kew Misc. 5: 261 (1853).
Abronia Fendleri Standl. Contr. U. S. Nat. Herb. 12: 324. *t. 43* (1909).

CHIHUAHUA: Sandhills south of Samalayuca, Sept. 20, 1886, *Pringle 794;* Los Medanos, 1935, *LeSueur 389.*

Texas to South Dakota, west to Idaho and New Mexico, and south into northern Chihuahua. A plant of sandy places. The flowers are white or pinkish.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

PLANTAE PAPUANAE ARCHBOLDIANAE, XIV*

E. D. Merrill and L. M. Perry

The Rubiaceae, brought together in the collections made by the Richard Archbold Expeditions and from other sources, is only one of the groups which we had hoped could be elaborated by our colleagues abroad. In all large families a specialist, familiar with details of classification, is always in a strategic position when it comes to rendering final opinions regarding the status and relationships of any particular form. As the present war deepened, it has been impossible for us to maintain our contacts with or to transmit specimens to our associates in Europe, who not only were willing to study the representatives of particular groups, but also were better qualified through accumulated knowledge and experience to handle the material more skilfully than we could possibly hope to do. Under these circumstances and with considerable reluctance on our part, we have undertaken a study of this and of certain other families of plants. It would seem to be particularly essential that we make accessible for future studies these plants already assembled, in view of the fact that there is a possibility of receiving supplementary collections from the Southwestern Pacific area; this can be done only by carrying the identifications in all groups as far as possible on the basis of literature and specimens available for study and comparison. The remaining genera of the Rubiaceae will be considered in another paper. In general, we have followed the work of Valeton rather closely, but we do not consider our efforts, as herein presented, in any sense as a monographic treatise.

RUBIACEAE (in part)

Bikkia Reinwardt

Bikkia Commersoniana K. Schum. var. **latifolia** Valeton, Bot. Jahrb. 60: 3. 1925.

Solomon Islands: Three Sisters: Aliti, *Brass 2998*, October 1932, sea beach, common (small tree 3–5 m. high; branchlets and leaves fleshy; corolla 4-angled, pale pink). New Guinea and the Bismarck Archipelago.

This specimen is an excellent match for *Warburg 21495* from the Bismarck Archipelago. *Bikkia Bridgeana* F. v. Muell., (extra-print from) Vict. Nat. Feb. 1885, ought to be compared with this species and variety as well as with *B. Pancheri* (Brongn.) Guill. The latter, represented here by a single collection from New Caledonia, has been reported from the Solomon Islands, but it appears to be distinct from the material cited above.

Dolicholobium A. Gray

Dolicholobium leptocarpum sp. nov.

Arbor 10 m. alta; ramulis teretibus maturis glabris cinerascentibus;

*Botanical Results of the Richard Archbold Expeditions. See Jour. Arnold Arb. **24**: 422–439. 1943.

stipulis elongatis, 2–3.5 cm. longis adpresse villosulis et parce longe patenti-pilosis; foliis lanceolato-ellipticis, 12–21 cm. longis, 4–6.5 cm. latis, utrinque angustatis, basi cuneatis vel subobtusis, apice obtuse longiuscule acuminatis, supra glabris, subtus novellis dense maturis parce (costa nervisque dense) pilosulis, nervis lateralibus utrinsecus ± 16 patenti-adscendentibus marginem versus arcuatis, reticulo subtus manifesto; petiolo 1.5–2.5 cm. longo, adpresse villosulo et parce longe patenti-piloso; inflorescentiis in axillis superioribus; pedunculo ± 2 cm. longo ceterum ut petiolo; floribus ♂ 4, pedicellis sericeo-pilosulis, 1.5 cm. longis; calycis tubo 0.5 mm. longo, glabrato truncato ciliato; corolla in alabastro 1.5 cm. longa, glabra; flore ♀ centrali sessili, calycis limbo 1.5 (–3 in fructu) mm. longo utrinque pilosulo, margine 5-lobato, lobis 0.5 (–1) mm. longis; corolla glabra, tubo 11 mm. longo, lobis 1.7 cm. longis basi 3.5 mm. latis; antheris 2.5 mm. longis; stigmatis lobis (7 mm.) paullo stylo (6 mm.) longioribus; ovario 2.6 cm. longo adpresse villosulo; fructibus immaturis circiter 25 cm. longis et 1.5 mm. diametro, parce pilosulis sulcatis.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass 13887* (TYPE), April 1939, alt. 70 m., rain-forest on lower mountain slopes (substage tree 10 m. high; flowers white).

In the general habit and the glabrous corolla, the species suggests *Dolicholobium rubrum* Schlechter ex Valeton, but it differs in the smaller flowers and the very long slender fruits.

Dolicholobium Kajewskii sp. nov.

Frutex 2 m. altus; ramulis teretibus, novellis pubescentibus cito glabratis; stipulis oblongis, 1.5–2.5 cm. longis, 0.5–0.9 cm. latis, novellis dense hirsutis, maturis glabratis; foliis ellipticis vel ovato-ellipticis, 7.5–12 cm. longis, 4–7 cm. latis, basi subrotundatis vel obtusis, apice obtusissime acuminatis, supra glabris, subtus costa nervisque parce pubescentibus (novellis supra fere glabris subtus dense adpresse villosis), nervis lateralibus utrinsecus 8 vel 9, venis inconspicuis; petiolo 1.5–3 cm. longo, parce hirsuto vel glabrato; pedunculo 1–2 cm. longo, pubescente; floribus ♂ 3 vel 4, pedicellis ± 1.5 cm. longis, adpresse pilosis; calycis limbo 1 mm. longo, glabro ciliato; corolla in alabastro adpresse pilosula, tubo 1.5 cm. longo gracili, lobis 1.5 cm. longis oblongo-linearibus; antheris 5 mm. longis; flore centrali ♀ sessili; calycis tubo 3.5 mm. longo, margine sinuato, adpresse pilosulo; corollae tubo 1 cm. longo extus pilosulo, lobis 2 cm. longis, linearibus; ovario 1.5 cm. longo, adpresse hirtello; stigmatis lobis spathulatis.

SOLOMON ISLANDS: Guadalcanal: Ululolo, Tutuve Mountain, *Kajewski 2577* (TYPE), April 1931, alt. 1200 m., rain-forest (shrub up to 2 m. high; young leaves very hairy; petals cream).

Dolicholobium Kajewskii differs from *D. solomonense* in the smaller leaves, hirsute stipules, and smaller flowers.

Dolicholobium Brassii sp. nov.

Arbuscula; ramulis pallide brunneis glabris; stipulis oblongis anguste obtusiusculis, circiter 1.5 cm. longis et 4 mm. latis, margine ciliatis ceterum fere glabris; foliis lanceolato-ellipticis, 5–11 cm. longis, 2–5 cm. latis, utrinque angustatis, apice acutis vel breviter obtuse acuminatis, basi cuneatis, maturis utrinque glabris, juvenilibus supra glabris, subtus nervis et margine sericeo-pilosis; nervis lateralibus utrinsecus circiter 10 patenti-

adscendentibus versus marginem arcuatis; petiolo 1–2 cm. longo glabro; inflorescentiis in axillis superioribus; pedunculo 0.5–1.5 cm. longo; floribus ♂ 3 vel 4, pedicellis circiter 2 mm. longis; calycis limbo 1 mm. longo latoque, corollae tubo (in alabastro) 1.3 cm. longo, lobis 1 cm. longis, antheris 1 cm. longis; flore centrali ♀ subsessili; calycis limbo subcampanulato truncato vel minute 5-dentato, 3 mm. longo, 2.5 mm. lato, extus glabro intus adpresse piloso; corolla hypocrateriformi, tubo 1 cm. longo versus apicem extus parce pubescente, lobis 5 circiter 1 cm. longis vix 3 mm. latis, anguste oblongis obtusis, basi oblique anguste auriculatis, antheris 5 circiter 2 mm. longis; stigmatis lobis spathulatis inclusis; ovario adpresse pubescente, 1.5 cm. longo, lineari; capsulis immaturis 10–12 cm. longis, 1.5 mm. diametro, glabratis, leviter sulcatis.

SOLOMON ISLANDS: San Cristobal: Huru, *Brass 3005* (TYPE), October 1932, lowlands (small river-bank tree; leaves very dull dark green; flowers white).

This species is readily recognized by the small flowers, the slender fruits, and its nearly glabrous character.

Dolicholobium solomonense sp. nov.

Arbuscula 4–5 m. alta; ramulis compressis, novellis pubescentibus; stipulis ellipticis, 1.5–2.5 cm. longis, 0.6 1 cm. latis, velutino-pubescentibus; foliis ellipticis vel leviter obovatis, 12–31 cm. longis, 5.5–17 cm. latis, basi obtusis, apice acuminatis, acumine 1–2 cm. longo 0.5–1 cm. lato, novellis villosulis cito glabratis, maturis supra glabris, subtus (costa nervisque dense) pilosis, nervis lateralibus utrinsecus ± 14 oblique adscendentibus, venis inconspicuis subclathratis; petiolo 2–6 cm. longo pubescente vel glabrato; pedunculo 1–2 cm. longo patenti-pubescente; floribus ♂ 4–7, pedicellis ± 2 cm. longis, pubescentibus; calycis limbo vix 1 mm. longo, glabrato; corolla in alabastro 3 cm. longa extus adpresse villosula; flore centrali ♀ sessili; calycis limbo 4 mm. longo latoque, extus glabrato margine ciliato; corolla hypocrateriformi, tubo 1 cm. longo adpresse piloso, lobis 2.5 3 cm. longis, in parte media 4 mm. basi 6.5 mm. latis, oblique auriculatis, antheris 3 mm. longis; stigmatis lobis spathulatis vix exsertis; ovario 2.3 cm. longo, 2 mm. lato, velutino.

SOLOMON ISLANDS: San Cristobal: Wainamura, *Brass 2656, 2850* (TYPE), August, September, 1932, lowland rain-forests (slender tree 4–5 m. tall; leaves paler beneath; flower cream-colored).

In some features this species suggests *Dolicholobium Gertrudis* K. Schum., but the ♀ flowers are sessile rather than pedicellate.

Dolicholobium ulawaense sp. nov.

Arbor gracilis 10 m. alta; ramulis subangulatis glabris; stipulis obovato-ellipticis, ± 2.2 cm. longis et 1.3 cm. latis, apice rotundatis, utrinque pubescentibus cito glabratis, margine ciliatis; foliis obovato-ellipticis, ± 26 cm. longis et 16 cm. latis, basi obtusiusculis, apice abrupte brevissime et obtuse acuminatis, acumine 7 mm. longo latoque, supra glabris, subtus (costa nervisque dense) pilosis, nervis lateralibus utrinsecus ± 17 oblique adscendentibus, venis inconspicue clathratis; petiolo 3 cm. longo, pubescente vel glabrato; inflorescentiis in axillis superioribus; pedunculo 3 cm. longo, dense villosulo; floribus ♂ 9 vel 10, pedicellis glabratis 1–1.5 cm. longis; calycis limbo campanulato, 1 mm. longo, 1.5 mm. lato; corollae tubo 1.5 cm. longo, villosulo, lobis 1.5 cm. longis, antheris 4.5 mm. longis;

flore centrali ♀ sessili; calycis limbo extus glabrato intus dense pubescente, truncato, 4 mm. longo latoque; corolla hypocrateriformi, tubo 1 cm. longo, adpresse piloso, lobis 1.3–1.5 cm. longis in parte media 4 mm. latis (in alabastro extus adpresse villosulis) oblongo-lanceolatis, basi 6 mm. latis oblique auriculatis; antheris 2.5 mm. longis; stigmatis lobis spathulatis paullo exsertis; ovario adpresse villosulo, 1.5 cm. longo, 3 mm. lato.

SOLOMON ISLANDS: **Ulawa**: *Brass 2967* (TYPE), October 1932, alt. 200 m., rain-forest, common (slender tree 10 m. tall; flower white).

The species differs from the preceding chiefly in the relative size of the parts of the flower, *Dolicholobium solomonense* having very long almost ligulate corolla-lobes and a slender ovary, whereas *D. ulawaense* has shorter and broader corolla-lobes and a shorter broader ovary. There is also a difference in the size and the pubescence of the stipules.

Dolicholobium callianthum sp. nov.

Arbuscula 6 m. alta; ramulis apicem versus subcompressis glabris; internodiis brevissimis; stipulis non visis; foliis obovatis, apice breviter obtuse acuminatis, acumine 1 cm. longo latoque, basi cuneatis, 25–30 cm. longis, 13–16 cm. latis, novellis 8–12 cm. longis, 3.5–5.5 cm. latis, utrinque adpresse villosis, maturis glabris vel subtus costa nervisque inconspicue pubescentibus; nervis lateralibus utrinsecus 10–14 patenti-adscendentibus marginem versus arcuatis, venis subclathratis; petiolo 2.5–3 cm. longo, glabro; pedunculo 5 mm. longo, villoso; floribus ♂ pedicellatis, pedicellis 2–5 mm. longis ± villosulis; calycis tubo 2 mm. longo subglabro; corollae tubo in alabastro 2.5–3 cm. longo, adpresse villoso, lobis ± 1 cm. longis; antheris 1 cm. longis; flore ♀ subsessili, calycis tubo 8 mm. longo, truncato, adpresse villoso; corollae tubo 3–3.5 cm. longo extus adpresse villoso, lobis 6 oblongis, 3.5 cm. longis, 1 cm. latis, intus supra faucem parce pubescentibus; antheris supra medium tubo insertis, 3 mm. longis; ovario 2.5 cm. longo, dense adpresse villoso; stigmatis lobis oblongo-clavatis; capsulis (fide Kajewski) 20 cm. longis, 6 mm. diametro.

SOLOMON ISLANDS: **Guadalcanal**: Uulolo, Tutuve Mountain, *Kajewski 2655* (TYPE), May 1931, alt. 1200 m., rain-forest (small bushy tree 6 m. high; young leaves covered with silky hair; flowers white, very showy, pleasantly scented; fruit 20 cm. long, 6 mm. diameter).

This species is closely related to *Dolicholobium acuminatum* Burk., differing in the longer pubescence on the lower surface of the young leaves and also in the calyx. This is longer and narrower than in Burkill's species and truncate; both differ from the other Solomon Islands species in that the ♂ flowers have pedicels considerably shorter than the ovary of the ♀ flower in the same cluster.

Coptosapelta Korthals

Coptosapelta Carrii sp. nov.

Planta scandens; ramulis, petiolis et inflorescentiis crispe tomentosis; foliis ellipticis, 5–8 cm. longis, 2.5–4.5 cm. latis, basi rotundatis vel obtusis, apice abrupte et anguste acuminatis, acumine 5–10 mm. longo, chartaceis vel tenuiter coriaceis, supra glabris costa interdum crispe pilosulis, subtus (costa nervisque ± dense) crispe pilosulis, nervis primariis utrinsecus 3 arcuatim adscendentibus, supra impressis subtus prominulis, reticulo utrinque manifesto; stipulis inconspicuis, triangularibus, circiter 2 mm.

longis, subtomentosis; petiolo 5–8 mm. longo; inflorescentiis brachiatis terminalibus vel in axillis superioribus 3–?5 cm. longis, floribus subsessilibus vel breviter pedicellatis; calycis lobis ovatis obtusis 0.6–0.8 mm. longis, subtomentosis; ovario dense subtomentoso globoso, 2 mm. longo; corollae lobis ± 6 mm. longis oblongis acutiusculis, supra glabris, subtus partim adpresso-pilosulis, tubo circiter 5 mm. longo adpresso-pilosulo, intus glabro fauce retrorse pilosa excepta; filamentis 2 mm. longis dense patenti-pilosulis, antheris 4 mm. longis dorso adpresso-sericeo-pilosulis; disco 5-lobato; stylo 9 mm. longo.

BRITISH NEW GUINEA: Koitaki, *Carr 12613* (TYPE in Herb. N.Y.B.G.), June 1935, alt. 450 m. (climber in forest; flowers white).

The leaves resemble those of *Coptosapelta flavescens* Korth. in their pubescence on the lower surface; the flower is like that of *C. hameliaeblasta* (Wernh.) Val. except that the corolla is smaller. The 5-lobed disk is perhaps a distinctive feature.

Badusa A. Gray

Badusa corymbifera (Forst. f.) A. Gray, Proc. Amer. Acad. 4: 308. 1859; Gillespie, Bishop Mus. Bull. 74: 28. *f. 37*. 1930.

Cinchona corymbifera Forst. f. Nova Acta Reg. Soc. Sci. Ups. II. 3: 176. 1780, Prodr. no. 88. 1786.

SOLOMON ISLANDS: Ysabel: Cape Prieto, *Brass 3472*, January 1933, alt. 150 m., open hillsides, common (tall shrub or very slender small tree 2–3 m. tall; leaves pale with whitish midribs and nerves; flower pale pinkish white).

Polynesia. Forster's material was collected "intra tropicos in insulis Tongatabu et Eaoowe maris pacifici." The genus occurs in the Palau Islands, the New Hebrides, Fiji, and the Tonga Islands; new to the Solomon Islands.

Nauclea Linnaeus

(*Sarcocephalus* Afzelius)

Nauclea tenuiflora (Havil.) Merrill, Jour. Wash. Acad. Sci. 5: 537. 1915; Kaneh. & Hatus. Bot. Mag. Tokyo 53: 13. 1939.

Sarcocephalus tenuiflorus Haviland, Jour. Linn. Soc. Bot. 33: 32. 1897; Valeton, Bot. Jahrb. 60: 47. 1925.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass 11854, 14033*, January (flowering material) and April (fruiting material) 1939, alt. 50 m., rain-forest of river flood-plain, plentiful on banks of creeks (tree 4–6 m. tall; flowers white). Northeastern New Guinea.

Neonauclea Merrill

Neonauclea papuana (Val.) comb. nov.

Nauclea papuana Valeton, Nova Guin. Bot. 8: 449. 1911; op. cit. 14: 258. 1925.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction Black River, *Brass 6955, 7336*, June, July 1936, alt. 100 m., common along banks of river; one of the principal components of the older seral forests on silt-loams along river (tree attaining 25 m.; flower-heads white or cream-colored, ± 5 cm. diameter). Previously collected in Netherlands New Guinea.

Neonauclea Schlechteri (Val.) comb. nov.

Nauclea Schlechteri Valeton, Bot Jahrb. 60: 50. 1925.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 12595*, February 1939, alt. 1200 m., on slope of ridge in primary

forest, rare (tree 20 m. high, with brown bark; flower-buds light green; fruit green-brown); 2 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 13534*, April 1939, alt. 650 m., occasional in primary forest (tree 17 m. high, bark black, scaly; flowers white).

These collections agree reasonably well with an isotype of this species; also two sterile or fragmentary specimens collected on Japen Island by the Netherlands Indies Forest Service (*bb. 30534, bb. 30551*) may belong here. The type of *Neonauclea tenuis* (Havil.) Merr. ought to be compared with this species; Valeton points out the likeness, and the differences seem to be variable.

Neonauclea maluensis (Val.) S. Moore, Jour. Bot. 65: 242. 1927.

Nauclea maluensis Valeton, Bot. Jahrb. 60: 51. 1925.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass 11077*, November 1938, alt. 2200 m., secondary forest, rare (tree 12 m. high); 15 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 11922*, January 1939, alt. 1720 m., occasional in rain-forest on steep slopes (tree 32 m. high; flowers yellow-green). Described from Northeastern New Guinea.

Neonauclea Dahlii (Val.) comb. nov.

Nauclea Dahlii Valeton, Bot. Jahrb. 60: 51. 1925. Known only from the Bismarck Archipelago.

Neonauclea obversifolia (Val.) comb. nov.

Nauclea obversifolia Valeton, Bot. Jahrb. 60: 52. 1925. Type from Northeastern New Guinea.

Neonauclea Versteeghii sp. nov.

Arbor 22 m. alta; ramulis brunnescentibus glabris cortice sulcato-ruguloso; internodiis 5–10 cm. longis; stipulis obovato-ellipticis, 2.5 cm. longis, vix 1.5 cm. latis, basim versus consperse hirtellis; foliis suborbicularibus vel late ellipticis, (10 × 9.5 cm.) usque 24–34 cm. longis et 23–25 cm. latis, basi rotundatis vel interdum obtusis breviter decurrentibus, apice rotundatis vel obtusis vel inconspicue breviter acuminatis, acumine [si adsit] vix 5 mm. longo latoque, valde chartaceis vel subcoriaceis, supra glabris, subtus novellis lamina consperse, costa nervisque densius puberulo-hirtellis, maturis costa nervisque tantum consperse puberulo-hirtellis, nervis primariis utrinsecus 8–10 supra distinctis, subtus perspicuis, oblique patentibus prope marginem arcuatim conjunctis, venis clathratis, venulis inconspicuis; petiolo 1.5–6 cm. longo, glabro; capitulis florentibus non visis, fructiferis 2.5–3 cm. diametro; pedunculis 3.5–5 cm. longis glabris compressis angulatis; bracteis 3–5 mm. sub apice non visis; calycis loborum partibus deciduis 4.5–5 mm. longis fusiformibus, parte inferiore adpresse sericeo-pubescente apice (circiter 1 mm.) obtuse acuminata brunnescente, partibus persistentibus 1.5 mm. longis pubescentibus; coccis 6 mm. longis, receptaculo hirsuto.

NETHERLANDS NEW GUINEA: 2 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 13509* (TYPE), March 1939, alt. 700 m., frequent in primary forest on slopes (tree 22 m. high; bark brown, scaly; fruit green-brown).

This species appears to be nearest to *Neonauclea cyclophylla* (Miq.) Merr., according to the description, but the fruiting heads are smaller in the New Guinea material, and the leaves are of somewhat different shape.

Neonauclea perspicuinervia sp. nov.

Arbor 20–25 m. alta; ramulis cinereo-brunnescentibus glabris; inter-

nodiis superioribus 1.5–2 cm. longis; stipulis glabris ellipticis, 1.5 cm. longis, 0.9 cm. latis; foliis subcoriaceis glabris late ellipticis, (9–) 18–38 cm. longis, (7.5–) 13–22 cm. latis, basi rotundatis vel obtusis deinde brevissime cuneatis vel leviter decurrentibus, apice obtusis et abrupte acuminatis, acumine 5–9 mm. longo, 3–5 mm. lato, obtuso, venis primariis utrinsecus 9–11 utrinque perspicuis, subtus in axillis domatia ferentibus, patenti-adscendentibus prope marginem arcuatis, venis clathratis utrinque manifestis, reticulo manifesto; petiolo 2–4.5 cm. longo glabro; capitulis immaturis 3.5 cm. diametro; pedunculo 2.5–3 cm. longo, bracteis sub apice non visis; calycis loborum partibus deciduis 7–8 mm. longis, elongato-cuneato-clavatis, apice obtusis cum acumine, villosulis, versus acuminem pilis brevissimis, partibus persistentibus subadpresse villosulis; corolla glabra 1.5 cm. longa tubulato-infundibulari, lobis ellipticis obtusis 2 mm. longis; antheris in fauce, oblongis obtusis; stylo 2.5 cm. longo.

NETHERLANDS NEW GUINEA: Patema, 40 km. from Nabire, *Kanehira & Hatusima 12387* (TYPE), March 1940, alt. 300 m., rain-forest (common tree 20 m. high); Bernhard Camp, Idenburg River, *Brass & Versteegh 13557*, April 1939, alt. 300 m., frequent in rain-forest of slopes (tree 25 m. high, with thick grey scaly bark; wood yellow-brown; flower-buds green).

Neonauclea perspicuinervia is probably related to *N. Hagenii* Lauterb. & K. Schum. but differs from the latter in its larger leaves, oblong-elliptic obtuse stipules, and the different shape of the calyx-appendages. The peduncle has two scars, one just under the head, and one near the middle of the peduncle.

Neonauclea cardiophylla sp. nov.

Ramuli novelli ± hirtelli complanati; internodiis 6–9 cm. longis sub nodis dense hirtellis; stipulis non visis; foliis cordiformibus vel late ovatis basi subcordatis apice abrupte acuminatis, 20–22 cm. longis, 18–20 cm. latis, acumine circiter 1.5 cm. longo obtuso, supra glabris, subtus lamina consperse costa venisque dense pilosulis, pilis ± patentibus vel subadpressis, nervis primariis utrinsecus circiter 9 supra obviis subtus prominulis, venis clathratis manifestis, reticulo inconspicuo; petiolo 3–4 cm. longo glabrato; foliis inflorescentiam subtendentibus 3.5–6 cm. longis 2–3 cm. latis ovatis basi decurrentibus apice acutiusculis, petiolo brevissimo; inflorescentiis terminalibus; pedunculo 2–5 cm. longo; bracteis sub apice cito caducis; capitulis immaturis 2.5 cm. diametro; calycis loborum partibus deciduis 4 mm. longis clavatis apice subtruncatis dense sericeo-pilosulis, pilis adpressis, partibus persistentibus adpresse pilosulis; corolla glabra (alabastro tantum viso); ovario glabro.

SOLOMON ISLANDS: Bougainville: *Waterhouse 24* (TYPE), April 1932.

In the characters of the flower-head perhaps nearest to *Neonauclea perspicuinervia* Merr. & Perry, but the species is readily distinguished from the latter by the cordate leaves with pubescent lower surface. The leaves subtending the inflorescence are much smaller than the foliar ones and are regarded by some authors as bracts; they are distinctly foliar in character but somewhat different in shape from the larger ones.

Uncaria Schreber

Uncaria bernaysioides sp. nov.

Frutex scandens (?), magnus; ramulis argute tetragonis fere alatis,

novellis parce pubescentibus; foliis ellipticis, 10–13 cm. longis, 4.5–7 cm. latis, basi rotundatis, apice acuminatis, acumine obtuso 8–10 mm. longo, supra glabris subtus nervis venisque parce inconspicue pubescentibus in axillis barbatulis; nervis primariis utrinsecus 8–10 oblique adscendentibus marginem versus arcuatis, supra impressis subtus perspicuis, venis supra subobscuris subtus prominulis, venulis fere obscuris; petiolo ± 7 mm. longo parce pubescente vel glabro; stipulis persistentibus reflexis rotundatis bilobatis, circiter 1 cm. longis, glabris; uncis non visis; pedunculo 3–4.5 cm. longo, infra articulationem compresso parce pubescente (2.5–3 cm. longo), supra subtereti (1 cm. longo) dense pubescente; bracteis 2–3-lobatis vel 2–3-fidis, glabris vel parce pubescentibus; receptaculo subgloboso, 3–4 mm. diametro, villosulo; capitulo, stylis non inclusis, ± 5 cm. diametro; floribus pedicellatis; pedicellis 5 mm. et ovario oblongo-clavato 3 mm. longis, dense pilosulis; calyce sericeo-pubescente, tubo 2 mm. longo, lobis 3.5–4 mm. longis, lineari-oblongis crassiusculis, apice truncatis; corolla extus pubescente, tubo circiter 10 mm. longo versus apicem paullo dilatato, lobis 3 mm. longis, 1.5 mm. latis, apice rotundatis; antheris 2.5 mm. longis; stylo 2.3–2.5 cm. longo, stigmate breviter clavato, 2 mm. longo.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13602* (TYPE), March 1939, alt. 850 m., common in seral rain-forest on banks of river (large scrambling shrub; flowers pale yellow).

This species strongly resembles *Uncaria Bernaysii* F. v. Muell. as represented in the collections by *Brass 7439*, one of the chief components of seral shrubberies on river-banks (large scrambling shrub; flowers yellow-brown) at Oroville Camp, Fly River (30 miles above D'Albertis Junction). The two differ in the following: von Mueller's species is glabrous, with larger and broader leaves, characterized by inconspicuous venation, and smaller flowers (ovary about 2.5 mm., calyx-tube 1.5 mm., lobes 2.5–3 mm., corolla ± 11 mm., style 1.5 cm. with narrowly elongate-clavate stigma about 3 mm. long).

Uncaria Valetoniana nom. nov.

Uncaria inermis Valeton, Nova Guin. 8: 454. 1911, Bot. Jahrb. 60: 57. 1925, non Willd. (1793).

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass 7485*, August 1936, abundant in rain-forests (large canopy liane; flower-clusters brown). SOLOMON ISLANDS: San Cristobal: Puepue River, *Brass 2791*, September 1932, riverine rain-forests on lowlands (stiffly branched climber; leaves paler beneath; flower-heads on very stiff peduncles; flowers green).

Type from Netherlands New Guinea; reported also from Northeastern New Guinea. Valeton's specific name is invalidated by the earlier one of Willdenow.

Uncaria sterrophylla sp. nov.

Frutex scandens(?) magnus; ramulis argute tetragonis glabris in sicco castaneis; foliis ovato-ellipticis, 5–8 cm. longis, 3.3–5 cm. latis, basi obtusis vel rotundatis, apice acuminatis, acumine ± 1 cm. longo obtuso, coriaceis, supra subnitidis, utrinque glabris, subtus in axillis barbatulis, nervis primariis utrinsecus 5 vel 6 patenti-adscendentibus marginem versus arcuatis, venis subobscuris, venulis sub lente dense reticulatis; petiolo ± 5 mm. longo glabro; stipulis caducis bifidis rotundatis vel obtusiusculis, circiter

1 cm. longis et 1.5 cm. latis, glabris; uncis gracilibus arcte curvis; pedunculo infra articulationem 1.3–1.7 cm. longo glabro, supra 1 cm. longo dense pubescente; bracteis trifidis; capitulo in fructu ± 7 cm. diametro; floribus pedicellatis; pedicellis vix 1 cm. (–2 cm. in fructu) et ovario oblongo 3 mm. longis, dense pilosulis; calyce infundibuliformi subsericeo, ± 3 mm. longo, fere ad medium fisso, lobis oblongis obtusis; corolla (marcida?) 1 cm. longa extus cineraceo-pubescente, lobis circiter 1.5 mm. longis recurvis; antheris in faucis margine obtusis, 1.6 mm. longis; stigmate longiuscule exserto anguste clavato; capsulis fusiformibus, ± 1.3 cm. longis.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass 11450* (TYPE), November 1938, alt. 2200 m., common in second growth forest on banks of river (large scrambling shrub).

The species suggests *Uncaria avenia* Val. in the tetragonous branchlets, the size of the leaves, and the faint venation; in the latter species, however, the petiole is much longer, the calyx is smaller, and the capsule has a considerably shorter stalk.

Uncaria salomonensis (Rechinger) comb. nov.

Uruparia (*Ouruparia*) *salomonensis* Rechinger, Repert. Sp. Nov. 11: 187. 1912, Denkschr. Math.-Naturw. Kais. Akad. Wiss. Wien 89: 607 (repr. 165). *t. 6, f. 12b.* 1913.

Possibly the material which we describe below as *Uncaria glabrescens* ought to have been placed here, but we have separated them on account of the following characters given in Rechinger's description: branchlets and leaves glabrous; ovary densely white-tomentose; corolla pilose; in addition the flower-heads shown in the illustration are about twice as large as those of *U. glabrescens*. An unusual character in the description is "staminibus tubo fere aequilongis, antheris corolla inclusis." Ordinarily the stamens are scarcely as long as the corolla-lobes and are situated around the margin of the throat.

Uncaria avenia Valeton, Bot. Jahrb. 60: 59. 1925, vel aff.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass 7650, 7915,* September 1936, scrambling shrub on floating islands in lake, flowers green.

These collections appear to be nearest to the description of *Uncaria avenia* Val. The branchlets are obtusely tetragonous, and the stipules have already fallen. The leaves are coriaceous rather than membranaceous and glabrous but show minute domatia in the angles formed by the larger veins. Hooks too are present, the upper ones being much shorter than those lower on the branchlets.

Uncaria philippinensis Elmer, Leafl. Philip. Bot. 1: 38. 1906; Merr. Enum. Philip. Fl. Pl. 3: 510. 1923.

SOLOMON ISLANDS: Malaita: Quoimonapu, *Kajewski 2335,* December 1930, rain-forest at sea level (vine); Guadalcanal: Mamassa, Konga, *Kajewski 2475,* February 1931, alt. 400 m., vine in rain-forest. Philippine Islands.

Uncaria glabrescens sp. nov.

Frutex scandens; ramulis obtuse angulatis consperse pilosis vel glabratis in sicco castaneis; foliis ovato-ellipticis, 6.5–9 cm. longis, 2.5–5 cm. latis, basi obtusis vel subrotundatis, apice acuminatis, acumine circiter 1 cm. longo, supra costa consperse pilosa ceterum glabris, subtus costa nervisque

± pilosis, in axillis nervorum barbatulis, nervis primariis utrinsecus 6 vel 7 oblique adscendentibus versus marginem leviter arcuatis, venis supra obscuris, subtus manifestis, reticulo compacto inconspicuo; petiolo 5–8 mm. longo ± pilosulo; stipulis cito caducis (non visis); uncis gracilibus brevibus leviter curvis; pedunculo infra articulationem 1–2 cm. longo pilosulo, supra 5 mm. longo dense pilosulo; bracteis trifidis glabratis; capitulo post anthesin circiter 1 cm. diametro; floribus pedicellatis; pedicellis vix 2 mm. et ovario 1 mm. longis, sparsim pilosulis, calyce glabro obconico ± 2 mm. longo, ad medium fisso, lobis oblongis acutiusculis; corolla 1 cm. longa glabra, lobis 1.5 mm. longis recurvis; antheris in faucis margine, 1.2 mm. longis; stigmate longiuscule exserto clavato; stylo ± 15 mm. longo.

SOLOMON ISLANDS: Bougainville: Siwai, *Waterhouse 140* (TYPE), November 1932 (trailing shrub).

This species reminds one of *Uncaria philippinensis* Elmer, but in the latter the peduncles are much longer, the calyx-lobes are persistently pubescent, and the corolla has somewhat broader lobes.

Mussaenda Linnaeus

Mussaenda cylindrocarpa Burck, Ann. Bot. Jard. Buitenz. 3: 118. *t. 17*. 1883; Valeton, Nova Guin. 8: 456. 1911, op. cit. 14: 259. 1925, Bot. Jahrb. 60: 61. 1925.

NETHERLANDS NEW GUINEA: Hollandia, *Brass 8901A*, June 1938, alt. 10 m., occasional on gravel-beds in river; Bernhard Camp, Idenburg River, *Brass 13272*, March 1939, alt. 850 m., occasional on sandy river-banks. BRITISH NEW GUINEA: Fly River, 528-mile Camp, *Brass 6733*, May 1936, soft-wooded shrub in rain-forest second growths; Palmer River, 2 miles below junction Black River, *Brass 7346*, July 1936, alt. 100 m., semi-shade on slopes of eroding clay banks of river (spreading shrub 1 m. high; flowers yellow; enlarged calyx-lobe white; fruit smooth, cylindrical).

As Valeton has already indicated, this species is exceedingly variable as to leaf-size and pubescence. In the Fly River material the leaves are 9–19 cm. long, 2.5–5 cm. broad, and almost caudate-acuminate, but the inflorescence does not differ essentially from that which is characteristic of the collections from Northeastern New Guinea and the Solomon Islands.

Mussaenda ornata S. Moore, Jour. Bot. 65: 243. 1927, in White, Jour. Arnold Arb. 10: 267. 1929.

BRITISH NEW GUINEA: Fly River, 528-mile Camp, *Brass 6628*, May 1936, alt. 80 m., climbing shrub in rain-forest second growth.

There are some slight differences between this collection and the isotype of *Mussaenda ornata* S. Moore. All parts of the specimen are a little more pilose-villous than on the isotype; the leaves are oblong or oblong-elliptic, 11–17 × 4–6 cm., with 10–14 primary nerves on either side of the midrib; the stipules are acuminate; and the calyx is 2 cm. long.

Mussaenda aestuarii K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee. Nachtr. 394. 1905; Valeton, Bot. Jahrb. 60: 65. 1925.

BRITISH NEW GUINEA: Ononge Road, Dieni, *Brass 3896*, April 1933, alt. 500 m., shrub in roadside re-growths (leaves shining, paler above; corolla cream-colored, the lobes yellow inside; enlarged calyx-lobe white); same locality, *Brass 3947*, May 1933, alt. 500 m., common in rain-forests (very large liane; smooth shining pale leaves; inside of corolla-lobes yellow; enlarged calyx-lobe white).

Except for the fact that this plant appears to be dioecious (the first col-

lection ♀, the second ♂), it agrees very well with the two descriptions cited above. The species was described from Northeastern New Guinea, and previously has been known only from the original collection.

Mussaenda oreadum Wernh. in Ridl. Trans. Linn. Soc. II. Bot. 9: 70. 1916.

BRITISH NEW GUINEA: Mt. Tafa, *Brass 5040,* September 1933, alt. 2400 m., liane ascending to tops of valley forest trees, not common (branches stiff, erect above, supporting tree-top; leaves shining and nerves impressed above; corolla-lobes bright yellow inside, paler outside and green-veined, the tube pale yellow; enlarged calyx-lobe cream-colored; flower "honeysuckle"-scented).

The leaves are 3–10 × 2–7 cm., in outline ovate-orbicular rather than elliptic or oblong; apart from this feature, the collection corresponds too closely with the description of the above species to place it elsewhere without comparing it with the original from Netherlands New Guinea.

Mussaenda brachygyna sp. nov.

Planta scandens; ramulis novellis minute pubescentibus, lenticellatis; foliis subcoriaceis ellipticis, 3–10 cm. longis, 1.4–5 cm. latis, basi subrotundato-cuneatis, apice subabrupte breviter obtuse acuminatis, acumine vix 5 mm. longo, supra glabris vel costa minute pubescente, subtus costa nervisque adpresse sparsim pubescentibus, nervis lateralibus utrinsecus ± 8 arcuato-adscendentibus, supra impressis subtus conspicuis, reticulo supra impresso, subtus distincto; petiolo 0.7–2 cm. longo, minute pubescente; stipulis 3 mm. longis, lanceolatis acuminatis, apice bifidis; inflorescentiis terminalibus cymosis laxifloris breviter pedunculatis, ramulis brevibus; floribus pedicellatis, pedicellis et ovario brevissimo vix 4 mm. longis adpresse pubescentibus; calycis lobis lineari-lanceolatis, ± 4 mm. longis, sparsim pubescentibus, sepalo phyllomorpho 0.6–1 cm. petiolato, orbiculari-ovato, obtusiusculo, 3–4.5 cm. longo, 2–4 cm. lato, subtus nervis pubescente; corollae tubo 4–4.5 cm. longo basim versus sparsim superne densius adpresse pubescente, fauce paullo dilatato tubuloso, 9 mm. longo, intus hirsuto, lobis oblongis subtus pubescentibus, supra papillatis, 9 mm. longis, acutiusculis; antheris 7 mm. longis, apice circiter 2 mm. infra faucis marginem; stylo 9 mm. longo, glabro, apice bifido; fructibus ellipsoideis lenticellatis, ± 2 cm. longis, 1–1.3 cm. diametro.

BRITISH NEW GUINEA: Fly River, 528-mile Camp, *Brass 6590* (TYPE), *6756,* May 1936, alt. 80 m. (large canopy liane; upper surface of leaves shining; flowers orange-yellow); Lake Daviumbu, Middle Fly River, *Brass 7500,* August 1936 (large scandent shrub ascending to tops of lesser canopy trees).

This species ought to be compared with the very fragmentary type of *Mussaenda Bevani* F. v. Muell. The latter consists of a single stunted leaf and an inflorescence, and no measurements were given in the original description. Since the magnification of the figures of the plate are also indefinite, it is difficult to suit either the description or the plate to specimens. Our species differs from the figures of the plate in the relative proportion of the corolla-tube and lobes; also the ovary is so short and inconspicuous as to suggest that the flowers are only staminate, but a dissection shows them to be perfect.

Mussaenda Ridleyana Wernh. Trans. Linn. Soc. II. Bot. 9: 70. 1916; Val. Nova Guin. Bot. 14: 261. 1925.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River,

Brass 12877, February 1939, alt. 1200 m., very common and conspicuous rain-forest canopy liane; 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13065*, March 1939, alt. 850 m., common along river-banks (large scrambling shrub).

In these collections the primary veins are ascending; the calyx-lobes vary in length (3–6 mm.), and the corolla-lobes are a little shorter (6 mm.) than in the original description, tending to be ovate-lanceolate rather than oblong.

Mussaenda Kajewskii sp. nov.

Frutex 5–6 m. altus; ramulis novellis hirtellis deinde glabratis pallide brunneis; foliis chartaceis ellipticis, (6–) 10–18 cm. longis, (3–) 5–7 cm. latis, utrinque angustatis, apice acuminatis, basi anguste cuneatis, supra consperse pilosulis (pilis brevibus), costa nervisque hirtellis, subtus consperse (costa et nervis et venis dense) hirtellis, nervis lateralibus utrinsecus 7–12 oblique adscendentibus, supra inconspicuis, subtus prominulis, venis subtus manifestis, reticulo obscuro; petiolo (1) 1.5–3.5 cm. longo, dense hirtello; stipulis cito caducis (non visis); inflorescentiis cymosis amplis, 5 cm. longis, 12 cm. latis, ramis divaricatis, ramis et ramulis et pedicellis hirtellis; pedicellis 2–3 mm. longis; sepalis lineari-lanceolatis, 2–2.4 mm. longis, utrinque hirtellis, sepalo phyllomorpho orbiculari-ovato, circiter 3.5 cm. longo, 2.5–3 cm. lato, obtuso, supra puberulo, subtus pilosulo; corollae tubo 2.5 cm. longo, ± crispe pubescente, fauce 8 mm. longa intus hirtella; lobis late ovatis, 4 mm. longis, apiculatis, supra dense papillatis, subtus dense pubescentibus (subhirtellis); antheris 5.5 mm. longis; stylo fere 2.5 cm. longo, glabro; ovario 3 mm. longo, hirtello; fructibus ovalibus, circiter 1.3 cm. longis, 0.8–1 cm. diametro, glabratis copiose lenticellatis.

SOLOMON ISLANDS: Guadalcanal: Berande, *Kajewski 2455* (TYPE), January 1931, rain-forest, common (shrub up to 5–6 m. tall; flowers with cream-colored petals and petaloid sepal; fruit brown when ripe, covered with corky pustules, 1.1 cm. × 1 cm.).

The species is perhaps nearest to *Mussaenda philippica* A. Rich. but may be distinguished by the more obtuse inconspicuously apiculate flower-buds, the shaggier pubescence, the obscure reticulation of the leaves, and the somewhat smaller fruits.

Mussaenda philippica A. Rich. Mém. Soc. Hist. Nat. Paris 5: 245. 1834; Merr. Enum. Philip. Fl. Pl. 3: 519. 1923.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski 1666*, April 1930, alt. 100 m., rain-forest (vine; fruit green, oblong, 1.6 cm. × 0.9 cm.); Ysabel: Meringe, *Brass 3538*, December 1932, alt. 200 m., rain-forest clearings (common large rambling shrub); Owa Riki: without further locality, *Brass 3075*, October 1932, common; rain-forest regrowths (large straggling shrub; flower velvety brown).

These collections do not seem to vary greatly from the Philippine material.

Mussaenda ovata sp. nov.

Planta 3 m. alta; ramulis brunnescentibus hirtellis vel subtomentosis; foliis anisophyllis, majoribus 8–15 cm. longis, 4.5–10.5 cm. latis, minoribus 2–11 cm. longis, 1.5–6 cm. latis, ovatis vel ovato-ellipticis, apice acuminatis, acumine 0.7–1 cm. longo, basi rotundatis vel rotundatis deinde breviter cuneatis, supra sparsim (costa nervisque densius) pubescentibus, subtus sparsim (costa, nervis et venis dense) hirtellis, nervis lateralibus utrinsecus 7–10 patentibus prope marginem arcuatis, supra

distinctis, subtus subprominulis, venis manifestis, reticulo laxo inconspicuo; petiolo 1–4.5 cm. longo subtomentoso; stipulis 8 mm. longis utrinque adpresse hirtellis, acuminatis; inflorescentiis terminalibus laxis sessilibus ramosis; ramulis et pedicellis hirtello-tomentosis; calycis lobis subulatis breviter hirtellis ± 7 mm. longis, sepalo phyllomorpho 5 cm. longo, lanceolato, 1 cm. petiolato; corollae tubo 5–6 cm. longo adpresse pubescente, intus supra medium hirtello, lobis ovatis apiculatis 1 cm. longis, supra papillatis, subtus adpresse pubescentibus; antheris 1 cm. longis, in medio tubo insertis; stylo 5 cm. longo supra antheris leviter dilatato complanato bifido; ovario 8 mm. longo hirtello subcylindrico; fructibus immaturis obovoideis, 1.7 cm. longis, 0.8 cm. diametro.

NORTHEASTERN NEW GUINEA: Nabire, *Kanehira & Hatusima 11620* (TYPE), February 1940, alt. 20 m., margin of rain-forest (3 m. high; flowers yellow).

Mussaenda ovata superficially suggests some likeness to *M. Kanehirae*, but the fruit is not cylindrical, the anthers are attached in the middle of the corolla-tube, and the corolla-lobes are only apiculate rather than caudate-acuminate.

Mussaenda Kanehirae sp. nov.

Ramuli novelli hirtelli lenticellati brunnescentes vel viridescentes; foliis ellipticis, 15–20 cm. longis, 7–10 cm. latis, utrinque angustatis, apice acuminatis, acumine 1–1.5 cm. longo, basi cuneatis, supra viridescentibus, costa sparsim pubescente, subtus cinerascentibus, costa et nervis et venis molliter hirtellis, nervis lateralibus utrinsecus 9 vel 10 supra manifestis, subtus distinctis non prominulis, venis supra inconspicuis subtus manifestis, reticulo subobscuro; petiolo 0.8–5 cm. longo, dense hirtello; stipulis 6–8 mm. longis, anguste triangularibus, acuminatis apice bifidis utrinque adpresse hirsutis; inflorescentiis terminalibus cymoso-paniculatis pedunculatis; axi, ramulis et pedicellis hirtellis; pedicellis 1–2 (–4 in fructu) mm. longis; calycis lobis subulatis 2–3 mm. longis sparsim hirtellis, sepalo phyllomorpho 1.5–2.5 cm. petiolato, elliptico, 3.5–5 cm. longo, 3–4 cm. lato, utrinque angustato, apice acuminato, supra glabrato subtus costa nervisque breviter hirtello; corollae tubo extus breviter hirtello 4–4.5 cm. longo, versus apicem dilatato (11 mm.) intus hirsuto deorsum glabro, lobis ovatis, 8 mm. longis, apice caudato-acuminatis; antheris 7 mm. longis; stylo glabro apice bifido, 4.5 cm. longo; ovario cylindrico, dense hirtello; fructibus cylindricis, apice leviter constrictis, 3 cm. longis, 5 mm. diametro, glabratis lenticellatis; calycis lobis deciduis.

NORTHEASTERN NEW GUINEA: Salamaua, *Kanehira 4011* (TYPE), February 1937, on beach.

The flowers of *Mussaenda Kanehirae* suggest those of *M. pluviatilis* S. Moore both in size and in the caudate-acuminate corolla-lobes, but the inflorescence of the latter is much more open, and the two differ in the type of pubescence present. In the former the hairs are spreading and somewhat softer than in the latter, where they are appressed and directed forward. The petioles of pairs of leaves are unequal, and possibly the leaves would also be anisophyllous if the pairs were available.

Mussaenda malacotricha sp. nov.

Planta scandens; ramulis retrorse ferrugineo-hirsutis; foliis chartaceis ovato-ellipticis, 11–16 cm. longis, 5–8 cm. latis, basi rotundatis, apice acuminatis, acumine 1–1.5 cm. longo, supra olivaceis consperse (costa

dense) hirtellis, subtus cinereis molliter subtomentosis vel crispe (costa nervisque dense) hirtellis, nervis primariis utrinsecus 10–14 patentibus versus marginem arcuatim adscendentibus, supra manifestis subtus prominulis, venis utrinque inconspicuis; petiolo 1–1.5 cm. longo ferrugineo-hirtello; stipulis caducis dense hirtellis ?bipartitis; inflorescentiis sessilibus amplis, ramulis patentibus 5–8 cm. longis, ramulis, pedicellis, ovario et calycis lobis dense breviter piloso-hirtellis; pedicellis 2 mm. longis; calycis lobis subulatis, 5 mm. longis, sepalo phyllomorpho magno, 14–15 cm. longo, 8–10 cm. lato, elliptico, apice acuto vel acuminato, basi subrotundato, 1.5–2 cm. petiolato, supra sparsim subtus densius molliter hirtello vel pilosulo; corolla immatura subadpresse hirtella, tubo versus apicem leviter dilatato, apice late ovato obtuso; ovario 5 mm. longo elongato-obconico.

NORTHEASTERN NEW GUINEA: Nabire, *Kanehira & Hatusima 11629* (TYPE), February 1940, alt. 100 m.

The collection most closely approaches the description of *Mussaenda chrysotricha* Val. It differs in the rounded base and the cinereous lower surface of the leaves; the flower-buds are immature, the longest corolla-tube being 2 cm. long, but the pubescence on the corolla does not consist of long hairs; the stipules have fallen except at one node, and here they appear to be parted into subulate segments about 5 mm. long.

Mussaenda procera F. M. Bail. Queensl. Agric. Jour. 3: 155 (repr. p. 2). 1898· S. Moore, Proc. Roy. Soc. Queensl. 34: 54. 1922.

BRITISH NEW GUINEA: Rona, Laloki River, *Brass 3571,* March 1933, alt. 450 m., common; on or in shelter of rocks on savanna slopes (bush 1–2 m. high; flowers yellow, petaloid sepal white); Baroka, *Brass 3726,* April 1933, alt. 10 m., common in rain-forests (large rambler or climber; corolla green outside, orange-brown inside); Kanosia, *Carr 11037,* January 1935, sea-level, undergrowth in secondary forest (flowers greenish yellow outside, bright orange inside).

This species has been twice reported for British New Guinea. The description is not wholly satisfactory, but as far as it goes, these collections seem to fit it fairly well except for the much shorter petioles. If the type is extant, the material should be compared with it and a more complete description given from this adequate material.

Mussaenda Whitei S. Moore, Proc. Roy. Soc. Queensl. 34: 54. 1922.

NETHERLANDS NEW GUINEA: Balim River, *Brass 11682,* December 1938, alt. 1600 m., occasional on grassy long deforested slopes (shrub 1 m. high).

The collection is a reasonable match for the original description of the type-collection, from Mafulu, British New Guinea, differing chiefly in having longer stipules (1.2 cm.) and shorter petioles (1–1.5 cm.) and cymes not too openly arranged. One inflorescence appears normal with fairly compact clusters of almost sessile flowers; the other is larger (12 cm. long, 15 cm. broad), and in this the calyx-lobes or sepals, instead of developing normally, have all become petaloid and are of varying size. The immature fruit is glabrate, oblong, 1.8 × 0.7 cm., and lenticellate.

Mycetia Reinwardt

Mycetia javanica (Bl.) Reinwardt ex Korthals, Ned. Kruidk. Arch. 2(2): 118. 1850; Valeton, Bot. Jahrb. 60: 68. 1925.
Bertiera javanica Blume, Bijdr. 987. 1826.

SOLOMON ISLANDS: Guadalcanal: Ululolo, Tutuve Mt., *Kajewski 2645*, May 1931, alt. 1200 m., on land-slides (shrub 2–3 m. high); San Cristobal: Balego-Nagonago, *Brass 2694*, August 1932, alt. 350 m., rain-forest floor, not plentiful (low shrub 0.5–1 m. high; stem very pale grey; leaves grey above, green beneath; fruit white, very fleshy). Java to the Philippines and New Guinea.

Maschalodesme Lauterbach & K. Schumann

Maschalodesme simplex sp. nov.

Arbuscula 1.5–2 m. alta non ramosa; trunco apicem versus subtetragono 4 mm. crasso glabro; foliis tenuiter coriaceis glabris, novellis breviter consperse pubescentibus, subsessilibus obovato-oblongis, 26–42 cm. longis, 8–13.5 cm. latis, apice longiuscule acuminatis, in tertio infero gradatim angustatis, basi rotundatis, nervis primariis utrinsecus 16–20, utrinque perspicuis, venis subclathratis utrinque manifestis; petiolo 3–5 mm. longo; stipulis 2 cm. longis ovatis; inflorescentibus axillaribus dense congestis; bracteis 2 cm. longis, ovatis glabris; calyce infundibulari, lobis oblongis acutiusculis, 1–3 mm. longis, extus parce intus dense pubescentibus; corollae tubo 5 mm. longo, fauce pubescente, lobis 2–3 mm. longis, vix 3 mm. latis, obtusiusculis reflexis, in alabastro imbricatis; staminibus 4, circiter 2.5 mm. longis, sessilibus, medio dorso in fauce affixis; ovario in pedicellum 7 mm. longum sensim transeunte; stylo glabro; stigmate oblongo-subclavato pubescente.

NETHERLANDS NEW GUINEA: 2 km. southwest of Bernhard Camp, Idenburg River, *Brass 13614* (TYPE), March 1939, alt. 700 m., rain-forest undergrowth; Bernhard Camp, Idenburg River, *Brass 13906, 13997*, April 1939, alt. 55 m. and 50 m., in rain-forest occasionally flooded by river. (Unbranched treelet 1–2 m. high; flowers white; fruits red, fleshy).

Maschalodesme simplex differs from *M. arborea* Lauterb. & K. Schum. in the larger leaves with closer and more numerous primary veins (in the original species only 8 or 9). The field note of each number indicates an unbranched treelet.

Lucinaea de Candolle

Lucinaea monantha sp. nov.

Frutex scandens; ramulis subtetragonis novellis dense setuloso-hirtellis deinde glabratis; foliis coriaceis glabris, 2–5 cm. longis, 0.8–2.3 cm. latis, lanceolato-ellipticis vel ellipticis utrinque angustatis apice leviter attenuato-acutis, basi obtuse cuneatis, supra nigrescentibus subtus fuscis, costa supra manifestis subtus prominulis, nervis lateralibus subobscuris; petiolo 0.5–1 cm. longo glabro nigro; stipulis caducis vaginantim connatis abrupte acuminatis, ± 7 mm. longis, fere glabris; floribus solitariis terminalibus in apice ramulorum brevium; pedunculis 3–5 mm. longis glabris; involucro cupuliformi integro; floribus 5-meris; calyce campanulato-tubulato subtruncato vel leviter 5-lobato circiter 5 mm. longo glabro; corolla infundibulari, tubo 4 mm. longo, fauce elongato-ampliata basi squamulis 5 dense barbatis subclausa, circiter 1 cm. longa, lobis 4 mm. longis carnosulis apice incrassatis, anguste trigonis; antheris in apice faucis sessilibus semiexsertis, vix 3 mm. longis; stylo glabro; stigmate bilobo dense papilloso.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass 11858* (TYPE), January 1939, alt. 1800 m., common in mossy forest (large scandent epiphytic shrub; solitary white fleshy flowers; fruit fleshy, white).

Lucinaea monantha closely resembles *L. Schlechteri* Val. in habit and *L. acutifolia* Val. in floral characters. Our species differs from the first in having 5-merous rather than 4-merous flowers, and it may be distinguished from the second by the glabrous peduncles, the shorter broader leaves with venation obscure except for the midrib, and the stouter branches. Both of Valeton's species have 2- or 3-flowered heads, whereas in *L. monantha* the heads are 1-flowered, an unusual character in the genus.

Lucinaea Schlechteri Val. Bot. Jahrb. 60: 81. 1925.

An isotype in our herbarium shows more mature flowers than those described in the original publication: heads 2–6-flowered; flowers sessile; calyx campanulate, truncate, 4 mm. long; corolla funnel-shaped, 15 mm. long, the tube ± 10 mm. long, within above the base 2–3 mm. bearing a ring of hairs, otherwise glabrous; stamens sessile in the throat, the anthers ± 2.5 mm. long.

Lucinaea Ledermannii Val. Bot. Jahrb. 60: 82. 1925.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass 12400,* January 1939, alt. 1500 m., common in rather open rain-forest (large climbing shrub; flowers white); 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13612,* March 1939, alt. 850 m., occasional in rain-forest (shortly scandent epiphytic shrub; flowers white).

These collections differ from the original description only in having occasionally on the lower surface of the leaves, particularly along the midrib, a rather crisp hairiness. In the latter character suggesting *L. ramiflora* var. *pubinervis* Valeton, the material differs in having the corolla glabrous except for the ring of hairs within near the base.

Randia Linnaeus

Randia Schumanniana nom. nov.

Randia speciosa K. Schumann, Fl. Kaiser Wilhelms Land 130. 1889, non DC. (1830).

Although the specific name *speciosa* may have been valid according to International Rules at the time it was established, according to the present Code it is invalid, and we have renamed the species for K. Schumann, who described it. It is known from several localities in Northeastern New Guinea.

Randia calliantha sp. nov.

Arbuscula 2–3 m. alta gracilis inflorescentiis exceptis glabra; ramulis ± sulcatis cinerascentibus; foliis coriaceis ellipticis vel lanceolato-ellipticis, 4–10 cm. longis, 2–5 cm. latis, utrinque angustatis, apice obtuse acuminatis, acumine 5–10 mm. longo, basi anguste cuneatis, nervis primariis utrinsecus 4–6 oblique adscendentibus vel patentibus prope marginem inconspicuis arcuatis, subtus in axillis domatia minuta ferentibus, venis subobscuris; petiolo 5–8 mm. longo; stipulis caducis; floribus in apice ramulorum 1–3, pedunculo 2–3 mm. longo, pedicellis circiter 2 mm. longis glabris vel pubescentibus; bracteis oppositis connatis in parte superiore libera cuspidatis, circiter 2 mm. longis; calyce campanulato in lobos infra medium diviso, tubo ± 5 mm. longo pubescente, lobis 5 lineari-lanceolatis, acutis, versus basim utrinque sparsim pubescentibus, 5–7 mm. longis, 1.5–2 mm. latis; corollae tubo 3–4 cm. longo extus glabro, intus fauce crispe

pilosulo deorsum sensim glabro, lobis 5 lanceolatis obtusis, 2 cm. longis, 6–7 mm. latis, supra prope faucem pubescentibus; antheris 11 mm. longis, apice circiter 4 mm. infra faucis marginem; stylo glabro, stigmatis lobis oblongis rotundatis, 3 mm. longis; ovario 2–3 mm. longo ± pubescente; fructibus immaturis, 2-loculatis, glabris.

BRITISH NEW GUINEA: Wuroi, Oriomo River, *Brass 5718* (TYPE), January 1934, alt. 10 m., undergrowth in light rain-forest (slender bush 2–3 m. tall; large fragrant white flowers).

This plant has the same general habit of *Randia Cumingiana* Vidal of the Philippines. It differs obviously in having flowers at least twice the size of those of the Philippine species. In Merr. Enum. Philip. Fl. Pl. 3: 527. 1923, the combination *Randia microcarpa* (Bartl.) Merr. is listed as the older name for *Randia Cumingiana* Vidal. This is true, but unfortunately the specific name *microcarpa* was already pre-empted by Mociño & Sessé (1887–1890), and hence the name *R. Cumingiana* Vidal should be retained for the Philippine species.

Randia decora Val. Bot. Jahrb. 60: 90. 1925, Nova Guin. Bot. 14: 266. 1925; vel aff.

BRITISH NEW GUINEA: Dieni, Ononge Road, *Brass 3887,* April 1933, alt. 500 m., bank of a rain-forest stream (slender tree 12 m. tall; large cream-colored flowers).

This species has been reported for both Netherlands New Guinea and Northeastern New Guinea. This specimen is too near the original description to place it elsewhere without a comparison with the type. It should be pointed out, however, that the leaves are 20–38 cm. long, 5–13.5 cm. broad, the inflorescence is about 5- or 6-flowered, branching about 5 mm. above the base of the peduncle then again ± dichotomously, giving the impression of an irregular cyme rather than a corymb, the pedicels are 1.5–2 cm. long, the calyx is definitely dentate, the teeth being about 1.5 mm. long and broad, the tube of the corolla is glabrous outside, within, the anthers, instead of being partly exserted as in most species, are included, the apiculate apex being about 3 mm. below the margin of the throat, and about in the middle of the tube is a band ± 5 mm. wide of crisp hairs. Valeton does not tell anything about the inner surface of the corolla tube, although he does mention the hairiness within the tube in *Randia sphaerocarpa* Lauterb. & K. Schum. The latter species differs in the much longer calyx-lobes.

Randia sessilis F. v. Muell. Fragm. Phytogr. Austr. 7: 47. 1869; F. M. Bail. Queensl. Fl. 3: 754. 1900; C. T. White, Contr. Arnold Arb. 4: 98. 1933.

Randia Macarthuri sensu Val. Nova Guin. 8: 466. 1911; non F. v. Muell. (1876).

BRITISH NEW GUINEA: Oriomo River, Dagwa, *Brass 5993,* February 1934, alt. 40 m., creek-bank gallery forest, rare (small tree 4 m. tall; leaves glabrous, shining; rather large white flowers; rufous brown globose fruit ± 3 cm. diameter); Tarara, Wassi Kussa River, *Brass 8683,* January 1937, common in rain-forest undergrowth (tree 3–5 m.; flowers white; fruit brown, scurfy, up to 4 cm. diameter).

These collections are a very good match for the two Australian specimens under this name in our herbarium, even to the appressed hairs on the inner surface of the calyx-remnants crowning the fruits. They also seem to agree with Valeton's elaborated description of *Randia Macarthuri,* which unfortunately is a misidentification.

Randia Macarthuri F. v. Muell. Notes on Pap. Pl. 1: 68. 1876; Becc. in D'Albertis, Nov. Guin. 2: 397. 1880; F. M. Bail. Queensl. Agric. Jour. 24: 22. 1910.
Randia Versteegii Val. Nova Guin. 8: 466. 1911, op. cit. 14: 266. 1925.
Gardenia Klossii Wernh. in Ridl. Trans. Linn. Soc. II. Bot. 9: 72. 1916.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction Black River, *Brass 7365*, August 1936, alt. 100 m., river banks (attractive small tree with white honeysuckle scented flowers); Fly River, between junctions Alice and Elevata Rivers, *Brass 7389*, river banks (small tree conspicuous on banks; flowers cream-colored; fruit subglobose, ± 6 cm. long, 5.5 cm. diameter); Lower Fly River, east bank opposite Sturt Island, *Brass 8011*, October 1936, flood plain rain-forests (substage tree 10 m. high; flowers yellow-white, honeysuckle scented).

Through the kindness of Mr. H. W. Jessep, Director of the Melbourne Botanic Gardens, we have received a flower from the type specimen of *Randia Macarthuri* F. v. Muell. This agrees in every way with that of *Brass 7365*. The inflorescence of this plant is branched and is a perfect match for Valeton's description of *R. Versteegii*. The other two collections cited appear to be conspecific. Mostly the inflorescence is fewer-flowered (3–5), but in one instance it is branched near the base much as in *Brass 7365*, which leads us to suspect that the suppression of branches of the inflorescence is due to some influence of habitat rather than an inherent character of the plant. In addition to the somewhat simpler inflorescence, it may be noted that the calyx is slightly longer and the corolla-tube a little shorter than in *Brass 7365*. Possibly the two with simpler inflorescences represent *R. Klossii* (Wernh.) Val., but it is to be noted that none of the measurements given in Wernham's original description are exclusive of those given in *R. Versteegii* Val. to which Wernham says it is related. All three types ought to be compared. With the material at hand, however, we cannot at present see more than one species.

Randia bernhardensis sp. nov.

Arbuscula? glabra, floribus exceptis; ramulis brunnescentibus teretiusculis cortice striato-sulcatis; foliis anguste ellipticis, 12–14.5 cm. longis, 6 cm. latis, basi cuneatis, apice acutiusculis vel breviter acuminatis, nervis lateralibus utrinsecus circiter 8 patenti-adscendentibus utrinque prominulis, venis subobscuris; stipulis lanceolatis caducis; petiolo ± 2 cm. longo glabro; ramo inflorescentiam ferente brevi oppositifolio; inflorescentiis vix ramosis, bracteis confertis, floribus fasciculatis; pedicellis ± 5 mm. longis, glabris; calyce campanulato glabro 3 mm. longo, apice 5-crenulato margine ciliolato; corolla (in alabastro tantum visa) 3 cm. longa, tubo extus subtomentoso, 1.8 cm. longo, intus supra medium (1 cm.) dense adpresse villosulo, ceterum glabro; lobis 1.5 cm. longis extus glabris, intus basim versus tomentosis; antheris 8 mm. longis apice apiculatis; stylo glabro, ovario 2–2.5 mm. longo, glabro.

NETHERLANDS NEW GUINEA: Hollandia, Bernhard Camp, *Neth. Ind. For. Service bb.25725* (TYPE), August 1938, alt. ± 50 m.

The flowers of *Randia bernhardensis* differ from those of other species of *Randia* which we have examined in the densely hairy inner surface of the upper half of the corolla-tube. The other species with corolla-tubes so densely pubescent outside usually have the lower part within shortly villous

or at least with a ring of hairs near the base. These also have a more obviously branched inflorescence.

Randia dryadum (S. Moore) comb. nov.

Gardenia dryadum S. Moore, Jour. Bot. 65: 246. 1927, Jour. Arnold Arb. 10: 267. 1929.

BRITISH NEW GUINEA: Rona, Laloki River, *Brass 3679,* March 1933, alt. 450 m., rain-forest, rare (small second storey tree with close grey bark; dull pale nerved leaves, yellowish underneath; fruit solitary in axils of leaves, green, covered with pale brown scurfy scales); Auga River at Mafulu, *Brass 5499,* November 1933, alt. 580 m., riverine rain-forest (small tree with white flowers); Lower Fly River, east bank opposite Sturt Island, *Brass 8016*, October 1936, rain-forest (substage tree 10–12 m. high, restricted to low flood plains; flowers cream-colored, corolla-lobes reflexed; fruit grey-brown scurfy, compressed-ovoid, ± 6.5 cm. long, 6 cm. diameter). SOLOMON ISLANDS: Ulawa: *Brass 2953,* October 1932, swampy rain-forest (shapely tree 4 m. tall; leaves smooth and shining; flower white; fruit nearly globose, 4.5 × 4 cm., covered with pale brown mealy scurf); Ysabel: Meringe, *Brass 3300,* December 1932, alt. 100 m., rain-forests on limestone hills (compact small tree; leaves shining, midrib pale; flowers cream-colored; fruit hard, pale brown, scurfy, about 4 × 3 cm.).

The above-cited specimens all agree in general habit, color of bark, shape of stipules, flowers where seen (some variation exists in the length of the corolla-lobes), and leaf-outline. The leaves were described as emarginate at the apex. In the isotype at hand, practically all the leaf-tips are injured. In some of the other specimens the leaves are obtusish or slightly contracted near the apex, giving the impression of being very shortly and obtusely acuminate, a character more marked in the material cited from the Solomon Islands than in that from New Guinea; also in the Solomon Islands material the corolla-lobes are longer. These scarcely seem to be specific differences. In *Brass 3679,* where the field-note indicates "fruit solitary in the axils," it appears that only one fruit develops from an inflorescence; these fruits are immature but seem to match very well those of *Brass 8016,* which are practically mature. The fruits are unquestionably those of the genus *Randia.* The outer covering of the pericarp is scurfy, the scales of the younger fruit somewhat lighter in color, the seeds, imbedded in pulp, are smoothish, slightly compressed, ovoid or ellipsoid, and about 5 mm. long and 3.5 mm. diameter. The species ought to be compared with *Randia albituba* Val. Bot. Jahrb. 60: 92. 1925, from the Bismarck Archipelago.

Randia Gaudichaudii Val. Not. Syst. 3: 54. 1914.

SOLOMON ISLANDS: Ysabel: Meringe, *Brass 3180,* November 1932, littoral rain-forests, common (handsome small tree; flower white; fruit smooth, red); N'Gela: Navotana, *Brass 3239,* November 1932, steep foreshores (compact small tree 8 m. tall; leaves smooth and shining [dull when dry]; flower white; fruit red, fleshy); north end of N'Gela, *Brass 3511,* January 1933, alt. 75 m., hill rain-forests (erect trees 10 m. tall; bark thick, uneven brown, yellow when cut; wood hard, yellow; flower white; fruit very small, smooth, red).

These collections appear to fit reasonably well the description of *Randia Gaudichaudii* Val., except the anthers are a centimeter long (in the description 1 mm., probably a typographical error), and the fruit is pisiform rather than pyriform. Valeton's type was from Rawak (on more modern maps Lawak) Island, near the coast of Waigeo.

Randia spicata Val. Nova Guin. Bot. 8: 468. 1911, op. cit. 14: 267. 1925.

BRITISH NEW GUINEA: Kubuna, *Brass 5574,* Nov. 1933, alt. 100 m., forest on low ridges (slender tree of 2nd storey; flowers white; fruit immature); Koitaki, *Carr 12555,* June 1935, alt. about 450 m., forest (tree 6 m. tall; fruit green).

In the material cited above, which we take from the description to be this species, the flowers are more mature than those described in the type. The calyx is 3.5 mm. long, puberulous, 5-dentate, glabrous within except for glands clustered around the sinuses; corolla tube 1.5–2 cm. long, glabrous except for a few occasional hairs between the anthers; anthers 5–6 mm. long, apiculate, about half exserted; style glabrous, stigma-lobes oblong or slightly lanceolate, striate.

Randia uncaria Elmer, Leafl. Philip. Bot. 1: 30. 1906; Merr. Philip. Jour. Sci. 1: Suppl. 130. 1906, Enum. Philip. Fl. Pl. 3: 529. 1923.

BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass 7988,* rain-forest (large canopy liane climbing by paired hooked thorns; flowers white, fragrant). Previously known only from the Philippines.

Randia macromera Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 563. 1900; Val. Bot. Jahrb. 60: 90. 1925.

The nomenclatural status of *Randia macromera* Lauterb. & K. Schum. versus *R. megalocarpa* K. Schum., Fl. Kaiser Wilhelms Land 131. 1889, needs reconsideration. In view of the reported loss of the Berlin Herbarium, it would be necessary to examine isotypes if any such are extant. Schumann & Lauterbach reduced *R. megalocarpa* K. Schum. to *R. speciosa* K. Schum., l. c. p. 564. Valeton, on the other hand, placed *R. megalocarpa* K. Schum. in the synonymy of *R. macromera* Lauterb. & K. Schum. citing the former as "nomen tantum." This is hardly the case, as Schumann's explanatory note concerning *Hollrung 497* is accepted as a description by Professor Rehder, a well known authority on nomenclature. Probably when sufficient flowering and fruiting material of all the species concerned has been collected the nomenclature can be straightened out.

Gardenia Ellis

Gardenia Archboldiana sp. nov.

Arbuscula epiphytica 5–10 m. alta; ramulis subteretibus cortice pallido lenticellato; internodio ultimo hirtello; foliis plerumque anisophyllis coriaceis glabris, 8–24 cm. longis, 4.5–12 cm. latis, ellipticis vel obovato-ellipticis utrinque angustatis, basi cuneatis, apice breviter acuminatis, acumine basi 1–1.5 cm. lato totidemque longo obtusiusculo, nervis primariis utrinsecus 7–10 patentibus prope marginem arcuatis, supra manifestis, subtus perspicuis in axillis domatia ferentibus, reticulo denso manifesto non prominulo; petiolo 0.5–1.5 cm. longo glabro; stipulis 2–3.5 cm. longis, 1–1.5 cm. latis, apice anguste obtusis vel acutiusculis, extus parce hirtellis; floribus in apice ramulorum breviter pedicellatis, pedicellis 5 mm. longis; calyce spathaceo-tubulato, 5.5–7 cm. longo, apice irregulariter breviter ± 6-fisso, laciniis rotundatis vel subtruncatis marginem versus pilosis; corolla hypocrateriformi, tubo 11–17 cm. longo, 2–3 cm. crasso, prope faucem sensim dilatato, fauce pilosa, lobis subrhomboideo-ovatis, 3 cm. longis, 2 cm. latis, apice emarginatis; antheris ± 1 cm. longis in apice faucis sessilibus partim

exsertis; ovario 7 mm. longo, hirtello; stylo apice (± 2 cm.) hirsuto ceterum glabro; fructu immaturo ellipsoideo 4 cm. longo, 2.5 cm. diametro, apice calyce tubulato 8 cm. longo coronato.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13229* (TYPE), common epiphyte in flood-plain rain-forest (tree 5–10 m. high; flowers white, later yellow).

Gardenia Archboldiana probably belongs in the same group with *G. Lamingtonii* F. M. Bail.; however, in the former the leaves are larger and more coriaceous, the calyx-tube, although incised, is truncate rather than oblique at the apex, the corolla-lobes are subrhombic-ovate rather than oblong, and the anthers are partly exserted.

Gardenia Lamingtonii F. M. Bail. Queensl. Agric. Jour. 3(2): 155 (repr. p. 2). 1898; Val. Nova Guin. Bot. 14: 268. 1925; vel aff.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction Black River, *Brass 7317*, July 1936, alt. 100 m., river flood-plain forest (arborescent hemi-epiphyte growing on tall canopy tree; corolla tube 18–21 cm. long, yellow, later orange; fruit spherical, tuberculate, yellow, 4–4.3 cm. diameter). NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass 12918*, February 1939, rain-forest (substage tree 12 m. high; fruit orange-colored).

The collection in flower corresponds reasonably well with Valeton's description of *Gardenia siphonocalyx* except that the anthers are not exserted. On Wernham's verification, he reduced his species to *G. Lamingtonii* F. M. Bail. He does not mention the character of the anthers given in Bailey's original description, "the base produced into a filiform appendage about ½-in. long," or the "ovary 6-ribbed"; these may be variable characters, or may not be noticeable in dried material (Bailey wrote his descriptions from fresh material he collected on a trip to New Guinea); at any rate neither of these characteristics appears in the specimens above cited.

Gardenia pallens sp. nov.

Frutex vel arbuscula glabra; ramulis teretibus vel obtuse angulatis, cortice pallido lenticellato; foliis plerumque leviter anisophyllis coriaceis, 3.5–11 cm. longis, 2–5.5 cm. latis, ellipticis, basi obtusis vel subrotundatis vel late cuneatis, apice abrupte breviter acuminatis, acumine 0.6–1 cm. longo acutiusculo, nervis primariis utrinsecus 6–9 patentibus prope marginem arcuatis supra distinctis, subtus prominulis in axillis domatia minuta ferentibus, reticulo in foliis novellis laxo, maturis obscuro; petiolo 0.5–1.2 cm. longo; stipulis membranaceis, 1.2–1.8 cm. longis, uno latere connatis (apice verisimiliter emarginatis); floribus in apice ramulorum pedicellatis, pedicellis ± 5 mm. longis glabris; calyce spathaceo-tubulato, 1.5–2 cm. longo, uno latere ab apice circiter 8 mm. partito emarginato glabro; corolla hypocrateriformi, tubo 5.5–7 cm. longo apicem versus leviter dilatato, fauce glabro, lobis plerumque 6 (5–7), subrhomboideo-ovatis, 1.5–2 cm. longis, 1–1.5 cm. latis, obtusis; antheris 1 cm. longis in apice faucis sessilibus apice exsertis; ovario vix 5 mm. longo glabro, stylo deorsum glabro ad apicem hirtello, stigmatis lobis conglobatis; fructu immaturo ellipsoideo, 3.5 cm. longo, 2 cm. lato, apice calyce tubuloso 2.5 cm. longo coronato.

NETHERLANDS NEW GUINEA: Balim River, *Brass 11614*, December 1938, alt. 1700 m.,

deforested slopes, common on grassy second growths (tree 3 m. high; flowers cream-colored, later yellow); same locality, *Brass 11695* (TYPE), December 1938, alt. 1600 m., occasional in grassy edges of forest (shrub 2 m. high; flowers fragrant, white, later orange).

Gardenia pallens is probably related to *G. Forbesii* Val., if the latter name is to be regarded as validly published; Valeton's binomial appears in the key to the genus, Bot. Jahrb. 60: 99. 1925. This alone would give the name only the status of a *nomen subnudum,* but when one considers the description which Valeton gave of the flower of *Forbes 467* in his original description of *G. siphonocalyx* Val., Nova Guin. 8: 470. 1911, his dissatisfaction of this disposition of the collection, op. cit. 8: 758. 1912, his tentative alliance of the specimen with *G. Gjellerupii* Val., and still later, op. cit. 14: 268. 1925, his expressed opinion that it must be considered as an independent species or subspecies along with *G. Gjellerupii* Val. and *G. Lamingtonii* F. M. Bail., one is inclined to believe that Valeton clearly intended *G. Forbesii* Val. to be represented by the specimen *Forbes 467.* If so, a sufficiently detailed description of the flower was given to establish this as a species. Professor Rehder has suggested that all that is necessary to establish this species without any doubt is the examination of a specimen so labeled by Valeton; this, of course, is impracticable at the present time. *Gardenia pallens* differs from the other species with somewhat spathe-like tubular calyces in the glabrous throat of the corolla and the partly exserted anthers. The fruits are immature, the endocarp appearing only as a very thin crustaceous layer, the seeds are still too small to show any particularly distinctive characters.

Gardenia vernicosa sp. nov.

Arbor 10 m. alta; ramulis glabris, novellis resiniferis, internodiis brevibus (in specimine typico tantum 0.7 1 cm. longis); stipulis coriaceis subpersistentibus ramulos ultimos annulatim vaginantibus; foliis tenuiter coriaceis vernicosis glabris ellipticis, 9–19 cm. longis, 4.5–8 cm. latis, utrinque angustatis, basi cuneatis, apice acuminatis, acumine 0.6–1 cm. longo obtuso, nervis primariis utrinsecus 11–14 patentibus prope marginem abrupte arcuatis utrinque prominulis subtus in axillis domatia minuta ferentibus, venis nervis fere perpendicularibus inconspicue manifestis, reticulo laxo; petiolo 0.8–1.5 cm. longo, resinifero; floribus in axillis superioribus; pedicellis circiter 7 mm. longis glabris; calyce 4-partito; lobis 2 cm. longis, versus basim 3 mm. versus apicem 5 mm. latis, lineari-spathulatis, venosis glabris; corollae tubo 8 cm. longo extus glabro, intus supra medium pubescente, lobis 6 ellipticis, 3 cm. longis, ± 1.5 cm. latis; antheris 6 linearibus 1.8 cm. longis paullo exsertis; stylo ± 5.5 cm. longo glabro; ovario circiter 6 mm. longo resinoso.

SOLOMON ISLANDS: San Cristobal: Star Harbor, *Brass 3093* (TYPE), October 1932, foreshore hills (densely foliaged tree 10 m. tall; leaves very glossy, paler beneath; corolla-tube green, the lobes white; flowers heavily perfumed).

In general habit this species strongly resembles *Gardenia Storckii* Oliv., but the leaves are larger, and the corolla-tube is about three times as long as the calyx-lobes. It should be noted that here the style is much shorter than the corolla-tube.

Mastixiodendron Melchior

In Jour. Arnold Arb. 23: 416. 1942, we have called attention to the fact that *Mastixiodendron* Melch., established to take care of *Fagraea pachyclados* K. Schum. Fl. Deutsch. Schutzgeb. Südsee Nachtr. 564. 1905, belongs to the Rubiaceae rather than to the Cornaceae, wherein it was originally placed, Bot. Jahrb. 60: 167. 1925. In checking over the unnamed Rubiaceae, we find a collection from Halmahera, *Netherlands Indian Forest Service bb. 24870*, May 1, 1940, which, although in fruit only, appears to be congeneric with the New Guinea collections. Hence the genus is no longer to be considered as endemic in New Guinea.

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ADDITIONS TO OUR KNOWLEDGE OF THE FLORA OF HAINAN[1]

HUI-LIN LI

OUR knowledge concerning the flora of Hainan Island is augmented in this paper with the addition of eighteen species and one variety. Twelve of the species and the one variety are proposed as new, the rest being previously described species now first credited to Hainan. Among the new species are five species of *Symplocos* named by Merrill & Chun in connection with their study of the Hainan flora. The genera *Albertisia* and *Lansium* are new to China.

The material used for this study is based on a part of the accumulated collections of Hainan and southern Chinese plants in the herbarium of the Arnold Arboretum, where the types of the new forms herein described are deposited. These collections were made under the auspices of the Botanical Institute of Sun Yatsen University and Lingnan University, with the financial coöperation of the Arnold Arboretum.

PROTEACEAE

Helicia Loureiro

Helicia silvicola W. W. Smith, Notes Bot. Gard. Edinb. 10: 181. 1918.

HAINAN: Kan-en District, Chim Fung Mt., near Sha Mo Kwat Village, *S. K. Lau 5000,* Dec. 13–31, 1934, a shrub, 4 m. high, rare, on dry gentle slopes, in forests, in fruit; Loktung, *S. K. Lau 27163,* June 17, 1936, a shrub, 4 m. high, in dense woods, flowers yellowish white. KWANGTUNG: Shih Wan Tai Shan, Tai Mien Shan, *H. Y. Liang 69656,* July 14, 1937, a shrub or small tree 4–6 m. high, in dense forests. Yunnan; new to Hainan and to Kwangtung.

MENISPERMACEAE

Albertisia Beccari

Albertisia Perryana sp. nov.

Frutex scandens, ramulis ultimis 1.5 mm. diametro, pubescentibus; foliis tenuiter coriaceis petiolatis ovatis vel ovato-ellipticis, 8–14 cm. longis, 2.5–5 cm. latis, acutis vel abrupte acuminatis, basi cuneatis, margine integris, supra subnitidis, in sicco utrinque concoloribus subolivaceis glabris, costa supra vix prominula, nervis lateralibus utrinsecus 3–5, subpatulis, supra subconspicuis, subtus elevatis, prope marginem anastomosantibus, inferioribus angulo-acutiore decurrentibus, ideoque lamina subtrinerviis, venulis supra subconspicuis, subtus distinctis; petiolis 1–2.5 cm. longis, teretibus, in sicco substriatis, utrinque dilatatis; floribus axillaribus, dioicis, floribus ♂ 3–6-fasciculatis, pedunculis ad 5 mm. longis, pubescentibus, pedicellis ad

[1]Prepared with partial support of a grant from the Penrose Fund, American Philosophical Society, to Dr. E. D. Merrill to assist him in working up the accumulated collections of Chinese botanical material in the herbarium of the Arnold Arboretum.

3 mm. longis; sepalis extus adpresse pubescentibus, exterioribus 6 minutis inaequalibus bracteiformibus, ad 1.5 mm. longis, interioribus 3 multo majoribus, circiter 8 mm. longis, in pseudocorollam connatis; petalis 6 minutis late obovatis, haud 1 mm. longis, extus pubescentibus, margine integris; staminibus numerosis, in columnam conicam coalitis, 5 mm. longis, antheris subglobosis, horizontaliter insertis bilocularibus transverse dehiscentibus; floribus ♀ ignotis; fructibus axillaribus subsessilibus 2–6 receptaculo insertis divergentibus ellipsoideis, 2.5–3.3 cm. longis, 1.5–2 cm. latis, haud compressis dense tomentellis, endocarpio haud compresso vel leviter latere compresso, leviter scabrido vel levi, exocarpio carnoso, 2–4 mm. crasso, condylis in seminis cavitate nullis, seminibus circiter 2 cm. longis et 1 cm. latis, haud compressis, cotyledonibus subaequalibus, albumine nullo; stylis in fructibus junioribus a basi notatis, filiformibus; pedunculis fructigeris 1–1.5 cm. longis, pubescentibus.

HAINAN: Hung Mo Shan and vicinity, *Tsang & Fung 691 = LU 18225,* Aug. 12, 1929, 6 m. high, on mountain tops, in forests; Mo San Leng, *N. K. Chun & C. L. Tso 44315,* Nov. 1932, a woody vine, alt. 3000 ft.; Ch'ang-kiang District, Ka Chik Shan and vicinity, *S. K. Lau 1618,* April 24, 1933, *2937,* Dec. 23, 1933, a woody climber, rare, on dry cliffs and gentle slopes, in thickets or forests; without exact locality, *H. Y. Liang 36737,* Oct. 23, 1933, *64748,* Jan. 17, 1934, a scandent shrub, open shrubbery or in light woods, twining on trees; Yaichow, *F. C. How 71040,* March–July, 1933, *H. Y. Liang 62145,* July 18, 1933, *62790,* Aug. 23, 1933, scandent, twining on trees and shrubs, in shade of mixed forests; Po-ting, *F. C. How 71852,* April 12, 1935, *72792,* June 9, 1935, *73303* (TYPE), July 25, 1935, *73721,* Sept. 25, *S. K. Lau 28279,* Nov. 30, 1936, twining, in forested ravines, alt. 750–1600 ft.; Bak Sa, *S. K. Lau 26331,* April 19, 1936, scandent, in dense woods; Loktung, *S. K. Lau 27254,* June 25, 1936, scandent, 6 m. high, in dense woods.

The genus *Albertisia,* with its single species *A. papuana* Becc. and its two varieties, was previously known only from New Guinea and the Malay Peninsula. This new species considerably extends the range of the genus and is apparently of wide and not too rare occurrence in Hainan. Among the specimens enumerated, *How 71852* and *Lau 1618* and *26331* are male plants in flower, while the rest are all female plants with fruits of varying stages of development. No female flowers are yet available. The Hainan plants agree closely with the characters of the genus except that in the male flowers there are six petals, more or less broadly ovate, entire-margined, and pubescent without; while in the type species of the genus there are only three petals, triangular in shape, glabrous and with crenate-lobulate margins. Only one New Guinean collection is available for comparison, and that has fruits and female flowers only. It agrees closely with the Hainan plants in general habit and other characters, and it is safe to conclude that the two species are congeneric.

In the shape and venation of the leaves, the Hainan plants manifestly resemble the Papuan species, except that in the former the leaves are much smaller, and the acumen of the leaves and the petioles are shorter. In addition to the characters mentioned above, *A. papuana* differs from the Hainan species in the fruits as well as the seeds being generally larger, more laterally compressed, the endocarps being thicker, and the cotyledons more unequal.

This new species is dedicated to Dr. L. M. Perry, who has painstakingly

helped the author to dissect and study the plant thoroughly and to compare it with the Papuan material and previously published data.

ROSACEAE

Photinia Lindley

Photinia Benthamiana Hance var. **obovata** var. nov.

A typo speciei recedit foliis plus minusve oblongo-obovatis, 6–8 cm. longis, 3–4 cm. latis, late acutis vel subrotundatis, floribus plus minusve confertis.

HAINAN: Ling Shui, *F. C. How 73904* (TYPE), Oct. 20, 1935, a tree 12 m. high, in thickets, alt. 3000 ft.

MELIACEAE

Lansium Jack

Lansium dubium Merr. Govt. Lab. Publ. [Philip.] 17: 23. 1904.

HAINAN: Bak Sa, *S. K. Lau 25411,* Feb. 23, 1936, a shrub along streams, fruits yellow, *25472,* Feb. 27, 1936, a tree in woods, fruits reddish yellow. Philippine Islands.

The genus *Lansium* has previously been unrecorded from China. These Hainan specimens are in fruit and they closely match specimens representing *Lansium dubium* Merr., a species of fairly wide distribution in the Philippines, especially with regard to the leaflets with the fine reticulations distinct on both surfaces. The Hainan plants have fruits somewhat ovoid in shape, while those of the Philippine specimens are more or less globose.

STERCULIACEAE

Reevesia Lindley

Reevesia lancifolia sp. nov.

Arbor 10–12 m. alta, ramulis junioribus inflorescentiisque leviter stellato-pubescentibus, ramis glabris teretibus; foliis chartaceis utrinque glabris concoloribusque, pallidis nitidis, oblongo-lanceolatis, 8–12 cm. longis, 1.5–2.5 cm. latis, longe acuminatis, basi acutis, margine integris, costa supra impressa subtus elevata, nervis lateralibus utrinsecus 6 vel 7, gracilibus, utrinque subconspicuis, prope marginem arcuato-anastomosantibus, venis tertiariis inconspicuis; petiolo 1–2.5 cm. longo, glabro; cymis terminalibus, consperse breviter stellato-pubescentibus, multifloris, haud pedunculatis, floribus inclusis usque ad 7 cm. longis, pedicellis 6–8 mm. longis; calycis tubo extus consperse breviter stellato-pubescente, 5–6 mm. longo, circiter 4 mm. diametro, lobis oblongo-ovatis acutis 1 mm. longis; petalis ignotis; androgynophoro glabro circiter 2.5 cm. longo, ovario glabro; fructibus longe pedicellatis lignosis, 3.5–4 cm. longis, 2.4–2.8 cm. latis, obovoideo-oblongis, 5-lobatis, apice rotundatis depressis, basi acutis, extus griseo-furfuraceis; pedicellis 2–2.5 cm. longis; seminibus circiter 2.6 cm. longis, alis brunneis circiter 2 cm. longis, basim versus 0.7 cm. latis, oblongis, apice valde obtusis.

HAINAN: Fan Yah, *N. K. Chun & C. L. Tso 44052,* in 1932–33, a tree 10 m. high, in forests; no precise locality, *H. Y. Liang 64955* (TYPE), Feb. 19, 1934, a tree 12 m. high, in forests on mountain slopes, fruit green.

A species allied to *R. thyrsoidea* Lindl., differing chiefly in the much narrower lanceolate leaves.

THEACEAE

Tutcheria Dunn

Tutcheria ovalifolia sp. nov.

Arbor 10 m. alta, ramis ramulisque glabris; foliis coriaceis, apice ramulorum confertis, oblongo-obovatis vel obovatis, 3.5–4.5 cm. longis, 1.8–3 cm. latis, rotundatis vel subrotundatis, basi cuneatis, margine deorsum integris vel subintegris, sursum incurvato-serratis, utrinque glabris, in sicco luteo-olivaceis utrinque subconcoloribus, supra subnitidis, nervis lateralibus utrinsecus 6–10 gracilibus supra subconspicuis, subtus distinctis; petiolis crassis, 2–3 mm. longis; floribus ignotis; capsulis solitariis, obovoideis, breviter (2 mm.) pedicellatis, 3-locularibus, 10 mm. longis, 6 mm. latis, adpresse pubescentibus vel glabris, leviter triangularibus, loculicide dehiscentibus, apice subacutis, stylis persistentibus, brevibus; seminibus subellipticis, plano-convexis, 4–5 mm. longis, 2 mm. latis.

HAINAN: Po-ting, *S. K. Lau 28218* (TYPE), Nov. 16, 1936, a tree 10 m. high, in forests.

This species is characterized by the relatively small obovate rounded leaves, which are more or less densely arranged at the tips of the branches. It is probably near *Tutcheria symplocifolia* Merr. & Metcalf, but it may be distinguished by the smaller, densely crowded, rounded leaves and by its somewhat different fruits, which are, unfortunately, not quite mature.

BEGONIACEAE

Begonia Linnaeus

Begonia peltatifolia sp. nov. § *Diploclinium*.

Herba acaulis glabra erecta ad 30 cm. alta, rhizomate circiter 6 mm. crasso; foliis chartaceis, longe petiolatis, latissime peltatis, leviter inaequilateraliter ovatis, 10–11 cm. longis, 7.5–8 cm. latis, basi latissime rotundatis, apice abrupte brevissime acuminatis, margine integris, 10–12-nerviis, nervis primariis supra leviter subconspicuis, subtus subconspicuis, reticulis laxis obscuris; petiolo circiter 18 cm. longo; caulibus floriferis efoliatis, 20 cm. longis; infructescentiis cymosis, longe pedunculatis, folia aequantibus vel quam eis longioribus, ramis longioribus ad 6.5 cm. longis, pedicellis 1–2.5 cm. longis, capsulis inaequaliter 3-alatis, circiter 1.6 cm. longis et 2.3 cm. latis, apice truncatis, basi subrotundatis, glabris, alis majoribus 1.5 cm. latis, apice subrotundatis, minoribus 8 mm. latis, rotundatis.

HAINAN: Bak Sa, *S. K. Lau 27552* (TYPE), July 20, 1936, an herb in dense woods, fruit pale brown.

A very distinct species, characterized by its totally glabrous habit and especially by its entire, only slightly inequilateral, broadly peltate leaves.

STYRACACEAE

Styrax Linnaeus

Styrax suberifolius Hook. & Arn. Bot. Beechey Voy. 196. *t. 40*. 1841.

HAINAN: Kumyun, *S. K. Lau 27607*, Aug. 3, 1936, a tree 7 m. high, in dense woods on slopes. Kwangtung to Yunnan; new to Hainan.

SYMPLOCACEAE

Symplocos Jacquin

Symplocos punctato-marginata A. Chev. ex Guillaum., Bull. Soc. Bot. France 79: 174. 1932, Lecomte, Fl. Gén. Indo-Chine 3: 1004. 1933; Merr. Lingnan Sci. Jour. 15: 424. 1936.

HAINAN: Yaichow, *H. Y. Liang 62253,* July 23, 1933, a tree 15 m. or more high, in forested ravines, in dense shade, flowers yellow; Po-ting, *F. C. How 72873,* June 12, 1935, a tree 10 m. high, alt. 2800 ft., flowers greenish white, fragrant. Indo-China, also recorded from Kwangtung proper; new to Hainan.

Symplocos hainanensis Merrill & Chun in herb. sp. nov. Subgen. *Hopea,* § *Bobua, Plura.*

Arbor 10–15 m. alta, ramis ramulisque glabris teretibus, atro-brunneis; foliis chartaceis distincte petiolatis glabris oblongo-ellipticis, 8–11 cm. longis, 2.5–4 cm. latis, acuminatis, basi cuneatis, margine crenato-serrulatis, supra nitidis viridibus, subtus pallide viridibus, costa supra leviter impressa subtus valde elevata, nervis lateralibus utrinsecus 7–10 arcuato-anastomosantibus, nervis venulisque utrinque perspicuis; petiolis 0.5–1 cm. longis glabris; inflorescentiis spicatis axillaribus gracilibus, ad 6 cm. longis, junioribus parce pubescentibus, mox glabrescentibus, multifloris; floribus sessilibus vel subsessilibus, bracteis minutis, late ovatis, circiter 1 mm. longis, parce pubescentibus; calycis tubo valde crasso, 1 mm. longo, glabro, lobis 4 vel 5 oblongis, 2 mm. longis, glabris; petalis 4 vel 5 albis ovatis, 4 mm. longis, glabris; staminibus circiter 25–30, filamentis gracilibus glabris, 3–5 mm. longis; ovario 3-loculari; disco annulari glabro; stylo 5 mm. longo, glabro, stigmate capitato; fructibus oblongis, ad 1.5 cm. longis et 0.5 cm. latis, glabris sessilibus vel breviter pedicellatis, pedicellis ad 2 mm. longis, calyce persistente.

HAINAN: Po-ting, *F. C. How 73130* (TYPE), July 8, 1935, a tree 12 m. high, in forested ravines, alt. 1500 ft., flowers white, slightly fragrant, *73264,* July 20, 1935, a tree 15 m. high, in forested ravines, alt. 1400 ft., fruit pale green, *73424,* no field notes available; Ling Shui, *F. C. How 73764,* Oct. 10, 1935, a tree 10 m. high, in forests, alt. 1800 ft., flowers white, fruit pale green.

This species is probably nearest *Symplocos lancifolia* Sieb. & Zucc., from which it may be distinguished by being glabrous except for the inflorescences, by the broader leaves, the more slender inflorescences, the white petals, and the oblong, much larger fruits.

Symplocos stenophylla Merrill & Chun in herb. sp. nov. Subgen. *Hopea,* § *Bobua, Plura.*

Frutex 2 m. altus, ramis brunneis teretibus, ramulis novellis glabris fulvis plus minusve angularibus; foliis chartaceis vel subcoriaceis subsessilibus vel breviter petiolatis glabris lanceolatis, 8–10 cm. longis, 1.2–1.5 cm. latis, longe acuminatis, basi valde attenuatis, margine serrulatis leviter revolutis, supra viridibus, subtus pallide viridibus, costa supra leviter impressa subtus elevata, nervis lateralibus utrinsecus 5–7 arcuato-adscendentibus prope marginem anastomosantibus, nervis venulisque gracilibus utrinque perspicuis; petiolis ad 5 mm. longis glabris; inflorescentiis spicatis simplicibus axillaribus parce pubescentibus vel glabrescentibus, 6–8 cm. longis, multifloris; floribus sessilibus, bracteis late ovatis, 1 mm. longis, pubescentibus; calycis tubo crasso 5-lobato glabro, lobis late ovatis, 1 mm. longis; petalis

5 oblongis, 5 mm. longis, 3 mm. latis, glabris; staminibus circiter 40, filamentis gracilibus glabris 5–6 mm. longis; ovario 3-loculari; disco annulari glabro; stylo 6 mm. longo glabro, stigmate capitato; fructibus plus minusve conicis, circiter 4 mm. diametro, glabris sessilibus, calyce persistente.

HAINAN: Lokwui, *F. C. How 72325* (TYPE), May 13, 1935, a shrub 2 m. high, on river banks, flowers white; Po-ting, *F. C. How 73675*, Sept. 15, 1935, a shrub 2 m. high, along streams, alt. 1200 ft., fruit pale green.

A species well characterized by its lanceolate leaves, long spicate inflorescences, and somewhat conical fruits. It is probably most closely related to *Symplocos laurina* Wall.

Symplocos Howii Merrill & Chun in herb. sp. nov. Subgen. *Hopea*, § *Bobua, Lodhra.*

Arbor circiter 18 m. alta, ramis teretibus fulvo-nigris, ramulis novellis glabris fulvis plus minusve angularibus; foliis subcoriaceis glabris distincte petiolatis oblongo- vel lanceolato-ellipticis, 7–11 cm. longis, 2–3 cm. latis, longe acuminatis, basi cuneatis, margine integris vel remote serrulatis, supra viridibus nitidis, subtus pallide viridibus, costa utrinque elevata, nervis lateralibus gracilibus utrinsecus 5 vel 6 adscendentibus anastomosantibus utrinque perspicuis, venulis reticulatis utrinque subconspicuis; petiolis circiter 1 cm. longis glabris; inflorescentiis ignotis; infructescentiis axillaribus spicatis, pedunculis circiter 1 cm. longis, minute pubescentibus vel glabris, 2–4-fructigeris; fructibus sessilibus vel subsessilibus ovoideis, 0.8–1 cm. longis, 0.6–0.8 cm. latis, glabris nitidis 3-locularibus; bracteis late ovatis, 1.5–2 mm. longis, calyce persistente.

HAINAN: Po-ting, *F. C. How 73286* (TYPE), July 23, 1935, a tree 18 m. high, in forests, alt. 1800 ft., fruit lustrous green, *73346*, no field notes available.

This species is very near *Symplocos setchuensis* Brand, differing in the leaves being narrower and sometimes serrulate, and in the infructescences being distinctly pedunculate.

Symplocos permicophylla Merrill & Chun in herb. sp. nov. Subgen. *Hopea*, § *Bobua, Lodhra.*

Frutex 2 m. altus, ramis teretibus gracilibus brunneo-nigris, ramulis novellis dense brunneo-pubescentibus; foliis perparvis coriaceis breviter petiolatis oblongo-ovatis, 1.5–2.5 cm. longis. 0.5–1 cm. latis, acuminatis, basi valde attenuatis, margine distincte glanduloso-serratis, utrinque glabris, supra viridibus subnitidis, subtus pallide viridibus, costa supra leviter impressa subtus elevata, venis venulisque utrinque obscuris; petiolis 2–3 mm. longis glabris interdum glandulosis; floribus axillaribus plerumque solitariis raro binis sessilibus vel subsessilibus, in ramulis hornotinis ortis, bracteis ovatis, 1.5 mm. longis, brunneo-pubescentibus; calycis tubo valde crasso, circiter 1 mm. longo, dense brunneo-pubescente, lobis 5 oblongis, 1.5 mm. longis, extus parce brunneo-pubescentibus, intus glabris; petalis 5 albis late ovatis rotundatis, 3.5 mm. longis, 2 mm. latis, omnino glabris; staminibus circiter 25–35, filamentis gracilibus glabris circiter 2–3.5 mm. longis, disco annulari indistincto; ovario 3-loculari, stylo 3.5 mm. longo glabro, stigmate capitato; fructibus immaturis oblongis, 6 mm. longis, 2 mm. latis, parce brunneo-pubescentibus, calyce persistente.

HAINAN: Po-ting, *F. C. How 72900*, June 14, 1935, a shrub 2 m. high, in forests, alt. 2400 ft., flowers white, fruit green, pubescent, *72972* (TYPE), June 23, 1935, a shrub 2 m. high, in forests, alt. 2900 ft., flowers white, fruit pale green, with brown pubescence.

A very distinct species, well characterized by its unusually small, coriaceous, sharply glandular-serrate leaves without visible veins and veinlets, and the mostly solitary axillary flowers, produced on the year's new branches.

Symplocos atriolivacea Merrill & Chun in herb. sp. nov. Subgen. *Hopea*, § *Bobua*, *Lodhra*.

Frutex 3–3.5 m. altus, ramis glabris brunneis, ramulis novellis adpresse hirsutis teretibus, brunneis; foliis chartaceis vel submembranaceis breviter petiolatis, in sicco atro-olivaceis utrinque subconcoloribus, in vivo e collectore supra atro-viridibus, subtus viridibus nitidis, oblongo-ovatis, 12–16 cm. longis, 3.5–5.5 cm. latis, acuminatis, basi late acutis, margine indistincte serrulatis, costa supra leviter impressa subtus valde elevata, venis lateralibus gracilibus utrinsecus 10–12 arcuato-anastomosantibus, nervis venulisque utrinque perspicuis; petiolis valde crassis circiter 5 mm. longis, glabris; inflorescentiis axillaribus fasciculatis subsessilibus vel leviter pedunculatis, 3–7-floris, pedunculis 2–3 mm. longis, pubescentibus; floribus sessilibus; bracteis late ovatis, 1.5 mm. longis, pubescentibus; calycis tubo crasso, 1 mm. longo, pubescente, lobis 5 ovatis, 3 mm. longis, extus pubescentibus, intus glabris; staminibus circiter 20, filamentis 2–3 mm. longis; disco protruso pubescente; ovario 3-loculari, stylo glabro 3 mm. longo, stigmate capitato; fructibus sublageniformibus, 1 cm. longis, 6 mm. crassis, pubescentibus, calyce persistente.

HAINAN: Po-ting, *F. C. How 72938*, June 18, 1935, a shrub 3 m. high, in thickets, alt. 2100 ft., fruit green, tomentose, *73262* (TYPE), July 20, 1935, a shrub 3.5 m. high, along trails near ravines, alt. 1300 ft., flowers white, fruit green.

In the olivaceous leaves, the densely pubescent, very short, and spicate inflorescences, and the prominent disk, this species is close to *Symplocos olivacea* Merr. of Tonkin, Indo-China. The two species, which evidently belong to the section *Bobua*, are rather unusual in having the leaves becoming strictly olivaceous when dry, in this character resembling species of the section *Cordyobaste* rather than *Bobua*. This new species can be distinguished from *S. olivacea* Merr. in the thinner, much larger, and more olivaceous leaves and the fewer stamens.

OLEACEAE

Olea Linnaeus

Olea neriifolia sp. nov.

Planta omnino glabra, ramis ramulisque cinereis, parce inconspicue lenticellatis; foliis chartaceis petiolatis lanceolatis, 5–8 cm. longis, 0.8–1 cm. latis, acuminatis, basi longe attenuatis, margine integris leviter revolutis, in sicco olivaceis utrinque concoloribus, costa supra leviter impressa subtus elevata, venis venulisque utrinque obscuris; petiolo crasso, circiter 5 mm. longo; inflorescentiis paniculatis axillaribus, circiter 3.2 cm. longis et 1.6 cm. latis; floribus minutis, pedicellis 1 mm. longis; calycibus 0.5 mm. altis, ad medium 4-lobatis, lobis ovatis acutis submembranaceis; corolla 1.5 mm. longa, ad ⅓ lobata, lobis acutis; antheris vix 1 mm. longis; ovario ovoideo, stylo brevi, stigmate inconspicuo.

HAINAN: No field data, *S. K. Lau 28388* (TYPE), in 1936.

A species resembling *O. cuspidata* Wall. but differing in the more lanceo-

late leaves, which are concolorous on both surfaces, as well as in its smaller flowers.

Olea hainanensis sp. nov.

Frutex 3–9 m. altus inflorescentiis exceptis glaber, ramis pallidis, ramulis plerumque brunneis pallide tessellatis; foliis chartaceis petiolatis ovato-oblongis, 10–15.5 cm. longis, 3–5 cm. latis, acuminatis, basi cuneatis, margine remote serratis vel subintegris, in sicco supra olivaceis subtus paullo pallidioribus, costa supra leviter impressa subtus elevata, venis lateralibus utrinsecus 7–9, utrinque subconspicuis, venis tertiariis supra obscuris subtus leviter impressis; petiolo crasso canaliculato ad 1 cm. longo; inflorescentiis paniculatis axillaribus, ad 5 cm. longis et 3 cm. latis, parce pubescentibus vel subglabris; floribus minutis, pedicellis 1 mm. longis; calycibus 0.75 mm. altis, ad medium lobatis, lobis triangularibus, subacutis, margine leviter ciliatis; corolla 1.5 cm. longa, ad ⅓ lobata, lobis rotundatis; antheris ad 1 mm. longis; ovario rudimentario; floribus perfectis ignotis.

HAINAN: Ling Shui, *F. C. How 73749* (TYPE), Oct. 7, 1935, a tree 9 m. high, in forests, alt. 1700 ft., flowers greenish; Po-ting, *F. C. How 73762,* Oct. 10, 1935, a large shrub 4 m. high, in forests, alt. 1700 ft., flowers greenish, *S. K. Lau 27977,* Oct. 14, 1936, *28108,* Oct. 27, 1936, a shrub 3–4 m. high, in dense woods, flowers pale green.

This species is very close to *O. dentata* Wall., of India, differing in the much shorter inflorescences and smaller flowers.

RUBIACEAE

Gardenia Ellis

Gardenia angkorensis Pitard in Lecomte, Fl. Gén. Indo-Chine 3: 252. 1923.

HAINAN: Kumyun, *S. K. Lau 27656,* Aug. 11, 1936, a shrub 3 m. high, in dense forests, on slopes, fruit green; Yaichow, *H. Y. Liang 63049,* Sept. 13, 1933, a shrub 2 m. high, in shady forests in ravines, fruit green. Indo-China. New to Hainan.

The occurrence of a plant from the southern part of Indo-China in Hainan is noteworthy. Pitard separates the Indo-Chinese plants originally referred by Pierre to a single species, *Gardenia cambodiana* Pierre, according to his manuscript names, into two species, *G. cambodiana* Pierre and *G. angkorensis* Pitard. The differences are that in *Gardenia cambodiana* the sepals are more or less foliaceous and the leaves slightly larger. Only one flowering specimen of *G. cambodiana* is available for study. The Hainan plants closely match the description of *G. angkorensis.* Both the Indo-Chinese and Hainan plants give indications of growing in a somewhat xerophytic habitat, this being revealed by their general appearance. I am not entirely certain that two species should be maintained here as Pitard has proposed.

Psychotria Linnaeus

Psychotria hainanensis sp. nov.

Suffrutex erectus circiter 1 m. altus, omnino glaber, ramulis ultimis circiter 2 mm. diametro; foliis subchartaceis oblongo-ellipticis, 8–14.5 cm. longis, 3.5–6 cm. latis, acuminatis, basi attenuatis, margine integris, supra viridibus, subtus pallidioribus, nervis lateralibus utrinsecus 8–14 adscendentibus prope marginem arcuatis utrinque conspicuis, venulis obscuris; petiolis 1–2 cm. longis; stipulis triangularibus, 8 mm. longis, 5 mm. latis,

apice longe acuminatis, caducis; floribus ignotis; infructescentiis terminalibus sessilibus 2-fructigeris, bracteis lineari-lanceolatis, circiter 7 mm. longis, acuminatis; fructibus glabris pedicellatis ovoideis, circiter 9 mm. longis et 7 mm. crassis, haud sulcatis, calycis lobis lineari-lanceolatis 1.5 mm. longis persistentibus coronatis; pedicellis 4 mm. longis; seminibus plano-convexis haud sulcatis, albumine aequabili.

HAINAN: Po-ting, *F. C. How 73609* (TYPE), Sept. 3, 1935, 1 m. high, in forests on summits of mountains, alt. 3800 ft., fruit green.

Lasianthus Jack

Lasianthus Chevalieri Pitard in Lecomte, Fl. Gén. Indo-Chine 3: 384. *f. 30, 6.* 1924; Merr. Jour. Arnold Arb. 21: 386. 1940.

HAINAN: Kan-en District, Chim Fung Mt., near Fong Ngau Po Village, *S. K. Lau 5221,* Jan. 2–31, 1935, 3 m. high, fairly common, on dry steep slopes, in forests, fruit yellow. Indo-China. New to Hainan.

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THE COMPARATIVE MORPHOLOGY OF THE WINTERACEAE
IV. ANATOMY OF THE NODE AND VASCULARIZATION OF THE LEAF

I. W. Bailey and Charlotte G. Nast

With three plates

NODAL ANATOMY

There are three basically different types of foliar nodal anatomy in the dicotyledons (Sinnott, 5), viz. unilacunar, trilacunar, and multilacunar. In the primitive trilacunar type, the strands or bundles of foliar vascular tissue are related at the node to three separate and distinct lacunae or interfascicular parts of the hypothetical, cauline, primary vascular cylinder.[1] In the derived unilacunar type, the strand or strands are related to a single "median" lacuna, whereas in the multilacunar one, the strands or bundles of foliar vascular tissue are related to five, seven, or more lacunae.

The nodal anatomy may be constant throughout a family or it may fluctuate in various ways within it. Many families exhibit a mixture of unilacunar and trilacunar nodes or of trilacunar and multilacunar ones, but comparatively few families have the entire range of all three types of nodes. This is due to the fact that most heterogeneous families show a trend of specialization either of reduction from trilacunar to unilacunar or of amplification from trilacunar to multilacunar. These lines of specialization in the nodal anatomy of dicotyledons are not infrequently closely correlated with specializations in other parts of the plants (Bailey and Howard, 1–4), and therefore they are of considerable significance in any discussion concerning natural subdivisions of families.

The nodal anatomy of the Winteraceae is remarkably stereotyped and constant throughout the family. Three foliar bundles are related, *Figs. 1* and *2*, to three lacunae in the vascular cylinder of the stem, i.e. the node is trilacunar in all representatives of the family. The nodal pattern is constant regardless of extreme variations in the size of the leaf, the length and diameter of the petiole, and the character of the lamina. Leaves of *Drimys microphylla* A. C. Sm. and *D. buxifolia* Ridley, a centimeter or less in length, have a similar nodal structure to those of *Bubbia longifolia* A. C. Sm., which may attain a length of 35 centimeters or more. This is particularly significant, since in other dicotyledons extreme reduction in the

[1]Recent investigations in palaeobotany and in the study of the ontogeny and comparative anatomy of the vascular plants render essential revaluations and modifications of various established morphological concepts and concomitant revisions and clarifications of terminologies. Owing to existing contradictions and uncertainties in botanical literature, we shall avoid the use of such terms as dictyostele, trace, gap, etc.

size of the leaf not infrequently leads to a reduction of trilacunar nodes to unilacunar ones, just as excessive enlargement of the leaf may lead to an amplification of trilacunar nodes to pentalacunar or multilacunar ones.

VASCULARIZATION OF THE LEAF

Although the nodal anatomy of the Winteraceae is highly stereotyped and stable, the vascularization of the petiole and lamina of the leaf is variable and rather unstable. Simpler types of foliar vascularization tend to occur in most species of *Drimys* and *Pseudowintera*, complex and more highly specialized ones in certain species of *Bubbia*, *Belliolum*, and particularly of *Exospermum* and *Zygogynum*. In the simpler type of vascularization, the three strands of vascular tissue extend outward[2] through the petiole and for varying distances into the lamina of the leaf, *Figs. 2*, *4*, and *5*. Sooner or later the lateral ones either diverge laterally or become fused to the median one, which extends outward to the tip of the leaf, *Fig. 6*. In the lower parts of the lamina, the subsidiary veins are detached from the flanks of the lateral strands, *Fig. 4*, whereas in the upper parts of the lamina they branch off from the flanks of the single arc-shaped bundle, *Fig. 6*. In *Drimys* and *Pseudowintera*, there appear to be two trends of specialization of this basic pattern of vascularization. One or more of the strands may divide in the base of the petiole. Such petioles contain 4, 5, or 6 bundles, *Fig. 3*, and in exceptional cases as many as 9 bundles, *Fig. 10*. These bundles may reunite at the base of the lamina, restoring the original number of 3, *Fig. 9*, or they may extend outward for varying distances into the lamina. A second trend of specialization consists of a precocious fusing of the strands to form a more or less conspicuously 3-lobed, arc-shaped bundle, *Fig. 7*, which arises at various levels of the petiole or of the base of the lamina. In certain cases, both types of specialization occur simultaneously, the numerous bundles in the lower part of the petiole fusing to form a more or less continuous arc-shaped strand, *Fig. 8*, in their outward course. The individual bundles vary considerably in size, form, and the amount of cambial activity that occurs within them. The three original strands usually are of comparatively uniform sizes, *Fig. 1*, but the products of their divisions may exhibit markedly different dimensions, *Figs. 3* and *10*. The individual bundles may be broad (tangentially) and shallow (radially), *Fig. 8*, or narrow and deep (due to greater cambial activity), *Fig. 9*.

Although there are a number of distinct patterns of foliar vascularization in *Drimys* and *Pseudowintera*, specific patterns are not stabilized in most cases within species or varieties. Not only do the types of vascularization fluctuate more or less extensively in different collections of the same species or variety, but also in different leaves from the same plant. In the case of the New World (*Wintera*) section of *Drimys*, which we have studied in considerable detail, the range of variability appears to be greater in *Drimys Winteri* varieties *punctata* (Lam.) DC. and *chilensis* (DC.) A. Gray and

[2]The terminology used is purely descriptive and bears no implications regarding sequences in ontogenetic development, viz. inward or outward development of procambium, xylem, and phloem.

D. granadensis var. *grandiflora* Hieron. than in *D. confertifolia* Phil., *D. Winteri* var. *andina* Reiche, and *D. granadensis* varieties *chiriquiensis* A. C. Sm. and *mexicana* (DC.) A. C. Sm. All of the previously described patterns of foliar vascularization are encountered in leaves from different collections of the first three plants, whereas the more complex types of vascularization have not been found in leaves of the last four. It may be significant, in this connection, that the leaves of the former plants commonly are larger or broader than those of the latter. That the type of vascularization is not determined directly and invariably by the size of the leaf is evidenced, however, by the fact that large leaves may at times have simpler patterns and small leaves complex ones. The length and form of the petiole in relation to the size and form of the lamina are evidently complicating factors in need of future detailed investigation.

In *Drimys* and *Pseudowintera*, division of the three strands to form more than six bundles in the petiole and the base of the lamina is of exceptional occurrence, being confined in the material that we have studied to leaves from certain collections of *Drimys Winteri* varieties *chilensis* and *punctata* and *D. granadensis* var. *grandiflora*. In these specimens there are 7–9 small bundles in the petiole, *Fig. 10*, which frequently tend to become more or less coherent in the basal part of the lamina, *Fig. 8*. The bundles have a normal abaxial orientation of phloem and are arranged in a single symmetrical arc. The tendency for the three strands to form five or more bundles in the petiole is intensified in *Belliolum*, *Bubbia*, *Exospermum*, and *Zygogynum*, and the bundles tend to maintain their individuality in the basal parts of the lamina, i.e. the bundles do not fuse into a more or less coherent arc of vascular tissue, except in certain species of *Bubbia*, e.g. *B. pachyantha* A. C. Sm. (*Brass 4371*).

In *Belliolum*, the more or less numerous bundles of the petiole and midrib, *Fig. 12*, are of normal form and orientation except that the median bundle may at times be conspicuously offset abaxially from a normal position in the arc of bundles, compare *Figs. 10* and *12*. Similar types of vascularization occur in *Bubbia*, but in certain cases three bundles are offset abaxially, *Fig. 14*. The xylem of the offset bundles commonly tends to assume an adaxially indented form as seen in transverse sections. Three of the bundles are offset in the petioles and midrib of *Exospermum Lecarti* v. Tiegh., *Fig. 15*. The median one commonly exhibits an amphicribral form, *Fig. 17*, whereas the xylem of the two lateral ones is indented or horseshoe-shaped. The numerous bundles of the slightly concave arc are of varied forms and orientations. The bundles in the petioles and midrib of *E. stipitatum* (Baill.) v. Tiegh., *Fig. 11*, tend to be associated in pairs that are jacketed in the lamina by sclerenchyma. As shown in *Fig. 13*, one bundle of each pair has an inverted orientation, i.e. the phloem is situated on the adaxial side of the xylem. Similar aberrant types of bundle structure and bundle orientation occur in *Zygogynum*, *Fig. 16*.

The patterns of foliar vascularization fluctuate in *Belliolum*, *Bubbia*, *Exospermum*, and *Zygogynum*, not only in different species, but also within different leaves of the same species. Furthermore, the specific topographical

features, visible in transverse sections, vary more or less at different levels of the petiole and midrib. The ranges of structural variability within species and genera are more or less extensive and may or may not overlap. In the past, most investigators have overlooked or ignored such factors of variability in attempting to differentiate species and genera of dicotyledons by their petiolar structure. Thus, van Tieghem (8) infers a greater stability of structural patterns in the Winteraceae than actually occurs. He states that there are seven bundles in the petioles of *Drimys, Pseudowintera,*[3] *Belliolum,* and *Bubbia,* three bundles from the median strand and four from the two bifurcating lateral ones. Whereas these bundles have a normal orientation of xylem and phloem, van Tieghem maintains that three of the seven bundles in *Exospermum stipitatum* and *E. Lecarti* have an inverted orientation and are associated in pairs with three normal bundles. Furthermore, according to van Tieghem, there are eight bundles in the petiole of *Zygogynum,* one of which is offset. In *Z. Balansae* v. Tiegh., *Z. bicolor* v. Tiegh., *Z. pomiferum* Baill. and *Z. spathulatum* v. Tiegh., none of these eight bundles divides to form paired bundles, whereas in *Z. Vieillardi* Baill. the offset bundle does so, and in *Z. Bailloni* v. Tiegh. all or several of the upper bundles may do so.

As we have previously shown, there is no such stability in the number and behavior of petiolar bundles in the Winteraceae as hypothesized by van Tieghem. The three foliar strands of *Drimys* and *Pseudowintera* may be unmodified or they may divide to form 4–9 bundles. Furthermore, the three strands or their derivative bundles may fuse to form a single arc-shaped strand. In *Belliolum* and *Bubbia* the petiolar bundles are of variable number and one or more of them may be abaxially offset, as in *Exospermum* and *Zygogynum.* Furthermore, the bundles of the latter genera fluctuate in number, form, and orientation.

Although much more comprehensive collections of the Winteraceae must be studied in detail before attempting to differentiate species and genera upon the basis of their petiolar structure, the available evidence indicates that there are fundamentally significant trends of structural specialization within the family. Two of these trends of specialization are discernible in *Drimys,* leading (1) toward division of the three foliar strands to form more or less numerous derivative bundles, and (2) toward the fusion of bundles to form a single arc-shaped vascular strand. The former trend of specialization is intensified in *Belliolum* and *Bubbia* and attains its climax in *Exospermum* and *Zygogynum,* where the most complex and highly modified types of vascularization occur. It is significant in this connection, however, that although the range of structural variability in the Winteraceae is relatively wide, the vascularization patterns do not overlap or even simulate those that occur in *Illicium, Tetracentron, Trochodendron,* the Magnoliaceae, Schisandraceae, Degeneriaceae, or Himantandraceae.

The size, form, thickness, and texture of the lamina fluctuate markedly in different representatives of the Winteraceae, as does the venation of

[3] *Pseudowintera* Dandy, i.e. *Wintera* sensu v. Tiegh., non Murray.

the leaves. *Figs. 21–23* illustrate the venation patterns of *Drimys granadensis* var. *grandiflora* Hieron. (*Cuatrecasas 6687*), *Bubbia oligocarpa* (Schlecht.) Burtt (*Schlechter 16470*), and *Bubbia pachyantha* A. C. Sm. (*Brass 4371*). The three leaves exhibit such conspicuous differences as to suggest the possibility of differentiating species by characteristic features of their patterns of venation, a problem of much significance to palaeobotanists. The three leaves shown in *Figs. 18–20* are from different collections of the same species, *Drimys piperita* Hook. f. The range of structural variability within this species obviously is nearly as great as that illustrated in *Figs. 21–23*. It is evident, accordingly, that in utilizing the venation of leaves for taxonomic purposes, it is essential to examine numerous collections from different parts of the range of each species, viz. from as different environments as possible.

Through the collaboration of our colleague, Dr. Smith (6, 7), we have had the opportunity of studying numerous identified collections of various representatives of the Winteraceae. It is evident from analyses of this material that the ranges of structural variability differ in different genera, species, and varieties. They may or may not overlap. Thus, the terminal veinlets of the New World (*Wintera*) section of *Drimys* are typically slender, *Fig. 21*. The coarser types of venation, *Figs. 20* and *23*, apparently do not occur in the New World representatives of the Winteraceae. This is significant in view of the diverse environments in which these plants grow in Mexico, Central America, South America, and Juan Fernandez, and indicates that genetic as well as environmental factors must be assessed in studying foliar venation. Less slender types of terminal veinlets are predominant in Old World representatives of the Winteraceae; the coarser types of venation, *Figs. 20* and *23*, having been encountered commonly in *Bubbia* and *Zygogynum* and less frequently in *Belliolum* and the *Tasmannia* section of *Drimys*.

The more conspicuous fluctuations in the diameter of the veins and veinlets, illustrated in *Figs. 18–23*, are determined largely by variations in the amount of sclerenchymatous tissue that jackets the vascular bundles. In the coarser-veined types of leaves, there is a massive development of sclerenchyma about the bundles of the midrib, the veins, and the terminal veinlets. In the slender-veined leaves of the *Wintera* section of *Drimys*, on the contrary, much less sclerenchyma is formed about the bundles of the midrib and veins, and the terminal veinlets commonly are devoid of sclerenchymatous jackets. Among the Old World representatives of the Winteraceae, such veinlets are of infrequent and sporadic occurrence, having been encountered by us only in certain collections of *Drimys insipida*, *D. lanceolata*, *D. piperita*, *D. stipitata*, *Pseudowintera axillaris* var. *colorata*, *Zygogynum pomiferum*, and *Z. spathulatum*.

It should be emphasized, in conclusion, that there is a conspicuous trend of specialization in *Belliolum*, *Bubbia*, *Exospermum*, and *Zygogynum* leading toward intense sclerification of both vegetative and floral organs. The formation of very coarsely veined leaves appears to be a concomitant of this general trend of structural specialization.

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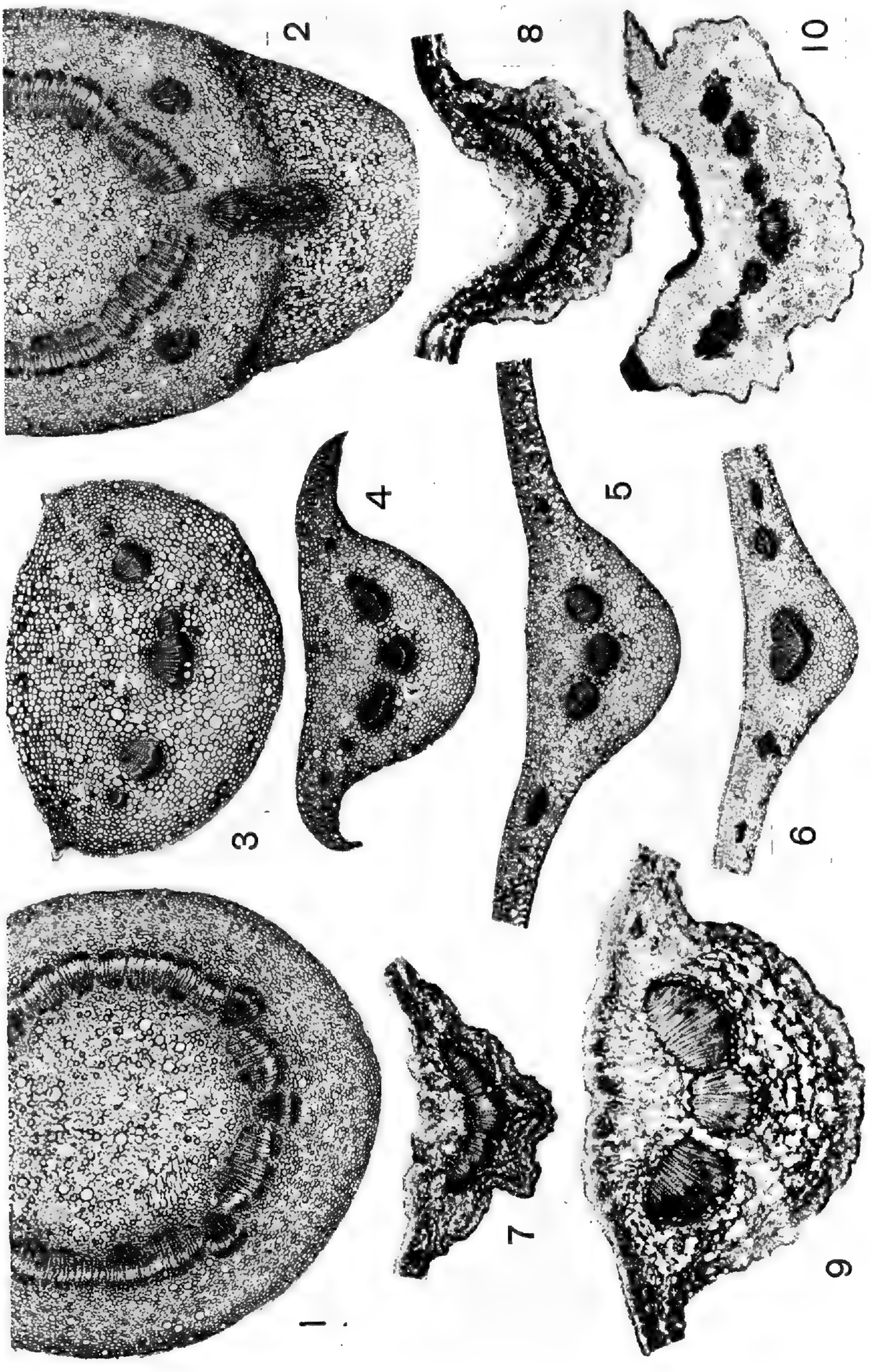
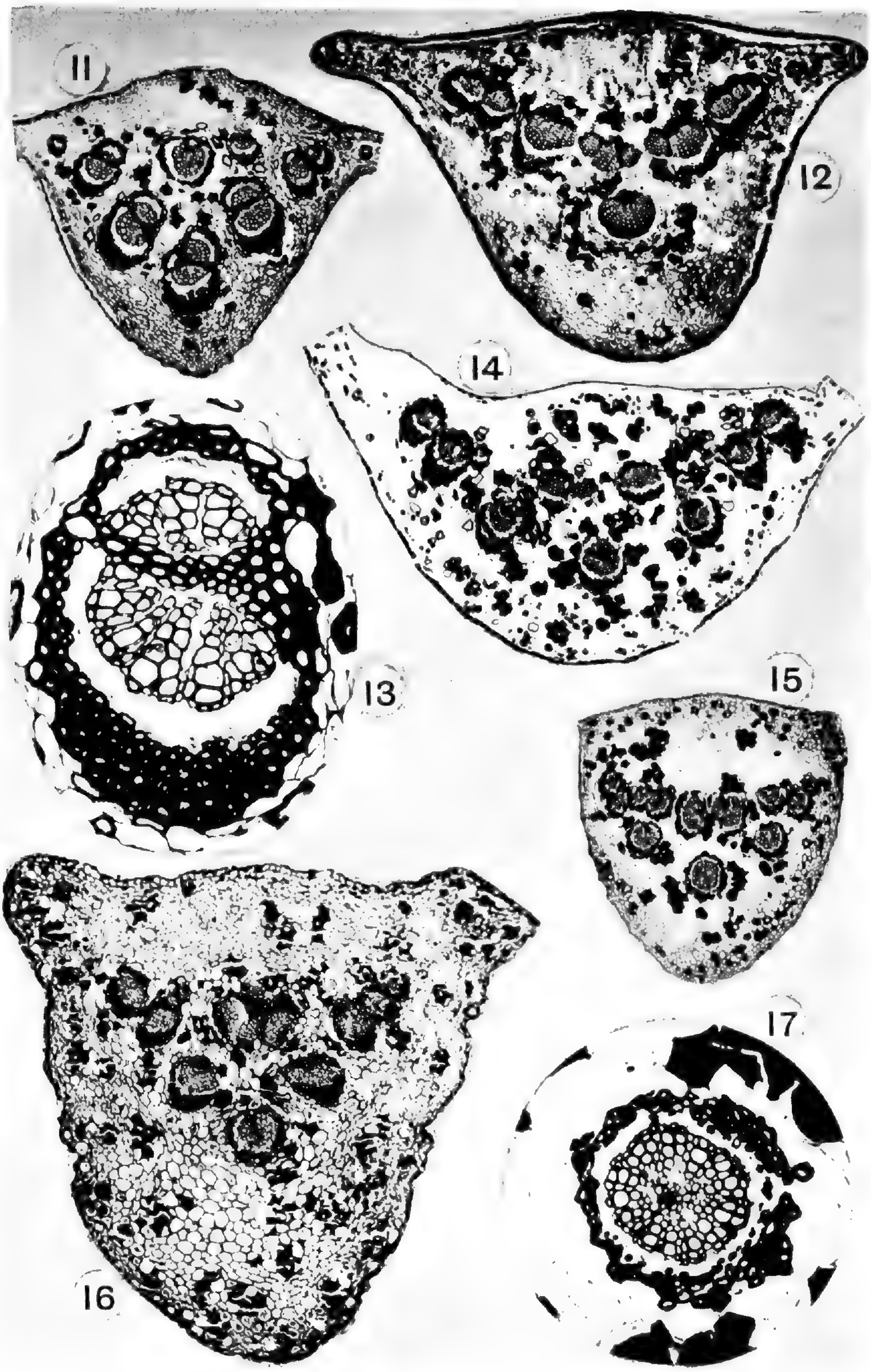
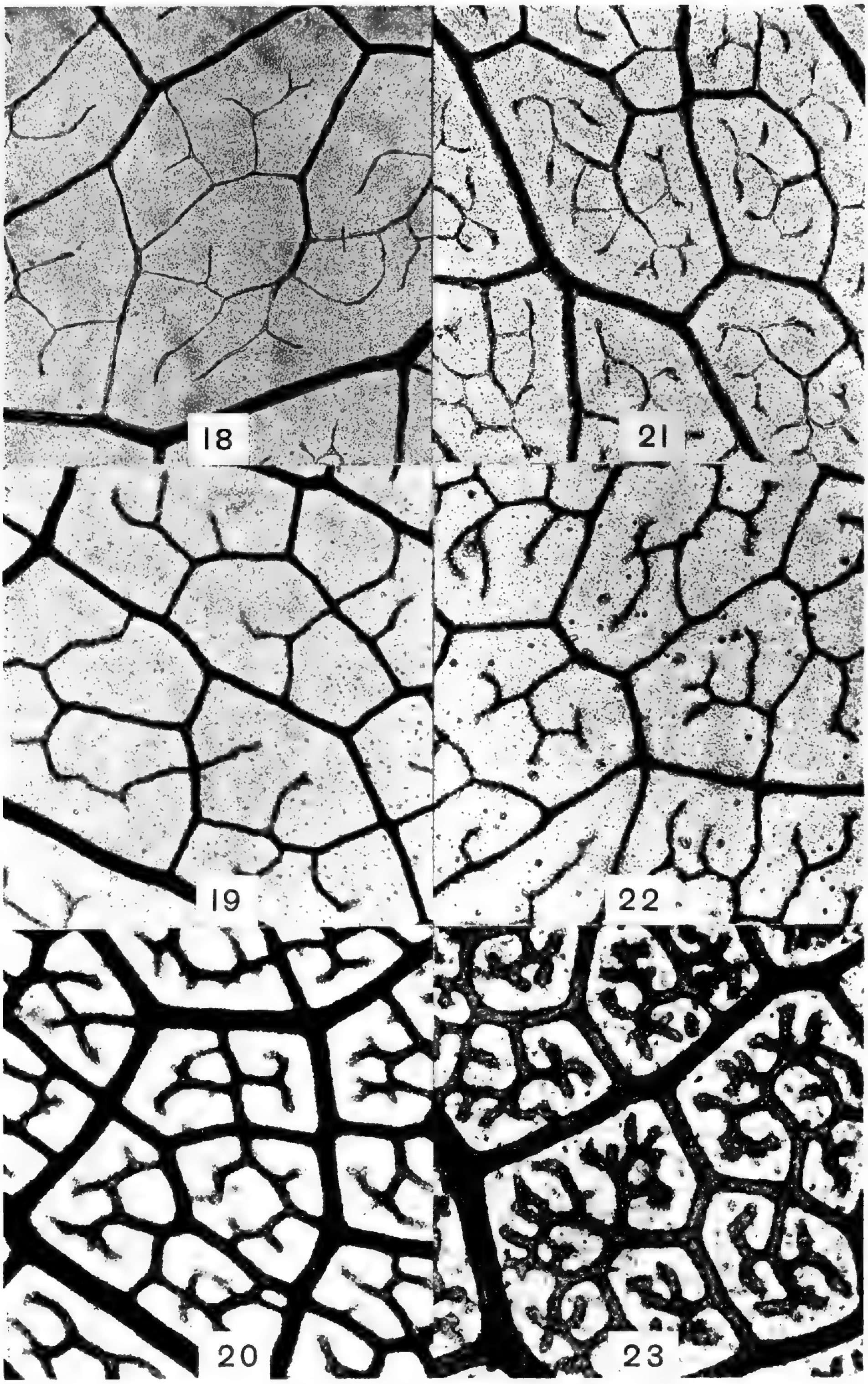


COMPARATIVE MORPHOLOGY OF THE WINTERACEAE



COMPARATIVE MORPHOLOGY OF THE WINTERACEAE



COMPARATIVE MORPHOLOGY OF THE WINTERACEAE

EXPLANATION OF PLATES

PLATE I

Figures 1–6 from greenhouse-grown material, fixed in chromo-acetic, embedded in celloidin, and stained with Haidenhain's haematoxylin and safranin. Figures 7–10 from herbarium material soaked in hot water and mounted in diaphane without embedding or staining. All × 16.

FIG. 1. *Drimys Winteri* J. R. & G. Forst., *H. U. 17321.* Transverse section of the node, showing three foliar strands at level of departure from stele. FIG. 2. *The same.* At a slightly higher level. FIG. 3. *The same.* Transverse section of the petiole, showing six bundles of unequal sizes. FIG. 4. *The same.* Transverse section at the base of lamina showing three conspicuous bundles of the midrib and diverging veins. FIG. 5. *The same.* Transverse section of the central part of the lamina, showing three conspicuous bundles. FIG. 6. *The same.* Transverse section of the apical part of the lamina, showing single bundle in the midrib. FIG. 7. *Drimys Winteri* var. *chilensis* (DC.) A. Gray, *Muñoz B117.* Transverse section at the base of the lamina, showing arc-shaped bundle. FIG. 8. *Drimys granadensis* var. *grandiflora* Hieron., *Triana s.n.* Transverse section at the base of the lamina, showing arc-shaped bundle. FIG. 9. *Drimys Winteri* var. *chilensis, Pennell 12605.* Transverse section at base of the lamina, showing three bundles. FIG. 10. *Drimys granadensis* var. *grandiflora, Holton 673.* Transverse section of petiole, showing numerous bundles.

PLATE II

Figures 11–17 from herbarium material re-expanded in hot dilute NaOH, embedded in paraffin, and stained in Haidenhain's haematoxylin and safranin.

FIG. 11. *Exospermum stipitatum* (Baill.) v. Tiegh., *Vieillard 2281.* Transverse section at base of the lamina, showing numerous bundles of normal and inverted orientation, × 22. FIG. 12. *Belliolum crassifolium* (Baill.) v. Tiegh., *Schlechter 15348.* Transverse section at base of the lamina, showing arc of numerous bundles and abaxially offset median bundle, × 22. FIG. 13. *Exospermum stipitatum, Vieillard 2281.* Pair of adjacent bundles of *Fig. 11* more highly magnified, × 100. FIG. 14. *Bubbia auriculata* v. Tiegh., *Vieillard 2280.* Transverse section of midrib, showing numerous bundles, three of which are abaxially offset, × 22. FIG. 15. *Exospermum Lecarti* v. Tiegh., *Lécart 144.* Transverse section of petiole, showing numerous bundles, three of which are abaxially offset, × 22. FIG. 16. *Zygogynum spathulatum* v. Tiegh., *Vieillard 2266.* Transverse section of petiole, showing numerous bundles, × 22. FIG. 17. *Exospermum Lecarti, Lécart 144.* Amphicribral bundle from *Fig. 15* more highly magnified, × 100.

PLATE III

Figures 18–23: Parts of leaves cleared in hot dilute NaOH and mounted unstained in diaphane. All × 14.

FIG. 18. *Drimys piperita* Hook. f., *Ramos 19583.* FIG. 19. *Drimys piperita, Mjoberg 193.* FIG. 20. *Drimys piperita, Mjoberg 101.* FIG. 21. *Drimys granadensis* var. *grandiflora* Hieron., *Cuatrecasas 6687.* FIG. 22. *Bubbia oligocarpa* (Schlecht.) Burtt, *Schlechter 16470.* FIG. 23. *Bubbia pachyantha* A. C. Sm., *Brass 4371.*

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STUDIES OF PAPUASIAN PLANTS, VI

A. C. SMITH

Continued from page 121

Elaeocarpus L.

IN the account of the Papuasian species of *Elaeocarpus* by Schlechter (in Bot. Jahrb. 54: 107–146. 1916), 57 species are discussed, although six of these species were insufficiently known to Schlechter and were not placed in sections by him. Since his treatment, 25 species have been described from Papuasia, mostly by R. Knuth. Thus, a total of 82 species has now been described from Papuasia; in the present treatment I describe 32 Papuasian species as new, bringing the total known from our region to about 114 species.

It has been pointed out by Schlechter and many other writers that *Elaeocarpus* is a difficult genus to break up into groups, due to the extraordinarily complex inter-specific relationships. The classical division of the genus into four sections, apparently first proposed by Masters (in Hook. f. Fl. Brit. Ind. 1: 400–408. 1874) and later adopted by K. Schumann (in E. & P. Nat. Pfl. 3(6): 5. 1890), is scarcely useful, for such a complex mass of species is not divisible into such a small number of sections, at least if any degree of natural grouping is to be retained. On the other hand, it is found that the species of various regions fall into more or less recognizable groups, much smaller than the originally proposed sections. Nine of these groups were recognized and named as sections by Schlechter among the Papuasian species, and my studies in the same region incline me to believe that these are more or less natural, although a certain degree of overlapping is evident. Schlechter's classification is extremely useful, and I am able to retain it with some modifications.

A classification of the Malayan species has recently been proposed by Corner (in Gard. Bull. Straits Settlem. 10: 308–329. 1939), without the use of sectional names. It remains for a monographer to bring together the treatments which have been suggested for various regions and to evaluate and limit the sections thus far named. It seems probable that the genus can be best treated by recognizing a greater number of sections than has as yet been proposed.

Before accepting Schlechter's sectional names, I attempted to typify the earlier-proposed sections in order to correlate them with Schlechter's. As a result, it seems that two of his names, § *Ptilanthus* and § *Papuanthus*, are referable to § *Ganitrus* and § *Monocera* respectively. The two remaining

sections of Masters, Schumann, etc., § *Dicera* and § *Acronodia,* appear not to occur in their limited sense in Papuasia.[1]

In the following pages I attempt to place in Schlechter's system those species which were not so placed by him or which have been subsequently described, referring my new species to the appropriate groups. The following key to the Papuasian sections is based primarily upon Schlechter's, with certain modifications made necessary by additional material.

KEY TO SECTIONS OCCURRING IN PAPUASIA

Ovary-locules with 2 collateral ovules.
  Petals broad, bilobed.....1. § *Lobopetalum.*
  Petals fimbriate, the lobes at least 5.
    Segments of the petals digitate, thickened at apex; racemes ascending; petals more or less erect.....2. § *Dactylosphaera.*
    Segments of the petals not thickened; racemes horizontally spreading; petals spreading at anthesis.....3. § *Chascanthus.*
Ovary-locules with 4–12 ovules (occasionally 2-ovulate in *E. roseo-albus* of §*Fissipetalum*).
  Ovary 5(rarely 4-, 6-, or 7-)-locular, each locule usually 4(rarely 6-)-ovulate; inflorescence usually arising from branchlets below leaves, often unilateral; fruit comparatively large, thick-walled, with frequently ornamented endocarp, the original 4–7 locules apparent but often sterile; leaves and branchlets essentially glabrous at maturity, the leaf-blades usually large, glossy, and serrulate or crenate.....4. § *Ganitrus.*

[1] *Elaeocarpus* § *Dicera* (Brongn. & Gris in Bull. Soc. Bot. Fr. 8: 201. 1861; Mast. in Hook. f. Fl. Brit. Ind. 1: 401. 1874; K. Schum. in E. & P. Nat. Pfl. 3(6): 5. 1890) is based on *Dicera* J. R. & G. Forst. (Char. Gen. 79. *t. 40.* 1776), which genus was proposed with two species, *D. dentata* and *D. serrata,* both New Zealand plants further amplified by G. Forster (Fl. Ins. Austr. Prodr. 41. 1786). Since the original illustration pertains to *Dicera dentata,* this has generally been taken to typify the Forsters' genus and thus as the type of *Elaeocarpus* § *Dicera.*

Elaeocarpus dentatus (J. R. & G. Forst.) Vahl has the following essential characters: racemes associated with the leaves; flowers of average size (petals 7–10 mm. long); petals membranaceous, strictly glabrous, and 3-lobed at the apex, the lobes rounded or undulate but not fimbriate; disk continuous, hispidulous; stamens 10–20, the anthers mucronulate or with a minute awn; ovary sericeous, 2-locular, each locule 4-ovulate [in the specimens available to me, and also in Hook. Ic. Pl. 7: *t. 602* (as *E. Hinau* A. Cunn.). 1844; Cheeseman, Ill. N. Zeal. Fl. 1: *pl. 24.* 1914, shows the ovules as 6, and some variation in this respect is probable].

The only Papuasian group of *Elaeocarpus* which suggests § *Dicera* (in its narrow sense) is § *Fissipetalum* Schlechter. However, the Papuasian plants of this section have smaller flowers and petals which are definitely laciniate or fimbriate rather than broadly lobed. Therefore I follow Schlechter in taking up the sectional name *Fissipetalum* for this group of Papuasian *Elaeocarpi,* although it is possible that a student of the entire genus may consider the petal characters secondary and refer this group to § *Dicera.* The extent of § *Dicera* beyond New Zealand, in its limited application, is questionable, but it has obviously been much too broadly interpreted by Masters and others.

Elaeocarpus § *Acronodia* (Mast. in Hook. f. Fl. Brit. Ind. 1: 408. 1874; K. Schum. in E. & P. Nat. Pfl. 3(6): 5. 1890) is based on *E. Acronodia* Mast. (*Acronodia punctata* Bl., not *Elaeocarpus punctatus* Wall.). It is a very distinct and natural group, with tetramerous flowers and staminate and monoecious individuals. Some authors (e. g. Corner in Gard. Bull. Straits Settlem. 10: 309. 1939) imply that *Acronodia* is worthy of subgeneric rank. It apparently does not extend east to Papuasia and thus does not concern the present problem.

Ovary 2- or 3-locular (said to be 5-locular in *E. sterrophyllus* of § *Oreocarpus*); fruit at maturity usually 1-locular, sometimes probably 2- or 3-locular.
Petals thinner than the sepals and usually obviously different, clearly broadened at apex.
Ovary-locules usually 4-ovulate (occasionally 2-ovulate in *E. roseo-albus* and 6-ovulate in *E. polydactylus*); inflorescences slender, associated with the leaves at anthesis; flowers small (petals up to 6 mm. long, usually essentially glabrous); stamens 10–30, erostrate; fruit comparatively thick-walled. .....5. § *Fissipetalum*.
Ovary-locules 6–12-ovulate (very rarely 4-ovulate; if 4- or 6-ovulate, the other characters obviously not of § *Fissipetalum*).
Flowers very large for the genus (petals often exceeding 20 mm. in length); leaves large, usually aggregated at ends of thick branchlets; flowers arranged in comparatively short few-flowered racemes arising from the branchlets below leaves; stamens numerous (frequently 50–100 or more), with conspicuously awned anthers; ovary sericeous; fruit large, somewhat flattened, the endocarp also flattened. .....8. § *Monocera*.
Flowers smaller (petals not exceeding 20 mm. in length, in most species much smaller); leaves not aggregated in terminal clusters; racemes often elongated and many-flowered; stamens fewer (usually 15–50); fruit round in cross-section, not flattened.
Ovary glabrous. .....6. § *Oreocarpus*.
Ovary sericeous. .....7. § *Blepharoceras*.
Petals about the size of the sepals (usually less than 8 mm. long) and often somewhat similar in texture, usually narrowed distally and subentire or obscurely toothed (in a few species broadened at apex and distinctly fimbriate), densely sericeous without and often within, often with a conspicuous swollen carina within; ovary-locules 6–12-ovulate; fruits comparatively small, the pericarp rarely exceeding 3 mm. in thickness. .....9. § *Coilopetalum*.

1. § LOBOPETALUM

Elaeocarpus § Lobopetalum Schlechter in Bot. Jahrb. 54: 109. 1916.

Based on the single species *E. bilobatus* Schlechter and its variety *acutatus* Schlechter, both entities from the Sepik region of Northeastern New Guinea, this section appears not to be represented in the material of the Archbold collections.

2. § DACTYLOSPHAERA

Elaeocarpus § Dactylosphaera Schlechter in Bot. Jahrb. 54: 111. 1916.

In addition to the six species upon which Schlechter originally founded this well-marked section, *E. Lamii* O. C. Schmidt and the new species described below also belong in § *Dactylosphaera*. The original six species are obviously closely related and Schlechter did not designate a type for the section. Since *E. heptadactylus* Schlechter is the only species illustrated by him, this may be designated as the lectotype of the section.

Elaeocarpus (§ *Dactylosphaera*) **myrmecophilus** sp. nov.

Arbor 5–6 m. alta, ramulis validis subteretibus fistulosis apicem versus puberulis et 7–10 mm. diametro demum glabratis; foliis apicem ramulorum versus congestis, petiolis subnullis, laminis chartaceis in sicco fusco-olivaceis anguste spathulato-obovatis, (15–) 20–30 cm. longis, 5–8.5 cm. latis, basim versus gradatim angustatis et basi ipso late obtusis vel abrupte rotundatis, apice obtusis vel rotundatis, margine apiculato-crenulatis (dentibus 1 vel 2 per centimetrum), utrinque glabris vel costa nervisque obscure

puberulis, costa valida utrinque prominente, nervis lateralibus utrinsecus 15–20 patentibus copiose anastomosantibus supra paullo subtus valde elevatis, rete venularum intricato conspicuo utrinque valde prominulo; racemis erectis 10–21 cm. longis, basi bracteis foliaceis deltoideis ad 3 cm. longis interdum subtentis, pedunculo brevi squamulis deltoideis puberulis circiter 2 mm. longis saepe vestito, rhachi angulata puberula gracili (1–1.5 mm. diametro); floribus numerosis, pedicellis curvatis gracilibus 3–5 mm. longis minute sericeo-puberulis; sepalis papyraceis deltoideo-oblongis, 3.5–4 mm. longis, 1.5–2 mm. latis, subacutis, utrinque obscure puberulis; petalis tenuiter carnosis unguiculato-cuneatis, 3.5–4 mm. longis, 1.5–2 mm. latis, intus basim versus et margine puberulis, superne in segmentis 6–8 subaequalibus circiter 1 mm. longis apice globoso-incrassatis divisis; disci lobis 5 sepalis oppositis liberis carnosis minute puberulis oblongis circiter 1 mm. longis et latis, apice truncato emarginatis; staminibus 15, glabris vel apice antherarum inconspicue setulosis, 2–2.5 mm. longis, antheris quam filamentis paullo longioribus apice truncatis; ovario conico conspicue 5-angulato minute puberulo 3-loculari, ovulis 2 in quoque loculo, stylo gracili circiter 1.5 mm. longo superne glabro.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, alt. 850 m., *Brass 13231* (TYPE), Mar. 1938 (tree 5–6 m. high, occasional on higher banks of river in rain-forest; branches upright, inhabited by ants; flowers green).

This species of § *Dactylosphaera* is very distinct in its sessile long narrowly spatulate-obovate leaf-blades, elongate racemes, and comparatively large flowers. In other characters it is perhaps most suggestive of *E. dolichodactylus* Schlechter.

Elaeocarpus (§ *Dactylosphaera*) **pachydactylus** Schlechter in Bot. Jahrb. 54: 113. 1916.

NETHERLANDS NEW GUINEA: Hollandia, Bernhard bivak, alt. about 55 m., *Neth. Ind. For. Serv. 25756.*

The cited specimen bears juvenile inflorescences, but in all respects agrees well with the description of *E. pachydactylus,* previously known only from the Sepik region of Northeastern New Guinea, also at low elevation.

3. § CHASCANTHUS

Elaeocarpus § Chascanthus Schlechter in Bot. Jahrb. 54: 115. 1916.

In proposing this very sharply marked section, based on two new species, Schlechter did not designate a type. However, since *E. multisectus* Schlechter is illustrated, this may arbitrarily be taken as the lectotype of the section. Duplicates of the type of *E. multisectus, Schlechter 16521,* are available at UC. Since Schlechter's treatment, no other species referable to § *Chascanthus* appear to have been described; below I propose two new species which are obviously of this relationship. In addition, *Brass 6956* and *7282,* from the Fly River region of British New Guinea, represent a new species of § *Chascanthus;* these specimens bear a manuscript name of Knuth which may already have been published.

Elaeocarpus (§ *Chascanthus*) **solomonensis** sp. nov.

Arbor ad 25 m. alta, ramulis gracilibus teretibus apicem versus puberulis cito glabratis purpurascentibus vel cinereo-fuscescentibus; petiolis conspicuis gracilibus (0.5–1 mm. diametro) canaliculatis, glabris vel incon-

spicue puberulis, 1–2 cm. longis, basi et apice paullo incrassatis; laminis papyraceis siccitate fusco-olivaceis oblongo-ellipticis, (6–) 10–13 cm. longis, (2–) 3–5 cm. latis, basi late obtusis, apice in acuminem ad 1.5 cm. longum gradatim angustatis, margine regulariter crenato-serrulatis (dentibus 3–5 per centimetrum primo saepe calloso-mucronulatis demum spinulosis vel obtusis), utrinque glabris vel costa juvenili obscure puberulosericeis, subtus in axillis nervorum interdum domatiiferis; racemis e ramulis infra folia ortis patentibus sub anthesi 15–30 cm. longis laxe multifloris, pedunculo brevi et rhachi gracilibus (1–1.5 mm. diametro) pedicellisque arcte cinereo-puberulis, pedicellis gracillimis subrectis 5–18 mm. longis; alabastris late conicis 3–4 mm. longis; sepalis submembranaceis elliptico-ovatis acutis, 4–5 mm. longis, 1.5–2 mm. latis, extus obscure puberulis, intus glabris; petalis submembranaceis ex ungue brevi perlate cuneatis, 6–7 mm. longis, apice 7–10 mm. latis, margine (et marginibus loborum) haud hispidulis ceterum glabris, infra medium plerumque 5- vel 6-lobatis, parte apicali in segmenta 60–90 linearia acuta copiose et irregulariter fimbriatis; disci lobis 5 sepalis oppositis oblongo-subglobosis, circiter 1 mm. diametro, minute et dense brunneo-velutinis, apice truncatis; staminibus 30–35 ubique minute hispidulis 4–4.5 mm. longis, filamentis gracilibus curvatis circiter 1.5 mm. longis, antheris erectis oblongo-subulatis 2.5–3 mm. longis apice acutis; ovario copiose et breviter pallido-sericeo 3-loculari, ovulis in quoque loculo 2 elongatis, stylo subulato circiter 1.5 mm. longo superne glabro; racemis pedicellisque sub fructu incrassatis, rhachis parte apicali interdum delapsa; fructibus ellipsoideis, maturitate 15–22 mm. longis et 8–13 mm. latis, basi et apice obtusis, pericarpio (epicarpio azureo duro et endocarpio crasso ruguloso inclusis) 2–4 mm. crasso, semine solitario oblongo-ellipsoideo.

SOLOMON ISLANDS: Bougainville: Siwai, *Waterhouse 96* (A, NY), *177* (A, NY) (trees 10–20 m. high, in jungle; native name: *ruhonai*); Kupei Gold Field, alt. 1200 m., *Kajewski 1752* (tree to 20 m. high, common in rain-forest; fruit blue); Guadalcanal: Ululolo, Tutuve Mt., alt. 1200 m., *Kajewski 2608* (common tree to 20 m. high with medium buttresses; bark fairly smooth; wood white, soft; fruit blue; native name: *chikora*); Malaita: Quoimonapu, alt. 50 m., *Kajewski 2327* (TYPE), Dec. 10, 1930 (tree to 25 m. high, common in rain-forest; trunk without prominent flanges or buttresses; flowers faintly scented, the petals white, feathery, the stamens black; native name: *isikor*); San Cristoval: Magoha River, *Brass 2751* (slender tree 20 m. high, in lowland rain-forest; bark pale brown, slightly flaky; wood soft, pale; leaf-blades smooth and shining above, paler beneath; fruit pale blue).

In spite of the altitudinal range indicated by the above-cited specimens, there can be no doubt that all are conspecific. The only specimen with mature flowers is indicated as the type, but younger inflorescences, agreeing in all details, are found on *Waterhouse 177* and *Kajewski 2608*. Fruiting specimens are *Kajewski 1752* and *2608* and *Brass 2751*.

Elaeocarpus solomonensis is a close relative of the New Guinean *E. multisectus* Schlechter, the two species agreeing in the texture, shape, and margins of leaves, their elongate inflorescences, copiously and irregularly fimbriate petals, erect blackish anthers on curved filaments, etc. However, the new species has the leaf-blades strictly glabrous at maturity (rather than sericeous-puberulent on both surfaces and persistently so beneath), the pedicels comparatively slender, and the petals glabrous except for a few

hairs at margins (rather than barbate on the claw without). In foliage, *E. solomonensis* suggests the specimens which I refer to *E. fauroensis* Hemsl. (see discussion below under § *Ganitrus*). However, *E. fauroensis* has a nearly globose fruit, larger and thicker-walled than that described above. Furthermore, Hemsley's species has somewhat larger leaf-blades, which are often broadest above the middle, and its petioles are shorter and much stouter than those of the new species.

Elaeocarpus (§ *Chascanthus*) **leucanthus** sp. nov.

Arbor ad 14 m. alta, ramulis subteretibus apicem versus 2–3 mm. diametro et brunneo-hirtis cito nigrescentibus glabratis; petiolis gracilibus 1.5–3.5 cm. longis ut ramulis decidue hirtis, basi et apice incrassatis; laminis chartaceis vel subcoriaceis in sicco fuscis ellipticis, 8–14 cm. longis, 3–6 cm. latis, basi late obtusis, apice in acuminem ad 1.5 cm. longum subito cuspidatis, margine recurvo obscure serrato-crenulatis (dentibus 1 vel 2 per centimetrum), supra glabris vel juventute sericeo-hirtellis, subtus praesertim nervis breviter brunneo-hirtellis, costa supra paullo subtus valde prominente, nervis lateralibus utrinsecus 5–7 arcuato-adscendentibus anastomosantibus supra subplanis subtus elevatis, rete venularum utrinque perspicue prominulo; racemis axillaribus vel infra folia orientibus sub anthesi 5–12 cm. longis, pedunculo brevi et rhachi gracilibus (0.5–1 mm. diametro) pedicellisque pilis circiter 0.5 mm. longis copiose brunneo-hirtis; floribus plerumque 15–20 per inflorescentiam, pedicellis gracilibus sub anthesi 12–20 mm. longis, alabastris anguste elongatis; sepalis tenuiter papyraceis lanceolatis, 7–8 mm. longis, circiter 1.5 mm. latis, acutis, utrinque obscure puberulis; petalis membranaceis oblongo-cuneatis, 9–10 mm. longis, 3.5–4.5 mm. latis, utrinque praesertim inferne sericeis, basi angustatis, parte apicali in segmenta 19–21 linearia obtusa leviter inaequalia pectinatis; disci lobis 5 sepalis oppositis subconnatis carnosis oblongis circiter 1 mm. longis et latis, dense sericeis, apice truncatis; staminibus circiter 20, 3–3.5 mm. longis, filamentis gracilibus glabris circiter 1 mm. longis, antheris membranaceis 2–2.5 mm. longis superne obscure hispidulis apice setas 8–12 conspicuas 0.3–1 mm. longas gerentibus; ovario ellipsoideo pilis circiter 0.8 mm. longis dense aureo-sericeo 3-loculari, ovulis in quoque loculo 2, stylo subulato circiter 4 mm. longo superne glabro; fructibus paucis ut videtur saepe 1 per inflorescentiam, immaturis ellipsoideis ad 25 × 18 mm., pericarpio duro 2–3 mm. crasso extus ruguloso et pallido-lenticellato.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, alt. 1600 m., *Brass 12229* (TYPE), Jan. 1939 (tree 14 m. high, in rain-forest on side of a ravine, the trunk 20 cm. diam.; flowers white).

Elaeocarpus leucanthus, of the alliance of *E. multisectus* Schlechter, clearly differs from that species in its thick leaf-blades with more obvious veinlets and less evident serrations, its shorter and more slender inflorescences with larger flowers, its less deeply and less copiously fimbriate petals, and its fewer stamens, which are conspicuously setose at apex.

4. § GANITRUS

Elaeocarpus § Ganitrus Brongn. & Gris in Bull. Soc. Bot. Fr. 8: 202. 1861; Mast. in Hook. f. Fl. Brit. Ind. 1: 400. 1874; K. Schum. in E. & P. Nat. Pfl. 3(6): 5. 1890.

Elaeocarpus b. *Ganitrus* Endl. Gen. Pl. 1011. 1840.
Elaeocarpus § *Ptilanthus* Schlechter in Bot. Jahrb. 54: 121. 1916.

Elaeocarpus § *Ganitrus* is founded nomenclaturally on *E. sphaericus* (Gaertn.) K. Schum. [*Ganitrus sphaericus* Gaertn.; *Elaeocarpus Ganitrus* Roxb.]. Gaertner (Fruct. 2: 271. *t. 139, f. 6.* 1791) took his generic name from *Ganitrus* Rumphius (Herb. Amb. 3: 160. *t. 101.* 1743), but his description was based on an actual specimen and his species must be interpreted from the material described, rather than from Rumphius' description and plate (see Merrill, Interpret. Herb. Amb. 351. 1917). *Ganitrus sphaericus* Gaertn., therefore, is an Indian species, and the identity of *Ganitrus* Rumph. (probably = *Elaeocarpus amboinensis* Merr., op. cit. 350) is not germane to an interpretation of *Elaeocarpus* § *Ganitrus*. *Elaeocarpus sphaericus* (Gaertn.) K. Schum. has been interpreted rather widely by most recent students, and its range is often stated as extending throughout Malaysia and even into New Guinea (e. g. Koorders & Valeton in Meded. Lands. Plant. 33: 419. 1900; Merrill in Contr. Arnold Arb. 8: 100. 1934; Corner in Gard. Bull. Straits Settlem. 10: 326. 1939). At present I cannot express an opinion on the true extent of this Indian species, but I have seen no New Guinean material which seems conspecific with *E. sphaericus*.

The essential characters of *Elaeocarpus* § *Ganitrus*, as typified by *E. sphaericus*, agree with those of *Elaeocarpus* § *Ptilanthus*, as was realized by Schlechter (in Bot. Jahrb. 54: 121. 1916). However, Schlechter felt that § *Ganitrus* had been too broadly interpreted and that not enough weight had been given to the number of ovules in the ovary-locules, and therefore he proposed to place the New Guinean plants of this relationship in a new section, *Ptilanthus*. In the New Guinean material available to him, Schlechter found four ovules per locule to be the uniform number. However, I now find that the locules of *E. trifidus* (described below) and sometimes those of *E. kaniensis* Schlechter are 6-ovulate; nevertheless these species are definitely members of § *Ptilanthus* Schlechter. The number of ovary-locules is not necessarily uniformly five as supposed by Schlechter, but may vary from four to seven.

Elaeocarpus sphaericus has large 5-locular fruits with a strongly rugulose endocarp; the number of ovules in the ovary-locules of the flower is not stated in the treatments examined by me, but Wight's illustration (Ic. Pl. Ind. Or. 1: *t. 66.* 1838) shows them to be probably six, while Endlicher (Gen. Pl. 1011. 1840) states, for *Elaeocarpus* b. *Ganitrus*, ". . . loculis quadriovulatis." At any rate, I believe that variation in the ovule-number within sections is somewhat greater than implied by Schlechter. In view of the fact that all the other essential characters of the two groups agree, I believe that § *Ptilanthus* must be placed in synonymy under § *Ganitrus*. The actual limits of this group, both morphological and geographical, cannot be stated without detailed study of the genus, but it is now known from India to the Solomon Islands.

§ *Ptilanthus* was originally erected by Schlechter to include eight species; no type was designated, but the sectional name implies that *E. ptilanthus*

Schlechter was intended as the basic species. To these eight Papuasian species (herewith transferred to § *Ganitrus*) must be added three others which are already described: *E. orohensis* Schlechter (originally placed in § *Blepharoceras*), *E. fauroensis* Hemsl., and *E. breviracemosus* Knuth. These three species are discussed below. Here I also add six new species, so that § *Ganitrus* in Papuasia is now composed of 17 species.

The essential diagnostic characters of § *Ganitrus*, at least as I assume it to be represented in Papuasia, are as follows: branches and branchlets comparatively stout; leaves and branchlets essentially glabrous, or sericeous or closely tomentellous on young parts; leaf-blades usually large, often glossy, oblong or obovate, serrulate or crenate, rarely velutinous on nerves beneath; inflorescences usually arising from branchlets below leaves, only rarely associated with the leaves, often unilateral; petals somewhat larger and thinner than the sepals, often essentially glabrous or puberulent to short-sericeous, usually deeply laciniate; stamens often numerous, the anthers often elongate, awned or not; style long, the ovary sericeous, 5 (rarely 4–7-)-locular, the ovules 4 (rarely 6) per locule; fruit comparatively large, thick-walled.

Elaeocarpus (§ *Ganitrus*) **kaniensis** Schlechter in Bot. Jahrb. **54:** 123. 1916.

NORTHEASTERN NEW GUINEA: Kani-Gebirges (Minjem River region), alt. about 600 m., *Schlechter 17893* (TYPE COLL.); Morobe District, alt. 250–1350 m., Sattelberg, *Clemens 3095* (flowers yellowish); Salamaua, *Clemens 7* (tree about 15 m. high; fruit bright blue); Yunzaing, *Clemens 4142* (tree, in secondary forest; fruit blue); Boana, *Clemens 41711* (fruit blue); Gaeng Station, *Clemens 41295* (tall tree, the trunk up to 1 m. diam.; fruit green, immature).

Elaeocarpus kaniensis, previously reported only from the type collection, appears to be fairly common in the Morobe District. Schlechter points out that its petals are unusual in § *Ptilanthus* [i. e. § *Ganitrus*] because of their concave elliptic shape, narrowed apex, and obscure laciniae, all these points being suggestive of § *Coilopetalum*. However, the petals lack the dense sericeous pubescence and the swollen carina usually found in § *Coilopetalum*, and on the basis of all its other characters, including the 5-locular ovary, *E. kaniensis* is indubitably correctly placed in § *Ganitrus*.

The flowers of *Clemens 3095* agree precisely with those of the type collection, but, being perhaps somewhat more mature, they permit an amplification of the dimensions given by Schlechter. The sepals may be up to 6 × 2.5 mm. and the petals to 8 × 3 mm.; the stamens have short filaments and anthers about 2.5 mm. long. The petals are usually laciniate to about one-third their length with 8 or 9 lanceolate teeth. The five ovary-locules may have either 4 or 6 ovules each, this number being variable even in the same flower.

All of the Clemens collections except no. *3095* are in fruit. The fruits are subglobose or slightly ellipsoid, 18–30 mm. in diameter at maturity. The epicarp is thin and brittle when dry and the mesocarp is somewhat fibrous. The endocarp is hard and bony, very thick, in larger specimens with numerous irregularly oblong processes which are 4–6 mm. long. In smaller fruits, the endocarp is merely conspicuously rugose, without ex-

tended processes. The locules are small, consistently 5, each with a single seed.

Elaeocarpus (§ *Ganitrus*) **altisectus** Schlechter in Bot. Jahrb. **54**: 123. 1916.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, alt. 75 m., *Brass & Versteegh 13569* (tree 31 m. high, frequent in primary rain-forest, on the lower mountain-slopes; trunk 42 cm. diam.; crown not wide-spreading; bark 7 mm. thick, gray-brown, fissured; sap-wood light brown; heart-wood brown; fruits dark green).

The cited specimen agrees very well in foliage with Schlechter's description of *E. altisectus*, based on specimens from the Sepik region at 20–100 m. altitude. The species is characterized by its narrowly oblong-obovate obtuse leaf-blades and very short winged petioles. No. *13569* bears fruits, doubtless immature, which are subglobose, up to 12 mm. in diameter, rugulose, with a thick pericarp (2–3 mm. thick). The epicarp is hard, the endocarp bony and irregularly sulcate, the locules 5 and apparently each 1-seeded. The mature fruit is doubtless larger and probably the endocarp develops more obvious processes.

Elaeocarpus (§ *Ganitrus*) **trifidus** sp. nov.

Arbor ad 30 m. alta, ramulis juventute angulatis saepe dense tomentello-puberulis cito subteretibus cinereo-purpurascentibus glabratis; petiolis ut ramulis saepe puberulis glabratisque supra complanatis 8–18 mm. longis; laminis chartaceis vel subcoriaceis in sicco olivaceo-fuscis ellipticis vel obovato-ellipticis, 7–12 cm. longis, 3–5 cm. latis, basi in petiolum gradatim angustatis et decurrentibus, apice breviter cuspidatis, margine serrulatis (dentibus 3–6 per centimetrum primo setulosis mox obtusis), utrinque glabris vel subtus praecipue nervis interdum supra costa dense puberulis cito glabratis, costa utrinque prominente, nervis lateralibus utrinsecus 7–10 arcuato-adscendentibus anastomosantibus utrinque elevatis, rete venularum intricato utrinque prominulo; racemis in ligno vetustiore ortis vel interdum axillaribus patentibus 6–12 cm. longis plerumque 20–30-floris et secundifloris, pedunculo brevi et rhachi sub anthesi circiter 1 mm. diametro pedicellisque dense hispidulo-puberulis, pedicellis gracilibus sub anthesi 10–14 mm. longis, alabastris breviter conicis ad 5 mm. longis conspicue cuspidatis; sepalis papyraceis ovato-lanceolatis, 5.5–6 mm. longis, 1.7–2 mm. latis, acuminatis, basim versus intus paullo incrassatis, utrinque puberulis; petalis subcarnosis ovato-oblongis, circiter 8 mm. longis, inferne 2–2.5 mm. latis, superne angustatis, basi ipso angustissimis, usque infra medium in lacinias 5–6 mm. longas irregulariter 2- vel 3-lacinulatas raro integras trifidis, margine inferne tomentello-ciliolatis, intus basim versus sericeis; disco annulari-pulvinato leviter crenulato minute hispidulo circiter 0.5 mm. alto; staminibus 2- vel 3-seriatis plerumque 50–60 praeter setas apicales 2.5–3.5 mm. longis, filamentis hispidulis brevibus, antheris 1.5–2.5 mm. longis ubique obscure setulosis apice in setas 1–3 ad 0.8 mm. longas productis; ovario subgloboso et styli basi dense sericeo-puberulis, loculis 6 (raro 7) 6-ovulatis, stylo crasso subulato 5–7 mm. longo; pedicellis sub fructu incrassatis, fructibus subglobosis maturitate ad 27 mm. diametro, epicarpio tenui duro, mesocarpio fibroso, endocarpio crasso osseo processibus irregularibus 3–6 mm. longis copiose ornato, loculis 6 vel 7 interdum sterilibus, semine in quoque loculo solitario.

NETHERLANDS NEW GUINEA: 2–4 km. southwest of Bernhard Camp, Idenburg

River, alt. 900–950 m., *Brass 13290* (TYPE), Mar. 1939, *Brass & Versteegh 13148, 13527* (trees 20–30 m. high, occasional in rain-forest, sometimes in primary mossy-forest on ridges; trunk 20–48 cm. diam.; crown not wide-spreading; bark 12–15 mm. thick, dark brown or black, scaly; sap-wood light yellow; heart-wood brown-yellow or brown-green; flowers cream-colored; fruits dark green or blue).

The only flowering specimen is designated as the type; no. *13148* bears young fruits and no. *13527* apparently mature fruits, which are described above. The fruiting specimens are glabrous throughout, whereas the flowering specimen has the branchlets, petioles, and leaf-blades puberulent, although these parts even here are glabrescent. In its deeply 3-lobed petals and its floral dimensions, *E. trifidus* suggests *E. altisectus* Schlechter, doubtless its closest relative, from which it differs in its longer-petiolate leaf-blades with cuspidate apices. The ovary-locules of the new species are 6 or 7 rather than 5, a feature which has not been otherwise noted in § *Ganitrus* but which is probably of little consequence. Furthermore, the ovules are consistently 6 per locule, and therefore the plant would fall into § *Blepharoceras* in Schlechter's key to the sections. In all its other characters of foliage, inflorescence, and fruit, *E. trifidus* obviously represents § *Ganitrus*, the characters of which must therefore be modified.

Another specimen which very possibly represents *E. trifidus* is *Brass & Versteegh 11915*, collected at 1740 m., 15 km. southwest of Bernhard Camp. This specimen bears mature fruits similar to those above-described in all respects except for having 5 locules. I do not positively refer the collection to *E. trifidus* because its leaves are also strongly suggestive of *E. acutifidus* (described below), in which the fruit is 5-locular; the two species concerned are difficult to distinguish without flowers.

Elaeocarpus (§ *Ganitrus*) **acutifidus** sp. nov.

Arbor ad 24 m. alta, ramulis juvenilibus cinereo-sericeo-puberulis angulatis mox teretibus glabratis saepe nigrescentibus; petiolis gracilibus supra canaliculatis 7–15 mm. longis ut ramulis puberulis mox glabratis; laminis in sicco fusco-olivaceis chartaceis supra nitidis utrinque glabris oblongo-ellipticis, 7–13 cm. longis, (2.5–) 3–6 cm. latis, basi acutis et in petiolum decurrentibus, apice cuspidatis, margine dentibus 3–5 per centimetrum primo spinulosis serrulatis, costa supra paullo subtus valde prominente, nervis lateralibus utrinsecus 8–12 erecto-patentibus utrinque peracute elevatis, rete venularum intricato copioso utrinque valde prominulo; racemis in ligno vetustiore ortis patentibus 4–6 cm. longis ut videtur circiter 15-floris, pedunculo brevi et rhachi angulata circiter 1 mm. diametro pedicellisque breviter sericeo-puberulis, pedicellis gracilibus sub anthesi 10–14 mm. longis, alabastris ellipsoideo-conicis ad 8 mm. longis conspicue acuminatis; sepalis submembranaceis acutis oblongo-lanceolatis, 12–15 mm. longis, 2.5–3 mm. latis, utrinque minute puberulis glabratisque; petalis membranaceis anguste oblongo-cuneatis, 17–20 mm. longis, 5–6 mm. latis, basim versus margine sericeo-puberulis, ceterum glabris, in lacinias 10–14 acutas 3–9 mm. longas irregulariter fissis; disco annulari-pulvinato 1–1.5 mm. alto crenulato minute hispidulo-velutino; staminibus 40–42 plerumque biseriatis erectis 7–10 mm. longis ubique breviter setuloso-sericeis, filamentis 2–3 mm. longis, antheris 5–8 mm. longis apice setas 1–3 ad 1 mm. longas gerentibus; ovario 5-loculari et styli basi pallide sericeis, loculis 4-ovulatis,

stylo crasso-subulato 18–21 mm. longo petala conspicue superante; rhachi pedicellisque sub fructu valde incrassatis, pedicellis ad 20 mm. longis et 3 mm. diametro; fructibus subglobosis maturitate 3.5–4.5 cm. diametro, basi obtuso-rotundatis, apice abrupte cuspidatis, epicarpio tenui duro valde ruguloso, mesocarpio fibroso, endocarpio crasso osseo processibus irregularibus ad 1 cm. longis implicite ornato etiam lacunis parvis hinc inde pervaso, loculis 5 interdum abortivis, semine in quoque loculo solitario.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt. 2300–2340 m., *Brass & Versteegh 11158* (TYPE), Nov. 23, 1938 (tree 24 m. high, frequent in primary forest on slope of a ridge; trunk 32 cm. diam.; crown not wide-spreading; bark 8 mm. thick, fairly smooth, brown; wood white; flowers white; young fruits dark green), *Brass & Versteegh 11136* (tree 19 m. high, common in old secondary forest on slope of a ridge; trunk 35 cm. diam.; crown not wide-spreading; bark 8 mm. thick, gray, rough; wood white; fruits dark green).

Flowers are described from the type, mature fruits from no. *11136*. The closest relative of *E. acutifidus* is doubtless *E. ptilanthus* Schlechter, the two species having in common a comparatively short and few-flowered inflorescence. The type of *E. ptilanthus* is from the Sepik region of Northeastern New Guinea, and Schlechter cites 11 Ledermann collections as probably representing the species; for the purpose of interpreting it, however, only the type and two other flowering specimens need be considered. These are characterized not only by their few flowers, but also by having only about 15 stamens. From *E. ptilanthus*, as described, *E. acutifidus* differs in its longer petioles and broader and elliptic rather than oblong-spatulate leaf-blades. The flowers of the two species are quite similar in shape of parts, but those of the new species have larger sepals, petals, and stamens; its petals are more finely laciniate and its stamens are 40–42 rather than about 15. In foliage, *E. acutifidus* is suggestive of *E. trifidus* (described above), but the differences between these two species in flower-size, petal-cutting, anthers, etc., are numerous and obvious.

Elaeocarpus (§ *Ganitrus*) **aemulus** sp. nov.

Arbor ad 27 m. alta *E. acutifido* supra descripto valde affinis, foliis floribusque minoribus, staminibus paucioribus, stylo multo breviore differt; petiolis 7–10 mm. longis, laminis 7–10 cm. longis, 2.5–3.5 cm. latis, apice obtusis, nervis lateralibus utrinsecus 7–10; racemis 3–4 cm. longis 5–10-floris, pedicellis sub anthesi 7–10 mm. longis; sepalis 10–11 × 2–2.5 mm.; petalis 15–16 × 5–6 mm., in lacinias 9–12 acutas 3–8 mm. longas fissis; staminibus 30–32 erectis 7–8.5 mm. longis, antheris 5–6 mm. longis; stylo 9–10 mm. longo quam petalis valde breviore; fructibus (unico viso) subglobosis circiter 2 cm. diametro.

NORTHEASTERN NEW GUINEA: Morobe District, Ogeramnang, alt. about 1780 m., *Clemens 5019* (TYPE), Jan. 16, 1937; above Kaile, enroute to Sarawaket, alt. 1650–1800 m., *Clemens 4910* (tree 25–27 m. high, in wet forest by stream; fruit blue).

In many respects, *E. aemulus* is intermediate between *E. ptilanthus* Schlechter and *E. acutifidus* (described above), its closest allies. The possibility that this species and *E. acutifidus* are only varietally distinct is to be considered, but for the time being I think it best to designate them as species. The differentiating floral characters are matters of degree, the

most marked difference being in length of style. The diagnostic characters of these three closely related species are as follows:

Petiole 5–8 mm. long; leaf-blades oblong-spatulate, 5–9 × 2–3.5 cm., obtuse; sepals about 10 mm. long; petals about 13 mm. long, fimbriate with 7–9 teeth; stamens about 15, about 6 mm. long; style exceeding the petals. .....*E. ptilanthus.*

Petiole 7–10 mm. long; leaf-blades oblong-elliptic, 7–10 × 2.5–3.5 cm., obtuse; sepals 10–11 mm. long; petals 15–16 mm. long, fimbriate with 9–12 teeth; stamens 30–32, 7–8.5 mm. long; style 9–10 mm. long, shorter than petals. .....*E. aemulus.*

Petiole 7–15 mm. long; leaf-blades oblong-elliptic, 7–13 × 3–6 cm., cuspidate; sepals 12–15 mm. long; petals 17–20 mm. long, fimbriate with 10–14 teeth; stamens 40–42, 7–10 mm. long; style 18–21 mm. long, exceeding the petals. ...*E. acutifidus.*

Elaeocarpus (§ *Ganitrus*) **chloranthus** sp. nov.

Arbor ad 25 m. alta ubique inflorescentiis exceptis glabra (partibus juvenilibus forsan puberulis), ramulis subteretibus crassis apicem versus saepe ad 7 mm. diametro dense foliatis; petiolis brevibus late alatis 2–5 mm. longis; laminis papyraceis in sicco fusco-viridibus anguste obovatis, (7–) 11–20 cm. longis, (3–) 4–7 cm. latis, basi in petiolum conspicue decurrentibus, apice rotundatis vel late obtusis, margine inconspicue crenulato-denticulatis (dentibus 3–6 per centimetrum primo spinulosis), supra nitidis, costa valida supra subplana vel elevata subtus prominente, nervis lateralibus utrinsecus 15–20 patentibus curvatis anastomosantibus utrinque peracute prominulis, rete venularum intricato utrinque valde prominulo; racemis in ligno vetustiore ortis patentibus 5–9 cm. longis secundifloris, pedunculo brevi et rhachi robusta striata pedicellisque breviter sericeo-puberulis, floribus confertis, bracteis oblongo-linearibus 4–6 mm. longis puberulis mox caducis, pedicellis gracilibus sub anthesi 5–9 mm. longis; sepalis papyraceis lanceolatis acutis, 8–9 mm. longis, circiter 2 mm. latis, utrinque obscure puberulis; petalis membranaceis anguste oblongo-cuneatis, 15–16 mm. longis, 4–5 mm. latis, intus et margine basim versus sericeo-puberulis, in lacinias 13–20 acutas 3–6 mm. longas irregulariter fissis; disco annulari-pulvinato obscure crenulato circiter 0.7 mm. alto minute hirtello; staminibus 27–32 plerumque biseriatis 7–10 mm. longis ubique minute setulosis, filamentis 1.5–3 mm. longis, antheris 5–7 mm. longis in apicem acutum gradatim angustatis; ovario 5-loculari et styli basi breviter sericeis, loculis 4-ovulatis, stylo crasso 7–11 mm. longo superne glabro.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard camp, Idenburg River, alt. 850 m., *Brass 13287* (TYPE), Mar. 1939 (tree 18–20 m. high, with umbrella crown, occasional in seral rain-forest on sandy flood-banks of river; flowers green); 15 km. southwest of Bernhard Camp, alt. 1770 m., *Brass & Versteegh 11939* (tree 25 m. high, occasional in forests of slopes; trunk 50 cm. diam.; crown not wide-spreading; bark 18 mm. thick, black, fairly smooth; sap-wood white; heart-wood brown-green; flower-buds green).

Elaeocarpus chloranthus is probably most closely related to *E. terminalioides* Schlechter, differing in its glabrous and obtuse or rounded rather than short-acuminate leaf-blades, its shorter and more compact inflorescences, its much larger petals with acute rather than obtuse and somewhat dilated segments, and its longer stamens.

Elaeocarpus (§ *Ganitrus*) **orohensis** Schlechter in Bot. Jahrb. **54**: 130. 1916.

NETHERLANDS NEW GUINEA: Valley of Oroh River, alt. 1300 m., *Pulle 1133* (TYPE COLL.), Feb. 24, 1913.

This is one of the species which Schlechter described very briefly, referring to a number of Nova Guinea which has not been published. Since he gives a few notes and dimensions, however, the species must be considered validly published. The exact locality is in doubt, "Oroh" being taken from a hand-written label and probably not accurate; the specimen was collected in the region south of Mt. Wilhelmina.

Schlechter's examination of the specimen must have been superficial, for he refers it to § *Blepharoceras*, a section characterized by having trilocular ovaries with the locules at least 6-ovulate. *Pulle 1133* has the locules 4-ovulate and either 4 or 5 in number; 4- and 5-locular ovaries occur about equally in the several flowers I have dissected. The species is clearly a member of § *Ganitrus*, in which it is probably related to *E. cuneifolius* Schlechter. The leaf-blades of *E. orohensis* are peculiarly rugulose on both surfaces with scattered elevations having the appearance of blisters. Because of the inadequacy of the original publication, I here redescribe the species.

Arbor ad 20 m. alta (ex Schlechter), ramulis teretibus brunneis juvenilibus puberulis mox glabris; petiolis supra complanatis mox glabratis 1–1.5 cm. longis; laminis chartaceis utrinque glabris et disperse rugulosis, siccitate viridi-olivaceis, obovato-ellipticis, 12–15 cm. longis, 5–7.5 cm. latis, basi et apice obtusis, margine anguste recurvato inconspicue crenulato-serratis (dentibus circiter 2 per centimetrum), costa supra elevata interdum canaliculata subtus prominente, nervis lateralibus utrinsecus 7–10 arcuatis utrinque elevatis, rete venularum copioso intricato utrinque valde prominulo; racemis axillaribus vel infra folia orientibus subrectis 10–15 (ad 20 ex Schlechter) cm. longis, pedunculo brevi et rhachi striata circiter 1.5 mm. diametro pedicellisque minute puberulis; floribus numerosis, pedicellis gracilibus sub anthesi 6–10 mm. longis, alabastris angustis 4–5 mm. longis; sepalis papyraceis acutis deltoideo-lanceolatis, 4–5 mm. longis, circiter 1.5 mm. latis, utrinque puberulis, intus glabratis; petalis membranaceis e basi angustata cuneatis, 5.5–6 mm. longis, 3–4 mm. latis, margine inferne puberulis ceterum glabris, in segmenta 25–30 linearia acuta irregularia circiter 2 mm. longa profunde fimbriatis; disco annulari-pulvinato circiter 0.5 mm. alto minute velutino-puberulo, lobis 5 oblongis confluentibus; staminibus 15–17 erectis 2.5–3 mm. longis ubique obscure setuloso-puberulis, filamentis brevibus gracilibus, antheris circiter 2 mm. longis apice acutis et minute hispidulis; ovario pallide sericeo 4- vel 5-loculari, loculis 4-ovulatis, stylo subulato circiter 4 mm. longo basim versus sericeo superne glabro.

Elaeocarpus (§ *Ganitrus*) **leptopus** sp. nov.

Arbor ubique partibus juvenilibus puberulis inflorescentiisque exceptis glabra, ramulis gracilibus subteretibus vel primo leviter angulatis; petiolis gracilibus 15–18 mm. longis supra complanatis et obscure sericeo-puberulis: laminis chartaceis in sicco fusco-olivaceis ellipticis, 8–11 cm. longis, 3–4.5 cm. latis, basi obtusis et in petiolum decurrentibus, in apicem brevem obtusum vel minute emarginatum cuspidatis, margine inconspicue crenato-serrulatis (dentibus 2–4 per centimetrum), supra nitidis, costa supra leviter subtus valde prominente, nervis lateralibus utrinsecus 8–12 patentibus anastomosantibus utrinque valde prominulis subtus in axillis saepe domatiiferis, rete venularum utrinque prominulis; racemis e ramulis infra folia ortis

sub anthesi 10–20 cm. longis multifloris, pedunculo brevi et rhachi gracili striata 0.5–1 mm. diametro pedicellisque sparse puberulis mox glabratis, pedicellis gracillimis sub anthesi 5–8 mm. longis; sepalis submembranaceis deltoideo-lanceolatis acutis, circiter 3.5 mm. longis et 1 mm. latis, extus sparse puberulis glabratis, intus glabris; petalis membranaceis obovato-cuneatis, circiter 4.5 mm. longis, 2.5–3 mm. latis, margine medium versus ciliolatis ceterum glabris, in lacinias 15–17 inaequales 1–2 mm. longas lineares obtusas fissis; disco annulari-pulvinato indistincte 5-lobato circiter 0.4 mm. alto minute hispidulo; staminibus circiter 15 erectis 2–2.8 mm. longis, filamentis gracilibus ad 1 mm. longis, antheris 1.5–1.8 mm. longis apice obtusis et setas 1–3 breves gerentibus; ovario subgloboso obscure hispidulo-sericeo 4- vel 5-loculari, loculis 4-ovulatis, stylo subulato glabro 2–2.5 mm. longo.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, alt. about 1000 m., *Clemens 2022* (TYPE), Mar. 12, 1936.

Although clearly a member of § *Ganitrus*, *E. leptopus* has flowers unusually small for the section. They approach those of *E. orohensis* Schlechter in size and shape of parts, but they are even smaller and have the petals less copiously laciniate. The rhachises and pedicels of the new species are much more slender than those of *E. orohensis*, while the leaves are smaller and different in shape and texture. Like *E. orohensis*, *E. leptopus* has its ovaries either 4- or 5-locular.

Elaeocarpus (§ *Ganitrus*) **savannarum** sp. nov.

Arbor ad 7 m. alta, ramulis juvenilibus angulatis sericeo-puberulis mox subteretibus glabratisque; petiolis gracilibus 8–15 mm. longis ut ramulis puberulis glabratis supra complanatis; laminis chartaceis fusco-viridibus oblongo-ellipticis, 7–11 cm. longis, 2–4 cm. latis, basim versus attenuatis et in petiolum decurrentibus, apice breviter et obtuse cuspidatis, margine inconspicue crenulato-serrulatis (dentibus 3–5 per centimetrum), costa supra saepe subplana subtus prominente, nervis lateralibus utrinsecus 6–10 adscendentibus supra leviter subtus valde prominulis et in axillis interdum domatiiferis, rete venularum utrinque prominulo vel supra subimmerso; racemis axillaribus sub anthesi 7–12 cm. longis multifloris, pedunculo brevi et rhachi striata circiter 0.5 mm. diametro pedicellisque arcte puberulis, pedicellis gracilibus sub anthesi 5–6 mm. longis; sepalis papyraceis deltoideo-lanceolatis acutis, circiter 3 mm. longis et 1 mm. latis, utrinque minute puberulis et glabratis; petalis membranaceis obovato-cuneatis, circiter 4 mm. longis, 2–2.5 mm. latis, praeter marginem medium versus puberulum ubique glabris, in lacinias 13–17 inaequales lineari-lanceolatas 1–2 mm. longas apice obtusas et paullo incrassatas fissis; disco annulari-pulvinato 5-lobato circiter 0.5 mm. alto minute hispidulo; staminibus 12 vel 13 uniseriatis 1.5–1.8 mm. longis, filamentis gracilibus brevibus, antheris 1.2–1.3 mm. longis apice obtusis et setas 1–3 circiter 0.5 mm. longas gerentibus; ovario subgloboso minute hispidulo 4-loculari, loculis 4-ovulatis, stylo subulato glabro circiter 2 mm. longo.

NETHERLANDS NEW GUINEA: Vicinity of Hollandia, alt. 20–100 m., *Brass 8814* (TYPE), June 14, 1938 (tree 6–7 m. high, common in small forest clumps on secondary savannas; flowers white).

Like the preceding new species (*E. leptopus*), *E. savannarum* has un-

usually small flowers for § *Ganitrus*, and in this species the ovaries are apparently uniformly 4-locular. *Elaeocarpus savannarum* has the sepals, petals, and anthers slightly smaller than those of *E. leptopus*, while its racemes are shorter and its leaf-blades are duller, with more ascending secondaries and less obvious veinlet-reticulation. The two species are very closely allied.

Elaeocarpus (§ *Ganitrus*) **fauroensis** Hemsl. in Kew Bull. 1896: 159. 1896; Schlechter in Bot. Jahrb. 54: 143. 1916.

SOLOMON ISLANDS: Bougainville: Kugumaru, Buin, alt. 150 m., *Kajewski 1900* (tree to 25 m. high, common in rain-forest; fruit blue; wood used for house-building by natives; native name: *ou-kari-pe*); Guadalcanal: Uulolo, Tutuve Mt., alt. 1200 m., *Kajewski 2495* (tree up to 30 m. high, common in rain-forest; trunk straight; fruit purple, eaten by cockatoos and pigeons; native name: *hy-cundi*).

Hemsley's brief description of the type specimen, collected on Fauro Island, applies very well to the above-cited specimens, both of which, like the type, are in fruit. The leaf-blades of the Kajewski specimens are mostly slightly smaller than those described by Hemsley, averaging about 15 × 4.5 cm., but some of them attain the dimensions of 18 × 5.5 cm., very close to the 7–8 × 2–2.5 inches stated in the original description. The available fruits are subglobose-ellipsoid, 2–3 cm. in diameter, with a comparatively thick and hard rugulose epicarp (often 1 mm. thick). The endocarp is very hard and bony, with numerous irregular processes 2–4 mm. long. The locules are 5, but sometimes all except 1 or 2 are small and empty. The seeds are dark brown and glossy, about 1 cm. long, and acute at both ends.

Schlechter saw no material of this species and did not attempt to place it. The characters of the foliage and fruit are unmistakably those of § *Ganitrus*, but without flowers I cannot indicate the immediate alliance of the plant.

Elaeocarpus (§ *Ganitrus*) **breviracemosus** Knuth in Rep. Sp. Nov. 48: 73. 1940.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass 7654* (TYPE COLL.) (spur-buttressed canopy tree, common in rain-forest; bark brown, thin, marked with shallow longitudinal fissures; fruit blue).

The fruits of this species, not described by Knuth, are borne on slender spreading racemes up to 9 cm. long, arising from the older parts of branchlets. The pedicels are 15–18 mm. long and fairly thick. The fruits are subglobose, about 2 cm. in diameter, with a smooth hard epicarp about 0.5 mm. thick and a somewhat fibrous mesocarp about 2 mm. thick. The endocarp is hard and bony, irregularly rugulose but without conspicuous processes; the locules are 5, each 1-seeded, but it is likely that sometimes fewer locules are fertile.

The species is unmistakably a member of § *Ganitrus*, but it cannot be more definitely placed without flowers.

5. § FISSIPETALUM

Elaeocarpus § Fissipetalum Schlechter in Bot. Jahrb. 54: 118. 1916.

Schlechter originally based this section on five species, among which *E. arfakensis* Schlechter (inadequately described) is anomalous because of its

densely tomentellous lower leaf-surface. The remaining four species have glabrous leaves. The only species illustrated is *E. polydactylus* Schlechter, and this obviously has all the characters which Schlechter intended to apply to the section. Therefore it seems advisable to designate *E. polydactylus* as the lectotype of § *Fissipetalum*.

Since Schlechter's work, several other species have been described which may be referred to § *Fissipetalum*: *E. Pulleanus* O. C. Schmidt, *E. azaleifolius* Knuth, and *E. Brassii* Knuth. These species are discussed below, and under the discussion of *E. azaleifolius* I also suggest that *E. crenulatus* Knuth may belong to this section. From the description, it seems probable that *E. koebrensis* Gibbs also belongs to § *Fissipetalum*, in which case its alliance may be with *E. Pulleanus* and its relatives or possibly with *E. arfakensis*. This latter species and two relatives described below as new differ from the remaining species of § *Fissipetalum* in the close tomentellous indument of their lower leaf-surfaces and inflorescences. In habit, they thus suggest certain species of § *Blepharoceras* (*E. latescens* F. v. Muell. and its allies, discussed below), but in essential floral characters *E. arfakensis* and its relatives appear to belong in § *Fissipetalum*.

To the eight or ten species which thus already constitute § *Fissipetalum*, I herewith add seven new species below. The section is fairly coherent, in spite of a great range of variation in leaf-size, as indicated by the extremes of *E. myrtoides* and *E. decorus*, both proposed as new. Its diagnostic characters are as follows: inflorescence slender, axillary, associated with the leaves (at least at anthesis), ascending; flowers small, the petals up to 6 mm. long, more or less equally 5–36-fimbriate in the distal half or third, usually essentially glabrous; stamens 10–30, erostrate but often apiculate or hispid-setulose at apex; ovary sericeous, puberulent, or glabrous, 2- or 3-locular, each locule 4-ovulate (occasionally 2-ovulate in *E. roseo-albus* and 6-ovulate in *E. polydactylus*, both discussed below); fruit globose to ellipsoid, comparatively thick-walled, usually unilocular at maturity, the endocarp rugulose or sulcate or pitted but not conspicuously ornamented (except in *E. sericoloides*, an aberrant new species with ornamented endocarp, discussed below).

Elaeocarpus (§ *Fissipetalum*) **roseo-albus** Schlechter in Bot. Jahrb. 54: 119. 1916.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, alt. 1800 m., *Brass 12015* (slender subsidiary tree 12–15 m. high, frequent in mossy-forest; leaves convex; calyx red; petals white).

The cited collection is referred to *E. roseo-albus* with reasonable certainty, in spite of minor differences in dimensions, etc. The type of the species was obtained in the Sepik region of Northeastern New Guinea at 2070 m. The most striking difference between the Brass plant and Schlechter's description lies in the fact that the ovules are predominantly two in each of the three locules in our specimen; occasionally the ovules are three, and rarely four. Four is the only number mentioned in the original description, and indeed this number of ovules was considered uniform for § *Fissipetalum* by Schlechter. However, it is obvious that *Brass 12015* cannot belong to any of Schlechter's first three sections, in which paired

ovules are universal; just as obviously, § *Fissipetalum* is the proper place for this collection, and therefore one must assume that the number of ovules is more variable than indicated by Schlechter.

The leaf-blades of *Brass 12015* sometimes attain the dimensions of 5.5 × 2.5 cm., but as a rule they approximate the size of 5 × 1.5 cm. indicated for *E. roseo-albus*. The petals of our collection, fully mature, measure about 3 × 1.5 mm. and are 9–11-laciniate; the disk is 5-lobed with each lobe slightly grooved; the stamens are 12–14, with anthers 0.8–1 mm. long and obscurely setulose at apex; the flowers are very rarely 4-merous. These slight variations, as compared with Schlechter's description, indicate the only points in which our plant differs from his. The fruits of *Brass 12015*, which may not be fully mature, are ellipsoid, up to 8 × 5 mm., with a pericarp about 1.5 mm. thick and a single seed. The epicarp is thin and rugulose when dry; the endocarp is thick and woody, with longitudinal grooves.

Elaeocarpus (§ *Fissipetalum*) **myrtoides** sp. nov.

Arbor 5–6 m. alta multiramosa dense foliata, ramis ramulisque subteretibus glabris cinereis copiose et conspicue verrucoso-lenticellatis, ramulis hornotinis rubris gracillimis; petiolis gracilibus canaliculatis 1–3 mm. longis; laminis parvis coriaceis saepe convexis obovato-ellipticis, 10–20 mm. longis, 5–8 mm. latis, basi gradatim angustatis et in petiolum decurrentibus, apice obtusis vel rotundatis, margine utrinsecus dentibus 3–5 crenulato-serratis, utrinque glabris (juventute sericeo-puberulis), costa supra impressa subtus prominente, nervis lateralibus utrinsecus plerumque 3 adscendentibus et rete venularum subtus prominulis; racemis axillaribus 1–2 cm. longis paucifloris, rhachi gracili glabra leviter angulata, pedicellis 6–8 mm. longis obscure sericeis vel glabratis; sepalis papyraceis acutis oblongo-lanceolatis, circiter 4 × 1.5 mm., extus inconspicue pallido-sericeis, intus glabris et carinatis; petalis submembranaceis obovato-oblongis circiter 4 × 1.5 mm., extus copiose sericeis, intus glabris, apice in segmenta circiter 6 subaequalia 0.6–1 mm. longa obtusa dissectis; disci lobis 5 late oblongis circiter 0.5 mm. altis, superne hispidulis; staminibus circiter 15 erectis 2.8–3 mm. longis, filamentis gracilibus glabris, antheris 1.7–2 mm. longis apice acutis et obscure hispidulis; ovario glabro biloculari, loculis 4-ovulatis, stylo brevi; fructibus ovoideo-ellipsoideis ad 10 × 6 mm. (immaturis?), basi rotundatis, apice obtusis et basi styli subpersistente coronatis, pericarpio (epicarpio ruguloso et endocarpio osseo inclusis) 1.5–2 mm. crasso, semine solitario.

BRITISH NEW GUINEA: Central Division, Murray Pass, Wharton Range, alt. 2840 m., *Brass 4505* (A, NY, TYPE), July 15, 1933 (much-branched shapely tree 5–6 m. high, common in forests; branchlets, petioles, leaf-margins, rachises, and pedicels red; leaf-blades with nerves impressed above; sepals yellow-brown; petals pale yellow; fruit olive-green).

Elaeocarpus myrtoides is clearly distinguished by its very small leaves, much smaller than those of any other species of § *Fissipetalum*. Its petals, with few and short teeth, suggest those of *E. roseo-albus* Schlechter but are larger. The glabrous bilocular ovary and the very short few-flowered inflorescences further distinguish the new species from its close relatives.

Elaeocarpus (§ *Fissipetalum*) **polydactylus** Schlechter in Bot. Jahrb. 54: 119. *fig. 6.* 1916.

NORTHEASTERN NEW GUINEA: Morobe District, Yunzaing, alt. 1650 m., *Clemens 3731;* Busu, alt. 1800–2400 m., *Clemens 6275.*

The cited specimens appear to fall into a reasonable concept of Schlechter's species, although the leaf-blades are sometimes larger (up to 7.5 × 2.5 cm.) than those originally described, while the petals at maturity are larger (up to 5 mm. long) and only 10- or 11-laciniate (rather than 12–15-laciniate). Otherwise our specimens agree precisely with the description and illustration. Schlechter has described a var. *podocarpoides* with leaf-blades up to 12 × 4 cm. Both the species and the variety are based on material from the Sepik region, at elevations of 1000–1350 m.

Clemens 3731 may have the locules either 4- or 6-ovulate, both conditions having been observed in a single flower. Therefore the 4-ovulate characterization of § *Fissipetalum* must be modified to permit the inclusion of occasional plants with 6-ovulate ovary-locules.

Elaeocarpus (§ *Fissipetalum*) **azaleifolius** Knuth in Rep. Sp. Nov. 48: 72. 1940.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, alt. 2400 m., *Brass 5002* (A, NY) (tree 12–13 m. high, uncommon in ridge-crest forests; crown flat, spreading, thinly foliaged; branchlets, petioles, leaf-costas, and rhachises reddish; flowers cream-colored; fruits blue-green).

The cited specimens precisely agree with the original description of *E. azaleifolius,* reported from the nearby Mt. Victoria at 2300 m. The ovary, not described in detail by Knuth, is 3-locular, with 4 ovules in each locule. Although the leaf-blades of the Brass specimen average in size, as those of Mt. Victoria material, about 3.5 × 1.3 cm., some of them attain a size of 5 × 2.2 cm. The fruits of *Brass 5002* are ellipsoid, up to 12 × 10 mm., with a pericarp about 3 mm. thick and a single seed. The endocarp is hard and woody, with narrow grooves. *Elaeocarpus azaleifolius* is a very close relative of *E. polydactylus* Schlechter, differing principally in its more obtuse and more obscurely crenate leaf-blades, shorter pedicels, and larger sepals and petals.

It seems probable that *E. crenulatus* Knuth (in Rep. Sp. Nov. 48: 74. 1940) also belongs in § *Fissipetalum;* it is based on a sterile specimen also from Mt. Victoria. According to the description, the leaves differ from those of *E. azaleifolius* only in having slightly longer petioles and broader blades.

Elaeocarpus (§ *Fissipetalum*) **mundulus** sp. nov.

Arbor 12 m. alta partibus juvenilibus inflorescentiisque exceptis glabra, ramulis teretibus gracilibus cinereis; petiolis leviter canaliculatis gracilibus 4–10 mm. longis; laminis coriaceis saepe convexis anguste obovato-ellipticis, (3–) 4.5–6 cm. longis, (1–) 1.5–2.5 cm. latis, basi attenuatis et in petiolum decurrentibus, apice obtusis vel rotundatis, margine recurvato obscure crenulato-serratis (dentibus 2 vel 3 per centimetrum), costa supra paullo subtus valde elevata, nervis lateralibus utrinsecus 4–7 brevibus adscendentibus et rete venularum copioso utrinque prominulis; racemis axillaribus erectis 4–9.5 cm. longis multifloris, pedunculo brevi et rhachi angulata minute sericeo-puberulis, floribus subconfertis saepe secundis, pedicellis gra-

cilibus 3–5 mm. longis glabratis; sepalis papyraceis deltoideo-lanceolatis circiter 4.5 × 1.5 mm. acutis, extus sparse puberulo-sericeis, intus glabratis; petalis submembranaceis ex ungue parvo obovato-cuneatis, 5–6 mm. longis, 2–3 mm. latis, in segmenta 11–13 lineari-lanceolata obtusa 1.5–2.5 mm. longa irregulariter dissectis, margine basim versus minute puberulis, ceterum glabris; disco annulari-pulvinato circiter 0.5 mm. alto superne hirsutulo, lobis 5 oblongis confluentibus; staminibus 17–20 erectis 2–2.8 mm. longis, filamentis gracilibus glabris, antheris 1.5–1.8 mm. longis apice obtuso obscure hirtellis; ovario breviter sericeo 3-loculari, loculis 4-ovulatis, stylo subulato 3.5–4 mm. longo glabro; fructibus (unico viso) globoso-ellipsoideis ad 11 × 9 mm., pericarpio crasso, epicarpio ruguloso.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, alt. about 2800 m., *Brass & Versteegh 10496* (TYPE), Nov. 1, 1938 (tree 12 m. high, frequent in mossy-forest; trunk 27 cm. diam.; crown small; bark 6 mm. thick, dark brown, fairly rough; flowers white).

Elaeocarpus mundulus is most closely allied to *E. azaleifolius* Knuth, from which it differs in its longer petioles and longer and proportionately narrower leaf-blades, which are somewhat thicker in texture, more convex, and with less obvious crenulations. The flowers of the two species are very similar, those of *E. mundulus* being slightly the larger in sepals and petals.

Elaeocarpus (§ *Fissipetalum*) **Brassii** Knuth in Rep. Sp. Nov. **48**: 73. 1940.

BRITISH NEW GUINEA: Western Division, Middle Fly River, Lake Daviumbu, *Brass 7450* (TYPE COLL.) (tree 10 m. high, common on small pieces of dry ground in marshes; flowers cream-colored), *Brass 7566* (tree to 25 m. high, plentiful in thin fringing forests of drier lake-shores; stem deeply fluted, covered with gray lenticellate bark; flowers cream-colored); Wuroi, Oriomo River, alt. 30 m., *Brass 5802* (A, NY) (tree 10 m. high, in small isolated forest patch on savanna; foliage pale, shining; fruit bright blue).

The species is clearly a member of § *Fissipetalum*, related to *E. polydactylus* Schlechter; its two ovary-locules contain four ovules each. *Brass 7566* has been reported by Knuth as the type collection of an unpublished species, but I fail to find any consequential differences between it and the type of *E. Brassii*, from the same locality. The leaf-blades of no. *7566* are slightly narrower than those of no. *7450* and have more ascending nerves and more obvious crenations, but these appear to be minor individual points; in inflorescence the two plants scarcely differ. *Brass 5802*, a fruiting specimen, precisely matches the type collection in foliage. The fruits are ellipsoid, up to about 15 × 10 mm. when fresh, with a pericarp 3–4 mm. thick and a solitary seed. The epicarp is bright blue and thin, becoming coarsely wrinkled when dry. The endocarp is hard and somewhat woody, with inconspicuous irregular lobes.

Elaeocarpus (§ *Fissipetalum*) **nubigenus** Schlechter in Bot. Jahrb. **54**: 120. 1916.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, alt. 2800 m., *Brass 10576* (slender tree 10–15 m. high, common along banks of streams; sepals brown; petals white; unripe fruit green). BRITISH NEW GUINEA: Central Division, Murray Pass, Wharton Range, alt. 2840 m., *Brass 4510* (A, NY), *4540* (A, NY), *4545* (A, NY) (straggling large shrubs or small trees, sometimes up to 13 m. high, often common in forests or more frequently on forest-borders; leaf-blades shining above; branchlets, petioles, leaf-margins and nerves, and rachises red or reddish brown; pedicels and calyx pale greenish yellow or yellow-brown; petals cream-colored; fruit blue).

The cited specimens can be referred with reasonable confidence to *E. nubigenus*, based on *Schlechter 18791* from the Bismarck Mts. of Northeastern New Guinea at 2500 m. Naturally a considerable range of dimensions is evident in the several available specimens. The leaf-blades were originally described as 6–8 × 3.2–5 cm., and this is about the average size, but our specimens have leaf-blades up to 10 × 6.2 cm. (*Brass 4510*). Schlechter states that the blades are "subintegra," but ours would be better described as definitely crenate, at first spinulosely so, with the crenulations 2 or 3 per centimeter. Our specimens have racemes up to 13 cm. long; the sepals and petals are as described by Schlechter, the latter having 16–18 laciniae. The stamens (lacking in the type collection) are about 13–17 in number, 2–3 mm. long, with short filaments and anthers 1.5–2.3 mm. long and obscurely hispidulous at the blunt apex. The fruits (*Brass 4510* and *10576*) are ellipsoid, up to 18 × 12 mm. at apparent maturity, with a pericarp 2–3 mm. thick and 1 or 2 seeds; the epicarp is conspicuously rugulose when dry, and the endocarp is thick and irregularly shallowly lobed.

Elaeocarpus (§ *Fissipetalum*) **Pulleanus** O. C. Schmidt in Nova Guin. Bot. 14: 154. *pl. 16B, f. 1–8.* 1924.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, alt. 2900 m., *Brass 10640* (tree 5–6 m. high, in disturbed forest on edge of a native rest clearing; leaves stiff, convex; fruit blue).

The cited specimen agrees well with the original description of this species, which is based on a collection from the northern slope of the central range of Netherlands New Guinea at 1450–3260 m. altitude. Schmidt describes the leaf-blades as being 4–5.5 × 2.6–3.5 cm., but his plate shows a blade up to 6 cm. long. *Brass 10640* has the leaf-blades 4–8 cm. long and 2.5–4.5 cm. broad. The flowers of our specimen are mostly immature, but they agree well with those described, except that the ovary appears to be 3- rather than 2-locular. The mature fruits accompanying no. *10640* are ellipsoid, up to 17 × 12 mm., obtuse at base and apiculate at apex. The epicarp is hard and comparatively thick, the mesocarp is sparsely fibrous, and the endocarp is bony, 2–3 mm. thick, and irregularly sulcate; the locule is single and 1-seeded. The species appears to be more closely related to *E. nubigenus* Schlechter than to *E. polydactylus* Schlechter, as suggested by Schmidt.

Elaeocarpus (§ *Fissipetalum*) **Archboldianus** sp. nov.

Arbor ad 19 m. alta, ramulis crassis apicem versus ad 5 mm. diametro valde angulatis strigoso-puberulis, mox glabratis, ramulis vetustioribus subteretibus cinereis; petiolis rugulosis crassis canaliculatis cito glabratis 8–17 mm. longis; laminis subcoriaceis in sicco olivaceis obovato- vel elliptico-oblongis, 7–13.5 cm. longis, 2.5–6.5 cm. latis, basi subacutis et in petiolum decurrentibus, apice obtuse cuspidatis vel rotundatis, margine anguste recurvatis et crenulato-serratis (dentibus 3 vel 4 per centimetrum), supra glabris nitidisque, subtus brunneo-punctatis et costa nervisque primo saepe strigoso-hirtellis cito glabratis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 6–12 erecto-patentibus anastomosantibus

supra prominulis subtus valde elevatis et in axillis saepe domatiiferis, rete venularum copiose intricato supra paullo subtus valde prominulo; racemis axillaribus 11–18 cm. longis erectis multifloris, pedunculo brevi et rhachi leviter angulata 1–2 mm. diametro pedicellisque dense tomentello-puberulis demum glabratis, pedicellis saepe curvatis sub anthesi 5–8 mm. longis; sepalis papyraceis acutis deltoideo-lanceolatis, 4.5–5.5 mm. longis, 1.5–1.8 mm. latis, extus breviter sericeis, intus obscure puberulis glabratis carinatis; petalis membranaceis basim versus carnoso-incrassatis, obovato-cuneatis, 5–6 mm. longis, 2–3 mm. latis, apice rotundatis et in lacinias 18–36 lineares obtusas 1–2 mm. longas irregulariter fissis, praeter marginem medium versus tomentello-ciliolatum glabris; disco carnoso annulari-pulvinato 5-lobato circiter 0.8 mm. alto minute hispidulo; staminibus 25–30 erectis 2.5–3 mm. longis, antheris 1.7–2.3 mm. longis apice obtusis et setas 1–3 ad 0.2 mm. longas gerentibus vel ebarbellatis; ovario conico-ellipsoideo 3-loculari et styli basi breviter sericeis, loculis 4-ovulatis, stylo subulato 2.5–3 mm. longo; rhachi pedicellisque sub fructu valde incrassatis, fructibus ellipsoideis ad 20 mm. longis et 11 mm. latis, basi obtusis, apice cuspidatis, epicarpio duro crasso, mesocarpio subnullo, endocarpio 2–4 mm. crasso osseo extus profunde et irregulariter sulcato, loculo plerumque unico, semine solitario.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt. 2300 m., *Brass & Versteegh 11127* (TYPE), Nov. 16, 1938 (tree 19 m. high, common in old secondary forest; trunk 38 cm. diam.; crown not wide-spreading; bark 8 mm. thick, black-brown, rough, shallowly fissured; outer wood white; inner wood dark brown; flowers white; fruits green), *Brass 11414* (substage tree 14 m. high, in fagaceous forest; flowers greenish white).

Elaeocarpus Archboldianus is a species of the relationship of *E. nubigenus* Schlechter and *E. Pulleanus* O. C. Schmidt, differing from both in its larger leaf-blades, longer inflorescences, and more copiously laciniate petals, from the former also in its thicker and sometimes pilosulous leaf-blades, and from the latter also in its longer petioles. The petal-segments are 30–36 in the type collection and usually 18–20 in no. *11414*, but the plants are otherwise identical.

Elaeocarpus (§ *Fissipetalum*) **decorus** sp. nov.

Arbor, ramulis crassis apicem versus valde angulatis 3–6 mm. diametro, juvenilibus dense brunneo-tomentellis, vetustioribus glabratis subteretibus cinereis; petiolis crassis supra complanatis 7–15 mm. longis ut ramulis tomentellis demum glabratis; laminis subcoriaceis siccitate fusco-olivaceis obovato-ellipticis, 10–22 cm. longis, 3.5–8 (–11) cm. latis, basim versus gradatim angustatis et basi in petiolum decurrentibus, apice rotundatis vel late obtusis interdum paullo emarginatis vel minute cuspidatis, margine leviter recurvatis et dentibus 3–6 per centimetrum primo spinuloso-serrulatis demum inconspicue crenulatis, supra costa interdum tomentella excepta glabris et subnitidis, subtus obscure punctatis et praecipue costa nervisque hirtellis demum subglabratis, costa supra leviter elevata subtus prominente, nervis lateralibus utrinsecus 13–20 erecto-patentibus valde anastomosantibus supra prominulis subtus peracute elevatis, rete venularum copioso utrinque prominulo; racemis axillaribus vel interdum e ramulis infra folia orientibus sub anthesi 14–22 cm. longis multifloris, pedunculo ad 2 cm. longo et rhachi angulata 1–2 mm. diametro pedicellisque arcte tomentellis,

bracteis oblongo-linearibus obtusis 5–7 mm. longis extus puberulis mox caducis, pedicellis gracilibus sub anthesi 5–11 mm. longis; sepalis papyraceis subacutis oblongo-lanceolatis, 3.5–4 mm. longis, 1.2–1.5 mm. latis, extus tomentello-puberulis, intus glabris; petalis membranaceis basim versus paullo incrassatis, anguste oblongo-cuneatis, 5–5.5 mm. longis, 1.7–2.5 mm. latis, praeter marginem medium versus puberulum glabris, in lacinias 10–16 lineares inaequales 1–2 mm. longas obtusas fimbriatis; disco annulari-pulvinato 5-lobato circiter 0.8 mm. alto dense hispidulo; staminibus 14–16 uniseriatis 2.2–3 mm. longis, filamentis gracilibus, antheris 1.7–2 mm. longis apice subacutis et setis 3–6 ad 0.15 mm. longis barbellatis; ovario conico-ellipsoideo 3-loculari et styli basi tomentello-puberulis, loculis 4-ovulatis, stylo subulato circiter 3 mm. longo superne glabro; rhachi pedicellisque sub fructu paullo incrassatis, fructibus ellipsoideis ad 16 × 13 mm., basi et apice rotundatis, epicarpio duro crasso ruguloso, mesocarpio subnullo, endocarpio osseo 3–4 mm. crasso profunde sulcato, maturitate loculo et semine solitario.

NORTHEASTERN NEW GUINEA: Morobe District, alt. 1200–1800 m.: Yunzaing, *Clemens 2420* (TYPE), Apr. 23, 1936, *3745;* Ogeramnang, *Clemens 4799* (tree 11 m. high, in forest; fruit blue), *5398;* Matap, *Clemens 11165* (tree, the trunk 20–25 cm. diam.; flower-buds with a dull purplish tinge; petals white); A-mieng, on Yaneng River, tributary of Buso River, *Clemens 12323* (sepals pink; petals dull white).

The type and no. *12323* bear inflorescences at anthesis, while nos. *3745* and *4799* are in fruit; the remaining collections bear immature inflorescences. Although no. *12323* has broader leaf-blades than the other specimens, there seems no doubt that all are conspecific. It seems that a plant so common in the Morobe District should have been described, but this well-marked species appears to be without a name. From its closest relatives, *E. Pulleanus* O. C. Schmidt and *E. Archboldianus* (above described), it differs in its substantially larger leaf-blades with more numerous secondary nerves, its fewer stamens, and its comparatively broader fruits; the fruits of both *E. Pulleanus* and *E. Archboldianus* are narrower, obtuse at base, and cuspidate or apiculate at apex. *Elaeocarpus decorus* is further differentiated from *E. Pulleanus* by its longer petioles and racemes, and from *E. Archboldianus* by its less copiously laciniate petals.

Elaeocarpus (§ *Fissipetalum*) **arfakensis** Schlechter in Bot. Jahrb. 54: 118. 1916.

This species, based on *Gjellerup 1198* from the Arfak Mts. of Netherlands New Guinea, was inadequately described, but nevertheless it must be considered validly published because of Schlechter's notes. It is said to differ from the other species of § *Fissipetalum* in its thickly tomentellous lower leaf-surfaces.

Kanehira & Hatusima 14031 and *14072*, also from the Arfak Mts., are probably correctly referred to *E. arfakensis* by the collectors, although, in the absence of an adequate description and without consultation of an isotype, such identification is open to question.

Elaeocarpus (§ *Fissipetalum*) **alpestris** sp. nov.

Arbor ad 25 m. alta dense foliata, ramulis subteretibus apicem versus 3–5 mm. diametro densissime brunneo-tomentello-velutinis, ramulis vetustioribus demum cinereis glabratisque; petiolis crassis 2–7 mm. longis ut ramulis dense tomentellis; laminis coriaceis in sicco fuscis ellipticis vel

obovato-ellipticis, 2.5–6 cm. longis, 1.7–3.8 cm. latis, basi et apice rotundatis vel late obtusis, margine leviter recurvatis et dentibus 2–5 per centimetrum serrulatis, supra primo cano-sericeis cito glabratis, subtus densissime brunneo-tomentello-velutinis demum interdum subglabratis, costa supra leviter elevata subtus prominente, nervis lateralibus utrinsecus 5–7 erecto-patentibus supra leviter subtus conspicue elevatis, rete venularum utrinque prominulo subtus indumento occulto; racemis axillaribus suberectis angustis 15–20-floris, pedunculo brevi et rhachi subteretibus robustis 4–7 cm. longis cum bracteis pedicellisque ut ramulis densissime tomentellis, bracteis lanceolatis acutis ad 7 mm. longis mox caducis, pedicellis saepe reflexis sub anthesi 3–5 mm. longis; sepalis tenuiter carnosis oblongo-lanceolatis, 3–4.5 mm. longis, 1.2–1.5 mm. latis, acutis, extus dense et arcte tomentellis, intus carinatis et sericeo-puberulis vel glabratis; petalis membranaceis obovato-cuneatis, 3.5–5 mm. longis, 2–2.5 mm. latis, in segmenta 14–20 filiformia obtusa subaequalia circiter 1 mm. longa laciniatis, margine puberulo excepto glabris vel extus basim versus sparse sericeis; disco continuo 5-lobato 0.4–0.6 mm. alto copiose brunneo-hispidulo; staminibus 14–20 circiter 2.5 mm. longis, filamentis gracilibus circiter 0.7 mm. longis glabris, antheris 1.5–1.8 mm. longis ubique obscure hispidulo-papillosis apice obtusis et setas 1–3 minutas interdum gerentibus; ovario ovoideo 3-loculari et styli basi copiose brunneo-sericeis, loculis 4-ovulatis, stylo subulato 1.5–2 mm. longo superne glabro; pedicellis sub fructu ad 1 cm. longis; fructibus coriaceis ellipsoideis maturitate ad 18 × 13 mm., pericarpio 3–4 mm. crasso, epicarpio duro ruguloso, mesocarpio subnullo, endocarpio osseo ruguloso et leviter sulcato, loculo unico, semine solitario.

NETHERLANDS NEW GUINEA: Lake Habbema, alt. 3225 m., *Brass 9092* (TYPE), Aug. 1938 (densely foliaged tree 4–10 m. high, plentiful in closed forest and sometimes in the taller mossy thickets of peat ridges; petals white; mature fruit blue), *Brass & Myer-Drees 10434* (tree 8 m. high, in forest; trunk 31 cm. diam. [sterile]); 9 km. northeast of Lake Habbema, alt. 2900 m., *Brass & Versteegh 10460* (tree about 25 m. high, rare in mossy-forest; trunk 45 cm. diam.; crown very small, dark; bark 16 mm. thick, black, rough; outer wood white; inner wood brown; flowers pale yellow).

Among described species, *E. alpestris* is to be compared only with *E. arfakensis* Schlechter, with which it has in common densely tomentellous leaves and inflorescences and a type of flower suggesting § *Fissipetalum*, with 4-ovulate ovary-locules. The only definite statement about the flowers of *E. arfakensis* given by Schlechter indicates that the petals have about 10 segments; those of *E. alpestris* have 14–20 segments. If the Kanehira and Hatusima specimens mentioned above are correctly referred to *E. arfakensis*, that species further differs from *E. alpestris* in its smaller and less obviously toothed leaves with closer tomentum.

Elaeocarpus (§ *Fissipetalum*) **dasycarpus** sp. nov.

Arbor ad 16 m. alta dense foliata, ramis ramulisque subteretibus, ramulis juvenilibus circiter 2.5 mm. diametro densissime brunneo-tomentello-velutinis, ramulis vetustioribus glabratis; foliis confertis, petiolis inconspicuis 1–2 mm. longis ut ramulis tomentellis anguste alatis, laminis coriaceis in sicco fuscis ellipticis, 1.5–3.5 cm. longis, 1–2 cm. latis, basi obtusis et in petiolum decurrentibus, apice rotundatis vel late obtusis, margine dentibus 6–8 per centimetrum obscure spinuloso-serrulatis, supra glabris vel cito glabratis, subtus indumento ferrugineo arcto dense tomentellis, costa supra

leviter subtus valde elevata, nervis lateralibus utrinsecus 6–9 brevibus patentibus supra subplanis subtus elevatis, rete venularum supra immerso subtus prominulo vel indumento occulto; racemis axillaribus sub alabastro 3–4 cm. longis ut videtur circiter 10-floris, rhachi robusta leviter angulata et bracteis pedicellisque densissime tomentellis, bracteis lanceolato-ellipticis circiter 6 mm. longis mox caducis, pedicellis visis circiter 2 mm. longis; floribus eis *E. alpestris* similibus, sepalis in alabastro ad 4.5 × 2 mm., segmentis petalorum circiter 20, staminibus circiter 25, antheris 1.7–2 mm. longis, ovario etiam 3-loculari et loculis 4-ovulatis; inflorescentiis sub fructu valde incrassatis, pedicellis ad 6 mm. longis et diametro; fructibus plerumque solitariis coriaceis obovoideo-ellipsoideis, maturitate ad 5.5 × 4.8 cm., pericarpio crassissimo, epicarpio tenui ruguloso, mesocarpio 1.5–2 mm. crasso fibroso, endocarpio lignoso 10–12 mm. crasso lacunis parvis hinc inde pervaso extus disperse scrobiculato, loculis 2 (vel interdum 1?), semine in quoque loculo solitario elongato utrinque subacuto.

BRITISH NEW GUINEA: Central Division, Murray Pass, Wharton Range, alt. 2840 m., *Brass 4742* (A, NY, TYPE), Aug. 7, 1933 (tree up to 16 m. high, with straight bole and dense crown; one of the principal trees in range-top forests; leaf-blades smooth and bluish green above, brown-pubescent beneath; fruits usually solitary, erect on thick stiff peduncles, bluish green, the putamen hard and pitted; native name: *oriso* [Kuama dialect]).

Elaeocarpus dasycarpus is closely allied to *E. alpestris* (described above), from which it differs in its subsessile leaf-blades, which are smaller, more finely and copiously serrulate, more closely tomentellous beneath, and with more immersed venation. Although only immature inflorescences of *E. dasycarpus* have been seen, it is probable that they will prove to be shorter and with fewer flowers than those of *E. alpestris*, while the sepals appear to be slightly broader and the stamens more numerous. Apparently mature fruits of both species are available, those of *E. dasycarpus* being much the larger and with a very thick hard pitted endocarp.

From *E. arfakensis* Schlechter, the new species differs in its more copiously fimbriate petals and doubtless in other characters, an analysis of which must await examination of the type of *E. arfakensis*.

Elaeocarpus (§ *Fissipetalum*) **sericoloides** sp. nov.

Arbor ad 30 m. alta, ramulis subteretibus fuscis juventute puberulis demum glabratis; foliis saepe oppositis vel subopppositis, interdum alternantibus, petiolis gracilibus canaliculatis puberulis 1–3 mm. longis, laminis chartaceis glabris (vel costa substrigosis) ovato-ellipticis, 4–7 cm. longis, 1.5–3 cm. latis, basi rotundatis vel late obtusis, ad apicem obtusum gradatim acuminatis, margine inconspicue crenulato-serratis (dentibus 2–4 per centimetrum), costa supra leviter subtus valde elevata, nervis lateralibus utrinsecus 5–8 patentibus anastomosantibus et rete venularum intricato utrinque prominulis; racemis axillaribus sub anthesi 2–4 cm. longis, pedunculo brevi et rhachi gracili pedicellisque minute cano-puberulis, floribus bracteis membranaceis lanceolatis caducis 2–3 mm. longis subtentis, pedicellis gracillimis sub anthesi 3–8 mm. longis; sepalis membranaceis glabris ovato-deltoideis, 3.5–4 mm. longis, circiter 1.7 mm. latis, acutis; petalis membranaceis glabris obovato-cuneatis, 3.5–4 mm. longis, circiter 1.5 mm. latis, dimidio superiore segmentis 10–12 linearibus obtusis regulariter laciniatis; disco continuo annulari-pulvinato circiter 0.5 mm. alto 5-crenulato minute

velutino; staminibus 12 vel 13 erectis 2–2.5 mm. longis, filamentis gracilibus minute setulosis glabratisve, antheris circiter 1.5 mm. longis ubique minute setulosis apice obscure mucronulatis; ovario glabro subgloboso 3-loculari, loculis 4-ovulatis, stylo subulato circiter 1.5 mm. longo; fructibus globosis 25–32 mm. diametro, epicarpio tenui fragili, mesocarpio ut videtur carnoso, endocarpio duro crasso lignoso processibus numerosis irregularibus 4–8 mm. longis profunde lobato, semine parvo solitario.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, alt. 1000–1230 m., *Brass & Versteegh 12558* (TYPE), Feb. 22, 1939, *13110* (trees 30 m. high, rare in primary forest, on the slope of a ridge [*12558*] or along a small stream [*13110*]; crown not wide-spreading; bark 8 mm. thick, gray or brown, fairly smooth or fairly rough; wood white; flowers white).

At first glance this plant may be taken for a species of *Sericolea,* because of the predominantly opposite or subopposite leaves and the narrow small-flowered racemes. However, the continuous disk and the laciniate petals preclude this disposition, while the fruit is clearly of *Elaeocarpus.* This species demonstrates that *Elaeocarpus* may include species with opposite leaves, a fact that does not greatly weaken the status of *Sericolea,* which is well-characterized by its disk, petals, and fruit. The new species is placed in § *Fissipetalum* with hesitation, its fruit, with unusually long and irregular endocarpic processes, being quite different from that of other species of the section. The floral characters are excellent for § *Fissipetalum* and in this respect *E. sericoloides* is suggestive of *E. polydactylus* Schlechter, *E. azaleifolius* Knuth, and their allies, differing in obvious foliage characters, its setulose-pubescent anthers, glabrous ovary, etc. It is possible that *E. sericoloides* should be placed alone in an anomalous section.

6. § OREOCARPUS

Elaeocarpus § Oreocarpus Schlechter in Bot. Jahrb. 54: 127. 1916.

This small section was founded by Schlechter with five species, but one of these, *E. sterrophyllus* Schlechter, according to the few inadequate notes, has a 5-loculed ovary and is thus aberrant in the section. In the remaining species the ovary is bilocular and they seem correctly placed together; selection of a lectotype must be arbitrary. Since *E. populneus* Schlechter is the only species fully described in his treatment, I suggest taking this as the lectotype of the section.

Since Schlechter's work the following species have been described which are referable to § *Oreocarpus*: *E. sogerensis* Bak. f., *E. de Bruynii* O. C. Schmidt, *E. populneoides* Knuth, and *E. patens* Knuth; the last of these is discussed below as a synonym of *E. viscosus* Warb.

Elaeocarpus (§ *Oreocarpus*) **viscosus** Warb. in Bot. Jahrb. **18:** 201. 1893; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 432. 1901; Schlechter in Bot. Jahrb. 54: 127. 1916.

Elaeocarpus patens Knuth in Rep. Sp. Nov. 48: 77. 1940, syn. nov.

NORTHEASTERN NEW GUINEA: Morobe District: Sattelberg, alt. 1050–1200 m., *Clemens 1062* (large tree, in forested hills; trunk 30–60 cm. diam.; flower cream-colored); Ogeramnang, alt. about 1750 m., *Clemens 5149* (type coll. of *E. patens*).

Clemens 1062, a flowering specimen from the type locality, agrees precisely with the description of *E. viscosus* in all respects, including floral

dimensions, except that the sepals are scarcely puberulent without when young and are soon glabrate rather than ". . . extus appresse sericeo-pubescentibus . . ." The fruiting specimen cited above, the type collection of *E. patens*, agrees precisely with no. *1062* in vegetative characters. The viscid nature of the young branchlets and inflorescence, emphasized by Warburg and Schlechter, is apparently reflected in dried specimens by the shining surfaces of these parts. Scattered immersed yellow glands are also perceptible on the young branchlets, pedicels, and sepals.

Ridley (in Trans. Linn. Soc. II. Bot. 9: 21. 1916) has reported *E. viscosus* from the southern slopes of Mt. Carstensz, Netherlands New Guinea.

Elaeocarpus (§ *Oreocarpus*) **populneoides** Knuth in Rep. Sp. Nov. **48**: 78. 1940.

BRITISH NEW GUINEA: Western Division: Lake Daviumbu, middle Fly River, *Brass 7865* (TYPE COLL.) (common canopy tree in rain-forest; trunk flanged at base; bark thin, brown, marked with slight horizontal ridges; flowers white, sweet-scented); Tarara, Wassi Kussa River, *Brass 8705* (tree 8 m. high, in gallery rain-forest; bark close, gray, the inner bark green).

This species, based on the above-cited specimens, was described by Knuth without indication of relationship. Its ovary is glabrous and bilocular, each locule being 10-ovulate; thus it doubtless belongs in § *Oreocarpus*, where it seems closest to *E. populneus* Schlechter, a position doubtless implied by Knuth in his choice of an epithet. Several important details, which are not brought out in the original description, separate *E. populneoides* from Schlechter's species; for instance, the racemes are 7–14-flowered rather than 4–7-flowered, the laciniae of the petals are 25–30 rather than 12–15, and the stamens are about 35 in number rather than about 15.

Elaeocarpus (§ *Oreocarpus*) **culminicola** Warb. in Bot. Jahrb. **16**: 23. 1892; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 432. 1901; Schlechter in Bot. Jahrb. **54**: 128. 1916.

NORTHEASTERN NEW GUINEA: Morobe District, Busu, alt. 1800–2400 m., *Clemens 6269*. BRITISH NEW GUINEA: Central Division, Mt. Tafa, alt. 2300–2400 m., *Brass 4069* (A, NY) (sparsely branched slender shrub about 2 m. high, rare in mossy-forest; leaves glossy, paler beneath; flowers pale pink), *Brass 4918* (A, NY) (very slender small tree, in dense forest; leaves smooth and shining; flower-buds brown; immature fruit smooth, up to 25 × 15 mm.), *Brass 5016* (A, NY) (weak bush or slender tree 2–3 m. high, in undergrowth of forest; young growth red; leaf-margins and midribs above very pale; pedicels and calyx brownish pink; petals cream-colored; fruit smooth, blue-green, about 2 cm. long).

The above-cited specimens are referred to *E. culminicola* with reasonable confidence, as they agree with the original description in such essential details as the entire and prominently veined leaf-blades, few-flowered inflorescences, comparatively large flowers, and pilose long-awned stamens. The type collection, from the Finisterre Mts. of Northeastern New Guinea at 2300 m. altitude, consists of sparse and inferior material, according to Schlechter. Therefore it is not surprising that the ample material now available discloses that the specific concept needs amplification. The species appears remarkably variable in the size of its parts; even on the

same specimen the petiole may vary from 8 to 40 mm. in length, the leaf-blades being 8–19 × 2.5–7 cm. The dimensions given by Warburg are similar to those of the smaller leaves available to me. The inflorescences are 3–8 cm. long and 5–12-flowered. The pedicels vary from 15 to 35 mm. in length, and mature flowers are larger than those described by Warburg, with sepals 16–19 × 2–3.5 mm., petals 17–20 × 7–10 mm. and laciniate into 20–26 segments which are 4–6 mm. long, about 25 stamens with filaments 2–2.5 mm. long, and a style 12–13 mm. long. The anther-dimensions given by Warburg are about correct. The ovary is glabrous and 2-locular, each locule being 8–12-ovulate.

7. § Blepharoceras

Elaeocarpus § Blepharoceras Schlechter in Bot. Jahrb. 54: 129. 1916.

In basing § *Blepharoceras* upon three species, Schlechter remarks that its limits are not entirely satisfactory. One of the three original species, *E. orohensis* Schlechter, definitely represents § *Ganitrus*, and as such it has been discussed above. The two remaining species, *E. blepharoceras* Schlechter (the type species of the section) and *E. coloides* Schlechter, are quite different in vegetative characters, but they agree in the fundamental floral characters; as thus delimited the section appears quite recognizable and useful, although perhaps not natural.

Since Schlechter's work two other species have been proposed which are referable to § *Blepharoceras*: *E. ihuensis* O. C. Schmidt and *E. filiformidentatus* Knuth. The first of these certainly belongs here and the second probably, although I have not seen material of it and the description lacks verifying details of the ovary-structure.

A new species related to *E. blepharoceras* is described below, and I also propose to add to § *Blepharoceras* a group of five montane species (*E. latescens* F. v. Muell. and four new species) which differ sharply from other members of the section in having the lower leaf-surfaces and inflorescences densely tomentellous. These five species form a closely knit group which, in Schlechter's system, can be referred only to § *Blepharoceras*, although in appearance the plants do not suggest this section. Actually, they bear a much closer superficial resemblance to certain species of § *Fissipetalum* (*E. arfakensis*, *E. alpestris*, and *E. dasycarpus*, discussed above) than to any species of § *Blepharoceras*, but in floral characters these two groups of tomentellous-leaved species do not seem closely related. If floral characters are to be used as the principal basis of sectional grouping in *Elaeocarpus*, as seems most practical, it thus becomes necessary to place in widely separated sections two species-groups which are vegetatively quite similar. A further relationship should be noted between *E. latescens* and its four close allies on the one hand and certain species of § *Coilopetalum* (e. g. *E. fuscus* Schlechter and *E. fuscoides* Knuth) on the other. These two species have all the characters of § *Coilopetalum* except for their copiously tomentellous leaves and inflorescences, in which they suggest the above-mentioned members of § *Blepharoceras*. The complex inter-relationship of the species of *Elaeocarpus* is here well illustrated.

As now constituted, § *Blepharoceras* consists of ten species, of which five are described as new in the present treatment. The fruits of only four species (*E. tafaensis, E. erianthus, E. latescens,* and *E. whartonensis*) of § *Blepharoceras* are thus far known. Although widely divergent in size, these fruits agree in having an unusally dry and strongly fibrous mesocarp. The significance of this as a sectional character is as yet doubtful.

Elaeocarpus (§ *Blepharoceras*) **tafaensis** sp. nov.

Arbor dense foliata ad 25 m. alta, ramulis gracilibus juventute angulatis cano-sericeo-puberulis demum subteretibus cinereis glabratis; foliis apicem ramulorum versus confertis, petiolis gracilibus supra complanatis dense sericeis glabratisve (5–) 10–18 mm. longis, laminis subcoriaceis in sicco fuscis obovato-ellipticis, (4–) 6–9 cm. longis, (1.5–) 2–4 cm. latis, basi acutis et in petiolum gradatim decurrentibus, in apicem 2–5 mm. longum abrupte cuspidatis, margine anguste recurvatis et integris vel inconspicue undulato-crenatis, supra praecipue costa nervisque primo sericeis cito glabratis, subtus dense et persistenter pallido-brunneo-sericeis, costa supra paullo elevata subtus prominente, nervis lateralibus utrinsecus 5–8 adscendentibus supra leviter subtus peracute elevatis, rete venularum intricato supra prominulo subtus indumento occulto; racemis axillaribus patentibus gracilibus laxis sub anthesi 6–9 cm. longis 8–15-floris, pedunculo et rhachi 0.7–1 mm. diametro pedicellisque primo sericeo-puberulis mox glabratis, bracteis parvis caducis, pedicellis striatis sub anthesi 11–15 mm. longis, alabastris anguste conicis, 8–11 mm. longis, circiter 2 mm. latis, acutis; sepalis submembranaceis lanceolatis, 12–13 mm. longis, basi 2–2.5 mm. latis deinde ad apicem subacutum gradatim angustatis, utrinque minute pallido-sericeis glabratisque, intus carinatis; petalis membranaceis oblongis, 13–17 mm. longis, 2–3 mm. latis, extus glabris, intus infra medium praecipue margine et carina prominente copiose pallido-tomentellis, in segmenta 15–35 filiformia apice obtusa et paullo incrassata 2–4 mm. longa irregulariter laciniatis; disco annulari-pulvinato 1.2–1.5 mm. alto, irregulariter sulcato, apice crenulato, minute hispidulo; staminibus 15–20 uniseriatis erectis gracilibus 7–9 mm. longis, filamentis glabris 2.5–3 mm. longis, antheris arista copiose hispidula 1–1.5 mm. longa excepta 3.5–4.5 mm. longis obscure sericeis; ovario ellipsoideo 3-loculari et styli basi copiose sericeis, loculis 6(raro 4-)-ovulatis, stylo subulato 11–12 mm. longo superne glabro; rhachi pedicellisque sub fructu incrassatis, fructibus subglobosis 30–42 mm. diametro, epicarpio tenui sublevi, mesocarpio conspicue fibroso 5–10 mm. crasso, endocarpio osseo 1–3 mm. crasso ut videtur sine processibus, loculis 3 vel abortu 1 vel 2.

British New Guinea: Central Division, Mt. Tafa, alt. 2300–2350 m., *Brass 4102* (A, type, NY), May 27, 1933 (dense-foliaged tree up to 25 m. high, one of the largest mossy-forest trees; bark dark, furrowed, scaly; wood hard, yellowish; leaf-blades convex, dark green and glossy above, pale brown and shining beneath; peduncles, pedicels, and calyces reddish; petals pale yellow; anthers pale purple; style yellow), *Brass 5058* (A, NY), Sept. 17, 1933 (dense-foliaged tree 10–15 m. high, common in substage of tall forests; leaf-blades convex, thinly pale-pubescent above, brown-silky-pubescent beneath; pedicels and sepals reddish brown; petals pale green; fruit glaucous-green, apparently not quite mature, up to 42 × 40 mm.).

Elaeocarpus tafaensis appears to be closely related to *E. blepharoceras* Schlechter, from the Sepik region of Northeastern New Guinea at about 1000 m. altitude. As Schlechter's type had only immature flowers, a com-

parison of the two plants cannot be entirely satisfactory, but it seems likely that the new species has substantially larger flowers than *E. blepharoceras*. The pedicels of Schlechter's species, from not wholly mature flowers, are said to be 4 mm. long, and the sepals are 5 mm. long, whereas even the buds of *E. tafaensis* have dimensions exceeding these. The petals of the new species are copiously tomentellous within rather than merely ". . . marginibus medio barbellata, caeterum subglabra." In foliage, *E. tafaensis* has the leaf-blades obovate rather than elliptic, definitely broadest above the middle, merely cuspidate rather than acuminate at apex, and with the margins essentially entire.

The fact that the ovary-locules of *E. tafaensis* are sometimes 4-ovulate suggests § *Fissipetalum*. However, as now constituted, § *Fissipetalum* has much smaller flowers (petals not exceeding 6 mm. in length), with erostrate anthers. Therefore I place *E. tafaensis* in § *Blepharoceras*, but it should be noted that the line between the two sections is not entirely satisfactory. Both the cited numbers are accompanied by fruits, which are remarkable for their thick and fibrous mesocarp, somewhat similar to that of the fruits of *Aceratium*.

Elaeocarpus (§ *Blepharoceras*) **coloides** Schlechter in Bot. Jahrb. 54: 130. 1916.

NETHERLANDS NEW GUINEA: Northern slope of Gautier Mts., alt. about 400 m., *Gjellerup 898* (TYPE COLL.), Nov. 1911.

Elaeocarpus coloides clearly has the floral characters which Schlechter intended to include in his § *Blepharoceras*, although in vegetative characters it is not very suggestive of *E. blepharoceras* Schlechter. The closest ally of *E. coloides* is *E. ihuensis* O. C. Schmidt, as pointed out by Schmidt (in Jour. Arnold Arb. 10: 80. 1929). As Schlechter's original publication of *E. coloides* consists of only a few brief notes, I herewith re-describe the species from an isotype.

Frutex 4 m. altus ubique partibus juvenilibus sparse puberulis et florum partibus exceptis glaber, ramulis subteretibus cinereis apicem versus 3–5 mm. diametro; petiolis rectis leviter canaliculatis 2–3 cm. longis basi et apice incrassatis; laminis chartaceis anguste obovato-ellipticis, 10–17 cm. longis, 4–6 cm. latis, basi obtusis, apice in acuminem ad 1 cm. longum cuspidatis, margine inconspicue et remote serrulato-crenulatis, costa utrinque prominente, nervis lateralibus utrinsecus 9–11 arcuato-adscendentibus supra prominulis subtus peracute elevatis, rete venularum intricato utrinque leviter prominulo; racemis gracilibus ad 5 cm. longis circiter 8–12-floris, pedunculo brevi et rhachi gracili pedicellisque obscure puberulis glabratis, bracteis oblongis cuspidatis circiter 1 mm. longis, pedicellis sub anthesi 5–7 mm. longis; sepalis subcarnosis lanceolatis, circiter 7 mm. longis et 1.7 mm. latis, subacutis, extus glabris, intus cano-puberulis; petalis membranaceis ubique glabris oblongo-cuneatis, 8–9 mm. longis, 3–4 mm. latis, 3-lobatis, in segmenta 12–17 breves irregulariter laciniatis; disco annulari circiter 0.7 mm. alto superne puberulo; staminibus 25–30 erectis 3.5–3.8 mm. longis, filamentis glabris, antheris ubique setuloso-puberulis circiter 2 mm. longis apiculo brevi (ad 0.3 mm. longo) excepto; ovario sericeo 2-loculari, loculis ut videtur 8-ovulatis, stylo deciduo.

Elaeocarpus (§ *Blepharoceras*) **trichophyllus** sp. nov.

Arbor ad 18 m. alta, ramulis subteretibus, hornotinis 3–5 mm. diametro densissime ferrugineo-tomentellis, annotinis glabratis cinereis lenticellatis; petiolis robustis (circiter 2 mm. diametro) 1–2 cm. longis subteretibus ut ramulis tomentellis; laminis subcoriaceis in sicco supra viridibus subtus ferrugineis, ellipticis vel obovato-ellipticis, 6–11 cm. longis, 4–7 cm. latis, basi et apice rotundatis vel basi late truncatis, margine dentibus 2–4 per centimetrum obscure spinuloso-serrulatis, supra costa tomentella excepta glabris vel mox glabratis, subtus densissime et persistenter ferrugineo-tomentellis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 6–11 patentibus in dentibus marginis exeuntibus supra prominulis subtus prominentibus in axillis saepe obscure domatiiferis, rete venularum intricato utrinque leviter prominulo vel subtus indumento occulto; racemis axillaribus suberectis 7–12 cm. longis plerumque 10–18-floris, pedunculo subtereti 1–2 cm. longo et rhachi leviter angulata pedicellisque densissime ferrugineo-tomentellis, pedicellis curvatis sub anthesi 10–15 mm. longis, alabastris ovoideis breviter cuspidatis; sepalis tenuiter carnosis lanceolatis, 8–9 mm. longis, 2.5–3 mm. latis, extus copiose tomentellis, intus breviter sericeis, margine incrassato farinoso-puberulis; petalis membranaceis late obovato-cuneatis, 10–12 mm. longis, 8–10 mm. latis, apice profunde 3–5-lobatis etiam in segmenta 35–45 lanceolata acuta 2–4 mm. longa irregulariter fimbriatis, utrinque copiose sericeis (pilis intus brevioribus); disci lobis 5 reniformi-oblongis copiose hispidis, circiter 1 mm. altis et 2 mm. longis; staminibus circiter 45 erectis 4.5–5.5 mm. longis, filamentis gracilibus 1–1.5 mm. longis glabris vel obscure hispidulis, antheris ubique hispiduloso-papillosis arista subulata erecta 1.5–2 mm. longa excepta 2–2.5 mm. longis; ovario ovoideo 2-loculari dense sericeo, loculis 10-ovulatis, stylo subulato glabro circiter 4 mm. longo.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt. about 2300 m., *Brass & Versteegh 11118* (TYPE), Nov. 14, 1938 (tree about 18 m. high, rare in substage of primary forest; trunk 34 cm. diam.; crown small; bark 5 mm. thick, dark brown, fairly rough; outer wood white; inner wood brown; flowers white).

Elaeocarpus trichophyllus is the first of a group of five montane species with tomentellous lower leaf-surfaces and inflorescences, referred to § *Blepharoceras* because of a similarity of essential floral characters rather than because of any habital resemblance. The complex relationships of this group are discussed above under the sectional name.

Elaeocarpus (§ *Blepharoceras*) **erianthus** sp. nov.

Arbor ad 8 m. alta vel ultra, ramulis subteretibus apicem versus 2.5–4 mm. diametro densissime ferrugineo- vel canescenti-tomentellis demum cinereis glabratisque; petiolis validis 5–8 mm. longis ut ramulis tomentellis; laminis coriaceis oblongo-ellipticis, 2.5–5 cm. longis, 1.5–4 cm. latis, basi subcordatis vel rotundatis, apice rotundatis vel late obtusis, margine dentibus 5–7 per centimetrum obscure calloso-serrulatis, supra in sicco olivaceis primo puberulis demum costa tomentella excepta glabratis, subtus densissime ferrugineo- vel demum cano-tomentellis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 6–8 patentibus in dentibus marginis exeuntibus supra immersis vel impressis subtus valde elevatis, rete venularum supra immerso subtus inconspicue prominulo; racemis axillaribus suberectis 4–7 cm. longis circiter 10-floris, pedunculo 1–2.5 cm. longo

et rhachi subteretibus pedicellisque copiose tomentellis, pedicellis curvatis validis 6–9 mm. longis, alabastris ovoideis obtusis; sepalis carnosis acutis ovato-lanceolatis, 7–8 mm. longis, circiter 3 mm. latis, extus dense tomentellis, intus carinatis et breviter sericeis; petalis late obovato-cuneatis, 7–8 mm. longis, 4–6 mm. latis, utrinque dense sericeis, saepe concavis vel margine anguste involutis, apice in segmenta 30–40 lanceolata acuta 1–1.5 mm. longa irregulariter fimbriatis; disci lobis 5 late oblongis circiter 1 × 2 mm. copiose sericeis; staminibus 40–50 erectis 4–4.5 mm. longis, filamentis gracilibus subteretibus glabris 0.8–1 mm. longis, antheris minute hispidulo-papillosis arista subulata erecta vel reflexa 1.5–1.8 mm. longa excepta 1.7–2 mm. longis; ovario ovoideo 2-loculari dense sericeo-hispidulo, loculis 12-ovulatis, stylo subulato glabro circiter 2 mm. longo; fructibus ovoideis ad 12 × 9 mm., pericarpio 2–3 mm. crasso, epicarpio tenui ruguloso, mesocarpio conspicue fibroso, endocarpio osseo extus leviter et irregulariter sulcato, loculo unico, semine solitario.

BRITISH NEW GUINEA: Central Division, Murray Pass, Wharton Range, alt. 2840 m., *Brass 4537* (A, NY) (tree 7–8 m. high, abundant in forests on south side of pass; crown dense, rounded, composed of short stiff branches; leaves very stiff, pale brown beneath; fruit bluish green), *Brass 4767* (NY, TYPE), Aug. 8, 1933 (large dense-crowned forest tree; only one flowering specimen found).

Elaeocarpus erianthus is closely related to the preceding new species, *E. trichophyllus,* from which it differs in its smaller leaf-blades, which are more finely serrulate and have the secondaries and veinlets immersed rather than prominulous above, its shorter pedicels, and its smaller floral parts. The petals of *E. erianthus* are fimbriate with comparatively short segments and are not divided into lobes, as are those of *E. trichophyllus.*

Elaeocarpus (§ *Blepharoceras*) **eximius** sp. nov.

Arbor ad 30 m. alta, ramulis subteretibus apicem versus 2.5–3 mm. diametro primo cano-tomentellis vel laxe squamulosis mox glabratis, annotinis nigrescentibus vel cinereis; petiolis ut ramulis saepe squamulosis mox glabris supra complanatis 1–2.5 cm. longis; laminis coriaceis obovato-ellipticis, (5–) 7–10 cm. longis, (3–) 4–5.5 cm. latis, ad basim obtusum vel subacutum gradatim angustatis, apice rotundatis vel late obtusis, margine dentibus 3 vel 4 per centimetrum minute calloso-serrulatis, supra in sicco olivaceis glabris vel juventute indumento cano-squamuloso-tomentello indutis, subtus dense cano-tomentellis vel -lanatis demum subglabratis, costa supra valde elevata subtus prominente, nervis lateralibus utrinsecus 8–13 patentibus in margine exeuntibus supra prominulis subtus valde elevatis, rete venularum utrinque prominulo vel subtus subimmerso; racemis apicem ramulorum versus axillaribus vel in ramulis brevibus 2 vel 3 aggregatis 5–9 cm. longis 8–14-floris, pedunculo brevi et rhachi angulata pedicellisque dense cano-tomentellis, bracteis ovatis acutis ad 4 mm. longis cito caducis, pedicellis curvatis sub anthesi 4–7 mm. longis, alabastris ovoideis obtusis; sepalis carnosis lanceolatis acutis, 8–9 mm. longis, 2–2.5 mm. latis, extus copiose et arcte tomentellis, intus breviter sericeis; petalis submembranaceis vel tenuiter carnosis obovato-cuneatis, 8–9 mm. longis, 3.5–4.5 mm. latis, extus dense sericeis, intus copiose tomentellis, apice in segmenta 10–15 lanceolata acuta 1–3 mm. longa irregulariter fimbriatis; disci lobis 5 carnosis late oblongis circiter 0.8 × 1.3 mm. dense sericeis; staminibus 30–35 ubique minute hispidulis 4.5–5.5 mm. longis, filamentis

gracilibus subteretibus 2–2.5 mm. longis, antheris arista erecta subulata 1.2–1.5 mm. longa excepta 1.2–1.5 mm. longis; ovario ovoideo 2-loculari et styli basi copiose sericeis, loculis 10-ovulatis, stylo subulato 2.5–3 mm. longo superne glabro; fructibus immaturis ellipsoideis ad 10 × 8 mm. dense tomentellis demum forsan glabratis, epicarpio ruguloso.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, alt. 2400 m., *Brass 4954* (A, TYPE, NY), Sept. 2, 1933 (tree to 30 m. high, with rather open crown of pale scurfy foliage, pale slightly scaly bark, and white wood; one of the commonest and most striking trees in the sheltered valley forests; flowers pale brown).

Closely related to the two preceding new species (*E. trichophyllus* and *E. erianthus*), *E. eximius* differs from them in its somewhat canescent and scurfy tomentum, obtuse or subacute leaf-bases, narrower perianth-segments, less copiously fimbriate petals, and longer filaments. In leaf-venation, the new species resembles *E. trichophyllus* more closely than *E. erianthus*.

Elaeocarpus (§ *Blepharoceras*) **latescens** F. v. Muell. in Trans. Roy. Soc. Vict. **1**(2): 2. 1889; Schlechter in Bot. Jahrb. 54: 143. 1916.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, alt. 2350–2400 m., *Brass 4078* (A, NY) (compact small tree or tall shrub of erect branching habit, in small patch of burnt-over mossy-forest; leaf-blades brown beneath; sepals brown; petals paler brown, with whitish tips), *Brass 4896* (A, NY) (tree 10–15 m. high, with compact rounded crown, common in forests; leaf-blades gray underneath when old, brown in young stages; flowers pale yellow-brown).

Elaeocarpus latescens is based on a collection made by MacGregor on the Musgrave Range, and the original description, although inadequate in detail and lacking dimensions, indicates that a species with the leaf-blades rounded at apex and closely brown-tomentellous beneath is represented. In attempting to match this description among the plants collected by Brass in the nearby Wharton Range and the Mt. Tafa region, I conclude that nos. *4078* and *4896* best represent Mueller's concept. In all essential characters these collections agree with Mueller's description, whereas the species which I describe above as *E. dasycarpus*, *E. erianthus*, and *E. eximius* each have several features which are less well suited to the description. Furthermore, nos. *4078* and *4896* bear a striking resemblance to the plate of *E. coriaceus* (in Hook. Ic. Pl. 2: *pl. 154*. 1837) which, according to Mueller, "approaches in form of leaves and in several other characteristics to this Papuan subalpine species."

Schlechter saw no material of *E. latescens* and did not attempt to place the species. If correctly interpreted by me, it is clearly related to the three new species described above (*E. trichophyllus*, *E. erianthus*, and *E. eximius*), differing from them in the closer and somewhat farinose tomentum of the lower leaf-surfaces and inflorescences, the smaller floral parts, the fewer stamens with shorter-awned anthers, and the fewer ovules. The following description is based entirely upon the two Brass collections.

Frutex vel arbor ad 15 m. alta, ramulis gracilibus subteretibus apicem versus 1–2 mm. diametro densissime et arcte ferrugineo-tomentellis, annotinis glabratis cinereis; petiolis gracilibus 4–10 mm. longis primo tomentellis cito glabratis; laminis coriaceis obovato-ellipticis, (2–) 3–5 cm. longis, (1.3–) 2–3 cm. latis, basi obtusis vel subacutis, apice rotundatis vel sub-

truncatis, margine dentibus 4–6 per centimetrum obscure calloso-serrulatis, supra in sicco olivaceis costa interdum tomentella excepta glabris, subtus densissime et arcte ferrugineo-tomentellis, costa supra leviter elevata subtus prominente, nervis lateralibus utrinsecus 4 vel 5 suberectis supra subplanis subtus valde elevatis, rete venularum intricato supra obscure prominulo subtus indumento occulto; racemis axillaribus suberectis 3–9 cm. longis 10–17-floris, pedunculo ad 2 cm. longo demum subglabrato, rhachi gracili et bracteis pedicellisque densissime ferrugineo-tomentellis, bracteis lanceolatis 3–4 mm. longis mox caducis, pedicellis gracilibus curvatis sub anthesi 5–7 mm. longis, alabastris ovoideis obtuse cuspidatis; sepalis papyraceis acutis oblongo-lanceolatis, 4.5–6 mm. longis, 1.3–1.5 mm. latis, extus ut pedicello tomentellis, intus minute sericeis; petalis membranaceis obovato-cuneatis, 5–7 mm. longis, 2.5–3.5 mm. latis, extus dense sericeis, intus sparse sericeis glabratisve, apice in segmenta 12–25 lanceolata acuta 1–2 mm. longa irregulariter fimbriatis; disci lobis 5 subreniformibus vel late oblongis circiter 0.5 × 0.7 mm. conspicue sericeis interdum bilobatis; staminibus 20–25 ubique obscure hispidulo-papillosis 3–3.5 mm. longis, filamentis gracilibus subteretibus 1.2–1.7 mm. longis, antheris arista inconspicua 0.3–0.5 mm. longa excepta 1–1.3 mm. longis; ovario ovoideo 2-loculari et styli basi copiose brunneo-sericeis, loculis 8-ovulatis, stylo subulato 2–2.5 mm. longo superne glabro; fructibus submaturis ellipsoideis ad 10 × 8 mm., basi et apice rotundatis, pericarpio 2–3 mm. crasso, epicarpio tenui ruguloso, mesocarpio ad 1 mm. crasso fibroso, endocarpio duro inconspicue sulcato, loculo unico, semine ut videtur solitario.

Elaeocarpus (§ *Blepharoceras*) **whartonensis** sp. nov.

Arbor ad 7 m. alta dense foliata, ramulis teretibus, hornotinis 1.5–2 mm. diametro dense ferrugineo- vel cano-tomentellis, annotinis fusco-cinereis glabratis; petiolis gracilibus 9–15 mm. longis tomentellis demum glabratis; laminis coriaceis convexis ovato-ellipticis, (3.5–) 4–7 cm. longis, 2–4 cm. latis, basi late obtusis, apice in acuminem 3–6 mm. longum angustatis, margine recurvatis et dentibus 3–5 per centimetrum calloso-serrulatis, supra olivaceis mox glabratis, subtus indumento arcto ferrugineo dense indutis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 7–11 erecto-patentibus in dentibus marginis exeuntibus supra leviter prominulis subtus valde elevatis, rete venularum supra paullo prominulo subtus occulto; racemis axillaribus 2–6 cm. longis 5–10-floris, pedunculo brevi et rhachi gracili pedicellisque arcte ferrugineo-tomentellis, pedicellis curvatis sub anthesi 6–8 mm. longis, alabastris ovoideis obtuse cuspidatis; sepalis tenuiter carnosis acutis oblongo-lanceolatis, 6–7 mm. longis, 1.5–2.5 mm. latis, extus ut pedicello tomentellis, intus valde carinatis et breviter sericeis; petalis submembranaceis oblongo-cuneatis, 6–7 mm. longis, 2–3 mm. latis, utrinque copiose sericeis, apice in segmenta 10–16 lanceolata acuta circiter 1.5 mm. longa subaequalia laciniatis; disco continuo 5-lobato circiter 0.8 mm. alto dense sericeo; staminibus circiter 25 ubique minute hispidulosis 3.5–4 mm. longis, filamentis gracilibus subteretibus 1.5–2 mm. longis, antheris arista erecta subulata circiter 0.5 mm. longa excepta 1.3–1.5 mm. longis; ovario 2-loculari et stylo infra medium copiose sericeis, loculis 6-ovulatis, stylo subulato circiter 2.5 mm. longo superne glabro; fructibus submaturis ellipsoideis ad 14 × 10 mm., basi rotundatis, apice styli basi apiculatis, pericarpio eo *E. latescentis* simili, loculis saepe 2, seminibus in quoque loculo solitariis.

BRITISH NEW GUINEA: Central Division, Murray Pass, Wharton Range, alt. 2840 m., *Brass 4559* (A, TYPE, NY), July 19, 1933 (dense-foliaged small tree 5–7 m. high, common in forests; leaves convex, stiff, dull green above, pale brown beneath; sepals, pedicels, and rachises dark brown; petals pale brown; fruits green-blue).

Elaeocarpus whartonensis is obviously a close relative of *E. latescens* F. v. Muell., as interpreted above, differing in its longer petioles, ovate- rather than obovate-elliptic leaf-blades which are acuminate rather than rounded or subtruncate at apex and have more numerous secondaries, shorter and fewer-flowered racemes, slightly larger sepals and stamens, proportionately narrower petals which are more regularly fimbriate and densely sericeous rather than glabrate within, and 6- rather than 8-ovulate ovary-locules. Although most of these differences are minor in nature, those pertaining to the leaf-apex, the number of secondary nerves, and the petal-pubescence appear to be of specific consequence.

8. § MONOCERA

Elaeocarpus § Monocera Brongn. & Gris in Bull. Soc. Bot. Fr. 8: 201. 1861; Benth. & Hook. f. Gen. Pl. 1: 240. 1862; Mast. in Hook. f. Fl. Brit. Ind. 1: 404. 1874; K. Schum. in E. & P. Nat. Pfl. 3(6): 5. 1890.

Monocera Jack in Malay. Misc. 1(5): 42. 1820 [repr. in Hook. Bot. Misc. 2: 85. 1830; in Calcutta Jour. Nat. Hist. 4: 225. 1843; et in Miscel. Papers Indo-China II. 2: 243. 1887].

Elaeocarpus § Papuanthus Schlechter in Bot. Jahrb. 54: 130. 1916.

Elaeocarpus § Monocera has been very broadly interpreted by most recent students, to such an extent that its true characters and limitations have been overlooked; doubtless for this reason Schlechter did not attempt to correlate the name with any group of Papuasian *Elaeocarpi*. However, the section is easily typified, since it rests solely upon the genus *Monocera* Jack. The original publication of *Monocera* states: "This genus, whose characters appear to be sufficiently distinct, will include, besides the following new species, several hitherto referred to *Elaeocarpus*, viz. *E. Monocera* Cavanilles, the separation of which has already been suggested, and of which the specific name may be appropriately adopted for the genus, . . ." It is therefore obvious that *Elaeocarpus § Monocera* is typified by *E. monocera* Cav., regardless of the breadth of interpretation applied to the concept by Jack, Bentham & Hooker, Masters, or any subsequent students.

Elaeocarpus monocera Cav. (Ic. 6: 1. *t. 501.* 1801) is a well-known Philippine species, of which ample herbarium material is available (see Merr. Enum. Philip. Fl. Pl. 3: 18. 1923). Its essential characters are as follows: leaves large, aggregated at the ends of thick branchlets; flowers large (sepals to 13 mm. long; petals to 16 mm. long), arranged in comparatively short few-flowered racemes arising from branchlets below leaves; petals copiously and irregularly laciniate, sericeous without, glabrous within; disk annular, 5-lobed, hispid; stamens numerous, with conspicuously awned anthers; ovary elongate-ovoid, densely sericeous, 2-locular, the locules usually 6-ovulate (rarely 4- or 5-ovulate), the style slender; fruit large (up to 7 × 5 cm.), ellipsoid, somewhat flattened, with fibrous mesocarp and very thick bony endocarp, which is slightly rugulose but

without conspicuous processes, the locule apparently single at maturity, with one large flattened seed.

The concept thus typified by *E. monocera* in my opinion definitely includes the Papuasian § *Papuanthus* Schlechter, originally based on eight species, among which a type species was not designated. This oversight is not important, as the original eight species obviously form a coherent section. The only important characters which might be used to separate § *Papuanthus* from § *Monocera* (restricting the latter, for the purpose of clarification, solely to *E. monocera*) are: flowers usually larger, ovules 10–12 per ovary-locule rather than 6 (or 4 or 5), and fruits (in the few species for which they are known) tomentellous or pulverulent. As to the number of ovules, this is known to vary in other coherent groups (e. g. § *Coilopetalum*) between 6 and 12, and therefore great weight cannot be attached to it in the present case. The pubescence of the fruits in § *Papuanthus* does not seem very significant — at least not as significant as other fruit characters such as the large size, the somewhat flattened shape (especially obvious as regards the endocarp and seed), the fibrous mesocarp, and the fairly smooth endocarp without notable processes. These fruit characters are emphasized by Schlechter as distinguishing characters for § *Papuanthus*.

In view of the facts brought out above, I herewith propose to reduce § *Papuanthus* to § *Monocera*, delimiting the latter much more strictly than is currently done. Its geographic limits probably extend considerably beyond the Philippines and Papuasia, but to what extent cannot yet be said. Since Schlechter's work, three other Papuasian species referable to § *Monocera* have been described: *E. comatus* White & Francis, *E. boridiensis* Knuth, and *E. lamekotensis* Knuth; although I have seen no collections of the last two, their descriptions indicate that they belong in this section. Below I propose two new species of § *Monocera*, which thus now consists of 13 species in Papuasia.

Elaeocarpus (§ *Monocera*) **Schlechterianus** nom. nov.

Elaeocarpus megacarpus Schlechter in Bot. Jahrb. 54: 131. 1916; non Elmer in Leafl. Philip. Bot. 7: 2627 (as *E. megacarpa*). 1915.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1200 m., *Brass & Versteegh 12538* (tree 27 m. high, frequent in primary forest of a valley; trunk 57 cm. diam.; crown fairly wide-spreading; bark 9 mm. thick, gray, fairly smooth; wood white; flowers white); Bernhard Camp, Idenburg River, alt. 350 m., *Brass & Versteegh 13592* (tree 28 m. high, occasional in primary rain-forest on slope of a ridge; trunk 43 cm. diam.; crown not wide-spreading; bark 9 mm. thick, gray-brown, fairly smooth; wood rose; sterile).

Elaeocarpus megacarpus Schlechter was based on *Ledermann 9439*, from the Sepik region of Northeastern New Guinea at about 850 m. altitude, and it has also been reported from the Central Division of British New Guinea by Lane-Poole (Rep. For. Res. Papua 111. 1925) and White and Francis (in Proc. Roy. Soc. Queensl. 38: 238. 1927). Although the Brass and Versteegh specimens are referred here with reasonable confidence, the determination remains questionable because the type lacked sepals and petals and these organs have not yet been described. In characters of

foliage and stamens, *Brass & Versteegh 12538* agrees precisely with the original description; no. *13592* is sterile but has identical foliage.

The sepals of no. *12538* are 22–23 × 5–6 mm. and densely tomentellous without; the petals are oblong, 23–25 × about 10 mm., unequally laciniate with about 25 short segments, and very densely golden-sericeous without; the stamens are about 90 in number and agree with those discussed by Schlechter in dimensions, the anthers being sericeous along the dorsal midline; the densely sericeous ovary is 2-locular, each locule being 10-ovulate, and the style is sericeous except at apex and is subequal to the petals.

Elaeocarpus (§ *Monocera*) **leiophyllus** sp. nov.

Arbor ad 21 m. alta, ramis ramulisque validis teretibus cinereis lenticellatis glabris, ramulis apicem versus 6–9 mm. diametro; foliis ad apices ramulorum aggregatis, petiolis validis puberulis glabratisque supra complanatis 1–4 cm. longis, basi et apice incrassatis, laminis coriaceis in sicco fuscis obovato-ellipticis, (10–) 15–20 (–25) cm. longis, (4–) 7–9 cm. latis, basim versus angustatis et basi ipso anguste rotundato-subcordatis, apice obtusis vel inconspicue mucronulato-cuspidatis, margine remote undulato-crenulatis, utrinque glabris vel costa obscure puberulis, costa valida utrinque prominente, nervis lateralibus utrinsecus 9–13 erecto-patentibus anastomosantibus supra subplanis subtus valde elevatis, rete venularum intricato supra immerso subobscuro subtus leviter prominulo; racemis in ligno vetustiore ortis abbreviatis 3–7-floris, pedunculo brevi et rhachi 1.5–4 cm. longis teretibus validis (2–3.5 mm. diametro) pedicellisque dense et arcte brunneo-tomentello-velutinis, bracteis mox caducis, pedicellis validis sub anthesi 12–25 mm. longis; sepalis crasse carnosis oblongo-lanceolatis acutis, 17–21 mm. longis, 4–5 mm. latis, extus et marginibus latis dense velutino-puberulis, intus sparse pilosis glabratisque; petalis submembranaceis saepe leviter concavis et margine basim versus involutis, oblongo-cuneatis, 20–23 mm. longis, 8–11 mm. latis, extus dense aureo-sericeis, intus glabris vel superne obscure sericeis basim versus incrassato-carinatis, apice inconspicue 3-lobatis et in segmenta 25–30 deltoideo-lanceolata 1–3 mm. longa irregulariter fimbriatis; disco annulari circiter 1 mm. alto sericeo-hispido; staminibus circiter 100 pluriseriatis 16–20 mm. longis ubique minute papillosis, filamentis gracilibus teretibus 8–9 mm. longis, antheris arista exclusa 6–9 mm. longis dorso linea mediana sericeis, arista 1.5–2.5 mm. longa; ovario ellipsoideo 2-loculari et stylo copiose sericeis, loculis 10- vel 12-ovulatis, stylo crasso subulato 15–18 mm. longo superne glabro.

Netherlands New Guinea: 4 km. southwest of Bernhard Camp, Idenburg River, alt. 900 m., *Brass & Versteegh 13525* (type), Mar. 30, 1939 (tree 21 m. high, occasional in primary mossy-forest on the slope of a ridge; trunk 39 cm. diam.; crown not widespreading; bark 9 mm. thick, black; wood light yellow; flowers light yellow).

Elaeocarpus leiophyllus appears most closely related to *E. Schlechterianus* A. C. Sm. (*E. megacarpus* Schlechter, non Elmer), at least as that species is interpreted above. Like the new species, *E. Schlechterianus*, as I understand it, is characterized by its essentially glabrous petioles, large flowers, and densely sericeous petals. *Elaeocarpus leiophyllus* differs from this in its shorter petioles, narrower leaf-blades with the veinlet-reticulation immersed and obscure above rather than obviously prominulous, more compact inflorescences, smaller flowers in all parts, and more deeply laciniate petals.

The new species differs from *E. Nouhuysii* Koorders (to which it may be keyed in Schlechter's treatment) in obvious foliage characters and in its sericeous rather than essentially glabrous petals.

Elaeocarpus (§ *Monocera*) **Nouhuysii** Koorders in Nova Guin. Bot. 8: 173. 1909; Schlechter in Bot. Jahrb. 54: 131. 1916.

BRITISH NEW GUINEA: Western Division, Palmer River, 2 miles below junction with Black River, alt. 100 m., *Brass 7074* (large canopy tree attaining 30 m. or more in height, common on low ridges near river; trunk spur-buttressed; bark thick, gray, somewhat flaky; leaf-blades glabrous and shining, with undulate margins; flowers greenish white, in numerous lateral racemes below the leaves).

The cited specimen agrees very well with the original description of the type, obtained in southern Netherlands New Guinea near Van Weelskamp in the upper Lorentz River region. Our specimen is also a good match for *Schlechter 16144* (UC), from the Minjem region of Northeastern New Guinea, cited by Schlechter as representing the species. The Brass specimen has occasional leaf-blades up to 25 × 13 cm., and its rachises are sometimes up to 13 cm. long; in general, however, the dimensions of its leaves and flowers approximate those given by Koorders.

Elaeocarpus (§ *Monocera*) **polyandrus** sp. nov.

Arbor ad 20 m. alta, ramis ramulisque validis fusco-nigrescentibus teretibus glabratis, ramulis annotinis cicatricibus foliorum delapsorum conspicue ornatis, ramulis hornotinis 4–5 mm. diametro cano-puberulis; foliis subaggregatis, petiolis subteretibus striatis mox glabratis (4–) 6–9 cm. longis, 2–3 mm. diametro, basi et apice incrassatis, laminis papyraceis in sicco fusco-olivaceis utrinque glabris late ovatis, (8–) 15–23 cm. longis, (5–) 10–15 cm. latis, basi rotundatis, apice ut videtur obtusis, margine anguste revolutis et remote undulato-crenulatis, costa valida utrinque prominente, nervis lateralibus utrinsecus 8–10 subrectis erecto-patentibus supra leviter subtus valde elevatis, rete venularum intricato utrinque prominulo; racemis in axillis foliorum delapsorum ortis abbreviatis 4–6-floris, pedunculo brevi et rhachi 2.5–4 cm. longis teretibus validis (2 mm. diametro) pedicellisque minute sericeo-puberulis mox glabratis, pedicellis validis sub anthesi 2.5–3.7 cm. longis; sepalis crassissimis alutaceis lanceolatis, 20–22 mm. longis, 3–4.5 mm. latis, peracutis, extus sparse sericeo-puberulis glabratis, intus sericeis carinatis; petalis membranaceis oblongo-ellipticis, 23–26 mm. longis, 7–8 mm. latis, basim versus concavis vel involuto-marginatis, extus sparse sericeis, intus glabris et basim versus incrassatis, apice profunde 3-lobatis, quoque lobo 4–8 mm. longo deltoideo integro et acuto vel in segmenta 2 vel 3 brevia inconspicue fimbriato; disco annulari erecto-patente carnoso superne hispidulo glabrato 1–1.5 mm. alto 10-crenulato; staminibus numerosissimis (circiter 150) pluriseriatis gracilibus 17–20 mm. longis, filamentis teretibus hispido-sericeis 7–9 mm. longis, antheris ubique minute papillosis aristis exclusis 7–8 mm. longis, dorso linea mediana sparse sericeis, biaristatis, aristis circiter 2 mm. (interiore) et 3 mm. (exteriore) longis erectis; ovario ellipsoideo 2-loculari arcte sericeo, pariete crassissimo, loculis 12-ovulatis, stylo crasso subulato 17–19 mm. longo inferne sericeo-puberulo superne glabro.

SOLOMON ISLANDS: Bougainville: Kugumaru, Buin, alt. 150 m., *Kajewski 1866* (TYPE), June 28, 1930 (tree up to 20 m. high, common in rain-forest; petals

yellowish green, tipped with pink; native name: *tu-ah-lu;* timber said by natives to be very durable).

Elaeocarpus polyandrus is very well characterized by its long glabrous petioles, broadly ovate leaf-blades, very thick sepals, few-lobed petals, biaristate anthers, and thick-walled ovary. In foliage the new species suggests *E. lamekotensis* Knuth, of New Ireland, but that species has comparatively short and slender pedicels, much smaller flowers, and more copiously fimbriate petals.

Elaeocarpus (§ *Monocera*) **comatus** White & Francis ex Lane-Poole, Rep. For. Res. Papua 111. 1925, in Proc. Roy. Soc. Queensl. 38: 238. *f. 6.* 1927.

BRITISH NEW GUINEA: Northern Division, Kumusi River, *Lane-Poole 185* (TYPE COLL.).

This well-marked species of § *Monocera,* referred by its authors to the relationship of *E. amplifolius* Schlechter, is apparently closer to *E. finisterrae* Schlechter, from which it differs in its longer petioles and much smaller flowers.

9. § COILOPETALUM

Elaeocarpus § Coilopetalum Schlechter in Bot. Jahrb. 54: 134. 1916.

§ *Coilopetalum* was founded by Schlechter with 13 species, among which no type species was designated. From Schlechter's discussion it appears that he was uncertain of the place of his last four species in this section. Furthermore, he states (l. c.) that "Die typischen, d. h. die dickblättrigen, langstieligen Arten bilden stets grosse Bäume, . . .," indicating that the nucleus of the section, in his concept, was composed of his species numbered 40–42. Of these, *E. clethroides* Schlechter is the only species illustrated, and therefore I believe that it may be designated as the lectotype of § *Coilopetalum.*

It should be pointed out that *E. fuscus* Schlechter and to a certain extent *E. pachyanthus* Schlechter and *E. mallotoides* Schlechter (ex char., none of these three species being available to me) are unusual in the tomentum of their lower leaf-surfaces and inflorescences; in this they strongly suggest a group of five species (*E. trichophyllus* A. C. Sm. and its allies) referred above to § *Blepharoceras.* The line between these two sections becomes weak at this point and the species are divided rather arbitrarily upon characters of petal-shape, texture, and degree of laciniation.

Other described species belonging to § *Coilopetalum* are *E. floridanus* Hemsl., *E. pseudosepicanus* O. C. Schmidt, *E. confertifolius* Knuth, *E. lingualis* Knuth, *E. fuscoides* Knuth, and probably *E. novo-mecklenburgensis* Knuth; some of these are discussed below. To this section I here-with add nine new species, making a total of 28 Papuasian species now known in § *Coilopetalum.* The section doubtless extends beyond Papuasia, but I cannot indicate its geographic limits at present.

The more important diagnostic characters of § *Coilopetalum* are as follows: habit usually glabrous or subglabrous, the leaves sometimes hirsute beneath and in a few species closely tomentellous; inflorescences usually associated with leaves or slightly below them; flowers comparatively small

(sepals and petals usually less than 8 mm. long, rarely up to 12 mm. long); petals about the size of the sepals and often somewhat similar in texture, usually narrowed distally and subentire or obscurely toothed (in a few species broadened at apex and distinctly fimbriate), densely sericeous without and often within, often with a conspicuous swollen carina within; stamens comparatively small, variable in number, awned or not; ovary 2- or 3-locular, pubescent (apparently glabrous only in *E. habbemensis*, an aberrant species described below), each locule 6–12-ovulate; fruits comparatively small, the pericarp rarely exceeding 3 mm. in thickness, with thin epicarp, sparse mesocarp, and hard verrucose or rugulose endocarp, the locule solitary and at length apparently 1-seeded.

Elaeocarpus (§ *Coilopetalum*) **sepikanus** Schlechter in Bot. Jahrb. **54**: 135. 1916.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, alt. 120 m., *Brass & Versteegh 13549* (tree 22 m. high, rare in primary rain-forest on slopes of a ridge; trunk 43 cm. diam.; crown not wide-spreading; bark 10 mm. thick, brown; wood red-brown; flowers dark yellow).

The cited specimen agrees excellently with the original description, based on several Ledermann collections from the Sepik region of Northeastern New Guinea at low elevations, differing only in its slightly longer pedicels and fewer stamens (about 35 rather than about 50). The species has also been reported from the Northern Division of British New Guinea by Lane-Poole and White and Francis, but I believe that the specimen cited by them represents a new species, described below as *E. elatus*.

Elaeocarpus (§ *Coilopetalum*) **fluviatilis** sp. nov.

Arbor ad 25 m. alta inflorescentiis exceptis glabra, ramulis crassis apicem versus 5–6 mm. diametro et dense foliatis; petiolis rectis 3–4.5 cm. longis supra complanatis; laminis papyraceis vel chartaceis siccitate olivaceis ellipticis, 9–15.5 cm. longis, 4–6 cm. latis, basi anguste rotundatis vel late obtusis, apice in acuminem 1–2 cm. longum obtusum abrupte angustatis, margine dentibus circiter 2 per centimetrum conspicue crenatis, costa et nervis secundariis utrinsecus 5–7 adscendentibus supra paullo elevatis subtus prominentibus, rete venularum intricato utrinque prominulo; racemis axillaribus subrectis 5–10 cm. longis plerumque 15–20-floris, pedunculo 1.5–3 cm. longo et rhachi angulatis robustis pedicellisque dense et breviter argenteo-sericeis, pedicellis gracilibus sub anthesi 5–7 mm. longis, alabastris ovoideis circiter 5 mm. longis cuspidatis angulatis; sepalis 5 papyraceis vel subcarnosis ovato-ellipticis, 6–7 mm. longis, circiter 3 mm. latis, breviter acuminatis, extus puberulis, intus glabris; petalis 5 papyraceis ovato-ellipticis circiter 5 × 2.5 mm., apice acutis et integris, utrinque dense aureo-sericeis, pilis intus retrorsis, carina inconspicua; disco inconspicuo 10-lobato, lobis circiter 0.2 mm. altis superne hirtellis; staminibus 65–70 pluriseriatis 3–4 mm. longis, filamentis 0.4–1.2 mm. longis sericeo-hispidis, antheris dorso sericeis arista 0.5–0.8 mm. longa excepta circiter 2 mm. longis; ovario ovoideo 2-loculari dense sericeo, loculis 12-ovulatis, stylo subulato glabro circiter 2 mm. longo.

BRITISH NEW GUINEA: Central Division, Kubuna, alt. 100 m., *Brass 5569* (A, TYPE, NY), Nov. 25, 1933 (tree 20–25 m. high, common in riverine rain-forests; trunk raised above ground on an irregular mass of prop-roots about 1 m. high).

From the closely related *E. sepikanus* Schlechter, *E. fluviatilis* differs in its more distinctly toothed leaf-margins, more copiously flowered racemes, and more numerous and shorter stamens with longer awns.

Elaeocarpus (§ *Coilopetalum*) **confertifolius** Knuth in Rep. Sp. Nov. 48: 74. 1940.

BRITISH NEW GUINEA: Central Division, Koitaki, alt. about 450 m., *Carr 12697* (NY).

Elaeocarpus confertifolius is based on *Carr 12067,* a flowering specimen not available to me, also from Koitaki. No. *12697* agrees precisely with the original description except for its slightly smaller leaf-blades. The fruits are ellipsoid, about 10 × 7 mm. at apparent maturity, rugulose when dried, with a pericarp about 2 mm. thick, a verrucose endocarp, and a single one-seeded locule. The habit and fruit of no. *12697* are obviously of § *Coilopetalum,* and the original description of the flower also implies this section; the species appears to be of the general relationship of *E. clethroides* Schlechter.

Elaeocarpus (§ *Coilopetalum*) **idenburgensis** sp. nov.

Arbor ad 16 m. alta inflorescentiis exceptis glabra, ramulis subteretibus superne 3–5 mm. diametro brunneis copiose lenticellatis; foliis apicem ramulorum versus confertis, petiolis gracilibus 3–5 cm. longis leviter canaliculatis, laminis chartaceis in sicco fusco-viridibus ellipticis, 8–13 cm. longis, 4–6 cm. latis, basi anguste rotundatis vel obtusis, apice in acuminem ad 1 cm. longum obtusum cuspidatis, margine dentibus 2 vel 3 per centimetrum inconspicue serrulato-crenulatis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 5–7 adscendentibus supra prominulis subtus elevatis et in axillis saepe domatiiferis, rete venularum copioso utrinque prominulo; racemis axillaribus 3–8 cm. longis 8–15-floris, pedunculo brevi et rhachi angulatis pedicellisque pallide puberulis demum glabratis, pedicellis gracilibus curvatis sub anthesi 6–7 mm. longis, alabastris ovoideis 4–5 mm. longis cuspidatis leviter angulatis; sepalis 5 papyraceis crasso-marginatis ovato-oblongis, circiter 6 mm. longis et 2 mm. latis, apice breviter acuminatis, extus breviter sericeis, intus glabris carinatis, petalis 5 carina intus incrassata excepta submembranaceis, oblongis, 5.5–6 mm. longis, circiter 2 mm. latis, apice truncato irregulariter et minute 3–5-denticulatis, margine involutis, utrinque dense sericeis (pilis margine et intus carina retrorsis); disco 10-lobato, lobis deltoideo-oblongis 0.2–0.3 mm. altis et latis superne hispidulis; staminibus 36–39, 2–3-seriatis, 3–3.5 mm. longis, filamentis sericeis 0.7–1.3 mm. longis, antheris oblongis circiter 2 mm. longis minute hispidulo-papillosis apice obscure mucronulatis; ovario ovoideo 2-loculari dense sericeo, loculis 12-ovulatis, stylo subulato glabro circiter 2.5 mm. longo.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, alt. 850 m., *Brass 13458* (TYPE), Mar. 1939 (subsidiary tree 16 m. high, in rain-forest of the ridges; trunk 20 cm. diam.; flowers numerous, pale yellow, sweet-scented).

Elaeocarpus idenburgensis is a species of the general relationship of *E. clethroides* Schlechter, from which it differs in its shorter-petiolate and smaller leaf-blades with crenulate margins, its shorter racemes, its slightly larger and 5- rather than 4-merous flowers, and its fewer stamens and more numerous ovules. *Elaeocarpus flavescens* Schlechter, another related

species, differs from *E. idenburgensis* in its short-petiolate obovate subentire leaf-blades, obtuse flower-buds, smaller flowers, and fewer stamens.

Elaeocarpus (§ *Coilopetalum*) **brevirostris** sp. nov.

Arbor inflorescentiis exceptis ubique glabra, ramulis teretibus apicem versus 5–6 mm. diametro cicatricibus foliorum delapsorum conspicue ornatis; foliis apicem ramulorum versus confertis, petiolis gracilibus (ad 1 mm. diametro) 3–4 cm. longis supra paullo complanatis, laminis chartaceis vel papyraceis in sicco viridibus oblongo- vel obovato-ellipticis, 10–12 cm. longis, 4–5.3 cm. latis, basi anguste rotundatis, apice obtusis vel obtuse cuspidatis, margine obscure undulato-crenulatis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 5–7 adscendentibus supra prominulis subtus valde elevatis in axillis saepe domatiiferis, rete venularum intricato utrinque prominulo; racemis apicem ramulorum versus confertis saepe in axillis foliorum delapsorum ortis ut videtur 10–20-floris, pedunculo brevi et rhachi leviter angulata (3–) 6–8 cm. longis gracilibus pedicellisque arcte sericeis, pedicellis sub anthesi 5–8 mm. longis saepe curvatis, alabastris ovoideis 5 mm. longis peracute cuspidatis; sepalis papyraceis ovato-lanceolatis, 6–6.5 mm. longis, 2–2.3 mm. latis, cuspidatis, extus pallide breviter sericeis, intus glabris carinatis; petalis subcarnosis et intus bulboso-incrassato-carinatis, in sicco roseo-purpureis, oblongo-ellipticis, 5.5–6 mm. longis, 2–2.5 mm. latis, margine valde involutis, apice in segmenta 4–6 ad 0.5 mm. longa obscure fimbriatis, utrinque dense aureo-sericeis (pilis intus et margine retrorsis); disco inconspicuo dense hispidulo; staminibus 50–60 pluriseriatis 3–4 mm. longis, filamentis 1.5–2 mm. longis dense sericeo-hispidulis, antheris obscure papillosis arista rigida 0.3–0.5 mm. longa inclusa 1.5–2 mm. longis; ovario ellipsoideo 2-loculari et styli basi pallide sericeis, loculis 10-ovulatis, stylo crasso 2.5–3 mm. longo superne glabro.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, alt. 900 m., *Clemens 2270* (TYPE), Apr. 9, 1936.

Elaeocarpus brevirostris is closely related to *E. sarcanthus* Schlechter, which, according to the description, has coriaceous and slightly smaller leaf-blades, shorter petioles and pedicels, and obtusish sepals which are densely puberulent within. The new species also bears a close superficial similarity to *Clemens 195*, from the Morobe District, which Knuth has cited as representing his *E. novo-mecklenburgensis*. From this specimen and the description of *E. novo-mecklenburgensis*, the new species differs in its longer and more slender petioles, shorter racemes, sericeous rachis, pedicels, and sepals, ovoid flower-bud, densely sericeous petals, aristate anthers, and sericeous ovary. The fact that the petals of *E. novo-mecklenburgensis* are described as ". . . extus basin versus sparsim pilosa, ceterum glabra . . ." does not suggest § *Coilopetalum*, but in other respects the species appears to belong here, especially if *Clemens 195* has been correctly referred to it.

Elaeocarpus (§ *Coilopetalum*) **elatus** sp. nov.

Elaeocarpus sepikanus sensu Lane-Poole, Rep. For. Res. Papua 111. 1925; White & Francis in Proc. Roy. Soc. Queensl. 38: 239. 1927; non Schlechter.

Arbor grandis inflorescentiis exceptis glabra, ramulis subfuscis superne 3–5 mm. diametro; petiolis ad 1.5 mm. diametro 4–6 cm. longis leviter canaliculatis; laminis papyraceis in sicco fusco-viridibus oblongo-ellipticis,

10–14.5 cm. longis, 5.5–8 cm. latis, basi rotundatis vel late obtusis, apice in acuminem ad 1 cm. longum obtusum abrupte angustatis, margine evidenter crenulato-undulatis, costa supra valde elevata subtus prominente, nervis lateralibus utrinsecus 7–9 arcuato-patentibus supra prominulis subtus conspicue elevatis in axillis plerumque domatiiferis, rete venularum copioso utrinque valde prominulo; racemis axillaribus brevipedunculatis ad 11 cm. longis (vel ultra?) ut videtur 15–20-floris, rhachi crassa (2–3 mm. diametro) pedicellisque pallide farinoso-puberulis, pedicellis sub anthesi 7–9 mm. longis, alabastris ovoideis obtusis; sepalis crasso-carnosis oblongo-lanceolatis, circiter 7 mm. longis, 2.5–3 mm. latis, subacutis, extus et margine incrassato arcte puberulis, intus glabris et valde carinatis; petalis carina incrassato-carnosa intus excepta papyraceis oblongo-ellipticis, circiter 7 mm. longis, 2–3 mm. latis, margine saepe involutis, apice in dentes circiter 0.5 mm. longos acutos inconspicue lobatis, utrinque dense sericeis (pilis intus retrorsis); disco 10-lobato, lobis carnosis patulis deltoideo-oblongis circiter 0.6 mm. longis sparse hispidulis; staminibus circiter 80 pluriseriatis 4.5–5 mm. longis, filamentis circiter 1.5 mm. longis subteretibus glabris, antheris minute papillosis arista erecta 0.5–0.7 mm. longa excepta 2.5–3 mm. longis; ovario ellipsoideo 2-loculari et styli basi breviter sericeis, loculis 10-ovulatis, stylo crasso circiter 2.5 mm. longo superne glabro.

BRITISH NEW GUINEA: Northern Division, Buna District, in forests near village of Wasida and along main path to Wire Rope, alt. up to 450 m., ***Lane-Poole 178*** (TYPE), July 1922 (large tree, with 60-ft. bole and 8-ft. girth; bark about 6 mm. thick, gray mottled with brown; wood white to cream-colored; flowers cream-colored; native name: *tangere* [notes from Lane-Poole, l.c.]).

Elaeocarpus elatus clearly differs from *E. sepikanus* in its toothed petals, among other characters, and is more closely allied to *E. sarcanthus* Schlechter and *E. brevirostris* (described above). From both of these, the new species differs in its larger leaves and flowers, longer leaf-apices, more numerous stamens, and in other details of foliage and inflorescence. Although White and Francis (l. c.) state that the ovary of *Lane-Poole 178* is 3-celled, it appears to be 2-celled in the flowers dissected by me, but this character may not be stable.

Elaeocarpus (§ *Coilopetalum*) **lingualis** Knuth in Rep. Sp. Nov. **48**: 76. 1940.

NORTHEASTERN NEW GUINEA: Morobe District: Yoangen, alt. about 1250 m., *Clemens 6597* (COTYPE COLL.); Ogeramnang, alt. about 1750 m., *Clemens 4833* (COTYPE COLL.) (large tree, on forested hill; fruit slate-blue), *5463* (COTYPE COLL.); Matap, alt. 1500–1800 m., *Clemens 11103* (tree, the trunk 15–25 cm. diam.; fruit lead-blue), *11220* (tree, the trunk 30 cm. diam.; fruit slate-blue); Wantoat, *Clemens 41193* (tree, the trunk 25 cm. diam.; fruit lead-blue). NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, alt. 1800 m., *Brass & Versteegh 12510* (rare tree 34 m. high; trunk 42 cm. diam.; crown not wide-spreading; bark 12 mm. thick, gray; sap-wood white; heart-wood brown-yellow; flowers orange-brown); Bele River, 18 km. northeast of Lake Habbema, alt. about 2300 m., *Brass & Versteegh 11125* (tree 15 m. high, common in old secondary forest; trunk 29 cm. diam.; crown not wide-spreading; bark 4 mm. thick, fairly smooth, gray-brown; wood white; fruits blue); Balim River, alt. 2050 m., *Brass & Versteegh 11186* (tree 9 m. high, in low open forest on a sandy slope; trunk 34 cm. diam.; crown fairly wide-spreading; bark 6 mm. thick, gray, smooth; wood white; fruits dark green).

The first three collections cited above were listed by Knuth without designation of the type; *Clemens 6579* and *Brass & Versteegh 12510* bear

flowers and the remaining specimens fruits. Clearly a member of § *Coilopetalum,* this well-marked species is probably most closely allied to *E. sarcanthus* Schlechter, differing in its longer petioles, larger leaf-blades, anthers which are minutely apiculate at apex but scarcely ". . . in setam brevem subulatam exeunte . . .," and more numerous ovules. The sepals and petals are up to 8 mm. long, the latter being obscurely denticulate at apex; the stamens are about 50, and the ovary is 2-locular, each locule having 12 ovules. Although the specimens from Netherlands New Guinea have the leaves averaging smaller than those from the Morobe District, the differences among the cited specimens appear no more than individual. The fruiting inflorescences of *Brass & Versteegh 11186* are up to 18 cm. long, while the remaining specimens, both flowering and fruiting, have the inflorescences only 3–11 cm. long.

Elaeocarpus (§ *Coilopetalum*) **floridanus** Hemsl. in Kew Bull. 1896: 158. 1896; Schlechter in Bot. Jahrb. 54: 143. 1916.

SOLOMON ISLANDS: Bougainville: Kugumaru, Buin, alt. 150 m., *Kajewski 1896* (tree up to 20 m. high, common in rain-forest; fruit black when ripe, about 12 × 7 mm.; native name: *nor-kiri-tor*); Koniguru, Buin, alt. 950 m., *Kajewski 2085* (tree up to 20 m. high, common in rain-forest; fruit black when ripe, up to 11 × 8 mm.; native name: *gucana*); Marmaromino, alt. 50 m., *Kajewski 2201* (tree up to 15 m. high, common in rain-forest; flowers fragrant, cream-colored; fruit shiny, dark green or bluish, up to 13 × 9 mm.; native name: *bi-ri-gimor*); Olevunga, N'Gela (Florida Islands): *Brass 3490* (pale-barked small tree, in coastal rain-forest; leaf-blades with pale costa and nerves; fruit immature); Guadalcanal: Quoi-mon-apu, alt. sea-level, *Kajewski 2349* (tree up to 30 m. high, common in rain-forest; flower-buds green; native name: *isikor*).

Elaeocarpus floridanus, based on *Guppy 231* from Florida Island, was not placed by Schlechter, but the above-cited specimens agree excellently with the original description, and the place of the species in § *Coilopetalum* is certain. The ovary is 3-locular and each locule is 6-ovulate (in *Kajewski 2201,* which has mature flowers). The relationship of Hemsley's species is probably with *E. sarcanthus* Schlechter, which has on the average shorter petioles and smaller leaf-blades, much shorter racemes and pedicels, and fewer flowers.

Elaeocarpus (§ *Coilopetalum*) **microdontus** Schlechter in Bot. Jahrb. 54: 140. 1916.

NETHERLANDS NEW GUINEA: Behind Hollandia, alt. 300 m., *Gjellerup 678* (TYPE COLL.), Sept. 1911.

As this species was only very briefly discussed by Schlechter, I offer a more complete description below. As indicated in the original publication, the species is close only to *E. subinteger* Schlechter, differing in its shorter petioles and racemes, slightly smaller flowers, truncate and obscurely toothed rather than subentire and obtusish petals, and fewer stamens. It should be noted that the characters of ". . . Stamina ca. 15, ca. 3 mm. lang . . .," mentioned in Schlechter's key, are not entirely accurate.

Arbor gracilis (?), ramis ramulisque gracilibus nigrescentibus subteretibus, juventute sericeis et cicatricibus confertis foliorum delapsorum ornatis, squamulis coriaceis 2–3 mm. longis plus minusve persistentibus; foliis apicem ramulorum versus aggregatis, petiolis gracilibus 5–7 mm. longis supra complanatis sericeis mox glabratis, laminis subcoriaceis glabris obo-

vatis, 5–7 cm. longis, 2.5–3.5 cm. latis, basim versus gradatim angustatis, apice rotundatis vel breviter et obtuse cuspidatis, margine integris vel obscure undulatis, costa utrinque valde elevata, nervis lateralibus utrinsecus 4 vel 5 arcuatis supra subplanis subtus elevatis, rete venularum laxo supra leviter subtus valde prominulo; racemis axillaribus patentibus gracilibus 6–8-floris, pedunculo brevi et rhachi 2.5–3.5 cm. longis pedicellisque breviter argenteo-sericeis, pedicellis sub anthesi circiter 5 mm. longis; sepalis tenuiter carnosis deltoideo-lanceolatis, 5–6 mm. longis, 1.3–1.7 mm. latis, acutis, utrinque breviter sericeis, intus glabratis carinatis; petalis carina intus bulboso-carnosa excepta membranaceis, ovato-oblongis, 4.5–5 mm. longis, circiter 1.5 mm. latis, utrinque breviter sericeis, carina intus copiose longe sericeis, margine valde involutis et hispidulis, apice angustato subtruncatis, dentibus 3 vel 4 obtusis inconspicuis; disco pulvinato carnoso circiter 0.4 mm. alto conspicue 10-lobato minute hispidulo; staminibus circiter 20 uniseriatis 3.5–4.5 mm. longis ubique minute hispidulis, filamentis graciiibus teretibus 1.5–2.5 mm. longis, antheris (arista 0.4–0.7 mm. longa excepta) 1.3–1.5 mm. longis; ovario 2-loculari copiose hispido-sericeo, loculis 8-ovulatis, stylo subulato circiter 3 mm. longo glabro.

Elaeocarpus (§ *Coilopetalum*) **fuscoides** Knuth in Rep. Sp. Nov. **48**: 75. 1940.

NORTHEASTERN NEW GUINEA: Morobe District, Ogeramnang, alt. about 1800 m., *Clemens 4599, 4681A* (TYPE COLL.).

This very well marked species, as indicated by Knuth's choice of a specific epithet, suggests *E. fuscus* Schlechter in its indument; the differences between the two species, both foliar and floral, are conspicuous. The petals of *E. fuscoides* are conspicuously carinate within and sericeous on both surfaces, divided into three main lobes and quite obviously fimbriate; the sericeous ovary is 2-locular, each locule being 12-ovulate.

Elaeocarpus (§ *Coilopetalum*) **pycnanthus** sp. nov.

Arbor ad 26 m. alta, ramulis teretibus apicem versus 3–4 mm. diametro primo puberulis mox glabratis, squamulis subpersistentibus lanceolatis 3–4 mm. longis squarrosis, cicatricibus foliorum delapsorum ornatis; foliis apicem ramulorum versus confertis, petiolis gracilibus inconspicue canaliculatis (1.5–) 2–3 cm. longis glabris vel cito glabratis, laminis subcoriaceis in sicco fuscescentibus anguste oblongis, 7–12 cm. longis, (1.5–) 2–3.3 cm. latis, basi late obtusis vel anguste rotundatis, apice in acuminem obtusum 5–10 mm. longum gradatim angustatis, margine leviter recurvatis et inconspicue undulato-crenulatis, utrinque glabris vel costa et interdum lamina disperse sericeo-puberulis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 7–9 brevibus erecto-patentibus supra subplanis subtus valde elevatis et in axillis saepe conspicue domatiiferis, rete venularum intricato utrinque leviter prominulo; racemis axillaribus 7–12-floris, pedunculo conspicuo ad 2.5 cm. longo et rhachi 3–5 cm. longis pedicellisque dense breviter sericeis, pedunculo demum glabrato, bracteis subcoriaceis tripartitis, dentibus lateralibus subpersistentibus subulatis circiter 2 mm. longis, pedicellis 6–8 mm. longis; sepalis tenuiter carnosis acutis oblongo-lanceolatis, 6–7 mm. longis, 2–2.5 mm. latis, extus breviter pallido-sericeis, intus margine incrassato copiose puberulo excepto glabris carinatis; petalis subcarnosis et intus bulboso-incrassato-carinatis, oblongis, 7–8 mm. longis, 2.5–3.5 mm. latis, margine basim versus involutis, apice in segmenta 9–11 lanceolata

acuta 1–1.5 mm. longa subaequalia laciniatis, extus copiose pallido-sericeis, margine retrorse sericeis, intus basim versus praecipue carina antrorse sericeis superne glabris; disci lobis 10 patulis deltoideis circiter 0.7 mm. longis superne hispidulis; staminibus 35–40 ubique minute sericeo-hispidulis 4–4.5 mm. longis, filamentis teretibus 1.5–2 mm. longis, antheris arista 0.2–0.5 mm. longa saepe recurva inclusa 2.5–2.8 mm. longis; ovario ellipsoideo 3-loculari et styli basi dense sericeis, ovarii pariete crasso, loculis 8-ovulatis, stylo crasso 3–3.5 mm. longo superne glabro; fructibus ellipsoideis submaturis ad 11 × 7 mm., apice obtusis, pericarpio in sicco circiter 2 mm. crasso, epicarpio tenui ruguloso, mesocarpio fibroso, endocarpio verrucoso, loculo et semine solitariis.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, alt. 1780–1800 m., *Brass & Versteegh 11903* (tree 26 m. high, rare in primary forest on slope of a ridge; trunk 51 cm. diam.; crown fairly wide-spreading; bark 10 mm. thick, fairly rough; sap-wood yellow-brown; heart-wood dark brown; fruits green), *Brass 12146, 12148* (common subsidiary trees in mossy-forest of upper slopes, up to 20 m. high; trunk 20 cm. diam.; tips of branchlets exuding a gray resin; leaves concave; fruits immature), *Brass 12292* (TYPE), Jan. 1939 (common subsidiary tree in lower edges of mossy-forest; tips of branches resinous; flowers cream-colored).

The petals of *E. pycnanthus* at anthesis are oblong and clearly laciniate, but the place of the species in § *Coilopetalum* is indicated by the densely sericeous character of the petals and their swollen carina. The closest relative of the new species appears to be *E. Ledermannii* Schlechter, from which it differs in its proportionately much narrower leaf-blades which are subglabrate beneath, longer pedicels, oblong rather than ovate petals, and 3- rather than 2-locular ovary.

Elaeocarpus (§ *Coilopetalum*) **poculiferus** sp. nov.

Arbor ad 29 m. alta partibus juvenilibus puberulis inflorescentiisque exceptis glabra, ramulis apicem versus 3–5 mm. diametro, squamulis parvis interdum squarrosis; foliis apicem ramulorum versus confertis, petiolis gracilibus canaliculatis 7–15 mm. longis, laminis coriaceis in sicco fuscescentibus anguste elliptico-oblongis, 4–9 cm. longis, 1.2–2.5 cm. latis, basi acutis vel obtusis et in petiolum decurrentibus, apice obtusis, margine saepe valde recurvatis et dentibus 3–5 per centimetrum crenulatis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 5–8 brevibus arcuatis supra subprominulis subtus acute elevatis et in axillis plerumque conspicue domatiiferis, rete venularum intricato utrinque prominulo; racemis axillaribus erectis 5–10 cm. longis 4–8-floris, pedunculo conspicue elongato ad 7 cm. longo subtereti mox glabrato, rhachi brevi pedicellisque breviter sericeo-puberulis, bractearum dentibus lateralibus coriaceis subpersistentibus subulatis circiter 2 mm. longis, pedicellis 7–16 mm. longis, alabastris elongato-conoideis acutis; sepalis subcarnosis lanceolatis, 10–11 mm. longis, basim versus 2–3 mm. latis, deinde ad apicem acuminatum gradatim angustatis, extus breviter sericeis, margine puberulis, intus glabris carinatis; petalis submembranaceis vel tenuiter carnosis et intus bulboso-incrassato-carinatis, oblongo-cuneatis, 9–12 mm. longis, 3–5 mm. latis, saepe concavis, extus copiose pallido-sericeis, intus carina basim versus sericeo-tomentella excepta glabris, apice in segmenta 9–15 lanceolata acuta 2–4 mm. longa conspicue patenti-fimbriatis; disci lobis 10 carnosis deltoideo-oblongis patentibus circiter 0.5 mm. diametro sparse hispidulis; staminibus 30–40

erectis 6–7 mm. longis, filamentis teretibus glabris gracilibus 1.5–2 mm. longis, antheris minute papillosis dorso sparse sericeis arista rigida interdum reflexa 1.5–2 mm. longa excepta 2–3 mm. longis; ovario ovoideo-subgloboso 3-loculari et styli basi sericeis, ovarii pariete crasso, loculis 8-ovulatis, stylo subulato 4.5–5 mm. longo superne glabro; fructibus ellipsoideis ad 12 × 8 mm., apice subacutis, pericarpio in sicco 2–3 mm. crasso, epicarpio tenui ruguloso, mesocarpio inconspicue fibroso, endocarpio verrucoso, loculo et semine solitariis.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, alt. 2700–2820 m., *Brass & Versteegh 10451, 10451A* (trees up to 21 m. high, frequent in forest of valleys; trunk about 29 cm. diam.; crown not wide-spreading; bark 6 mm. thick, brown, shallowly fissured; wood white; flowers yellowish green; young fruits green), *Brass 10767* (TYPE), Oct. 1938 (profusely flowering tree up to 25 m. high, common in forest of lower slopes and valley bottoms; flowers greenish yellow); 18 km. southwest of Bernhard Camp, Idenburg River, alt. 2200 m., *Brass & Versteegh 11991* (tree 29 m. high, frequent in primary forest on slope of a ridge; trunk 53 cm. diam.; crown not wide-spreading; bark 12 mm. thick, black; sap-wood white; heart-wood red-brown; fruits blue-green).

Although obviously related to the preceding new species (*E. pycnanthus*), *E. poculiferus* differs from it in its shorter petioles, smaller leaf-blades with obtuse rather than acuminate apices, longer-pedunculate and fewer-flowered inflorescences, substantially larger flowers, more deeply fimbriate petals, and stamens with more elongate awns. Although the petals of *E. poculiferus* are not of the type commonly occurring in § *Coilopetalum*, its relationships are definitely with this section.

Elaeocarpus (§ *Coilopetalum*) **habbemensis** sp. nov.

Arbor ad 25 m. alta inflorescentiis exceptis ubique glabra, ramulis hornotinis subangulatis flavo-brunneis 2–3 mm. diametro, ramulis annotinis teretibus cinereis verrucoso-lenticellatis; petiolis gracilibus canaliculatis 10–22 mm. longis; laminis subcoriaceis in sicco flavescentibus ellipticis, 5–9 cm. longis, 2.5–4.5 cm. latis, basi late obtusis, apice rotundatis vel late obtusis, margine dentibus 3–5 per centimetrum conspicue crenulato-serratis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 5–7 erecto-patentibus anastomosantibus supra paullo insculptis subtus elevatis et in axillis saepe conspicue domatiiferis, rete venularum intricato utrinque prominulo; racemis axillaribus suberectis 4–10 cm. longis 6–12-floris, pedunculo 2–4 cm. longo et rhachi gracilibus leviter angulatis pedicellisque minute sericeo-puberulis demum subglabratis, pedicellis gracilibus curvatis 10–16 mm. longis, alabastris anguste ovoideis acutis; sepalis papyraceis acutis oblongo-lanceolatis, 7–8 mm. longis, circiter 2 mm. latis, utrinque breviter sericeis, intus glabratis, margine incrassato puberulis; petalis submembranaceis, basim versus paullo incrassatis et intus inconspicue carinatis, obovato-cuneatis, 6–8 mm. longis, 2.5–3 mm. latis, in segmenta 10–12 lanceolata 1.5–2 mm. longa irregulariter fimbriatis, extus dense sericeis, intus carina sericeo-hispidula excepta glabratis; disco annulari-pulvinato crenulato circiter 0.7 mm. alto sparse hispidulo; staminibus 22–27 ubique minute hispidulis 4–4.5 mm. longis, filamentis gracilibus subteretibus 0.7–1.3 mm. longis, antheris apiculo inconspicuo 0.3–0.5 mm. longo incluso 3–3.5 mm. longis; gynaecio glabro, ovario ellipsoideo 2-loculari, loculis 8–10-ovulatis, stylo subulato circiter 3.5 mm. longo; fructibus ellipsoideis

ad 16 × 10 mm., apice basi styli apiculatis, pericarpio 1–1.5 mm. crasso, epicarpio et endocarpio extus rugulosis, mesocarpio subnullo, loculo solitario vel dissepimento interdum subpersistente.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, alt. 2700–2840 m., *Brass & Versteegh 10444* (tree 22 m. high, rare in mossy-forest, on a ridge; trunk 37 cm. diam.; crown not wide-spreading; bark 9 mm. thick, smooth, brown; outer wood white; inner wood gray-green; fruits green), *Brass & Versteegh 11101* (TYPE), Oct. 29, 1938 (tree 25 m. high, frequent in mossy-forest; trunk 35 cm. diam.; crown not wide-spreading; bark 6 mm. thick, gray, fairly smooth; outer wood white; inner wood brown; flowers white; young fruits green).

Although the petals of this species are broader and more copiously laciniate than in most species of § *Coilopetalum,* while the glabrous ovary is also aberrant in this section, nevertheless this seems the best place for it. Its relationship is doubtless with *E. Ledermannii* Schlechter and the two new species described above (*E. pycnanthus* and *E. poculiferus*), from all of which its glabrous ovary and its petals, which are subglabrous and obscurely carinate within, readily distinguish it. *Elaeocarpus habbemensis* is further differentiated by its elliptic obtuse leaf-blades, glabrous habit, subentire disk, and many minor characters.

Elaeocarpus (§ *Coilopetalum*) **luteolus** sp. nov.

Arbor ad 15 m. alta copiose ramosa, ramulis hornotinis leviter angulatis 1.5–2 mm. diametro pallide sericeis squamulis minutis saepe squarrosis, ramulis annotinis glabratis teretibus verrucoso-lenticellatis; petiolis gracilibus canaliculatis 4–9 mm. longis mox glabratis; laminis chartaceis vel subcoriaceis in sicco pallide viridibus vel fuscescentibus ellipticis, (2–) 3–7 cm. longis, (1.2–) 1.5–3 cm. latis, basi obtusis vel acutis, apice obtusis vel obtuse breviter cuspidatis, margine recurvatis et dentibus 3–6 per centimetrum spinuloso-serrulatis, supra costa interdum puberula excepta glabris, subtus nervis venulisque sparse sericeo-hispidulis demum glabratis, costa supra acute prominula subtus valde elevata, nervis lateralibus utrinsecus 4 vel 5 adscendentibus supra leviter impressis subtus elevatis, rete venularum intricato utrinque prominulo vel supra subplano; racemis axillaribus 3–6 (–11) cm. longis 6–9(–15)-floris, pedunculo conspicuo ad 3 (–4) cm. longo glabrato, rhachi gracillima pedicellisque breviter sericeo-puberulis, bracteis oblongis 2–3 mm. longis mox caducis basi dentes 2 laterales subulatos gerentibus, pedicellis gracilibus 5–11 mm. longis, alabastris ovoideis subacutis; sepalis papyraceis acutis oblongo-lanceolatis, 5–6 mm. longis, 1.3–1.8 mm. latis, extus dense sericeis, intus puberulis carinatis; petalis tenuiter carnosis obovato-cuneatis, 5–6 mm. longis, 2–2.3 mm. latis, utrinque dense pallido-sericeis, intus planis, apice rotundatis et in segmenta 9–18 lanceolato-linearia 0.7–1.2 mm. longa fimbriatis; disco annulari crenulato circiter 0.5 mm. alto brunneo-hispidulo; staminibus 15–18 ubique minute sericeo-hispidulis 2.5–3.2 mm. longis, filamentis gracilibus 1–1.5 mm. longis, antheris mucrone obscuro circiter 0.15 mm. longo incluso 1.4–1.7 mm. longis; ovario ellipsoideo 2-loculari et styli basi dense sericeis, loculis 8(raro 6- vel 7-)-ovulatis, stylo subulato 2.5–3 mm. longo superne glabro; fructibus ellipsoideis submaturis ad 10 × 7 mm., apice obtusis et stylo subpersistente saepe mucronulatis, pericarpio 1.5–2 mm. crasso, epicarpio tenui ruguloso, mesocarpio fibroso, endocarpio ut videtur sublevi, loculo et semine solitariis.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt. 2200–2300 m., *Brass 11073* (TYPE), Nov. 1938 (small bushy tree 3 m. high, on edge of a forest clearing; flowers yellow; fruits immature), *Brass 11334* (tree 15 m. high, in old secondary forest; trunk 20 cm. diam.; flowers brown; fruits blue-green).

From *E. altigenus* Schlechter, its only close ally, *E. luteolus* differs in its shorter petioles, obtuse or obtusely cuspidate (rather than long-acuminate) leaf-blades, which are thicker in texture and have the veinlet-reticulation less obvious, and mucronulate rather than obviously aristate anthers. Examination of an isotype of *E. altigenus* (*Schlechter 18793* [UC], from the Bismarck Mts., Northeastern New Guinea) shows that the anthers of that species bear conspicuous awns at least 1 mm. long. These two species form a compact group and, in spite of the plane rather than carinate inner surfaces of their petals, their position in § *Coilopetalum* is unquestionable. Number *11334* has smaller leaves than the type of *E. luteolus*, but in other respects the cited specimens are identical; my description is inclusive.

Elaeocarpus (§ *Coilopetalum*) **fulgens** sp. nov.

Arbor ad 30 m. alta, ramulis apicem versus 2–4 mm. diametro striatis dense brunneo-sericeis, ramulis annotinis subteretibus fusco-cinereis glabratis; petiolis gracilibus supra complanatis 1–2 cm. longis breviter sericeis; laminis chartaceis vel subcoriaceis in sicco supra fusco-viridibus subtus pallidioribus fulgentibusque, oblongo-ellipticis, 4–7 cm. longis, 1.5–3 cm. latis, basi late obtusis, apice in acuminem ad 1 cm. longum saepe mucronulatum angustatis, margine dentibus 5–7 per centimetrum nigro-mucronulatis obscure serrulatis, supra costa interdum puberula excepta glabris, subtus densissime et persistenter argenteo-sericeis, costa supra peracute prominula subtus prominente, nervis lateralibus utrinsecus 5–7 adscendentibus supra subplanis subtus elevatis, rete venularum intricato supra leviter prominulo subtus indumento occulto; racemis axillaribus 5–10-floris, pedunculo brevi et rhachi gracilibus pedicellisque dense et breviter sericeo-hispidulis, pedicellis 3–8 mm. longis; sepalis petalisque non visis; disci lobis 5 carnosis oblongis bilobatis circiter 0.4 mm. altis sparse hispidulis; staminibus sub fructu juvenili saepe persistentibus circiter 2 mm. longis, filamentis gracilibus hispidulis 0.8–1 mm. longis, antheris anguste ellipsoideo-oblongis 1–1.2 mm. longis dorso sparse sericeis apice obtusis; ovario ellipsoideo pallide sericeo 2-loculari, pariete valde incrassato, loculis ut videtur 8-ovulatis, stylo mox caduco non viso; fructibus ellipsoideis maturitate ad 8 × 6 mm., basi et apice rotundatis, pericarpio circiter 1.5 mm. crasso, epicarpio tenui ruguloso, mesocarpio sparso fibroso, endocarpio verruculoso, loculo et semine solitariis.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1150 m., *Brass & Versteegh 12551* (TYPE), Feb. 20, 1939 (tree 24 m. high, occasional in primary forest on a ridge; trunk 61 cm. diam.; crown not wide-spreading; bark 8 mm. thick, dark brown; sap-wood brown; heart-wood dark brown; fruits green), *Brass & Versteegh 13107* (tree 30 m. high, frequent in primary forest on slope of a ridge; trunk 61 cm. diam.; crown not wide-spreading; bark 10 mm. thick, gray; wood white; young fruits green, the ripe ones blue).

In spite of the lack of perianth-parts, the cited specimens are sufficiently ample to permit recognition and description of this new species. The maturing ovaries of no. *12551* are accompanied by a few stamens. The relation-

ship of the new species is obviously with *E. altigenus* Schlechter and *E. luteolus* (described above), from both of which it differs in the dense and persistent pubescence of the lower leaf-surfaces, the short peduncles and pedicels, and the separate disk-lobes. In the length of its petioles and in its acuminate leaf-blades, *E. fulgens* resembles *E. altigenus*, while in its unawned anthers it resembles *E. luteolus*. The stamens of *E. fulgens* are shorter than those of its allies, indicating that the other floral parts may also prove to be smaller.

It is quite possible that *E. Ledermannii* var. *timoniifolius* Schlechter (in Bot. Jahrb. 54: 142. 1916) will prove to be identical with the new species.

PAPUASIAN ELAEOCARPI NOT PLACED IN SECTIONS

In the preceding pages I have attempted to place in Schlechter's system all the species not so placed by him and also those species described since his work in 1916. There remains a residue of species for which I can suggest no definite place in the system. Two of these species (*E. Muellerianus* Schlechter [*E. Ganitrus* sensu F. v. Muell. in Jour. Bot. 31: 321. 1893, non Roxb.] and *E. Reedyi* F. v. Muell. [*E. Arnhemicus* F. v. Muell. Pap. Pl. 1: 6. 1875, pro parte novo-guin., excl. typo austral.]) have never been properly described and may be dismissed as *nomina subnuda*. *Elaeocarpus aberrans* Brandis is a species of *Sloanea*, as which it will be discussed below.

The remaining unplaced species are *E. Sayeri* F. v. Muell., *E. florulentus* Ridley, *E. firmus* Knuth, *E. Peekelii* Knuth, and *E. rugulosus* Knuth. A careful perusal of the descriptions of these species convinces me that they are not represented in the Papuasian material now available, but critical points are sometimes omitted from the descriptions. An isotype of *E. firmus* is available but is not in condition to place.

(*To be concluded*)

JOURNAL

OF THE

ARNOLD ARBORETUM

VOL. XXV JULY, 1944 NUMBER 3

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Dubouzetia Pancher

Dubouzetia Pancher (ex Brongn. & Gris in Bull. Soc. Bot. Fr. 8: 199. 1861) is now composed of five species, all endemic to New Caledonia, according to the informative revision by Sprague (in Kew Bull. 1907: 125–128. 1907). The differences between *Dubouzetia* and its closest ally, the Chilean *Tricuspidaria* R. & P. (*Crinodendron* Mol., in part), are adequately discussed by Sprague (loc. cit., also op. cit. 10–12).

The discovery of two New Guinean species which indubitably represent *Dubouzetia* is of especial interest and further illustrates the occurrence of certain floristic elements in both the New Caledonian and Papuasian regions. *Antholoma,* also of the Elaeocarpaceae, is already known to have a similar distribution (see discussion below under *Sloanea*).

Dubouzetia novoguineensis sp. nov.

Arbor ad 14 m. alta partibus juvenilibus sericeo-puberulis inflorescentiisque exceptis glabra, ramulis gracilibus apicem versus angulatis vetustioribus subteretibus lenticellatis; petiolis gracilibus nigrescentibus canaliculatis 5–12 mm. longis; laminis chartaceis in sicco fusco-olivaceis ellipticis, (4–)5–9 cm. longis, 2.5–5.5 cm. latis, basi obtusis et in petiolum decurrentibus, apice obtusis vel rotundatis, margine repando-denticulatis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 5–7 erecto-patentibus anastomosantibus supra prominulis subtus elevatis, rete venularum copioso utrinque prominulo; inflorescentiis axillaribus vel e ramulis defoliatis ortis breviter racemosis 4–8-floris, pedunculo brevi et rhachi striatis parce puberulis sub anthesi et sub fructu 5–10 mm. longis, bracteis ellipticis puberulis ad 4 mm. longis ante anthesin caducis, pedicellis gracilibus puberulis sub anthesi 15–25 mm. longis sub fructu incrassatis interdum ad 30 mm. longis; sepalis 5 papyraceis oblongo-lanceolatis, 12–14 mm. longis, basim versus 3–4 mm. latis deinde ad apicem subacutum gradatim angustatis, utrinque minute sericeo-puberulis, intus carinatis; petalis 5 membranaceis oblongis, 16–18 mm. longis, 7–8 mm. latis, margine involutis

et basim versus saepe subcohaerentibus, apice rotundatis et obscure 3- vel 4-denticulatis (lobis deltoideis obtusis circiter 0.2 mm. longis), flabellatim paucinervatis et intus inferne inconspicue carinatis, utrinque basim versus et margine parce hirtellis ceterum glabris; disco 10-lobato, lobis carnosis subglobosis circiter 1 mm. diametro superne minute hirtellis; staminibus circiter 31 ubique hispidulo-puberulis 2- vel 3-seriatis, filamentis subteretibus 8–9 mm. longis, antheris 4–4.5 mm. longis; ovario 3–5-loculari subgloboso-ovoideo dense aureo-sericeo, loculis 6-ovulatis, stylo subulato obscure sulcato circiter 12 mm. longo inferne ut ovario sericeo superne glabro; capsulis depresso-subglobosis, 10–15 mm. longis, paullo latioribus, inconspicue sericeo-puberulis, primum ad medium vel fere ad basim locilicide denique perfecte septicide dehiscentibus, epicarpio tenui, endocarpio duro, basi styli persistente fisso, seminibus ut videtur circiter 3 pro loculo ellipsoideis circiter 3 mm. longis castaneis nitidis strophiolatis.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, alt. 2300–2400 m., *Brass 4041* (A, NY) (small slender weakly branched tree, in mossy-forest; leaves glossy on both sides), *Brass 4888* (A, NY) (clean-boled tree, common in ridge forests; crown spreading, thin-foliaged; leaves darker and shining above, reddish in age), *Brass 5059* (A, TYPE, NY), Sept. 17, 1933 (tree 12–14 m. high, common in substage of tall *sama* forest; leaves dark, with pale midrib and nerves; petals cream-colored).

Dubouzetia novoguineensis is quite distinct from the known New Caledonian species of the genus, being most suggestive of *D. elegans* Brongn. & Gris, according to Sprague's key (in Kew Bull. 1907: 126. 1907). The new species differs from *D. elegans* in its proportionately broader and apparently thinner leaf-blades, in having its flowers 4–8 on an obvious rachis rather than paired and subfasciculate, and in having its sepals somewhat larger at anthesis and its stamens more numerous.

Dubouzetia dentata sp. nov.

Arbor ad 25 m. alta sub fructu ubique infructescentiis exceptis glabra, ramulis gracilibus castaneis apicem versus angulatis inferne subteretibus; petiolis gracilibus canaliculatis 8–13 mm. longis; laminis chartaceis vel subcoriaceis in sicco fusco-olivaceis anguste ellipticis, 8–12.5 cm. longis, 2.5–4.5 cm. latis, basi obtusis, in apicem acutum gradatim angustatis, margine anguste recurvatis et dentibus apiculatis distantibus conspicue crenato-serratis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 6–9 leviter curvatis supra paullo subtus valde prominulis, rete venularum copioso utrinque prominulo; inflorescentiis sub fructu e ramulis infra folia orientibus vel interdum axillaribus, breviter racemosis, pedunculo brevi et rhachi 4 10 mm. longis demum glabratis, pedicellis sub fructu gracilibus 15–30 mm. longis puberulis vel glabratis; sepalis petalisque non visis; disco persistente 10-lobato, lobis carnosis oblongis circiter 1.2 mm. altis superne hirtellis; staminibus interdum subpersistentibus ut videtur circiter 30 ubique copiose hirtellis, filamentis gracilibus 5–7 mm. longis, antheris 1.7–2 mm. longis; capsulis 2–4 per inflorescentiam apicem rhachis versus ortis, obovoideis, maturitate 16–20 mm. longis et 12–15 mm. latis, basim versus angustatis, apice basi styli persistente fisso coronatis, cano-puberulis demum glabratis, primum parum loculicide denique perfecte septicide dehiscentibus, epicarpio tenui in sicco ruguloso, endocarpio osseo, seminibus paucis ellipsoideis 3–4 mm. longis atro-castaneis strophiolatis.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt.

2300 m., *Brass 11251* (TYPE), Nov. 1938 (subsidiary tree 25 m. high in fagaceous forest of slopes; trunk 60 cm. diam.; bark fibrous, fissured).

Although the described collection lacks flowers, the characteristics of the fruit and the available persistent stamens leave no doubt that a species of *Dubouzetia* is represented. *Dubouzetia dentata* is of the general relationship of *D. novoguineensis* (described above), differing in its proportionately narrower and more sharply toothed leaf-blades, its much smaller anthers, and its obovoid fruits, which are gradually narrowed rather than rounded at base. The new species closely resembles the New Caledonian *D. elegans* Brongn. & Gris in leaf-shape and -texture but has the veinlets more obvious on both surfaces and the flowers more numerous; the anthers of *D. elegans* are about 3 mm. long, but apparently the fruits have not yet been described.

Sloanea L.

The Papuasian species of Elaeocarpaceae with loculicidally dehiscent fruits, a flattened staminiferous torus, and laterally dehiscent anthers not opening at the apex (*Sloanea* sens. lat.) were placed by Schlechter (in Bot. Jahrb. 54: 146–155. 1916) in three genera, *Echinocarpus* Bl., *Anoniodes* Schlechter, and *Antholoma* Labill. The biological validity of these genera can be appraised only by considering groups of this alliance in other parts of the world, including the proposed genera *Echinocarpus* and *Phoenicosperma*.

Echinocarpus Bl. (Bijdr. Fl. Ned. Ind. 56. 1825) was based on *E. Sigun* Bl. (loc. cit.), a Javan species with the following essential characters: inflorescences 1-flowered; petals differing from the sepals, toothed at apex; stamens with obvious filaments, awned at apex; ovary pubescent and obscurely muricate, the style moderately long; fruit copiously echinate; aril partial, covering apical portion of the seed only, irregular-margined. This concept is the basis of *Sloanea* § *Echinocarpus* F. v. Muell. ex K. Schum.

Phoenicosperma Miq. (in Ann. Mus. Bot. Lugd.-Bat. 2: 68. *t. 3.* 1865) was based on *P. javanicum* Miq. (loc. cit.), with the following essential characters: inflorescence few-flowered, racemose or paniculate; petals sepaloid in texture, shape, and size; stamens with distinct filaments and awned anthers; ovary velutinous, not muricate, the style moderately long; fruit thick-walled, closely pubescent but not echinate; seeds nearly completely enveloped in an aril, this eventually irregular-margined along one side (ex descr. et icon. Miq.) but probably covering young seeds completely except for the hilar area. *Sloanea* § *Phoenicospermum* K. Schum. is based upon this concept.

An examination of the Malaysian and continental Asiatic species of this alliance indicates that many of them fall into the concept typified by *Echinocarpus Sigun*, while others have the fruit non-echinate like that of *Phoenicosperma;* some have the petals sepaloid and others have them dentate, while many have the anthers essentially erostrate. These characters are found in diverse combinations, to such a degree that the limits

of *Echinospermum* and *Phoenicosperma,* as genera, are no longer useful. Further to complicate the picture, certain Australian species, such as *Sloanea Macbrydei* F. v. Muell. and *S. Woollsii* F. v. Muell., lack petals altogether.

There remains to be considered the possible separation of the Old World species of this alliance (as *Echinocarpus*) from *Sloanea,* which is based on *S. dentata* L., a West Indian species, pertaining to which the discussions of Urban (in Rep. Sp. Nov. 15: 321. 1918, and in Notizbl. Bot. Gart. Berlin 8: 27. 1921) are of importance. The American species of *Sloanea* are as diverse as their Old World relatives, having the fruit either echinate or not, the stamens with filaments of various lengths and with anthers either awned or not, and the flowers usually in open clusters but sometimes essentially fasciculate or even solitary. Petals are apparently lacking among the American species except in *S. jamaicensis* Hook. (Ic. Pl. 7: *pl. 693–696.* 1844). In view of this diversity, no single character nor any combination of characters will serve to separate the New and Old World species into two different genera. This is the prevailing viewpoint, adopted by K. Schumann (in E. & P. Nat. Pfl. III. 6: 5. 1890). However, Schumann's division of *Sloanea* into three sections, § *Eusloanea,* § *Echinocarpus,* and § *Phoenicospermum,* does not seem adequate, the genus being far more complex than such a division suggests. It is probable that a monographer of the group will erect many more sections, each based upon a combination of characters. None of Schumann's sections, in the narrow sense, occurs in Papuasia.

Support for a comprehensive concept of *Sloanea* is indicated by the treatments of Baillon (Hist. Pl. 4: 190–191. 1873), Szyszylowicz (in Bot. Jahrb. 6: 454. 1885), Koorders & Valeton (Bijdr. Boom. Java 1: 235–240. 1894), F. M. Bailey (Queensl. Fl. 1: 159–160. 1899), Gagnepain (in Lecomte, Fl. Gén. Indo-Chine 1: 562–564. 1910), Rehder & Wilson (in Sargent, Pl. Wils. 2: 361–362. 1915), and the majority of other students who have considered the group.

Contrary opinions, however, are expressed by Bentham (in Jour. Linn. Soc. Bot. 5: Suppl. 2: 62–74. 1861), Bentham & Hooker (Gen. Pl. 1: 238–239. 1862, and 987. 1867), Masters (in Hook. f. Fl. Brit. Ind. 1: 399–400. 1874), and Schlechter (in Bot. Jahrb. 54: 146–154. 1916). Schlechter proposed to segregate the Old World *Echinocarpus* from the American *Sloanea* on the basis of the following characters: the flowers of *Echinocarpus* are solitary and those of *Sloanea* clustered; the stamens are more numerous in *Echinocarpus;* the style is entire in *Echinocarpus* and 3–5-parted in *Sloanea;* and the aril of the seeds in *Echinocarpus* is lacerated and in *Sloanea* entire. However, none of these characters is dependable, various combinations of them being found in both hemispheres.

While the generic value of *Antholoma* appears not to have been questioned, I am unable to separate this genus from *Sloanea.* It is, in fact, very closely related to the section of *Sloanea* which I describe below as § *Pachycarpaea,* while these two sections are comparatively remote from other Papuasian sections. Thus it is undesirable to retain *Antholoma* as a genus unless the concept of *Sloanea* is broken up into numerous genera,

perhaps a dozen or two, a course which seems unwise in view of the complicated and reticulate inter-specific relationships within the group.

The Papuasian species of *Sloanea* fall into four natural groups, which are designated as sections, as follows:

Petals essentially similar to sepals in texture, shape, and size, not dentate at apex; stamens with short scarcely differentiated filaments, the anthers with short obtuse or subacute apices, essentially erostrate; ovary muricate as well as pubescent, the processes often minute and hidden by tomentum at anthesis; style comparatively short, often subconical, eventually deeply divided; seeds nearly completely enveloped by the aril.

Inflorescence racemose, several- or many-flowered, usually axillary, sometimes terminal on short branchlets and with the lower flowers solitary in leaf-axils; stamens all fertile; ovary muricate with obtuse or acute non-plumose processes; fruit copiously echinate with stiff sharp persistent non-irritant spines; aril extending nearly to the hilum, irregular- or subentire-margined.....§ *Anoniodes*.

Inflorescence axillary, 1-flowered, the peduncle and pedicel subcontinuous, articulate; fertile stamens surrounded by numerous linear staminodes; ovary muricate with stout hair-like processes which are copiously plumose distally; fruit covered with stiff slender plumose irritant spines, these at length more or less caducous, leaving the fruit-surface setose with smaller simple hairs or at length glabrous and finely pitted (pits indicating attachment of irritant spines); aril essentially complete except for the hilar scar.....§ *Cnidocarpaea*.

Petals differing from sepals in texture, shape, and size, dentate at apex; stamens all fertile, with obvious filaments and long-awned anthers; ovary velutinous or tomentellous with simple hairs, not muricate; style elongate, subulate, subentire or at length apically divided; fruit smooth, velutinous or tomentellous, not echinate, at length subglabrescent but then not pitted; aril partial, covering the apical portion of the seed and extending downward along one side nearly to the hilum.

Inflorescence short-racemose, few- or rarely 1-flowered; petals 4–6, rarely more, essentially equal in width, not plicate, free or very rarely subconnate; aril thick and waxy even when dried, the lateral flange linear-oblong, very gradually tapering.....§ *Pachycarpaea*.

Inflorescence usually 1-flowered (in Papuasian species), the peduncle and pedicel subcontinuous and obscurely articulate; petals plicate distally, connate into a corolla, rarely free and 2–4 in number (equal in width if 2, of diverse widths if 3 or 4); aril thin and papyraceous when dried, the lateral flange essentially triangular, abruptly tapering.....§ *Antholoma*.

Because of the transfer to *Sloanea* of the species of this alliance proposed by Schlechter and other students, the nomenclature of the Papuasian species is inevitably somewhat complicated. Therefore I list all the known species of the region, although material of some of them is not available. Seventeen species of *Sloanea*, most of which were proposed under other genera, are thus far described from Papuasia, to which number I add 12 new species below.

§ Anoniodes

Sloanea § Anoniodes (Schlechter) comb. nov.

Anoniodes Schlechter in Bot. Jahrb. 54: 149. 1916.

In founding *Anoniodes* upon nine endemic New Guinean species, Schlechter contrasts it with *Echinocarpus*, from which it is said to differ in having its inflorescences racemose rather than 1-flowered, its petals sepaloid, its stamens differently shaped and with a short scarcely differentiated filament, and its style shorter. Although these characters are

indeed noteworthy, they hardly seem of generic value in this complex group, as discussed above. No genotype was designated for *Anoniodes*, an oversight of little consequence, but in order to clarify any future discussion I should like to designate as the lectotype of § *Anoniodes* a well-known species of which ample material is available, *Sloanea Nymanii* K. Schum.

The differences between § *Anoniodes* and the other Papuasian sections are noted in the above key. From § *Echinocarpus*, § *Anoniodes* differs in its sepaloid petals, short filaments and essentially erostrate anthers, and its nearly complete rather than apical aril. From § *Phoenicospermum*, § *Anoniodes* differs in its short filaments and essentially erostrate anthers, its muricate ovary, and its copiously echinate rather than smooth capsules.

The only New Guinean species described since 1916 which is referable to § *Anoniodes* is *S. sogerensis* Bak. f., discussed below as the acceptable binomial for *Anoniodes sterculiacea* Schlechter. With the addition of the five species herewith described as new, the section is now composed of 14 species.

Sloanea (§ *Anoniodes*) **Nymanii** K. Schum. in K. Schum. & Lauterb. Nachtr. Fl. Deutsch. Schutzgeb. Südsee 314. 1905; Bak. f. in Jour. Bot. 61: Suppl. 5. 1923.
Anoniodes Nymanii Schlechter in Bot. Jahrb. 54: 150. 1916.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, alt. 900–1000 m., *Clemens 501* (tree 15–18 m. high; seeds scarlet), *Clemens 1973* (tree 15–18 m. high, along forest trail); in den Wäldern oberhalb der Kaulo-Etappe, alt. about 1000 m., *Schlechter 17189* (UC) [det. Schlechter]. BRITISH NEW GUINEA: Central Division, Bella Vista, alt. 1450 m., *Brass 5456* (A, NY) (profusely flowering tree 20 m. high, in forest below oak formations; leaves pale, with whitish nerves; flowers cream-colored; seeds red).

Clemens 501 and *1973*, both in fruit, are from the type locality. *Brass 5456* also bears fruit and has mature inflorescences. Neither the fully mature flowers nor the fruits appear to have been described, and therefore the following notes seem desirable:

Inflorescences axillary or terminal on short branchlets, at maturity often up to 11 cm. long and 10–20-flowered, the lower flowers subtended by reduced leaves; pedicels at anthesis 10–17 mm. long, to 20 mm. long in fruit; sepals 4, up to 6 × 4 mm.; petals 4, resembling the sepals or slightly longer; torus about 2.5 mm. in diameter, the stamens 3- or 4-seriate, 50–55 (*Brass 5456*) to about 86 (*Schlechter 17189*), 2.5–3 mm. long, the filaments inconspicuous; ovary subglobose, hispid-pilose and densely muricate, the stylar column conical, stout, 1–1.3 mm. long, deeply 3- or 4-divided, the locules 3 or 4 (probably rarely 2), each 6-ovulate; capsule ellipsoid, at maturity 17–28 mm. long and 13–23 mm. broad before dehiscence, 3- or 4- or rarely 2-valved, the pericarp woody, 2–3 mm. thick, closely tomentellous-puberulent, densely echinate, the spines conical, 2–4 mm. long, glabrescent distally; seeds few or often only 1 per capsule, oblong-ellipsoid, 10–17 mm. long, 5–8 mm. broad, nearly completely covered by the aril, this undulate- or subentire-margined near the hilum.

Sloanea (§ *Anoniodes*) **glabra** (Schlechter) comb. nov.
Anoniodes glabra Schlechter in Bot. Jahrb. 54: 150. 1916.

Reported only from the type collection, *Ledermann 9107*, "Im dichten Höhenwalde auf dem Etappenberg, ca. 850 m.," Northeastern New Guinea.

Sloanea (§ *Anoniodes*) **aculeata** sp. nov.

Arbor ad 25 m. alta, ramulis robustis subteretibus rugulosis apicem versus sub fructu cano-puberulis demum subglabratis; petiolis gracilibus subteretibus 8–25 mm. longis ut ramulis puberulis glabrescentibusque; laminis coriaceis in sicco fuscis elliptico- vel paullo obovato-oblongis, (5–)8–13 cm. longis, (2.5–)3.5–7 cm. latis, basi anguste subcordatis vel truncatis et inconspicue quinquenerviis, apice acutis et interdum cuspidatis vel rotundatis apiculo parvo ornatis, margine inconspicue crenatis, supra costa interdum puberula excepta glabris, subtus primo nervis venulisque molliter cano-hirtellis demum glabrescentibus, costa supra impressa vel in sulculo leviter elevata subtus prominente, nervis lateralibus utrinsecus 4–7 erecto-patentibus supra leviter impressis subtus valde elevatis, rete venularum intricato supra paullo subtus saepe valde prominulo; ramulis ut videtur in inflorescentiam terminalem transeuntibus, rhachi ramulis simili ad 6 cm. longa saepe breviore ut videtur pluriflora; fructibus paucis saepe in axillis foliorum apicem ramulorum versus solitariis, pedicellis sub fructu robustis 3–5.5 cm. longis puberulis glabrescentibusque; capsulis subgloboso-ellipsoideis maturitate 3–4 cm. longis paullo angustioribus, dense puberulis atque spinis crassis subulatis 8–15 mm. longis puberulis copiose ornatis, demum basibus spinarum irregulariter tuberculatis, 4- vel raro 5-valvatis; stylo crasso subulato ad 15 mm. longo mox caduco vel basi subpersistente cum valvis fisso; pericarpio lignoso spinis exceptis basim versus circiter 10 mm. superne 4–5 mm. crasso; seminibus in quoque loculo ut videtur circiter 4 ellipsoideis, 9–14 mm. longis, 5–8 mm. latis, fere totis arillo hilum versus sinuato-marginato arcte occlusis, arillo demum hinc inde caduco, testa glauco-nigrescente.

Netherlands New Guinea: 2 km. southwest of Bernhard Camp, Idenburg River, alt. 850 m., *Brass & Versteegh 13529* (type), Apr. 1, 1939 (tree 25 m. high, frequent in primary rain-forest on a ridge; trunk 58 cm. diam.; crown not wide-spreading; bark 16 mm. thick, gray, shallowly fissured; wood red-brown; fruits yellow-brown); 6 km. southwest of Bernhard Camp, alt. 1200 m., *Brass & Versteegh 13104* (tree 21 m. high, rare in primary forest on a ridge; trunk 44 cm. diam.; crown fairly small; bark 6 mm. thick, brown, scaly, fairly rough; sap-wood white; heart-wood red; fruits red).

The specimen indicated as the type bears fully mature fruits and has the leaves essentially glabrous, while no. *13104* has younger fruits and the leaves still pubescent on the nerves and veinlets beneath. The closest relative of *S. aculeata* is probably *S. glabra* (Schlechter) A. C. Sm., which is more completely glabrous in habit and has longer petioles and a larger 3-valved fruit with fewer seeds.

Sloanea (§ *Anoniodes*) **Pullei** sp. nov.

Arbor ad 28 m. alta, ramulis robustis subteretibus apicem versus 5–10 mm. diametro mox glabris; stipulis parvis 1–2 cm. diametro foliaceis sessilibus basi cordatis mox caducis; petiolis crassis subteretibus (2.5–)3–8 cm. longis primo puberulis glabrescentibus; laminis chartaceo-coriaceis siccitate fuscescentibus late oblongo-ellipticis, (12–)17–33 cm. longis, (7–)10–20 cm. latis, basi rotundato-truncatis vel leviter cordatis et 7-nerviis, apice obtusis vel rotundatis et minute mucronulato-cuspidatis, margine irregulariter spinuloso-crenulatis, utrinque glabris vel nervis evanescenter puberulis, costa valida supra elevata subtus prominente, nervis e basi orientibus utrinsecus 3 rectis haud conspicuis, nervis lateral-

bus e costa utrinsecus 6–9 adscendentibus supra elevatis subtus prominentibus, eis basim versus nervulos conspicuos inferne emittentibus, rete venularum copioso utrinque plus minusve prominulo; inflorescentiis racemosis axillaribus 11–19 (sub fructu ad 23) cm. longis 15–20-floris, pedunculo conspicuo (rhachem subaequali) et rhachi leviter angulatis sub anthesi cum bracteis pedicellisque dense tomentello-puberulis sub fructu incrassatis et glabrescentibus, bracteis lanceolatis 4–5 mm. longis mox caducis, pedicellis sub anthesi gracilibus 12–15 mm. longis; sepalis 4 papyraceo-subcoriaceis elliptico-oblongis, 7–8 mm. longis, 3.5–4 mm. latis, subacutis, utrinque cano-puberulo-tomentellis; petalis 4 sepalis similibus sed ad 4.5 mm. latis; toro ad 3 mm. diametro; staminibus circiter 50 plerumque 3-seriatis circiter 3.5 mm. longis, filamentis carnosis glabris 0.5–1 mm. longis, antheris curvatis dorso obscure hispidulis apiculo glabro circiter 1 mm. longo exeuntibus; ovario ovoideo 4-angulato 4-loculari pilis stramineis circiter 0.3 mm. longis dense hispido atque obscurissime muricato, loculis 10-ovulatis, stylo crasso conico circiter 1.5 mm. longo superne glabro apice obscure 4-fido; pedicellis sub fructu valde incrassatis ad 2 cm. longis; capsulis maturis ellipsoideis 4–5 cm. longis paullo angustioribus, persistenter cano-puberulis atque spinis subulatis ad 10 mm. longis (mox interruptis) ornatis, demum basibus spinarum tuberculatis, 4- vel raro 3-valvatis; pericarpio lignoso 9–10 mm. crasso; seminibus in quoque loculo ut videtur 4–6 ellipsoideis, 12–15 mm. longis, 5–7 mm. latis, fere totis arillo hilum versus subintegro-marginato occlusis.

NETHERLANDS NEW GUINEA: Mt. Perameles, alt. 1100 m., *Pulle 519* (TYPE), Dec. 1, 1912; 4 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 13135* (tree 28 m. high, occasional in primary rain-forest on the slope of a ridge; trunk 44 cm. diam.; crown not wide-spreading; bark 8 mm. thick, gray, fairly rough; sap-wood light yellow; heart-wood red-brown; fruits light brown).

The specimen designated as the type bears flowers and has been indicated by Dr. O. C. Schmidt to be a new species, with the specific epithet selected above; apparently Schmidt's binomial has not been published. Mt. Perameles lies to the south of Mt. Wilhelmina and consequently on the other side of the main range from the Idenburg River locality. The Brass and Versteegh specimen bears fruits and in foliage is essentially identical with the type.

Sloanea Pullei appears to be most closely related to *S. glabra* (Schlechter) A. C. Sm. and *S. aculeata* (above described), from both of which its much larger leaves and its elongate axillary inflorescences immediately distinguish it.

Sloanea (§ *Anoniodes*) **micrantha** nom. nov.

Anoniodes parviflora Schlechter in Bot. Jahrb. 54: 151. 1916; non *Sloanea parviflora* Planch. ex Benth., 1861.

Known only from the original collection, *Ledermann 10369*, "Im lichten Bergwalde auf dem Lordberg, ca. 1000 m.," Northeastern New Guinea.

Sloanea (§ *Anoniodes*) **brachystyla** (Schlechter) comb. nov.

Anoniodes brachystyla Schlechter in Bot. Jahrb. 54: 151. 1916.

Reported only from the type collection, *Ledermann 10356*, "Im montanen Walde auf dem Lordberg, ca. 1000 m.," Northeastern New Guinea.

Sloanea (§ *Anoniodes*) **Schumanni** Warb. in Bot. Jahrb. 13: 372. 1891; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 433 (as *S. Schumannii*). 1901; Bak. f. in Jour. Bot. 61: Suppl. 5. 1923.

Anoniodes Schumannii (sic) Schlechter in Bot. Jahrb. 54: 151. 1916.

The type was collected by Warburg (presumably no. *20023*) near Finschhafen, Northeastern New Guinea. Two other collections from the same general region are cited by Schlechter, and Baker lists a collection from Sogere, British New Guinea.

Sloanea (§ *Anoniodes*) **speciosa** sp. nov.

Arbor, ramulis gracilibus subangulatis apicem versus 2–3 mm. diametro crispato-hispidulis mox glabratis; stipulis inconspicuis lanceolatis ad 1 cm. longis interdum in laminam minutam expansis mox caducis; petiolis gracilibus subteretibus 1.5–4 cm. longis ut ramulis hispidulis et glabrescentibus; laminis papyraceo-chartaceis oblongo-ellipticis, maturis 10–16 cm. longis et 4.5–7 cm. latis, basi anguste subcordatis vel rotundato-truncatis et inconspicue 5-nerviis, apice acutis vel breviter mucronulato-cuspidatis, margine dentibus 1 vel 2 per centimetrum calloso-crenulatis, supra costa interdum puberulis, subtus costa nervisque laxe crispato-pilosis, ceterum glabris, demum omnino glabrescentibus, costa supra subplana subtus prominente, nervis lateralibus e costa utrinsecus 5–8 rectis adscendentibus supra impressis subtus valde elevatis, rete venularum intricato utrinque prominulo; inflorescentiis racemosis axillaribus vel terminalibus (ramulis in inflorescentiam transeuntibus, floribus interdum in axillis foliorum solitariis) 8–12 cm. longis plerumque 6–12-floris, pedunculo conspicuo et rhachi mox glabratis, bracteis linearibus hirtellis 1–2 cm. longis interdum foliaceis demum deciduis; pedicellis gracilibus sub anthesi 3–5 cm. longis copiose et pallide tomentellis; sepalis 4 papyraceis late ovato-ellipticis, 12–15 mm. longis, 7–9 mm. latis, subacutis, utrinque dense tomentello-puberulis; petalis 4 textura et indumento sepalis similibus, intus basim versus subglabratis, lanceolato-oblongis, 16–18 mm. longis, 5–7 mm. latis, subacutis; toro circiter 5 mm. diametro; staminibus circiter 110 valde falcatis 4- vel 5-seriatis 6–7 mm. longis, filamentis carnosis complanatis 1.5–2 mm. longis, antheris dorso sericeo-hispidulis apiculo acuto glabro 1–1.5 mm. longo exeuntibus; ovario ovoideo 4-loculari pilis simplicibus stramineis circiter 2 mm. longis dense hispido atque processibus circiter 0.15 mm. longis occultis obscure muricato, loculis circiter 16-ovulatis, stylo carnoso subulato circiter 5 mm. longo leviter sulcato apice obscure 4-fido.

Northeastern New Guinea: Morobe District, Quembung, alt. about 750 m., *Clemens 1189* (type), Dec. 12, 1935.

From *S. Schumanni* Warb., apparently its closest ally, *S. speciosa* is readily distinguished by the sparse rather than copious indument of its petioles and leaf-nerves, its smaller leaf-blades, its sometimes terminal inflorescence with the flowers often solitary in leaf-axils, and its much longer pedicels. Mature floral dimensions have not been given for *S. Schumanni*, but the bud is presumably about the size of that of the new species.

Sloanea (§ *Anoniodes*) **sogerensis** Bak. f. in Jour. Bot. 61: Suppl. 6. 1923.

Anoniodes sterculiacea Schlechter in Bot. Jahrb. 54: 152. 1916; O. C. Schmidt in Jour. Arnold Arb. 10: 237. 1929; non *Sloanea sterculiacea* Rehder & Wilson, 1915.

Netherlands New Guinea: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1250 m., *Brass & Versteegh 12529* (tree 25 m. high, occasional in primary forest on a ridge; trunk 50 cm. diam.; crown not wide-spreading; bark 8 mm. thick, gray, fairly smooth; sap-wood light rose; heart-wood red-brown; fruits brown-yellow). Northeastern New Guinea: Morobe District: Sattelberg, alt. 750–1050 m., *Clemens 1854*

(large tree, in forest; trunk more than 1 m. diam.; fruit yellow-gray), *Clemens 1899* (tree, in forested hills; trunk 45–60 cm. diam.; fruit gray-green), *Clemens 3103;* Bulung River, alt. about 900 m., *Clemens 5334;* Boana, alt. 750–1350 m., *Clemens 41805* (large tree; seeds scarlet). BRITISH NEW GUINEA: Central Division: Iawarere, alt. about 350 m., *Brass 691* (large straight-boled tree, with brittle corky bark and pale hard wood); Mafulu, alt. 1250 m., *Brass 5210* (A, NY) (large tree, in tall forest of mountain-slopes; crown dense, thickly branched; fruit pale yellow, the seeds orange-red).

Anoniodes sterculiacea was based on *Ledermann 9581,* "In dichtem Höhenwald auf dem Etappenberge, ca. 850 m.," Northeastern New Guinea; the specific epithet is not available in *Sloanea. Sloanea sogerensis* is typified by four collections of Forbes, from Sogere, Central Division, British New Guinea. A comparison of the two original descriptions indicates that the same species was under consideration, characterized by large and subpersistent stipules, large leaf-blades which are persistently hirtellous beneath, and elongate inflorescences. *Sloanea sogerensis* is described as having longer petioles and pedicels than *Anoniodes sterculiacea,* but in the series of specimens cited above I find the petioles to vary from 2 to 8 cm. and the pedicels from 1 to 3.5 cm. in length, indicating that these characters are variable. The racemes are often elongated to 30 cm. in fruit. The flowers are predominantly 4-merous (sepals said to be commonly 3 in *Anoniodes sterculiacea*), the stamens about 200 and 5- or 6-seriate, the capsule at maturity subglobose, 3–4 cm. in diameter, usually 4-valved, copiously covered with spines 6–12 mm. long, and the seeds are few, often only 1 per locule, large (up to 18 × 9 mm.), and nearly completely arillate.

Sloanea (§ *Anoniodes*) **oxyacantha** sp. nov.

Arbor ad 17 m. alta, ramulis subteretibus apicem versus 3–5 mm. diametro dense brunneo-tomentello-puberulis inferne demum subglabrescentibus; stipulis saepe subpersistentibus textura foliaceis suborbicularibus sessilibus basi cordatis 6–12(–25) mm. diametro; petiolis robustis subteretibus ut ramulis tomentellis (1.5–)3–6.5 cm. longis; laminis chartaceo-coriaceis in sicco fuscis deltoideo-ovatis vel -ellipticis, (8–)12–24 cm. longis, (5–)7–13.5 cm. latis, basi profunde cordatis et 7- vel raro 5-nerviis, apice acutis et calloso-apiculatis, margine dentibus 1 vel 2 per centimetrum calloso-apiculatis crenulatis, supra costa nervisque copiose hispidulis et rete venularum interdum pilifero exceptis glabris, subtus molliter et breviter hirtellis, costa supra leviter subtus valde prominente, nervis lateralibus e costa utrinsecus 6–9 erecto-patentibus supra leviter elevatis subtus prominentibus, eis basim versus nervulos paucos inferne emittentibus, rete venularum intricato utrinque prominulo; inflorescentiis sub fructu axillaribus racemosis 3–8 cm. longis, pedunculo subnullo, rhachi crassa subtereti pedicellisque ut ramulis puberulis demum subglabrescentibus; fructibus paucis, pedicellis 11–17 mm. longis; capsulis subglobosis spinis exclusis ad 1 cm. diametro, dense puberulis atque spinis crassis subulatis 8–12 mm. longis copiose obtectis, ut videtur interdum 2-valvatis (apertis non visis), stylo brevi inconspicuo coronatis, pericarpio 2–3 mm. crasso; seminibus ut videtur interdum solitariis, fere totis arillo occlusis.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, alt. 1700 m., *Brass & Versteegh 11924* (tree 17 m. high, frequent in rain-forest of upper slopes; trunk 39 cm. diam.; crown not wide-spreading; bark 5 mm. thick, brown; wood

rose-colored; fruits brown-yellow), *Brass 12045* (TYPE), Jan. 1939 (tree 4 m. high, one specimen seen in undergrowth of a rain-forest gully).

Although known only from the two cited fruiting specimens, *S. oxyacantha* is obviously most closely related to *S. sogerensis* Bak. f., which it resembles in its stipules and in the texture, shape, pubescence, and venation of its leaf-blades. The leaf-blades of the new species are inclined to be more deltoid-ovate than elliptic-ovate in shape, while in fruit the two species are quite different. *Sloanea oxyacantha* has the inflorescence much more compact and short-pedunculate, while the capsules are short-pedicellate and much smaller, with correspondingly fewer spines.

Sloanea (§ *Anoniodes*) **Ledermannii** nom. nov.

Anoniodes rufa Schlechter in Bot. Jahrb. 54: 152. *f. 9, H–M.* 1916; non *Sloanea rufa* Planch. ex Benth., 1861.

Recorded only from the type collection, *Ledermann 12616,* "Im Gebirgswalde bei dem Lager 'Felsspitze' ca. 1400–1500 m.," Northeastern New Guinea.

Sloanea (§ *Anoniodes*) **pulchra** (Schlechter) comb. nov.

Anoniodes pulchra Schlechter in Bot. Jahrb. 54: 153. *f. 9, A–G.* 1916; Lane-Poole, Rep. For. Res. Papua 110. 1925; White & Francis in Proc. Roy. Soc. Queensl. 39: 64. 1928.

The type was collected by Ledermann (no. *9267*), "In dichtem Höhenwalde auf dem Etappenberg, ca. 850 m.," Northeastern New Guinea. Lane-Poole and White and Francis refer here a collection by Lane-Poole from the Finschhafen district.

Sloanea (§ *Anoniodes*) **Clemensiae** sp. nov.

Arbor, ramulis hornotinis leviter angulatis 3–4 mm. diametro dense fulvo-villosis, annotinis subglabratis striatis fusco-cinereis; petiolis validis ut ramulis juvenilibus dense villosis subteretibus 12–17 mm. longis; laminis chartaceis in sicco atro-brunneis late ellipticis, (7–)10–15 cm. longis, (5–)7–10 cm. latis, basi rotundatis vel anguste subcordatis et inconspicue 5-nerviis, apice acutis et calloso-apiculatis, margine dentibus 1 vel 2 per centimetrum inconspicue calloso-crenulatis, supra costa nervisque fulvo-hispidulis exceptis glabris, subtus pilis pallidis mollibus persistenter hirtellis, costa supra leviter elevata subtus prominente, nervis lateralibus e costa utrinsecus 4–6 erecto-patentibus supra subplanis subtus valde elevatis, rete venularum intricato utrinque prominulo; inflorescentiis axillaribus vel terminalibus (ramulis in inflorescentiam gradatim transeuntibus, floribus inferne in axillis foliorum solitariis) 9–12 cm. longis 8–15-floris, rhachi pedicellisque ut ramulis dense villosis, bracteis linearibus villosis ad 15 mm. longis vel foliaceis mox caducis, pedicellis sub anthesi 4–4.5 cm. longis; floribus paullo ante anthesin solis visis; sepalis 4 subcoriaceis ovatis circiter 10 × 7 mm., acutis, extus hispidulo-tomentellis, intus arcte cano-sericeis; petalis sepalis subsimilibus, ovato-ellipticis, circiter 9 × 6 mm., subacutis, extus tomento denso sericeo obtectis, intus arcte sericeis; toro carnoso circiter 6 mm. diametro pilis stramineis circiter 1 mm. longis dense hispido; staminibus circiter 90 pluriseriatis 6–7 mm. longis, filamentis carnosis complanatis 0.5–1.3 mm. longis, antheris oblongo-falcatis dorso pilis stramineis circiter 0.5 mm. longis dense hispido-sericeis apiculo carnoso obtuso 1 mm. longo exeuntibus; ovario 4-loculari pilis stramineis simplicibus 1.5–2 mm. longis dense hispidulo atque processibus circiter 0.25 mm. longis occultis copiose muricato, loculis 14-ovulatis, stylo carnoso conico 4-sulcato circiter 3 mm. longo basi tomento occulto apice

4-fido; capsulis maturis ellipsoideis 2.5–3.5 cm. longis, persistenter strigulosis atque spinis subulatis ad 10 mm. longis puberulis ornatis, ut videtur 4-valvatis, pericarpio lignoso 2–3 mm. crasso, seminibus non visis.

NORTHEASTERN NEW GUINEA: Morobe District, Ogeramnang, alt. about 1700 m., *Clemens 4900* (TYPE), Jan. 9, 1937.

Sloanea Clemensiae is most closely related to *S. pulchra* (Schlechter) A. C. Sm., from which it differs in its shorter-petiolate leaf-blades, which are glabrous rather than velutinous above, its longer pedicels, its probably smaller flowers, and its 4- rather than 5-merous perianth and ovary (probably not a very important character). In the terminal inflorescences of *S. Clemensiae* the branchlets pass imperceptibly into the rachis, and the lower flowers are solitary in leaf-axils. This flowering habit occurs in some other species of § *Anoniodes* and indicates that it is not of primary consequence whether the flowers are solitary and axillary or aggregated into racemes.

Sloanea (§ *Anoniodes*) **velutina** (Schlechter) comb. nov.

Anoniodes velutina Schlechter in Bot. Jahrb. 54: 154. 1916.

Known only from the original collection, *Ledermann 12014*, "In bemoostem Gebirgswalde auf dem Schraderberge, ca. 2070 m.," Northeastern New Guinea.

§ CNIDOCARPAEA

Sloanea § Cnidocarpaea sect. nov.

Sectio *Sloaneae* petalis textura et apice sepalis similibus, staminibus staminodiisque numerosissimis (circiter 250–275), staminodiis linearibus, staminibus apiculo brevi crasso exeuntibus, ovario setuloso et processibus plumosis muricato, fructibus spinas numerosas breves urentes gerentibus, seminibus arillo omnino obtectis distinguitur. Arbores, inflorescentiis axillaribus 1-floris, pedunculo et pedicello subcontinuis articulatis; petalis quam sepalis paullo longioribus vel subsimilibus subacutis; staminodiis circiter 90–100, staminibus intra staminodia circiter 160–180, filamentis brevibus; ovario 3- vel 4-loculari, loculis 10–20(vel ultra?)-ovulatis, stylo crasso conico brevi profunde fisso; capsulis magnis 3- vel 4-valvatis, valvis lignosis densissime et breviter plumoso-spinosis atque minute setulosis; seminibus 6–20 in quoque loculo, arillo praeter hili cicatricem omnino occlusis.

The sectional name is compounded from the Greek words for nettle and fruit, referring to the fact that the capsules are covered by irritant plumose hair-like bristles, which are readily caducous and extremely unpleasant to the touch. To the two already known species of New Guinea which are referable to this section, I add one new species below. *Sloanea Brassii* (O. C. Schmidt) A. C. Sm. is herewith designated as the type species of § *Cnidocarpaea*.

The new section is very distinct and is readily distinguished from the other Papuasian sections as pointed out in the key above. In having its numerous stamens surrounded by sterile staminodial organs and in its fruit-indument, § *Cnidocarpaea* is unlike the other described sections of *Sloanea*. In the general characters of its petals, stamens, and aril, § *Cnidocarpaea* resembles § *Anoniodes*, while its thick-walled capsules in texture resemble those of § *Pachycarpaea* and § *Antholoma*. The new

section differs obviously from § *Echinocarpus* in characters pertaining to its petals, stamens, staminodes, ovary- and fruit-indument, and aril; from § *Phoenicospermum* it differs in its simple inflorescence, its stamens, staminodes, and ovary- and fruit-covering.

Sloanea (§ *Cnidocarpaea*) **Brassii** (O. C. Schmidt) comb. nov.

Sloanea paradisearum sensu F. M. Bailey in Queensl. Agr. Jour. 22: 147. *pl. 24.* 1909; Lane-Poole, Rep. For. Res. Papua 111 (*S. paradisiarum*). 1925; non F. v. Muell.

Echinocarpus Brassii O. C. Schmidt in Jour. Arnold Arb. 10: 79, 237. 1929.

BRITISH NEW GUINEA: Bisiatabu, in foothill forest, alt. 450 m., *Brass 619* (TYPE COLL.) (handsome buttressed tree 18 m. high; bark thin, rough, brown; wood pale; sepals pink; petals white). NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, alt. 75 m., *Brass & Versteegh 13551* (tree 21 m. high, occasional in primary rain-forest on lower mountain-slopes; trunk 43 cm. diam.; crown fairly small; bark 6 mm. thick, fairly rough; wood red-brown; fruits red), *Brass & Versteegh 14002* (tree 24 m. high, rare in primary rain-forest on lower mountain-slopes; trunk 48 cm. diam.; crown not wide-spreading; bark 14 mm. thick, black; sap-wood brown; heart-wood black; flowers white); ? Hollandia, *Neth. Ind. For. Serv. 28927* [sterile].

The cited specimens are very uniform and offer ample material for study. Although the original description is in general adequate, several important features are omitted, making desirable the following amplification:

Leaves more or less persistently puberulent on petiole and principal nerves of lower surface; petioles 15–40(–65?) mm. long; leaf-blades papyraceous or chartaceous, dark brown when dried, obovate-elliptic, (7–)12–23 cm. long, (4–)6–12 cm. broad, narrowly rounded or subcordate at base, obtuse-cuspidate at apex, undulate-crenate at margin; inflorescence axillary, 1-flowered, the peduncle and pedicel subcontinuous, obscurely jointed, 15–25 mm. long; sepals 4 (or sometimes 3 by fusion of 2), 11–12 mm. long, 8–10 mm. broad, soon glabrous without, short-sericeous within; petals 4, papyraceous-subcoriaceous, 14–17 mm. long, 7–8 mm. broad; torus about 5 mm. in diameter, copiously hispidulous; stamens and staminodes very numerous (about 250–260), 5–6-seriate, 6–8 mm. long; staminodes about 90, linear-oblong, composed of a puberulent filament about 3 mm. long and a sterile glabrous body, sometimes lightly coherent laterally; stamens about 165, inside the staminodes, the filaments about 2 mm. long, glabrous or sparsely sericeous above, the anthers subacute, sericeous on both surfaces; ovary oblong-ellipsoid, 3- or 4-locular, setose with simple hairs about 0.6 mm. long and also copiously beset with shorter stouter hair-like processes, these 0.3–0.4 mm. long and copiously plumose toward apex; locules 10–14-ovulate; style subconical, 3–6 mm. long, deeply 4-fid, glabrous distally; fruit solitary, the combined peduncle and pedicel (obscurely jointed) 3–4.5 cm. long, stout (4–6 mm. in diameter); capsules oblong-ellipsoid, 5–7.5 cm. long, 4–5.5 cm. broad, 3- or 4-valved, the valves 2.5–3.5 cm. broad at base; pericarp woody, 7–12 mm. thick, covered without by innumerable stiff slender crowded subclavate bristles, these about 2 mm. long, plumose, irritant, at length deciduous, leaving the fruit-surface densely setose with stiff simple hairs or at length glabrescent and copiously pitted; seeds 6–16 per locule, angular-ellipsoid, 12–16 mm. long, 5–8 mm. broad, obtuse at base, rounded at apex, the aril completely investing the seed except for the hilar scar.

In presenting a brief re-description of *S. paradisearum,* Bailey (loc. cit.)

apparently based it in part upon Mueller's description and in part upon a specimen collected by Mrs. H. P. Schlencker at Boku, British New Guinea. The illustration doubtless portrays the latter plant and seems referable to *S. Brassii* rather than to Mueller's species. Lane-Poole (loc. cit.) also seems to have described *S. Brassii*, stating that his plant is "a common tree with a wide range around the lower altitudes of Papua from the plain to 2,000 feet." The description of the petioles as "½ to 2½ inches" and the leaf-blades as "undulate, . . . thin," indicates *S. Brassii* rather than *S. paradisearum*. Whether the latter species occurs beyond the Fly River basin remains to be ascertained.

Sloanea (§ *Cnidocarpaea*) **paradisearum** F. v. Muell. Pap. Pl. 1: 84. 1877; Schlechter in Bot. Jahrb. 54: 148. 1916.

BRITISH NEW GUINEA: Fly River, 528-mile Camp, alt. 80 m., *Brass 6822* (large tree with spur-buttressed base, in canopy-layer of ridge-forest; crown spreading, rather open; leaves glabrous, shining, the nerves prominent; fruits covered with irritant red hairs).

Apparently the above-cited Brass specimen is only the second collection which may be accurately referred to *S. paradisearum*, which is based on a collection by D'Albertis, also from the upper Fly River. F. M. Bailey and Lane-Poole have referred to this species plants from the eastern part of British New Guinea, which I believe are better placed in *S. Brassii*, as discussed above. The flowers of *S. paradisearum* are apparently still unknown. *Brass 6822* agrees closely with the original description of Mueller's species, but certain details are in need of amplification, as follows:

Leaves glabrous in fruiting specimens or with a few obscure weak hairs on the petiole and the costa of lower leaf-surface; petioles slender, 6–18(–25) mm. long [2–3 lines ex Mueller]; leaf-blades chartaceous-subcoriaceous, green when dried, oblong-elliptic, (9–)13–20 cm. long, (4–)5–9 cm. broad, broadly obtuse or narrowly rounded at base, narrowed to a short obtuse acumen at apex, obscurely undulate or subentire at margin; fruit solitary on thickened peduncles, the combined peduncle and pedicel (obscurely jointed) 5 7 mm. in diameter and 6–7 cm. long; capsules oblong-ellipsoid, up to 10 cm. long and 6 cm. broad, 3- or 4-valved, the valves 3–4 cm. broad at base; pericarp 8–12 mm. thick, with indument similar to that described above for *S. Brassii* but with the bristles about 3 mm. long; seed 2-ranked, closely crowded, 14–20 per locule, essentially identical with those described above for *S. Brassii*.

In the absence of flowering material, comparison of this species with *S. Brassii* cannot be complete, but I believe that both species may be maintained. In comparison, *S. paradisearum* has shorter petioles, leaf-blades which remain green in drying and are slightly thicker in texture, more completely glabrescent petioles and nerves of the lower leaf-surface, and longer-peduncled and larger capsules, which have proportionately narrower valves, slightly longer spines, and more numerous seeds.

Sloanea (§ *Cnidocarpaea*) **myriandra** sp. nov.

Arbor, ramulis apicem versus gracilibus (2–3 mm. diametro) angulatis dense et molliter hirtellis, vetustioribus purpurascentibus glabratis striatis;

foliis suboppositis vel alternatis, petiolis gracilibus subteretibus 13–30 (vel ultra?) mm. longis ut ramulis hirtellis, laminis tenuibus papyraceis in sicco viridibus late ellipticis, 10–25 cm. longis, 6.5–15 cm. latis, basi late obtusis vel subrotundatis, apice breviter et obtuse cuspidatis, margine inconspicue undulatis subintegrisve, supra costa nervisque crispato-hirtellis exceptis glabris vel hinc inde inconspicue pilosis, subtus pilis pallidis 0.3–0.5 mm. longis molliter hirtellis, costa supra leviter elevata subtus prominente, nervis lateralibus utrinsecus 7–10 erecto-patentibus supra valde prominulis subtus elevatis, rete venularum intricato utrinque paullo prominulo; inflorescentiis axillaribus 1-floris, pedunculo (8–15 mm. longo) et pedicello (circiter 10 mm. longo crassiore) articulatis gracilibus dense puberulo-tomentellis; sepalis 4 (interdum 2 connatis) papyraceis ovato-ellipticis, 13–15 mm. longis, 7–10 mm. latis, subacutis, extus pallide puberulo-tomentellis, intus minute sericeo-puberulis et basim versus glabrescentibus; petalis 4 vel 5 textura sepalis similibus, elliptico-oblongis, 13–16 mm. longis, 6–8 mm. latis, subacutis, utrinque sericeo-puberulis, intus basim versus glabrescentibus; toro circiter 5 mm. lato minute hispidulo; staminibus staminodiisque numerosissimis (250–275) 5- vel 6-seriatis 6–7 mm. longis valde falcatis imbricatis; staminodiis 90–100 lineari-oblongis stipite obscure hispidulo 3–4 mm. longo excepto glabris; staminibus 160–180, filamentis carnosis complanatis 1–2 mm. longis subglabris, antheris dorso sericeo-hispidulis apiculo subglabro subacuto 1–2 mm. longo exeuntibus; ovario ovoideo-ellipsoideo 4-loculari leviter sulcato, processibus cylindricis circiter 0.2 mm. longis apicem versus dense plumosis copiose muricato, atque pilis simplicibus 0.3–0.5 mm. longis minute et dense setuloso, ovarii pariete crasso, loculis 10–12-ovulatis, stylo crasso conico 3–5 mm. longo, apicem versus vel fere ad basim 4-partito, basi hispidulo superne glabro.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, alt. 1000–1200 m., *Clemens 1048* (TYPE), Dec. 3, 1935.

This well-marked species is readily distinguished from its only close allies, *S. Brassii* (O. C. Schmidt) A. C. Sm. and *S. paradisearum* F. v. Muell., by its thin leaf-blades, which are soft-pilose beneath, and its copiously pubescent branchlets, petioles, peduncles, and pedicels. Its flowers closely resemble those of *S. Brassii* but have the stamens less copiously pubescent and the ovary-indument slightly closer.

§ PACHYCARPAEA

Sloanea § Pachycarpaea sect. nov.

Echinocarpus sensu Schlechter in Bot. Jahrb. 54: 146, quoad spec. novo-guin. 1916; non Bl.

Sectio *Sloaneae* petalis latis, antheris aristatis, fructibus arcte pubescentibus non echinatis, seminibus apice et uno latere arillatis distinguitur. Arbores, inflorescentiis axillaribus breviter racemosis paucifloris; petalis quam sepalis majoribus, apice latis dentatisque; staminibus numerosis (plerumque 50–125) pluriseriatis, filamentis distinctis, antheris arista subulata conspicua exeuntibus; ovario pilis simplicibus velutino vel tomentello, 3–5(raro 2-)-loculari, loculis 16–28-ovulatis, stylo elongato; capsulis magnis 3–5(raro 2-)-valvatis, valvis crassis lignosis extus velutinis vel tomentellis non echinatis demum subglabrescentibus; seminibus plerumque 6–16 in quoque loculo, arillo crasso apicem seminis obtegente atque uno latere fere ad hilum extenso.

The sectional name refers to the thick-walled fruit; the differences between § *Pachycarpaea* and the other sections occurring in Papuasia are pointed out in the key above. Four already described species from New Guinea are here placed in § *Pachycarpaea*, to which number I add three more, one of them from the Solomon Islands. Whether this section extends beyond Papuasia is yet to be decided. *Sloanea Forbesii* F. v. Muell. is herewith designated as the type species of § *Pachycarpaea*.

From § *Echinocarpus*, the new section differs in its non-muricate ovary, its closely pubescent but non-echinate fruit, and the lateral extension of its aril; in § *Echinocarpus* the aril appears to cover only the apical portion of the seed. The fruits of § *Pachycarpaea* are so entirely different that the Papuasian species can hardly logically be placed in § *Echinocarpus*. The new section differs from § *Phoenicospermum* in the form of its inflorescence, its broadened dentate petals, and its aril; in § *Phoenicospermum* the aril is presumably nearly complete, as in § *Anoniodes*. Superficially the fruits of § *Pachycarpaea* and § *Phoenicospermum* are similar, but the characters of the petals and the aril amply differentiate the sections.

From the preceding paragraph it is seen that § *Pachycarpaea* is more suggestive of both § *Echinocarpus* and § *Phoenicospermum* than it is of the Papuasian sections *Anoniodes* and *Cnidocarpaea*. Its closest relative, however, is § *Antholoma*.

Sloanea (§ *Pachycarpaea*) **papuana** (Schlechter) comb. nov.

Echinocarpus papuanus Schlechter in Bot. Jahrb. 54: 148. 1916; White & Francis in Proc. Roy. Soc. Queensl. 39: 64. 1928.

NORTHEASTERN NEW GUINEA: Morobe District, alt. 750–2400 m., Sattelberg, *Clemens 301* (tree 24–27 m. high, somewhat flanged at base, in hill-forest; trunk 30–60 cm. diam.; calyx cream-colored; petals pale green), *Clemens 958* (tree 15–18 m. high, in marginal forest; trunk 30 cm. diam.); Yunzaing, *Clemens 4100;* Kaile to Sarawaket, *Clemens 4924;* vicinity of Wantoat, *Clemens 11324* (tree, the trunk 30 cm. diam.; flowers pale greenish); Boana, *Clemens 41551* (herb. Univ. Mich.), *Clemens 41722* (large tree; trunk 45 cm. diam.; fruits dull yellow). NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1050 m., *Brass & Versteegh 13109* (tree 32 m. high, occasional in primary forest on the slope of a ridge; trunk 51 cm. diam.; crown not wide-spreading; bark 12 mm. thick, brown; fruits red-brown).

The cited specimens appear to agree well with the original description of *Echinocarpus papuanus*, based on *Ledermann 10315*, "Im montanen Walde auf dem Lordberg, ca. 1000 m.," and the species has also been reported from Yunzaing by White and Francis. The specimens now available make desirable some amplification of the original description, as follows:

Petiole 1–3 cm. long; leaf-blades 8–19 cm. long, 4–11.5 cm. broad, glabrous but sometimes obscurely barbellate in axils of nerves beneath; inflorescences axillary, short-racemose, short-pedunculate, 2–4- or often only 1-flowered, the rachis to 3.5 cm. long but usually much shorter, the pedicels 8–25 mm. long; flowers either 4- or 5-merous; sepals 9–13 mm. long, 3.5–6 mm. broad; petals 14–20 mm. long, 6–12 mm. broad (rarely 6 in number, and then the sixth one very narrow), 6–9-dentate; torus about 6 mm. in diameter; stamens 55–75, about 3-seriate, 10–12 mm. long, the filaments short, 2–2.5 mm. long, the anthers (excl. awns) 3–4 mm. long, the awns 4–7 mm. long; ovary 3–5-locular, each locule about 16-ovulate,

the style 9–13 mm. long; capsules usually solitary, oblong-ellipsoid, 3–5 cm. long (to 6 cm. ex White & Francis), 2.5–3.5 cm. broad, 3–5-valved, the pericarp woody, 4–8 mm. thick, closely brown-tomentellous without; seeds usually 6–10 per locule, ellipsoid, 8–12 × 4–5 mm., the aril covering the distal one-third and extending down one side nearly to the hilum, the testa dark castaneous.

Sloanea (§ *Pachycarpaea*) **Forbesii** F. v. Muell. in Vict. Nat. 8: 164, nomen. 1892, in op. cit. 9: 111. 1892, in Jour. Bot. 31: 323. 1893; Bak. f. in Jour. Bot. 61: Suppl. 5. 1923.

Echinocarpus Forbesii Schlechter in Bot. Jahrb. 54: 148. 1916.

BRITISH NEW GUINEA: Central Division: Kanosia, alt. about 15 m., *Carr 11584* (NY) (tree about 21 m. high, on river-flats; flowers cream-colored); Mafulu, alt. 1250 m., *Brass 5399* (A, NY) (large tree, in lower primary forest; bark thick, lenticellate, pale brown; wood soft, pale; leaf-nerves pale, prominent on both sides; fruits pale brown; seeds brown-black, with red aril). NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, alt. 75 m., *Brass & Versteegh 14029* (tree 21 m. high, common in primary rain-forest of lower mountain slope; trunk 41 cm. diam.; crown not wide-spreading; bark 8 mm. thick, brown, fairly smooth; sap-wood white; heart-wood brown; flowers white); 4 km. southwest of Bernhard Camp, alt. 800 m., *Brass & Versteegh 13160* (tree 20 m. high, common in primary rain-forest on the flat plain; trunk 60 cm. diam.; crown not wide-spreading; bark 9 mm. thick, brown; wood yellow-brown; fruits brown).

Among the specimens available to me, those cited above agree best with the descriptions of *S. Forbesii,* based on *Forbes 273,* from Sogere. If my identification is correct, the leaf-pubescence is somewhat less obvious than implied by Schlechter, but it agrees fairly well with Mueller's description (1893) of "leaves . . . soon almost glabrous on the surface, puberulous beneath . . ." The following descriptive notes are based on the above-cited specimens:

Petiole usually 2–4 cm. long; leaf-blades 15–22(–30) cm. long, 9–15 cm. broad, often puberulent on nerves beneath and usually persistently barbellate in axils of nerves; inflorescences axillary, short-racemose, short-pedunculate, 2–5-flowered, the rachis 2–4 cm. long or sometimes shorter, the pedicels very slender in flower, 20–35 mm. long; flowers 4–6-merous; sepals 13–15 mm. long, 4–5 mm. broad; petals 22–25 mm. long, 13–16 mm. broad, 6–11-dentate; torus about 6 mm. in diameter; stamens about 100 [25–30 according to Mueller, surely an error, as the species of this relationship never have so few stamens], 4- or 5-seriate, 12–13 mm. long, the filaments 5–6 mm. long, the anthers (excl. awns) 3–3.5 mm. long, the awns 3.5–4 mm. long; ovary 3- or 4(apparently rarely 2-)-locular, each locule 20–22-ovulate, the style 20–25 mm. long; capsules oblong-ellipsoid, 5–8.5 cm. long, 3.5–6.5 cm. broad, 3- or 4(rarely 2-)-valved, the pericarp woody, 10–20 mm. thick, closely brown-velutinous without, eventually subglabrescent; seeds usually about 6–12 per locule, ellipsoid, 10–13 × 4–5 mm., the aril covering the distal quarter and extending down one side nearly to the hilum, the testa nigrescent.

From the above discussions of *S. papuana* and *S. Forbesii,* it is seen that the distinctions between them are less sharp than implied by Schlechter, that is, if my identifications are correct. However, it seems that the two species may be maintained, on the ground that *S. Forbesii* has larger leaf-blades on the average, with more persistent (but nevertheless inconspicu-

ous) hairs beneath, somewhat larger flowers, longer filaments, more numerous ovules, a longer style, and larger and much thicker-walled fruits.

Brass & Versteegh 13160, a fruiting specimen, agrees precisely with *Brass 5399; Brass & Versteegh 14029* bears immature flowers which are smaller than those of *Carr 11584* as to petals, stamens, and style, but which agree in all fundamental characters. Apparently the flowers expand rapidly after the bud opens, and measurements based on flowers which are not fully mature are unreliable.

Sloanea (§ *Pachycarpaea*) **aberrans** (Brandis) comb. nov.

Elaeocarpus aberrans Brandis in Kew Bull. 1899: 97. 1899.

BRITISH NEW GUINEA: Central Division, Dieni, Ononge Road, alt. 500 m., *Brass 3944* (A, NY) (tall tree with buttressed trunk and spreading crown, common in rainforest; leaves paler beneath; flowers pale green).

The type of *Elaeocarpus aberrans* was collected on Mt. Scratchley, Central Division of British New Guinea, alt. 2000–4000 ft., by Giulianetti. The cited Brass collection agrees excellently with the original description, differing only in its more numerous stamens; this character may be variable or the original observation may have been inaccurate. The species is related to *S. papuana* (Schlechter) A. C. Sm., differing in having its leaf-blades more gradually narrowed to an attenuate base, its petals broader, and its ovules more numerous. Since the original description omits certain important points and dimensions, the following supplementary notes are offered:

Petiole 8–25 mm. long; leaf-blades (6–)9–15 cm. long, (3–)5–7 cm. broad, glabrous at anthesis; inflorescence axillary, short-racemose, (1–)2–6-flowered, the rachis up to 3 cm. long, the pedicels slender, 20–30 mm. long at anthesis; flowers usually 4-merous but sometimes 5-merous; sepals 10–12 mm. long, 5–6 mm. broad; petals 17–20 mm. long, 12–16 mm. broad, 7–14-dentate; torus 5–6 mm. broad; stamens 75–80(50–60 ex Brandis), 10–11 mm. long, copiously hispidulous except for the glabrous awn, the filaments about 3 mm. long, the anthers (excl. awns) 3–4 mm. long, the awns 4–5 mm. long; ovary 3- or 4-locular, each locule 20–22-ovulate, the style 11–12 mm. long, sulcate.

Another specimen of this relationship, or possibly also representing the species, is *Clemens 376,* from Sattelberg, Morobe District, Northeastern New Guinea, alt. about 1050 m. (tree 30–38 m. high, in forest; trunk 60 cm. diam.; buds yellow-green). An exact comparison of this collection with *Brass 3944* is not satisfactory, as the Clemens plant bears only immature flowers. In foliage it seems similar to *S. aberrans,* although the leaves are somewhat smaller. Its immature petals are laterally connate into a corolla, but whether this feature persists at maturity (as in § *Antholoma*) remains to be seen; in this case the individuality of the petals is apparent. The locules are 24–26-ovulate.

Sloanea (§ *Pachycarpaea*) **gymnocarpa** sp. nov.

Arbor alta, ramulis apicem versus gracilibus (3–5 mm. diametro) rugulosis leviter angulatis pedicellisque minute brunneo-puberulis demum forsan glabratis; foliis saepe oppositis interdum alternatis, petiolis robustis subteretibus 3–7 cm. longis apice valde incrassatis, laminis chartaceo-

coriaceis in sicco olivaceis late ellipticis, 13–22 cm. longis, 8–13 cm. latis, basi late obtusis vel rotundatis, apice obtuse et breviter cuspidatis raro subrotundatis, margine undulato-crenatis vel subintegris, utrinque glabris vel interdum subtus in axillis nervorum inconspicue barbellatis, costa utrinque prominente, nervis lateralibus utrinsecus 8–11 subpatentibus utrinque valde elevatis, rete venularum copioso utrinque leviter prominulo vel subplano; fructibus infra folia solitariis (vel interdum binis?), pedunculo sub fructu robusto (5–6 mm. diametro) glabro tereti 5–7 cm. longo, pedicellis sub fructu valde incrassatis (apice ad 10 mm. diametro) 2–2.5 cm. longis ut pedunculo glabro et ruguloso; capsulis ovato-ellipsoideis 4-angulatis maturitate 11–12 cm. longis et 6–7 cm. latis, 4-valvatis, valvis basi 3.5–6 cm. latis longitudinaliter conspicue sulcatis; pericarpio lignoso 13(apice)–23(basi) mm. crasso, extus indumento densissimo arcto brunneo-velutino induto demum subglabrescente et valde ruguloso, intus impressionibus seminium valde notato;. seminibus in quoque loculo 10–16 ellipsoideis, 11–15 mm. longis, 4–5 mm. latis, basi acutis vel ad hilum cuspidatis, apice rotundatis, arillo conspicuo crasso quartam apicalem seminis obtegente atque uno latere fere ad hilum extenso, testa variegata.

BRITISH NEW GUINEA: Upper Fly River region, Palmer River, 2 miles below junction of Black River, alt. 100 m., *Brass 7259* (TYPE), July 1936 (tall spur-buttressed tree, common in river flood-bank forest; bark gray, lenticellate; fruit solitary on long peduncles below the leaves).

Although *S. gymnocarpa,* like *S. paradisearum* F. v. Muell., is known from the upper Fly River region, the two species are quite unlike in their fruit-indument and their arils, and they belong to different sections of the genus. *Sloanea gymnocarpa* further differs from Mueller's species in its longer-petioled leaves. Among the other species of § *Pachycarpaea, S. gymnocarpa* is most suggestive of *S. Forbesii* F. v. Muell. in its large leaves. It differs, however, in its longer petioles, its more completely glabrescent foliage, its obtuse or rounded but scarcely subcordate leaf-bases, and its even larger capsules. The aril- and seed-characters of the two species are essentially similar.

Sloanea (§ *Pachycarpaea*) **coriacea** Ridley in Trans. Linn. Soc. II. Bot. 9: 22. 1916.

Judging from the original description of *S. coriacea,* collected by the Wollaston Expedition along the Tsingarong River, alt. 3100 ft., south of Mt. Carstensz, Netherlands New Guinea, the species definitely belongs in § *Pachycarpaea.* It seems to be unrepresented in the material available to me, being suggestive, according to the description, of the species proposed below as *S. anacantha* and *S. insularis.*

Sloanea (§ *Pachycarpaea*) **anacantha** sp. nov.

Arbor grandis, ramulis gracilibus teretibus vel apicem versus angulatis glabris; foliis oppositis vel alternatis, petiolis leviter canaliculatis gracilibus glabris 1.5–2.5 cm. longis, laminis chartaceo-subcoriaceis in sicco fuscescentibus ovato-ellipticis, (6–)9–16 cm. longis, (3.5–)5–8 cm. latis, basi late obtusis vel subacutis, apice in acuminem breve obtusum interdum emarginatum angustatis, margine subintegris vel obscure undulatis, utrinque glabris raro subtus in axillis nervorum obscure barbellatis, costa supra elevata subtus prominente, nervis lateralibus utrinsecus 5–7 arcuatis supra

subplanis subtus elevatis, rete venularum intricato utrinque prominulo; inflorescentiis completis non visis sed ut videtur breviter racemosis pauci-floris, pedicellis sub anthesi gracilibus glabris ad 33 mm. longis, sepalis petalisque 4 vel 5; sepalis carnosis deltoideo-lanceolatis, 14–17 mm. longis, 6–8 mm. latis, subacutis, extus glabris, intus et margine incrassato dense tomentellis; petalis submembranaceis oblongis, 26–28 mm. longis, 14–19 mm. latis, utrinque obscure puberulis glabrescentibus, apice 6–8-dentatis, lobis obtusis 2–3 mm. longis; toro carnoso complanato circiter 10 mm. lato; staminibus 90–100 circiter 5-seriatis 11–13 mm. longis ubique arista inclusa copiose hispidulis, filamentis carnosis teretibus 3–3.5 mm. longis, antheris arista subulata 4–5 mm. longa exclusa 3.5–4.5 mm. longis; ovario ovoideo angulato 4- vel 5-loculari et styli basi dense brunneo-tomentellis, ovarii pariete crasso intus puberulo, loculis circiter 28-ovulatis, stylo crasso sub-ulato 10–12 mm. longo sulcato superne glabro; capsula unica visa oblongo-ellipsoidea 4-angulata, circiter 7.5 cm. longa et 4.5 cm. lata, 4-valvata, valvis basi 3–3.5 cm. latis longitudinaliter leviter sulcatis; pericarpio lignoso 13–16 mm. crasso, extus ruguloso et copiose arcte brunneo-velutino; semini-bus paucis ut videtur 6–8 in quoque loculo ellipsoideis, 10–12 mm. longis, 5–6 mm. latis, basi subacutis, apice rotundatis, arillo crasso apicem seminis obtegente et uno latere fere ad hilum extenso, testa in sicco nigrescente nitida.

BRITISH NEW GUINEA: Central Division, Mafulu, alt. 1250 m., *Brass 5510* (A, TYPE, NY), Nov. 16, 1933 (large tree, with narrow flange-like buttress-roots, in tall forest of lower levels; bark pale brown; leaves smooth, dark; flowers yellow; fruit brown, with red seeds).

Sloanea anacantha, a species characterized by having its leaf-blades acute to obtuse at both ends, with the veinlet-reticulation intricate and prominu-lous, is probably most closely allied to *S. coriacea* Ridley. It differs from this in having its leaves averaging smaller and with fewer secondaries, in its larger flowers, and in its glabrous pedicels and outer surface of sepals. The last character distinguishes the new species from all the other known Papuasian members of § *Pachycarpaea,* in which the pedicels and the outer surfaces of the sepals are persistently pubescent past anthesis.

Sloanea (§ *Pachycarpaea*) **insularis** sp. nov.

Arbor ad 30 m. alta, ramulis subteretibus rugulosis apicem versus 2–5 mm. diametro mox glabratis; foliis oppositis vel alternatis, petiolis glabratis gracilibus subteretibus 1–3 cm. longis apice incrassatis, laminis chartaceo-subcoriaceis fuscescentibus ovato-ellipticis, (8–)12–19 cm. longis, (4.5–)6–9 cm. latis, basi late obtusis vel anguste rotundatis, apice in acuminem ad 1 cm. longum obtusum angustatis, margine undulato-crenatis vel sub-integris, utrinque glabris vel subtus costa nervisque evanescenter puberulis, costa supra paullo elevata subtus prominente, nervis lateralibus utrinsecus 6–10 erecto-patentibus supra leviter subtus valde elevatis, rete venularum intricato utrinque plano vel inconspicue prominulo; inflorescentiis axillari-bus breviter racemosis (1–)2–4-floris, pedunculo brevi, rhachi ad 1.5 cm. longa gracili pedicellisque cano-puberulis, pedicellis sub anthesi gracilibus 15–28 mm. longis sub fructu valde incrassatis; sepalis 5 vel 6 subcoriaceis ovato-oblongis, 12–13 mm. longis, 4–6 mm. latis, subacutis, utrinque puberulo-tomentellis, interdum plus minusve connatis; petalis 5 vel 6 (interdum ad 8 angustioribus paucidentatis) submembranaceis oblongis,

16–18 mm. longis, 10–11 mm. latis, utrinque pallido-puberulis subglabratis, apice plerumque 7–10-dentatis, lobis deltoideo-oblongis obtusis circiter 2 mm. longis; toro complanato circiter 7 mm. lato minute velutino; staminibus 85–125 circiter 4- vel 5-seriatis 12–13 mm. longis ubique arista glabra excepta minute hispidulis, filamentis gracilibus subteretibus 5.5–6.5 mm. longis, antheris arista subulata 2–3 mm. longa exclusa 4–4.5 mm. longis; ovario ovoideo leviter angulato 3- vel 4-loculari et stylo basim versus brunneo-velutinis, ovarii pariete crasso intus subhirsuto, loculis 18–22-ovulatis, stylo crasso subulato circiter 18 mm. longo sulcato superne glabro; capsula unica visa ellipsoidea leviter angulata, ad 5.5 cm. longa et 3.5 cm. lata, 4- vel forsan 3-valvata, valvis basi circiter 2.5 cm. latis; pericarpio lignoso 8–12 mm. crasso, extus dense et arcte velutino; seminibus paucis ellipsoideis, circiter 12 × 5 mm., basi obtusis, apice rotundatis, arillo apicem seminis obtegente et uno latere fere ad hilum extenso, testa in sicco atro-castanea nitida.

SOLOMON ISLANDS: Bougainville: Koniguru, Buin, alt. 1200 m., *Kajewski 2127* (TYPE), Aug. 20, 1930 (tree up to 30 m. high, common in rain-forest; sepals bright cream-green; fruit light green; native name: *twino;* timber said to be very durable; sap used by natives as source of a black dye); Siwai, *Waterhouse 97* (NY) (tree about 25 m. high; native names: *kuinotui, tugtuqini*); Guadalcanal: Ululolo, Tutuve Mt., alt. 1200 m., *Kajewski 2594* (tree to 20 m. high, common in rain-forest; bark mottled).

In the shape of its leaves, *S. insularis* suggests *S. coriacea* Ridley and *S. anacantha* (above described). It differs from *S. anacantha* in its pubescent pedicels and sepals and its less obvious veinlet-reticulation, as well as in minor floral details, such as its presumably smaller petals, longer filaments, longer style, and fewer ovules. The original description of *S. coriacea* does not permit a very accurate comparison of *S. insularis* with it, but apparently the Solomon Islands species differs at least in its less obvious venation, slightly larger flowers, and longer filaments.

This species extends the known range of *Sloanea* into the Solomon Islands. Of the above-cited specimens, *Waterhouse 97* has the only mature flowers, from which the stated dimensions are taken. The type has young flowers and a single mature fruit, while *Kajewski 2594* has very young fruits.

§ ANTHOLOMA

Sloanea § Antholoma (Labill.) comb. nov.

Antholoma Labill. Rel. Voy. Rech. Pérouse 2: 235. *pl. 41.* 1800, Nov. Holl. Pl. Sp. 2: 121. 1806; Choisy in DC. Prodr. 1: 565. 1824; Endl. Gen. Pl. 1030. 1840; Planch. in Ann. Sci. Nat. IV. 2: 260. 1854; Baill. in Adansonia 2: 21. *pl. 1.* 1861; Benth. & Hook. f. Gen. Pl. 1: 239. 1862; Vieill. in Bull. Soc. Linn. Normand. 9: 334. 1865; K. Schum. in E. & P. Nat. Pfl. III. 6: 7. 1890; Schlechter in Bot. Jahrb. 54: 154. 1916; O. C. Schmidt in Nova Guin. Bot. 14: 155. 1924.

In describing the genus *Antholoma,* based on the New Caledonian *A. montana,* Labillardière did not refer it to a family. Choisy, in 1824, unaccountably referred the genus to the Marcgraviaceae, in which he was followed by Endlicher. Planchon, in 1854, was apparently the first properly to place *Antholoma* in the "Tiliacées-Elaeocarpées." In this he was followed by Baillon, in 1861, and Bentham (in Jour. Linn. Soc. 6: 123. 1862), who states that *Antholoma* "is indeed closely allied to *Sloanea,*

differing chiefly in the petals united into a tubular, almost conical corolla." Bentham thus repudiated his earlier suggestion (in op. cit. 5: Suppl. 2: 74. 1861) that the genus was nearer the Sapotaceae than the Tiliaceae.

Apparently no student of the group has thus far questioned the generic status of *Antholoma,* now known from three New Caledonian and two New Guinean species, although its close affinity to *Sloanea* has been generally recognized. The Archbold Expeditions have added nine collections to *Antholoma,* previously reported from New Guinea from only three collections. Therefore a more careful consideration of the genus is now possible, and it becomes evident that the only important generic character which separates it from *Sloanea,* the presence of a corolla of fused petals, is not constant. In various species the corolla is sometimes split to the base on one side, while in *Sloanea Archboldiana* (described below) the corolla, although superficially gamopetalous and characteristically plicate, often consists of two to four entirely distinct petals of various widths. In all other fundamental characters, *Antholoma* resembles *Sloanea* § *Pachycarpaea,* in which, as a matter of fact, the petals are occasionally loosely connate. A gradual transition between *Antholoma* and *Sloanea* is thus established, and it seems unwise to retain Labillardière's genus as distinct.

In characters pertaining to the seed, a slight difference between § *Antholoma* and § *Pachycarpaea* is discernible. In the latter section, the aril is thick and waxy, even when dried, and the lateral flange tapers very gradually toward the hilum. In § *Antholoma,* the aril becomes thin and papery when dried, and the lateral flange tapers more abruptly, being essentially triangular. Furthermore, the testa of § *Antholoma* appears to be thinner and more brittle than that of § *Pachycarpaea.*

The two groups proposed in *Antholoma* by Schmidt (loc. cit.), *Papuanae* and *Montanae,* are not very satisfactory as a basis for separating the New Guinean and the New Caledonian[1] species of this alliance. In its solitary flowers, for instance, *Sloanea haplopoda* agrees with the New Guinean rather than the New Caledonian species and thus provides a transition, since its entire long-petiolate leaves suggest the other New Caledonian species. Some of the New Guinean species also have scarcely dentate leaves, and the number of ovary-locules is not of primary importance. The section, as it includes both New Caledonian and New Guinean representatives, seems very coherent and perhaps not in need of further division.

Below I propose three new species of § *Antholoma,* which is therefore now represented by eight species, of which five are New Guinean.

[1]In view of the proposed reduction of *Antholoma* to *Sloanea,* it seems advisable to record the three new combinations which are necessary for the New Caledonian species:

Sloanea (§ *Antholoma*) **montana** (Labill.) comb. nov.
Antholoma montana Labill. Rel. Voy. Rech. Pérouse 2: 236. *pl. 41.* 1800, Nov. Holl. Pl. Sp. 2: 122. 1806; Vieill. in Bull. Soc. Linn. Normand. 9: 335. 1865.

Sloanea (§ *Antholoma*) **Billardieri** (Vieill.) comb. nov.
Antholoma Billardieri Vieill. in Bull. Soc. Linn. Normand. 9: 335. 1865.

Sloanea (§ *Antholoma*) **haplopoda** (Guillaumin) comb. nov.
Antholoma haplopoda Guillaumin in Bull. Mus. Hist. Nat. Paris 26: 259. 1920.

Sloanea (§ *Antholoma*) **Tieghemi** (F. v. Muell.) comb. nov.

Antholoma Tieghemi F. v. Muell. in Vict. Nat. 8: 164, nomen. 1892, in op. cit. 9: 111. 1892, in Jour. Bot. 31: 322. 1893; Schlechter in Bot. Jahrb. 54: 155. 1916; Lane-Poole, Rep. For. Res. Papua 110. 1925; White & Francis in Proc. Roy. Soc. Queensl. 38: 239. 1927.

British New Guinea: Central Division, Mt. Tafa, alt. 2400 m., *Brass 5064* (A, NY) (bush 1–2 m. high, with upright branching habit, common on old landslips; leaves rather stiff, shining above; corolla pale yellow-green).

Antholoma Tieghemi, based on a collection made near the summit of Mt. Yule (not far from Mt. Tafa, with an elevation exceeding 3000 m.), was originally described "from very fragmentary material." In view of this, too close an agreement between Mueller's descriptions and *Brass 5064* is perhaps not to be expected. However, our specimen agrees with Mueller's plant in the essential details, apparently differing in its usually larger leaves (interspersed with leaves only 2–3 inches long, as described for *Antholoma Tieghemi*), slightly longer sepals and corolla, stamens nearly twice as long and more numerous ("60–70" ex Mueller), and larger fruits and seeds. In spite of these differences, it seems most likely that the Brass collection represents Mueller's species. It also seems probable that *Lane-Poole 370*, collected in the Owen Stanley Range at 6000 ft. and briefly discussed by Lane-Poole and White and Francis, represents the same species as *Brass 5064*. A description based entirely on *Brass 5064* is given below.

Low shrub, the young branchlets and leaves copiously brown-floccose-tomentellous, soon glabrescent, the branchlets slender, angled and 2–3 mm. in diameter distally; leaves alternate, the petioles slender, subterete, 1–2.5 cm. long, the blades subcoriaceous or sometimes papyraceous, greenish or olivaceous when dried, elliptic, diverse in size, 6–15 cm. long, 3–10 cm. broad, broadly obtuse or rounded at base, abruptly cuspidate at apex with a callose-apiculate tip up to 1 cm. long, remotely but conspicuously spinulose-serrate at margins, the costa and the 4–7 lateral nerves raised above and prominent beneath, the veinlet-reticulation intricate and prominulous on both surfaces; inflorescences axillary, usually 1-flowered, the peduncle and pedicel subcontinuous, articulate, slender, 3–4 cm. long, at first tomentellous, glabrate in fruit; sepals 4 (2 sometimes fused), carnose-coriaceous, deltoid-oblong, 15–18 mm. long, 7–10 mm. broad, subacute, closely puberulent-tomentellous on both surfaces; petals completely fused into a submembranaceous campanulate corolla, this puberulent-tomentellous on both sides, soon glabrescent distally, copiously longitudinally nerved and plicate distally, 30–40 mm. long at anthesis, 7–12 mm. broad at base, flaring to 25–35 mm. at apex, copiously dentate, the teeth deltoid, 2–3 mm. long and broad, subacute; torus thick-carnose, flattened, about 10 mm. broad, rugose, copiously velutinous; stamens 90–100, about 4-seriate, erect, hispidulous throughout, 13–14 mm. long, the filaments slender, subterete, about 5 mm. long, the anther-locules 4.5–6 mm. long, the awns subulate, 3–3.5 mm. long; ovary triquetrous-ellipsoid, sharply angled, 3-locular (probably sometimes 2-locular), copiously velutinous, the locules about 18-ovulate, the style subulate, sulcate, about 25 mm. long, at length deeply 3-fid; capsules narrowly triquetrous-ellipsoid and 3-valved (or somewhat flattened and 2-valved), 3.5–5.5 cm. long, 2–2.5 cm. broad, the pericarp 4–6 mm. thick, rugulose and eventually glabrate without; seeds few, some-

times only 1 per locule, ellipsoid, 13–15 mm. long, 7–8 mm. broad, subacute at base, rounded at apex, the aril thin, papery when dried, covering the distal ⅓ to ½ and sinuate-margined, extending down one side in a narrowing strip nearly to the hilum, the testa castaneous, shining, very thin and brittle.

Sloanea (§ *Antholoma*) **Lamii** nom. nov.

Antholoma papuana O. C. Schmidt in Nova Guin. Bot. 14: 155. *t. 17.* 1924; non *Sloanea papuana* A. C. Sm. [*Echinocarpus papuanus* Schlechter].

From the description and the excellent plate, this species seems to be unrepresented in the collections of the Archbold Expeditions. It is based on *Lam 1930,* "Bivak auf dem Rücken des Doorman-Massives in 2480 m. Höhe," Netherlands New Guinea. *Sloanea Lamii* most nearly suggests *Brass 5064,* which I have above referred to *S. Tieghemi,* and Schmidt's species would indeed appear to be close to Mueller's, at least as I have interpreted this. It can probably be distinguished, however, by its longer leaf-acumen, much longer sepals (28–30 mm. long), and shorter-awned anthers. In the description of *Antholoma papuana* the stamens are said to be glabrous, but on the plate they are shown as copiously setulose, and this is doubtless correct.

Sloanea (§ *Antholoma*) **Archboldiana** sp. nov.

Arbor ad 15 m. alta, partibus juvenilibus omnino copiose fulvo-floccoso-tomentellis mox subglabrescentibus, ramulis subteretibus vel superne angulatis et 2–3 mm. diametro; foliis oppositis vel alternatis, petiolis gracilibus supra leviter canaliculatis 5–25 mm. longis, laminis chartaceo-subcoriaceis in sicco fuscescentibus ellipticis vel obovato-ellipticis, 4–11 cm. longis, 2.5–6 cm. latis, basi subacutis vel late obtusis, apice obtusis vel in acuminem obtusum ad 5 mm. longum abrupte angustatis, margine undulatis vel remote calloso-crenulatis, maturitate glabris vel subtus dispersim floccoso-puberulis et interdum in axillis nervorum persistenter barbellatis, costa supra leviter elevata subtus prominente, nervis lateralibus utrinsecus 4–7 erecto-patentibus anastomosantibus supra paullo subtus valde elevatis, rete venularum intricato utrinque prominulo vel subimmerso; inflorescentiis axillaribus 1(raro 2-)-floris, pedunculo brevi et pedicello gracili sub anthesi ad 4 cm. longo obscure articulatis primo tomentello-puberulis sub fructu glabratis; bracteis pedicelli paucis mox caducis, eis apice sub calyce plus minusve persistentibus, majoribus 1 vel 2 lanceolatis vel spathulatis ad 11 × 2.5 mm. tomentellis, minoribus 1–4 inconspicuis; sepalis 4 vel 5 (2 interdum connatis) carnoso-subcoriaceis ovato-oblongis, 14–20 mm. longis, 6–12 mm. latis, subacutis, margine incrassatis, utrinque dense brunneo-tomentellis; petalis in corollam interdum connatis, interdum 2 aequalibus latissimis, interdum 3 vel 4 et latitudine valde inaequalibus; corolla submembranacea 28–35 mm. longa apice ad 45 mm. diametro, utrinque puberula apicem versus glabrata et plicata, apice copiose dentata, lobis deltoideo-oblongis obtusis 2–4 mm. longis; toro carnoso circiter 7 mm. diametro dense brunneo-velutino; staminibus 75–100 plerumque 4- vel 5-seriatis maturitate 10–12 mm. longis ubique praeter aristae apicem dense hispidulis, filamentis gracilibus subteretibus 3–4 mm. longis, antheris arista subulata 2.5–4 mm. longa excepta 4–5.5 mm. longis; ovario 3- vel 4- vel raro forsan 2-loculari angulato et styli basi dense brunneo-velutinis, ovarii pariete crasso, loculis

16–20-ovulatis, stylo subulato 16–20 mm. longo sulcato vel angulato subintegro; pedunculo et pedicello sub fructu subcontinuis valde incrassatis, capsulis ellipsoideis maturitate (3.5–)5–7.5 cm. longis et 2.5–4 cm. latis, 3- vel 4- vel raro 2-valvatis (valvis 2 in fructibus sterilibus solis visis), pericarpio lignoso 8–13 mm. crasso ruguloso et dense velutino demum glabrescente; seminibus 6–12 in quoque loculo obovoideis, 8–11 mm. longis, 4–6 mm. latis, basi subacutis, apice rotundatis, arillo tenui in sicco papyraceo quartam apicalem seminis obtegente sinuato-marginato atque uno latere fere ad hilum extenso, testa atro-castanea nitida tenui.

NETHERLANDS NEW GUINEA: Balim River, alt. 1600 m., *Brass & Versteegh 11174* (tree 8 m. high, frequent in relic forest on rocky banks of river; trunk 25 cm. diam.; crown small; bark 8 mm. thick, black, fairly rough; flowers yellow-green), *Brass 11837* (TYPE), Dec. 1938 (tree 7–8 m. high, common in relic forest on rocky banks of river; flowers yellow); Bele River, 18 km. northeast of Lake Habbema, alt. 2200–2300 m., *Brass & Versteegh 11130* (tree 13 m. high, frequent in old secondary forest; trunk 40 cm. diam.; crown not wide-spreading; bark 4 mm. thick, brown, rough; wood white; flowers yellow-green; fruits brown-green), *Brass 11217* (tree up to 15 m. high, common in old secondary forest; fruits brown, the seeds black, with orange-red aril); Arfak Mts., Angi, in the spinneys by Lake Gita, alt. 1900 m., *Kanehira & Hatusima 13675* (tree 8 m. high).

The type collection bears mature flowers, from which the above dimensions are taken, and also fruits; the latter are probably not typical for the species, being comparatively narrow, often 2-valved, and completely sterile. More normal fruits are associated with nos. *11130* and *11217*, while an old fruit accompanies *Kanehira & Hatusima 13675*. Younger flowers are borne by no. *11174* and a few old flowers by no. *11130*.

The new species is readily distinguished from the two thus far described from New Guinea in § *Antholoma*, *S. Tieghemi* (F. v. Muell.) A. C. Sm. and *S. Lamii* A. C. Sm., by its consistently smaller leaves with undulate-crenate or subentire, rather than spinulose-serrate, margins, and with less conspicuously cuspidate apices. In floral characters, *S. Archboldiana* is hardly distinguishable from its allies, although the corolla is often split down one side or variously divided into 2–4 petals. This fact, while of no specific consequence (all extremes being found on one plant), bridges the most significant difference between *Antholoma* and *Sloanea* § *Pachycarpaea*.

Sloanea (§ *Antholoma*) **perbella** sp. nov.

Arbor ad 28 m. alta multiramosa, ramulis gracilibus, ultimis brevibus angulatis 1–2 mm. diametro ferrugineo-tomentellis, vetustioribus subteretibus cinereis glabratis; foliis alternatis vel subopppositis, petiolis gracilibus supra complanatis 4–16 mm. longis, laminis coriaceis fuscescentibus angulato-ellipticis, 2.5–5.5 cm. longis, 1.5–3 cm. latis, basi acutis vel late obtusis, apice in acuminem obtusum 3–7 mm. longum cuspidatis, margine remote calloso-crenatis vel conspicue undulatis, maturitate supra glabris subtus indumento crispo-ferrugineo-tomentello dense et persistenter obtectis, costa supra acute elevata subtus prominente, nervis lateralibus utrinsecus 3–5 patentibus supra valde prominulis subtus elevatis, rete venularum intricato supra prominulo vel immerso subtus indumento occulto; inflorescentiis axillaribus unifloris, pedunculo brevi et pedicello subcontinuis sub anthesi dense tomentello-puberulis, pedicellis 8–12 mm. longis bracteis paucis linearibus mox caducis apicem versus ornatis; sepalis 5 vel 6 (2 interdum con-

natis) carnoso-subcoriaceis deltoideo-lanceolatis, 13–15 mm. longis, 4–7 mm. latis, subacutis, utrinque puberulo-tomentellis; petalis in corollam campanulatam interdum uno latere ad basim fissam connatis, corolla papyraceo-submembranacea utrinque dense puberula sub anthesi 18–22 mm. longa et apice 13–17 mm. diametro (matura?), apicem versus plicata, apice copiose dentata, lobis oblongo-lanceolatis subacutis 2–3 mm. longis; toro 6–7 mm. lato minute velutino; staminibus circiter 50 plerumque 3-seriatis 9–10 mm. longis (submaturis) ubique minute hispidulis, filamentis crassis teretibus 2–2.5 mm. longis, antheris arista subulata 3–3.5 mm. longa excepta 4–5 mm. longis; ovario ovoideo angulato 3-loculari (an semper?) et styli basi dense brunneo-velutinis, loculis 12–14-ovulatis, stylo crasso-subulato 8–9 mm. longo sulcato superne glabro; pedunculo et pedicello sub fructu incrassatis subcontinuis ad 3 cm. longis, capsulis ellipsoideis maturitate ad 5 × 2.5 cm., 3-valvatis, valvis circiter 2 cm. latis dorso leviter sulcatis, pericarpio lignoso 4–7 mm. crasso ruguloso dense velutino demum glabrato; seminibus ut videtur paucis, modo sectionis arillatis.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, alt. 2150–2200 m., *Brass & Versteegh 11990* (tree 28 m. high, frequent in primary forest on a ridge; trunk 43 cm. diam.; crown not wide-spreading; bark 9 mm. thick, gray, fairly smooth; wood yellow-brown; flowers green-yellow; fruits red-brown), *Brass 12710* (TYPE), Feb. 1939 (tree up to 25 m. high, plentiful on upper slopes of the ridges in mossy-forest; trunk 50 cm. diam.; flowers greenish yellow).

Sloanea perbella is readily distinguished from its allies by its small few-nerved leaves, which are persistently ferruginous-tomentellous beneath and somewhat angular in outline. The flowers are comparatively small, but this is not a very reliable character in § *Antholoma,* where the corolla and stamens elongate rapidly in maturing flowers. The comparatively small number of stamens and ovules is perhaps a more dependable feature.

The type bears flowers and mature fruits, while no. *11990* has a few flower-buds and fruits. Only one seed has been seen, and this, although imperfectly developed, has the thin partial aril characteristic of the section.

Sloanea (§ *Antholoma*) **Versteeghii** sp. nov.

Arbor ad 26 m. alta, partibus juvenilibus omnino copiose fulvo-squarroso-tomentellis mox glabrescentibus, ramulis apicem versus conspicue complanatis 3–5 mm. latis, vetustioribus subteretibus cinereis; foliis oppositis vel alternatis, petiolis validis subteretibus vel leviter canaliculatis 6–20 mm. longis ut ramulis tomentellis mox glabratis, laminis coriaceis vel subcoriaceis fuscescentibus ellipticis, (7–)12–21 cm. longis, (4–)5–10 cm. latis, basi late obtusis vel subrotundatis, apice obtusis, margine integris vel haud undulatis, maturitate utrinque glabris vel subtus costa nervisque farinoso-puberulis, costa supra elevata subtus valde prominente, nervis lateralibus utrinsecus 6–10 subrectis adscendentibus supra leviter subtus valde elevatis, rete venularum copioso utrinque prominulo vel subplano; inflorescentiis axillaribus unifloris, pedunculo et pedicello subcontinuis circiter 1.5 mm. longis validis sub anthesi puberulis demum glabratis, bracteis pedicelli paucis dense puberulis mox caducis, eis medium versus spathulatis ad 10 mm. longis, eis apicis lanceolatis 4–5 mm. longis; sepalis 4 carnoso-subcoriaceis lanceolato-oblongis, 17–21 mm. longis, 5–6 mm. latis, subacutis, utrinque copiose puberulo-velutinis; petalis in corollam siccitate sub-

membranaceam campanulatam connatis, corolla 27–30 mm. longa, apice circiter 25 mm. diametro, utrinque pallido-puberula, superne plicata, apice copiose dentata, lobis subacutis deltoideo-oblongis circiter 3 × 2 mm.; toro carnoso circiter 7 mm. diametro dense velutino; staminibus ut videtur circiter 70 plerumque 3-seriatis 11–12 mm. longis ubique copiose hispidulis, filamentis crassis subteretibus 3–3.5 mm. longis, antheris arista subulata loculos subaequante excepta 3.5–5 mm. longis; ovario acute angulato 3- vel 4-loculari et styli basi arcte brunneo-velutinis, loculis circiter 20-ovulatis, stylo crasso-subulato sulcato circiter 15 mm. longo; pedicellis sub fructu incrassatis ad 2 cm. longis, capsulis ellipsoideis ad 5 × 3 cm. 3- vel 4-valvatis, pericarpio lignoso 5–9 mm. crasso ruguloso velutino; seminibus in quoque loculo circiter 8 ellipsoideis, 9–10 mm. longis, 5–6 mm. latis, basi subacutis, apice rotundatis, arillo modo sectionis tenui apicali atque uno latere fere ad hilum extenso, testa atro-castanea nitida.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, alt. 1500 m., *Brass & Versteegh 12514* (TYPE), Feb. 12, 1939 (tree 26 m. high, occasional in forest of the slopes; trunk 45 cm. diam.; crown not wide-spreading; bark 5 mm. thick, gray; sap-wood light brown; heart-wood brown; flowers green-yellow; fruits brown-green).

Sloanea Versteeghii differs from its similarly large-leaved New Guinean congeners, *S. Tieghemi* (F. v. Muell.) A. C. Sm. and *S. Lamii* A. C. Sm., in its coriaceous and essentially entire-margined leaf-blades, which are obtuse or nearly so at the apex, rather than cuspidate-acuminate, and which have more numerous secondaries; the combined peduncle and pedicel of the new species is comparatively short.

It is probable that *Brass & Versteegh 13503* (2 km. southwest of Bernhard Camp, alt. 800 m.) also represents *S. Versteeghii,* although it differs from the type in its spreading rather than suberect secondaries. This specimen is accompanied by mature fruits, which are up to 8 × 5 cm., with a pericarp 7–15 mm. thick and seeds similar to those described above. A more complete series of specimens is desirable to indicate the variation within the species.

SUMMARY

In the preceding pages 60 Papuasian species of Elaeocarpaceae have been described as new, for the most part based upon the collections of the Archbold Expeditions. The new species are distributed in five genera as follows: *Sericolea* 5, *Aceratium* 9, *Elaeocarpus* 32, *Dubouzetia* 2, and *Sloanea* 12. Previously the family had been represented in our region by about 127 described species, of which all but a very few appear maintainable. Thus about 187 species of Elaeocarpaceae are now known from Papuasia, more than double the number known to Schlechter in 1916. A key to the genera occurring in Papuasia follows:

Stamens inserted within the disk or at its upper margin, the disk-surface free of stamens; anthers transversely dehiscent at apex, the clefts sometimes extending downward laterally; fruit various, but not a completely loculidically dehiscent capsule, the seeds not arillate.

Fruit a berry, the pericarp thin when dried, with inconspicuous mesocarp and endocarp; slender plants, often epiphytic; leaves opposite or subopposite; petals with the apex rounded, truncate, undulate, or 2- or 3-lobed; disk lobed, with the lobes often spreading, or rarely subcontinuous; stamens 10–15, not awned. . . *Sericolea*.

Fruit a drupe, the pericarp thick, with pulpy or fibrous mesocarp and bony endocarp; plants comparatively robust, not or rarely epiphytic; petals various, often copiously fimbriate, sometimes entire; disk annular-pulvinate or with fleshy lobes.

Leaves opposite or subopposite; petals dentate at apex, the margins toward base often laterally coherent by means of a tangled tomentum; stamens usually 15, rarely 12 or up to 20, not awned; fruits usually conical-ellipsoid, the pericarp often irregularly fissured, disclosing the thick fibrous mesocarp, which is firmly adherent to the endocarp.....*Aceratium*.

Leaves alternate, very rarely opposite (in Papuasia only in *E. sericoloides*); stamens indefinite, usually numerous, the clefts often extending downward laterally, one lip often awned; fruit usually ellipsoid to subglobose, the mesocarp pulpy or sometimes fibrous, at length usually free from the endocarp, which is sometimes conspicuously ornamented.....*Elaeocarpus*.

Fruit a capsule, at first imperfectly loculicidally dehiscent, finally completely septicidally dehiscent and separating into open cocci, the seeds conspicuously strophiolate; leaves alternate; petals involute and often subcoherent toward base, inconspicuously denticulate at apex; disk with carnose lobes; stamens 20–40, not awned, the anthers dehiscing by a small apical 2-lipped pore.....*Dubouzetia*.

Stamens inserted on the broad flattened disk-like surface of the torus; anthers dehiscing laterally, the clefts elongate but not extending across the apex, which is continued into a single short mucro or subulate awn; fruit a loculicidally dehiscent capsule, the seeds arillate.....*Sloanea*.

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NEW OR NOTEWORTHY PLANTS FROM SOUTHWESTERN CHINA[1]

Hui-Lin Li

This paper consists of descriptions and notes based on selected specimens of plants mainly from Yunnan, with a few from the neighboring provinces Szechuan and Kweichow. The Yunnan material was accumulated through the extensive explorations of that province made in recent years under the auspices of the Fan Memorial Institute of Biology, with the financial co-operation of the Arnold Arboretum. Vast collections of plant specimens were assembled from practically all parts of the province. Some specimens from older collections made by A. Henry and J. F. Rock that have remained unnamed have also been considered. The Kweichow collections were made for the Botanical Institute of Sun Yatsen University.

A total of twenty-six presumably new species and a few new varieties and forms are described. Notes concerning previously described species new to these provinces are given, as well as a number of new synonyms. All types of the new forms herein described are deposited in the herbarium of the Arnold Arboretum.

ANNONACEAE

Mitrephora Hooker f. & Thomson

Mitrephora Maingayi Hook. f. & Thomson in Hook. f. Fl. Brit. Ind. 1: 77. 1872; King, Ann. Bot. Gard. Calcutta 4: 112. *t. 154.* 1893; Ast, Suppl. Fl. Gén. Indo-Chine 1: 100. 1938.

Kweichow: Chen-feng, Do-wan, *S. W. Teng 90866,* Sept. 13, 1936, a tree 10 ft. high, in dense woods, flowers white to yellow. Borneo, Malay Peninsula, Indo-China, Hainan; new to continental China.

HAMAMELIDACEAE

Corylopsis Siebold & Zuccarini

Corylopsis Veitchiana Bean, Bot. Mag. 136: *t. 8349.* 1910; Rehd. & Wils. in Sargent, Pl. Wils. 1: 425. 1913.

Kwangsi: No data, *Z. S. Chung 82307;* Tzu-yuen District, *Z. S. Chung 83556,* Aug. 5, 1937, a tree, in woods. Kweichow: Fan Ching Shan, Tou Shan, *Steward, Chiao & Cheo 571,* Sept. 5, 1931, a shrub 5 m. high, on rocky slopes in forests, alt. 1400 m.

This species was formerly known from western Hupeh; the present collection considerably extends its known range. The leaves of the Kwangsi plants are mostly larger than the others.

Corylopsis polyneura sp. nov.

Frutex 0.5 m. altus, ramis gracilibus, ramulis glabris cinereo-brunneis

[1]Prepared with partial support of a grant from the Penrose Fund, American Philosophical Society, to Dr. E. D. Merrill to assist him in working up the accumulated collections of Chinese botanical material in the herbarium of the Arnold Arboretum.

minute lenticellatis, lenticellis rotundatis albidis; foliis subchartaceis petiolatis oblongo-ovatis, 6–8.5 cm. longis, 3–5.5 cm. latis, leviter inaequilateralibus, margine uno interdum rectis, apice breviter acutis, basi subcordatis, margine sinuato-denticulatis, dentibus fere ad mucronem reductis, nervis lateralibus utrinsecus 8–14 dense compactis, inferioribus manifeste ramosis, cum costa supra distincte impressis subtus elevatis perspicuis, venulis dense reticulatis gracilibus supra subimpressis subtus elevatis; petiolis 0.5–1.5 cm. longis, glabris interdum parce stipitato-glandulosis; inflorescentiis ignotis; infructescentiis spicatis, 4.5 cm. longis, pedunculis 1.5 cm. longis, glabris; fructibus 4–6 mm. diametro, glabris atrobrunneis.

YUNNAN: Cham-pu-tong, Soo-roo-la, *C. W. Wang 66738* (TYPE), Oct., 1935, a shrub 1.5 ft. high, in woods, alt. 3000 m., fruit greenish yellow.

A species apparently close to *Corylopsis platypetala* Rehd. & Wils. and *C. glaucescens* Hand.-Maz., differing in the more numerous veins, which are densely and compactly arranged, strongly impressed above, and distinctly elevated beneath, the lower one branching considerably, and also in the smaller fruits.

Mytilaria Lecomte

Mytilaria laosensis Lecomte, Bull. Mus. Hist. Nat. Paris 30: 504. 1924; Chun, Sunyatsenia 1: 244. 1934.

YUNNAN: No data, *J. C. Liu & C. Wang 85072*, in 1939.

This Indo-Chinese species has been recorded by Chun (l. c.) from Kwangtung and Kwangsi; new to Yunnan. In addition to the plants enumerated by Chun, the following specimens are also noted from Kwangsi: *W. T. Tsang 22180* and *S. P. Ko 55988*.

ROSACEAE

Neillia D. Don

Neillia serratisepala sp. nov.

Frutex circiter 1.3 m. altus, ramulis gracilibus teretibus glabris; foliis petiolatis subchartaceis oblongo-ovatis, 6–7.5 cm. longis, 2.5–4.5 cm. latis, caudato-acuminatis (acumine ad 1.5 cm. longo), basi truncatis vel subcordatis, margine dupliciter serratis, saepissime leviter 2–4-lobatis (lobis acutis, vix 1.2 cm. longis), in sicco olivaceis, subtus pallidioribus, supra leviter hirsutis vel glabrescentibus, subtus leviter pubescentibus, nervis lateralibus utrinsecus 5 vel 6, arcuato-adscendentibus, supra subconspicuis, subtus distinctis; petiolo circiter 5 mm. longo, pubescente; stipulis ovatis, circiter 6 mm. longis et 5 mm. latis, acutis, margine distincte serratis, glabris vel subglabris; inflorescentiis terminalibus vel axillaribus gracilibus glabris, axillaribus racemosis circiter 4 cm. longis, terminalibus paniculatis circiter 6 cm. longis; bracteis bracteolisque variis, ovatis vel ovato-lanceolatis, 4–8 mm. longis, 2–3 mm. latis, acutis vel acuminatis, serrulatis; pedicellis gracilibus, 2–3 mm. longis; calycis tubo 3 mm. longo, 2 mm. lato, pubescente, lobis 5, triangularibus, acuminatis, 1.5 mm. longis; petalis albis ovatis 1.5 mm. longis; staminibus numerosis, filamentis ad 1 mm. longis.

YUNNAN: Shang-pa, *H. T. Tsai 59158* (TYPE), Oct. 31, 1934, a shrub 4 ft. high, in woods, alt. 2000 m., flowers white.

A species characterized by the pubescent leaves and calyces, the serrate sepals, and the very delicate inflorescences.

Rubus Linnaeus

Rubus pectinellus Maxim. Bull. Acad. Sci. St. Pétersb. 17: 147. 1871, Mél. Biol. 8: 374. 1871; Focke, Bibl. Bot. 17 [Heft 72]: 22. *f. 6.* 1910.

KWEICHOW: Hsu-feng, She-won-shan, *S. W. Teng 90491,* July 2, 1936, herb, in dense shade. Japan, Formosa, Fukien; new to western China.

Rubus aralioides Hance, Jour. Bot. 22: 41. 1884; Focke, Bibl. Bot. 17 [Heft 72]: 196. 1911.

KWEICHOW: Hsu-feng, *S. W. Teng 90429,* June 29, 1936, a shrub on open slopes, flowers purplish red. KWANGSI: Nam Tan-yuen, *C. Wang 40855,* June 22, 1937, a scandent shrub in waste places, alt. 2500 ft., fruit green. Kwangtung, Fukien; new to western China.

MELIACEAE

Dysoxylum Blume

Dysoxylum cupuliforme sp. nov. § *Eudysoxylum.*

Arbor circiter 8 m. alta, foliis alternis, circiter 35 cm. longis, petiolis rhachibusque glabris; foliolis circiter 11 subalternis chartaceis breviter petiolulatis utrinque glabris oblongis vel oblongo-lanceolatis, 10–15 cm. longis, 4–5 cm. latis, acutis, basi leviter inaequilateraliter rotundatis, nervis lateralibus utrinsecus 9–12, curvatis, supra inconspicuis, subtus perspicue elevatis, venis tertiariis utrinque obscuris; petiolulis 5 mm. longis, glabris; paniculis supra-axillaribus laxis paucifloris breviter ramosis, ramis inferioribus circiter 2 cm. longis; floribus paucis 4-meris, circiter 1.2 cm. longis, in ramis primariis plus minusve compacte dispositis, pedicellis dense puberulis dein glabratis, 3–5 mm. longis; calyce cupulato, crasse coriaceo dense puberulo dein glabrato, margine integro; petalis 4, liberis valde incrassatis, extus dense puberulis, oblongis, circiter 8 mm. longis et 4 mm. latis; tubo stamineo brevi, 1.5 mm. longo, 2 mm. diametro, pauce ciliato crenulato; antheris 8; disco 1 mm. longo, crenato; ovario villoso; stylo 3 mm. longo, leviter ciliato.

YUNNAN: Fo-hai, *C. W. Wang 74908* (TYPE), July, 1936, alt. 1340 m., in forests, river side, flowers light yellow.

This species is near *Dysoxylum binectariferum* Hook. f. in most of its characters, both species being characterized by their coriaceous cupulate calyces. The new species can be distinguished from *D. binectariferum* by its much shorter, broader, and thicker calyx, which is entire and densely puberulous at first on the outside.

Dysoxylum filicifolium sp. nov. § *Eudysoxylum.*

Arbor circiter 20–30 m. alta, ramulis novellis dense pubescentibus, foliis alternis, circiter 55 cm. longis, petiolis rhachibusque dense pubescentibus; foliolis 15 vel 17 oppositis vel suboppositis breviter petiolulatis, membranaceis supra subglabris costa dense pubescente excepta, subtus molliter villosis, oblongo-lanceolatis, 8–14 cm. longis, 3–4.5 cm. latis, cuspidato-acuminatis, basi inaequilateraliter subrotundatis, nervis lateralibus utrinsecus 10–15, supra subconspicuis, subtus manifestis, venis tertiariis utrinque obscuris; petiolulis 3–5 mm. longis, dense pubescentibus; paniculis supra-axillaribus anguste pyramidatis laxis paucifloris, circiter 17 cm. longis; floribus paucis 4-meris circiter 4–5 mm. longis, in ramis primariis racemose dispositis, pedicellis circiter 1.5 mm. longis, puberulis; calyce puberulo, 1 mm. longo,

4-dentato, lobis orbicularibus, rotundatis, ad ⅓–½ connatis; petalis 4 glabris spathulatis obtusis, circiter 4 mm. longis et 1.5 mm. latis; tubo stamineo cylindrico, utrinque ciliato, crenulato, circiter 1.5 mm. diametro et 2.5 mm. longo; antheris 8; disco 1 mm. longo, villoso; stylo 2.5 mm. longo, leviter ciliato; stigmate capitato; fructu immaturo subpyriformi, glabro, 1.1 cm. longo.

YUNNAN: Nan-chiao, *C. W. Wang 75309* (TYPE), June, 1936, alt. 1760 m., mountain slopes, in forests, 90 ft. high, flowers green; Che-li District, Maan-shang, *C. W. Wang 78581*, Sept., 1936, alt. 1300 m., mixed forests, 80 ft. high, fruit greenish yellow.

This species resembles *Dysoxylum hainanense* Merr. in leaf characters, except that the leaflets of the new species are larger and fewer. The inflorescences as well as the individual flowers of *D. hainanense* Merr. are much the longer. Moreover, its calyx-lobes are free or almost free, while in our species they are united for ⅓ to ½ their length. Hence *D. hainanense* falls in § *Didymocheton*, while the new species is included in § *Eudysoxylum*.

Dysoxylum grandifolium sp. nov. § *Eudysoxylum*.

Arbor parva circiter 3 m. alta; foliis alternis magnis, circiter 80 cm. longis, petiolis rhachibusque glabris; foliolis circiter 11 alternis chartaceis breviter petiolulatis, utrinque glabris, elliptico-oblongis, 15–30 cm. longis, 8–14 cm. latis, acutis, basi inaequilateraliter rotundatis, nervis lateralibus utrinsecus 12–15, supra inconspicuis, subtus prominentibus, venis tertiariis utrinque obscuris; petiolulis 1 cm. longis; inflorescentiis floribusque ignotis; fructu subpyriformi elongato glabro, circiter 4.5 cm. longo et 1.8 cm. crasso, loculicide 2-valvo, pericarpio valde crasso, loculis 1-spermis.

YUNNAN: Nan-chiao, *C. W. Wang 75342* (TYPE), June, 1936, alt. 1250 m., in ravine, in forests, 10 ft. high, fruit yellow.

This species is imperfectly represented by one leaf and one fruit. However, the striking characters revealed by these parts alone are sufficient to distinguish it from other known species. With flowering material available, it may possibly prove to be related to *Dysoxylum binectariferum* Hook. f. The 2-valved fruit may be due to a reduction in parts.

Dysoxylum hongkongense (Tutcher) Merr. Lingnan Sci. Jour. 13: 33. 1934; Merr. & Chun, Sunyatsenia 5: 90. 1940.

Chisocheton hongkongensis Tutcher, Jour. Linn. Soc. Bot. 37: 64. 1905.

YUNNAN: Fo-hai, *C. W. Wang 73908*, May, 1936; Nan-chiao, *C. W. Wang 76972*, June, 1936; Che-li District, Meng-la, *C. W. Wang 78090*, Sept., 1936; Che-li District, Meng-seeng, Dah-meng-lung, *C. W. Wang 78449, 78449A*, Sept., 1936; Che-li District, Dah-meng-lung, Maan-hung-han, *C. W. Wang 78600*, Sept., 1936; Jenn-yeh District, Meng-la, *C. W. Wang 80596, 80662*, Nov., 1936.

Originally described from Hong Kong, known also from Hainan; a new record for Yunnan. The occurrence of this Hainan and Hong Kong species, as well as of the following, *Dysoxylum Lukii* Merr., also from Hainan, in the southern part of Yunnan is worthy of note. It is highly probable that these species may eventually be found in Tonkin.

Dysoxylum Lukii Merr. Philip. Jour. Sci. 23: 247. 1923.

YUNNAN: Che-li District, *C. W. Wang 78588, 78658*, Sept., 1936.

Previously known only from Hainan; a new record for Yunnan. The Yunnan plants, compared with the Hainan type, are taller and with smaller

inflorescences and more numerous (about 15) leaflets; but these characters are also present in some of the Hainan specimens representing the species, such as *H. Y. Liang 62273* and *F. C. How 72718*, which the Yunnan specimens closely match.

Dysoxylum spicatum sp. nov. § *Eudysoxylum*.

Arbor circiter 7 m. alta, ramulis glabris; foliis alternis, 50–70 cm. longis, petiolis rhachibusque glabris, foliolis 7–9 subalternis chartaceis breviter petiolulatis, utrinque glabris, ellipticis vel oblongo-ellipticis, 10–22 cm. longis, 5–10 cm. latis, cuspidatis, basi inaequilateralibus uno latere rotundatis altero subrectis, nervis lateralibus utrinsecus circiter 15, curvatis, supra inconspicuis, subtus manifestis, venis tertiariis utrinque inconspicuis; petiolulis 5 mm. longis, glabris; paniculis supra-axillaribus spicatis breviter pedunculatis, 11–14 cm. longis, glabris, pedunculis 1 cm. longis vel brevioribus; floribus 4-meris, 6–7 mm. longis, ad 3–6-fasciculatis, pedicellis glabris, 2–3 mm. longis; calyce 2 mm. longo, glabro, profunde 4-dentato, lobis acutis; petalis 4, extus glabris, oblongis, 5–6 mm. longis, 2 mm. latis; tubo stamineo cylindrico, 3 mm. longo, denticulato, extus puberulo, intus glabro; antheris 8; disco brevi leviter crenulato glabro; ovario hirsuto; stylo puberulo, stigmate distincte capitato.

YUNNAN: Szemao, south mountains, *A. Henry 11748* (TYPE), in forests, alt. 5000 ft., a tree 20 ft. high, flowers white; Szemao, *A. Henry 11748A*, in forests, alt. 4000 ft., a tree 20 ft. high, flowers white.

This is apparently close to *Dysoxylum flavescens* Hiern, a species of the Malay Peninsula, particularly in being glabrous, and in having oblong-elliptic and cuspidate leaves and spicate inflorescences. The Chinese plant has larger leaves and glabrous petals, while the flowers are clustered on the main axis of the inflorescence, characters which may be used to differentiate it from Hiern's species.

Aglaia Loureiro

Aglaia attenuata sp. nov. § *Euaglaia*.

Arbor 5–13 m. alta, ramulis novellis ochraceo-lepidotis; foliis circiter 40 cm. longis, petiolis circiter 7 cm. longis rhachibusque teretibus glabris; foliolis 9 alternis breviter petiolulatis firme membranaceis, utrinque glabris, lanceolatis, 18–20 cm. longis, 3.5–5 cm. latis, inferioribus minoribus, acuminatis, basi inaequilateraliter attenuatis, nervis lateralibus utrinsecus 12–15 arcuato-adscendentibus, supra subconspicuis, subtus prominulis, nervis tertiariis obscuris; petiolulis circiter 7 mm. longis, glabris; paniculis supra-axillaribus, laxis, parce lepidotis, 11–13 cm. longis, parce ramosis, paucifloris, pedunculis ad 4 cm. longis, ramis simplicibus vel breviter ramulosis; floribus 3 mm. longis, pedicellatis, pedicellis 4 mm. longis, rectis lepidotis; calyce subcupulato, 1.5 mm. longo, extus lepidoto, obtuse 5-dentato; petalis 3, obovatis, 3 mm. longis, extus parce pubescentibus vel glabris, concavis, imbricatis, basi cum tubo plus minusve connatis; tubo stamineo urceolato, deorsum angustato, circiter 2 mm. longo, glabro, antheris 6, circiter 1 mm. longis, inclusis; ovario pubescente, stigmate ovoideo glabro; fructu globoso, glabro, 1.8 cm. crasso, 1-loculari, calyce persistente, 5-dentato.

YUNNAN: Szemao, south mountains, *A. Henry 12170* (fruit), alt. 4000 ft., a tree

15 ft. high; Szemao, *A. Henry 12228* (TYPE), in forests, alt. 4500 ft., a tree 30 ft. high, *12228A*, in forests, alt. 5000 ft., a tree 40 ft. high.

A species characterized by its lanceolate, acuminate, and attenuate leaflets. It is apparently closely allied to *Aglaia tenuifolia* Li, described below, differing in the firmer, narrower, and more numerous leaflets, and in the shorter and more obtuse calyx-lobes.

Aglaia Wangii sp. nov. § *Hearnia*?

Arbor 3–13 cm. alta, ramulis lepidotis, indumento pallido; foliis circiter 50 cm. longis, modice petiolatis; petiolis 8–12 cm. longis rhachibusque teretibus, glabratis; foliolis 7 vel 8 oppositis vel subopppositis aequalibus chartaceis breviter petiolulatis, supra lepidotis vel costa tantum lepidotis, subtus dense lepidotis, oblongo-lanceolatis, 14–18 cm. longis, 5–8 cm. latis, acuminatis, basi leviter inaequilateraliter cuneatis, nervis lateralibus utrinsecus 12–15, supra subconspicuis, subtus perspicue elevatis, venis tertiariis obscuris; petiolulis 5–8 mm. longis, lepidotis; paniculis fructigeris simplicibus, circiter 6 cm. longis vel longioribus, lepidotis; fructu subgloboso, circiter 2.3 cm. longo, 1.8 cm. lato, apice acuto, rufescente, glabro, 3-loculari, pedicello 1.3 cm. longo, calyce persistente, 4- vel 5-sepalo.

YUNNAN: Fo-hai, *C. W. Wang 73924*, May, 1936, alt. 1550 m., in thickets, 40 ft. high; Che-li District, Sheau-meng-yeang, *C. W. Wang 75593* (TYPE), Aug., 1936, alt. 960 m., in forest, 15 ft. high, fruit pink; Jenn-yeh District, Meng-la, *C. W. Wang 80772*, Nov., 1936, alt. 900 m., in mixed woods, 35 ft. high, fruit green.

A species characterized by the dense lepidote indumentum on the adult leaflets, especially on the under surface. It is apparently very close to the Malayan and Burman *Aglaia minutiflora* Bedd., which Beddome originally described as stellate-pubescent (Ic. Pl. Ind. Or. 1: 44. *t. 193*. 1874). In C. de Candolle's monograph (Monogr. Phan. 1: 616. 1878), it is described as lepidote, which agrees with the Chinese specimens. The Chinese plants in general differ from Beddome's species in having larger leaflets with acuminate apices, inequilateral bases, and pale indumentum. The fruit is 3-celled. Flowering material is desirable for further characterization.

Aglaia Wangii var. **macrophylla** var. nov.

A typo speciei differt foliolis alternis, ad 30 cm. longis et 11.5 cm. latis, fructu globoso, circiter 2.2 cm. crasso, calyce persistente, 5-sepalo.

YUNNAN: Nan-chiao, *C. W. Wang 75131* (TYPE), June, 1936, alt. 1400 m., in forest, 60 ft. high, fruit reddish white.

Aglaia perviridis Hiern in Hook. f. Fl. Brit. Ind. 1: 556. 1875; C. DC. Monogr. Phan. 1: 610. 1878.

YUNNAN: Che-li District, Jah-kuang, *C. W. Wang 79063, 79064*, Sept., 1936; Jenn-yeh District, Lung-huk, *C. W. Wang 80112A*, Oct., 1936.

Previously known from the Khasia Mountains, India. *Wang 80112A* is a flowering specimen with 11-foliolate leaves. *Wang 79063* and *79064* are fruiting specimens with 9-foliolate leaves. The mature fruit is inequilaterally ellipsoid, 3.5 cm. long and 2 cm. wide, brownish when dry, and exactly matches Indian material available for comparison.

Aglaia tenuifolia sp. nov. § *Euaglaia*.

Frutex 2–5 m. altus, indumento in ramulis novellis lepidoto pallido; foliis

ad 40 cm. longis, petiolis 7–9 cm. longis rhachibusque teretibus, parce lepidotis vel glabratis; foliolis 7 alternis tenuiter membranaceis breviter petiolulatis, utrinque glabris, in sicco utrinque virescentibus, oblongo-lanceolatis, superioribus 15–18 cm. longis, 4.5–5 cm. latis, inferioribus minoribus, 7–8 cm. longis, 3–3.5 cm. latis, acute cuspidatis, basi aequilateraliter vel leviter inaequilateraliter cuneatis, nervis lateralibus utrinsecus 10-12, supra subconspicuis, subtus perspicuis, elevatis, adscendentibus, venis tertiariis obscuris; petiolulis circiter 5 mm. longis; paniculis supra-axillaribus, laxis, parce lepidotis, 8–14 cm. longis, parce ramosis, paucifloris, pedunculis ad 3 cm. longis, ramis simplicibus; floribus 3 mm. longis, longe pedicellatis, pedicellis 0.7–1 cm. longis, gracilibus, lepidotis, plerumque recurvis; calyce subcupulato, 1 mm. longo, obscure 5-dentato, lepidoto; petalis 3 obovatis obtusis, 2.5 mm. longis, extus parce pubescentibus vel glabris, concavis, imbricatis, basi cum tubo plus minusve connatis; tubo stamineo urceolato, deorsum angustato, circiter 2 mm. longo, antheris 6, 1 mm. longis, inclusis; ovario pubescente, stigmate angulato-cylindrico, apice rotundato.

YUNNAN: Che-li District, Dah-meng-lung, *C. W. Wang 77803* (TYPE), Aug., 1936, alt. 1100 m., ravine, in dense forests, 4 m. high, frequent; Che-li District, Kuen-ger, *C. W. Wang 79306,* Oct., 1936, alt. 1100 m., in mixed forests, 2 m. high; Che-li District, *C. W. Wang 78043A,* Aug., 1936, alt. 800 m., in thickets, 5 m. high.

This species is characterized by the very thinly membranaceous, oblong-lanceolate, acutely cuspidate leaflets, the short lax inflorescences, and the slender, long, frequently recurved pedicels.

Aglaia yunnanensis sp. nov. § *Euaglaia.*

Frutex 7–10 m. altus, ramulis novellis lepidotis, indumento pallido; foliis circiter 35 cm. longis, petiolis 8–9 cm. longis rhachibusque teretibus, parce lepidotis vel glabratis; foliolis 4 vel 5, breviter petiolulatis, firme membranaceis, utrinque glabris, oblongo-ovatis vel oblongo-lanceolatis, superioribus majoribus, circiter 20 cm. longis et 7.5 cm. latis, inferioribus minoribus, circiter 12 cm. longis et 4.5 cm. latis, ceteris magnitudine intermediis, apice breviter acute cuspidatis, basi inaequilateralibus uno latere subrotundatis altero subrectis, nervis lateralibus utrinsecus 10–12, patulo-adscendentibus, supra conspicuis, subtus perspicuis, elevatis, venis tertiariis subconspicuis vel obscuris; petiolulis 0.5–1 cm. longis, glabratis; paniculis supra-axillaribus laxis lepidotis, ad 14 cm. longis, parce ramosis paucifloris, pedunculis ad 5 cm. longis, ramis simplicibus vel ramulosis; floribus 4 mm. longis, pedicellis 5 mm. longis vel brevioribus, lepidotis, crassis pro more rectis; calyce cupulato, 2 mm. longo, extus lepidoto, profunde 5-dentato, lobis acutis; petalis 3 obovatis, 3 mm. longis, extus parce pubescentibus vel glabris, concavis, imbricatis, basi cum tubo plus minusve connatis; tubo stamineo urceolato, deorsum plus minusve angustato, circiter 2 mm. longo, glabro, antheris 6, circiter 1 mm. longis, inclusis; ovario plus minusve pubescente, stigmate obtuse conico, glabro.

YUNNAN: Fo-hai, *C. W. Wang 74823A,* June, 1936, alt. 1000 m., in ravines, 20 ft. high; same locality and habitat, *C. W. Wang 74830* (TYPE), June, 1936, 30 ft. high.

A species resembling *Aglaia tenuifolia* Li in the short, lax, few-branched inflorescences, but readily distinguished by the shorter, thick, and more or less straight pedicels and the larger, fewer, and firmer leaflets.

ANACARDIACEAE

Dracontomelon Blume

Dracontomelon macrocarpum sp. nov.

Arbor circiter 23 m. alta; foliis imparipinnatis 15-foliolatis, 50 cm. longis, rhachibus teretibus glabris; petiolis teretibus glabris, circiter 12 cm. longis; foliolis brevi-petiolulatis chartaceis utrinque glabris oblongis, 10–13 cm. longis, 3.5–4.2 cm. latis, acuminatis, basi profunde inaequilateralibus uno latere acutis altero rotundatis, margine integris, nervis lateralibus utrinsecus 8–10 utrinque elevatis, venis tertiariis reticulatis utrinque conspicuis, petiolulis 4 mm. longis; inflorescentiis infructescentiisque ignotis; fructibus globosis depressis interdum sublenticellatis, 4 cm. diametro, 5-locularibus nuciformibus; endocarpio valde lignoso crasso (3.5 × 2.5 cm.) extus insculpto-vermiculato; exocarpio laxo spongioso extus glabro, nigrescente, duro; seminibus ellipsoideis, oleosis.

YUNNAN: Jenn-yeh District, Meng-pung, *C. W. Wang 78978* (TYPE), Oct., 1936, in mixed woods, frequent, alt. 1200 m., seeds edible, oily.

This is the first species of the genus known from Yunnan. *Dracontomelon Dao* (Blanco) Merr. & Rolfe (*D. Duperreanum* Pierre, *D. mangiferum* sensu Forbes & Hemsl. non Blume, *D. sinense* Stapf), a species extending from Indo-China to the Philippines, Celebes, and Moluccas, is recorded from Kwangtung. This new species is easily distinguished from *D. Dao* by its larger leaflets and its much larger fruits. In this herbarium, in addition to the specimens attributed to *D. Dao*, there is a sterile specimen, *Canton Christian College 1219*, also from Kwangtung, which closely simulates *D. mangiferum* Blume. *Dracontomelon mangiferum* Blume differs from the species here described in the larger leaflets and more numerous lateral nerves and in the size of the fruits.

SAPINDACEAE

Mischocarpus Blume

Mischocarpus productus sp. nov.

Arbor parva; foliis 8-foliolatis, circiter 30 cm. longis, glabris, rhachibus teretibus; petiolis circiter 5 cm. longis, teretibus; foliolis subopppositis coriaceis breviter petiolulatis ovato-oblongis, 11–17 cm. longis, 4–5.5 cm. latis, acuminatis, basi acutis, nervis lateralibus utrinsecus 10–12 utrinque elevatis prominulis, venis tertiariis subtiliter reticulatis utrinque elevatis distinctis; petiolulis 3–5 cm. longis; floribus ignotis; infructescentiis axillaribus parce pubescentibus vel glabrescentibus, ad 35 cm. longis, graciliter et laxe ramosis, fructibus spicatim dispositis, pedicellatis, inferne stipitatis (stipite gracili, circiter 12 mm. longo et 1 mm. crasso), superne distincte triangularibus, 6 mm. crassis, apice retusis, stylo brevi ad 1 mm. longo vel nullo, stigmatibus 3 recurvis persistentibus; pedicellis gracilibus, 5–6 mm. longis, parce pubescentibus vel glabrescentibus, sepalis 5, persistentibus triangularibus, 1 mm. longis.

YUNNAN: Ping-pien District, *H. T. Tsai 60868* (TYPE), July 14, 1934, a small tree on rocky slopes, alt. 1300 m.

A species strongly characterized by the long, slenderly branched infruc-

tescences bearing relatively small but elongated fruits distinctly triangular at the upper part and narrowly elongate in the lower part, manifestly retuse at the apex with 3 persistent stigmas, which are subsessile or on an exceedingly short style.

THEACEAE

Gordonia Ellis

Gordonia yunnanensis (Hu) comb. nov.

Polyspora yunnanensis Hu, Bull. Fan Mem. Inst. Biol. Bot. 8: 135. 1938.

YUNNAN: In addition to the type, *H. T. Tsai 56805*, the following numbers may be cited: *H. T. Tsai 53540, 61773.*

Anneslea Wallich

Anneslea alpina sp. nov.

Frutex 2.6–4 m. altus, omnino glaber, ramulis purpureo-brunneis, teretibus crassis, 5 mm. diametro, lenticellatis; foliis subcoriaceis, plerumque in apice ramulorum confertis, ovatis, 4–6 cm. longis, 3–4.2 cm. latis, obtusis, basi late acutis, margine subintegris, in sicco supra atro-olivaceis, subtus pallidioribus minute nigro-puncticulatis, nervis lateralibus utrinsecus circiter 6, gracilibus, utrinque subobscuris, venulis obscuris; petiolo circiter 5 mm. longo; floribus axillaribus solitariis, in apice ramulorum confertis, pedicellis 1–1.5 mm. longis; sepalis coriaceis glabris ovatis acutis, circiter 12 mm. longis et 8 mm. latis, integris; petalis membranaceis, ovato-oblongis, 16 mm. longis, 10 mm. latis; filamentis glabris 4 mm. longis, antheris oblongis, 5 mm. longis, glabris, connectivo rostrato filiformi acuminato, 3 mm. longo; ovario glabro, stylo 16 mm. longo, stigmate 3-lobato.

YUNNAN: Mien-ning, Po-shang, *T. T. Yü 18031* (TYPE), Oct. 11, 1938, a shrub 8–12 ft. high, common in forests, alt. 2700 m., flowers purplish red.

A species related to *Anneslea fragrans* Wall., but distinguished by its smaller, characteristically ovate leaves, with much shorter petioles.

GUTTIFERAE

Hypericum Linnaeus

Hypericum ellipticifolium sp. nov.

Frutex 0.3 m. altus, omnino glaber, rhizomatibus subhorizontalibus, caulibus singularibus erectis teretibus gracilibus rufo-brunneis simplicibus; foliis subchartaceis sessilibus ellipticis, 4 5 cm. longis, 2–3 cm. latis, rotundatis vel leviter emarginatis, basi rotundatis, in sicco olivaceis, subtus pallidioribus, nervis lateralibus utrinsecus 2 vel 3, gracilibus valde arcuato-adscendentibus, ad apicem incurvatis, supra subconspicuis, subtus distinctis, venulis tertiariis gracilibus numerosis plus minusve cum margine parallelis; inflorescentiis terminalibus umbellatis circiter 6-floris, pedunculis circiter 1 cm. longis, bracteolis minutis, acutis, vix 1 mm. longis, pedicellis circiter 8 mm. longis; sepalis oblongo-ovatis, acuminatis, circiter 7 mm. longis et 2 mm. latis; petalis obovatis 1–1.2 cm. longis, acutis; staminibus numerosis, filamentis ad 6 mm. longis; ovario ovoideo, stylis 3, liberis, 2 mm. longis; capsulis ovoideis circiter 1.1 cm. longis et 4 mm. latis, sepalis stylisque persistentibus.

YUNNAN: Taron-Taru divide, Valley of Bucahwang, *T. T. Yü 20125* (TYPE), Sept. 4, 1938, common on mountain slopes in open grassland, flowers white.

A distinct species, strongly characterized by the elliptic leaves with delicate tertiary veins more or less parallel with the margins. The flowers are white, rather small, and in a terminal umbel.

Hypericum bellum sp. nov.

Frutex 0.3–0.6 m. altus, omnino glaber, rhizomatibus horizontalibus, caulibus erectis teretibus gracilibus rufo-brunneis, simplicibus vel e basi ramosis; foliis subchartaceis sessilibus cordato-ovatis, 3–5 cm. longis, 2–4 cm. latis, rotundatis vel subemarginato-rotundatis, basi subcordatis vel cordatis, in sicco olivaceis, subtus pallidioribus, nervis lateralibus utrinsecus 2 4, adscendentibus prope marginem valde arcuato-anastomosantibus, supra subconspicuis, subtus conspicuis, venulis obscuris; inflorescentiis terminalibus umbellatis, 2- vel 3-floris, interdum unifloris, glabris, sessilibus vel pedunculatis, pedunculis ad 1.2 cm. longis, bracteis bracteolisque ovato-oblongis, ad 1.2 cm. longis et 5 mm. latis, acuminatis, pedicellis 1–2.5 cm. longis; sepalis ovatis, 5 7 mm. longis, 3–7 mm. latis, rotundatis, subrufis; petalis obovatis circiter 1.8 cm. longis et 1.3 cm. latis, rotundatis, aureis; staminibus numerosis, filamentis ad 7 mm. longis; ovario ovoideo, stylis 5 liberis 3 mm. longis; capsulis ovoideis, 1.2–1.4 cm. longis, 8–9 mm. latis, sepalis stylisque persistentibus.

YUNNAN: Eastern slopes of Likiang Snow Range, Yangtze watershed, *J. F. Rock 10852*, a shrub 1–1.5 ft. high, alt. 11000 ft., flowers yellow; Kiukiang Valley (Taron), Mt. Chingtinglaka, *T. T. Yü 19497* (TYPE), July 28, 1938, a shrub 1–2 ft. high, common on mountain slopes in open grassland, alt. 1800–2400 m., flowers golden yellow. SIKANG: Dzer-nar, Tsa-wa-rung, *C. W. Wang 66384*, Sept., 1935, on mountain slopes, alt. 3000 m., fruit brown; Nar-jou, Tsa-wa-rung, *C. W. Wang 66482*, Sept., 1935, in pine forest, alt. 3300 m., flowers yellow.

An elegant species with large showy flowers. It is probably near *Hypericum Prattii* Hemsley, differing in the shorter, broader, and more cordate leaves, and in the fewer flowers with larger petals and shorter filaments.

Ochrocarpus Thouars

Ochrocarpus yunnanensis sp. nov.

Arbor circiter 17 m. alta, omnino glabra, ramulis teretibus luteo-brunneis subnitidis, ultimis 6 mm. diametro; foliis breviter petiolatis coriaceis oblongo-lanceolatis, 20–24 cm. longis, 6–7 cm. latis, acutis vel rotundatis, basi acutis, leviter rotundato-auriculatis, leviter revolutis, in sicco olivaceis utrinque subconcoloribus, costa crassa supra prominente, subtus valde elevata, venis primariis circiter 30–35 valde obscuris, patentibus, in trabecularum reticulo confertissimo fere occultatis; petiolis 5–8 mm. longis, crassis, supra distincte canaliculatis; floribus ignotis; fructibus magnis ovoideis, 5.5 6 cm. longis, 3–3.5 cm. diametro, acutis, basi leviter constrictis, in sicco atro-brunneis, subconspicue et graciliter striatis, pedicellis saltem 1 cm. longis, seminibus singularibus ovoideis, 3.8–4.5 cm. longis, 2.2–2.4 cm. latis, utrinque rotundatis.

YUNNAN: Jenn-yeh District, Meng-pung, *C. W. Wang 78973* (TYPE), Oct., 1936, a tree 50 ft. high, 2 ft. in diameter, cultivated, alt. 760 m., Tai name: "long sol-pee."

The genus *Ochrocarpus* has not previously been reported from China. This species is allied to *O. siamensis* T. Anders., differing in the much larger size and the stouter branchlets, the longer and sometimes acute leaves, which

are rounded and slightly auriculate at their bases, and the larger fruits. The lateral veins of the leaves are very numerous and are conspicuous on both surfaces; they are very slender and are united by numerous veinlets forming a delicate network, being hardly distinguishable from each other. From *O. Harmandii* Pierre the new species can be differentiated especially by the much shorter petioles, and by the leaf-bases being rounded and slightly auriculate instead of cordate. This tree is cultivated in temple grounds of the Tai aborigines. Only detached fruits were collected, but the field label states that the tree blooms in April and has very fragrant white flowers.

FLACOURTIACEAE

Bennettiodendron Merrill

Bennettiodendron lanceolatum sp. nov.

Frutex 2 m. altus, ramulis teretibus pubescentibus; foliis membranaceis longe petiolatis lanceolatis, 14–18 cm. longis, 2–3 cm. latis, longe acuminatis, basi anguste rotundatis, margine remote serratis (dentibus prominulis longe triangularibus plus minusve papillatis ad 2 mm. longis obtusis), supra atro-viridibus glabris, subtus viridibus parce pubescentibus, costa venisque supra conspicuis, subtus valde perspicuis, nervis lateralibus utrinsecus 8–10 valde arcuato-adscendentibus prope marginem coalitis, venulis reticulatis utrinque perspicuis; petiolis ad 4 cm. longis pubescentibus; floribus ignotis; infructescentiis axillaribus vel terminalibus paniculatis circiter 1 cm. longis, pubescentibus, pedunculis 2–3 cm. longis, pedicellis 5 mm. longis, lenticellatis, fructibus globosis 1 cm. diametro, 1-locularibus, glabris atro-brunneis.

KWEICHOW: Wong-moo, Chen-feng, *S. W. Teng 90993* (TYPE), Sept. 20, 1936, a shrub 6 ft. high, in dense mixed woods.

This species is strongly characterized by its long-petiolate, narrowly lanceolate, long-acuminate leaves, which are pubescent on the petioles and the under surface, and which have very prominent, somewhat papillate, remote, obtuse serrations.

THYMELAEACEAE

Wikstroemia Endlicher

Wikstroemia Domkeana nom. nov.

Daphne gracilis E. Pritz. Bot. Jahrb. 29: 480. 1900; Nitsche, Beitr. Kenntn. Daphne 28. 1907; Rehd. in Sargent, Pl. Wils. 2: 548. 1916.

Wikstroemia gracilis Domke, Notizbl. Bot. Gart. Berlin 11: 362. 1932, non Hemsley, 1849.

SZECHUAN.

MELASTOMATACEAE

Blastus Loureiro

Blastus **Tsaii** nom. nov.

Blastus yunnanensis Li, Jour. Arnold Arb. 25: 15. 1944, non H. Lév. 1912.

In recently proposing a new species from Yunnan based on *H. T. Tsai 60813*, I overlooked the fact that H. Léveillé had previously described a *Blastus yunnanensis* in 1912, which is the basis of *Bredia yunnanensis* (H. Lév.) Diels. In the synonymy of this latter species, I erroneously cited

Léveillé's binomial as *Bredia yunnanensis* H. Lév. (op. cit. 24) rather than *Blastus yunnanensis* H. Lév.

Medinilla Gaudichaud

Medinilla yunnanensis Li, Jour. Arnold Arb. 25: 39. 1944.

Two collections cited as representing this species were erroneously listed as *A. Henry 10275* and *10275A;* these numbers actually are *A. Henry 12075* (type) and *12075A.*

CORNACEAE

Helwingia Willdenow

Helwingia himalaica Hook. f. & Thomson, var. **crenata** (Lingelsh.) comb. nov.

Helwingia crenata Lingelsh. ex Limpricht, Repert. Sp. Nov. Beih. 12: 453. 1922; Hand.-Maz. Symb. Sin. 7: 688. 1933; Chun, Sunyatsenia 4: 246. 1940.

YUNNAN: Wei-si District, Kan-pu, *C. W. Wang 64128,* July, 1935. Szechuan, Hunan, Kwangtung.

The type was collected by Limpricht at Kuan Hsien, Szechuan (*Limpricht 1286A,* April, 1904); fragments and a photograph of this are in the herbarium of the Arnold Arboretum. Among the Chinese specimens of this variety, in addition to the Yunnan specimen cited above, are *F. T. Wang 20545, 22880,* and *T. S. Wen 534* from Szechuan, and *Handel-Mazzetti 539 = 11868* from Hunan, which manifestly represent the same form, but *Wang-Te-Hui 121* from Hunan and *W. P. Fang 1334* and *Y. Tsiang 4966* from Kweichow have the leaves not at all crenate and thus should not be included in this concept, as cited by Handel-Mazzetti.

Wangerin (Pflanzenr. 41 [IV. 229]: 37. 1910) treats the genus *Helwingia* as having three species, but I fail to notice clear-cut specific differences between them, especially between *H. chinensis* Bat. and *H. himalaica* Hook. f. & Thomson. Both are variable and widely distributed. As noted by Merrill in his statement regarding *H. himalaica* var. *stenophylla* (Brittonia 4: 137. 1941), the two varieties here described which represent the extreme forms might with equal propriety be placed under *Helwingia chinensis* Bat.

Helwingia himalaica Hook. f. & Thomson, var. **stenophylla** Merr. Brittonia 4: 137. 1941.

YUNNAN: Suen-oui, *E. E. Maire 444;* Pe-yen-tsin, *Siméon Ten 127,* May, 1916; no data, *G. Forrest 9828, H. T. Tsai 57590A;* Pin-chuan District, *H. T. Tsai 52908,* July, 1933; Ho-kin, Luho near Sung-kwei, *K. M. Feng 863,* April, 1939. Upper Burma; new to Yunnan.

Helwingia himalaica Hook. f. & Thomson, var. **parvifolia** var. nov.

A typo speciei recedit foliis ovato-lanceolatis, longe attenuatis, basi attenuatis, 2–5 cm. longis et 0.5–1.2 cm. latis.

YUNNAN: Mountains of Londjre, Mekong-Salween watershed, *J. F. Rock 8371* (TYPE), in 1923; Kunming, *C. W. Wang 62996,* April, 1935; Sung-tsu-yuan, Chen-kiang, *H. Wang 41451,* June, 1939.

Aucuba Thunberg

Aucuba chinensis Benth. forma **subintegra** f. nov.

A typo speciei recedit foliis ovatis, apice rotundatis, margine integris,

raro dentibus paucis mucronulatis apicem versus praeditis, 14–18 cm. longis et 6–8 cm. latis.

YUNNAN: Mong-ka, *H. T. Tsai 56310* (TYPE), Feb., 1934.

Cornus Linnaeus

Cornus oblonga Wall. forma **pilosula** f. nov.

A typo speciei differt foliis maturis supra subglabratis, subtus dense pilosulis.

YUNNAN: Mi-le District, *A. Henry 9930;* Lo-ping, Bentijian, *H. Handel-Mazzetti 10163,* Nov., 1917; mountains south of Likiang, near Ho-ching and Chiu-ho, *J. F. Rock 4069,* May, 1922; Lu-se, *H. T. Tsai 56983* (TYPE), Feb., 1934; Wei-si District, *H. T. Tsai 59994,* Nov., 1934; no data, *T. T. Yü 8162;* Meng-hau, Hsia-chi-chang, *T. T. Yü 15841,* May, 1938; southern Chungtien, Chiao-tou on the bank of the Yangtze River, *K. M. Feng 3077,* Oct., 1939.

Tsai 56983 and *59994* have their leaves very densely hairy beneath, while the other specimens have leaves slightly less so. Among the Szechuan specimens of the species, *T. T. Yü 757, 1613,* and *Y. S. Liu 2126* apparently represent the same form.

Cornus macrophylla Wall. in Roxb. Fl. Ind. 1: 433. 1820; Hemsl. Kew Bull. 1909: 330. 1909; Wang. Pflanzenr. 41 (IV. 229): 71. 1910; Rehd. in Sargent, Pl. Wils. 2: 575. 1916; Hand.-Maz. Symb. Sin. 7: 689. 1933.

Cornus alosiphila W. W. Smith, Notes Bot. Gard. Edinb. 10: 19. 1917, syn. nov.

This is a common species, ranging from the Himalayan region through western and central China to Korea and Japan. As has been noticed by Rehder (l. c.), the shape of the style in *Cornus macrophylla* Wall. and related species, upon which much stress is laid by Koehne and by Wangerin, is quite variable. *Cornus alosiphila* W. W. Smith (Yunnan: on Tong-shan in the Yangtze bend, *G. Forrest 11176* [isotype, A]) is described as having a cylindric style, but an examination of an isotype in the herbarium of the Arnold Arboretum reveals a slight enlargement of the style at its apex like that of *C. macrophylla* Wall. As it is not distinguishable from the latter by other characters, a reduction seems desirable.

Cornus kweichowensis sp. nov. Subgen. *Thelycrania,* § *Amblycaryum.*

Arbor 10 m. alta, ramulis novellis gracilibus adpresse strigosis vel glabratis; foliis oppositis petiolatis chartaceis ovatis vel oblongo-ovatis, 5–8 cm. longis, 2–4 cm. latis, longe acuminatis, basi cuneatis, supra viridibus plus minusve dense adpresseque strigosis, subtus pallide viridibus dense adpresseque strigosis, nervis lateralibus utrinsecus 2 vel 3, arcuatim adscendentibus, supra subconspicuis, subtus elevatis prominentibus, venis tertiariis utrinque conspicuis; petiolis adpresse strigosis, 0.7–1.2 cm. longis; inflorescentiis dense corymbosis terminalibus circiter 5 cm. longis, 4–7 cm. latis, omnino adpresse strigosis, pedunculis 2–2.5 cm. longis, pedicellis brevibus, 0.5–1.5 mm. longis, floribus albis, 5 mm. diametro, calyce dense strigoso, 1.5 mm. longo, margine distincte 4-dentato, dentibus triangularibus, 0.5 mm. longis; petalis 4 lanceolatis acutis, 2.5 mm. longis, 1 mm. latis, extus puberulis, intus glabris; staminibus 4, filamentis 2 mm. longis; ovario 2-loculari, stylo sparse adpresseque puberulo toto cylindrico crasso longitudinaliter striato, 2 mm. longo; fructu ignoto.

KWEICHOW: Hsu-feng, Tsa-Swee, *S. W. Teng 90577* (TYPE), July 13, 1936, a tree 30 ft. high, in dense woods, flowers white.

This species is characterized by the more or less dense appressed-strigose hairs on both surfaces of the leaves, the few (2 or 3 on each side) lateral nerves, and the rather stout, cylindric, longitudinally grooved styles. According to Wangerin's arrangement, this species falls in the subgenus *Thelycrania* Endl., Sect. *Amblycaryum* Koehne, Subsect. *Nigrae* Koehne. It is related to *Cornus poliophylla* C. K. Schneider & Wang. and *C. Monbeigii* Hemsl., but is distinguished from both by the characters indicated above.

Cornus yunnanensis sp. nov. Subgen. *Thelycrania*, § *Amblycaryum*.

Arbor circiter 5 m. alta, ramulis novellis pilosulis mox glabratis; foliis oppositis petiolatis chartaceis late ovatis vel ovato-ellipticis, 9–11 cm. longis, 4–5.5 cm. latis, longe acuminatis, basi late cuneatis vel subrotundatis, supra glabratis, subtus parce pilosulis vel subglabratis, nervis lateralibus utrinsecus circiter 4, arcuatim adscendentibus, supra paullo impressis, subtus prominentibus, venis reticulatis utrinque inconspicuis, supra leviter impressis; petiolis parce pilosulis vel glabratis, 1.5–2 cm. longis; inflorescentiis 2.5 cm. longis, 3.5 cm. latis, in ramulis axillaribus brachyblastis totis plus minusve pubescentibus, circiter 1 cm. longis, corymbosis, pedunculis brevibus, 0.5 cm. longis, pedicellis 1–1.5 cm. longis; calyce dense pilosulo, 1 mm. longo, margine leviter 4-dentato; petalis 4, lanceolatis, 3 mm. longis, 1 mm. latis, extus puberulis, intus glabris; staminibus 4, filamentis 2.5 mm. longis; ovario 2-loculari, stylo glabro, 3 mm. longo, apice clavato, stigmate depresse capitato; fructu ignoto.

YUNNAN: Southern Chungtien, between Zer-I and Kai-lou-wai on the banks of the Yangtze River, *K. M. Feng 3410* (TYPE), Nov., 1930.

This species is near *Cornus macrophylla* Wall., from which it differs in the fewer lateral nerves and the small short-pedicellate flowers, which are more or less crowded in very small corymbs produced on short axillary branches.

STYRACACEAE

Styrax Linnaeus

Styrax rugosus Kurz, Jour. Asiat. Soc. Beng. 40(2): 61. 1871, Forest Fl. Brit. Burma 2: 141. 1877; C. B. Clarke in Hook. f. Fl. Brit. Ind. 3: 589. 1882; Perkins, Pflanzenr. 30 (IV. 241): 78. 1907.

YUNNAN: Fo-hai, *C. W. Wang 74113*, May, 1936, a woody plant, 20 ft. high, in mixed forests, alt. 1540 m., flowers white, *77088*, June, 1936, 3 m. high, in thickets, alt. 1400 m.; Nan-chiao, *C. W. Wang 75068*, June, 1936, a woody plant 10 ft. high, in forests, alt. 1350 m., *75198*, June, 1936, a woody plant 5 ft. high, in forests, flowers white. India and Burma; new to Yunnan and to China.

Styrax chrysocarpus sp. nov.

Arbor 7–20 m. alta, ramulis novellis dense brunneo-tomentosis vel glabrescentibus; foliis chartaceis breviter petiolatis, supra scabride stellato-tomentosis, subtus stellato-tomentosis, plus minusve scabridis, oblongo-ovatis, 10–20 cm. longis, 5.5–11 cm. latis, acuminatis, basi rotundatis, margine integris, nervis lateralibus utrinsecus 5–10 supra subconspicuis cum costa dense tomentosis, subtus elevatis distinctis, venis tertiariis supra

inconspicuis subtus prominulis; petiolis 5–8 mm. longis, dense tomentosis; infructescentiis axillaribus brevibus oligocarpis dense tomentosis, floribus ignotis; fructibus ovoideis, circiter 1.8 cm. longis et 1.2 cm. diametro, apice leviter mucronatis, extus dense flavido-tomentosis; calyce persistente cupuliformi membranaceo brunneo, circiter 6 mm. longo, parce stellato-tomentoso, margine irregulariter lobato; pedicello brevi, circiter 4 mm. longo, dense tomentoso.

YUNNAN: Ping-pien District, *H. T. Tsai 62505* (TYPE), July 9, 1934, a tree 25 ft. high, in ravines, alt. 1400 m., *62522,* July 11, 1934, a tree 20 ft. high, on open slopes, alt. 1400 m., *62766,* July 18, 1934, a tree 60 ft. high, in ravines, alt. 1500 m.

A species characterized by its rather large, oblong-ovate leaves, more or less scabrid-hairy on both surfaces, the bright yellow tomentose fruits, and the membranaceous calyx.

Alniphyllum Matsumura

Alniphyllum Eberhardtii Guillaum. Bull. Soc. Bot. France 70: 885. 1923.

YUNNAN: Ping-pien District, *H. T. Tsai 60533,* June 28, 1934, in woods, alt. 1400 m., *61240,* June 26, 1934, a tree 30 ft. high, alt. 1000 m., in ravines, *61511,* Aug. 17, 1934, a small tree, 20 ft. high, alt. 1200 m., on open slopes. Indo-China; new to Yunnan.

OLEACEAE

Linociera Swartz

Linociera longiflora sp. nov. § *Ceranthus.*

Arbor parva circiter 10 m. alta, glabra vel subglabra, ramis pallide brunneis glabris, consperse lenticellatis, ramulis junioribus castaneis, leviter pubescentibus; foliis chartaceis, oblongo-ovatis, ad 15 cm. longis et 6.5 cm. latis, acuminatis, basi attenuatis, margine integris, in sicco pallide olivaceis, utrinque concoloribus, glabris vel junioribus supra minutissime lepidotulis, nervis lateralibus utrinsecus circiter 8, arcuato-anastomosantibus, supra distinctis, subtus elevatis, venis tertiariis reticulatis laxis utrinque conspicuis; petiolo circiter 3.5 cm. longo, glabro; inflorescentiis axillaribus glabris, 6–9 cm. longis, distincte pedunculatis (pedunculis ad 3 cm. longis); bracteis bracteolisque lanceolatis acuminatis, 2–4 mm. longis; floribus perfectis, circiter 7 mm. longis, breviter (1 mm.) pedicellatis; sepalis ovatis obtusis, circiter 1.5 mm. longis; petalis liberis vel deorsum connatis, lanceolatis, revolutis, circiter 7.5 mm. longis et 1.5 mm. latis, sursum vix angustatis, obtusis; filamentis brevibus, 0.5 mm. longis, antheris ellipsoideis, 2 mm. longis, apice appendiculis 1 vel 2 ad 0.5 mm. longis praeditis; ovario ovoideo, glabro, circiter 1 mm. longo, stylo 1 mm. longo, stigmate capitato.

YUNNAN: Field notes not available, *H. T. Tsai 55863* (TYPE), 1933; Chen-kang District, *C. W. Wang 72273,* March, 1936, a tree 30 ft. high, on mountain slopes, alt. 1700 m., flowers yellow.

This species is characterized by its long petals and the more or less elongated appendages on the anther-tips, usually in pairs but sometimes only one developed. It probably belongs in the alliance of *L. ramiflora* (Roxb.) Wall., but evidently is not very closely related to that species.

Linociera Henryi sp. nov. § *Ceranthus.*

Arbor parva 5–7 m. alta, glabra vel subglabra, ramis glabris pallide

brunneis, distincte lenticellatis, ramulis ultimis subcastaneis, minute tomentellis; foliis amplis coriaceis obovato-lanceolatis 18–33 cm. longis, 6–10.5 cm. latis, acuminatis, basi longe attenuatis, margine integris, in sicco olivaceo-brunneis, subtus tomentellis, nervis lateralibus utrinsecus 12–15, subpatulis, distantibus, marginem versus curvatis, obscure arcuato-anastomosantibus, supra leviter impressis, subtus distinctis, reticulis laxis, utrinque obscuris; petiolo 2.5–4 cm. longo, glabro; inflorescentiis axillaribus vel subterminalibus, longe pedunculatis (pedunculis 2–3.5 cm. longis), paniculatis, cum pedunculis ad 15 cm. longis; floribus hermaphroditis, sublaxe dispositis, sessilibus vel subsessilibus, bracteis lanceolatis, minutis, 2–3 mm. longis; sepalis oblongo-ovatis, acuminatis, circiter 1.5 mm. longis, extus pubescentibus; petalis albidis subliberis vel deorsum minute connatis, oblongis, extus leviter pubescentibus vel glabris, circiter 3 mm. longis et 1.5 mm. latis, apice longe acuminatis; filamentis brevissimis, 0.5 mm. longis, crassis, antheris ellipticis vel oblongo-ellipticis, 1 mm. longis; ovario ovoideo, stylo 0.5 mm. longo, stigmate capitato; fructibus ovoideis angustis glabris, ad 5 cm. longis et 2.5 cm. latis.

YUNNAN: Szemao, eastern mountains, *A. Henry 12042* (TYPE), a tree 20 ft. high, alt. 4500 ft.; Szemao, eastern forests, *A. Henry 12236,* a tree 15 ft. high, alt. 4500 ft., flowers white; same locality, *A. Henry 12236A,* a tree 15 ft. high, alt. 4000 ft., in fruit; Ping-pien District, *H. T. Tsai 60578,* June 29, 1934, a shrub 12 ft. high, in ravines, alt. 1200 m., flowers green; Che-li District, Meng-soong, Dah-meng-lung, *C. W. Wang 78387,* Sept., 1936, 8 m. high, in mixed forests, alt. 1900 m., fruit green.

This species is closely allied to *Linociera Thorelii* Gagnep., particularly in the acuminate sepals and petals. However, it differs from this in the larger, more distinctly obovate leaves, with generally fewer nerves and relatively shorter petioles. It also has longer panicles, and, of more importance, capitate instead of divergent stigmas.

Olea Linnaeus

Olea laxiflora sp. nov.

Frutex glaber circiter 2.5 m. altus; foliis chartaceis petiolatis oblongo-ovatis, 9–13 cm. longis, 2.5–4 cm. latis, longe acuminatis (acumine 2 cm. longo), basi longe acutis, margine integris, in sicco utrinque concoloribus olivaceis, costa supra leviter depressa, subtus valde elevata, nervis lateralibus utrinsecus 8–12, utrinque subconspicuis, venis tertiariis obscuris; petiolis 1–1.5 cm. longis, supra valde canaliculatis; inflorescentiis paniculatis axillaribus gracilibus laxifloris, circiter 6.5 cm. longis, pedunculis 2 cm. longis, pedicellis 6–10 mm. longis, gracilibus, floribus ♂ solis visis: calycibus 1–1.5 mm. longis, profunde 4-lobatis, lobis ovato-acuminatis, margine leviter ciliatis; corollae tubo 2 mm. longo, 4-lobato, lobis triangularibus, rotundatis, 1 mm. longis; staminibus 2, subhypogyneis, filamentis 0.5 mm. longis, antheris oblongis, 0.75 mm. longis; floribus perfectis ignotis.

YUNNAN: Taron-Taru Divide, Tang-teh-wang, *T. T. Yü 20988* (TYPE), Nov. 7, 1938, a shrub 8 ft. high, in mixed forests, casual, alt. 2200 m., flowers white.

This is a dioecious or polygamo-dioecious, wholly glabrous species. It is probably near *Olea yunnanensis* Hand.-Maz., but is distinguished by its long-acuminate leaves and its lax inflorescences with slender pedicels.

Olea densiflora sp. nov.

Frutex 2–7 m. altus, ramulis junioribus dense pubescentibus; foliis

chartaceis petiolatis oblongo-ovatis vel oblongo-lanceolatis, 10–14 cm. longis, 3–5 cm. latis, longe acuminatis, margine pauce denticulatis vel integris, in sicco olivaceis utrinque subconcoloribus, supra glabris, subtus dense pubescentibus, costa supra impressa, subtus valde elevata, nervis lateralibus utrinsecus 6–10, supra leviter impressis, subtus subconspicuis, venis tertiariis obscuris; petiolis 0.5–1 cm. longis, pubescentibus; inflorescentiis axillaribus vel terminalibus, pubescentibus, floribus polygamo-dioicis; inflorescentiis ♂ longe paniculatis, ad 20 cm. longis, bracteis oblongis, ad 8 mm. longis, floribus plus minusve confertis minutis, pedicellis gracilibus 2 mm. longis, calycibus 4-lobatis, circiter 1 mm. longis, corolla 1.5 mm. longa, 4-lobata, lobis rotundatis, minutis, antheris 1 mm. longis; inflorescentiis ☿ paniculatis, 2–3 raro ad 10 cm. longis, floribus plus minusve confertis, minutis, pedicellis 1 mm. longis, calycibus 4-lobatis, circiter 1 mm. longis, corolla 3 mm. longa, 4-lobata, lobis rotundatis minutis, antheris 1 mm. longis, ovario glabro, stylo brevi, stigmate leviter 2-lobato; fructibus ellipsoideis, circiter 1.2 cm. longis et 6 mm. latis.

YUNNAN: Szemao, *A. Henry 11661* (♂), *11661A, 11661B, 11661C, 11661E,* a shrub 5–10 ft. high, alt. 4500–5000 ft., flowers white, *A. Henry 12598* (fruit), a shrub 10 ft. high, in forests, alt. 4000 ft.; between Keng Hung and Muang Hing, *J. F. Rock 2667* (♂), *2706* (♂), Feb. 25 – March 1, 1922, a shrub or tree to 20 ft. high, on dry ridges, alt. 4000 ft.; between Muang Hing and Szemao, *J. F. Rock 2749* (☿, TYPE), *2707* (♂), March 2–12, 1922, a shrub 8–10 ft. high, on dry hills, flowers yellow; Fo-hai, *C. W. Wang 73504* (☿), *73602* (sterile), *73826* (☿), *77136* (young fruits), May, 1936, a shrub 5–16 ft. high, in mixed forests, alt. 1400–1530 m.; Nan-chiao, *C. W. Wang 75151* (young fruits), *75173* (young fruits), June, 1936, a shrub 6–7 ft. high, in forests, alt. 1380 m.; Che-li District, *C. W. Wang 75689* (fruits), Aug., 1936, a shrub 2–2.5 m. high, in mixed forests, alt. 1050–1400 m.; Jenn-yeh District, Meng-la, *C. W. Wang 80702* (fruits), *80703* (sterile), Nov., 1936, a shrub 10–20 ft. high, alt. 850 m.

This is a polygamo-dioecious species with long staminate and short hermaphrodite panicles. From *Olea dioica* Roxb. it is readily distinguished by its pubescence and the presence of a corolla in the perfect flowers. It is apparently close to *Olea dentata* Wall., but can be distinguished by the very unequal staminate and hermaphrodite panicles, the smaller, often entire, and distinctly pubescent leaves, and the smaller flowers.

VERBENACEAE

Clerodendron Linnaeus

Clerodendron Tsaii sp. nov.

Frutex 2–7 m. altus, ramulis dense pubescentibus; foliis chartaceis petiolatis, cordato-ovatis vel ovato-oblongis, 10–19 cm. longis, 5.5–13 cm. latis, acuminatis, basi truncatis vel cordatis, margine integris, supra parce subtus dense pubescentibus, venis lateralibus utrinsecus 4–6 subconspicuis, rete venularum obscuro; petiolis cylindricis, 3–7.5 cm. longis, dense pubescentibus; inflorescentiis cymosis terminalibus ad 11 cm. longis, dense pubescentibus, pedunculis 1.5–3 cm. longis, bracteis lanceolatis acuminatis, 4–5 mm. longis, caducis, pedicellis 1 mm. longis; calycibus 3.5–4 mm. longis, dense pubescentibus, perspicue glandulosis, 5-dentatis, dentibus linearibus acuminatis, 1 mm. longis; corollae tubo 8–9 mm. longo, 0.5 mm. lato, subglabro, 5-lobato, lobis oblongo-ovatis, 3 mm. longis, 2 mm. latis, extus parce pubescentibus; staminibus 7–8 mm. exsertis; stylis 4–5 mm.

exsertis, stigmate minute 2-lobato; fructibus ovoideis, 5–8 mm. longis, 4–7 mm. latis, calycibus accrescentibus, 5–7 mm. longis.

YUNNAN: Ping-pien District, *H. T. Tsai 61055*, July 20, 1934, *61410*, Aug. 5, 1934, *61673*, Aug. 25, 1934, *61748* (TYPE), Sept. 1, 1934, *61826*, Sept. 5, 1934, *61863*, Sept. 3, 1934, a shrub or small tree 6–30 ft. high, on open slopes or in ravines, alt. 1300–1400 m., flowers white.

In its pubescence, this species is probably close to *Clerodendron viscosum* Vent., but it is distinguished by the much smaller flowers with the calyces shorter than the fruits and by the very early caducous bracts and bracteoles. The flowers are not infrequently hypertrophied, apparently due to the presence of certain insects, with the corolla tubes enlarged to 2 cm. in length.

BIGNONIACEAE

Millingtonia Linnaeus f.

Millingtonia hortensis Linn. f. Suppl. 291. 1781.

YUNNAN: Che-li District, Mong-hain or Gan-lan-ba, *C. W. Wang 79856*, Oct., 1936, 8 ft. high, in thickets, alt. 800 m., flowers light greenish yellow; Che-li District, Sheau-meng-yeang, *C. W. Wang 81011*, Oct., 1936, 8 m. high, alt. 900 m., flowers white; Jenn-yeh District, Lung-huk, *C. W. Wang 80113*, a tree 50 ft. high, in forested ravines, alt. 980 m., flowers pinkish yellow. Indo-China, Siam, India, Malaysia; new to China.

Wightia Wallich

Most authors include the genus *Wightia* in the Scrophulariaceae, but the proper position for the genus is in the Bignoniaceae. Hallier (Bull. Herb. Boiss. II. 3: 181–207. 1903) has clearly demonstrated that the genera *Wightia* and *Paulownia* should be removed from the Scrophulariaceae to the Bignoniaceae. More recently Campbell (Bull. Torrey Bot. Club 57: 47–50. 1930) reached the same conclusions for *Paulownia*, although he apparently overlooked Hallier's earlier statement.

Wightia speciosissima (D. Don) Merr. Jour. Arnold Arb. 19: 67. 1938.
Gmelina speciosissima D. Don, Prodr. Nepal. 104. 1825.
Wightia gigantea Wall. Pl. As. Rar. 1: 71. *t. 81*. 1830.

YUNNAN: No precise locality, *G. Forrest 18801*, 1917-19; Yun-lung District, *H. T. Tsai 54557*, Sept. 25, 1933, a small tree 20 ft. high, in ravines, alt. 2100 m., flowers dark pink; Mien-ning, Hopientsun, *T. T. Yü 18157*, Nov. 2, 1938, a tree 15–20 ft. high, common in forests, alt. 2000 m., flowers pink; Kiukiang Valley, west of Kungsian, *T. T. Yü 20512*, Sept. 28, 1938, a tree 20–30 ft. high, common in forests, alt. 1250 m., flowers pink. India, Burma, Indo-China. The genus and species are new to China.

Wightia elliptica Merr. Jour. Arnold Arb. 19: 66. 1938.

YUNNAN: Yung-chou, Changpoling, *T. T. Yü 18222*, Nov. 16, 1938, a tree 20–25 ft. high, rare along the margins of rice fields, alt. 1550 m., flowers purplish pink. Indo-China; new to China.

RUBIACEAE

Hymenopogon Wallich

Hymenopogon oligocarpus sp. nov.

Frutex circiter 2 m. altus, ramulis tortuosis cicatricosis glabris, foliis juvenilibus in apice ramulorum confertis; foliis membranaceis petiolatis elliptico-lanceolatis, 10–15 cm. longis, 3–5 cm. latis, longe acuminatis, basi

attenuatis, margine integris, supra viridibus, subtus subalbis, utrinque laxe pubescentibus pilis praesertim in costa nervisque dispositis, nervis lateralibus utrinsecus 7–9, utrinque distinctis, oblique adscendentibus prope marginem arcuatim anastomosantibus, venis tertiariis utrinque subconspicuis; petiolis 1–1.5 cm. longis, pubescentibus; floribus ignotis; infructescentiis corymbosis terminalibus, rhachibus pubescentibus, circiter 5.5 cm. longis, gracilibus trichotomis, pedunculis circiter 1 cm. longis, pubescentibus, fructus 1 vel 2 gerentibus, ad basim bracteatis, bracteis triangulari-ovatis acutis, circiter 2 mm. longis, pedicellis 0.5–1 cm. longis, bracteis inferioribus saepe accrescentibus subpetaloideis petiolatis oblongis, circiter 3.5 cm. longis et 1 cm. latis, attenuatis acutis, nervis 8-jugis, petiolis circiter 2.5 cm. longis gracilibus; fructibus capsularibus glabris turbinatis, circiter 1 cm. longis et 5 mm. crassis, membranaceis, septicide 2-valvis, calycis lobis persistentibus triangulari-ovatis, 5 mm. longis, acutis; seminibus multis linearibus utrinque acute alatis, circiter 6 mm. longis, nigris.

YUNNAN: Taron-Taru Divide, Lung-nan, *T. T. Yü 20026* (TYPE), Aug. 28, 1938, a shrub 6 ft. high, in forests, alt. 2400 m., rare.

A new species in this small genus, strongly characterized by its membranaceous, few-nerved leaves and the rather small, few capsules.

Adina Salisbury

Adina pilulifera (Lam.) Franch. var. **tonkinense** (Pitard) Merr. in herb. comb. nov.

Adina globiflora Salisb. var. *tonkinense* Pitard in Lecomte, Fl. Gén. Indo-Chine 3: 39. 1922.

KWANGSI: Chuen Yuen, *Z. S. Chung 81999,* June 18, 1937, a small tree in woods, along streams, flowers yellowish; Ling-wan District, *S. K. Lau 28480,* July 5, 1937, a shrub 4 m. high, in dense woods. YUNNAN: Wen-shan District, *H. T. Tsai 51606,* Jan. 22, 1933, *51724,* Feb. 10, 1933, a tree 25–30 ft. high, in forests, alt. 2000 m.; Ping-pien District, *H. T. Tsai 60253,* June 17, 1934, *60482, 60486,* June 29, 1934, *62129,* June 2, 1934, *62246,* June 4, 1934, a shrub or small tree, 10–30 ft. high, in ravines, alt. 1400 m.; Mengtze, *A. Henry 13466,* southeastern mountains, a tree 40 ft. high, alt. 6000 ft. Tonkin, Hainan; new to continental China.

Adina mollifolia Hutchinson in Sargent, Pl. Wils. 3: 391. 1916.

Adina asperula Hand.-Maz. Anz. Akad. Wiss. Wien 58: 232. 1921, Symb. Sin. 7: 1018. 1936, syn. nov.

SZECHUAN: Between Telipin and Yalung, *C. Schneider 136,* May 8, 1914. YUNNAN: Beyendjing, *Handel-Mazzetti 6301,* May 13, 19, 1915; Szemao, *A. Henry 11888, 12852;* Talang, *A. Henry 13265.*

The type of *A. asperula* Hand.-Maz. is *S. Ten 218,* which I have not seen. *Handel-Mazzetti 6301* is from the type locality of *A. asperula* and is cited (Symb. Sin. 7: 1018. 1936) by him as representing that species. The heads are slightly smaller than are those of *A. mollifolia* Hutchinson as represented by *Henry 11888,* the type, and other specimens, but they are also younger. Otherwise it cannot be distinguished from *A. mollifolia,* nor does Handel-Mazzetti's original description reveal any noticeable difference. A new record for Szechuan.

Anthocephalus A. Richard

Anthocephalus indicus A. Rich. Mém. Soc. Hist. Nat. Paris 1834: 237. 1834; Pitard in Lecomte, Fl. Gén. Indo-Chine 3: 32. 1922.

YUNNAN: Che-li District, Sheau-meng-yeang, *C. W. Wang 75585,* Aug., 1936, *79612,* Sept., 1936, a tree 40 ft. high, in forests, alt. 910–1000 m.; Che-li District, Dah-meng-lung, *C. W. Wang 77417,* Aug., 1936, a large tree 30 m. high, frequent in dense forests; Jenn-yeh District, Meng-hing, *C. W. Wang 80024,* Nov., 1936, a tree 40 ft. high, in woods, alt. 850 m.; Jenn-yeh District, Meng-la, *C. W. Wang 80791,* Nov., 1936, 40 ft. high, in mixed woods, alt. 900 m.; Luh-shuen District, Maan-tsang, Sheau-meng-yeang, *C. W. Wang 81077,* Nov., 1936, 15 m. high, in thickets, alt. 800 m. India, Ceylon, Malay Peninsula, Sumatra, Borneo, Siam, Indo-China; new to China.

Anthocephalus indicus A. Rich. var. **glabrescens** var. nov.

A typo speciei differt foliis subtus glabrescentibus.

YUNNAN: Che-li District, *C. W. Wang 78648* (TYPE), Sept., 1936, a tree 35 ft. high, in mixed forests, alt. 1000 m.

Mussaenda Linnaeus

Mussaenda Hossei Craib, Kew Bull. 1911: 388. 1911.

Mussaenda Rehderiana Hutchinson in Sargent, Pl. Wils. 3: 397. 1916, syn. nov.

SIAM: Pass of Doi Nang Keo, *J. F. Rock 1576,* Dec. 31, 1921; between Meh Soi and Hue San, *J. F. Rock 1839,* Jan. 5, 1922; Doi Chang Mountain, near Hue San, *J. F. Rock 1717,* Jan. 10, 1922; in deep forest near Ba Meh Ki near Meh Cham, *J. F. Rock 1896,* Jan. 18, 1922. YUNNAN: In forest of Pang Khun, between Keng Hung and Muang Hing, *J. F. Rock 2591,* Feb. 25–March 1, 1922; Szemao, mountains to the south, *A. Henry 11790* (type of *M. Rehderiana* Hutchinson).

Craib's type was from Chiengmai, northern Siam, whence Rock's specimens came; these closely match Craib's description. Rock's and Henry's Yunnan specimens unquestionably represent the Siamese species originally described by Craib.

Tarenna Gaertner

Tarenna depauperata Hutchinson in Sargent, Pl. Wils. 3: 411. 1916.

KWEICHOW: Cheng-feng, Gen-Kai, *S. W. Teng 91044,* Sept. 24, 1936, a shrub 4 ft. high, in shady places. KWANGSI: Sui-luk District, southwest of Nanning, mountains surrounding Pa Lau Village, *W. T. Tsang 21901,* March 1–18, 1933, 5 ft. high, in forests, fairly common on dry steep slopes, sandy soil; flowers yellow. Previously known from Yunnan only.

CAPRIFOLIACEAE

Abelia R. Brown

Abelia Graebneriana Rehd. in Sargent, Pl. Wils. 1: 118. 1911.

KWEICHOW: Hsu-feng, She-Won-Shan, *S. W. Teng 90483,* July 2, 1936, a shrub 5 ft. high, in light woods, bark pale gray, branches red, flowers pink. Western Hupeh and western Szechuan; new to Kweichow.

Weigela Thunberg

Weigela japonica Thunb. var. **sinica** (Rehd.) Bailey, Gentes Herb. 2: 49. 1929.

Diervilla japonica DC. var. *sinica* Rehd. Mitt. Deutsch. Dendr. Ges. 12: 264. 1913.

KWANGSI: Tzu-yuen District, *Z. S. Chung 83603,* Aug. 7, 1939, a shrub in woods, flowers young, pale green. KWEICHOW: Hsu-feng, She-Won-Shan, *S. W. Teng 90477,* July 1, 1936, a shrub 6 ft. high, by side of stream, fruit green. Anhwei, Chekiang, Hupeh, Szechuan.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

A REVISION OF DISTYLIUM AND SYCOPSIS (HAMAMELIDACEAE)[1]

EGBERT H. WALKER

With four text-figures

THIS revision has been undertaken because of the difficulty encountered in determining herbarium material and in integrating the scattered references to *Distylium* and *Sycopsis*. Judging from the number of references to unpublished names, especially in recent literature, there seems to be considerable work which is unpublished because of the war or suspended because of the confusion encountered in these genera. Although this revision clarifies much of our understanding of the genera, it must be considered as somewhat tentative, because several species are still represented by very inadequate collections and because several important specimens have not been available for study, being deposited in places of safety due to the war. Furthermore, no specimens could be borrowed from Europe, where most of the actual types are deposited.

The author has had the privilege of examining material from the following herbaria: Arnold Arboretum of Harvard University (A), Chicago Museum of Natural History, formerly Field Museum of Natural History (F), Gray Herbarium of Harvard University (G), University of Michigan Herbarium (Mi), Missouri Botanical Garden (Mo), New York Botanical Garden (Y), and United States National Museum (W).

In addition the writer wishes to acknowledge the great benefits of three projects undertaken in recent years aimed to assist botanical work such as this. The first is the insertion of botanical literature in herbaria along with the specimens, a project fostered and developed largely by Dr. E. D. Merrill, now Director of the Arnold Arboretum of Harvard University. By means of literature clipped or typed and attached to herbarium sheets or covers, many references were thus made immediately available. In some cases important published items were found which would not have been located by the usual means. This clipped literature was made available by loan along with the specimens.

Another project of major importance was the interpretation of H. Léveillé's woody plants by Prof. Alfred Rehder of the Arnold Arboretum, based on his study of Léveillé's collections in Edinburgh and the photographs and fragments which have been deposited at the Arnold Arboretum,[2] the results published from 1929 to 1931 in the Journal of the Arnold Arboretum. Without Professor Rehder's work our lists of "species insufficiently

[1]Published by permission of the Secretary of the Smithsonian Institution.

[2]For index to published results of these studies see Jour. Arnold Arb. 18: 278–321. 1937.

known" in taxonomic treatments would be embarrassingly long. There remains, however, much yet to be done in interpreting Léveillé's herbaceous species.

A third project was the photographing by Mr. R. C. Ching — under grant from the Rockefeller Foundation to the Fan Memorial Institute of Biology, Peking — of types and other important specimens in European herbaria. Only a partial set of these photographs is to be found in American herbaria, mostly at the New York Botanical Garden. The many references in this treatment to photographs of types in the Kew herbarium attest the value of this project. With the probable loss of much basic herbarium material in European institutions, the value of this work will become even greater.

Besides these three there are various other basic undertakings which might be mentioned as contributing greatly to this and other taxonomic interpretations of the eastern Asiatic flora. Research on Asiatic botany seems to be declining in Europe but increasing in America. It would wane here too if our great collections, all too poorly housed in these days of danger, should be injured, as is not impossible.

The genera *Distylium* Sieb. & Zucc. (occurring in Java, India, E. Asia, and Central America), *Sycopsis* Oliver (occurring in India and China), and *Sinowilsonia* Hemsl. (in Hook. Ic. Pl. 29: *pl. 2817*. 1907, occurring in China) constitute the tribe Distylieae Hallier f. of the subfamily Hamamelidoideae Reinsch., according to H. Harms (in Engler & Prantl, Nat. Pfl. ed. 2. **18a**: 331–335. 1930). This tribe was characterized by H. Hallier as follows:

> Leaves leathery, entire or toothed, evergreen with small lanceolate stipules, spicular cells, two-layered palisade tissue and small solitary crystals; inflorescences glomerate or racemose, axillary, solitary, peduncled; bracts small; flowers monoecious or andromonoecious, apetalous, the stamens with oblong anthers gradually narrowed downward into a short filament and upward into a point, dehiscing by two simple lateral longitudinal clefts. (Translated from the German in Beih. Bot. Centralbl. **14**: 255. 1903.)

Sinowilsonia differs from this characterization in having thinner closely toothed and probably deciduous leaves and terminal inflorescences. Its flowers resemble closely in structure those of *Sycopsis* but have a longer receptacle tube and apparently a semi-inferior ovary. Although *Sinowilsonia* has no petals, it may better be placed with *Corylopsis* and *Fortunearia* in the tribe Corylopsideae, as A. Rehder has implied (in Sarg. Pl. Wils. **1**: 428. 1913) and as H. K. Airy-Shaw has stated (in Curtis's Bot. Mag. **160**: *pl. 9501*. 1937). The most recently described genus of Hamamelidaceae, *Matudaea* Lundell (in Lloydia 3: 209. 1940), from Mexico, conforms with Hallier's characterization of the Distylieae in most respects. It is near *Distylium* and was described as having only perfect flowers, these with 20 to 24 stamens. Its trinerved leaf bases are very distinctive.

The genus *Distylium* was first described in 1835 from Japan and remained an Old World genus distributed westward to India and south to

Java until 1933, when Radlkofer's description of the first New World species, *D. guatemalense,* from Central America, was published. In the present paper is described a second New World species, *D. hondurense* Standl. This interesting distribution on both sides of the Pacific Ocean is paralleled in various other genera, especially of Celastraceae, as has been discussed by T. Loesener (in Bot. Jahrb. **24**: 197–201. 1897). The genus has been introduced into cultivation and thrives in warm temperate and subtropical climates in both Europe and the United States, the type species, *D. racemosum,* being rather frequently mentioned in the literature on cultivated woody plants. It flowers in the early spring, its numerous red anthers adding color to the landscape.

In several, if not all, of the species of *Distylium* there is a marked tendency toward variability in both vegetative and reproductive parts, reaching in some species almost to polymorphism. This variability has led to the proposing of a number of new species which have been reduced to synonymy as more material has been found to link extreme forms. It furthermore makes the describing of new species based on only a few specimens a very unsatisfactory proceeding. The great variability in the flowers on the same plant has already been discussed by W. B. Hemsley (in Hook. Ic. Pl. 29: *pl. 2835.* 1907).

A review of some of the principal characters used in describing and differentiating species may lead to a better understanding of specific limits. The species of both *Distylium* and *Sycopsis* are either trees or shrubs. *Distylium racemosum* in cultivation seems always to be a shrub, but in its natural habitat it is almost always a tree. *Distylium buxifolium* (in the literature as *D. chinense*) is apparently always a shrub, but some species of these genera seem to be either large shrubs or small trees. The indument consists of lepidote scales, usually fimbriate, or of stellate hairs, the latter obviously derived from the former. Their character and presence or absence is fairly definite and is of some value in differentiating species. Leaf size, shape, and serration are very variable and difficult to use in most cases, but the lack of diagnostic characters in the flowering and fruiting parts makes it necessary to use these variable leaf characters in keys. The marginal teeth, when present, are always rather remote and confined to the upper half of the leaf. They may or may not, however, be present in the same species. Leaf venation likewise is fairly uniform, being always pinnate with about 6 lateral nerves, curved-anastomosing fairly far from the margins, except in serrate leaves, where the nerves usually end in the teeth. There is considerable variation among species in the prominence of the lateral nerves on the under sides of the leaves.

The variations in the floral parts between one species and another are so little or so inconsistently variable that they are of scant use in differentiating species. The inflorescences at anthesis are usually short, but lengthen as the fruits mature, as do also the pedicels. It is often difficult to determine whether flowers are unisexual or bisexual, because there may be found stamens and pistils of all degrees of development even in the same inflo-

rescence. Fruit characters are likewise unreliable for species differentiation, at least in our present state of knowledge, because the scarcity of material representing some species prevents our knowing the range of variation.

The genus *Sycopsis* was first described in 1860 from Assam, India, and is so far as now known confined to the Old World, ranging across China, through the Philippines, and south to New Guinea. It differs principally from *Distylium* in the elongated receptacle, which forms a tube completely covering the ovary and growing with the developing ovary or splitting irregularly and forming a cup around the base of the fruit. In its indument and leaf form and venation it closely resembles *Distylium*, except in the characteristic densely setose-pilose ovaries and fruits. The species of *Sycopsis* are much more distinct from one another than are those of *Distylium* and there is more consistent variation in the inflorescences, so much so in fact that the characteristics of these parts can be satisfactorily used in keys.

Both *Distylium* and *Sycopsis* are frequent hosts for gall-forming insects. Galls, often very large, appear on the leaf blades or petioles, and sometimes the inflorescences seem to be transformed. One often finds small tufts of hairs surrounding small domatia in the axils of the lateral nerves and midribs on the lower surface of the leaves.

KEY TO GENERA

Ovary exposed, lepidote or stellate-pubescent, never densely setose-pilose; sepals and stamens hypogynous on margin of unexpanded receptacle; stamens 6 or less. . . . . *Distylium*.

Ovary free, enclosed in an expanded globose to urceolate receptacle tube, densely setose-pilose; sepals and stamens perigynous on upper edge of receptacle surrounding the style bases; stamens 10 or less. . . . . *Sycopsis*.

DISTYLIUM

Distylium Sieb. & Zucc. Fl. Japon. 1: 178. *pl. 94*. 1835. — Based on the single species *D. racemosum* Sieb. & Zucc. from Japan.

Flowers unisexual and monoecious or andromonoecious in separate or the same axillary, erect, spicate or racemose, rarely branched inflorescences, bracteate, the bracts scarcely distinguishable from sepals. Sepals 0–6, small, bractlike, variable, below the ovary. Petals none. Staminate flowers in short spikes or glomerules, the pistils wanting or more or less developed, the stamens 1–6, the filaments rather slender, of varying lengths, the anthers ellipsoid, dehiscing by widely spreading longitudinal slits, the connective more or less protruding, apiculate. Pistillate or perfect flowers with superior, usually lepidote or stellate-hairy, bicarpellary ovary, each carpel 1-celled, 1-ovuled, the styles free, elongate, diverging, slender, more or less hairy, the stigmas apiculate. Fruits ovoid or subglobose, woody, stellate-lepidote or pilose capsules, splitting into 2 or 4 apiculate valves, the first rupture being through the style bases and perpendicular to the common partition between the two cells, the second beween the styles and parallel to the partition, the elongate seeds thus escaping, the carpellary walls separating into two layers, the inner (endocarp) horny or woody, thicker than the outer. Leaves simple, alternate, coriaceous, evergreen,

ovate to lanceolate, entire or with a few teeth above the middle, pennineryed, the lateral nerves always curved-anastomosing.

Spring-flowering evergreen trees or shrubs, usually in woods or forests or along stream banks (*D. buxifolium* especially), in subtropical and warm temperate eastern and southeastern Asia (Japan to Assam and southern China, also Java) and Central America (Guatemala and Honduras).

Because of the great variability, especially in the floral parts, and the lack of material representing several species, the details of flowers and fruits in the following specific descriptions should be accepted with caution.

KEY TO NEW WORLD SPECIES

Leaves glabrous beneath, not peltate.....1. *D. guatemalense.*
Leaves distinctly stellate-pubescent beneath, peltate.....2. *D. hondurense.*

KEY TO OLD WORLD SPECIES[3]

Leaf blades 5 cm. long or less; Formosa, Bonin Islands, China.
  Leaves rather broadly elliptic-ovate, very rarely toothed; trees or shrubs; Formosa or Bonin Islands.
    Apex of leaf obtuse to rounded; small trees; Formosa.....3. *D. gracile.*
    Apex of leaves usually rounded; shrubs; Bonin Islands.....4. *D. lepidotum.*
  Leaves lanceolate or oblanceolate to elliptic-ovate or obovate, frequently with a few teeth; shrubs; China.....5. *D. buxifolium.*
Leaf blades usually over 5 cm. long, or, if smaller, from Java only.
  Leaves glabrous beneath, even when young.
    Lateral nerves not raised beneath.....6. *D. racemosum.*
    Lateral nerves fine but distinctly raised beneath.
      Margins of leaves entire or toothed; China.....7. *D. myricoides.*
      Margins of leaves entire; India.....8. *D. indicum.*
  Leaves pubescent beneath.[4]
    Leaf blades over 10 cm. long and 4 cm. wide.
      Young branchlets minutely puberulent; Java.....9. *D. stellare.*
      Young branchlets densely pubescent, not minutely so; China....10. *D. Tsiangii.*
    Leaf blades under 10 cm. long.
      Leaf tips long-acuminate.
        Leaves entire.....11. *D. pingpienense.*
        Leaves serrate.....11a. *D. pingpienense* var. *serratum.*
      Leaf tips short-acuminate, acute, obtuse, or rounded.
        Young branchlets minutely puberulent; Java.....9. *D. stellare.*
        Young branchlets densely pubescent, not minutely so; China..12. *D. Chungii.*

1. **Distylium guatemalense** Radlk. ex Harms in Notizbl. Bot. Gart. Berlin 11: 716. 1933. — Type, *H. von Tuerckheim II. 1613,* from Guatemala, in the Munich herbarium.[5]

A tree with grayish bark, the branchlets slender, minutely puberulent when young, glabrescent. Leaves petiolate, the petioles 1 to 1.5 cm. long,

[3]This key is based wholly on vegetative characters and must be used with considerable caution. Floral and fruiting characters are entirely unreliable and even vegetative characters are very variable. For other keys see Guillaumin in Bull. Soc. Bot. France 61: 34. 1914; Harms (after Guillaumin) in Engler & Prantl, Nat. Pfl. ed. 2. 18a: 331–332. 1930; and C. P'ei in Contr. Biol. Lab. Sci. Soc. China Bot. Ser. 10: 122. 1936.

[4]The original description of *D. indicum* says the leaves are "more or less stellately pubescent" beneath, but available specimens and the only other description known (D. Brandis, Indian Trees. 301. 1906) indicate that they are glabrous.

[5]H. Harms published after Radlkofer's death the latter's incomplete description based on his Munich specimens, completing the description from the Berlin specimens.

stellate-puberulent, the lower part thicker than the upper, the blade ovate or elliptic- or oblong-ovate, acute or acuminate at apex, obtuse or broadly acute and asymmetric at base, 8 to 13 cm. long, 4 to 6.5 cm. wide, entire or somewhat wavy-margined, glabrous except on the prominent midrib beneath and near base above, the lateral nerves about 5 pairs, raised beneath, curved-anastomosing but not prominently so, connected by raised scalariform tertiary nerves. Flowers andromonoecious or perfect (so far as known), in dense pubescent spikes or racemes about 2 cm. long, the pedicels minute or wanting, the bracts few, small, lanceolate to ovate, caducous. Stamens 5 or 6, the anthers 1 to 1.5 mm. long, with a tuft of hairs at apex, the filaments glabrous, variable in length. Fruit unknown.

GUATEMALA: Alta Verapaz: *H. von Tuerckheim II. 1613* (A, W — originally in the John Donnell Smith herbarium), in a thicket of indigenous species in a pasture near the entrance to the city of Coban, in flower Jan. 1907.

This is the first described New World member of this genus. It appears to be much restricted in distribution. An additional collection (sterile) is reported by H. Harms from a forest on the Chiu River, Sept. 1912.

2. **Distylium hondurense** Standl. apud Walker, sp. nov.

Arbor 6–9-metralis, ramulis gracilibus plus minusve flexuosis dense stellato-tomentosis, tomento ochraceo vel brunnescente; folia petiolata subchartacea, petiolo ca. 1.5 cm. longo stellato-tomentoso vel glabrato; lamina ovata vel oblongo-ovata 6.5–11 cm. longa 3–5.5 cm. lata, breviter vel longiuscule acuminata, basi vulgo plus minusve obliqua obtusa vel anguste rotundata et breviter (2–3 mm. supra basin) peltata, supra viridis primo sparse stellato-puberula, cito glabrata, subtus ubique dense stellato-tomentosa tactu mollis, costa elevata, nervis lateralibus utroque latere ca. 7 leviter arcuatis marginem attingentibus, non distincte anastomosantibus, marginibus fere integris vel remote obscure denticulatis, supra medio interdum undulato-denticulatis; flores ignoti; capsula (tantum in statu aperto visa) ca. 13 mm. longa 4-valvata stellato-tomentosa lignosa. [Description by P. C. Standley]

DISTRIBUTION: Known only from Honduras.

HONDURAS: Comayagua: In a wet ravine near El Achote, in mountains above the plains of Siguatepeque, 1350 m. alt., *T. G. Yuncker, R. F. Dawson and H. K. Youse 6377* (F — TYPE), Aug. 1936; Tegucigalpa: In a pine and oak forest near the river, Montaña de la Flor, 960 m. alt., *Christine & Wolfgang von Hagen 1193* (F), Dec. 1937; local name Matón.

The second collection cited is sterile and was taken from what was probably a luxuriant branch. The leaf blades are as much as 18 cm. long and 11.5 cm. wide. This was first reported from Honduras as *D. guatemalense* Radlk. (Field Mus. Publ. Bot. 17: 364. 1938).

3. **Distylium gracile** Nakai in Jour. Arnold Arb. 5: 77. 1924. — Type, *E. H. Wilson 11107*, from Formosa, at the Arnold Arboretum.

"A small tree 10 m. high, trunk 60 cm. diam." (according to E. H. Wilson, collector), the branchlets slender, grayish brown, stellate-pubescent when young, glabrescent. Leaves with stellate-pubescent petioles 2 to 4 mm. long, the blade broadly elliptic-ovate to obovate, obtuse to broadly acuminate with callose tip, obtuse to acute at base, 2 to 3 cm. long, 0.7 to 2 cm. wide, entire or rarely with 1 or 2 teeth on each side above the middle,

glabrous, the lateral nerves 3 or 4 pairs, inconspicuous, only slightly raised. Flowers unknown. Capsules globose to ovoid, 1 cm. long, light brown, closely stellate-pubescent, 1 or 2 in racemose inflorescences up to 1 cm. long.

FORMOSA: Prov. Karenko: Cliff near Seisui, *E. H. Wilson 11107* (A, W).

This is a very distinct species, recognized by its small, broadly ovate leaves.

4. **Distylium lepidotum** Nakai in Bot. Mag. Tokyo **32**: 220. 1918, **44**: 23. 1930.—Types collected by H. Hattori on Anishima and Chickishima, Bonin Islands, probably in the Tokyo herbarium. Not seen.

A shrub 1.5 to 3 m. high or a tree to 10 m. with a trunk diameter of "3–4 feet" (according to E. H. Wilson's notes), the branchlets grayish, densely lepidote when young, glabrescent. Leaves with glabrous or lepidote petiole about 5 mm. long, the blade rather broadly elliptic-ovate, usually rounded or sometimes very broadly obtuse at apex, obtuse at base, 2 to 4 cm. long, 1.5 to 2.5 cm. wide, entire, glabrous, "rather glaucous" (according to E. H. Wilson), green above, greenish beneath (when dry), the midrib prominent beneath, the lateral nerves about 4 pairs, obscure, not raised beneath. Flowers in short stellate-lepidote spikes or racemes up to 2 cm. long, the bracts ovate, lepidote, the sepals lanceolate, glabrous or lepidote. Stamens apparently only up to 4 in number, the anthers large, apiculate,

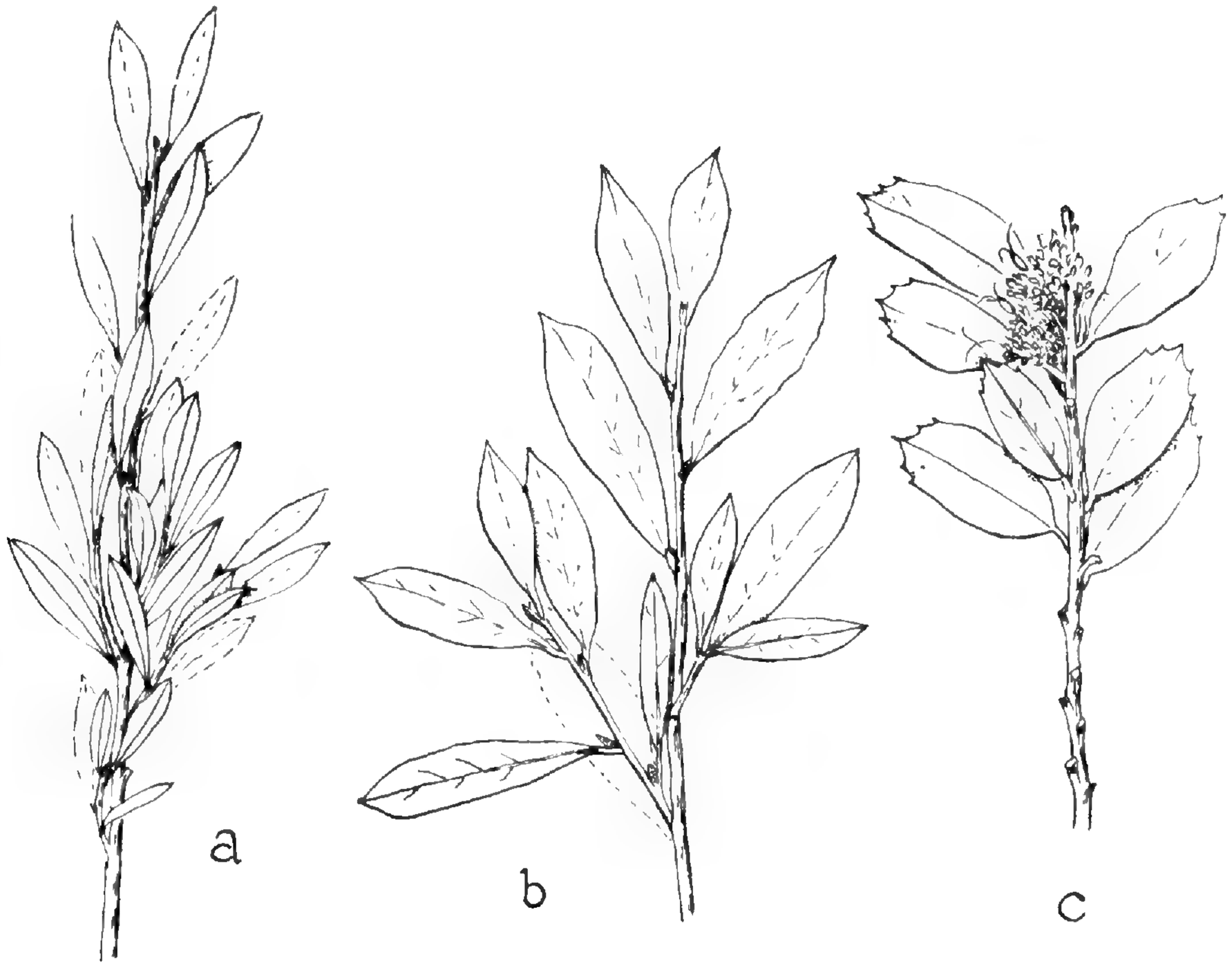

FIG. 1. *Distylium buxifolium*, showing leaf variations, × ½: *a*. drawn from *Dunn* (Herb. Hongkong *2681*) (A), from Fukien, isotype of *D. strictum* Hemsl.; *b*. drawn from *E. H. Wilson 2961* (W), from Hupeh; *c*. drawn from *Henry 3314* (W), from Hupeh.

the filaments variable in length. Capsules solitary or few, elliptic-ovoid, about 1.5 cm. long, densely lepidote when young.

BONIN ISLANDS: Chickishima: *E. H. Wilson 8241* (A, W), *8347* (A, Mo, W); Anishima: *E. H. Wilson,* May 3, 1917; no precise locality: *C. Wright 174* (U. S. North Pacific Exploring Expedition under commanders Ringgold and Rodgers, 1853) (G, W).

Although this species was first described in 1918, based on Japanese specimens, it was first collected in 1853 by the American botanist Charles Wright. In the distribution of the duplicates of this Wright collection confusion of labels resulted in some being referred to the Liu Chiu Islands. This confusion has been clarified by reference to Asa Gray's unpublished manuscript at the Gray Herbarium. Each of the Wright collections at the U. S. National Herbarium, the Gray Herbarium, and the Kew Herbarium has been designated by separate workers as the type of a new species, but none of these "herbarium names" have been published, so far as can now be ascertained.

5. **Distylium buxifolium** (Hance) Merr. in Sunyatsenia 3: 251. 1937. — Based on *Myrsine buxifolia* Hance. FIG. 1.

Myrsine buxifolia Hance in Ann. Sci. Nat. IV. Bot. 15: 225. 1861. — Type, *C. F. M. DeGrijs* (Herb. Hance *6687*), from Fukien, in the British Museum herbarium (see Merrill in Sunyatsenia 3: 251. 1937). A rubbing has been examined.

Distylium racemosum var. *chinense* Franch. ex Hemsl. in Jour. Linn. Soc. Bot. 23: 290. 1887. — Based on a Delavay collection probably in the Paris herbarium.[6]

Distylium chinense (Franch.) Diels in Bot. Jahrb. 29: 290. 1900. — Based on *D. racemosum* var. *chinense* Franch.

Rapanea buxifolia (Hance) Mez in Pflanzenr. 9 (IV. 236): 362. 1902. — Based on *Myrsine buxifolia* Hance.

Distylium chinense Hemsl. in Hook. Ic. Pl. 29: *pl. 2835.* 1907. — Based on *D. racemosum* var. *chinense* Franch., although designated as "n. sp."

Distylium strictum Hemsl. in Hook. Ic. Pl. 29: sub *pl. 2835* (p. 3). 1907. — Type, *S. T. Dunn* (Herb. Hongkong *2681*), from Fukien, in the Kew herbarium. Duplicate examined.

Distylium Dunnianum H. Lév. in Repert. Sp. Nov. 11: 67. 1912. — Type, *Cavalerie 3551,* from Kweichow, in the Léveillé herbarium in Edinburgh. Duplicate examined.

Myrica Seguini H. Lév. in op. cit. 12: 537. 1913. — Type, *J. Cavalerie 3929,* from Kweichow, in the Léveillé herbarium in Edinburgh. Duplicate examined.

Myrica rapaneoides H. Lév. in Bull. Acad. Int. Géogr. Bot. 24: 146. 1914. — Type, *J. Cavalerie 3929,* from Kweichow, in the Léveillé herbarium in Edinburgh. Duplicate examined.

A densely branching shrub up to 2 m. high, the branchlets grayish brown, stellate-puberulent when young, glabrescent. Leaves with short, puberu-

[6]In the original publication the authority is given as "Franchet in litt." and the description is enclosed in quotation marks. The specimens cited are *A. Henry,* from Ichang, Hupeh, and *Delavay,* "rocks on the banks of the Blue river at Kouimen," Szechwan, both in the Kew herbarium. Collector's numbers were not cited, but a photograph by R. C. Ching distributed from the Fan Memorial Institute of Biology to the New York Botanical Garden of the Kew specimens shows them to be *Henry 1300* (received at Kew in 1886) and *Delavay 2290,* collected March 20, 1882. As Franchet's description was in all probability based on the Delavay specimen in Paris, where his collections were being studied, *Delavay 2290* in the Paris herbarium is presumably the type. Both the Henry and Delavay specimens have the toothed form of leaf.

lent petiole about 2 mm. long, the blade very variable in shape, from oblong or elliptic-lanceolate to ovate or obovate, acute to subrounded and sometimes acuminate with callose tip, acute at base, 2.5 to 5 cm. long, entire or with 1 to 3 callose teeth on each side above the middle (the shape then usually somewhat obovate), generally glabrous but sometimes stellate-puberulent beneath especially on the prominent midrib, the lateral nerves 4 or 5 pairs, not conspicuous, the veinlets sometimes distinctly reticulate. Flowers appearing conspicuously red, in subglobose to spicate stellate-pubescent inflorescences up to 2 cm. long in fruit, the bracts and sepals alike, ovate, glabrous or pubescent, about 3 mm. long. Stamens up to 6, often unequal, the anthers large, red, apiculate, the filaments variable, up to 3 mm. long. Capsules 1–8 in each inflorescence, ovoid, about 7 mm. long (reported up to 1.5 cm. long by Hemsley), more or less stellate-puberulent.

DISTRIBUTION: China. Occurs in sandy or rocky places along river banks which are subject to being flooded.

CHINA: Hupeh: Ichang, *Henry 3314* (A, G, W, Y), *4280* (A, W), *Wilson* (Arnold Arb. Exp.) *3537* (A, W); no precise locality, *Henry 3826* (A, G), *7805* (G), *Wilson* (Veitch Exp.) *115, Wilson* (Arnold Arb. Exp.) *2691;* Kweichow: Lofou, *J. Cavalerie 3551* (A); no precise locality, *J. Cavalerie 3929* (A); Gan Chouen, *J. Cavalerie 4236* (A); Djiangdi, *Handel-Mazzetti 10272* (A); Dyun (or Tyun), *Handel-Mazzetti 10692* (A); Gudschou, *Handel-Mazzetti 10810* (A); Tehkiang, Tsaoti, *Steward, Chiao & Cheo 898* (A); Lungli, *Y. Tsiang 8404* (Y); Chekiang: Sui Chang Hsien, *H. H. Hu 493* (A); Tsingtien, *Y. L. Keng 123* (A); no precise locality, *Barchet 170* (W), *S. Chen 3230* (A), *3431* (A); Fukien: No precise locality, *S. T. Dunn* (Herb. Hongkong *2680, 2681*) (A).

This species is usually referred to as *D. chinense* Franch. The fairly abundant material assembled for this study shows that the range of variation is very great in this species. Hemsley described *D. chinense* and *D. strictum* at the same time, selecting *Wilson* (Veitch Expedition) *115*, a partly toothed wide-leaved specimen, as typical of the former, and *Dunn 2681*, an entire and unusually narrow-leaved form as compared with other material from Fukien, as representative of the latter. By study of intermediates these now appear to represent one species, the oldest name, however, unfortunately not being that in common use. The great variability in flowers has been pointed out by H. K. Airy-Shaw (in Curtis's Bot. Mag. 160: *pl. 9501.* 1937). The variation in leaf shape is very striking. This is apparently the most common species in China.

6. **Distylium racemosum** Sieb. & Zucc. Fl. Japon. 1: 179. *pl. 94.* 1835. — Originally described, without mention of specimens, from Kiushiu, Japan.

Usually a large tree, up to 25 m. high, the branchlets densely stellate-lepidote when young, glabrescent. Leaves with glabrous or lepidote petiole 3 to 8 mm. long, the blade elliptic-ovate or rarely slightly obovate, generally obtuse or sometimes acute or often broadly obtuse to subrounded at apex, acute or obtuse at base, 5 to 7 cm. long, 2 to 3 cm. wide, rarely up to 8.5 cm. long and 4 cm. wide, entire (for possible exception see discussion), glabrous, the midrib prominent beneath, the lateral nerves about 6 pairs, obscure on both surfaces. Flowers appearing red, in usually densely stellate-lepidote spikes or racemes up to 4 cm. long in fruit, the bracts ovate or oblong, stellate-pubescent or lepidote, about 4 mm. long, the sepals variable, lanceolate or ovate, about 3 mm. long, stellate-lepidote. Stamens up to 6,

the anthers bright crimson, up to 4 mm. long, apiculate, the filaments variable, up to 3 mm. long, rather slender. Capsules ovoid with apiculate valves, about 1 cm. long, brown to tan-colored, densely stellate-lepidote or puberulent.

DISTRIBUTION: Eastern Asia. In forests, often on mountains.

KOREA: Saishu To (Quelpaert Isl.): *U. Faurie 549, 550, 1612, 1613* (A) (all 1906 or 1907), *E. J. Taquet 819, 820, 821, 4252, 4253, 4254, 4255* (A) (Jan.–July 1910), *E. H. Wilson 9515* (A, W). JAPAN: Tsushima Strait: *U. Faurie 4831* (A); Kyushu: Nagasaki, *C. J. Maximowicz,* Iter secunda, 1863 (G, W, Y), *R. Oldham 466* (G, Y); Higashi-kirishima, *E. H. Wilson 6222* (A); Satsuma, *H. Mayr,* Feb. 28, 1886 (A); no precise locality, *E. H. Wilson 6039* (A, Mo, W); Honshu: Cultivated at Yokohama: *E. H. Wilson 6414* (A); no precise locality: *Buerger* (ex Herb. Lugd.-Bat.) (G). LIU KIU ISLANDS: Okinawa-shima: Kunigami-ken, *R. Kanehira 3283, 3326* (Y); near Nago, *E. H. Wilson 8070* (A, W); Amami Oshima: *R. Kanehira 3406* (Y). FORMOSA: South Cape, *A. Henry 980* (A). CHINA: Chekiang: *C. Y. Chiao* (Herb. Univ. Nanking *14642*) (A, W); Kwang-tung: Hongkong, *C. Ford* (G, Y), *C. Wilford* (G, Y), *C. Wright 183* (U. S. North Pacific Exploring Expedition under commanders Ringgold and Rodgers) (G, W).

This is the most widely cultivated species of *Distylium* or *Sycopsis*. In cultivation it appears usually to be a shrub, but in its native habitat it is described as a tree. Cultivated plants seem to bear larger leaves and inflorescences. The most comprehensive treatment of this species is that by H. K. Airy-Shaw in Curtis's Bot. Mag. 160: *pl. 9501.* 1937. Two variants, apparently only horticultural forms, have been recognized, var. *variegatum,* attributed by H. Harms to Siebold,[7] and var. *pendulum* Makino, in Jour. Jap. Bot. 6: 4. 1929, based on a collection by Makino in 1928. The leaves of all the Hongkong specimens are green above and distinctly brown beneath, a character which appears also in *D. indicum* and occasionally elsewhere but which can not now be interpreted. R. Kanehira's collections from the Liu Kiu Islands, nos. *3283* with mature fruit, *3326* with immature fruit, and *3406* sterile, all in the New York Botanical Garden, have been designated as representing a new species, but the name seems not to have been published. These specimens vary considerably in leaf size and shape, especially no. *3283* with distinctly smaller leaves, but all readily conform to the characters of *D. racemosum* as here given. Some of the leaves of no. *3406* have a few remote teeth above the middle, a character common in *D. buxifolium* of China, but not found elsewhere in *D. racemosum*. Recognition of a new species on the basis of these variations does not seem justifiable.

7. **Distylium myricoides** Hemsl. in Hook. Ic. Pl. 29: sub *pl. 2835* (p. 2). 1907. — Type, *S. T. Dunn* (Herb. Hongkong *2684*), in the Kew herbarium. Duplicate examined.

A large shrub 3 m. high to a large tree up to 20 m. high with a trunk diameter of 45 cm., the branchlets grayish or brownish, somewhat lepidote when very young. Leaves with lepidote petiole 5 to 10 mm. long, the blade elliptic-ovate to obovate, acute and sometimes acuminate at apex, acute at base, 5 to 10 cm. long, 2 to 4 cm. wide, entire or with 1 to 3 obscure or definitely callose serrate teeth near the acuminate tip (the blades then

[7]Mitt. Deutsch. Dendr. Ges. 44: 5. 1932. The only other reference found is a description in W. J. Bean, Trees & Shrubs Brit. Isl. 1: 501. 1914.

generally obovate), glabrous, rather shining green above, paler beneath (when fresh), the midrib impressed above, prominent beneath, the lateral nerves about 5 pairs, rather fine but raised beneath. Flowers in short lepidote spikes or racemes up to 2 cm. long in fruit, the bracts and sepals variable, about 3 mm. long, caducous. Stamens few, the anthers rather large, apiculate. Capsules solitary or few in a raceme, elliptic-ovoid, 1 cm. long, gray to grayish green, not ferruginous, densely stellate-lepidote to puberulent.

DISTRIBUTION: Eastern and southeastern China. In dense or open woods or in thickets along streams, in ravines, or on slopes.

CHINA: Anhwei: Hwangshan, *R. C. Ching 3026* (A); Tien Chu Shan, Chien Shan Hsien, *C. S. Fan & Y. Y. Li 128* (A); Kiangsi: Lushan, *H. H. Chung & S. C. Sun 634* (A, Y); Chekiang: South of Ping Yung, *R. C. Ching 2081* (A, W, Y); Tai Pai Shan, *Y. L. Keng 1147* (A); western Chekiang, *R. C. Ching 3293* (A, Y—photo); Fukien: Buong Kang, Yenping, *H. H. Chung 3328* (A); Kushan, *H. H. Chung 8503* (A); no precise locality, *H. H. Chung 7855* (A); *S. T. Dunn* (Herb. Hongkong *2684*) (A); Kwangtung: Fan Shui Shan, Wung Yuen Dist., *S. K. Lau 2568;* Yang Kue Ho, Yao Shan, Lochang Dist., *C. L. Tso 20869* (A, Y).

This species resembles most closely *D. buxifolium,* from which it may be distinguished by its larger leaves.

8. **Distylium indicum** Benth. ex C. B. Clarke in Hook. f. Fl. Brit. Ind. **2**: 427. 1878.—Type, *Griffith 3377,* from Khasi Hills, Assam, India, in the Kew herbarium. Duplicate examined.

A small tree, the branchlets ferruginous-stellate-pubescent when young, glabrescent. Leaves with margined petiole less than 1 cm. long, the blade obovate or elliptic, rounded or gradually or abruptly acuminate at apex, cuneate at base, 7 to 10 cm. long, entire, glabrous or pubescent (see footnote 4, in key to species, above), green above, distinctly brown beneath when dry, the lateral nerves about 6 pairs, rather prominently raised beneath, the lower pair subbasal or more acutely diverging than the others. Flowers in spikes or racemes up to 6 cm. long (from descriptions), the bracts and sepals caducous, the remainder unknown. Mature fruit unknown, the immature fruit about 1.3 cm. long, densely stellate-pubescent.

INDIA: Assam: Khasi Hills, *Griffith 3377* (G).

So far as known, the only specimen cited in any treatment of this species is *Griffith 3377.*[8] The original description makes no mention of the habit, but the most recent treatment describes it as a small tree. The above description is based in part on these earlier publications. The species is apparently rare. Airy-Shaw (in Curtis's Bot. Mag. **160**: *pl. 9501.* 1937) has suggested that *D. indicum* Benth. and *D. myricoides* Hemsl. from China may be the same, but in view of the scarcity of material from India, it seems inadvisable to combine them at this time. Comparison of available material shows the Indian species to have somewhat larger leaves with the lateral nerves more prominent beneath. The brown lower leaf surfaces of *D. indicum* resemble those in the Hongkong specimens of *D. racemosum.*

[8]D. Brandis, Indian Trees. 301. 1906, and U. N. and P. C. Kanjilal and A. Das, Flora of Assam **2**: 236. 1938, are the only known references, besides the original description. In the Flora of Assam this specimen is erroneously referred to as *3397.* A photograph at the New York Botanical Garden of the type at Kew has been examined.

9. **Distylium stellare** O. Kuntze, Rev. Gen. Pl. 1: 233. 1891. — Originally described from Java without mention of specimens, but the type identified through subsequent treatments[9] as *O. Kuntze 5751,* in the New York Botanical Garden. Examined.

A tall tree up to 13 m. high, the branchlets grayish to brownish, lenticellate, stellate-pubescent when young, glabrescent. Leaves with stellate-pubescent petiole up to 1 cm. long, the blade ovate to elliptic- or oblong-ovate, sometimes slightly obovate, obtuse or acute and more or less acuminate at apex, acute to obtuse at base, 4 to 8 cm. long, 2.5 to 4 cm. wide (3 to 17 cm. long, 1.5 to 6.5 cm. wide, according to J. J. Smith), entire,[10] glabrous and shining above, stellate-lepidote or puberulent beneath when young, glabrescent, the midrib slightly impressed above, raised beneath, the lateral nerves 5 or 6 pairs, raised beneath. Flowers in spikes, the staminate inflorescences 0.4 to 0.5 cm. long, the pistillate 0.8 to 1.9 cm. long (according to J. J. Smith), the fruiting up to 2 cm. long, bearing 1 to 4 fruits, the bracts ovate-oblong, about 3 mm. long, the sepals lanceolate, about 2 mm. long, stellate-pubescent. Stamens 3 to 5 (according to J. J. Smith), the anthers cordate-ovate, obtuse, about 2 mm. long, the filaments rather long. Capsules apparently sessile, ovoid to subglobose, 1 to 1.5 cm. long, little split parallel to wall between cells of ovary, the valves apiculate, the surface densely rather dark stellate-pubescent.

DISTRIBUTION: Java, alt. 1000 to about 2500 m., Sumatra? (see Backer in Brittonia 3: 79. 1938), and Malay Peninsula.

JAVA: Preanger, *Koorders 1807 β* (A); *C. G. G. J. van Steenis 12231* (A); Preanger, Mt. Patoeha, *C. G. G. J. van Steenis* (Herb. Hort. Bot. Bog. *6984*) (A); Besoeki, *C. G. G. J. van Steenis 10817* (A); Kedoe, *Koorders 27640 β* (A); Dienggebirge, *Kuntze 5751* (Y); Wonosobo, C. Java, *Netherlands Indies Forest Service* (Herb. Hort. Bot. Bog. *2555*) (A); Bandoeng, Tjipadaroeöem, W. Java, *Netherlands Indies Forest Service* (Herb. Hort. Bot. Bog. *3977*) (A). MALAY PENINSULA: Pahang: Cameron's Highlands, about 1600 m. alt., *M. R. Henderson* (Singapore Field no. *23567*) (A).

10. **Distylium Tsiangii** Chun in herb., ex Walker, sp. nov. FIG. 2.

Arbor 7 m. alta, ramulis junioribus valde stellato-pubescentibus glabrescentibus. Foliorum petiolus dense stellato-pubescens 1–1.5 cm. longus; lamina elliptico- vel oblongo-lanceolata ad ovata, apice acuta vel acuminata, basi late acuta, 11–15 cm. longa, 4–5 cm. lata, integra vel apicem versus paucidentata, supra nitida viridis, subtus pallidior ("deep lustrous green above, light green below" — ex Y. Tsiang) et valde stellato-pubescens, praesertim in costa et nervis lateralibus, his circa 7-jugis, supra impressis subtus valde elevatis, capillis aliquis fere atris, nervulis elevato-reticulatis. Flores ignoti. Inflorescentiae fructiferae racemosae valde pubescentes ad 3 cm. longae, capsulis ovoideis circa 1.2 cm. longis, valde stellato-pubescentibus, cinereis ("light gray" — ex Y. Tsiang). [Description by Walker]

CHINA: Kweichow: Waichai, Tuhshan, near the Kwangsi border, in a densely wooded ravine, *Y. Tsiang 6692,* Aug. 25, 1930 (A — TYPE, W, Y).

[9]An important subsequent description is by J. J. Smith in Meded. Dept. Landb. [Nederl.-India] 18: 81. 1914 (S. H. Koorders & T. Valeton, Bijdr. Boomsorten Java 13: 80. 1914). Further references occur in or may be found through the following: Versl. Med. Akad. (Amsterdam) 18[1]: 359–361. 1909; H. Hallier in Meded. Rijks Herb. Leiden 37: 15. 1918; C. A. Backer in Brittonia 3: 79. 1938.

[10]J. J. Smith describes the leaves on young trees as laxly dentate, and O. Kuntze says "ad apicem versus repando paucidentata."

Y. Tsiang's nos. *7019* and *6692* were distributed as "*Distylium Tsiangii* Chun sp. nov." In 1932 W. C. Cheng (in Contr. Biol. Lab. Sci. Soc. China 8: 142) referred the first of these numbers to *D. Chungii* (Metc.) Cheng, when transferring that species from *Sycopsis*, and mentioned in his notes that Prof. Chun had named it "*D. Tsiangii*" but that the name had not been published. As I have found no subsequent publication of this species, but believe that it may have appeared in print and not become available in this country because of the war, it seems advisable to use Chun's name.

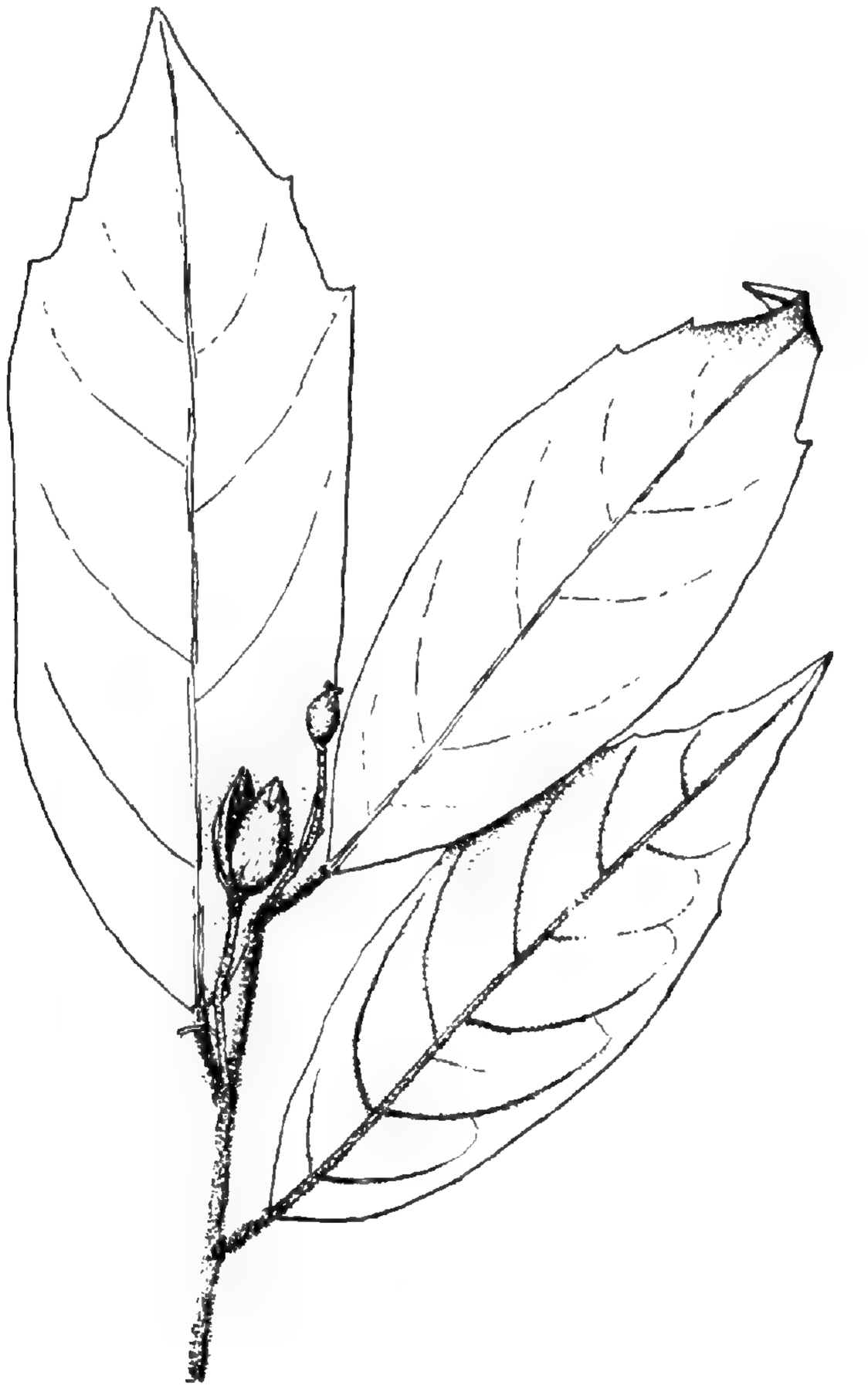

FIG. 2. *Distylium Tsiangii*, drawn from the type, × ½.

Using this name will thus minimize the adjustment, if it should subsequently appear that this name has already been published. It would be preferable to choose as the type the same collection selected by Chun, no. *7019*, of which a duplicate is at the New York Botanical Garden. However, that specimen is in safe storage for the duration of the war and only *Tsiang 6692* is available for study.

11. **Distylium pingpienense** (Hu) Walker, comb. nov. FIG. 3, a.

Sycopsis pingpienensis Hu in Bull. Fan Mem. Inst. Biol. Bot. 10: 149. 1940. — Type, *H. T. Tsai 62201*, from Yunnan, at the Fan Memorial Institute of Biology, Peking. Duplicate examined.

A shrub 3 m. high, the branchlets very slender, stellate-pubescent when young, glabrescent. Leaves with densely stellate-pubescent or hirsute petiole about 8 mm. long, the blades ovate to elliptic-ovate or lanceolate, long-acuminate at apex, obtuse to subrounded and more or less asymmetric at base, entire, glabrous and shining above, glabrous or stellate-pubescent beneath especially on the prominently raised midrib and the 5 to 8 raised lateral nerves, these inconspicuous and slightly impressed above. Flowers unknown. Fruiting inflorescences racemose, up to 2 cm. long, the capsules immature, ovoid, densely pubescent with yellowish-brown stellate hairs.

CHINA: Yunnan: Pingpien Hsien, *H. T. Tsai 62201* (A).

11a. **Distylium pingpienense** var. **serratum** Walker, var. nov. FIG. 3, b.

E forma typica foliis serratis, dentibus utrinque 1–4 tenuiter apiculatis supra medio nonnihil remotis, nervis lateralibus curvato-anastomosantibus vel in dentibus terminantibus, capsulis atro-fuscis differt.

CHINA: Hupeh: Patung Hsien, *Ho-ch'eng Chow 706* (A — TYPE, Y).

This variety is proposed in order to focus attention on the distinctive serration with apiculate teeth, in the hope that collectors will obtain more material by which the true value of this character may be determined. In

FIG. 3. *Distylium pingpienense*, × ½: *a*. drawn from an isotype of the species (A); *b*. var. *serratum*, drawn from the type.

related species of which abundant material is available, leaf serration is merely a variation without recognizable taxonomic significance. The great distance between the type localities of the species and its variety should also be considered. The difference in pubescence of fruits may prove to be inconstant.

12. **Distylium Chungii** (Metc.) Cheng in Contr. Biol. Lab. Sci. Soc. China Bot. Ser. 8: 140. 1932. — Based on *Sycopsis Chungii* Metc.

Sycopsis Chungii Metc. in Lingnan Sci. Jour. 10: 414. *pl. 59*. 1931. — Type, *H. H. Chung 2095*, from Pehling Inn, Fukien, in the Amoy University herbarium. Duplicate examined.

A forest tree up to 20 m. high, the branches grayish, densely stellate-pubescent when young, glabrescent. Leaves with densely stellate-pubescent petiole 1 cm. long, the blade elliptic- to oblong-ovate, subrounded to obtuse with acuminate or merely callose apiculate tip, obtuse to rounded at base, 5 to 9 cm. long, 2.5 to 4 cm. wide, entire or with 1 to 3 obscure callose teeth on each side above the middle, shining and glabrous above except on the impressed midrib, stellate-pubescent beneath especially on the prominent midrib, the lateral nerves 5 or 6 pairs, usually impressed above, raised beneath. Flowers unknown but reported to be "red" (according to H. H. Chung). Fruiting inflorescences racemose, scarcely 2 cm. long, densely stellate-lepidote or puberulent, the capsules ovoid, about 1.2 cm. long, densely stellate-lepidote or puberulent.

China: Fukien: Pehling, Minhow Hsien, *H. H. Chung 2095* (A — isotype); Foochow, *H. H. Chung 8190* (A, Y); Kuliang, *F. P. Metcalf & T. C. Chang 248* (A), *J. B. Norton 1568* (W); Hinghwa Hsien, *H. H. Chung* (Herb. Amoy Univ. *1012*) (A).

An excellent drawing of this species is given in H. H. Hu and W. Y. Chun, Ic. Pl. Sin. 3: 43. *pl. 143*. 1933, but with the name "*Sycopsis Chingii* Metc.," which is apparently a typographical error.

Species Insufficiently Known

1. **Distylium formosanum** Kanehira, Anat. Char. & Ident. Formos. Woods. 106. 1921, Formos. Trees ed. 2. 253. 1936.

The original description of this species dealt almost entirely with anatomical structures of the wood and cited a wood specimen only. The morphological characters were described in 1936 with reference to the original anatomical description but without mention of herbarium specimens. Thus the wood specimen must stand as the technical type. Kanehira's description of the wood anatomy of this new species from Formosa has been compared with his description of the wood anatomy of *D. racemosum* Sieb. & Zucc. in Japan. Mr. W. N. Watkins of the Section of Wood Technology, U. S. National Museum, has examined a specimen in the Museum's collection of wood samples originally received from Yale University as *D. racemosum* Sieb. & Zucc. and labeled as "authenticated" (without further explanation of the meaning of this term). We are strongly inclined to the belief that *D. racemosum* and *D. formosanum* can not be differentiated on the basis of wood anatomy alone. H. K. Airy-Shaw (in Curtis's Bot. Mag. 160: *pl. 9501*. 1937) suspected that Kanehira's 1936 description was inaccurate, because of the comparison of *D. formosanum*, an endemic tree,

with *D. chinense* (Franch.) Diels, a shrub of the mainland, rather than with *D. racemosum* Sieb. & Zucc., a tree occurring in Japan, southern Formosa, and Hongkong. Comparison of Kanehira's description of *D. formosanum* with the characters here given for *D. racemosum* shows significant leaf differences as follows:

D. formosanum: Leaves oblong, acuminate, stellate-lepidote, 10 cm. long, the upper part obscurely crenate.

D. racemosum: Leaves ovate, obtuse or acute, glabrous, 5 to 8.5 cm. long, entire except one uncertain specimen from the Liu Kiu Islands with smaller leaves.

The original publication states that this is a tree of primary forests at medium altitudes, abundant in Sintiku and Arisan. Until significant material from Formosa has been examined, this species must remain in doubt.

2. **Distylium velutinum** Hu in Bull. Fan. Mem. Inst. Biol. Bot. 10: 148. 1940. — Type, *H. T. Tsai 62636,* from Tsing Pien Hsien, Yunnan, China, collected July 14, 1934; *T. T. Yü 3659* and *3205* from La Po Hsien, southwestern Szechwan, are also cited.

None of the originally cited specimens and little material of this genus from Yunnan and Szechwan have been available for this study. This shrub, about 3 meters high, seems, according to the original description, to be especially distinct in the stellate-velutinous and stellate-lepidote under surfaces of the leaves, these also bearing coarser black stellate hairs on the veinlets. They are also described as 3-veined at the base and sometimes remotely setose-denticulate along the margins. It is compared with "*D. Chingii* Chun," which differs in having larger leaves, but I am unable to find any publication of this name. Concerning the fruits Hu says: "exocarpium lepidotum, endocarpium superne ad stylum persistentem, dense longe albo-villosum." In no other species of *Distylium* has any indument been noted on the endocarp. It is possible that the enlarged receptacle tube of a species of *Sycopsis* has been mistaken for the exocarp, and that the enclosed fruit, which is always pilose or villose in *Sycopsis,* has been mistaken for the "endocarpium." But until representative material can be examined this species must remain in doubt.

3. **Distylium lanceolatum** Chun ex W. C. Cheng in Contr. Biol. Lab. Sci. Soc. China Bot. Ser. 10: 124. 1936. Based on *R. C. Ching 5512,* from Kwangsi.

In his discussion of *D. strictum* Hemsl. (now *D. buxifolium* (Hance) Merr.), W. C. Cheng inadvertently effected publication of Chun's name, which until then was apparently unpublished. His remarks are as follows: "The closely related species, *D. lanceolatum* Chun (R. C. Ching no. 5512 from Kwangsi), which differs from the present species by its lanceolate leaves dull brown on the lower surface when dry, not callose-apiculate at apex, and by its somewhat obovate capsules with light brown stellate hairs, is probably not yet published." Although there is a specimen of *Ching 5512* in the New York Botanical Garden, distributed under this name and designated as "cotype," it is unfortunately in safe storage for the duration of the war and is not available for this study. The brown lower surface of the leaves is apparently another occurrence of this as yet uninterpreted

character mentioned in the discussion of *D. indicum* Benth. and *D. racemosum* Sieb. & Zucc.

Excluded Species

In 1937 H. K. Airy-Shaw mentioned in his treatment of *Distylium racemosum* Sieb. & Zucc. (Curtis's Bot. Mag. 160: *pl. 9501.* 1937) the existence of an unidentified New World species of this genus in the G. B. Hinton collections from Mexico. His associate, N. Y. Sandwith, has kindly reported that the Hinton collections are nos. *3090* (fls.) and *6163* (frts.). Duplicates of these in the U. S. National Herbarium have been compared with the type of *Matudaea trinervia* Lundell, *E. Matuda S-194* (Mi) and found to be the same. This New World genus has been described as similar to *Distylium* and may be considered as in the Distylieae.

SYCOPSIS

Sycopsis Oliv. in Trans. Linn. Soc. 23: 83. *pl. 8.* 1860. — Based on the single species *S. Griffithiana* Oliv., from Assam, India.

Flowers unisexual and monoecious or andromonoecious in separate or the same axillary headlike spikes or racemes, these bracteate, the lower bracts in some species broad, imbricate, involucre-like enclosing the unopened flowers, the bracts below individual opened flowers 2 or more, sometimes on sides of urceolate receptacle. Sepals 1 to 5, irregular, small, resembling the bracts, on upper edge of receptacle. Petals none. Staminate flowers in short compact spikes or glomerules, the pistils wanting or very rudimentary, the stamens 7 to 10 on edge of a more or less enlarged globose to urceolate receptacle, the filaments of varying lengths, the anthers basally attached, 2-celled, ellipsoid, dehiscing by widely spreading longitudinal slits, the connective often protruding as a point. Pistillate or perfect flowers with bicarpellary, 2-celled, setose-pilose, free ovary surrounded by the globose to urceolate, lepidote receptacle-tube bearing 1 to 5 sepals and 1 to 10 reduced or mature stamens and closely investing the 2 free, elongate, diverging, slender, glabrous styles, the stigmatic surfaces elongate, papillose on inner sides of styles; ovules solitary in each cell, pendant. Fruits subglobose, woody, 2- or 4-valved, setose-pilose capsules, splitting longitudinally, first perpendicular to the common partition between the two carpels, thus permitting the two seeds to escape, later the 2-pointed apex of each valve more or less splitting, the carpellary walls separating into two layers, the inner (endocarp) ligneous and somewhat thicker than the outer, the 2 seeds ovate-oblong, shining, brown or whitish with impressed whitish hilum. Leaves simple, alternate, coriaceous, evergreen, petiolate, glabrous, lepidote or velutinous, entire or with a few rather remote teeth above the middle, the lateral nerves usually curved anastomosing (except in *S. laurifolia*), the petiole usually lepidote, the stipules small, lanceolate, caducous.

Spring-flowering evergreen trees or shrubs, usually in forests or woods, extending from New Guinea through the higher mountains in the Philippine Islands and central and southern China to Assam, India. At the Arnold Arboretum is a single sterile specimen, *Mrs. H. Greenway 30*, from Langbian Peak, Dalat, Annam, Indo-China, referable to this genus but insufficient for further identification.

KEY TO SPECIES

Flowers in heads or headlike spikes, in bud enclosed by dark brown imbricate involucral bracts.
  Leaves glabrous or stellate-pubescent beneath when young; leaf bases cuneate; blades 4 to 8 cm. long, entire; India.....1. *S. Griffithiana*.
  Leaves glabrous or lepidote beneath when young; leaf bases obtuse to rounded, blades 5 to 13 cm. long, entire or toothed above the middle; China..2. *S. sinensis*.
Flowers in spikes or racemes, not glomerate, not enclosed in bud by dark brown involucral bracts.
  Leaves closely and densely tomentose beneath; lateral nerves not curved-anastomosing.....3. *S. laurifolia*.
  Leaves glabrous beneath; lateral nerves curved-anastomosing.
    Blades of leaves ovate.
      Apex of leaves acute or acuminate; petiole 1 to 1.5 cm. long.....4. *S. Dunnii*.
      Apex of leaves broadly obtuse or rounded; petiole 5 mm. long or less.....5. *S. Tutcheri*.
    Blades of leaves narrowly or linear-lanceolate.....6. *S. salicifolia*.

1. **Sycopsis Griffithiana** Oliv. in Trans. Linn. Soc. 23: 83. *pl. 8*. 1860; Brandis, Indian Trees. 301. 1906. Originally described from Khasi Hills, Assam, India, without mention of specimens, the type in all probability being *Griffith 3375* at Kew (see discussion below).

A branching shrub or small tree, the branchlets minutely puberulent or lepidote when young, glabrescent. Leaves with channeled glabrous or lepidote petiole up to 7 mm. long, the blade elliptic-ovate, generally slender acuminate at apex, cuneate at base, 4 to 8 cm. long, 2 to 3 cm. wide, entire, glabrous (stellate-pubescent when young—according to Clarke), the midrib and about 8 pairs of lateral nerves slightly impressed above, raised beneath, curved-anastomosing. Flowers in subglomerate, stellate-pubescent heads or headlike spikes, bracteate at base, the lower portion of the calyx tube adnate to the ovary, the free portion pubescent within (according to Brandis). Stamens up to "8 (of which number several appear abortive)" (according to Hooker). Capsules globose or ovoid, about 1.5 cm. long, with ruptured lepidote receptacle tube at base.

INDIA: Assam: *Griffith 3375* (G—isotype).

Henry 11464, from Yunnan, has been referred by A. Rehder and E. H. Wilson (in Sarg. Pl. Wils. 1: 431. 1913) to this species, but this collection has not been examined in the course of this study.

In the discussion following the original description Oliver says: "The foregoing description . . . rests upon specimens met with in the course of arrangement of the late William Griffith's herbarium. These, although very numerous, appear to be all of one gathering, and, unfortunately, are almost all a little too far advanced to enable me to furnish, from a sufficient number of female flowers, complete details of their earlier condition . . . It is not improbable that they may have been obtained by some of the collectors despatched . . . to the Khasia Hills." Neither the original description nor Hooker's Flora of British India mentions any collector's number for Griffith's specimen, but a specimen in the Gray Herbarium bears the data "Herbarium of the late East India Company, no. 3375. East Bengal. Herb. Griffith. Distributed at the Royal Gardens, Kew, 1863–4." The specimen conforms with the original description and excellent drawing. Its

distribution from Kew in 1863–4, subsequent to the publication in 1860 of this species, suggests its having been numbered, and possibly geographically labeled, subsequent to its study by Oliver. The failure to include the collector's or herbarium number in the Flora of British India 2: 427. 1878 is unfortunate, for it could probably have been easily supplied. As no other collections of this species are mentioned in the literature examined, it may be assumed that the Gray Herbarium specimen of *Griffith 3375* is an isotype. The type is doubtless at Kew.

2. **Sycopsis sinensis** Oliv. in Hook. Ic. Pl. 20: *pl. 1931*. 1890, 29: *pl. 2834*. 1907. — Based on *Henry 6019, 7574, 7574b,* and *7825,* from Yunnan, in the Kew herbarium. Duplicates of the first two syntypes have been examined.

Sycopsis sinensis var. *integrifolia* Diels in Bot. Jahrb. 29: 381. 1900. — Type, *von Rosthorn 2261,* from Szechwan, in the Berlin herbarium. Photograph and fragment examined.

A tree up to 14 m. high with trunk diameter up to 45 cm., the bark brown or gray, smooth, longitudinally fissured, the branchlets grayish, stellate-lepidote, glabrescent. Leaves with densely stellate-lepidote petioles 1 to 1.5 cm. long, the blades elliptic-ovate to slightly obovate, sometimes lanceolate, acuminate at apex, obtuse to rounded at base, 5 to 13 cm. long, 2.5 to 5 cm. wide, entire or with 1 to 5 callose teeth above the middle, glabrous, more or less lepidote beneath, paler and glaucous beneath when fresh, the lateral nerves about 6 pairs, more or less impressed above, somewhat raised beneath, curved-anastomosing. Flowers in short peduncled subglomerate heads or headlike spikes, enclosed in bud by broad ferruginous, pubescent, imbricate, involucral bracts, in fruit reaching 2 cm. long, the sepals about 3, ovate, about 1 mm. long, hairy on outside. Stamens 10, the anthers red, apiculate, slightly curved, the filaments glabrous, up to 1.5 cm. long in staminate flowers. Capsules globose, about 8 mm. long, with ruptured receptacle tube around base.

DISTRIBUTION: China. In thickets, woods, and deep forests.

CHINA: Szechwan: Ping Shan Hsien, *F. T. Wang 22815* (A); Kweichow: Yinking, *Y. Tsiang 7658, 7667, 7685, 7687, 7910* (Y); Hupeh: Chang Yang Hsien, *E. H. Wilson* (Arnold Arb. Exp.) *2586* (A, G, W); Patung Hsien, *Ho-ch'eng Chow 855* (A, Y); Siu Yueh Sie (Sin Yeh Su?), *W. Y. Chun* (Herb. Univ. Nanking *4068*) (A), *W. Y. Chun 3726* (A); S. Wushan, *E. H. Wilson* (Veitch Exp.) *1825* (A, W, Y); no specific locality, *A. Henry 6019* (G, W, Y), *7574* (A, G, W, Y), *E. H. Wilson* (Veitch Exp.) *727* (W, Y); Hunan: Hang Shan, *C. S. Fan & Y. Y. Li 404* (A); southern Anhwei: Western Wu Yuan, *R. C. Ching 3250* (A); Kiangsi: Woo Kung Shan, An Fu, *H. H. Hu 702* (A); Kunnan Hsien, Sai Hang Cheung, near Tung Lei village, *S. K. Lau 4059* (A, W), *4329* (A, W); Hwangdschou-ling, between Dingdschou and Ningdu, Kiangsi-Fukien border, *Handel-Mazzetti 378* (A); southern Chekiang: King Yuan region, *R. C. Ching 2387* (A, G, W, Y).

3. **Sycopsis laurifolia** Hemsl. in Hook. Ic. Pl. 29: sub *pl. 2836* (p. 2). 1907; K. Y. Tong, Stud. Hamamel. 37. 1926. — Type, *Henry 11365,*[11] from Mengtze, Yunnan, in the Kew herbarium. Duplicate examined. FIG. 4.

A shrub 3 m. high or a tree up to 15 m., the branchlets grayish, abundantly lenticellate, lepidote when young. Leaves with densely puberulent or lepidote petioles 1 to 1.8 cm. long, the blades elliptic-ovate, acute or

[11]The type was cited as *14365,* but this is apparently a misprint for *11365,* as noted in Sarg. Pl. Wils. 1: 431. 1913, and as seen from a photograph at the New York Botanical Garden of the type at Kew.

FIG. 4. *Sycopsis laurifolia*, drawn from an isotype (A), × ½.

acuminate at apex, acute to obtuse at base, 6 to 10 cm. long, 2.5 to 4.5 cm. wide, entire, glabrous above, much paler and finely and densely velutinous beneath, the lateral nerves 4 or 5 pairs conspicuous beneath, the lower pair sometimes longer and more acutely diverging from the midrib than the others, none prominently anastomosing, connected by rather conspicuous scalariform tertiary nerves. Flowers in spikes or racemes not distinctly subglomerate and enclosed in involucral bracts in bud, reaching 2 cm. long in fruit, the bracts 2 to 4 at base or on receptacle tube, hairy, the sepals 0 to 2, hairy. Stamens up to about 6, about 4 mm. long, the anthers apiculate, the filaments variable in length. Capsule globose, more or less pointed, about 1 cm. long, entirely enclosed in the brownish lepidote receptacle tube (always?).

CHINA: Yunnan: Mengtze, *A. Henry 11365* (A — isotype), *11365 A* (A, W, Y); Ping Pien Hsien, *H. T. Tsai 62636* (A).

This species is readily recognized by its velutinous lower leaf surfaces and nerves ending at the margin, not curved-anastomosing.

4. **Sycopsis Dunnii** Hemsl. in Hook. Ic. Pl. 29: *pl. 2836*. 1907. Type, *S. T. Dunn* (Herb. Hongkong *2695*), from Fukien, in the Kew herbarium (see discussion below). Photograph and rubbing examined.

Sycopsis philippinensis Hemsl. in loc. cit. (p. 2). — Type, *Loher 4881*, from Baguio, Luzon, Philippine Islands, in the Kew herbarium. Duplicate examined.

Croton curviflorus Elmer, Leafl. Philip. Bot. 1: 310. 1908. — Type, *A. D. E. Elmer 8651*, from Baguio, Luzon, Philippine Islands, in the Manila herbarium. Duplicate examined.

A shrub or tree up to 10 m. high,[12] the branchlets grayish or brownish, glabrous or scattered lepidote when young. Leaves petiolate, the petiole 1 to 1.5 cm. long, at least the lower part densely lepidote with large scales, the upper part in most eastern continental specimens more slender and narrowly margined and not lepidote, the blades elliptic-ovate, acute to acuminate at apex, subrounded, obtuse, acute or acuminate and somewhat narrowly decurrent at base, 5 to 10 cm. long, 2 to 5 cm. wide, entire, glabrous or stellate-lepidote on both surfaces when young, the midrib and 6 or 7 pairs of lateral nerves impressed above, raised beneath, curved-anastomosing. Flowers in lepidote, few-flowered short spikes or racemes reaching 2.5 cm. long in fruit, especially short in all staminate inflorescences but not covered with involucral bracts in bud, the bracts at base or on the receptacle tube, ovate, the sepals about 6, oblong-ovate or ovate, about 1.5 mm. long, glabrous or hairy. Stamens up to 10, the anthers about 2 mm. long, apiculate, the pollen brown, the filaments 2 to 5 mm. long, rather slender. Capsules 1 or 2 in each inflorescence, subglobose, about 1 cm. long, with ruptured receptacle tube surrounding about the lower half. Seeds brown or whitish.

DISTRIBUTION: From Yunnan and Fukien in China to the Philippine Islands, Celebes, and New Guinea. Woods, forests and grassy slopes.

CHINA: Southern Yunnan: Banks of Nam Ha, between Muang Hai and Keng Hung, *J. F. Rock 2466* (A, W); Kwangsi: Hung Hsien, Ta Tze Shan, *A. N. Steward & H. C. Cheo 827* (A, Y); Yuin Hsien, Na Kan-Lin, *A. N. Steward & H. C. Cheo 165, 170, 199* (A, Y); Shap Man Tai Shan, *W. T. Tsang 22362* (A); Tong Shan, *W. T. Tsang 22795* (A); Kwangtung: Kook Kiang Dist., Lung Tau Shan, *S. P. Ko 50161, 50209* (Y); Hongkong, New Territories, Tai Mo Shan, *W. T. Tsang 21092* (A, Y); Fukien: Kutien, *H. H. Chung 4008, 4009* (A); Yenping, *Kuang-han Chou 8704* (A); no precise locality, *H. H. Chung 7917* (A), *S. T. Dunn* (Herb. Hongkong *2696, 2697*) (A). PHILIPPINE ISLANDS: Luzon: Benguet Subprov., Baguio, alt. 1500 m., *A. D. E. Elmer 8651, 8688* (A, W), *C. Garcia* (For. Bur. *25506*) (G, Mo), *A. Loher 4881* (W), *J. K. Santos 13* (A, Mo); Nueva Vizcaya Prov., Caraballo Mtn., *A. Loher 13628* (A); Zambales Prov., Mt. Marayep, *Ramos & Edaño* (Bur. Sci. *44784*) (A); Nueva Ecija Prov., Mt. Umingan, *Ramos & Edaño* (Bur. Sci. *26419*) (A, W); Bataan Prov., Lamao Forest Reserve, *Curran* (For. Bur. *6246*) (W, Y); Tayabas Prov., Mt. Camatis, *Alcasid & Edaño* (Philip. Nat. Herb. *4988*) (A); Rizal Prov., Balabano, *A. Loher 13081* (A); Mt. Susong-Dalaga, *Ramos & Edaño* (Bur. Sci. *29326*) (W); no precise locality, *M. Ramos 1999* (G, Mo, Y); Laguna Prov., Mt. Banajo, *Curran & Merritt* (For. Bur. *7923*) (W); Batangas Prov., *C. Mabesa* (For. Bur. *28053*) (A); Mindoro: Paluan, *M. Ramos* (Bur. Sci. *39604*) (A, W); Palawan: Mt. Balogbag, 1200 m. alt., *G. Edaño* (Bur. Sci. *77801,* For. Bur. *77805*) (Y); Dinagat: *Ramos & Convocar* (Bur. Sci. *83922*) (Y). CELEBES: "En Ond. Gowa, Lembaja, Beroe," 1600 m. alt., *Netherlands Indies Forest Service* (Herb. Hort. Bot. Bog. *BB 20432, BB 20433*) (A); "Sum. Atjeh en Ond. Gajo Loeëus Penosan (Gn. Geroepal)," about 2200 m. alt., *Netherlands Indies Forest Service* (Herb. Hort. Bot. Bog. *BB 22366*) (A); "en Ond. Masamba, Borschaft, Takalaki, Malili," 2200 m. alt., *Netherlands Indies Forest Service* (Herb. Hort. Bot. Bog. *BB 23361*) (A). BRITISH NEW GUINEA: Central Division, Vanapa Valley, probably at Ononge, *Father Dubuy* (without number) (A).

[12]Hemsley's description of *S. Dunnii* says "arbor 9–10 m. alta," but the specimens here cited, so far as data are available, indicate that this species is a shrub up to 5 m. high. Available duplicates of specimens studied by Hemsley bear no habit, habitat, or descriptive data. Elmer describes it as a "tree-like shrub or erect tree, 10 m. high with rather short numerously branched ascending branchlets."

Careful comparison of Chinese and Philippine specimens shows few differences, these appearing to be of less significance than the variations found within either supposedly distinct species. There are no good male flowers from the Philippines, and the fruiting inflorescences seem to have fewer fruits. The tendency of the leaf bases in most of the Chinese specimens to be cuneate and somewhat narrowly decurrent on the petiole above the lower densely lepidote part of the petiole is only slightly suggested in the Philippine material. Obtuse to subrounded leaf bases are fairly common in the Philippine material but rare in the Chinese material. However, *Rock 2466* has broadly obtuse and rounded leaf bases and larger leaves. Furthermore it is reported by the collector as a "tree 50 ft.," which is considerably larger than is noted for any of the remaining material from China or the Philippines. There are no significant differences in the original descriptions of the Philippine and Chinese species. There seems, therefore, little reason to maintain distinct species for the material from these two areas, or to consider the Rock specimen as representing a distinct species.

At the New York Botanical Garden is a photograph of a Kew specimen of this species bearing two labels, *Dunn* (Herb. Hongkong *533*) and (same) no. *2695*. The specimen on this sheet is large and ample, but so far as can be determined there are no stamens in the flowers. There is a pocket labeled *533*. As the original description cites only "*533, 2695,*" and as the *533* part of the Kew specimen is apparently a fragment, *Dunn* (Herb. Hongkong *2695*) at Kew should be considered the type. The original citation of this species describes and illustrates the apparently non-functioning stamens from an otherwise pistillate plant. There is another photograph in the New York Botanical Garden of a Kew specimen labeled at the top "Hongkong herb. nos. *2697 = 1340,*" to which is attached a drawing in pencil bearing a pocket stating it to contain a "stamen taken from specimen, W. B. H. 1907," the drawing labeled "Ic. Pl. 2836. Sycopsis 2696 & 737. Returned to Hongkong." Comparison of this drawing with that of the plate published with the original description reveals strong evidence that it is the original rough draft. Thus the original description and illustration in respect to abortive stamens were based on the Hongkong specimen of *2696*, which was not cited with the original description. However, all these specimens seem to represent the same species.

In discussing and citing additional specimens of *S. Dunnii* Hemsl., W. Y. Chun (in Sunyatsenia 1: 245. 1934) mentions the aberrant characters of *S. P. Ko 51428* from Kwangtung, and suggests it might prove to be new. It has "small spatulate-obovate leaves abruptly attenuate to a long petiole, and very small capsules." This collection has not been seen.

5. **Sycopsis Tutcheri** Hemsl. in Hook. Ic. Pl. 29: *pl. 2834*. 1907. — Type, *W. J. Tutcher* (Herb. Hongkong *1340*), from Hongkong, in the Kew herbarium. Duplicates examined.

A shrub about 2 m. high in Hongkong, a tree up to 12 m. in Hainan, the branches dense, dark gray, glabrous, scattered lepidote when young. Leaves with densely lepidote petioles up to 5 mm. long, the blade elliptic-ovate or slightly obovate, broadly obtuse to rounded at apex, acute to obtuse at

base, 4 to 6 cm. long, 2 to 3 cm. wide, entire, glabrous, slightly paler beneath, the lateral nerves 5 pairs, generally inconspicuous above, slightly raised beneath, curved-anastomosing. Flowers in short lepidote spikes or racemes up to 1.5 cm. long, the bracts irregular, ovate, the sepals small, with a few hairs. Stamens "red" (according to Wilson), otherwise unknown. Capsules globose to ovoid, 1 to 1.3 cm. long, the lower third surrounded by the ruptured lepidote receptacle tube.

DISTRIBUTION: Southeastern China. In forests and mountain ravines.

CHINA: Kwangtung: Hongkong, New Territory, Tai Ue Mtn., *Fung Hom* (Lingnan Univ. Herb. *19462*) (Y); Victoria Peak, Mtn. Lodge, Herb. Hongkong *9060* (A); east of Mtn. Lodge, *W. J. Tutcher* (Herb. Hongkong *1340*) (A — isotype); south side of Victoria Peak, *E. H. Wilson,* Apr. 17, 1909 (A); Hainan: Mixed forests, *C. Wang 36555* (A, Y).

A very distinct species, recognized by its glabrous, broadly obtuse leaf blades.

6. **Sycopsis salicifolia** H.-L. Li apud Walker, sp. nov.

Frutex circiter 3 m. altus, ramis cinereis, ramulis novellis cinereo-brunneis, puberulis vel glabris. Foliorum petiolus brevis, 3–4 mm. longus; lamina subcoriacea lineari-lanceolata, 7–10 cm. longa, 0.8–1.8 cm. lata, acuta vel breviter acuminata, basi attenuata, supra viridis, subtus pallidior, margine integra leviter revoluta, nervis lateralibus utrinsecus 5–8, utrinque inconspicuis vel subconspicuis, arcuato-adscendentibus, prope marginem confluentibus, rete venularum obscuro. Inflorescentiae breves pauciflorae racemosae. Flores bracteati, bracteis ovatis, 2–4 mm. longis, puberulis, calycis tubo minuto, saltem 2–3 mm. longo, puberulo, margine 4-lobato, lobis oblongis 2–3 mm. longis, caducis; staminibus 6–8, filamentis 2–4 mm. longis, antheris oblongis, 2–3 mm. longis, apice rostratis; ovario nullo vel si praesente tomentoso, stylis gracilibus 5–6 mm. longis, leviter puberulis. Fructus immaturus calycis tubo inclusus. [Description by Li]

CHINA: Hainan: Bo Ting, in thickets, *S. K. Lau 27953* (A) (TYPE), *27956* (A), Oct. 10, 1936.

This is a distinct species, strongly characterized by its linear-lanceolate leaves. *Lau 27953* is a flowering specimen, bearing both staminate and perfect flowers, which are similar in appearance. *Lau 27956* has young fruits only.

Note: The author will furnish on request, without cost, a mimeographed list of the specimens cited in this paper arranged alphabetically and numerically by collectors.

U. S. NATIONAL HERBARIUM,
WASHINGTON, D. C.

THE COMPARATIVE MORPHOLOGY OF THE WINTERACEAE
V. FOLIAR EPIDERMIS AND SCLERENCHYMA

I. W. BAILEY AND CHARLOTTE G. NAST

With three plates

FOLIAR CUTICLE

THE dried leaves of specimens of the Winteraceae frequently have a more or less conspicuously glaucous under surface, which fluctuates from faintly grayish to an intense uniform white. This glaucescence resolves under comparatively low magnifications into a number of distinct patterns. In most cases, the under surface of the leaf is speckled with white dots, *Figs. 1–6*. These dots vary in size and in number per unit area. They may be uniformly distributed and widely spaced, *Fig. 2*, or they may be aggregated and apparently coalesced in diverse patterns, *Fig. 3*. Furthermore, they may be surrounded by brownish tissue, *Figs. 1* and *2*, or they may be embedded in a grayish or white layer that coats the entire under surface of the leaf, *Figs. 4–6*. In extreme cases, e.g. leaves of certain collections of *Drimys granadensis* L. f., *D. brasiliensis* Miers, and *Pseudowintera axillaris* var. *colorata* (Raoul) A. C. Sm., the white layer may be so compact and thick that no spots are detectable within it.

The white spots are due to minutely granular or finely alveolar deposits in the oval or circular depressions in which the stomata are situated, *Figs. 7* and *8*. The alveolar substance covers the guard cells, *occluding the orifice*, and commonly extends outward over the adjacent subsidiary cells. In such leaves as those illustrated in *Figs. 1* and *2*, the finely alveolar material is localized over and about the stomata, whereas in those shown in *Figs. 4–6* it extends across the intervening areas, but in a thinner or less homogeneous form. Only in exceptional cases is the entire surface covered by a thick uniform layer of finely alveolar material which conceals the location of the stomata.

The white color is due to the presence of air in the interstices of the incrusting material. This may be demonstrated by dropping a glaucous leaf in boiling water. The leaf turns brown as the air is displaced by hot water, and the white color returns as the leaf is re-dried. This raises an important question regarding the extent to which the glaucescence of winteraceous leaves may be modified by differences in the drying or curing of herbarium specimens. The leaves of different collections of the same species frequently vary in color from brown to white. Not infrequently different leaves of the same collection or even of the same sheet exhibit similar variations in glaucescence. The conspicuously glaucous leaves of certain sheets exhibit more or less extensive brown discolored areas. A detailed microscopic examination of such discolored leaves indicates that

there was a migration and exudation of sap in the discolored tissue. As this sap evaporated, it left a brownish residue in the minute interstices of the incrusting material. The occurrence of browning during drying is dependent in part upon the structure and condition of the leaves and upon the thickness of the incrusting material.

We have found more or less conspicuous white stomatal areas on the leaves of most investigated species and varieties of all six genera of the Winteraceae. Thus the occlusion of stomata by deposits of minutely alveolar material appears to be an outstanding characteristic of the family. Where the stomatal plugs are not clearly discernible in ordinary surface views of the leaves, microscopic analyses of transverse sections demonstrate that they are concealed by papillae (*Drimys brasiliensis* pro parte), *Fig. 11*, by excessively thick layers of glaucescent material (e.g. certain collections of *D. granadensis* vars. *mexicana* (DC.) A. C. Sm. and *grandiflora* Hieron.), *Figs. 9* and *10*, or have been infiltrated with brownish residues during drying.

Since the publication of De Bary's (2) "Vergleichende Anatomie," granular, areolate, rod-like, and other types of structures on the outer surface of cuticles have commonly been referred to as wax or waxy coatings. It is significant in this connection, however, that although the incrusting material of the Winteraceae stains in Sudan III and is optically anisotropic, it does not melt in boiling water and is insoluble in boiling alcohol, hot ether, and other non-polar solvents. Thus, it exhibits none of the properties that are commonly assumed to be characteristic of plant waxes and, therefore, differs from the glaucescence of certain Magnoliaceae and Schisandraceae which is soluble in boiling alcohol and in ether at room temperature. The question arises, accordingly, whether the seemingly incrusting material of the Winteraceae is a distinct layer of different chemical composition or merely a physically different (i.e. more porous) outer part of the cuticle. The thick cuticles of the Winteraceae, as of many other plants, exhibit numerous intergradations between putative homogeneity and more or less conspicuously striated, lamellated, areolated, granular, ribbed, fluted, and warty structures. At present, there is no convincing evidence to suggest that any one of these diverse morphological forms is indicative necessarily of a waxy rather than of a cutinaceous composition.

As previously stated, the stomatal plugs of the Winteraceae usually have a uniform and finely alveolar structure, *Figs. 7* and *8*. They commonly grade off marginally (i.e. in the inter-stomatal areas) and more or less abruptly into varying admixtures of finely alveolar and coarsely granular or warty structures, which may grade in turn into more or less extensive and irregular patches of relatively homogeneous material. In certain cases, the entire under surface of the leaf may have a relatively thick coating of finely alveolar material upon which irregular masses of homogeneous material are superimposed, *Figs. 9* and *10*. The thick cuticle of the inter-stomatal areas is three-layered, *Fig. 10*, consisting of a homogeneous layer which grades into an alveolar layer which grades in turn into irregular

masses of homogeneous material. Since there are all intergradations of texture, it seems likely that the finely alveolar material of the Winteraceae may represent a physically porous phase of the chemically complex, cuticular emulsion. In many families, there obviously is a segregation of specific continuents (e.g. wax) of this complex emulsion upon the outer surface of the cuticle, but there are no *a priori* reasons for assuming that this must necessarily occur in the Winteraceae.

Our colleague, Dr. Smith (3), with whom we are collaborating in the study of woody ranalian families, has shown that the white stomatal areas are of some taxonomic significance in the classification of the Winteraceae. The consistent plugging of the stomata makes the family of interest from physiological and ecological points of view, and leads one to wonder whether there is any significant correlation between the peculiar stomatal and vascular structures within the family. The fact that there is no comparable plugging of the stomata in the vesselless *Tetracentron* and *Trochodendron* renders untenable any teleological inferences regarding the absence of vessels in the Winteraceae. The tendency toward reduction of scalariform pitting in the family might, however, be correlated with reduced transpiration through plugging of the stomata. It is of interest in this connection that the Coniferae (where scalariform bordered pits have been eliminated from both the metaxylem and the secondary xylem) are characterized by having stomata that are plugged with finely alveolar material.

PAPILLATE EPIDERMIS

The aerial organs of the Winteraceae with the notable exception of the carpels are characteristically glabrous. In certain cases, hairs are formed along the margins of bud scales and of young leaves, but the only tendency toward the formation of extensively distributed hairy structures on mature leaves is the papillate,. lower epidermis of *Drimys brasiliensis, Fig. 11.* Most specimens of the four varieties of this species, vars. *campestris* (St. Hil.) Miers, *retorta* (Miers) A. C. Sm., *angustifolia* (Miers) A. C. Sm., and *roraimensis* A. C. Sm., exhibit papillate surfaces, but certain collections of var. *campestris* (*Burchell 3567, Claussen 1064, Dusén 14504, Hoehne 1205* and *28700, Lützelberg 268*, and *Miers 4604*) do not. The papillae fluctuate considerably in form, length, and breadth, and in the character of their cuticular covering, which varies from finely alveolar to coarsely granular or warty. The absence of papillate surfaces in certain collections of *D. brasiliensis* var. *campestris* is not correlated with other significant morphological differences. Nor is the geographical distribution of these collections indicative of a stable glabrous variety of *D. brasiliensis*. As Dr. Smith (3) has shown, the morphological characters of the New World (*Wintera*) section of *Drimys* are relatively unstable. The various taxonomic entities are not sharply defined and may be differentiated only by their general trends of morphological specialization. Thus, the papillate character is variable and unstable in *D. brasiliensis* and by itself cannot be relied upon in differentiating taxonomic entities.

FOLIAR SCLERENCHYMA

The leaves of the Winteraceae fluctuate markedly in texture and thickness and exhibit corresponding variations in their internal structure. The cells of the epidermis and mesophyll vary in size, form, and arrangement, in the thickness of their walls, and in the character of their pitting. The cellular characters fluctuate so markedly within species and apparently also within different leaves of the same individual that it is difficult to utilize such characters in differentiating taxonomic entities without examining a much wider range of material than is available at present. There are, however, certain structures and certain trends of specialization in the leaves of the Winteraceae that deserve mention. The stomata of the Winteraceae are characterized by having from 2 to 6 subsidiary cells oriented parallel to the guard cells. The leaves of the family are also characterized by the presence of numerous spherical secretory cells such as occur in the cortex and pith of the stem and in the floral organs. Since both of these cellular characters are of common occurrence in woody ranalian families, they are not indicative of close relationship to any one of these families.

As indicated in the preceding paper (1) of this series, the larger foliar veins are jacketed by sclerenchyma in the *Wintera* section of *Drimys*, whereas the terminal veinlets are not, the only lignified elements being spirally or reticulately thickened tracheids, *Figs. 13* and *15*. The sclerenchymatous jackets of the larger veins are composed of slender, elongated, thick-walled cells. The leaves of this section of *Drimys* form, in addition, more or less numerous large, armed sclereids that are scattered through the spongy part of the mesophyll, *Figs. 13* and *15*. These sclereids are conspicuous features of the leaves of *D. brasiliensis* and *D. granadensis*, being poorly developed or absent in only a few collections of these species. On the contrary, they are absent or feebly developed in *D. Winteri* var. *andina* Reiche. They fluctuate in abundance in *D. confertifolia* Phil., *D. Winteri* var. *punctata* (Lam.) DC., and *D. Winteri* var. *chilensis* (DC.) A. Gray. In var. *punctata* of *D. Winteri*, they tend to be more numerous on either side of the midrib, whereas in var. *chilensis* they frequently tend to be unevenly thickened and to be associated with smaller more nearly isodiametric thick-walled cells.

In the *Tasmannia* section of *Drimys*, both the coarser veins and the terminal veinlets usually are embedded in more or less massive sclerenchymatous jackets, *Figs. 14* and *18*. Only infrequently does one encounter a specimen having terminal veinlets of the type which characterizes the *Wintera* section of the genus. In most cases, the veins have an inner jacket of elongated thick-walled cells and, in addition, an outer layer of shorter, broader lignified cells whose secondary walls fluctuate considerably in thickness in different specimens, *Figs. 14* and *18*. Interspersed sclereids, of the type which are formed so commonly in the *Wintera* section of *Drimys*, are of exceptional occurrence, having been encountered by us only in certain atypical specimens of *Drimys Brassii* A. C. Sm., *D. hatamensis* Becc., and

D. reticulata Diels. These interspersed sclereids are, however, conspicuously smaller and have less extensively projecting arms than those of the *Wintera* section. Such sclereids, of the type shown in *Fig. 17*, are of more frequent occurrence in *Pseudowintera axillaris* var. *colorata* (Raoul) A. C. Sm., but the veinlets of this plant, as of var. *typica* A. C. Sm., are somewhat intermediate in structure between those of the *Wintera* and the *Tasmannia* sections of *Drimys*.

In the six species of *Belliolum* available to us, the veins and terminal veinlets have sclerenchymatous jackets of the *Tasmannia* type. Isolated, lignified, thick-walled cells and clusters of sclereids are of sporadic occurrence in the leaves of *B. rivulare* v. Tiegh. (*Vieillard 2278*). The cells of the mesophyll in leaves of *B. crassifolium* (Baill.) v. Tiegh. (*Schlechter 15348*) have curious lignified reticulate thickenings, such as were encountered by van Tieghem (4) in the leaves of *B. Pancheri* (Baill.) v. Tiegh. and *B. Vieillardi* v. Tiegh. We have not observed such thickenings, however, in the leaves of *B. Burttianum* A. C. Sm. (*Kajewski 1680*), *B. gracile* A. C. Sm. (*Brass 2898*), *B. haplopus* (Burtt) A. C. Sm. (*Kajewski 1994*), *B. Kajewskii* A. C. Sm. (*Kajewski 2099*), and *B. rivulare* v. Tiegh. (*Vieillard 2278*).

In the leaves of the 17 species of *Bubbia* examined by us, the veins and terminal veinlets have sclerenchymatous jackets of the *Tasmannia* type, *Fig. 16*, but the mesophyll exhibits a wide range of structural variability. The cells of the mesophyll may have walls of relatively uniform thickness, *Fig. 16*, or they may have lignified reticulate thickenings as in certain collections of *Belliolum*. Isolated, interspersed, lignified, thick-walled cells, *Fig. 17*, which vary in form, abundance, distribution, and wall thickness, occur in more than half of the species examined by us. More or less massive clusters or nests of sclereids, *Fig. 12*, are formed in a number of species. In *B. pachyantha* A. C. Sm. (*Brass 4371*), they occur in association with interspersed, isolated sclereids; in *B. isoneura* v. Tiegh. (*Vieillard 17*), *B. semecarpoides* (F. v. Muell.) Burtt (*Kajewski 1216*), *B. sylvestris* A. C. Sm. (*Clemens 41142*), and *B. Whiteana* A. C. Sm. (*Kajewski 1495*), they occur among reticulately thickened mesophyll cells. It is of interest that, as shown in *Figs. 12* and *17*, the structure of the leaf may fluctuate markedly in different collections of the same species. In *B. sylvestris*, the walls of the mesophyll in *Clemens 41800* are of relatively uniform thickness throughout, whereas in *Clemens 4463* they are provided with reticulate thickenings, and in *Clemens 41142* with such thickenings in association with conspicuous nests of sclereids.

There is an even wider range of variability in the foliar structures of *Zygogynum*. Thus, the terminal veinlets of *Z. pomiferum* Baill. (*Balansa 2328*) and *Z. spathulatum* v. Tiegh. (*Vieillard 2266*) are without well developed sclerenchymatous jackets, the cells of the mesophyll have relatively uniform thickenings, and there are no interspersed sclereids or nests of sclereids. On the contrary, in *Z. Bailloni* v. Tiegh. (*Franc*), *Z. bicolor* v. Tiegh. (*Lécart 41*), and *Z. Vieillardi* Baill. (*Franc 1740*), the veins and

terminal veinlets are of the *Tasmannia* type, the cells of the mesophyll have reticulate types of thickenings, and both armed thick-walled cells and nests of sclereids are scattered through the mesophyll. The veins and veinlets are of the *Tasmannia* type in both species of *Exospermum, E. Lecarti* v. Tiegh. (*Lécart 144*) having a reticulately thickened mesophyll and *E. stipitatum* (Baill.) v. Tiegh. (*Vieillard 2281*) a thin-walled one with scattered more or less isodiametric sclereids.

The available evidence indicates that internal foliar characters are unstable and variable in the Winteraceae, particularly in the genera *Belliolum, Bubbia,* and *Zygogynum.* Much more extensive collections must be studied before attempting to utilize such characters as an aid in differentiating taxonomic entities. Sufficient material has been analyzed, however, to indicate that there are certain significant trends of foliar specialization in the Winteraceae. In the *Wintera* section of *Drimys,* increasing coriaceousness is attained largely by the formation of large, armed sclereids interspersed through the mesophyll, *Figs. 13* and *15.* On the contrary, in the *Tasmannia* section of *Drimys,* sclerification progresses along the veins and veinlets, the bulk of the mesophyll remaining thin-walled, *Figs. 14* and *18.* In *Belliolum, Bubbia,* and *Zygogynum,* increasing coriaceousness commonly involves intensified sclerification along the veins and veinlets, *Fig. 16,* the formation of interspersed sclereids and clusters of sclereids, *Figs. 12* and *17,* and not infrequently the formation of lignified thickenings throughout the mesophyll. In the more coriaceous species of *Bubbia* and *Zygogynum,* all three trends of sclerification may occur simultaneously.

As noted by van Tieghem (4), there are conspicuous variations in the occurrence and distribution of sclerenchymatous cells in the stems and petioles of the Winteraceae. In the stem, each vascular strand of the eustele is capped externally by slender thick-walled fibers and is subtended internally by elongated, lignified, thick-walled cells. During the earlier stages of the development of the secondary body, the external arcs of fibers may be fused into a more or less continuous ring of sclerenchyma by the sclerification of intervening parenchymatous elements. The later-formed secondary phloem is not stratified as in the Degeneriaceae, Magnoliaceae, and Annonaceae, but contains irregularly oriented patches of sclerenchymatous tissue. The pith and cortex may contain scattered sclerenchymatous cells of varied form, clusters of sclereids, or may be largely devoid of such structures. In general, there is a much more extensive sclerification of the cortex and pith in the Old World representatives of the Winteraceae. Particularly in the more coriaceous species of *Belliolum, Bubbia, Exospermum,* and *Zygogynum,* there tends to be an exaggerated development of clustered sclereids throughout the pith and cortex.

It should be mentioned in conclusion that crystal-bearing cells are of relatively infrequent occurrence in the lamina of winteraceous leaves. They have been observed by us only in *Bubbia Clemensiae* A. C. Sm. (*Clemens 4596*) and *Exospermum stipitatum* (Baill.) v. Tiegh. (*Vieillard 2281*). According to van Tieghem (4), there are no crystalliferous cells in the

stems and leaves of *Drimys*, but such cells occur in the stems of *Pseudowintera*, *Belliolum*, *Bubbia*, *Exospermum*, and *Zygogynum*, being commonly more or less closely associated with the medullary and cortical sclerenchyma.

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EXPLANATION OF PLATES

PLATE I

Lower surface of dry leaves photographed with reflected light. Magnification × 40.

FIG. 1. *Zygogynum Vieillardi* Baill., *Franc 1740*. FIG. 2. *Pseudowintera axillaris* var. *typica* A. C. Sm., *Kirk 347*. FIG. 3. *Bubbia longifolia* A. C. Sm., *Brass 13868*. FIG. 4. *Drimys piperita* Hook. f., *Elmer 9912*. FIG. 5. *Drimys Winteri* var. *chilensis* (DC.) A. Gray, *Hastings 355*. FIG. 6. *Drimys granadensis* var. *mexicana* (DC.) A. C. Sm., *Standley 42319*.

PLATE II

Figures 7–11: transverse sections of leaves stained with Haidenhain's haematoxylin and Sudan III and mounted in glycerin.

FIG. 7. *Zygogynum Bailloni* v. Tiegh., *Franc*. Showing occlusion of stoma by alveolar cutin, × 900. FIG. 8. *Drimys Winteri* var. *chilensis* (DC.) A. Gray, *Sargent*. Showing occlusion of stoma by alveolar cutin, × 1180. FIG. 9. *Drimys granadensis* var. *grandiflora* Hieron., *Holton 673*. Showing occlusion of stoma by internally alveolar and externally homogeneous cutin, × 900. FIG. 10. *Drimys granadensis* var. *grandiflora* Hieron., *Triana*. Showing 3-layered cuticle in interstomatal region, the middle layer being alveolar, × 900. FIG. 11. *Drimys brasiliensis* var. *campestris* (St. Hil.) Miers, *Mexia 5791*. Showing occluded stoma between two papillae, × 900. FIG. 12. *Bubbia Whiteana* A. C. Sm., *Kajewski 1495*. Cleared leaf showing clusters of sclereids, × 80.

PLATE III

Leaves cleared in hot dilute NaOH and mounted unstained in diaphane. Magnification × 145.

FIG. 13. *Drimys granadensis* var. *grandiflora* Hieron., *Cuatrecasas 6687*. FIG. 14. *Drimys rubiginosa* A. C. Sm., *Brass 12629*. FIG. 15. *Drimys granadensis* var. *grandiflora*, *Balls 5749*. FIG. 16. *Bubbia longifolia* A. C. Sm., *Brass 13868*. FIG. 17. *Bubbia Whiteana* A. C. Sm., *Brass 2278*. FIG. 18. *Drimys macrantha* A. C. Sm., *Brass 4519*.

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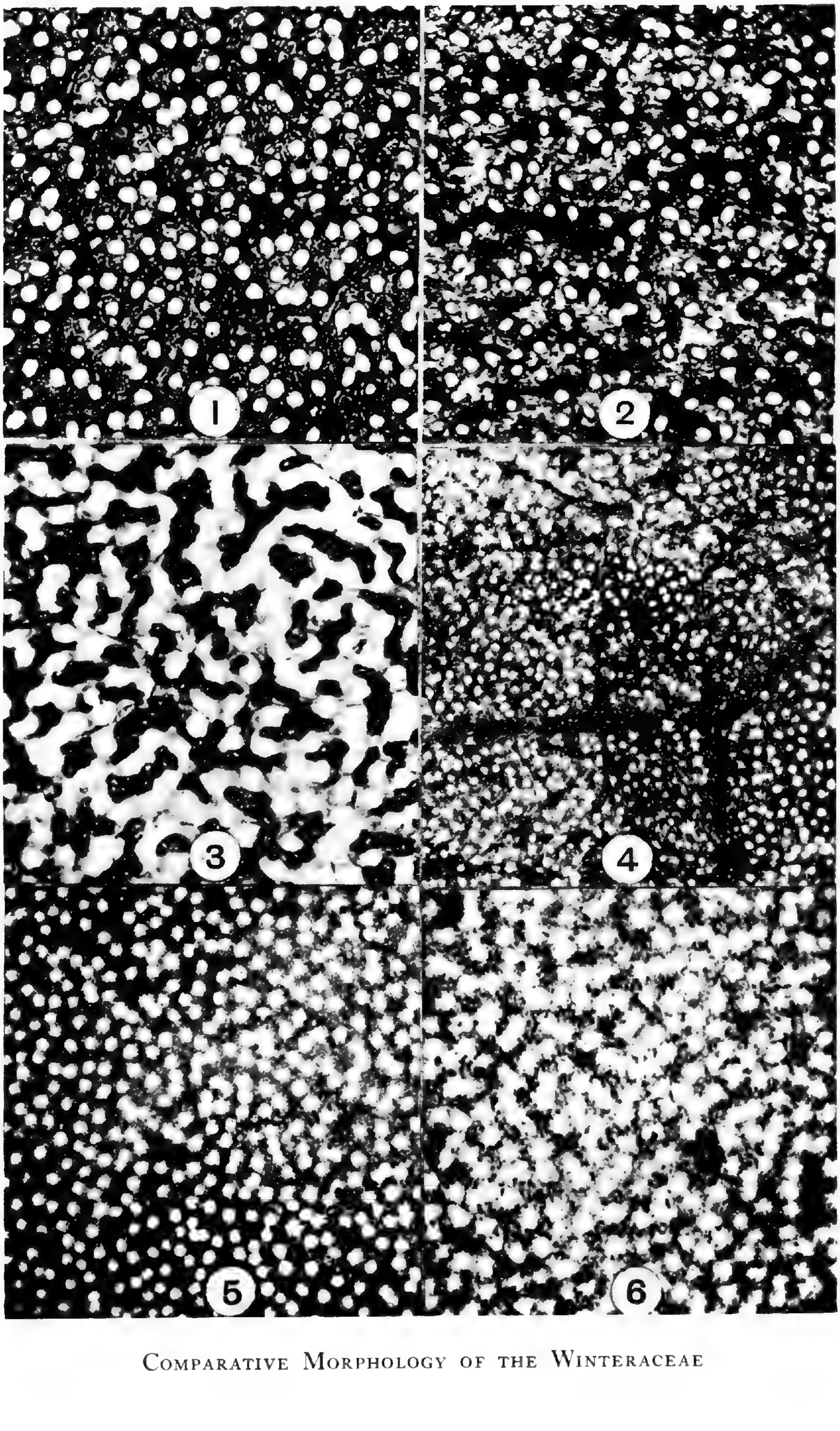
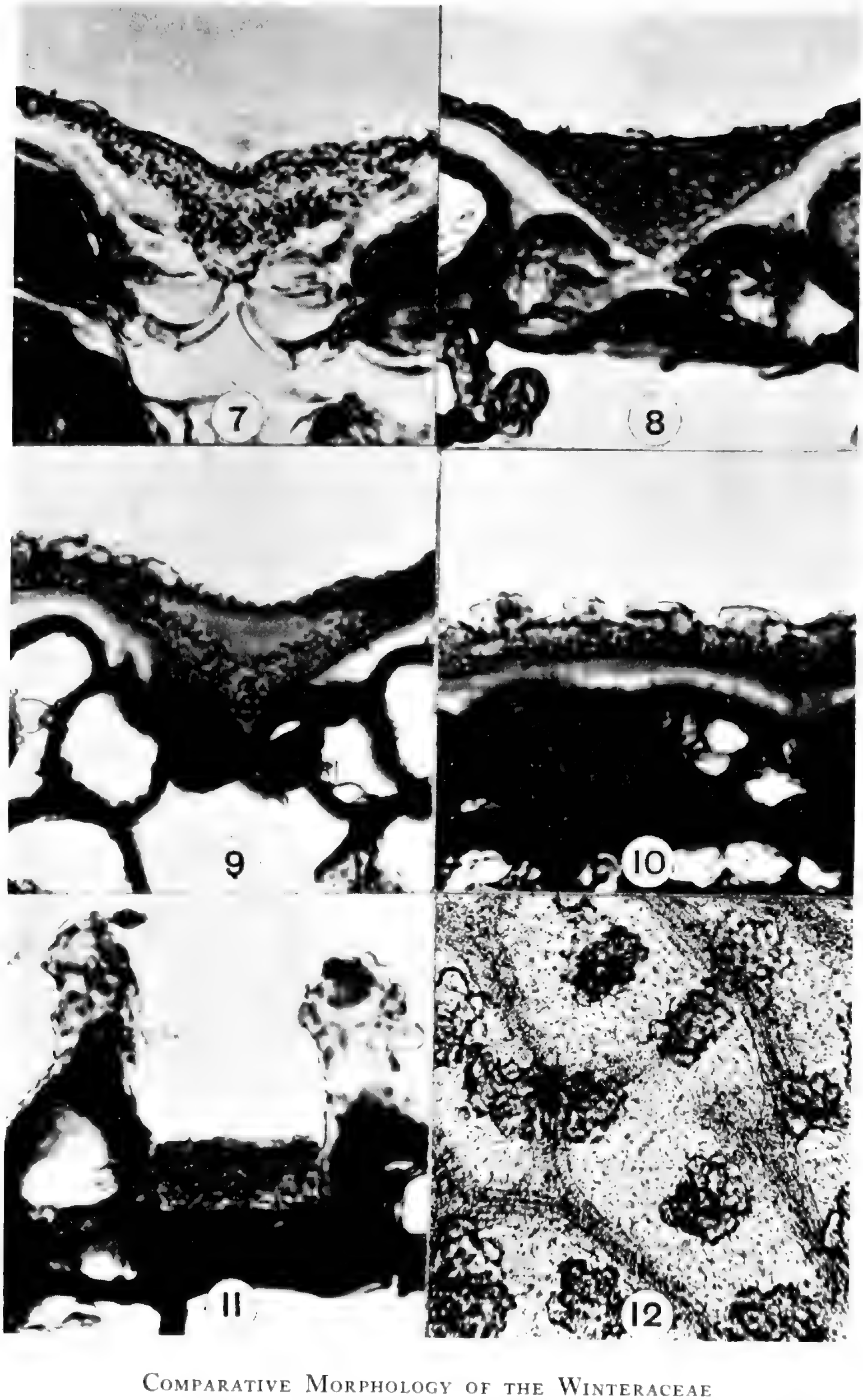


COMPARATIVE MORPHOLOGY OF THE WINTERACEAE



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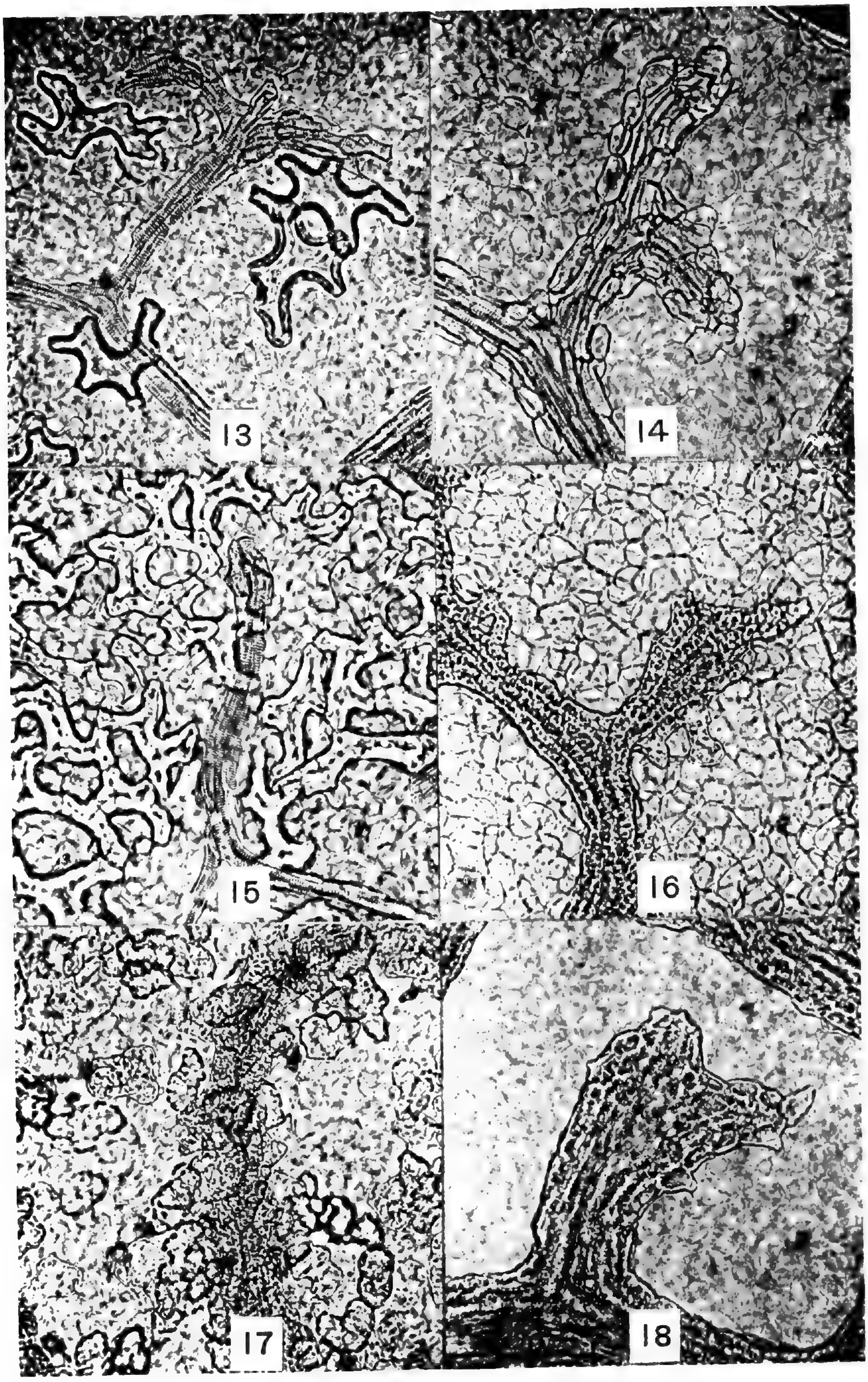

COMPARATIVE MORPHOLOGY OF THE WINTERACEAE

REVISION DEL GENERO ONOSERIS

RAMÓN FERREYRA*

Con nueve láminas

INTRODUCCION

EL GÉNERO *Onoseris* es uno de los miembros de la tribu Mutisieae, de las Compuestas. Comprende plantas que viven en Méjico, Centro América, y principalmente en la Cordillera Occidental de los Andes del Ecuador y Perú. Son de aspecto atractivo particularmente por sus flores que son moradas y amarillas. Algunas especies son anuales y endémicas de las "formaciones de loma" propias de la costa peruana, que se caracteriza por intermitentes precipitaciones denominadas "garúas", las que se inician en Junio y duran hasta Septiembre. Dentro de este grupo llama la atención por la hermosura de sus capítulos y flores la especie *O. odorata*.

Es de presumir que algunas especies se podrían domesticar como plantas de adorno dada la belleza de sus flores.

HISTORIA

Las primeras especies del género *Onoseris* fueron publicadas por Linneo hijo, Suppl. Pl. 349, 350 (1781), bajo los nombres de "*Atractylis purpurea*" y "*Atractylis Mexicana*". Afortunadamente estas especies se pudieron identificar con exactitud, por las ilustraciones que Smith, Ic. ined. 65, *t. 65*, hizo del material de Linneo.

El género *Onoseris* fué establecido por Willdenow, Sp. Pl. 3^3: 1702 (1804), incluyendo las 2 especies de Linneo bajo los nombres de *O. purpurata* Willd. y *O. mexicana* Willd. Este concepto de Willdenow fué por lo tanto artificial. Las 2 especies pertenecen á distintos géneros de las Mutisieae, Compuestas.

El primero que reconoció ese artificio fué de Candolle, Ann. Mus. Paris **19**: 65 (1812), quien dió una descripción original del género y agregó un concepto muy importante al decir: "Huc *Onoseris purpurata* Wild. Altera species est dubia." Posteriormente Cassini, Dict. Sci. Nat. **33**: 463, 475 (1824), no aceptó el concepto artificial y separó las 2 especies de Willdenow, tomando *O. mexicana* para describir el nuevo género *Lycoseris*. Excepto Kuntze, Rev. Gen. **1**: 354 (1891), los botánicos siguieron á Cassini considerando *O. purpurata* como Tipo de *Onoseris*.

En 1807 Willdenow, Mag. Ges. Naturk. Fr. Berlin **1**: 139 (1807), publicó el género *Seris*, basándose en un espécimen de Colombia recibido de Humboldt y descrito brevemente como sigue: "I. SERIS Calyx imbri-

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catus patulus Corollae tubulosae Pappus pilosus sessilis. Receptaculum nudum. Gehört zur *Syngenesia aequalis* und hat mit *Cacalia* und *Staehelina* Aehnlichkeit." Esta planta que más tarde se describió como *Isotypus onoseroides* H. B. K. (1820) es ahora conocida con el nombre de *Onoseris onoseroides* (H. B. K.) Robinson. Otto Kuntze, Rev. Gen. 1: 364 (1891), declara que Willdenow publicó el binomio "*Seris onoserodes*", pero en realidad este binomio parece haber sido publicado primero por Sprengel, Syst. Veg. 3: 426 (1826). El género *Seris* Willd. no se usó mucho y en la literatura está dado en su mayor parte como sinónimo de *Isotypus* ó insuficientemente descrito. Lessing, Linnaea 5: 253 (1830), descartó completamente *Seris* Willd. y usó el nombre genérico para otro género (*Richterago* Kuntze) de Compuestas.

En 1891, Kuntze sostiene que el nombre *Onoseris* pertenece con la segunda especie de *Onoseris* de Willdenow al género usualmente llamado *Lycoseris* Cass. El mismo autor Kuntze usó *Seris* Willd. como el correcto nombre genérico para las plantas tratadas en la presente monografía. También sostuvo que Willdenow consideró *O. mexicana* como típica de su género, apoyándose en las siguientes razones. Primera, el herbario de Willdenow contenía un espécimen (posteriormente descrita como *Lycoseris denticulata* Less.) guardado en la cubierta de *Onoseris*. Segunda, Willdenow al publicar *Seris*, dió un nombre genérico para *Onoseris purpurata*, dejando el nombre de *Onoseris* para *O. mexicana*. El asunto de que Willdenow, después de describir su género *Onoseris*, recibió un ejemplar de *Lycoseris* y lo depositó en su herbario como una especie de *Onoseris* es interesante pero no importante. Aunque Willdenow publicó *Seris*, él desconoció la estrecha relación de *Seris* con respecto de su primer género *Onoseris* y por eso no pudo dar ninguna opinión acerca de cuál de las 2 especies debería ser el Tipo de ese género.

Con excepción de Kuntze, de todos los autores comenzando con de Candolle en 1812, cada uno excluyó *O. mexicana* de *Onoseris* ó la consideró como un miembro dudoso de este género. El primer botánico (Cassini, 1830) que dividió *Onoseris* conservó *O. purpurata* en dicho género y colocó la segunda especie de Willdenow, *O. mexicana*, en el nuevo género descrito *Lycoseris*. Es costumbre permitir á la primera persona que segrega un género artificial seleccionar cuáles de los miembros deberían conservarse en el género limitado. Desde que Willdenow no dió ninguna prueba evidente para saber cuál de sus 2 especies era la más típica de *Onoseris* parece razonable seguir á Cassini y á la gran mayoría de botánicos continuadores, los cuales tipifican el género por *Onoseris purpurata* Willd.

El género *Isotypus* H. B. K., Nov. Gen. et Sp. 4: 12. *t. 307*, con una sóla especie *I. onoseroides* H. B. K., fué publicado en 1820. Aunque fué antedatado por *Seris* Willd. (1807) y aparentemente basado en duplicados de la misma colección de Humboldt, lo aceptaron los botánicos (y *Seris* citada como un sinónimo) hasta que Bentham & Hooker, Gen. Pl. 2: 487 (1873), lo consideraron como una Sección de *Onoseris*. Los botánicos posteriores á Bentham & Hooker consideraron *Isotypus* simplemente como un grupo bien marcado de especies de *Onoseris*.

El género *Hipposeris* Cass., Dict. Sci. Nat. **33**: 464 (1824), fué publicado para incluir *Onoseris "Salicifosia"* [*salicifolia*] H. B. K. y *O. acerifolia* H. B. K. Cassini no hizo la combinación *Hipposeris salicifolia* é *Hipposeris acerifolia*. Estos nombres aunque atribuídos á él fueron primero publicados en el Index Kewensis, **2**: 1164 (1893).

En 1829, D. Don, Trans. Linn. Soc. **16**: 254 (1829), funda el género *Centroclinium* de material del herbario de Ruiz y Pavón encontrado "In Peruvia". Solamente cita una especie *C. albicans*. Sin embargo, Don al referirse á *Onoseris salicifolia* dice: "may possibly belong to this genus". D. Don describe en el mismo tomo un nuevo género *Chaetachlaena*, fundándose también en el material del herbario de Ruiz & Pavón y Tafalla. Aunque este último, posiblemente por error, indica la localidad: "In Guayaquila Peruvianorum", la única especie de este género citada por Don *"C. odorata"*, y que en el presente trabajo se llama *Onoseris odorata*, sólo es endémica de la vertiente occidental de los Andes del centro y sur del Perú. También Don está de acuerdo que *Centroclinium* tiene estrecha relación con este nuevo género porque dice: *"Chaetachlaena* is intimately allied to the preceding genus; the structure of the florets and pappus proves this most satisfactorily;".

De Candolle publicó en Prodromus 7^1: 33 (1838) el nombre genérico *Hilairia* como sinónimo de *Isotypus* H. B. K.

Tres años más tarde Bentham, Pl. Hartw. 88 (1841), describe el género *Caloseris* con una sóla especie, *C. rupestris*, encontrada por Hartweg en Guatemala. Este nombre es sinónimo de *Onoseris onoseroides* (H. B. K.) Robinson.

Spach, Hist. Nat. Veg. **10**: 35 (1841), considera el género *Cladoseris*, basándose sólo en *Onoseris* Sección *Cladoseris* Lessing, Linnaea **5**: 341 (1830), donde figura la descripción de una especie, *O. annua* Less., procedente del Perú. No se ha podido encontrar ningún binomio bajo este género.

Nuttall, Trans. Am. Philos. Soc. n. s. **7**: 422 (1841), estableció el género *Cursonia* describiendo una especie, *C. peruviana*, que probablemente pertenece á *Onoseris odorata*.

Klotzsch, Allg. Gartenz. **17**: 82 (1849), hizo la descripción de un nuevo género, *Schaetzellia*, con una sóla especie, *S. Deckeri* Kl. Fué descrita de material cultivado de semillas enviadas de Colombia. Este nombre es sinónimo de *Onoseris onoseroides* (H. B. K.) Robinson.

Dos años después Turczaninow, Bull. Soc. Nat. Moscou 24^2: 94. *t. 2* (1851), funda el género *Rhodoseris* y la especie *R. conspicua* de material colectado por Jurgensen en Méjico. El nombre *R. conspicua* es sinónimo de *Onoseris onoseroides* (H. B. K.) Robinson.

Posteriormente Koch & Fintelmann, Wochenschrift Gärt. u. Pflanzenkunde **2**: 163 (1859), menciona, sin hacer descripción, el género *Cataleuca* y la especie *C. rubicunda*. Esta especie no figura en el Index Kewensis y se la cultivó en Bélgica bajo el nombre de *C. rubicunda*. En esta monografía recibe el nombre de *Onoseris onoseroides* (H. B. K.) Robinson. Por último Coulter, Bot. Gaz. **20**: 52. *t. 6* (1895), describe el género *Pereziopsis*, basado de un material colectado por Heyde & Lux en Guatemala

y cita *P. Donnell-Smithii*, que es sinónimo de *Onoseris Donnell-Smithii* (Coult.) Ferreyra.

MORFOLOGIA

RAÍZ. Casi todo el material estudiado carece de raíz completa y por eso me veo en la imposibilidad de hacer un estudio detallado de su morfología. Existen 6 especies de raíz anual más ó menos pivotante y el resto de raíz perennial.

TALLO. Los tallos son por lo general costados, excepción de *O. acerifolia*, que es terete. Algunas especies, entre ellas *O. hastata*, *O. alata*, y *O. sagittata*, se caracterizan por tener un tallo subterráneo distinto al rizoma, el cual origina ramas que crecen en el subsuelo y de las que se desprenden el escapo ó las hojas, que siempre son de posición semiarrosetada. En *O. speciosa*, la base del tallo es diferente de las anteriores, se distingue por ser más corta y contraída como la forma de un caudex, además está cubierta de un tomento bruno y copioso. Otras especies arbustivas, como *O. onoseroides*, *O. silvatica*, y *O. costaricensis*, poseen un tallo vertical bien desarrollado. Con excepción de *O. acerifolia*, que tiene tallo leñoso y cubierto de pelos glandulosos, todas las demás especies tienen tallo poco consistente y blanco ó gris-lanuginoso.

HOJAS. Son alternas y de distribución esparcida ó más ó menos arrosetada. El limbo es muy variado no solamente por su forma sino también por sus dimensiones. En *O. onoseroides* y *O. Donnell-Smithii* las hojas son muy desarrolladas, el limbo es cordiforme y alcanza hasta 280 mm. de largo por 320 mm. de ancho; no sucede lo mismo con *O. hyssopifolia* de hojas pequeñas cuyo limbo lineal puede tener hasta 45 mm. de largo por 3 mm. de ancho. El limbo puede ser también asaetado ó poco más ó menos truncado en la base, como en *O. Castelnaeana*, *O. hastata*, *O. alata*, y *O. sagittata*. La forma predominante es lanceolada (10 especies). El margen generalmente es dentado y extendido ó muy poco revoluto. La forma y el tamaño de los dientes son variables, siendo ellos en las especies arbustivas más grandes, numerosos, y desiguales contrariamente á *O. Drakeana* y *O. salicifolia* cuyos dientes son pequeños y escasos. Únicamente *O. hyssopifolia* tiene margen entero y muy revoluto; otro caso particular es *O. acerifolia* cuyo margen presenta lóbulos angulosos é irregulares.

La disposición de las nervaduras puede ser palminerviada ó penninerviada. Todas las especies de Centro América y algunas de Sudamérica son palminerviadas, la base siempre posee 5 nervios palmados, solamente *O. acerifolia* tiene 7 á 8 nervios, también palmados. Las especies anuales y las sufruticosas *O. albicans*, *O. salicifolia*, *O. Weberbaueri*, y *O. gnaphalioides* son penninerviadas.

El haz es más ó menos araneoso y luego glabrescente, el envés gris-lanuginoso. Sin embargo *O. salicifolia* tiene el envés blanco-lanuginoso y su limbo membranáceo es de menor espesor que el de cualquier otra especie.

Las hojas usualmente son pecioladas, siendo sésiles en *O. minima*, *O. hyssopifolia*, *O. gnaphalioides*, y *O. Weberbaueri*. El pecíolo es terete en una especie, *O. acerifolia*, alado sin lóbulos en *O. hastata* y *O. Drakeana*,

y finalmente alado y con lóbulos en *O. onoseroides, O. costaricensis, O. Donnell-Smithii, O. silvatica, O. peruviana, O. fraterna, O. speciosa, O. purpurea,* y *O. sagittata.* El número de los lóbulos varía siendo en *O. silvatica,* variedad colombiana, de 11 pares y en *O. fraterna* de 9 pares; por el contrario *O. sagittata* lo tiene de 1–3 pares. El margen de los lóbulos puede ser muy dentado (*O. Donnell-Smithii*) ó entero (*O. sagittata*).

PUBESCENCIA. Hablando de una manera general, los pelos son largos ó cortos, rígidos ó más ó menos laxos. Solamente *O. acerifolia* se distingue por sus pelos que son hirsutos, numerosos, y terminan en una glándula que después se hace bruna. También *O. Donnell-Smithii* se caracteriza por tener pelos glandulosos, purpurascentes, los cuales se pueden encontrar en el eje de la inflorescencia. Algunas especies presentan una pubescencia muy compacta, suave, y más ó menos araneosa como sucede por ejemplo con *O. peruviana* y *O. silvatica,* mientras que otras la tienen mucho menos compacta; entre éstas últimas se pueden citar *O. Weberbaueri* y *O. hyssopifolia.*

INFLORESCENCIA. Todas las especies anuales y las sufruticosas *O. albicans, O. acerifolia, O. Weberbaueri, O. salicifolia, O. hyssopifolia,* y *O. gnaphalioides* se caracterizan por tener capítulos solitarios y terminales, ya sea en las ramas ó en el ápice del tallo. Las especies arbustivas poseen numerosos capítulos, dispuestos en panícula, pudiendo ésta alcanzar un gran desarrollo como *O. onoseroides,* que tiene hasta 300 capítulos aproximadamente. Otras especies sudamericanas pueden tener una inflorescencia muy poco ramificada, es decir de 2–8 capítulos (*O. speciosa, O. purpurea, O. sagittata, O. alata, O. Drakeana,* y *O. Castelnaeana*).

INVOLUCRO. Es acampanado pero en *O. Donnell-Smithii* y *O. onoseroides* es visiblemente turbinado. Puede ser también hemisférico (*O. salicifolia* y *O. acerifolia*). Las brácteas involucrales son más ó menos lanceoladas. Existen 2 especies, *O. odorata* y *O. acerifolia,* que muestran peculiaridades en las brácteas del involucro; en ambas el ápice de las brácteas es largamente atenuado y muy flexuoso, además la segunda tiene el dorso de sus brácteas cubierto totalmente de pelos glandulosos. En *O. fraterna* el ápice es bruscamente agudo y *O. Castelnaeana* muestra un ápice rígido y curvado hacia fuera. La mayor parte de las especies tienen el dorso de sus brácteas más ó menos araneoso. Sin embargo *O. Donnell-Smithii* presenta glándulas subuladas á lo largo del nervio medio, mientras que *O. onoseroides* tiene el dorso casi glabro. Las 2 últimas especies se distinguen también por el color rojizo de sus brácteas.

FLORES. De las 25 especies 3 (*O. onoseroides, O. Donnell-Smithii,* y *O. costaricensis*) son de capítulos homógamos, el resto heterógamos.

FLOR DEL DISCO. La corola tubulosa es siempre amarilla. El tubo por lo general es recto pero en *O. odorata* y *O. Cumingii* es geniculado y la rodilla rodeada de pequeños pelos. En *O. amplexicaulis, O. salicifolia,* y *O. hyssopifolia* el tubo es recto y adornado por pelos cortos de disposición anular y cerca de la parte media. Las siguientes especies, *O. albicans, O. gnaphalioides, O. fraterna, O. silvatica, O. peruviana, O. costaricensis,* son de tubo completamente glabro, las demás especies del género son más

ó menos pubescentes. El tubo puede ser cilíndrico ó ampliado en la parte superior; pertenecen al primer caso *O. albicans* y *O. fraterna* y al segundo *O. silvatica, O. peruviana,* y *O. Castelnaeana.* Las 3 especies homógamas y las heterógamas, *O. salicifolia* y *O. hyssopifolia,* tienen la corola bilabiada con un lóbulo más grande que los 4 restantes iguales. También son bilabiadas *O. amplexicaulis, O. albicans, O. minima, O. odorata, O. Cumingii, O. gnaphalioides,* y *O. fraterna,* pero este grupo se diferencia del anterior porque tiene 2 lóbulos iguales y más grandes que los otros 3. Todas las corolas zigomorfas son siempre de lóbulos ascendentes.

Las especies de corola actinomorfa pueden dividirse en 2 grupos según sean sus lóbulos revolutos ó ascendentes. Son de lóbulos revolutos *O. Drakeana, O. Castelnaeana, O. alata, O. acerifolia,* y *O. Weberbaueri* mientras que *O. sagittata, O. peruviana, O. silvatica, O. hastata, O. purpurea,* y *O. speciosa* son de lóbulos ascendentes. La mayor parte de especies poseen pequeños pelos en el dorso de sus lóbulos.

Es interesante comprobar que las corolas zigomorfas y actinomorfas presentan formas de transición; tal sucede con *O. fraterna* cuyos lóbulos son ligeramente desiguales, luego con *O. hyssopifolia* y *O. albicans* que muestran gradualmente mayor diferenciación. Los estambres son asaetados y la cola puntiaguda, sin embargo *O. albicans* y *O. amplexicaulis* tienen el ápice de la cola filiforme. Algunas especies poseen cola adornada por pelos cortos divaricados y únicamente *O. Donnell-Smithii* se diferencia por tener los pelos más grandes y ascendentes. El filamento es cilíndrico, siendo unas veces glabrescente como en *O. amplexicaulis* y *O. gnaphalioides* y otras veces finamente pubescente; entre estas últimas destaca *O. hastata* cuyos pelos son más grandes. El estigma es claviforme y más ó menos cilíndrico en *O. onoseroides* y *O. purpurea.* Las ramas son generalmente glabrescentes pero ciertas especies tienen el dorso ó el margen de las ramas cubierto de pelos muy cortos (*O. alata, O. salicifolia,* y *O. speciosa*).

FLOR MARGINAL. La corola es bilabiada y morado-violada. El tubo es aproximadamente cilíndrico y sólo en *O. peruviana* es contraído encima de la parte media. Más de la mitad de las especies tienen el tubo más ó menos pubescente. Son de tubo glabro *O. minima, O. odorata, O. amplexicaulis, O. Cumingii, O. albicans, O. gnaphalioides, O. fraterna,* y *O. peruviana.* El labio externo siempre es de mayor longitud que la del tubo, excepción de *O. fraterna* y *O. peruviana,* que son casi de la misma longitud. La mayoría de las especies son de labio externo lanceolado y con 6 nervios, solamente *O. acerifolia* presenta hasta 12. El ápice es tridentado, variando el tamaño de sus lóbulos; por ejemplo los lóbulos de *O. amplexicaulis* son muy desarrollados á diferencia de *O. Drakeana, O. purpurea,* y *O. fraterna* de lóbulos muy pequeños. El dorso es araneoso pero *O. hastata, O. Weberbaueri, O. speciosa,* y *O. acerifolia* presentan además pelos cortos y laxos. El labio interno es de 2 clases: entero y bipartido. Son de labio entero *O. fraterna, O. silvatica, O. purpurea, O. Drakeana, O. peruviana,* y *O. acerifolia;* las 3 primeras tienen el ápice muy poco retorcido al contrario de las 3 últimas que son de ápice espiralado y muy revoluto. Las demás especies poseen labio interno bipartido y con el ápice siempre atenuado.

La longitud del labio también es variable, en *O. hyssopifolia* es muy corto siendo en *O. Weberbaueri* y *O. speciosa* muy largo y retorcido en el ápice. Las especies *O. alata* y *O. amplexicaulis* se caracterizan de todas las demás, porque el seno situado entre los 2 lóbulos del labio interno es más profundo que los senos laterales.

AQUENIO. No maduro, es más ó menos cilíndrico y costado; algunas especies se distinguen por sus costillas de borde ancho y obtuso como *O. odorata, O. minima,* y *O. albicans.* Exceptuando *O. gnaphalioides, O. albicans,* y *O. Cumingii,* de aquenios glabrescentes, todas las demás especies son totalmente pubescentes y los pelos cortos, ascendentes, amarillos; sin embargo *O. alata* presenta pelos casi estrigosos.

PAPUS. Los pelos son siempre numerosos, amarillos, y cortamente barbelados. Es necesario indicar que algunas especies son de papus heteromorfo con los pelos internos de mayor longitud y grosor que los externos. Los pelos internos pueden ser más anchos y poco curvados cerca del ápice como en *O. salicifolia, O. albicans,* y *O. sagittata,* mientras que en otras especies pueden ser más anchos en la base y largamente atenuados y rectos hasta el ápice como en *O. amplexicaulis, O. odorata, O. Cumingii,* y *O. minima.* Se ha podido observar que en la flor hermafrodita los pelos del papus tienen mayor longitud que en la flor marginal; sin embargo *O. fraterna* se caracteriza porque los pelos del papus tienen igual longitud en ambas flores.

RELACIONES GENERICAS

Al intentar relacionar el género *Onoseris* con otros géneros, no ha sido posible hallar caracteres particulares con los cuales se pueda establecer una relación directa. El género *Onoseris* posee caracteres propios y distintos. Se ha colocado en Mutisieae-Gochnatinae porque sus flores son actinomorfas como en *O. Drakeana, O. Castelnaeana, O. alata, O. acerifolia, O. Weberbaueri, O. sagittata, O. peruviana, O. silvatica, O. hastata, O. purpurea,* y *O. speciosa.* Las especies restantes presentan flores ligeramente zigomorfas y de acuerdo con la descripción dada en la llave, dichas especies deberían ser colocadas dentro del grupo Mutisieae-Mutisinae. Sin embargo no es posible hacerlo porque casi la mitad del total de especies son enteramente actinomorfas y las otras especies en su mayor parte tienen la corola tubulosa muy poco dividida de manera que sus flores no se pueden considerar estrictamente zigomorfas; además estas últimas se caracterizan porque sus lóbulos son siempre ascendentes y nunca revolutos. Algunos autores colocaron erróneamente ciertas especies del género *Trichocline* dentro de *Onoseris.* En *Trichocline* la flor tubulosa es bilabiada, siendo el labio externo liguliforme, extendido, ó revoluto y el labio interno generalmente más grande y sus 2 lóbulos siempre revolutos y divergentes. Tratándose de *Onoseris,* como ya se ha indicado arriba, los lóbulos de la flor considerada semibilabiada son siempre ascendentes. Por otra parte en *Trichocline* las ramas del estilo son muy cortas y más ó menos truncadas en el ápice (*T. hieracioides* (H. B. K.) Ferreyra; *T. caulescens* Phil.);

además las hojas son arrosetadas (excepto *T. nervosa* Less.). El género *Urmenetea* fué asimismo confundido con *Onoseris;* sin embargo tampoco existe relación directa porque la única especie del citado género, *U. atacamensis*, se caracteriza por tener hojas de envés muy reticulado, completamente distinto á *Onoseris*, aun más, la corola tubulosa es blanco-rosada (no amarilla); el tubo de la flor del disco, según se ha visto en la tábula, aparece con una ampliación ó ampolla más ó menos esférica cerca de la parte media; las ramas del estilo son muy cortas y obtusas (estilo no cilíndrico ni claviforme como en *Onoseris*) y finalmente el papus heteromorfo tiene 5 pelos subulados internos cuya longitud es aproximadamente 2 veces más que la longitud de los pelos externos que son más numerosos.

DISTRIBUCION

El área de distribución se extiende desde Méjico (*O. onoseroides*) hasta el norte de Argentina (*O. alata*), siguiendo la orientación de los Andes.

Las especies arbustivas tienen mayor concentración en Centro América y parte de la región más septentrional de Sudamérica; son endémicas de la selva. Las especies anuales son exclusivamente indígenas de la vertiente occidental de los Andes peruanos.

En el Perú habitan alrededor de 13 especies, de las que 9 son endémicas; en Centro América viven 4 y las otras especies tienen por habitat Colombia, Venezuela, Ecuador, Bolivia, y Argentina.

La planta de mayor distribución es *O. onoseroides*, la cual es posible encontrar en Méjico, Centro América, Colombia, y Venezuela; sigue *O. albicans* cuya dispersión geográfica comprende Ecuador, Perú, y Bolivia; á continuación sigue *O. gnaphalioides*, que se extiende desde el Noroeste del Perú hasta el Noroeste de Bolivia. Las otras especies tienen áreas mucho más reducidas, por ejemplo *O. hyssopifolia* que sólo habita en el Norte de Ecuador (Provincias de Imbabura y Pichincha).

MATERIAL EXAMINADO

Dejo constancia de mi agradecimiento á las personas encargadas de los herbarios, que á continuación se indican, por su gentileza al prestar el material necesario.

Los herbarios consultados y sus abreviaturas son los siguientes: Gray Herbarium of Harvard University (G); Field Museum of Natural History (FM); New York Botanical Garden (NY); United States National Herbarium (US); Department of Agriculture (National Arboretum) (DA).

Dado los inconvenientes actuales de la guerra no ha sido posible disponer de todos los Tipos, como hubiera sido mi deseo, pero pese á esa circunstancia se ha dispuesto de bastantes Tipos, fotografías, y material auténtico de la mayor parte de las especies y que al parecer son suficientes para hacer la identificación.

Las ilustraciones fueron ejecutadas por el autor, y en muchas de ellas, se simplificaron algunos detalles de poca importancia, con el exclusivo objeto de poder apreciar mejor los caracteres principales.

RECONOCIMIENTOS

La Estación Experimental Agrícola de La Molina acordó enviar un estudiante graduado á la Universidad de Harvard como pensionado del Gobierno peruano, con el fin de seguir estudios de Taxonomía. El Profesor Dr. Augusto Weberbauer, Técnico de La Molina, distinguido botánico cuyo nombre está asociado á numerosas plantas del Perú, á insinuación del ingeniero Bernardo Moravsky, entonces Superintendente; hizo la designación entre sus alumnos graduados de la Universidad Nacional Mayor de San Marcos. A mediados de 1942, el autor siendo Asistente de Botánica, fué elegido, obteniendo así la posibilidad de adquirir importantes conocimientos taxonómicos en una de las Universidades más prestigiosas de la Unión. Deseo expresar mi profundo agradecimiento al ilustre maestro Dr. Weberbauer, quien desde las aulas sanmarquinas supo despertar mi devoción por la Botánica y al ingeniero Bernardo Moravsky, actual Director de Agricultura, gran propulsor de todo lo relacionado con la agricultura nacional, por el honor y oportunidad que me han conferido.

En la Universidad de Harvard, el Profesor E. D. Merrill, Administrator of Botanical Collections, arregló el temporal nombramiento como Research Fellow at the Arnold Arboretum, concediéndome en esta forma todos los privilegios de un miembro de la Universidad. La mayor parte de los estudios fueron hechos en el Gray Herbarium, donde gracias á la bondad del Profesor M. L. Fernald, su Director, recibí todas las facilidades para el trabajo, el cual se hizo bajo la dirección del Dr. I. M. Johnston, quien sugirió *Onoseris* como un objeto de estudio y me concedió al mismo tiempo su ayuda y amistosa crítica á fin de llevar adelante la monografía. Durante la visita á Washington, D. C., el autor recibió la gentil ayuda del Sr. B. Y. Morrison, Dr. S. F. Blake, y Sr. E. P. Killip. A todos esos amigos y distinguidos botánicos en el Perú y Estados Unidos deseo expresar mi reconocimiento.

TRATAMIENTO SISTEMATICO

Onoseris Willdenow, Sp. Pl. 3^3: 1702 (1804); H. B. K. Nov. Gen. et Sp. 4: 12. *t. 307* (1807); de Candolle, Ann. Mus. Paris **19**: 65. *t. 12* (1812); Lagasca, Opúscula 41 (1816); Cassini, Dict. Sci. Nat. 33: 464 (1824); Lessing, Linnaea 5: 337 (1830); de Candolle, Prod. 7^1: 33 (1838); Bentham & Hooker, Gen. Pl. **2**: 486 (1873); Hoffmann, in Engler & Prantl, Nat. Pfl. IV. 3: 338 (1893).

Capítulo heterógamo u homógamo, flores marginales femeninas dispuestas en una serie, flores del disco hermafroditas. Involucro acampanado, hemisférico ó turbinado; brácteas dispuestas en 4–12 series, imbricadas, lanceoladas, planas, ápice agudo, acuminado ó largamente atenuado, margen escarioso, las exteriores gradualmente menores. Receptáculo plano, convexo, fimbrillífero, piloso ó desnudo. Corola femenina bilabiada, labio externo liguliforme, extendido, 6 nervios, raramente hasta 12, ápice tridentado, labio interno bilabiado ó entero; corola hermafrodita tubulosa, limbo usualmente cilíndrico ó ampliado, recto ó raramente geniculado, quinquefido, lóbulos iguales ó desiguales, rectos ó con ápice revoluto. Anteras de base sagitada, cola corta ó muy larga, desnuda ó con pelos divaricados, puntiaguda, raramente filífera. Estilo de la flor hermafrodita claviforme ó cilíndrico. Aquenio subterete, 5 costillas, raramente 4–6,

pubescente ó glabrescente. Papus setáceo, persistente, pelos en 2 ó más series, homomorfo ó raramente con pelos internos más largos y anchos, numerosos, cortamente barbelados más ó menos amarillentos. Herbácea, sufruticosa, perenne ó arbustiva. Hojas radicales ó alternas, igualmente dispuestas en el tallo ó más ó menos agrupadas en el extremo de las ramas, pecioladas, subsesiles, ó sésiles, limbo lanceolado hasta lineal, de aovado hasta sagitado y hastado, envés gris-lanuginoso, raramente blanco-lanuginoso. Capítulo solitario y terminal, inflorescencia panícula ó inflorescencia poco ramificada, pedúnculo corto ó muy largo, la parte superior adornada por brácteas subuladas, raramente sin brácteas. Corola purpúrea.

Clave para la Determinación de las Especies

Planta anual, herbácea, pequeña, habita en la vertiente occidental de los Andes del Perú.
Brácteas involucrales con el ápice largamente atenuado filiforme y retorcido.....
.....1. *O. odorata*.
Brácteas involucrales con el ápice brevemente atenuado ó acuminado y no retorcido.
Hojas de margen entero ó poco dentado, dientes pequeños, haz grisáceo; tubo de la flor hermafrodita geniculado, la rodilla adornada por pelos rígidos, amarillos y más ó menos cortos.
Tallo erecto; pedúnculo de 2.5–9 mm. de largo; involucro á lo mayor de 12 mm. de altura.....2. *O. Cumingii*.
Tallo decumbente con más capítulos; pedúnculo de 6–12 mm. de largo; involucro á lo mayor de 8 mm. de altura.....3. *O. longipedicellata*.
Hojas de margen conspicuamente dentado, haz glabrescente verdoso; tubo de la flor hermafrodita recto con pelos más cortos cerca de la parte media externa.
Base ancha amplexicaule en las hojas superiores, la parte media del limbo más angosta.....4. *O. amplexicaulis*.
Base aguda en las hojas superiores, la parte media del limbo más ancha.
Capítulo acampanado, ancho; ápice de las brácteas involucrales agudo ó escasamente acuminado; los 5 lóbulos de la flor tubulosa pubescentes en el dorso.....5. *O. annua*.
Capítulo acampanado angosto con menos flores; ápice de las brácteas involucrales largamente acuminado; los 2 lóbulos mayores de la flor tubulosa poco pubescentes en el dorso.....6. *O. minima*.
Planta perenne más ó menos sufruticosa.
Pecíolo alado con margen lobulado.
Capítulo homógamo sin flores liguladas; brácteas del involucro angostas, usualmente menos de 2 mm.; papus amarillento; tubo de la corola semibilabiado, 1–4 lóbulos.
Dorso de las brácteas involucrales pardo y araneoso; Costa Rica.....
.....7. *O. costaricensis*.
Dorso de las brácteas involucrales rojizo, glabrescente ó glabro.
Tubo de la flor pubescente; el pedúnculo con pelos erectos más ó menos numerosos y glandulosos cerca del capítulo; dorso de las brácteas involucrales pubescente á lo largo de la costa, los pelos glandulosos.....
.....8. *O. Donnell-Smithii*.
Tubo de la flor glabro; pedúnculo y brácteas involucrales sin pelos glandulosos
.....9. *O. onoseroides*.
Capítulo heterógamo siempre con flores liguladas; brácteas del involucro anchas; papus amarillo-oscuro; tubo de la corola con 5 lóbulos iguales ó semibilabiado con 2–3 lóbulos.
Brácteas involucrales con el ápice acuminado y el dorso tomentoso.
Lóbulos de la flor hermafrodita iguales.
Tubo de la flor marginal cilíndrico y mucho más corto que el labio externo; la longitud de los lóbulos de la flor del disco es siempre más de 2 veces

su ancho; la panícula con más capítulos (18–21); margen de la hoja conspicuamente dentado, los dientes más agudos; la base del limbo con el par de nervios inferiores bien desarrollado; Costa Rica — Colombia .....10. *O. silvatica.*

Tubo de la flor marginal contraído encima de la parte media, más ó menos igual á la longitud del labio externo; la longitud de los lóbulos de la flor del disco es siempre menos de 1½ veces su ancho; la panícula con menos capítulos (7–9); margen de la hoja casi siempre muy poco dentado, los dientes pequeños; la base del limbo con el par de nervios inferiores poco desarrollado; Perú.....11. *O. peruviana.*

Lóbulos de la flor hermafrodita desiguales; tubo de la flor del disco con la parte superior más ó menos del mismo ancho del de su base; las brácteas involucrales más anchas bajo el ápice y bruscamente agudas; Bolivia.... .....12. *O. fraterna.*

Brácteas involucrales con el ápice largamente atenuado y el dorso glabrescente.

Hojas radicales; inflorescencia escapo; aquenio más ó menos glabrescente, los pelos muy cortos.....13. *O. speciosa.*

Hojas caulinares colocadas encima de un tallo de unos decímetros de alto; inflorescencia más ó menos ramificada; aquenio totalmente pubescente, los pelos más grandes.

Limbo hastado; pecíolo con lóbulos dentados; brácteas del involucro con el ápice largamente atenuado; lóbulos de la flor tubulosa glabros en el dorso; tubo de la flor marginal ligeramente pubescente; Colombia.... .....14. *O. purpurea.*

Limbo asaetado; pecíolo con lóbulos enteros; brácteas del involucro con el ápice brevemente atenuado; lóbulos de la flor tubulosa pubescentes en el dorso; tubo de la flor marginal densamente pubescente; Bolivia..... .....15. *O. sagittata.*

Pecíolo no alado ó alado pero sin lóbulos.

Planta cubierta de pelos glandulosos; tallo terete; ápice de las brácteas involucrales muy atenuado y flexuoso, el dorso pubescente; haz de la hoja conspicuamente pubescente.....16. *O. acerifolia.*

Planta sin pelos glandulosos; tallo anguloso; ápice de las brácteas involucrales agudo ó acuminado, el dorso glabrescente; haz de la hoja glabrescente.

Base de la hoja ancha, limbo sagitado ó más ó menos aovado.

Brácteas del involucro rígidas con el ápice curvado hacia fuera; base del limbo de la hoja truncada.....17. *O. Castelnaeana.*

Brácteas del involucro con el ápice recto; base del limbo de la hoja sagitada ó raramente truncada.

Limbo de la hoja de margen entero ó escasamente dentado, dientes pequeños; lóbulos de la flor tubulosa revolutos; flor marginal con el labio interno entero, espiralado, y muy retorcido.....18. *O. Drakeana.*

Limbo de la hoja de margen conspicuamente dentado, dientes desiguales; lóbulos de la flor tubulosa ascendentes; flor marginal con el labio interno bipartido, recto ó poco retorcido.

Inflorescencia escapo monocéfalo; brácteas del involucro anchas, 2–2.5 mm., de dorso araneoso purpurascente y de ápice acuminado..... .....19. *O. hastata.*

Inflorescencia ramificada (2–8 capítulos); brácteas del involucro angostas, 1.4–2 mm., de dorso glabrescente grisáceo y ápice agudo..20. *O. alata.*

Base de la hoja aguda, limbo lanceolado ó lineal.

Hojas escasas arrosetadas; flor del disco con sus lóbulos iguales y revolutos; flor marginal con el labio interno largamente atenuado y muy retorcido, y su tubo totalmente pubescente.....21. *O. Weberbaueri.*

Hojas más ó menos numerosas, no arrosetadas; flor del disco con sus lóbulos desiguales y ascendentes; flor marginal con el labio interno brevemente atenuado y muy poco retorcido, su tubo glabro ó escasamente pubescente.

Papus con pelos de 2 clases, los externos más cortos y más delgados; el ápice de las brácteas involucrales acuminado.
Limbo de la hoja de poco espesor, haz más ó menos glabrescente-verdoso; nervaduras conspicuas, el margen escasamente revoluto.....
.....22. *O. salicifolia.*
Limbo de la hoja de mayor espesor, haz blanco-araneoso; nervaduras poco visibles, el margen mucho más revoluto.....23. *O. albicans.*
Papus con una clase de pelos; el ápice de las brácteas involucrales agudo.
Haz del limbo de la hoja poco araneoso; brácteas del involucro con pelos rígidos y cortos en su haz y cerca del ápice; tubo de la flor hermafrodita con un anillo de pelos cortos ascendentes cerca de la parte media y externa; lóbulos de la flor del disco glabros en el dorso; Ecuador...
.....24. *O. hyssopifolia.*
Haz del limbo de la hoja muy araneoso ó más ó menos tomentoso; brácteas del involucro sin pelos; tubo de la flor hermafrodita glabro, sus 2 lóbulos mayores con pelos cortos, escasos en el dorso; Perú y Bolivia.....25. *O. gnaphalioides.*

DESCRIPCIÓN DE LAS ESPECIES

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Leysera odorata R. et P. según D. Don, l.c. En sinónimo.
Cursonia peruviana Nutt. Trans. Am. Philos. Soc. n. s. 7: 422 (1841).
Seris odorata Kuntze, Rev. Gen. 1: 364 (1891).
Onoseris parva Muschler, Bot. Jahrb. 50: Beibl. 3: 95 (1913).
Onoseris integrifolia var. *filiphila* Cuatr. Anal. Univ. Madrid 4^2: 237 (1935).

Planta herbácea, anual, de 6–70 cm. de alto, más ó menos erecta, gris-lanuginosa, ramosa, ramas de 30–150 mm. de longitud. Hojas numerosas, cortamente pecioladas; limbo de 12–90 mm. de largo por 4–25 mm. de ancho, lanceolado, largamente atenuado en la base, el haz araneoso, luego glabrescente, envés gris-lanuginoso, penninerviado, el raquis prominente en el envés, ápice frecuentemente acuminado, raramente agudo, el margen desigualmente sinuoso-dentado, los dientes separados por trechos de 1.5–7 mm. Pecíolo de 2–4 mm. de largo, gris-lanuginoso. Capítulo solitario y terminal. Pedúnculo de 25–230 mm. de longitud, la parte superior adornada por brácteas de 3–7 mm. de largo, subuladas, escasas, laxas y de dorso araneoso, costado; costillas 14–16, de borde ancho, obtuso. Involucro de 8–15 mm. de altura por 5–8 mm. de diámetro, acampanado; brácteas dispuestas en 5–6 series, las interiores de 12–18 mm. de largo por 1.5–2 mm. de ancho, ápice largamente atenuado y muy flexuoso, el haz con pelos numerosos, cortos, rígidos, ascendentes, amarillos y dispuestos cerca del ápice, el margen poco escarioso, dorso araneoso y con pelos escasos, cortos, en la costa; las brácteas exteriores gradualmente menores. Receptáculo convexo y cubierto de páleas heteromorfas, amarillas y laciniosas. Flor del disco: corola de 7–11 mm. de longitud; tubo de 5–8.5 mm. de largo por 0.5–0.6 mm. de ancho en su base y 1.2–1.4 mm. en la parte superior, 5-nerviado, geniculado cerca de la parte media, la rodilla rodeada por pelos cortos, rígidos, ascendentes, amarillos y dispuestos en forma de anillo; limbo terminado en 5 lóbulos agudos, 3 lóbulos iguales, de 1.2–1.8 mm. de largo por 0.4–0.6 mm. de ancho en su base y 2 lóbulos de 2–2.5 mm. de largo por 0.6–0.8 mm. de ancho en su base, los 5 ascendentes con el dorso poco pubescente, raramente glabro. Anteras de 3–5 mm. de longitud, cola de 1.5–2 mm. de largo, puntiaguda, glabra; filamento de 2–3 mm. de

longitud, cilíndrico y finamente pubescente. Estilo claviforme; ramas anchas de 1.4–2 mm. de longitud. Aquenio de 2.2–4 mm. de largo por 0.7–1.2 mm. de ancho, con pelos escasos, cortos, amarillos, ascendentes, dispuestos cerca del papus, costado; costillas 5, de borde ancho, obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 8 mm. de longitud. Flor marginal: corola de 14–30 mm. de longitud; tubo de 2.5–4 mm. de largo por 0.6–0.8 mm. de ancho, glabro; labio externo de 11.5–26 mm. de largo por 2.5–5 mm. de ancho, 6-nerviado, dorso araneoso y con pelos escasos, cortos, ascendentes, el ápice tridentado, los 3 lóbulos más ó menos iguales, agudos, de 2–3 mm. de largo por 0.6–1.2 mm. de ancho en su base; labio interno bipartido, lóbulos de 1–2.4 mm. de largo, la base con pocos pelos cortos, el ápice atenuado y filiforme. Estilo conspicuamente claviforme, glabrescente; ramas de 2.2–3.2 mm. de longitud. Aquenio de 1.8–4 mm. de largo por 0.4–0.8 mm. de ancho, con pelos escasos, cortos, amarillos, ascendentes, dispuestos cerca del papus, costado; costillas 5, de borde ancho obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 6 mm. de longitud. LÁM. I, FIGS. 1–6.

DISTRIBUCIÓN: El área de distribución comprende la región occidental de los Andes peruanos, situada en los Departamentos de Lima y Arequipa, altura (100–)800–2500 metros.

PERÚ: Lima: Río Chillón, cerca Viscas, Junio 10–15, 1925, *Pennell 14479* (G, FM, US, NY), *Pennell 14468* (G, US, FM, NY), *Pennell 14454* (G, FM, US, NY); "Quive Department of Lima, June 9, 1925," *Pennell 14302* (G, FM, US, NY); Obrajillo, sin fecha, *Expedición Wilkes,* sin número (G, US); montañas cerca Chosica, Ferrocarril Lima-Oroya, Abril, 1910, *Weberbauer 5314* (G, FM, US); cerca Santa Eulalia, arriba de Chosica, Prov. Huarochirí, Abril 2, 1939, *Goodspeed 11303* (G, DA); Chosica, Marzo 11–13, 1923, *Macbride 2868* (FM, US); Camino Chosica-Matucana, Octubre 20, 1935, *Mexia 4088* (G, US); "Agua Verrugas", 1910, *Caec. et Ed. Seler 231* (US); "Purruchuca", 1834–40, *Mathews 569* (ISOTIPO G); Arequipa: Mollendo, Noviembre 17, 1923, *Hitchcock 22361* (US); lomas al Este de Mollendo, Enero 24, 1937, *West 8240* (G, DA); lomas detrás del puerto de Mollendo, Octubre 16, 1925, *Johnston 3540* (G).

Esta planta se caracteriza por ser anual, pequeña, de tallo gris-lanuginoso y aproximadamente erecto; de flores hermafroditas amarillas y marginales violadas. Sin embargo uno de los caracteres más fácil de reconocer lo constituyen las brácteas involucrales, cuyo ápice es largamente atenuado y muy flexuoso.

La descripción de *Chaetachlaena odorata* D. Don es igual á esta especie; sin embargo el material encontrado en posesión del herbario de Lambert y colectado por Tafalla indica la localidad siguiente: "In Guayaquila Peruvianorum". Los especímenes examinados en esta monografía y pertenecientes á esta especie proceden de los Departamentos de Lima y Arequipa, por lo tanto es de presumir que la localidad citada por Tafalla debe ser probablemente errónea.

Es muy probable que *Cursonia peruviana* Nutt. es sinónimo de esta especie porque la descripción corresponde á la de *O. odorata;* por ejemplo al referirse á las brácteas involucrales dice: "linear-lanceolate, setosely acuminate and rather rigid"; además agrega que las hojas tienen el limbo dentado, el haz araneoso y el envés más ó menos blanco-tomentoso. También es sabido que la mayor parte de la colección de Curson procede de Arequipa.

La especie *Onoseris parva* Muschler fué fundada por *Weberbauer 1492*, procedente de las lomas cerca de Mollendo. He visto la fotografía del Tipo y la descripción original, y se puede deducir que no existen diferencias que puedan permitir separar *O. odorata* y *O. parva*. Además Domke, Notizbl. Bot. Gart. Berlin 13: 247 (1936), comparando el Tipo de *O. parva* y el Isotipo de *O. odorata*, perteneciente á Madrid, llega á la conclusión de que ambas son iguales.

José Cuatrecasas, Anal. Univ. Madrid 4^2: 237 (1935), estudiando los ejemplares de *Pennell 14479* y *14468*, de la localidad de Viscas, afirma que pertenecen á *Onoseris integrifolia* Less. variedad *filiphila;* no obstante se pueden identificar dichos ejemplares como pertenecientes á *O. odorata*, porque resaltan á primera vista los capítulos con sus brácteas involucrales largamente atenuadas y retorcidas en el ápice. Algunos ejemplares de Pennell, inclusive los anteriores, se distinguen por sus grandes dimensiones con relación á los demás, pero este mayor desarrollo se explica porque el año 1925, en que fueron colectados, se produjeron grandes precipitaciones en la vertiente occidental de los Andes peruanos.

2. **Onoseris Cumingii** Hook. & Arn. Comp. Bot. Mag. 1: 103 (1835).
Seris Cumingii Kuntze, Rev. Gen. 1: 364 (1891).

Planta herbácea, anual, erecta, gris-lanuginosa, de 12–29 cm. de alto, ramosa, ramas de 40–170 mm. de longitud. Hojas más ó menos numerosas, cortamente pecioladas, agrupadas en el ápice del tallo ó en el extremo de las ramas; limbo de 8–65 mm. de largo por 3–20 mm. de ancho, oblanceolado, haz araneoso, envés gris-lanuginoso, penninerviado, raquis prominente en el envés, el ápice agudo, margen brevemente sinuoso-dentado. Peciolo de 2–4 mm. de longitud, gris-lanuginoso. Capítulo solitario y terminal. Pedúnculo de 22–120 mm. de longitud, gris-lanuginoso, costado; costillas 8–10, de borde ancho, obtuso; la parte superior adornada por brácteas de 2.5–5 mm. de largo por 0.2–0.3 mm. de ancho en su base, subuladas, escasas, de dorso araneoso. Involucro de 8–12 mm. de altura por 7–9 mm. de diámetro, acampanado; brácteas dispuestas en 5–6 series, las interiores de 8–10 mm. de largo por 0.8–1.4 mm. de ancho, ápice acuminado, su haz con pelos numerosos, cortos, rígidos, amarillos, ascendentes y dispuestos cerca del ápice, el dorso araneoso, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo semiconvexo, cubierto de páleas heteromorfas, amarillas y laciniosas. Flor del disco: corola de 8–11 mm. de longitud; tubo de 6–8.4 mm. de largo por 0.4–0.5 mm. de ancho en su base y 0.8–1.2 mm. en la parte superior, 5-nerviado, geniculado cerca de la parte media, la rodilla rodeada de pelos cortos, rígidos, amarillos, ascendentes y dispuestos en forma de anillo; limbo terminado en 5 lóbulos agudos, 3 lóbulos iguales de 1–2 mm. de largo por 0.4–0.5 mm. de ancho en su base y 2 lóbulos de 2–2.6 mm. de largo por 0.6–0.7 mm. de ancho en su base, los 5 ascendentes, de dorso frecuentemente glabro ó raramente con pelos escasos, cortos. Anteras de 3.8–4.5 mm. de longitud, cola de 1.5–2 mm. de largo, puntiaguda, glabra; filamento de 2.5–4 mm. de largo, cilíndrico y finamente pubescente. Estilo claviforme; ramas anchas de 2–2.5 mm. de longitud. Aquenio de 2–3.5 mm. de largo por 0.6–1 mm. de ancho, más ó menos glabrescente ó provisto de pelos escasos, cortos, ascendentes, amarillos, dispuestos cerca del papus, costado; costillas 5, de borde ancho,

obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 6 mm. de longitud. Flor marginal: corola de 15–25 mm. de longitud; tubo de 2.5–4 mm. de largo por 0.4–0.6 mm. de ancho, glabro; labio externo de 12.5–21 mm. de largo por 2.5–3.5 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los 3 lóbulos agudos, más ó menos iguales, de 1–1.8 mm. de largo por 0.6–1 mm. de ancho en su base; labio interno bipartido, lóbulos de 1.5–3 mm. de longitud, glabros, el ápice atenuado y filiforme. Estilo claviforme, glabro; ramas de 2.5–4 mm. de longitud. Aquenio de 1.5–3 mm. de largo por 0.5–1 mm. de ancho, glabrescente ó provisto de pelos escasos, cortos, ascendentes, amarillos, dispuestos cerca del papus, costado; costillas 5, de borde ancho, obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 5 mm. de longitud. LÁM. I, FIGS. 7–12.

DISTRIBUCIÓN: Se ha encontrado solamente al Norte del Perú.

PERÚ: Piura: Cerro Pan de Azúcar, 5 millas al Noreste de la Brea, Junio 2, 1929, *Haught 30* (G, FM, US, NY); Dept. ?: *Cuming 995* (Fotografía TIPO FM).

Esta especie es muy afín á *O. odorata* de la que se diferencia principalmente por sus hojas de limbo oblanceolado y las brácteas involucrales de ápice acuminado no flexuoso. Además la localidad del Tipo se dice: "North Peru, Lima, etc., *Cuming 995*" y el material correspondiente á esta especie procede del Departamento de Piura situado al Norte del Perú; mientras que *O. odorata* es procedente de los Departamentos de Lima y Arequipa ó sea del Centro y Sur del Perú.

3. **Onoseris longipedicellata** Muschler, Bot. Jahrb. 50: Beibl. 3: 96 (1913).

Planta anual, de 35–40 cm. de alto, tallo erecto, gris-tomentoso, la base del tallo de 3–4 mm. de diámetro. Hojas opuestas (entrenudos de 3–4 cm. de longitud), brevemente pecioladas (pecíolo de 2.5–3 mm. de largo con el haz semiacanalado, densamente tomentoso-lanuginoso) ó subsesiles; limbo de 15–20 mm. de largo por 4.5–5 mm. de ancho, lanceolado ó aovado-lanceolado, haz densamente gris-lanuginoso, envés araneoso-lanuginoso, margen poco dentado. Capítulo solitario y terminal, largamente pedunculado. Pedúnculo de 60–120 mm. de largo, más ó menos terete, semicurvado ó erecto, densamente araneoso-lanuginoso, adornado por brácteas de 3–4.5 mm. de largo, subuladas ó filiformes. Involucro acampanado; brácteas dispuestas en 4–5 series, las interiores de 3–3.5 mm. de largo por 0.7–1 mm. de ancho, lineales ó raramente lineal-lanceoladas, dorso araneoso-tomentoso, ápice agudo ó acuminado; las brácteas exteriores gradualmente menores. Receptáculo plano y desnudo, de 3–3.5 mm. de diámetro. Flores del disco 25–30, tubulosas, hermafroditas; corola tubulosa-cilíndrica, glabra; limbo terminado en 5 lóbulos agudos. Antera sagitada. Estilo claviforme de 4–4.5 mm. de largo. Aquenio cubierto por pelos muy cortos y amarillentos. Papus plumoso y blanquecino-amarillento. Flores marginales 8–10, semibilabiadas; corola de tubo delgado, la parte inferior con pelos escasos, la parte superior glabra; limbo bilabiado, labio externo de 7–8 mm. de largo por 1–2.5 mm. de ancho, lineal-lanceolado, 6-nerviado, el ápice tridentado; labio interno brevemente bipartido. Estilo, papus y aquenio igual que en la flor hermafrodita.

DISTRIBUCIÓN: Ha sido encontrada en el Departamento de Lima, Perú.

PERÚ: Lima: San Bartolomé, estación vía férrea entre Lima y Oroya, altura 1700–1800 metros, *Weberbauer 1698* (Fotografía TIPO FM).

Por falta de material no ha sido posible estudiar esta especie, de manera que sólo se ha reproducido la descripción original que se indica arriba. Se ha examinado la fotografía del Tipo, y en mi opinión parece que existen algunas discrepancias entre los caracteres que describe Muschler y dicha fotografía. De acuerdo con la descripción el tallo es erecto, las hojas opuestas, y las brácteas involucrales interiores de 3–3.5 mm. de longitud. Sin embargo la fotografía muestra con toda claridad que el tallo es decumbente, las hojas alternas ó más ó menos agrupadas y, de acuerdo con la escala, las brácteas involucrales interiores tienen 10–12 mm. de longitud.

4. **Onoseris amplexicaulis** sp. nov.

Planta herbacea annua ad 25 cm. alta e basi sparse et longe ramosa; foliis plus minusve numerosis pinnato-nervatis supra glabrescentibus subtus lanuginosis margine inaequaliter sinuato-dentatis, foliis inferioribus oblanceolatis infra medium basim versus gradatim attenuatis, foliis superioribus lanceolatis basi plus minusve amplexicaulibus; capitulis caulem et ramulos terminantibus; bracteis involucralibus 7–11 mm. longis apice acuminatis dorso araneosis plus minusve purpureis margine scariosis; floribus heteromorphis; floribus marginalibus 18–21 mm. longis, tubo ca. 3 mm. longo, labio exteriore 15–17 mm. longo ca. 4 mm. lato, labio interiore bilobato lobulis flagelliformibus; floribus disci ad 8 mm. longis bilabiatis, lobis tribus ad 1 mm. longis, lobis duobus ad 1.5 mm. longis; pappis heteromorphis setis interioribus ad 6 mm. longis quam exterioribus duplo longioribus et crassioribus.

Planta de 11–25 cm. de alto, erecta, tallo gris-lanuginoso, ramoso, ramas de 90–160 mm. de longitud. Hojas inferiores sésiles, las superiores amplexicaules; limbo de 14–75 mm. de largo por 3–20 mm. de ancho, oblanceolado ó lanceolado, los limbos mayores atenuados en la base, haz araneoso, luego glabrescente, envés gris-lanuginoso, penninerviado, raquis prominente en el envés, el ápice acuminado, raramente agudo, margen desigualmente sinuoso-dentado, los dientes separados por trechos de 3–9 mm. Capítulo solitario y terminal. Pedúnculo de 15–48 mm. de longitud, gris-lanuginoso, luego glabrescente, la parte superior adornada por brácteas de 3–5 mm. de longitud, subuladas, escasas, y de dorso araneoso, costado; las costillas de 8–10, de borde ancho, obtuso. Involucro de 7–11 mm. de altura por 5–6 mm. de diámetro, acampanado; brácteas dispuestas en 4–5 series, las interiores de 11–12 mm. de largo por 2–2.2 mm. de ancho, las brácteas exteriores gradualmente menores. Receptáculo convexo y cubierto de páleas heteromorfas, amarillas, y laciniosas. Flor del disco: corola de 7.8–8.5 mm. de longitud; tubo de 6.6–7 mm. de largo por 0.5–0.6 mm. de ancho en su base y 1–1.2 mm. en la parte superior, 5-nerviado, pubescente cerca de la parte media, los pelos cortos, rígidos, ascendentes, amarillos, y dispuestos en forma de anillo; limbo terminado en 5 lóbulos agudos, 3 lóbulos iguales de 0.8–1 mm. de largo por 0.4–0.5 mm. de ancho en su base y 2 lóbulos de 1.2–1.5 mm. de largo por 0.5–0.6 mm. de ancho en su base, los 5 ascendentes y de dorso poco pubescente, los pelos escasos, cortos. Anteras de 3–3.5 mm. de longitud, cola de 1.2–1.5 mm. de largo, glabra, el ápice filiforme; filamento de 2–2.2 mm. de largo, más ó menos cilíndrico, glabro. Estilo claviforme; ramas de 1.4–1.6 mm. de longitud, glabras. Aquenio de 2.5–4.2 mm. de largo por 0.8–1 mm. de ancho, pubescente, los

pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde ancho, obtuso. Papus con pelos numerosos, amarillos, los internos más grandes hasta 8 mm. de longitud. Flor marginal: corola de 18–21 mm. de longitud; tubo de 3–3.5 mm. de largo por 0.6–0.7 mm. de ancho, pubescente, los pelos escasos, cortos, ascendentes, amarillos; labio externo de 15–17.5 mm. de largo por 3.5–4 mm. de ancho, 6-nerviado, dorso araneoso, y con pelos escasos, cortos, ascendentes, amarillos, dispuestos en la parte inferior, el ápice tridentado, los 3 lóbulos agudos, más ó menos iguales, de 2.5–3 mm. de largo por 1.2–1.3 mm. de ancho en la base; labio interno bipartido, lóbulos de 2–2.5 mm. de largo, glabros, el ápice atenuado y filiforme, el seno situado entre los 2 lóbulos más profundo que los senos laterales. Estilo claviforme, glabro; ramas de 1.8–2 mm. de longitud. Aquenio de 2–4 mm. de largo por 0.8–1 mm. de ancho, pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde ancho, obtuso. Papus con pelos numerosos, amarillos, los internos más grandes hasta 6 mm. de longitud. LÁM. I, FIGS. 13–18.

DISTRIBUCIÓN: Habita en las inmediaciones de la ciudad de Matucana, altura 2400 metros, situada en el Departamento de Lima. Esta región se encuentra comprendida en la vertiente occidental de los Andes, casi al centro del territorio peruano.

PERÚ: Lima: Alrededores de Matucana, Julio 9, 1914, *Rose & Rose 18668* (US); Matucana, Abril 12 – Mayo 3, 1922, *Macbride & Featherstone 131* (FM, US), *Macbride & Featherstone 310* (TIPO Field Mus. 516844, Isotipo G).

Esta especie se acerca mucho á *Onoseris annua* Less., diferenciándose de ésta por tener las hojas superiores conspicuamente amplexicaules; el tallo más ramoso; las brácteas involucrales largamente atenuadas en el ápice y con el dorso más ó menos purpurascente; además el aquenio presenta costillas de borde ancho, obtuso, y fácilmente visible.

5. **Onoseris annua** Less. Linnaea 5: 341 (1830).

Planta herbácea, anual, de 12–16 cm. de alto, erecta, gris-lanuginosa, poco ramosa. Hojas escasas hasta 12, cortamente pecioladas; limbo de 10–25 mm. de largo por 5–10 mm. de ancho, lanceolado, largamente atenuado en la base, haz araneoso, luego glabrescente, envés gris-lanuginoso, penninerviado, el raquis prominente en el envés, el ápice agudo (raramente acuminado), margen desigualmente sinuoso-dentado, los dientes separados por trechos de 2–5 mm. Pecíolo de 1.5–2 mm. de longitud, gris-lanuginoso. Capítulo solitario y terminal. Pedúnculo de 10–70 mm. de longitud, gris-lanuginoso, luego glabrescente, costado, las costillas 8–10, de borde ancho, obtuso. Involucro de 9–10 mm. de altura por 5–7 mm. de diámetro, acampanado; brácteas dispuestas en 5–6 series, las interiores de 9–10 mm. de largo por 1.4–2 mm. de ancho, el ápice agudo, el haz con pelos cortos, rígidos, amarillos, ascendentes y dispuestos cerca del ápice, el dorso araneoso, el margen muy escarioso; las brácteas exteriores gradualmente menores. Receptáculo más ó menos plano cubierto de páleas heteromorfas, amarillas, y laciniosas. Flor del disco: corola de 7–7.5 mm. de longitud; tubo de 5.6–6 mm. de largo por 0.4–0.6 mm. de ancho en su base y 0.8–1 mm. en la parte superior, 5-nerviado, pubescente encima de la base, los pelos escasos, cortos, ascendentes y dispuestos en forma de anillo; limbo terminado en 5 lóbulos agudos, 3 lóbulos iguales de 0.8–1.2 mm. de largo por 0.3–0.4 mm. de ancho en su base y 2 lóbulos de 1.4–1.5 mm. de largo por 0.5–0.6 mm. de ancho en su base, los 5 ascendentes, y de dorso pubescente,

los pelos escasos, cortos, amarillos, y ascendentes. Anteras de 3.4–3.6 mm. de longitud, cola de 1.2–1.5 mm. de largo, puntiaguda, glabra; filamento de 1.6–1.8 mm. de longitud, cilíndrico, glabrescente. Estilo claviforme; ramas de 1–1.2 mm. de longitud. Aquenio de 2.2–3.5 mm. de largo por 0.5–0.9 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 6 mm. de longitud. Flor marginal: corola de 18–20 mm. de longitud; tubo de 3.5–4 mm. de largo por 0.5–0.6 mm. de ancho, pubescente en la parte superior, los pelos cortos, ascendentes, escasos, y amarillos; labio externo de 14.5–16 mm. de largo por 2.2–2.5 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los 3 lóbulos agudos, iguales, de 1.5–2 mm. de largo por 0.6–0.8 mm. de ancho en su base; labio interno bipartido, lóbulos de 2–2.2 mm. de largo, glabros, más ó menos filiformes. Estilo claviforme, glabrescente; ramas de 1.8–2 mm. de longitud. Aquenio de 2–2.2 mm. de largo por 0.5–0.6 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 5 mm. de longitud. LÁM. II, FIGS. 1–6.

DISTRIBUCIÓN: Ha sido encontrada solamente en el Departamento de Lima.

PERÚ: Lima: Sin localidad, sin fecha, *Dombey* (probablemente ISOTIPO FM); Indefinido (G); sin localidad, sin fecha, *Dombey* (Fotografía TIPO G).

Esta planta se caracteriza por ser de pequeñas dimensiones; el tallo es erecto y conspicuamente gris-lanuginoso; sus hojas escasas presentan un limbo sinuoso-dentado. El material típico fué colectado por Dombey: "In Chinchin"; esta región, de acuerdo con el relato de Hipólito Ruiz, Relación del Viaje, 26 (1931), se encuentra al Este de Huacho, Departamento de Lima, posiblemente en los alrededores de los actuales baños termales de Churín.

6. **Onoseris minima** Domke, Notizbl. Bot. Gart. Berlin 13: 247 (1936).

Planta herbácea, anual, de 10–14 cm. de altura, erecta, gris-lanuginosa, poco ramosa, ramas de 80–120 mm. de longitud, tallo costado, las costillas de 6–8, de borde ancho, obtuso. Hojas escasas, de 6 hasta 18, sésiles; limbo de 18–45 mm. de largo por 3–12 mm. de ancho, lanceolado, largamente atenuado en su base, haz araneoso, luego glabrescente, envés gris-lanuginoso, penninerviado, raquis prominente en el envés, el ápice frecuentemente acuminado, raramente agudo, margen brevemente sinuoso-dentado. Capítulo solitario y terminal. Pedúnculo de 5–35 mm. de longitud, gris-lanuginoso, costado; costillas 6–8, de borde ancho, obtuso. Involucro de 9–12 mm. de altura por 4–6 mm. de diámetro, más ó menos acampanado; brácteas dispuestas en 4–5 series, las interiores de 11–12 mm. de largo por 2–2.2 mm. de ancho, el ápice largamente atenuado, el dorso araneoso, el margen muy escarioso; las brácteas exteriores gradualmente menores. Receptáculo más ó menos convexo, cubierto de páleas heteromorfas, amarillas, y laciniosas. Flor del disco (8–10 flores): corola de 6–6.5 mm. de longitud; tubo de 5–5.2 mm. de largo por 0.6–0.7 mm. de ancho, 5-nerviado, pubescente, los pelos cortos, ascendentes, amarillos, dispuestos en forma de anillo y cerca de la parte media; limbo terminado en 5 lóbulos agudos, 3 lóbulos

iguales de 0.8–1 mm. de largo por 0.3–0.4 mm. de ancho en su base y 2 lóbulos de 1–1.2 mm. de largo por 0.4–0.5 mm. de ancho en su base, los 5 ascendentes, glabros ó raramente con pelos escasos, cortos en el dorso de los lóbulos mayores. Anteras de 2.2–2.4 mm. de longitud, cola de 0.8–1 mm. de largo, puntiaguda, glabra; filamento de 1.8–2 mm. de largo, cilíndrico y finamente pubescente. Estilo claviforme, glabro; ramas de 1–1.2 mm. de longitud. Aquenio de 2.6–3 mm. de largo por 0.5–0.7 mm. de ancho, pubescente, los pelos cortos, ascendentes, amarillos, dispuestos en la parte superior, costado; costillas 5, de borde ancho, obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 6 mm. de longitud. Flor marginal (7–9 flores): corola de 10–11 mm. de longitud; tubo de 3.2–3.5 mm. de largo por 0.5–0.6 mm. de ancho, glabro; labio externo de 6.8–7.5 mm. de largo por 1.6–1.8 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentato, los 3 lóbulos agudos, iguales, de 1.1–1.2 mm. de largo por 0.5–0.6 mm. de ancho en su base; labio interno bipartido, lóbulos de 1.5–2 mm. de longitud, pubescentes en el dorso, los pelos escasos, cortos, ascendentes, el ápice atenuado y más ó menos filiforme. Estilo claviforme, glabro; ramas de 1.8–2 mm. de longitud. Aquenio de 2.5–2.7 mm. de largo por 0.5–0.7 mm. de ancho, más ó menos pubescente, los pelos cortos, ascendentes, amarillos y dispuestos cerca del papus, costado; costillas 5, de borde ancho, obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 4.5 mm. de longitud. LÁM. II, FIGS. 7–12.

DISTRIBUCIÓN: Ha sido encontrada en el Departamento de Arequipa y en la Provincia Litoral de Moquegua, altura 1200–1900 metros.

PERÚ: Moquegua: Monte Estuquiña, Noroeste de Moquegua, Marzo 22, 1925, *Weberbauer 7440* (G, FM, NY, US); Dept. ?: Entre el valle del Río de las Trancas y Llaxwa, Marzo, 1913, *Hrdlicka* (US).

Esta especie es muy afín á *Onoseris annua*, de la cual se diferencia por los capítulos más angostos (15–19 flores); las brácteas involucrales largamente atenuadas en el ápice y sin pelos en el haz; los 5 lóbulos de la flor del disco glabros ó raramente con pelos escasos en el dorso de los 2 lóbulos mayores; además las hojas tienen el margen del limbo muy poco dentado. El ejemplar Tipo procede de "Dep. Arequipa; Socosami, nordwestlich von Arequipa" (Srta. *D. B. Stafford* sin número) y el material limitado, de Moquegua, ambos situados al Sur del Perú; en cambio *O. annua* se encontró: "In Chinchin", que está en el Departamento de Lima.

7. **Onoseris costaricensis** sp. nov.

Planta robusta; foliis grandis, lamina 6–22 cm. longa 5–28 cm. lata cordiformi angulata palminervia, margine inaequaliter sinuoso-dentata, petiolo 4–28 cm. longo margine anguste alato et lobulato, lobulis 2–4-jugis majoribus 4–11 cm. longis; capitulis numerosis paniculatis, bracteis involucralibus multiseriatis dorso araneosis canescentibus; floribus homomorphis semibilabiatis 14–18 mm. longis, lobis inaequalibus 4 similibus 2.2–2.5 mm. longis, lobo exteriore 5–6 mm. longo; pappis ad 15 mm. longis plus minusve fuscis barbellatis.

Planta herbácea, perenne, de 100 cm. más ó menos de altura, erecta, gris-lanuginosa. Hojas de 14 hasta 16, casi agrupadas; limbo de 65–220 mm. de largo por 55–280 mm. de ancho, la base palminerviada con 5 nervios, haz primero araneoso y después glabrescente, envés gris-lanuginoso, ápice

agudo, raramente acuminado, margen desigualmente sinuoso-dentado, los dientes separados por trechos de 5–12 mm. Pecíolo de 45–280 mm. de longitud, lóbulos aovado-lanceolados, 2–4 pares opuestos ó raramente alternos, los mayores de 45–110 mm. de largo por 22–68 mm. de ancho gradualmente más grandes hacia el limbo. Inflorescencia panícula de 27–30 capítulos homógamos, cada uno con 10–12 flores hermafroditas. El eje de la panícula de 300–340 mm. de longitud cubierto totalmente por un indumento gris-lanuginoso y adornado por brácteas de 2–3 mm. de largo, escasas, subuladas, de dorso araneoso. Involucro, de 17–23 mm. de altura por 6–8 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 15–21 mm. de largo por 1.2–1.8 mm. de ancho, de ápice acuminado, el dorso canescente-araneoso; las brácteas exteriores gradualmente menores. Receptáculo plano con páleas amarillas, heteromorfas, que rodean la base de cada flor. Flores homógamas: corola semibilabiada, de 14–18 mm. de longitud; tubo de 9–12 mm. de largo por 1–1.2 mm. de ancho, 5-nerviado, glabro; limbo terminado en 5 lóbulos, 4 lóbulos iguales, de 2.2–2.5 mm. de largo por 0.4–0.7 mm. de ancho en su base, el quinto de 5–6 mm. de longitud por 0.6–0.8 mm. de anchura y separado de los otros por senos mayores, los 5 agudos, rectos, el dorso con pelos escasos, cortos, ascendentes y cerca del ápice. Anteras de 7.5–8 mm. de longitud, cola de 3.5–4 mm. de largo, puntiaguda y provista de pelos muy cortos; filamento de 4–8 mm. de longitud, cilíndrico y finamente pubescente. Estilo más ó menos cilíndrico, glabrescente; ramas de 3.5–4 mm. de longitud. Aquenio de 3–7 mm. de largo por 1–1.2 mm. de ancho, totalmente pubescente, pelos ascendentes, amarillos, costado; costillas 5–6, de borde más ó menos obtuso, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 15 mm. de longitud. LÁM. II, FIGS. 13–18.

DISTRIBUCIÓN: Habita en Costa Rica, altura 500–900 metros.

COSTA RICA: San Ramón, Diciembre 27, 1928, *Brenes 6520* (TIPO, Field Mus. 854945); Santiago de San Ramón, camino de San Gerardo, Diciembre 8, 1928, *Brenes 6467* (G); "Taillis du Rodeo de Pacaca", Enero 1–2, 1891, *Pittier 3312* (G); El Brasil, Diciembre 26, 1927, *Valerio* (US); "Cabeceras del Bkis", Febrero, 1897, *Pittier 10596* (US).

Esta especie se relaciona estrechamente á *O. onoseroides* (H. B. K.) Robinson, pero se diferencia de ella fácilmente por sus brácteas involucrales que tienen el dorso conspicuamente gris-araneoso. Standley, en su obra "Flora of Costa Rica", página 1502, señala esta especie con el nombre de *Onoseris silvatica* Greenman, cuyos caracteres son enteramente distintos, siendo sus capítulos heterógamos, la flor tubulosa con sus 5 lóbulos iguales y sus brácteas involucrales más anchas y con pelos en el dorso de la costa. La etiqueta del ejemplar Tipo (*Brenes 6520*) señala una localidad casi ininteligible pudiéndose leer solamente San Ramón.

8. **Onoseris Donnell-Smithii** (Coult.) comb. nov.
Pereziopsis Donnell-Smithii Coult. Bot. Gaz. 20: 53. *t. 6* (1895).

Planta robusta, perenne, de 50–300 cm. de altura, erecta, gris-lanuginosa. Hojas escasas, hasta 8, agrupadas en el extremo del tallo; limbo de 60–260 mm. de largo por 68–320 mm. de ancho, cordiforme, haz araneoso, luego glabrescente, envés gris-lanuginoso, palminerviado, la base con 5 nervios prominentes en el envés, el ápice más ó menos acuminado, el margen desigualmente sinuoso-dentado, los dientes separados por trechos de 2–12

mm. Pecíolo de 40–195 mm. de longitud, alado-lobulado, lóbulos casi sésiles, aovado-lanceolados, de 1–2 pares opuestos ó alternos, los mayores de 25–65 mm. de largo por 17–40 mm. de ancho, gradualmente más grandes hacia el limbo. Inflorescencia panícula, de 30–32 capítulos homógamos, cada uno con 10–11 flores hermafroditas. El eje de la panícula de 125–380 mm. de longitud, anguloso, cubierto de un indumento gris-lanuginoso y con pelos glandulosos, de 0.2–0.5 mm. de largo, erectos, purpurascentes; adornado por brácteas, de 1.5–4 mm. de longitud, subuladas, purpurascentes y más numerosas cerca del involucro. Involucro de 17–30 mm. de altura por 7–9 mm. de diámetro, turbinado; brácteas dispuestas en 7–8 series; las interiores de 23–24 mm. de largo por 1.4–1.8 mm. de ancho, ápice acuminado, margen escarioso, el dorso araneoso-rojizo y con pelos más ó menos glandulosos; las brácteas exteriores gradualmente menores. Receptáculo plano, con páleas heteromorfas, amarillas, que rodean la base de cada flor. Flores homógamas: corola de 20–21 mm. de longitud; tubo de 10.5–11 mm. de largo por 1.2–1.6 mm. de ancho, 5-nerviado, pubescente, los pelos numerosos, cortos, ascendentes; limbo terminado en 5 lóbulos, agudos, rectos, 4 lóbulos iguales, de 2–2.4 mm. de largo por 0.4–0.6 mm. de ancho en su base y el quinto de 9.5–10 mm. de largo por 0.6–0.9 mm. de ancho en su base, los 5 con el dorso pubescente, los pelos cortos, ascendentes, y amarillos. Anteras de 10.5–11 mm. de longitud, cola de 4.5–4.8 mm. de largo, puntiaguda, provista de pelos cortos, rígidos, ascendentes, más grandes los del lado interno; filamento de 7–10 mm. de largo, cilíndrico y finamente pubescente. Estilo cilíndrico, glabro; ramas de 4–5.5 mm. de longitud. Aquenio de 3.2–5 mm. de largo por 1.2–1.4 mm. de ancho, totalmente pubescente, los pelos ascendentes, amarillos, cortos, costado; costillas 5–6, de borde ancho, obtuso, amarillas. Papus con pelos numerosos, amarillos, los más grandes hasta 16 mm. de longitud. LÁM. III, FIGS. 1–6.

DISTRIBUCIÓN: Se conoce solamente al Sudeste de Guatemala y al Oeste del Salvador, altura 650–1450 metros.

GUATEMALA: Santa Rosa: Río de los Esclavos, Febrero, 1893, *Heyde & Lux 4527* (TIPO Univ. Chic. 264905; Isotipo G). EL SALVADOR: Ahuachapán: Sierra de Apaneca, región de Finca Colima, Enero 17–19, 1922, *Standley 20067* (G, US); Santa Ana: Alrededores de Santa Ana, Enero 8, 1922, *Standley 19701* (G, US, NY); Dept. ?: Cerro del Guayabal, Enero, 1924, *Calderón 2018* (G, US, FM, NY).

Esta especie es estrechamente afín á *Onoseris onoseroides* (H. B. K.) Robinson, de la cual se puede diferenciar por sus capítulos más grandes; el tubo de la flor es pubescente lo mismo que el dorso de sus lóbulos; finalmente el eje de la inflorescencia presenta numerosos pelos glandulosos, erectos, y más ó menos purpurascentes, los cuales son más numerosos cerca del capítulo.

9. **Onoseris onoseroides** (H. B. K.) Robinson, Proc. Am. Acad. 49: 514 (1913).

Isotypus onoseroides H. B. K. Nov. Gen. et Sp. 4: 12. *t. 307* (1820).
Seris onoseroides Willd. según Spreng. Syst. Veg. 3: 426 (1826).
Onoseris paniculata DC. Prodr. 7[1]: 33 (1838). En sinónimo.
Hilairia paniculata DC. Prodr. 7[1]: 33 (1838). En sinónimo.
Caloseris rupestris Benth. Pl. Hartw. 88 (1841).
Schaetzellia Deckeri Klotzsch, Allg. Gartenz. 17: 82 (1849).
Rhodoseris conspicua Turcz. Bull. Soc. Nat. Moscou 24[2]: 95. *t. 2* (1851).
Cataleuca rubicunda Hort. según Koch & Fintelmann, Wochenschr. Gärt. u. Pflanzenk. 2: 163 (1859).

Onoseris isotypus Benth. & Hook. f. Gen. Pl. 2: 487 (1873).
Seris conspicua Kuntze, Rev. Gen. 1: 364 (1891).
Seris rupestris Kuntze, Rev. Gen. 1: 364 (1891).
Onoseris paniculata Klatt, Bull. Soc. Bot. Belg. 31[1]: 214 (1892).
Onoseris conspicua Greenm. Proc. Am. Acad. 41: 268 (1905).
Onoseris rupestris Greenm. Proc. Am. Acad. 41: 268 (1905).

Planta robusta, más ó menos arbustiva, perenne, de 75–400 cm. de alto, erecta, gris-lanuginosa. Hojas casi basales, escasas; limbo de 120–280 mm. de largo por 125–300 mm. de ancho, cordiforme, haz araneoso, luego glabrescente, envés gris-lanuginoso, palminerviado, la base con 5 nervios, prominentes en el envés, el ápice agudo, raramente acuminado, el margen desigualmente sinuoso-dentado, los dientes muy grandes, separados por trechos de 7–22 mm. Pecíolo de 22–480 mm. de longitud, alado y con lóbulos; lóbulos de lanceolados hasta aovados, raramente más ó menos cordiformes, de 2 hasta 6 pares, opuestos ó alternos, los lóbulos mayores de 25–120 mm. de largo por 11–116 mm. de ancho, gradualmente más grandes hacia el limbo (raras veces aparecen 2 pequeños lóbulos entre el limbo y los lóbulos superiores). Inflorescencia panícula con numerosos capítulos homógamos, cada uno provisto de 4–7 flores. El eje de la panícula de 140–450 mm. de longitud, anguloso (4–5 ángulos) cubierto de un indumento gris-lanuginoso y adornado por brácteas de 2–8 mm. de largo, subuladas, de dorso poco araneoso-purpurascente, y más numerosas cerca del involucro. Involucro de 9–23 mm. de altura por 4–9 mm. de diámetro, turbinado; brácteas dispuestas en 7–8 series, las interiores de 19–26 mm. de largo por 1.2–1.8 mm. de ancho, de ápice acuminado, el dorso glabrescente-rojizo, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano con páleas heteromorfas, amarillas, laciniosas, que rodean la base de cada flor. Flores homógamas: corola de 15–25 mm. de longitud; tubo de 6–13 mm. de largo por 0.8–1.2 mm. de ancho en su base y 1.8–2 mm. en la parte superior, 5-nerviado, glabro; limbo terminado en 5 lóbulos agudos, ascendentes, 4 lóbulos iguales, de 1.6–4 mm. de largo por 0.4–0.6 mm. de ancho en su base y el quinto de 9–12 mm. de largo por 0.5–1.2 mm. de ancho en su base, los 5 ligeramente pubescentes en el dorso, raramente glabros, los pelos cortos, ascendentes, amarillos. Anteras de 9–12 mm. de longitud, cola de 3.6 4.5 mm. de largo, puntiaguda y provista de pelos cortos divaricados; filamento de 5–11 mm. de largo, cilíndrico y finamente pubescente. Estilo más ó menos cilíndrico, glabro; ramas de 3.6–5 mm. de longitud. Aquenio de 2–10 mm. de largo por 1.1–1.5 mm. de ancho, totalmente pubescente, los pelos ascendentes, amarillos, cortos, costado; costillas 4–5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillentos, los más grandes hasta 17 mm. de longitud. LÁM. III, FIGS. 7–11.

DISTRIBUCIÓN: Es de amplia distribución, ha sido encontrada al Sur de Méjico, Guatemala, Honduras Británica, Panamá, Colombia, y al Norte de Venezuela, altura 400–1800 metros.

MÉJICO: Jalisco: Hacienda del Ototal, San Sebastián, Sierra Madre, Marzo 10, 1927, *Mexia 1858* (G, FM, NY, US); Sierra Madre, Enero 19, 1899, *Langlassé 759* (G, US); Oaxaca: Plumia, Marzo 17, 1895, *Nelson 2480* (G, US); alrededores de Cafetal, Concordia, Abril 1–15, 1933, *Morton & Makrinius 2402* (FM, US); Cafetal, Soledad, Diciembre 27, 1917, *Reko 3705* (US); entre Plan de Minas y Puchalengo, Distrito de Inquila, Diciembre 29, 1921, *Conzatti 4546* (US); Chiapas: San Bartolomé, Marzo 21, 1904, *Goldman 763* (US). GUATEMALA: Sololá: Cerca

San Lucas, Febrero 27, 1907, *Kellerman 6326* (FM); Chimaltenango: Chimaltenango, Diciembre 30, 1937, *J. R. Johnston 1150* (FM); Sacatepéquez: Barranco Hondo, Diciembre 16, 1938, *Standley 60263* (FM); cerca Barranco Hondo, al Sudeste de Alotenango, Febrero 9, 1939, *Standley 64963* (FM); Dept. ?: Sin localidad, sin fecha, *Pittier* (US); sin localidad, 1905, *Pittier* (US). HONDURAS BRITÁNICA: Distrito del Cayo, Marzo 16, 1938, *Gentle 2356* (NY, DA). PANAMÁ: Chiriquí: Entre Hato del Jobo y Cerro Vaca, al Este de Chiriquí, Diciembre 25–28, 1911, *Pittier 5412* (G, US); Calderas, Chiriquí Viejo, Marzo, 1938, *Bro. Maurice 850* (US). COLOMBIA: Magdalena: Santa Marta, 1898–1901, *H. Smith 676* (G, FM, US). VENEZUELA: Aragua: Faldas escarpadas de Rancho Grande, Aragua, Enero 11, 1939, *L. Williams 11066* (G, FM, US); Colonia Tovar, 1856–7, *Fendler 679* (G); Maracay, 1928, *Vogl 662* (G); Camino á Choroni, Marzo 2, 1941, *Chardon 276* (US); Carabobo: Alrededores de Valencia, Enero 5–17, 1920, *Pittier 8742* (G, US, NY).

Esta planta arbustiva llega á adquirir un gran desarrollo (más ó menos 4 metros de altura) y es quizás la más robusta de todas las del género. Se caracteriza también por su inflorescencia panícula, la cual puede contener hasta 300 capítulos homógamos, cada uno con 4–11 flores hermafroditas. El involucro es turbinado y las brácteas involucrales de dorso araneoso y purpurascente. Habita en las regiones cálidas y muy húmedas. Por ejemplo, el material que sirvió de Tipo se dice: "Crescit regione calida in ripa fluvii Tuy, alt. 300 hex. (Prov. Venezuelae)". Por la descripción original y por la tábula fué fácil identificar los numerosos especímenes que aquí se limitan. Me parece importante anotar que la mayoría de los ejemplares presentan de 4–7 flores en cada capítulo mientras que los otros de 8–11 flores. Entre estos últimos podemos citar los procedentes de Guatemala, Honduras Británica, y Colombia. Conviene advertir también que algunos especímenes de Méjico exhiben en el pecíolo hasta 5 pares de lóbulos, opuestos ó alternos, siendo en el resto de menos pares, además los pelos del papus son de amarillo hasta amarillo-claro; sin embargo los caracteres más importantes son iguales.

Tanto *Onoseris paniculata* DC. como *Hilairia paniculata* DC. fueron publicadas en sinónimos bajo el nombre de *Isotypus onoseroides* H. B. K.

El espécimen que sirvió de Tipo para fundar *Caloseris rupestris* Benth. fué encontrado por Hartweg (*599*), "In rupibus prope montem Chorro, milias duodecim ab urbe Guatemala distantem"; su descripción original corresponde á los caracteres del material determinado. De semillas enviadas de Colombia por Karsten, se cultivó una planta en uno de los jardines de Alemania, que más tarde se describió con el nombre de *Schaetzellia Deckeri.* Según Schultz, Flora 33: 419 (1850), dicho binomio es igual á *Isotypus onoseroides* H. B. K. Ambas descripciones así lo evidencian. Diez años más tarde se la cultivó en Bélgica, bajo el nombre de *Cataleuca rubicunda* Hort., cuyo género y especie nunca fueron descritos.

El botánico Turczaninow describió el género *Rhodoseris* y su especie *R. conspicua,* que fué fundada de material colectado por Jurgensen en "Sierra San Pedro, Nolasco", situado en Méjico. He visto dicha descripción lo mismo que su tábula, y ambas muestran los mismos caracteres de *Onoseris onoseroides.*

Desde el punto de vista taxonómico la especie *Onoseris isotypus* Benth.

& Hook. f. es igual á *Isotypus onoseroides* H. B. K. El nombre específico de *O. isotypus* fué obtenido por Bentham & Hooker del nombre genérico de *Isotypus onoseroides*.

En Bull. Soc. Belg. 31[1]: 214 (1892) se cita sin descripción *Onoseris paniculata* Klatt como igual á "*Isotypus onoseroides* H. B. et K." y se indica como localidad de la primera: "Forêts de l'Alto del Rodeo, 1100 m. (n. 1622)"; sin embargo este ejemplar de Pittier no pertenece á *O. onoseroides*, sino á otra especie muy distinta, de capítulo heterógamo, denominada *Onoseris silvatica* Greenm.

10. **Onoseris silvatica** Greenm. Proc. Am. Acad. 40: 51 (1904).

Planta herbácea, perenne, de 48–200 cm. de altura, erecta, caulescente gris-lanuginosa. Hojas de 3 hasta 6, largamente pecioladas; limbo de 61 290 mm. de largo por 58–300 mm. de ancho, cordiforme, con orejas usualmente obtusas, el haz araneoso, luego glabrescente, el envés gris-lanuginoso, palminerviado, la base con 5 nervios, prominentes en el envés, el ápice acuminado, el margen desigualmente sinuoso-dentado, los dientes separados por trechos de 5-20 mm. Pecíolo de 45 310 mm. de longitud, alado y con lóbulos (raras veces las hojas mayores tienen pecíolo alado sin lóbulos) aovado-lanceolados, 7 pares, raramente 3–4 pares, opuestos ó alternos, los mayores de 14–55 mm. de largo por 9–36 mm. de ancho, gradualmente más grandes hacia el limbo. Inflorescencia panícula con 6–14 capítulos heterógamos. Eje de la panícula de 250–850 mm. de longitud, anguloso (4 5 ángulos), gris-lanuginoso, adornado por brácteas de 3 9 mm. de largo por 0.5–1 mm. de ancho en su base, subuladas, de dorso araneoso, escasas. Involucro de 15–24 mm. de altura por 9–14 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 18–20 mm. de largo por 2.5–3.3 mm. de ancho, ápice acuminado, el dorso araneoso y con pelos escasos, cortos, ascendentes, dispuestos en la costa, el margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano, con páleas heteromorfas, amarillas y laciniosas. Flor del disco: corola de 17.2 -21 mm. de longitud; tubo de 15–18.2 mm. de largo por 1–1.3 mm. de ancho en su base y 2.4–2.8 mm. en la parte superior, 5-nerviado, glabro; limbo terminado en 5 lóbulos agudos, iguales, de 2.2–2.8 mm. de largo por 1–1.2 mm. de ancho en su base, los 5 ascendentes y de dorso más ó menos pubescente, los pelos cortos, amarillos y dispuestos cerca del ápice. Anteras de 6–7 mm. de longitud, cola de 3.2–4 mm. de largo, puntiaguda, glabra; filamento de 7–9 mm. de largo, casi cilíndrico y finamente pubescente. Estilo más ó menos cilíndrico, glabro; ramas de 3–3.2 mm. de longitud. Aquenio de 3.2 -6.5 mm. de largo por 1–1.5 mm. de ancho, totalmente pubescente, los pelos ascendentes, cortos, amarillos, costado; costillas 5–6, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 18 mm. de longitud. Flor marginal: corola de 20.5–21 mm. de longitud; tubo de 7 8 mm. de largo por 0.6–0.7 mm. de ancho, glabro; labio externo de 12.5–13 mm. de largo por 2.2 -2.8 mm. de ancho, 6-nerviado, raramente 4–7 nervios, dorso araneoso y con pelos cortos, escasos, ascendentes, el ápice tridentado, los 3 lóbulos agudos, más ó menos iguales, de 0.3–0.8 mm. de largo por 0.3–0.6 mm. de ancho en su base; labio interno entero de 9–11 mm. de longitud por 0.4 -0.5 mm. de anchura en su base, glabro, largamente atenuado y retorcido en el ápice. Estilo más ó menos cilíndrico, glabro; ramas de

3.6–4.8 mm. de longitud. Aquenio de 3.5–6.5 mm. de largo por 0.9–1.4 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5–6, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 16 mm. de longitud. LÁM. IV, FIGS. 1–6.

DISTRIBUCIÓN: Es indígena de Costa Rica.

COSTA RICA: "Forêts des collines de Nicoya, Jan., 1900", *Tonduz 13597* (G, US, FM); El Rodeo, sin fecha, *Lankester 1317* (FM); Tabarcia, Enero, 1938, altura 1000 metros, *Solís 533* (FM); "Forêts de l'Alto del Rodeo", Diciembre 28, 1889, altura 1100 metros, *Pittier 1622* (TIPO G).

Esta planta ha sido confundida con otras especies más robustas de Colombia como *O. onoseroides*, debido á que sus hojas eran más ó menos iguales. Sin embargo al examinar los capítulos se comprueba que los de *O. silvatica* son heterógamos y los de *O. onoseroides* son homógamos.

10a. **Onoseris silvatica** var. **colombiana** var. nov.

A varietate typica differt lobulis petioli numerosis ad 11, lobis florum disci glabris; costa bractearum involucralium glabra.

La variedad difiere de la típica principalmente por los siguientes caracteres: los capítulos son más angostos; el limbo de sus hojas es de mayor espesor y de indumento más compacto; el peciolo de las hojas superiores posee hasta 11 lóbulos muy visibles; los 5 lóbulos de la corola de la flor hermafrodita son glabros en el dorso; la costa de las brácteas involucrales es glabra en el dorso; además la variedad procede de la región oriental de los Andes situada más ó menos al centro del territorio colombiano mientras que la típica sólo ha sido encontrada en Costa Rica. LÁM. IV, FIGS. 7–12.

COLOMBIA: El Meta: A lo largo del Río Guatiquía, cerca Villavicencio, Marzo 18–19, 1939, altura 500 metros, *Killip 34429* (TIPO U. S. Nat. Herb. 1771256).

11. **Onoseris peruviana** sp. nov.

Planta robustula 6–10 dm. alta annua vel biennis; foliis paucis amplis supra medium caulis simplicis erecti gestis, laminis 10–19 cm. longis hastatis 8–20 cm. latis margine minute denticulatis supra viridibus subtus dense araneosis, petiolo 8–19 cm. longo alato lobulato, lobulis 3–6-jugatis sursum majoribus; capitulis 7–9 in paniculis laxis longipedunculatis gestis, bracteis involucralibus dorso araneosis plus minusve glabrescentibus costa pilis rigidis adscendentibus glanduliferis ornata; floribus heteromorphis; floribus marginalibus ad 2 cm. longis, tubo supra medium angustiore, labio exteriore quam longitudine tubi breviore, labio interiore integerrimo 6–7 mm. longo supra medium contorto; floribus disci regularibus ad 17 mm. longis supra medium tubi ampliatis, lobulis longitudine quam latitudine paulo majoribus.

Planta herbácea, perenne, de 60–100 cm. de altura, erecta, caulescente, tallo canescente, más ó menos tomentoso. Hojas hasta 7, largamente pecioladas; limbo de 100–190 mm. de largo por 86 205 mm. de ancho, hastado, haz araneoso, envés gris-lanuginoso, palminerviado, la base con 5 nervios, el ápice acuminado, margen desigualmente sinuoso-dentado, los dientes pequeños y separados por trechos de 3–26 mm. Pecíolo de 85–195 mm. de longitud, alado y con lóbulos aovado-lanceolados, desde 3 hasta 6 pares, opuestos ó alternos, los lóbulos mayores de 48–58 mm. de largo por 18–28 mm. de ancho, gradualmente más grandes hacia el limbo. Inflorescencia panícula con 7–9 capítulos heterógamos y largamente pedunculados.

Pedúnculo de 400–460 mm. de largo, anguloso (3–4 ángulos), gris-lanuginoso, luego glabrescente, adornado por brácteas de 3–6 mm. de largo por 0.4–1 mm. de ancho en su base, subuladas, escasas, de dorso araneoso, y más numerosas cerca del involucro. Involucro de 14–20 mm. de altura por 7–10 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 18–20 mm. de largo por 2.4–2.5 mm. de ancho, ápice acuminado, el dorso araneoso y con pelos cortos, escasos, ascendentes, dispuestos á lo largo de la costa, el margen escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y cubierto de páleas heteromorfas, amarillas, y laciniosas. Flor del disco: corola de 16–17 mm. de longitud; tubo de 14.8–15.6 mm. de largo por 0.8–1 mm. de ancho en su base y 1.8–2 mm. en la parte superior, glabro, 5-nerviado; limbo terminado en 5 lóbulos de 1.2–1.4 mm. de largo por 0.8–1 mm. de ancho en su base, los 5 agudos, iguales, ascendentes, y glabros en el dorso. Anteras de 4.5–4.8 mm. de longitud, cola de 2–2.2 mm. de largo, puntiaguda, glabra; filamento de 5–5.5 mm. de largo, más ó menos cilíndrico y finamente pubescente. Estilo claviforme; ramas de 3.5–4 mm. de longitud, cubiertas por pelos muy cortos. Aquenio de 4.5–5 mm. de largo por 1–1.1 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 15 mm. de longitud. Flor marginal: corola de 19–20 mm. de longitud; tubo de 9.5–10 mm. de largo por 0.5–0.6 mm. de ancho en su base y en la parte superior, encima de la parte media más ancho de 0.8–1 mm., glabro; labio externo de 9.5–10 mm. de largo por 1.8–2 mm. de ancho, 6-nerviado, dorso araneoso y con pelos escasos, cortos, ascendentes, amarillos, el ápice tridentado, los 3 lóbulos agudos, más ó menos iguales, de 0.4–0.6 mm. de largo por 0.3–0.4 mm. de ancho en su base; labio interno entero de 6–7 mm. de largo por 0.3–0.4 mm. de ancho en la base, glabro, largamente atenuado en el ápice, y retorcido. Estilo más ó menos claviforme; ramas de 4.5–5 mm. de longitud, cubiertas por pelos muy cortos. Aquenio de 4.2–5 mm. de largo por 0.9–1 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 14 mm. de longitud. LÁM. IV, FIGS. 13–19.

DISTRIBUCIÓN: Habita en el Departamento de Junín, en la región denominada "Ceja de montaña", altura 600–680 metros.

PERÚ: Junín: La Merced, Agosto 10–24, 1923, *Macbride 5425* (TIPO U. S. Nat. Herb. 1191547); Colonia Perené, Junio 14–22, 1929, *Killip & Smith 24937* (US).

Esta planta es afín á *Onoseris silvatica* Greenm., de la que se diferencia por el tallo más ó menos tomentoso; las hojas son de limbo hastado y de margen poco dentado; los 5 lóbulos de la flor hermafrodita son glabros en el dorso, el tubo de la flor marginal contraído encima de la parte media; la panícula tiene menos capítulos (7–9); además las localidades son distintas.

12. **Onoseris fraterna** Blake, Jour. Wash. Acad. Sci. 33: 368 (1943).

Planta robusta, perenne, hasta 300 cm. de alto, erecta, tallo gris-lanuginoso. Hojas escasas, largamente pecioladas; limbo de 110–120 mm. de largo por 230–240 mm. de ancho, cordiforme, haz araneoso, luego glabrescente, envés gris-lanuginoso, palminerviado, la base con 5 nervios prominentes en el envés, el ápice más ó menos acuminado, margen desigualmente

sinuoso-dentado, los dientes pequeños, separados por trechos de 5–19 mm. Pecíolo de 250–255 mm. de longitud, alado y con lóbulos aovado-lanceolados, de 8–9 pares opuestos ó alternos, los lóbulos mayores de 80–90 mm. de largo por 38–44 mm. de ancho, gradualmente más grandes hacia el limbo. Inflorescencia panícula con 23–24 capítulos heterógamos. El pedúnculo de 230–250 mm. de longitud, anguloso (5–6 ángulos), gris-lanuginoso, adornado por brácteas de 2–9 mm. de largo por 0.4–1.4 mm. de ancho en la base, subuladas, escasas, araneosas en el dorso y más numerosas cerca del involucro. Involucro de 17–23 mm. de altura por 8–12 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 16–19 mm. de largo por 2.8–3 mm. de ancho, ápice bruscamente agudo, el dorso araneoso y la costa cubierta de pelos cortos, ascendentes, el margen muy escarioso debajo del ápice; las brácteas exteriores gradualmente menores. Receptáculo plano y provisto de páleas amarillas, heteromorfas y laciniosas. Flor del disco: corola de 11.5–14 mm. de longitud; tubo de 10.8–13 mm. de largo por 1–1.2 mm. de ancho, 5-nerviado, glabro; limbo terminado en 5 lóbulos agudos, 3 lóbulos de 0.6–0.8 mm. de largo por 0.4–0.5 mm. de ancho en su base y 2 de 0.8–1 mm. de largo por 0.6–0.7 mm. de ancho en su base, los 5 ascendentes y glabros en el dorso. Anteras de 4–4.2 mm. de longitud, cola de 2.2–2.8 mm. de largo más ó menos puntiaguda, glabra; filamento de 4–5 mm. de longitud, cilíndrico y finamente pubescente. Estilo cilíndrico glabro; ramas de 1.7–2 mm. de longitud. Aquenio de 4–5 mm. de largo por 1.1–1.3 mm. de ancho, totalmente pubescente, pelos amarillos, ascendentes, cortos, costado; costillas 5, de borde angosto y cubiertas por el indumento. Papus con pelos numerosos, amarillos, más ó menos de la misma altura, los pelos más grandes hasta 16 mm. de longitud. Flor marginal: corola de 18–19 mm. de longitud; tubo de 9–9.5 mm. de largo por 0.8–1 mm. de ancho, glabro; labio externo de 9–9.5 mm. de largo (de igual longitud que el tubo) por 2.8–3 mm. de ancho, 6-nerviado (raramente 7 nervios), dorso araneoso, ápice tridentado, los 3 lóbulos pequeños, agudos, raramente más ó menos obtusos, de 0.2–0.3 mm. de largo por 0.2–0.3 mm. de ancho en su base; labio interno de 7–7.5 mm. de longitud por 0.2–0.3 mm. de anchura en su base, entero, largamente atenuado, glabro y con el ápice poco retorcido. Estilo cilíndrico, glabro; ramas de 2.5–3 mm. de longitud. Aquenio de 4.5–5 mm. de largo por 1.1–1.2 mm. de ancho, totalmente pubescente, pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto y cubiertas por el indumento. Papus igual al de la flor del disco. LÁM. V, FIGS. 1–8.

DISTRIBUCIÓN: Ha sido encontrada en la vertiente oriental de la Cordillera Real de Bolivia, al Este de la ciudad de La Paz.

BOLIVIA: La Paz: Cuenca del Río Bopi, San Bartolomé, cerca de Calisaya, Provincia de S. Yungas, Julio 1–22, 1939, altura 750–900 metros, *Krukoff 10266* (ISOTIPO G).

Esta especie es próxima á *Onoseris silvatica* Greenm., de la cual se distingue por tener el pecíolo mayor número de lóbulos; además el limbo de las hojas tiene el margen con dientes mucronados; por otra parte los 5 lóbulos de la flor del disco son desiguales; y las brácteas involucrales tienen el dorso más araneoso, grisáceo, y de ápice bruscamente agudo. Se puede observar también que los pelos del papus sobrepasan la longitud de la flor hermafrodita.

13. **Onoseris speciosa** H. B. K. Nov. Gen. et Sp. 4: 7. *t. 305* (1820); Less. Linnaea 5: 340 (1830).

Seris speciosa Kuntze, Rev. Gen. 1: 364 (1891).

Onoseris Stuebelii Hieron. Bot. Jahrb. 21: 366 (1895).

Planta herbácea, perenne, de 30–65 cm. de alto, acaule, escapo tricéfalo (raramente menos de 3 capítulos), caudex tomentoso y corto. Hojas arrosetadas naciendo del caudex, escasas, hasta 9; limbo de 35–100 mm. de largo por 20–90 mm. de ancho, cordiforme-hastado con orejas generalmente obtusas, de 18–46 mm. de largo por 17–42 mm. de ancho, la base triplinerviada, raramente palminerviada con 5 nervios, ápice frecuentemente agudo, raramente obtuso, el haz araneoso, el envés gris-lanuginoso, el margen desigualmente sinuoso-dentado, los dientes separados por trechos de 5–10 mm. Pecíolo de 18 160 mm. de longitud, alado-lobulado, el haz semi-acanalado, los lóbulos más ó menos aovados, 2 pares, raramente 1–4 pares, opuestos ó alternos, los lóbulos mayores, de 8–46 mm. de largo por 5–32 mm. de ancho, los lóbulos superiores más grandes. Capítulos 1–3, dispuestos en corimbo; escapo gris-lanuginoso y adornado por pelos numerosos, erectos, cortos, más ó menos glandulosos y conspicuos, costado; costillas 6–7, de borde ancho, obtuso, la parte superior del escapo con brácteas de 3–5 mm. de longitud, escasas, subuladas y de dorso pubescente. Involucro de 18 24 mm. de altura por 11–16 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 20–24 mm. de largo por 1.2–2 mm. de ancho, ápice largamente atenuado, el dorso araneoso y con pelos glandulosos, conspicuos, y numerosos, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y desnudo. Flor del disco: corola de 14–16 mm. de longitud; tubo de 12.2 15 mm. de largo por 0.6–1 mm. de ancho en la base y 1.5–2 mm. en la parte superior, pubescente, los pelos cortos, ascendentes, 5-nerviado; limbo terminado en 5 lóbulos, de 1.8 2.8 mm. de largo por 0.6–0.9 mm. de ancho en su base, los 5 agudos, iguales, recurvados, y con el dorso pubescente, los pelos escasos, cortos, y amarillos. Anteras de 6–7 mm. de longitud, cola de 2–3 mm. de largo, puntiaguda y provista de pelos escasos y muy cortos; filamento, de 4–5 mm. de largo, más ó menos cilíndrico y finamente pubescente. Estilo claviforme; ramas de 3–4 mm. de longitud y cubiertas de pelos muy cortos. Aquenio de 3.8–6 mm. de largo por 0.7–1.2 mm. de ancho, pubescente, los pelos muy cortos, ascendentes, y amarillos, costado; costillas 5, de borde angosto y cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 14 mm. de longitud. Flor marginal: corola de 29–39 mm. de longitud; tubo de 8–9.5 mm. de largo por 0.8–1 mm. de ancho, pubescente, los pelos más ó menos hirsutos, cortos y amarillos; labio externo, de 21–30 mm. de largo por 2.8–3.8 mm. de ancho, 6-nerviado, dorso araneoso y con pelos glandulosos, el ápice tridentado, los 3 lóbulos agudos, más ó menos iguales, de 0.6–1.8 mm. de largo por 0.4–0.6 mm. de ancho en su base; labio interno bipartido, lóbulos de 8–14 mm. de largo por 0.4–0.6 mm. de ancho en su base, glabros, largamente atenuados y retorcidos en el ápice. Estilo claviforme; ramas de 3.2–4.2 mm. de longitud y cubiertas de pelos muy cortos. Aquenio, de 4–6 mm. de largo por 0.6–1.2 mm. de ancho, pubescente, los pelos muy cortos, ascendentes, y amarillos, costado; costillas 5, de borde angosto y cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 12 mm. de longitud. LÁM. V, FIGS. 9–16.

DISTRIBUCIÓN: A lo largo de los Andes ecuatorianos, desde la Provincia de Chimborazo hasta la de Loja; también en la región septentrional de los Andes peruanos; altura 1200–2600 metros.

ECUADOR: Chimborazo: Huigra, Julio 4–27, 1923, *Hitchcock 20614* (G, US, NY); Hacienda de Licay, Huigra, Agosto 21, 1918, *J. N. Rose 23831* (FM, US, NY, G); Alausi, sin fecha, *Bonpland 3235* (ISOTIPO FM); Azuay: Río Paute, sin fecha, *Jameson* (G); Loja: Loja y San Lucas, Septiembre 6, 1923, *Hitchcock 21453* (G, US, NY); cerca de la ciudad de Alacete, Julio, 1864, *Jameson* (NY); Dept. ?: Sin localidad, sin fecha, *Jameson* (NY, US); sin localidad, sin fecha, *Jameson* (US); "In Andibus Ecuadorensibus", 1857–9, *Spruce 6005* (G, NY); "Palanda", 1875, *André 4363* (NY); Huancabamba, Noviembre 2, 1876, *André 5* (G); sin localidad, sin fecha, *Bonpland 3235* (Fotografía TIPO G). PERÚ: Dept. ?: "Peruvia", 1862, *Mathews 18* (G, NY).

Esta especie y *Onoseris purpurea* (L.f.) Blake son muy relacionadas, diferenciándose la presente de esta última por ser acaule y tener su escapo más ó menos cilíndrico con 6–7 costillas; sus hojas son radicales arrosetadas; la flor marginal tiene su labio interno bipartido, y la flor del disco tiene sus lóbulos revolutos y con pelos en el dorso. He considerado como sinónimo la especie *Onoseris Stuebelii,* porque tanto la descripción como la fotografía del Tipo (*Stübel 35d*), que posee Gray Herbarium, corresponden á los caracteres del material determinado. No obstante Hieronymus, Bot. Jahrb. 21: 366 (1895), sitúa *O. Stuebelii* entre *Onoseris hieracioides* — que está excluída por pertenecer al género *Trichocline* — y *Onoseris speciosa,* diferenciándola de ésta en: "foliis angustioribus, involucri squamis angustioribus etc." Sin embargo estos caracteres y otros más importantes no denotan una diferencia fundamental que permita separarlas en distintas especies. Por otro lado, las localidades de ambas se deduce que son vecinas porque uno de los ejemplares de *O. speciosa* fué coleccionado en "Peruvia" por Mathews y es sabido que este naturalista vivió mucho tiempo en Chachapoyas, Departamento de Amazonas; y en cuanto á la localidad del Tipo de *O. Stuebelii*: "Tambo de Carizal, in valle fluminis Utcubamba" se encuentra precisamente en el mismo Departamento de Amazonas.

14. **Onoseris purpurea** (L. f.) Blake, Proc. Biol. Soc. Wash. 38: 85 (1925); Less. según DC. Prodr. 7^1: 34 (1838) (en sinónimo).
Atractylis purpurea L. f. Suppl. Pl. 349 (1781).
Atractylis purpurata L. ex J. E. Sm. Pl. Icon. Ined. 3: 65. *t. 65* (1791).
Onoseris purpurata Willd. Sp. Pl. 3^3: 1702 (1804).
Seris purpurea Kuntze, Rev. Gen. 1: 354 (1891).

Planta sufruticosa, caulescente, perenne, de 32–75 cm. de altura, erecta, gris-lanuginosa, más ó menos hojosa hasta el ápice del tallo. Hojas escasas, largamente pecioladas; limbo de 21–155 mm. de largo por 10–140 mm. de ancho, hastado, haz araneoso, luego glabrescente, envés gris-lanuginoso, palminerviado, la base con 5 nervios prominentes en el envés, el ápice más ó menos agudo, el margen desigualmente sinuoso-dentado, los dientes mucronados. Pecíolo de 15–220 mm. de longitud, alado-lobulado, los lóbulos aovado-lanceolados de 3 hasta 7 pares, opuestos ó alternos, los lóbulos mayores de 15–25 mm. de largo por 6–10 mm. de ancho, gradualmente más grandes hacia el limbo, de margen sinuoso-dentado, el ápice frecuentemente acuminado, raramente agudo, haz araneoso, envés lanugi-

noso, con 1–3 nervios á uno y otro lado de la costa. Capítulos 2–7, largamente pedunculados. Pedúnculo, de 240–450 mm. de longitud, anguloso, albo-lanuginoso, y con pelos semiglobulosos, cortos, erectos, purpurascentes, más numerosos y conspicuos en la parte superior, adornado por brácteas subuladas de 3–8 mm. de longitud por 0.5–1 mm. de ancho en su base. Involucro, de 18–23 mm. de altura por 8–14 mm. de diámetro, acampanado; brácteas dispuestas en 6–8 series, las interiores de 19–24 mm. de largo por 2–2.2 mm. de ancho, ápice largamente atenuado, el dorso araneoso y con pelos cortos, más ó menos erectos, dispuestos á lo largo de la costa, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano cubierto de páleas amarillas, laciniosas, y cortas. Flor del disco: corola de 16–17 mm. de longitud; tubo de 14.2–15 mm. de largo por 0.8–1 mm. de ancho en su base y 1.5–1.6 mm. en la parte superior, pubescente, pelos escasos, cortos, ascendentes, amarillos, 5-nerviado; limbo terminado en 5 lóbulos agudos, iguales, ascendentes, glabros en el dorso, de 1.8–2 mm. de largo por 0.5–0.6 mm. de ancho en su base. Anteras de 5.2–6 mm. de longitud, cola de 2.6–2.8 mm. de largo, puntiaguda, glabra; filamento de 6–7 mm. de longitud, cilíndrico, finamente pubescente. Estilo más ó menos cilíndrico; ramas de 3–4 mm. de longitud, glabrescentes. Aquenio de 3–5 mm. de largo por 0.7–0.9 mm. de ancho, totalmente pubescente, pelos cortos, amarillos, ascendentes, costado; costillas 5, de borde angosto y cubiertas por el indumento. Papus con pelos numerosos, amarillo-oscuro, los más grandes hasta 14 mm. de longitud. Flor marginal: corola de 19–26 mm. de longitud; tubo de 7–9 mm. de largo por 0.5–0.7 mm. de ancho, pubescente, pelos escasos, cortos, y erectos; labio externo de 12–17 mm. de largo por 2.4–3 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los 3 lóbulos agudos, iguales, de 0.2–0.3 mm. de largo por 0.2–0.3 mm. de ancho en su base; labio interno entero, de 7–8 mm. de longitud por 0.4–0.5 mm. de anchura en su base, largamente atenuado, glabro, y retorcido. Estilo más ó menos cilíndrico, glabrescente; ramas de 4.5–6 mm. de longitud. Aquenio de 3.2–5 mm. de largo por 0.7–0.9 mm. de ancho, totalmente pubescente, los pelos cortos, amarillos, ascendentes, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillo-oscuro, los más grandes hasta 13 mm. de longitud. LÁM. V, FIGS. 17–22.

DISTRIBUCIÓN: En la región interandina formada por las Cordilleras Central y Oriental del Centro y Sur de Colombia, altura 250–1500 metros.

COLOMBIA: Cundinamarca: La Mesa, Julio, 1923, *Ariste-Joseph* (US); Cundinamarca y Sierra Templada, Febrero, 1916, (*colector ?*) *68* (US); Guaduas, Julio, 1923, *Ariste-Joseph* (US); Caparrapi, Junio 8–13, 1939, *García 7636* (US); "Guataqui", Julio, 1930, *Pérez Arbeláez 354* (US); Tolima: Santa Ana, Río Cabrera, 1883, *Lehmann 2339* (G, US); Río Paez, sin fecha, *Lehmann 4755* (G, US, FM); Honda, Enero 3–4, 1918, *Pennell 3603* (G, NY); Ibague — Girardot, llanos del Tolima, Julio 22, 1939, *Pérez Arbeláez & Cuatrecasas 6505* (US); Honda, Magdalena, 1875, *André 562* (NY); Huila: Este de Neiva, Cordillera Oriental, Julio 31, 1917, *Rusby & Pennell 495* (G, NY); entre Jagua y Laguna, Julio 4, 1926, *Juzepczuk 5629* (US); Dept. ?: Sin localidad, Julio 5, 1920, *M. Dawe* (US); sin localidad, *Herb. H. B. K.* (Fotografía TIPO FM); sin localidad, Diciembre, 1932, *Arbeláez 2169* (US); Cordillera Occidental Santamaría, 1918–19, *M. Dawe 814* (NY).

Esta especie se caracteriza por ser caulescente, el tallo erecto y gris-lanuginoso; el eje de la inflorescencia conspicuamente anguloso (4–5 ángulos), y la parte superior adornada por brácteas subuladas y también

por pelos híspidos más ó menos purpurascentes. El material típico fué colectado por Mutis, "In Nova Granada."

15. **Onoseris sagittata** (Rusby) Rusby, N. Sp. S. Am. Pl. 164 (1920).
Seris sagittatus Rusby, Mem. Torr. Bot. Cl. 6: 69 (1896).

Planta herbácea, perenne, de 12–70 cm. de alto, blanco-lanuginosa, erecta y caulescente. Hojas escasas hasta 18; limbo de 38–94 mm. de largo por 26–52 mm. de ancho, asaetado, la base palminerviada, con 5 nervios, el haz araneoso, luego glabrescente, envés blanco-lanuginoso, el ápice acuminado, el margen desigualmente sinuoso-dentado, los dientes separados por trechos de 6–16 mm. Pecíolo de 30–100 mm. de longitud, alado-lobulado, los lóbulos lanceolados, de 1–3 pares opuestos ó alternos, los mayores de 12–14 mm. de largo por 3–4 mm. de ancho, gradualmente más grandes hacia el limbo, de margen entero, el ápice acuminado ó raramente agudo, haz araneoso, envés blanco-lanuginoso. Inflorescencia escasamente ramosa, capítulos 1–3. Eje de la inflorescencia de 120–440 mm. de longitud, blanco-lanuginoso, luego glabrescente en la parte inferior, costado; costillas 8–10, de borde ancho, obtuso, conspicuas; la parte superior adornada por brácteas de 4–14 mm. de largo por 0.9–1.1 mm. de ancho en su base, subuladas, escasas, y de dorso araneoso. Involucro de 14–15 mm. de altura por 11–12 mm. de diámetro, acampanado; brácteas dispuestas en 5–6 series, las interiores de 15–16 mm. de largo por 2.6–2.8 mm. de ancho, ápice acuminado, el dorso muy araneoso, margen poco escarioso; las brácteas exteriores gradualmente menores. Flor del disco: corola de 14–15 mm. de longitud; tubo de 12.2–13 mm. de largo por 0.7–0.8 mm. de ancho en su base y 1.1–1.2 mm. en la parte superior, 5-nerviado, pubescente, los pelos más ó menos numerosos, cortos, ascendentes, amarillos; limbo terminado en 5 lóbulos agudos, de 1.8–2 mm. de largo por 0.5–0.6 mm. de ancho en su base, iguales, ascendentes y el dorso con pelos escasos, cortos, y amarillos. Anteras de 6–6.5 mm. de longitud, cola de 2–2.2 mm. de largo, puntiaguda, glabra; filamento de 6–7 mm. de largo, cilíndrico y finamente pubescente. Estilo claviforme; ramas de 1.8–2.2 mm. de longitud, cubiertas de pelos muy cortos. Aquenio de 3.5–4 mm. de largo por 0.9–1 mm. de ancho, totalmente pubescente, pelos ascendentes, cortos, amarillos, costado; costillas 5, de borde angosto y cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 15 mm. de longitud. Flor marginal: corola de 28–29 mm. de longitud; tubo de 7–7.5 mm. de largo por 0.8–0.9 mm. de ancho en la base y 1–1.2 mm. en la parte superior, pubescente, los pelos cortos, amarillos, ascendentes, y más ó menos numerosos; labio externo de 21–21.5 mm. de largo por 3.2–3.5 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los lóbulos de 0.5–0.6 mm. de largo por 0.4–0.5 mm. de ancho en su base, agudos, iguales; labio interno bipartido, de 5.5–6 mm. de largo por 0.8–0.9 mm. de ancho en su base, glabro, largamente atenuado, y no retorcido. Estilo claviforme; ramas de 2.5–3 mm. de longitud, cubiertas por pelos muy cortos. Aquenio de 4.2–5 mm. de largo por 1.2–1.4 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 14 mm. de longitud. LÁM. VI, FIGS. 1–7.

DISTRIBUCIÓN: Encontrada al centro del territorio boliviano, que comprende el Departamento de Cochabamba.

BOLIVIA: Cochabamba: "In dry gravelly or clayey soil, Turedon, vic. Cochabamba", 1891, *Bang 1139* (ISOTIPO G).

Rusby transfirió el nombre *"Seris sagittatus"* á *Onoseris,* y lo publicó bajo el nombre de *"O. sagittatus";* sin embargo se debe corregir el género del nombre específico. Es próxima á *Onoseris alata* Rusby, de la cual se diferencia por tener el pecíolo conspicuamente alado-lobulado (1–2 pares), las brácteas involucrales más anchas, de dorso muy araneoso y el ápice acuminado, y finalmente los pelos del aquenio ascendentes. Se acerca también á *Onoseris hastata,* pero esta última es acaule y de escapo monocéfalo. Por no malograr la única flor del Isotipo no se ha descrito el receptáculo.

16. **Onoseris acerifolia** H. B. K. Nov. Gen. et Sp. 4: 8 (1820).
Seris acerifolia Kuntze, Rev. Gen. 1: 364 (1891).
Hipposeris acerifolia Cass. según Jackson, Index Kew. 2: 1164 (1893).

Planta sufruticosa, perenne, de 50–80 cm. de alto, erecta, tallo terete, ramosa, ramas teretes de 80–300 mm. de longitud, totalmente pubescente, los pelos glandulosos más ó menos erectos, de 2–4 mm. de largo. Hojas más ó menos numerosas, largamente pecioladas; limbo de 10–90 mm. de largo por 11–120 mm. de ancho, la base casi cordiforme, palminerviada con 7–8 nervios muy prominentes en el envés, el margen lobulado, los lóbulos anchos, angulosos, irregulares, el haz araneoso y con pelos glandulosos, el envés gris ó albo-lanuginoso y con pelos glandulosos erectos y más numerosos en las nervaduras. Pecíolo de 15–75 mm. de longitud terete y adornado por pelos glandulosos erectos. Capítulo solitario y terminal. Pedúnculo de 20–75 mm. de longitud, terete, con pelos glandulosos y con brácteas de 5–9 mm. de largo por 1.5–2 mm. de ancho en su base, totalmente glandulosas, flexuosas, y más numerosas en la parte superior. Involucro de 7–25 mm. de altura por 5–20 mm. de diámetro, hemisférico; brácteas dispuestas en 6–7 series, las interiores de 22–29 mm. de largo por 1.5–2 mm. de ancho, ápice largamente atenuado y flexuoso, dorso araneoso y totalmente glanduloso, los pelos gradualmente más grandes hacia el ápice, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y cubierto de pelos numerosos, amarillos, cortos y rígidos. Flor del disco: corola de 14–16.5 mm. de longitud; tubo de 12.5–14 mm. de largo por 0.6–0.7 mm. de ancho en su base y 1–1.4 mm. en la parte superior, 5-nerviado, pubescente, los pelos cortos, ascendentes, amarillos; limbo terminado en 5 lóbulos, agudos, iguales, recurvados, de 1.5–2.5 mm. de largo por 0.6–0.8 mm. de ancho en su base, el dorso de los lóbulos con pelos escasos, cortos, amarillos, y cerca del ápice. Anteras de 5.6–7 mm. de longitud, cola de 2.4–3 mm. de largo, puntiaguda, glabra; filamento de 5–6 mm. de longitud, más ó menos cilíndrico y finamente pubescente. Estilo claviforme, glabrescente; ramas de 2.2–3 mm. de longitud. Aquenio de 2.4–5 mm. de largo por 1–1.5 mm. de ancho, totalmente pubescente, los pelos ascendentes, cortos, amarillos, costado; costillas 5–6, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 13 mm. de longitud. Flor marginal: corola de 33–44 mm. de longitud; tubo de 6–9 mm. de largo por 0.6–1 mm. de ancho, pubescente, los pelos numerosos, glandulosos, erectos; labio externo de 27–35 mm. de largo por 2.8–3.8 mm. de ancho, 6-nerviado (raramente hasta 12 nervios), dorso araneoso y con pelos glandulosos, numerosos, cortos, el ápice tridentado, los lóbulos

agudos, iguales, de 0.6–1.2 mm. de largo por 0.4–0.7 mm. de ancho en su base; labio interno de 5–17 mm. de largo por 0.3–0.5 mm. de ancho en su base, entero, glabro, largamente atenuado, y retorcido en el ápice. Estilo claviforme, glabrescente; ramas de 1.8–2.5 mm. de longitud. Aquenio de 2.4–4.5 mm. de largo por 0.5–1 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes amarillos, rígidos, costado; costillas 5–6, de borde más ó menos angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 12 mm. de longitud. LÁM. VI, FIGS. 8–13.

DISTRIBUCIÓN: Se ha encontrado en la región Noroeste del Perú y en el centro de Bolivia, altura 1200–1500 metros.

PERÚ: Cajamarca: Jaén, Provincia Jaén, Abril, 1912, *Weberbauer 6203* (G, FM); *Herb. H. B. K.* (Fotografía TIPO FM). BOLIVIA: Santa Cruz: Samaipata, Octubre 8, 1928, *Steinbach 8200* (G).

Esta planta, una de las más distintivas del género, se caracteriza por su tallo terete, robusto, y glanduloso; el involucro es conspicuamente hemisférico y sus brácteas involucrales son largamente atenuadas en el ápice, flexuosas, y su dorso totalmente cubierto de pelos glandulosos. La localidad del Tipo, "Provinciae Bracamorensis in devexis Parami de Yamoca inter pagos Colazey et Chontali", se encuentra en el Departamento de Cajamarca. Sin embargo la diagnosis es igual en los ejemplares aquí limitados. Las facies muestran á primera vista pequeñas diferencias de color; por ejemplo el material procedente del Perú se distingue por tener el haz de sus hojas más ó menos parduzco y el envés grisáceo, mientras que el procedente de Bolivia exhibe el haz del limbo verdoso y el envés blanco-lanuginoso. Estos cambios de color se supone que obedecen á los efectos producidos por los distintos procedimientos de desecación.

17. **Onoseris Castelnaeana** Wedd. Chlor. And. 1: 10 (1855).
Seris Castelnaeana Kuntze, Rev. Gen. 1: 364 (1891).

Planta sufruticosa, perenne, decumbente, albo-lanuginosa, ramosa. Hojas escasas, agrupadas en el extremo de las ramas, largamente pecioladas; limbo de 26–60 mm. de largo por 7–29 mm. de ancho, sagitado ó más ó menos truncado, palminerviado, la base con 5 nervios, haz blanco-araneoso, luego glabrescente-verdoso, envés níveo-lanuginoso, el ápice agudo, margen brevemente dentado, dientes pequeños separados por trechos de 3–7 mm. Pecíolo de 8–30 mm. de longitud, poco alado, alas de borde entero y semirevoluto. Inflorescencia poco ramificada, capítulos hasta 3. Eje de la inflorescencia de 50–160 mm. de longitud, blanco-lanuginoso, adornado por brácteas de 4–6 mm. de largo, subuladas, escasas, de dorso araneoso, y más numerosas en la parte superior. Involucro de 18–28 mm. de altura por 8–12 mm. de diámetro, acampanado; brácteas dispuestas en 10–12 series, las interiores de 22–24 mm. de largo por 1.8–2 mm. de ancho, ápice acuminado, el dorso araneoso y con pelos cortos, amarillos, rígidos, ascendentes, el margen poco escarioso; las brácteas exteriores gradualmente menores y todas con el ápice curvado hacia fuera. Receptáculo plano, cubierto de páleas amarillas y laciniosas. Flor del disco: corola de 18–22 mm. de longitud; tubo de 15.2–19 mm. de largo por 0.9–1 mm. de ancho en su base y 2–2.2 mm. en la parte superior, 5-nerviado, pubescente, los pelos más ó

menos numerosos, cortos, ascendentes, y dispuestos en los nervios; limbo terminado en 5 lóbulos agudos, iguales, poco recurvados, el dorso adornado por pelos escasos, cortos, y amarillos, los lóbulos de 2.8–3 mm. de largo por 1–1.2 mm. de ancho en su base. Anteras de 7–8 mm. de longitud, cola de 3–3.5 mm. de largo, puntiaguda, glabra; filamento de 6–7 mm. de largo, cilíndrico y finamente pubescente. Estilo claviforme, glabrescente; ramas de 0.8–1 mm. de longitud. Aquenio de 3–3.5 mm. de largo por 1–1.2 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 19 mm. de longitud. Flor marginal: corola de 46–48 mm. de longitud; tubo de 11–12 mm. de largo por 1–1.2 mm. de ancho, pubescente en la parte superior, los pelos cortos, escasos y ascendentes; labio externo de 35–36 mm. de largo por 3–3.4 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los lóbulos más ó menos agudos, iguales, de 0.4–0.7 mm. de largo por 0.3–0.6 mm. de ancho en su base; labio interno bipartido, lóbulos de 6–7 mm. de largo por 1–1.2 mm. de ancho en su base, glabros, largamente atenuados y más ó menos filiformes. Estilo claviforme, glabrescente; ramas de 1.2–1.4 mm. de longitud. Aquenio de 4–4.2 mm. de largo por 1–1.2 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 18 mm. de longitud. LÁM. VI, FIGS. 14–19.

DISTRIBUCIÓN: Se ha encontrado solamente en los Departamentos de Apurímac y Cuzco, situados al Sudeste del Perú, altura 2400–2900 metros.

PERÚ: Cuzco: Paruro, Prov. Paruro, Julio 28, 1937, *Vargas 403* (G); Apurímac: Alrededores de Abancay, Prov. Abancay, Agosto 7, 1937, *Vargas 404* (G); Dept. ?: Andes del Perú, Junio, 1847, *Castelnau* (Fotografía TIPO FM); sin localidad, sin fecha, *Castelnau 35* (Fragmentos TIPO FM).

El material que sirvió de Tipo fué colectado por Castelnau en "Pérou !". He visto la descripción original de Weddell, la fotografía del Tipo, y además he examinado algunas hojas y flores del *Castelnau 35*. La identificación se ha hecho con facilidad porque esta planta presenta caracteres muy conspicuos, como por ejemplo las brácteas involucrales que se disponen en 10–12 series; además el ápice es visiblemente curvado hacia fuera; por otra parte las hojas tienen limbo sagitado ó más ó menos truncado en su base. La expedición de Castelnau exploró el Departamento del Cuzco y justamente el material que se ha colocado dentro de esta especie procede de dicho Departamento y también de Apurímac vecino del anterior.

En la descripción de esta especie no se han indicado las dimensiones porque sólo se dispuso de una rama y de un capítulo.

18. **Onoseris Drakeana** André, Rev. Hort. 1883: 180 (1883).
Onoseris Trianae Hieron. Bot. Jahrb. 19: 69 (1894).

Planta sufruticosa, de 26 28 cm. de alto, más ó menos erecta, gris-lanuginosa, hojosa hasta el ápice del tallo. Hojas escasas hasta 12, largamente pecioladas; limbo de 48–90 mm. de largo por 15–50 mm. de ancho, aovado-lanceolado, raramente poco cordiforme, penninerviado con 6–7 nervios á uno y otro lado de la costa, el haz araneoso, luego glabrescente, envés gris-lanuginoso, el ápice agudo, el margen entero ó escasamente dentado, los

dientes pequeños y muy separados. Pecíolo de 27–44 mm. de longitud, ligeramente alado, gris-lanuginoso, las alas brevemente revolutas y con la base más ancha, amplexicaule. Capítulo 1–2, largamente pedunculado. Pedúnculo de 230–240 mm. de longitud, gris-lanuginoso, adornado por brácteas de 3.5–5 mm. de largo, subuladas, escasas, de dorso araneoso y más numerosas cerca del involucro. Involucro de 16–18 mm. de altura por 7–8 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 12–13 mm. de largo por 1.2–1.5 mm. de ancho, ápice acuminado, el haz con pelos cortos, rígidos, amarillos, dispuestos cerca del ápice, el dorso araneoso, el margen muy escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y cubierto de páleas amarillas, cortas, y laciniosas. Flor del disco: corola de 14–15 mm. de longitud, tubo de 12–12.5 mm. de largo por 0.6–0.7 mm. de ancho en su base y 1–1.2 mm. en la parte superior, 5-nerviado, pubescente, los pelos más ó menos numerosos, cortos, ascendentes; limbo terminado en 5 lóbulos agudos, iguales, recurvados, de 2–2.8 mm. de largo por 0.5–0.6 mm. de ancho en su base, y con el dorso pubescente, los pelos escasos, cortos, y amarillos. Anteras de 5–6 mm. de longitud, cola de 2.5–2.8 mm. de largo, puntiaguda, glabra; filamento de 4–5 mm. de longitud, cilíndrico y finamente pubescente. Estilo claviforme, glabro; ramas de 2.5–3 mm. de longitud. Aquenio de 2.5–3 mm. de largo por 0.7–0.8 mm. de ancho, totalmente pubescente, pelos ascendentes, amarillos, más ó menos cortos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 13 mm. de longitud. Flor marginal: corola de 20–21 mm. de longitud; tubo de 7.5–8 mm. de largo por 0.6–0.7 mm. de ancho, pubescente, los pelos escasos, cortos, ascendentes, amarillos; labio externo de 12.5–13 mm. de largo por 2–2.4 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los lóbulos agudos, iguales, de 0.2–0.3 mm. de largo por 0.2–0.3 mm. de ancho en su base; labio interno entero, de 7–8 mm. de largo por 0.3–0.4 mm. de ancho en su base, glabro, largamente atenuado en el ápice, espiralado, y muy retorcido. Estilo claviforme, glabro; ramas de 3–4 mm. de longitud. Aquenio de 2–2.5 mm. de largo por 0.7–0.8 mm. de ancho, totalmente pubescente, pelos ascendentes, amarillos, más ó menos cortos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 12 mm. de longitud. LÁM. VII, FIGS. 1–6.

DISTRIBUCIÓN: Al Sudoeste de Colombia, en la región Sur del valle del Cauca, altura 1050–1500 metros.

COLOMBIA: Cauca: "Dorotes, prope Mercaderes en alto valle flum. Cauca Novo-Granat.," 25 Aprilis 1876, *André 2917* (ISOTIPO FM); Nariño: "Rio Guaitara, 8 Marz 1881," *Lehmann 541* (G).

Esta especie se acerca á *Onoseris purpurea* (L. f.) Blake, diferenciándose de ésta por tener hojas de limbo aovado-lanceolado y de margen entero ó escasamente dentado; el pecíolo alado sin lóbulos; las brácteas involucrales con el ápice acuminado; los 5 lóbulos de la flor tubulosa recurvados y finalmente el papus amarillo-claro.

Comparando el Isotipo de *Onoseris Drakeana* perteneciente al Field Museum de Chicago y la fotografía del Tipo de *Onoseris Trianae* Hieron. del Gray Herbarium, resalta con evidencia su similitud; además confrontando las descripciones originales de ambas, no se ha podido encontrar

ninguna diferencia fundamental. Por otra parte la localidad de esta especie, "Dorotes, prope Mercaderes in alto valle flum. Cauca Novo-Granat.," se encuentra entre los límites de los Departamentos del Cauca y Nariño y la localidad de *Onoseris Trianae*, "Cangahua ad Rio Juanambu, prov. Pasto," está comprendida en esa región; por todas estas consideraciones se puede deducir que *O. Trianae* es sinónimo de *O. Drakeana* André.

19. **Onoseris hastata** Wedd. Chlor. And. 1: 9. *t. 7* (1855).
Seris hastata Kuntze, Rev. Gen. 1: 364 (1891).

Planta herbácea, perenne, de 19–48 cm. de alto, acaule, escapo monocéfalo. Hojas escasas hasta 15, arrosetadas; limbo de 30–48 mm. de largo por 21–46 mm. de ancho, asaetado, la base palminerviada, con 3–5 nervios, el haz araneoso, luego glabrescente verdoso, envés gris-lanuginoso, el ápice agudo, el margen desigualmente sinuoso-dentado, dientes separados por trechos de 5–11 mm. Pecíolo de 50–115 mm. de largo, alado, su haz más ó menos glabrescente-verdoso y envés gris-lanuginoso. Capítulo solitario y escapo costado; costillas 8–10, de borde ancho, obtuso, la parte inferior del escapo glabrescente, la parte superior con brácteas de 4–10 mm. de largo por 0.5–0.8 mm. de ancho en su base, escasas, subuladas, de dorso araneoso-purpurascente, más numerosas cerca del involucro. Involucro de 15–21 mm. de altura por 10–12 mm. de diámetro, acampanado; brácteas dispuestas en 5–6 series, las interiores de 18–20 mm. de largo por 2–2.5 mm. de ancho, ápice acuminado, el dorso araneoso-purpurascente, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y desnudo. Flor del disco: corola de 13.5–15 mm. de longitud; tubo de 11.5–12.5 mm. de largo por 0.8–1 mm. de ancho en la base y 1.1–1.2 mm. en la parte superior, 5-nerviado, glabro; limbo terminado en 5 lóbulos agudos, iguales, ascendentes, de 2–2.5 mm. de largo por 0.6–0.9 mm. de ancho en su base, pubescentes en el dorso, los pelos escasos, cortos, y ascendentes. Anteras de 5–6 mm. de longitud, cola de 2–2.2 mm. de largo, puntiaguda, glabra; filamento de 4.5–6 mm. de longitud, cilíndrico y finamente pubescente, los pelos más ó menos cortos. Estilo claviforme, glabro; ramas de 1.8–2.2 mm. de longitud. Aquenio de 5–8 mm. de largo por 1–1.2 mm. de ancho, totalmente pubescente, los pelos ascendentes, cortos, amarillos, costado; costillas 5, de borde más ó menos angosto, cubiertas por el indumento. Papus heteromorfo con pelos numerosos, amarillentos, los internos más grandes y casi claviformes, hasta 13 mm. de longitud. Flor marginal: corola de 32–34 mm. de longitud; tubo de 6.5–7.5 mm. de largo por 0.8–1 mm. de ancho, pubescente, los pelos cortos, amarillos, ascendentes, más numerosos en la parte superior; labio externo de 25.5–26.5 mm. de largo por 3.4–3.7 mm. de ancho, 6-nerviado, dorso araneoso y con pelos numerosos, cortos, laxos, y amarillos, el ápice tridentado, los 3 lóbulos de 0.4–0.8 mm. de largo por 0.3–0.5 mm. de ancho en su base, agudos, iguales; labio interno bipartido, de 4.5–5 mm. de largo por 0.9–1 mm. de ancho en su base, glabro, atenuado en el ápice y poco retorcido. Estilo claviforme, glabro; ramas de 3.5–3.8 mm. de longitud. Aquenio de 5–6 mm. de largo por 1–1.2 mm. de ancho, totalmente pubescente, los pelos ascendentes, cortos, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus heteromorfo con pelos numerosos, amarillentos, los internos más grandes y casi claviformes hasta 12 mm. de longitud. LÁM. VII, FIGS. 7–13.

DISTRIBUCIÓN: Ha sido encontrada en la región sur de la Cordillera Central de Bolivia, que comprende el Departamento de Chuquisaca.

BOLIVIA: Chuquisaca: Toldos, cerca Bermejo, Diciembre, 1903, altura 2200 metros, *Fiebrig 2380* (G, US); Monte Curi, Tomina, *Weddell 376.3* (Fragmentos TIPO G).

Esta planta se puede caracterizar fácilmente porque tiene escapo monocéfalo, hojas con el pecíolo conspicuamente alado pero sin lóbulos, y sus brácteas involucrales anchas, atenuadas en el ápice, y de dorso más ó menos araneoso-purpurascente.

20. **Onoseris alata** Rusby, N. Sp. S. Am. Pl. 163 (1920).

Planta herbácea, perenne, de 15–110 cm. de alto, gris-lanuginosa, erecta, caulescente, caudex hasta 120 mm. de longitud. Hojas hasta 22, semiarrosetadas en el ápice del tallo; limbo de 20–135 mm. de largo por 17–148 mm. de ancho, asaetado, la base palminerviada con 5–7 nervios, el haz araneoso, luego glabrescente, envés gris-lanuginoso, el ápice frecuentemente agudo, raramente obtuso, el margen desigualmente sinuoso-dentado, los dientes separados por trechos de 4–22 mm. Pecíolo de 18–190 mm. de longitud, alado, casi siempre sin lóbulos, la base más ó menos amplexicaule. Capítulos 1–8. Pedúnculo de 20–280 mm. de longitud. El eje de la inflorescencia de 90–480 mm. de largo, gris-lanuginoso, luego glabrescente, la parte superior adornada por brácteas de 2–6 mm. de largo por 0.5–1 mm. de ancho en su base, subuladas, escasas, de dorso araneoso, costado; costillas 8–10, de borde ancho, obtuso. Involucro de 16–20 mm. de altura por 7–10 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 15–19 mm. de largo por 1.4–2 mm. de ancho, ápice agudo, el dorso más ó menos araneoso y conspicuamente verdoso, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y desnudo. Flor del disco: corola de 13–16 mm. de longitud; tubo de 12–13.8 mm. de largo por 0.7–0.8 mm. de ancho en su base y 1.1–1.2 mm. en la parte superior, 5-nerviado, pubescente, los pelos escasos, cortos, ascendentes, amarillos; limbo terminado en 5 lóbulos agudos, de 1–2.2 mm. de largo por 0.6–0.9 mm. de ancho en su base, iguales, ascendentes y el dorso con pelos escasos, cortos y amarillos. Anteras de 4.2–6 mm. de longitud, cola de 1.8–2.4 mm. de largo, puntiaguda, glabra; filamento de 4–6 mm. de longitud, cilíndrico y finamente pubescente. Estilo claviforme; ramas de 1.8–2 mm. de longitud, cubiertas de pelos muy cortos. Aquenio de 5–6 mm. de largo por 0.8–1.2 mm. de ancho, totalmente pubescente, pelos ascendentes ó más ó menos estrigosos, cortos, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 14 mm. de longitud. Flor marginal: corola de 19–29 mm. de longitud; tubo de 8–9 mm. de largo por 0.6–0.8 mm. de ancho, pubescente, los pelos numerosos, cortos, amarillos, ascendentes; labio externo de 11–20 mm. de largo por 2.4–3 mm. de ancho, 6-nerviado, dorso araneoso y con pelos más ó menos numerosos, cortos, amarillos, el ápice tridentado, los lóbulos agudos, iguales, de 0.3–0.5 mm. de largo por 0.3–0.4 mm. de ancho en su base; labio interno bipartido, lóbulos de 3–5 mm. de largo por 0.5–0.7 mm. de ancho en su base, glabro, largamente atenuado, y muy poco retorcido. Estilo claviforme; ramas de 2–2.6 mm. de longitud, cubiertas de pelos muy cortos. Aquenio de 4–6.5 mm. de largo por 1–1.2 mm. de ancho, totalmente pubescente, pelos

más ó menos estrigosos, cortos, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 12 mm. de longitud. LÁM. VII, FIGS. 14–20.

DISTRIBUCIÓN: Desde el Sureste de Bolivia que comprende la vertiente oriental de los Andes bolivianos, hasta la región más septentrional de la República Argentina, altura 800–3000 metros.

BOLIVIA: Santa Cruz: Cerro Tres Cruces, Octubre 8, 1928, *Steinbach 8137* (G); Quebrada de Charagua, Agosto, 1934, *Cárdenas 2780* (FM); Charagua, Mayo, 1934, *Cárdenas 2685* (FM); Cochabamba: Cochabamba, Febrero, 1932, *Bro. Julio 276* (US); La Paz: Coroico, Yungas, Julio 30, 1894, *Bang 2365* (TIPO US; ISOTIPO G); Dept. ?: "Sailapata-Ayopoyo", Marzo, 1935, *Cárdenas 3109* (US); Indefinido (US). ARGENTINA: Jujuy: Quebreda del río Carapari, Depto. Orán, Julio 15, 1937, *Cabrera 4210* (FM); Sunchal, 1925, *Cockerell* (US); Sierra de Zenta, Depto. Humahuaca, Febrero 7, 1929, *Venturi 8358* (G, US); Sierra de Zenta, Depto. Humahuaca, Marzo 7, 1929, *Venturi 8359* (G, US); Salta: Los Baños, Depto. Rosario de la Frontera, Agosto 2, 1929, *Venturi 9306* (G, US, NY); Tucumán: Sierra Candelaria al Sur, Depto. Trancas, Julio 15, 1924, *Venturi 3504* (G, US); "Río Loro, Departamento Burroyaco", Noviembre 25, 1928, *Venturi 7576* (US); "Cerro del Campo, Departamento Burroyaco", Noviembre 24, 1928, *Venturi 7575* (G, FM, US); La Ovejería, Depto. Tafí, Mayo 28, 1924, *Venturi 3404* (US); Valle de Tafí, Depto. Monteros, Febrero 20, 1924, *Venturi 2892* (US).

Se acerca á *O. hastata* Wedd., de la cual se diferencia por ser caulescente; el eje de la inflorescencia casi siempre policéfalo (2–8 capítulos); sus brácteas involucrales angostas, de ápice agudo y de dorso glabrescente-verdoso.

21. **Onoseris Weberbaueri** sp. nov.

Planta herbacea perennis; caulibus gracilibus; foliis subverticillatis lanceolatis, 7–12 cm. longis, 15–25 mm. latis, infra medium basim versus gradatim attenuatis, supra araneosis mox glabrescentibus, subtus pallidis lanuginosis, margine sinuato-dentatis; capitulis pedunculos scapiformes 35–42 cm. longos terminantibus; receptaculo glabro; floribus heteromorphis, marginalibus ad 38 mm. longis, tubo ad 12 mm. longo pubescente, labio exteriore 25 mm. longo ad 4 mm. lato, labio interiore bifido lobulis ad 14 mm. longis et ca. 0.6 mm. latis apicem versus conspicue contortis; floribus disci ad 18 mm. longis, lobis revolutis aequalibus ad 2.8 mm. longis; pappis homomorphis, pilis numerosis ad 14 mm. longis.

Planta de 60–65 cm. de alto, erecta, más ó menos gris-lanuginosa, luego glabrescente, tallo conspicuamente delgado, costado; costillas 6–8, de borde ancho, obtuso. Hojas hasta 10, arrosetadas, sésiles; limbo de 75–120 mm. de largo por 15–25 mm. de ancho, penninerviado con 7–11 nervios, el haz araneoso, luego glabrescente, envés gris-lanuginoso, ápice más ó menos acuminado, el margen desigualmente sinuoso-dentado, los dientes grandes y separados por trechos de 3–12 mm. Capítulo solitario y terminal. Pedúnculo muy largo y delgado, de 355–420 mm. de longitud, gris-lanuginoso, luego glabrescente, la parte superior adornada por brácteas de 2–2.5 mm. de largo y 0.5–0.7 mm. de ancho en su base, escasas, subuladas, de dorso araneoso, costado; costillas 8–10, de borde ancho, obtuso. Involucro de 18–20 mm. de altura por 8–10 mm. de diámetro, más ó menos acampanado; brácteas dispuestas en 6–7 series, las interiores de 17–20 mm. de largo por 1.2–2 mm. de ancho, ápice agudo, el dorso araneoso, margen

poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y desnudo. Flor del disco: corola de 17.5–18 mm. de longitud; tubo de 15–15.2 mm. de largo por 0.6–0.7 mm. de ancho en su base y 1.2–1.4 mm. en la parte superior, 5-nerviado, pubescente, los pelos cortos, ascendentes, amarillos; limbo terminado en 5 lóbulos agudos, de 2.5–2.8 mm. de largo por 0.5–0.6 mm. de ancho en su base, pubescentes en el dorso, los pelos cortos, escasos. Anteras de 5.5–6 mm. de longitud, cola de 2.5–3 mm. de largo, puntiaguda, glabra; filamento de 5–5.2 mm. de largo, cilíndrico y finamente pubescente. Estilo claviforme, glabro; ramas de 3.8–4 mm. de longitud. Aquenio de 3–4.5 mm. de largo por 0.5–0.7 mm. de ancho, pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 15 mm. de longitud. Flor marginal: corola de 36–38 mm. de longitud; tubo de 11–12 mm. de largo por 0.5–0.6 mm. de ancho en su base y 0.7–0.8 mm. en la parte superior, pubescente, los pelos numerosos, cortos, ascendentes, amarillos; labio externo de 25–26 mm. de largo por 3.6–4 mm. de ancho, 6-nerviado, dorso araneoso y con pelos numerosos, cortos, el ápice tridentado, los 3 lóbulos agudos, iguales, de 0.4–0.5 mm. de largo por 0.3–0.4 mm. de ancho en la base; labio interno bipartido, lóbulos de 13–14 mm. de largo por 0.6–0.7 mm. de ancho en la base, glabro, muy atenuado, y retorcido en el ápice. Estilo claviforme, glabro; ramas de 3.5–3.8 mm. de longitud. Aquenio de 4–4.5 mm. de largo por 0.5–0.6 mm. de ancho, pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus con pelos numerosos, amarillos, los más grandes hasta 14 mm. de longitud. LÁM. VIII, FIGS. 1–6.

DISTRIBUCIÓN: Encontrada en el Norte andino del Perú.

PERÚ: Cajamarca: Cerros situados entre los ríos Tabaconas y Marañon, Abril 23, 1912, altura 1100–1300 metros, *Weberbauer 6163* (TIPO Field Mus. 628892).

El pedúnculo es muy largo y delgado; sus hojas arrosetadas de limbo lanceolado y margen muy dentado sirven para caracterizar esta planta. Es próxima á *O. speciosa,* diferenciándose de ésta por ser caulescente; las hojas son de limbo lanceolado y sus brácteas involucrales de ápice agudo y de dorso araneoso.

Es muy grato para el autor asociar con esta interesante planta el nombre del Profesor Dr. Augusto Weberbauer, cuyas sabias enseñanzas condujeron mi entusiasmo hacia la Taxonomía; botánico de altos relieves, el Dr. Weberbauer ha contribuído enormemente al conocimiento de la Flora del Perú y es por eso que sus esfuerzos han sido bien apreciados por los principales centros científicos del mundo.

22. **Onoseris salicifolia** H. B. K. Nov. Gen. et Sp. 4: 9 (1820); Less. Linnaea 5: 342 (1830).

Seris salicifolia Kuntze, Rev. Gen. 1: 364 (1891).

Hipposeris salicifolia Cass. según Jackson, Index Kew. 2: 1164 (1894).

Planta herbácea, sufruticosa, de 60–122 cm. de alto, erecta, blanco-lanuginosa, ramosa, ramas de 20–130 mm. de longitud. Hojas más ó menos numerosas, semiarrosetadas en el extremo del tallo ó de las ramas; limbo de 30–130 mm. de largo por 4–35 mm. de ancho, lanceolado, de poco espesor, largamente atenuado en la base, la costa con 2–3 nervios á cada lado, el haz

poco araneoso, luego glabrescente-verdoso, envés blanco-lanuginoso, el margen brevemente revoluto y dentado, los dientes pequeños, separados por trechos de 3–12 mm., el ápice usualmente acuminado, raramente agudo. Pecíolo de 2–6 mm. de longitud, blanco-lanuginoso. Capítulo solitario y terminal. Pedúnculo de 100–270 mm. de longitud, blanco-lanuginoso, luego glabrescente, costado; costillas 10–12, de borde ancho, obtuso; la parte superior adornada por brácteas de 7–9 mm. de largo, escasas, subuladas, y de dorso araneoso. Involucro de 13–15 mm. de altura por 12–14 mm. de diámetro, hemisférico; brácteas dispuestas en 6–7 series, las interiores de 11–12 mm. de largo por 1.8–2 mm. de ancho, ápice acuminado, el haz con pelos cortos, rígidos, amarillos, ascendentes, dispuestos cerca del ápice, el dorso araneoso, margen muy escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano y cubierto de páleas amarillas, laciniosas. Flor del disco: corola de 12–14 mm. de longitud; tubo de 8.5–10.5 mm. de largo por 1–1.2 mm. de ancho, 5-nerviado, pubescente, los pelos cortos, amarillos, ascendentes, y dispuestos en forma de anillo cerca de la parte media; limbo terminado en 5 lóbulos, 4 lóbulos iguales de 1.5–2 mm. de largo por 0.4–0.6 mm. de ancho en su base y el quinto de 3.2–4 mm. de largo por 0.7–0.8 mm. de ancho en su base, separado por un seno mayor, los 5 agudos, ascendentes y con el dorso pubescente, los pelos escasos, cortos y amarillos. Anteras de 4.8–5.2 mm. de longitud, cola de 2–2.5 mm. de largo, puntiaguda, glabra; filamento de 4.2–5 mm. de largo, cilíndrico y finamente pubescente. Estilo claviforme; ramas de 2–2.6 mm. de longitud, cubiertas de pelos muy cortos. Aquenio de 3–6 mm. de largo por 0.8–1 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 10 mm. de longitud. Flor marginal: corola de 18–33 mm. de longitud; tubo de 3.8–7.5 mm. de largo por 0.6–0.7 mm. de ancho, pubescente, los pelos cortos, ascendentes, amarillos, y dispuestos en la parte superior; labio externo de 14.2–25.5 mm. de largo por 2.2–2.8 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los 3 lóbulos agudos, iguales, de 1–1.5 mm. de largo por 0.6–0.9 mm. de ancho en su base; labio interno bipartido, lóbulos de 2.2–4 mm. de largo, glabros y más ó menos filiformes. Estilo claviforme; ramas de 2.6–4.2 mm. de longitud, cubiertas de pelos muy cortos. Aquenio de 2–3.2 mm. de largo por 0.8–1 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde angosto, cubiertas por el indumento. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 9 mm. de longitud. LÁM. VIII, FIGS. 7–13.

DISTRIBUCIÓN: En el Centro y Sur de los Andes ecuatorianos.

ECUADOR: Chimborazo: Alausi, Junio, 1864, *Jameson* (US); Provincia de Alausi, Julio, 1864, *Jameson* (US); Hacienda Licay, alrededores de Huigra, Agosto 28, 1918, *J. N. Rose 22422* (G, US, NY); Huigra, Julio 4–27, 1923, altura 1200 metros, *Hitchcock 20624* (G, US, NY); Huigra, Julio 6, 1921, *Rowlee 1189* (US); Alausi, sin fecha, *Bonpland 3226* (Fotografía TIPO G); Azuay: Alrededores de Cuenca, Septiembre 17–24, 1918, *J. N. Rose 22892* (US); Otavalo á Cuenca, Sibambe, Mayo 27, 1942, altura 1900 metros, *Haught 3318* (US); ejemplares cultivados: Loja: Cercanías de Loja, 1921, *Popenoe 582* (DA, 53756 S. P. I.); Loja, 1921, *Popenoe 1317* (DA, 53756 S. P. I.); Dept. ?: "In Andibus Ecuadorensibus," 1857–59, *Spruce 6053* (NY); sin localidad, Septiembre 25, 1918, *J. N. Rose 23913* (US); sin localidad, sin fecha, *Jameson* (US).

Esta especie se caracteriza por su tallo erecto y blanco-lanuginoso; el involucro hemisférico; sus hojas conspicuamente semiarrosetadas, el limbo lanceolado de poco espesor, el haz glabrescente y amarillo-verdoso y el margen más ó menos revoluto y muy poco dentado.

23. **Onoseris albicans** (D. Don) comb. nov.
Centroclinium albicans D. Don, Trans. Linn. Soc. 16: 256 (1829).
Hieracium albicans R. et P. según D. Don, l. c. En sinónimo.
Onoseris integrifolia Less. Linnaea 5: 343 (1830).
Centroclinium reflexum Hook. Bot. Mag. 58: *t. 3114* (1831).
Centroclinium appressum Hook. Bot. Mag. 58: *t. 3115* (1831).
Centroclinium adpressum Hook. según Less. Syn. Gen. Comp. 119 (1832).
Onoseris reflexa Less. Syn. Gen. Comp. 119 (1832).
Seris reflexa Kuntze, Rev. Gen. 1: 364 (1891).
Seris adpressa Kuntze, l. c.
Seris integrifolia Kuntze, l. c.
Onoseris Warszewiczii Hieron. Bot. Jahrb. 19: 70 (1894).

Planta herbácea, perenne, de 30–80 cm. de alto, erecta, más ó menos blanco-lanuginosa, ramosa. Hojas numerosas, sésiles ó cortamente pecioladas; limbo de 20–92 mm. de largo por 6–35 mm. de ancho, lanceolado, penninerviado, el haz araneoso, luego glabrescente, envés gris-lanuginoso, el ápice frecuentemente acuminado, raramente agudo, el margen conspicuamente revoluto y más ó menos sinuoso-dentado. Pecíolo de 5–10 mm. de longitud, gris-lanuginoso. Capítulo solitario y terminal. Pedúnculo de 70–244 mm. de largo, más ó menos blanco-lanuginoso, la parte superior adornada por brácteas de 4–9 mm. de largo, escasas, subuladas, de dorso araneoso, costado; costillas 8–10, de borde ancho, obtuso. Involucro de 12–20 mm. de altura por 7–13 mm. de diámetro, acampanado; brácteas dispuestas en 5–6 series, las interiores de 10–12 mm. de largo por 2–2.4 mm. de ancho, ápice acuminado, el haz con pelos cortos, rígidos, ascendentes, amarillos, y dispuestos cerca del ápice, el dorso araneoso, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo convexo cubierto de páleas heteromorfas, amarillas y laciniosas. Flor del disco: corola de 12–16 mm. de longitud; tubo de 10–13 mm. de largo por 0.5–0.7 mm. de ancho en su base y 1–1.3 mm. en la parte superior, 5-nerviado, glabro; limbo terminado en 5 lóbulos agudos, 3 lóbulos de 1.6–2.4 mm. de largo por 0.4–0.6 mm. de ancho en su base y 2 lóbulos de 1.8–2.6 mm. de largo por 0.5–0.8 mm. de ancho en su base, separados por un seno mayor, los 5 ascendentes y con el dorso glabro, raramente con pelos escasos y muy cortos. Anteras de 5–7.5 mm. de longitud, cola de 2–2.6 mm. de largo con el ápice filiforme, glabra; filamento de 3–4.8 mm. de largo, cilíndrico y finamente pubescente. Estilo conspicuamente claviforme, glabro; ramas de 2.4–3.2 mm. de longitud. Aquenio de 2.5–6.5 mm. de largo por 0.8–1.3 mm. de ancho, glabrescente ó con pelos escasos, cortos, ascendentes, amarillos, y dispuestos cerca del papus, costado; costillas 5–6, de borde ancho, obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 14 mm. de longitud. Flor marginal: corola de 26–40 mm. de longitud; tubo de 5.5–7 mm. de largo por 0.6–0.8 mm. de ancho, glabro; labio externo de 20.5–33 mm. de largo por 3.6–4.8 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los 3 lóbulos agudos, iguales, de 1.4–3.8 mm. de largo por 1–1.2 mm. de ancho en su base; labio interno bipartido, lóbulos de 2.2–3.5 mm. de largo por 0.8–0.9

mm. de ancho en su base, glabro, raramente la base de los lóbulos con pelos escasos, cortos, el ápice filiforme. Estilo claviforme, glabro; ramas de 3–5 mm. de longitud. Aquenio de 2.5–5 mm. de largo por 0.8–1 mm. de ancho, casi glabrescente, ó con pelos escasos, cortos, ascendentes, amarillos cerca del papus, costado; costillas 5–6, de borde ancho, obtuso. Papus heteromorfo con pelos numerosos, amarillos, los internos más grandes hasta 13 mm. de longitud. LÁM. VIII, FIGS. 14–20.

DISTRIBUCIÓN: Ha sido encontrada en los Andes situados al Sur del Ecuador; Centro y Sur del Perú y al Noroeste de Bolivia; altura 2300–3500 metros.

ECUADOR: Azuay: Oña y Cuenca, Septiembre 9–10, 1923, *Hitchcock 21579* (G, US, NY); alrededores de Cuenca, Septiembre 17–24, 1918, *J. N. Rose 22892* (G, NY); Prov. ?: Sin localidad, sin fecha, *Lehmann* (G). PERÚ: Lima: Obrajillo, río Chillón, Junio 15–17, 1925, *Pennell 14496* (G, NY, FM); Obrajillo, sin fecha, *Expedición Wilkes* (US); Purruchuca, sin fecha, *Mathews 570* (G); Viso, Prov. Huarochirí, Abril 23, 1939, *Goodspeed, Stork & Horton 11524* (G, DA); alrededores de Matucana, Julio 9, 1914, *Rose & Rose 18641* (US, NY); Matucana, Abril 12 – Mayo 3, 1922, *Macbride & Featherstone 240* (US, FM, G); Huánuco: Dunkafael, Huánuco, Octubre 28, 1927, *Sawada 77* (FM, US); Indefinido, (*colector?*) *665* (G); Junín: Alrededores de Oroya, *Kalenborn 71* (US); Huancavelica: Mejorada, Prov. Huancavelica, Marzo 13, 1939, *Goodspeed, Stork & Horton 10903* (FM); Cuzco: Urquillos, Prov. Urubamba, Marzo 8, 1939, *Vargas, Expedición Goodspeed 11097* (FM, DA); alrededores del Pueblo de Paruro, Prov. Paruro, Junio, 1935, *Vargas 132* (FM, G); Paucartambo, Cuzco, Mayo 4, 1939, *Balls 6686* (US); Challatamba, valle Limatambo, Mayo 14, 1939, *Balls 6835* (US); Dept. Cuzco, sin fecha, *Herrera 2586* (FM); Dept. ?: Sin localidad, *Dombey 25* (Fotografía ISOTIPO G); sin localidad, sin fecha, *Dombey 536* (FM); sin localidad, sin fecha, *Ruiz & Pavón* (G). BOLIVIA: La Paz: Sorata, Prov. Larecaja, 1857, *Mandon 3* (G, US, NY); Dept. ?: Sin localidad, sin fecha, *Bang 1811* (G, US, NY).

David Don, Trans. Linn. Soc. 16: 256 (1829), describe *Centroclinium albicans* utilizando especímenes del herbario de Ruiz y Pavón, que fueron colectados: "In Peruvia". Dicha descripción es igual á los caracteres de la especie que he limitado, además las localidades probablemente son iguales porque Ruiz y Pavón hicieron sus colecciones en los Departamentos de Lima, Junín, y Huánuco, siendo precisamente estos mismos lugares de donde proceden numerosos ejemplares de esta especie. Con el nombre de *Onoseris integrifolia* ha sido frecuentemente denominada esta planta; la descripción la hizo Lessing, utilizando un ejemplar del herbario de Kunth, colectado por Dombey; este último botánico fué compañero de Ruiz y Pavón y los tres recorrieron las mismas regiones. He visto la descripción y la fotografía del Isotipo de *Onoseris integrifolia*, y ambas corresponden al material aquí definido; es posible que el ejemplar de Dombey proceda de la misma localidad de la de los botánicos españoles. El año 1830, Alexander Cruckshanks, Botanical Miscellany 2: 168, hizo una excursión de Lima á Pasco, pasando por Yangas, Quives, Canta, Obrajillo, etc., y colectó en dicho recorrido numerosas plantas cuyas semillas las envió al Jardín Botánico de Glasgow. Más tarde Hooker describió 2 plantas que habían sido cultivadas con semillas remitidas por Cruckshanks y las incluyó dentro del género *Centroclinium*, diciendo: "are two species of the family of Compositae, and of the division Labiatiflorae, agreeing in so many points with Mr. Don's Genus *Centroclinium* (Linn. Trans. v. 16, 254) that I cannot suppose they are

other than the same," y por eso las designó bajo el nombre de *Centroclinium reflexum* y *Centroclinium appressum*. La descripción y la tábula de las 2 especies de Hooker corresponden á *Onoseris albicans*. La pequeña reflexión ó curvatura que muestra la tábula, en el ápice de las brácteas involucrales de *C. reflexum*, es un carácter que presentan algunos ejemplares examinados. Se supone que por error ortográfico se cita en Syn. Gen. Comp. 119 (1832), "*Centroclinium adpressum*". Hieronymus describió *Onoseris Warszewiczii* de material procedente del Ecuador y la consideró intermedia entre *O. hyssopifolia* H. B. K. y *O. salicifolia* H. B. K. Ni la descripción original de Hieronymus, "*Warscewicz* (n. *34*)," ni la fotografía del Tipo denotan diferencias fundamentales con respecto de *O. albicans*, y en mi opinión constituyen una misma entidad.

Esta especie es afín á *O. salicifolia*, de la cual se diferencia principalmente por sus hojas de posición no arrosetada y sus limbos de mayor espesor; el involucro acampanado; el tubo de la flor hermafrodita glabro; el aquenio más ó menos glabrescente. Es necesario indicar que esta planta tiene hojas de margen revoluto. Por otra parte el material procedente del Ecuador presenta hojas de limbo angosto y de margen poco dentado (igual al material encontrado en Huancavelica) mientras que los ejemplares del Departamento de Lima (Purruchuca, Obrajillo, Matucana), poseen hojas de limbo ancho y de margen muy dentado, además el ápice de las brácteas involucrales es poco curvado hacia fuera. Finalmente los especímenes colectados en Bolivia se distinguen por sus hojas de limbo ancho pero de margen poco dentado.

24. **Onoseris hyssopifolia** H. B. K. Nov. Gen. et Sp. 4: 9. *t.* 306 (1820); Less. Linnaea 5: 344 (1830).
Onoseris hyssopifolia α *planifolia* Wedd. Chlor. And. 1: 10 (1855).
Seris hyssopifolia Kuntze, Rev. Gen. 1: 364 (1891).

Planta sufruticosa, bianual, de 30–60 cm. de altura, decumbente, gris-lanuginosa, ramosa, ramas de 40–130 mm. de largo. Hojas numerosas, subsesiles, semiarrosetadas en el extremo del tallo ó de las ramas; limbo de 10–45 mm. de largo por 1–3 mm. de ancho, lineal, largamente atenuado en la base, raquis prominente en el envés, el haz poco araneoso, envés gris-lanuginoso, ápice agudo, raramente acuminado, margen entero y muy revoluto. Pecíolo de 1–1.5 mm. de longitud. Capítulo solitario y terminal. Pedúnculo de 35–235 mm. de largo, gris-lanuginoso, luego glabrescente, la parte superior adornada por brácteas de 2–2.5 mm. de largo, subuladas, escasas, de dorso araneoso, costado; costillas 10–12, de borde ancho, obtuso. Involucro de 10–13 mm. de altura por 6–9 mm. de diámetro, acampanado; brácteas dispuestas en 6–7 series, las interiores de 10–11 mm. de largo por 2.2–3 mm. de ancho, ápice agudo, el haz con pelos cortos, rígidos, ascendentes, amarillos y dispuestos cerca del ápice, el dorso araneoso, margen muy escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano cubierto de páleas heteromorfas, amarillas y laciniosas. Flor del disco: corola de 10–12 mm. de longitud; tubo de 7.8–9.5 mm. de largo por 0.7–0.8 mm. de ancho, 5-nerviado, pubescente cerca de la parte media, los pelos cortos, rígidos, ascendentes, amarillos, y dispuestos en forma de anillo; limbo terminado en 5 lóbulos agudos, ascendentes, 4 lóbulos más ó menos iguales de 0.9–1 mm. de largo por 0.3–0.5 mm. de ancho en su base y el

quinto de 2.2–2.5 mm. de largo por 0.5–0.6 mm. de ancho en la base. Anteras de 3.5–4 mm. de longitud, cola de 2–2.2 mm. de largo, puntiaguda, glabra; filamento de 2.8–4 mm. de largo, casi cilíndrico y finamente pubescente. Estilo claviforme, glabro; ramas de 2–2.8 mm. de longitud. Aquenio de 2–3 mm. de largo por 0.6–0.9 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde ancho, obtuso. Papus con pelos numerosos, amarillos, los más grandes hasta 10 mm. de longitud. Flor marginal: corola de 18.5–26 mm. de longitud; tubo de 4.5–6 mm. de largo por 0.7–0.8 mm. de ancho, pubescente, los pelos cortos, ascendentes, amarillos, más numerosos en la parte superior; labio externo de 14–20 mm. de largo por 3.5–4.5 mm. de ancho, 6-nerviado, dorso araneoso, el ápice tridentado, los 3 lóbulos más ó menos iguales, agudos, de 2–2.8 mm. de largo por 0.8–1.2 mm. de ancho en su base; labio interno bipartido, lóbulos muy cortos, de 1–1.2 mm. de largo por 0.6–0.8 mm. de ancho en su base, su dorso pubescente, los pelos cortos, ascendentes, amarillos, el ápice atenuado. Estilo claviforme, glabro; ramas de 3–3.5 mm. de longitud. Aquenio de 2–5.5 mm. de largo por 0.8–1 mm. de ancho, totalmente pubescente, los pelos cortos, ascendentes, amarillos, costado; costillas 5, de borde ancho, obtuso. Papus con pelos numerosos, amarillos, los más grandes hasta 7 mm. de longitud. LÁM. IX, FIGS. 1–6.

DISTRIBUCIÓN: Endémica de la región septentrional andina de la República del Ecuador, altura 1500–2700 metros.

ECUADOR: Imbabura: Río Guaillabamba, cerca Quito, Enero 5, 1880, *Lehmann 94* (US); Río Guaillabamba y Chota, Enero 30, 1881, *Lehmann 636* (G, US, FM, NY); Río Chota, Junio 7, 1876, *André 3519* (FM, NY); entre Ibarra y Salinas, Junio 23–24, 1935, *Mexia 7377* (DA); Ibarra, Junio 23, 1878, *Lehmann* (G); Cima del Pinllar, Febrero 13, 1928, *Firmin 716* (US, FM); Faldas del Pinllar, Febrero 13, 1928, *Firmin 380* (G, US); Ibarra, *ex Herb. Kunth* (Fotografía TIPO G); Pichincha: Quito—Otavalo, Noviembre 9, 1939, *Haught 2926* (US); Oton, Huilabamba á Cayambe, Agosto 4, 1939, *Balls 7329* (US); alrededores de San Antonio y Pomasqui, Octubre 29, 1918, *J. N. Rose 23563* (G, US, NY); Ravines, cerca Pomasqui y San Antonio, Septiembre, 1859, *Jameson 115* (NY); Cotocollao, sin fecha, *Sodiro 755* (NY), *Mille 755* (G, US); Prov. ?: Sin localidad, sin fecha, *Bonpland* (FM), *Jameson 437* (US). Ejemplares cultivados: Ibarra, *Popenoe 1246* (US, DA, 53178 S. P. I.); sin localidad, *Popenoe* (DA, 62682 S. P. I.).

Es una planta decumbente con numerosas hojas de limbo lineal, de borde muy revoluto, y de haz poco araneoso.

25. **Onoseris gnaphalioides** Muschler, Bot. Jahrb. 50: Beibl. 3: 94 (1913).
Onoseris hyssopifolia β teretifolia Wedd. Chlor. And. 1: 10 (1855).

Planta herbácea, perenne, de 11–70 cm. de alto, decumbente, más ó menos ramosa, ramas de 50–200 mm. de largo, gris-lanuginosa. Hojas numerosas, subsesiles, semiarrosetadas en el extremo del tallo ó de las ramas; limbo de 12–55 mm. de largo por 3–8 mm. de ancho, lanceolado, atenuado en su base, el haz muy araneoso ó casi tomentoso, envés gris-lanuginoso, el raquis prominente en el envés, el ápice acuminado, raramente agudo, margen brevemente sinuoso-dentado y revoluto. Pecíolo de 0.5–1 mm. de largo, gris-lanuginoso. Capítulo solitario y terminal. Pedúnculo de 22–165 mm. de longitud, gris-lanuginoso, luego glabrescente, la parte superior adornada por brácteas de 2–7 mm. de largo, subuladas, escasas, y de dorso araneoso, costado; costillas 10–12, de borde ancho, obtuso. Involucro de 8–12 mm. de altura por 4–7 mm. de diámetro,

acampanado; brácteas dispuestas en 6–7 series, las interiores de 11–12 mm. de largo por 1.8–2.2 mm. de ancho, ápice agudo, el dorso araneoso, margen poco escarioso; las brácteas exteriores gradualmente menores. Receptáculo plano, cubierto de páleas heteromorfas, amarillas, y laciniosas. Flor del disco: corola de 7.5–10 mm. de longitud; tubo de 6.5–8 mm. de largo por 0.7–0.9 mm. de ancho, 5-nerviado, glabro; limbo terminado en 5 lóbulos agudos, ascendentes, 3 lóbulos de 0.7–1 mm. de largo por 0.3–0.4 mm. de ancho en su base y 2 lóbulos de 1–2 mm. de largo por 0.4–0.5 mm. de ancho en su base, los lóbulos mayores pubescentes en el dorso, los pelos cortos, amarillos. Anteras de 3–3.5 mm. de longitud, cola de 1–1.5 mm. de largo, puntiaguda, glabra; filamento de 3–4 mm. de largo, cilíndrico, glabrescente. Estilo claviforme, glabro; ramas de 1.6–2 mm. de longitud. Aquenio de 2–4 mm. de largo por 0.6–1 mm. de ancho, glabrescente ó con pelos escasos, cortos, ascendentes, amarillos y dispuestos cerca del papus, costado; costillas 5, de borde ancho, obtuso. Papus con pelos numerosos, amarillos, los más grandes hasta 8 mm. de longitud. Flor marginal: corola de 17–19 mm. de longitud; tubo de 5–6 mm. de largo por 0.5–0.7 mm. de ancho, glabro; labio externo de 12–13 mm. de largo por 2.8–3.4 mm. de ancho, 6-nerviado, dorso araneoso y con pelos numerosos, cortos, ascendentes, amarillos, el ápice tridentado, los 3 lóbulos agudos, iguales, de 0.8–1.2 mm. de largo por 0.5–0.7 mm. de ancho en su base; labio interno bipartido, lóbulos de 1.6–2.2 mm. de largo por 0.4–0.5 mm. de ancho en su base, el dorso de la base con pelos escasos, cortos, ascendentes, amarillos, el ápice atenuado y filiforme. Estilo claviforme, glabro; ramas de 1.8–2 mm. de longitud. Aquenio de 2.5–5 mm. de largo por 0.6–1 mm. de ancho, glabrescente ó provisto de pelos escasos, cortos, ascendentes, amarillos, dispuestos cerca del papus, costado; costillas 5, de borde ancho, obtuso. Papus con pelos numerosos, amarillos, los más grandes hasta 7 mm. de longitud. LÁM. IX, FIGS. 7–12.

DISTRIBUCIÓN: Ha sido encontrada en el Norte, Centro, y Sur de los Andes peruanos y también en la región andina situada al Noroeste de Bolivia, altura 1700–2500 metros.

PERÚ: Piura: Valle del río Huancabamba, entre Sondor y Shumaya, Prov. Huancabamba, Mayo, 1912, *Weberbauer 6281* (G, US, FM); Ancash: Caraz, Mayo 19, 1903, *Weberbauer 3012* (Fotografía TIPO G); Huancavelica: Entre Quichicapota y Puente Mantaro, Prov. Tayacaja, Enero 14, 1939, *Stork & Horton 10399* (FM); Valle del Mantaro, bajo Colcabamba, Prov. Tayacaja, Marzo, 1913, *Weberbauer 6470* (G, FM, US); Apurímac: Pincos, Andahuailas, Marzo, 1927, *Herrera 1491* (G); Río Pachachaca, al Norte de Abancay, Prov. Abancay, Febrero 9, 1939, *Stork, Horton & Vargas 10542* (FM, DA); alrededores de la Población, Prov. Abancay, Agosto 7, 1937, *Vargas 405* (G, FM); Cuzco: Valle Apurímac, Cuzco, 1931, *Herrera 3055* (US); Dept. Cuzco, Octubre, 1839 – Febrero, 1840, *Gay* (G). BOLIVIA: Cochabamba: "Sailapata — Ayopoyo," Abril, 1935, *Cárdenas 3101* (US).

Esta planta se acerca mucho á *O. hyssopifolia* pero se diferencia de ésta por tener el limbo de sus hojas con el haz muy araneoso, el margen más ó menos dentado; la flor hermafrodita con el tubo glabro y sus 2 lóbulos mayores pubescentes en el dorso; el aquenio glabrescente; las brácteas involucrales más angostas y sin pelos en el haz. Las localidades también son distintas: esta especie procede del Perú (Norte, Centro y Sur andino) y Bolivia (Noroeste andino); en cambio *O. hyssopifolia* sólo ha sido encontrada en las Provincias de Imbabura y Pichincha, situadas al Norte del Ecuador.

El material procedente del Norte del Perú (*Weberbauer 6281*) presenta pequeñas diferencias con respecto á la típica, como por ejemplo pelos cortos en el dorso de los 5 lóbulos de la flor tubulosa; además los 2 lóbulos del labio interno de la flor marginal son glabros en el dorso.

Especies Excluídas

Onoseris altissima Kuntze, Rev. Gen. 1: 354 (1891) = **Centroclinium altissima** Poepp. & Endl. = **Lycoseris** ?

Onoseris atacamensis Hoffm. in E. & P. Nat. Pfl. IV. 5: 335, sub *fig. 152* (1893) = **Urmenetea atacamensis** Ph. La descripción y la tábula de *Urmenetea atacamensis* Ph., Flor. Atac. 201. *t. 3, fig. A* (1860); Benth. & Hook. f. Gen. Pl. 2: 487 (1876); Reiche, Flora de Chile 4: 302 (1905), denotan caracteres peculiares que permiten diferenciarla del género *Onoseris*. Sus hojas son gruesas, coriáceas, el envés rugoso; la corola tubulosa es blanco-rosada, el tubo presenta una dilatación esférica más ó menos cerca de la parte media y las ramas del estilo son obtusas; el aquenio es oblongo y completamente glabro y su papus heteromorfo posee de 5–6 pelos internos más grandes, subulados, mientras que los pelos internos son más numerosos, delgados, y su largo es casi igual á la mitad de la longitud de los pelos mayores.

Onoseris bracteata Kuntze, l. c. = **Lycoseris bracteata** Benth.

Onoseris brevifolia D. Don, Trans. Linn. Soc. 16: 246 (1829–33), según Baker, in Mart. Fl. Bras. 6^3: 373 (1884) = **Trichocline polymorpha** Baker.

Onoseris corymbosa (Less.) Benth., según Baker, in Mart. Fl. Bras. 6^3: 369. *t. 99* (1884), no es *Onoseris*. He visto la descripción original y la ilustración que hace Baker; además he examinado una hoja y fragmentos de un capítulo del Tipo, *Sellow 3479* (FM), y se llega á la conclusión que no pertenece al género *Onoseris*. Son evidentes las siguientes diferencias: hojas de limbo aovado, haz glabro, base triplinervia, los demás nervios muy reticulados; capítulos en corimbo; corola tubulosa con sus lóbulos redondeados; ramas del estilo obtusas y más ó menos revolutas; corola de la flor marginal con los 3 lóbulos del labio externo redondeados; las facies son también distintas, además esta especie procede del Brasil y probablemente pertenece al género *Gochnatia*.

Onoseris denticulata Willd. según DC. Prodr. 7^1: 22 (1838), Index Kew. 2: 350 (1894) = **Lycoseris denticulata** Cass.

Onoseris discolor Muschler, Bot. Jahrb. 50: Beibl. 3: 94 (1913). La descripción del Tipo y su fotografía parecen indicar que pertenece al género *Liabum*.

Onoseris ?eriocephala Benth. Pl. Hartw. 211 (1841–43), según el Index Kew. 2: 350 (1894) = **Hieracium erianthum** H. B. K.

Onoseris glandulosa Hieron. Bot. Jahrb. 21: 366 (1895). He visto la descripción original de esta especie así como la fotografía del Tipo, y me parece que pertenece al género *Liabum* y posiblemente á la especie *Liabum Szyszylowiczii* Hieron.

Onoseris grandis Kuntze, Rev. Gen. 1: 354 (1891) = **Lycoseris grandis** Benth.

Onoseris heterophylla Spreng. Syst. Veg. 3: 503 (1826), según el Index Kew. 2: 350 (1894) = **Trichocline heterophylla** Less.

Onoseris hieracioides Bert., según DC. Prodr. 7^1: 29 (1838), non H. B. K. (1820); según el Index Kew. 2: 350 (1894) = **Chaetanthera Berteriana** Less.

Onoseris hieracioides H. B. K. Nov. Gen. et Sp. 4: 7. *t. 304* (1820) = **Trichocline hieracioides** (H. B. K.) comb. nov.

Onoseris ?lanata Phil. Cat. Pl. Tarapacá 32. *t. 2* (1891), según Reiche, Flora de Chile 4: 363 (1905) = **Trichocline caulescens** Phil.

Onoseris lanuginosa Wall. Cat. n. 2929, p. 101 (1830), según el Index Kew. 2: 350 (1894) = **Gerbera lanuginosa** Sch. Bip.

Onoseris latifolia Kuntze, l. c. = **Lycoseris latifolia** Benth.

Onoseris linifolia Bert. Merc. Chil. n. 16: 737 (1829), según Cabrera, Rev. Mus. La Pla. 1: 175 (1937) = **Chaetanthera microphylla** (Cass.) Hook. & Arn.

Onoseris macrophylla Wall. según Steud. Nom. ed. 2. 216 (1841), según el Index Kew. 2: 350 (1894) = **Gerbera nepalensis** Sch. Bip.

Onoseris mexicana Willd. Sp. Pl. 3^3: 1703 (1804), según el Index Kew. 2: 350 (1894) = **Lycoseris mexicana** Cass.

Onoseris montevidensis Spreng. Syst. Veg. 3: 502 (1826), según el Index Kew. 2: 350 (1894) = **Leucopsis diffusa** Baker.

Onoseris nepalensis Steud. Nom. ed. 2. 216 (1841), según el Index Kew. 2: 350 (1894) = **Gerbera nepalensis** Sch. Bip.

Onoseris ovalifolia Wall. l. c., según el Index Kew. 2: 350 (1894) = **Gerbera piloselloides** Cass.

Onoseris spathulata Phil. Anal. Mus. Nac. Chil. 31 (1891); Reiche, Flora de Chile 4: 302 (1905). En opinión del autor esta especie no pertenece al género *Onoseris*, porque de acuerdo con la diagnosis original se pueden establecer las siguientes diferencias: las hojas tienen limbo conspicuamente espatulado y los pelos del papus son completamente blancos (no amarillos). Esta planta procede de Ascotan, Provincia de Tarapacá; esta región se caracteriza por ser más ó menos seca y se encuentra al Norte de Chile.

Onoseris squarrosa Kuntze, l. c. = **Lycoseris squarrosa** Benth.

Onoseris stricta Spreng. Syst. Veg. 3: 503 (1826), según el Index Kew. 2: 350 (1894) = **Trixis stricta** Less.

Onoseris trinervis Kuntze, l. c. = **Diazeuxis trinervis** Don = **Lycoseris** ?

Onoseris triplinervia Kuntze, l. c. = **Lycoseris triplinervia** Less.

Onoseris turbacensis Spreng. Syst. Veg. 3: 502 (1826), según el Index Kew. 2: 350 (1894) = **Lycoseris mexicana** Cass.

Seris amplexicaulis Gardn. in Hook. Lond. Journ. Bot. 6: 456 (1847) = **Richterago amplexifolia** (Gardn.) Kuntze.

Seris angustifolia Gardn. op. cit. 457, según el Index Kew. 2: 885 (1895) = **Trichocline angustifolia** Baker.

Seris corymbosa (Less.) Kuntze, Rev. Gen. 1: 364 (1891). Comparar con *Onoseris corymbosa* (Less.) Benth., *supra*.

Seris denticulata DC. Prodr. 7^1: 20 (1838), según el Index Kew. 2: 885 (1895) = **Trichocline polymorpha** Baker.

Seris discoidea Less. Linnaea 5: 255 (1830) = **Richterago discoidea** (Less.) Kuntze.

Seris eriocephala (Benth.) Kuntze, l. c. = **Hieracium erianthum** H. B. K.

Seris hieracioides (H. B. K.) Kuntze, l. c. = **Trichocline hieracioides** (H. B. K.) Ferreyra, *vide supra*.

Seris polymorpha Gardn. in Hook. Ic. Pl. 6: *t. 501* (1843), según el Index Kew. 2: 885 (1895) = **Trichocline arenaria** Baker.

Seris polymorpha Less. Linnaea 5: 254 (1830), según el Index Kew. 2: 885 (1895) = **Trichocline polymorpha** Baker.

Seris polyphylla Baker, in Mart. Fl. Bras. 6^3: 354 (1884) = **Richterago polyphylla** (Baker) comb. nov.

Seris rupestris Malme, Arkiv Bot. **24A**, no. 8: 55 (1932), no *S. rupestris* Kuntze (1891) = **Richterago Malmei** nom. nov.

Seris vaginata Gardn. in Hook. Ic. Pl. 6: *t. 501* (1843) = **Richterago amplexifolia** (Gardn.) Kuntze.

Especies Dudosas

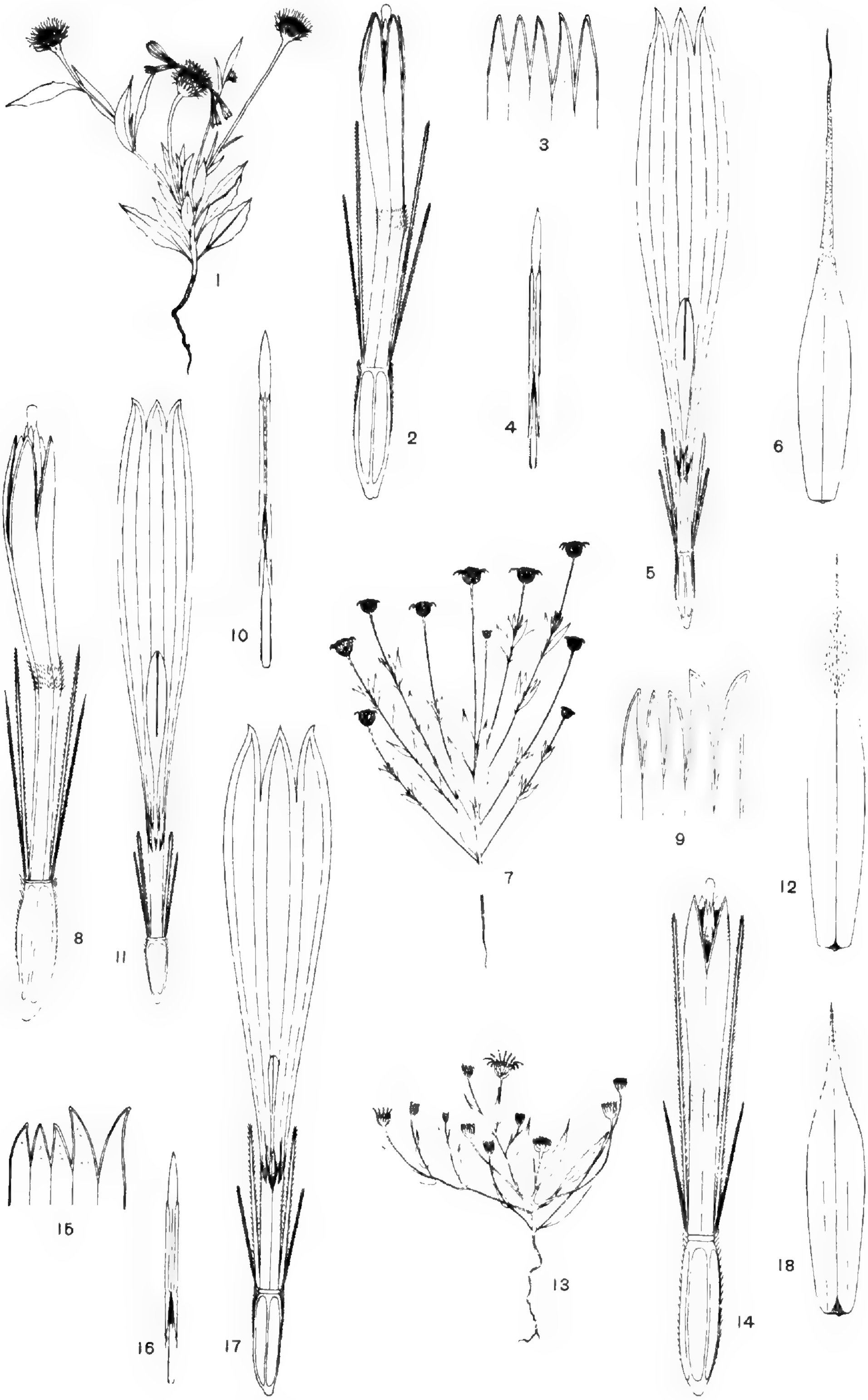
Onoseris integrifolia Less. var. *brachyphylla* Cuatr. Anal. Univ. Madrid 4^2: 237 (1935). Su descripción es muy pobre, sólo dice: "Squamae mediae et interiores late lanceolatae"; la localidad que indica es: "Peru: Quebrada de San Mateo". El ejemplar Tipo fué colectado por Isern (no. *382*, Septiembre 25, 1863); dicho ejemplar se conserva en Madrid. Probablemente corresponde á *O. albicans*.

Gray Herbarium,
Harvard University.

EXPLICACION DE LAS LAMINAS

Lámina I

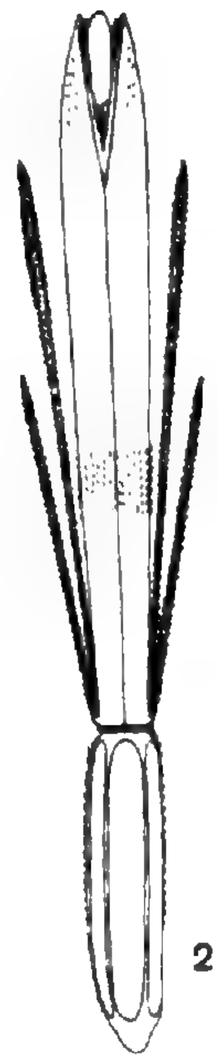
Figs. 1–6. *Onoseris odorata* (D. Don) Hook. & Arn., dibujado de *Weberbauer 5314*: 1. planta, × $\frac{1}{3}$; 2. flor del disco, × 4; 3. lóbulos de la flor del disco, dorso, × 4; 4. estambre de la flor del disco, × 4; 5. flor marginal, × $2\frac{1}{3}$; 6. bráctea interior del involucro, haz, × $3\frac{1}{3}$. Figs. 7–12. *Onoseris Cumingii* Hook. & Arn., dibujado de *Haught 30*: 7. planta, × $\frac{1}{6}$; 8. flor del disco, × 5; 9. lóbulos de la flor del disco, dorso, × 5; 10. estambre de la flor del disco, × 5; 11. flor marginal, × $2\frac{2}{3}$; 12. bráctea interior del involucro, haz, × 5. Figs. 13–18. *Onoseris amplexicaulis* Ferreyra, dibujado de *Macbride & Featherstone 310*: 13. planta, × $\frac{1}{8}$; 14. flor del disco, × 5; 15. lóbulos de la flor del disco, dorso, × 5; 16. estambre de la flor del disco, × 5; 17. flor marginal, × $3\frac{1}{3}$; 18. bráctea interior del involucro, haz, × $3\frac{1}{3}$.

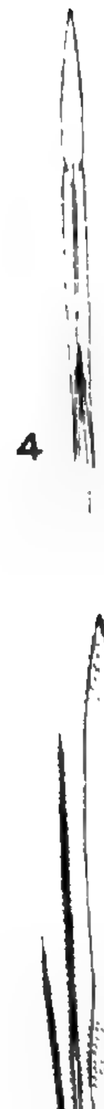


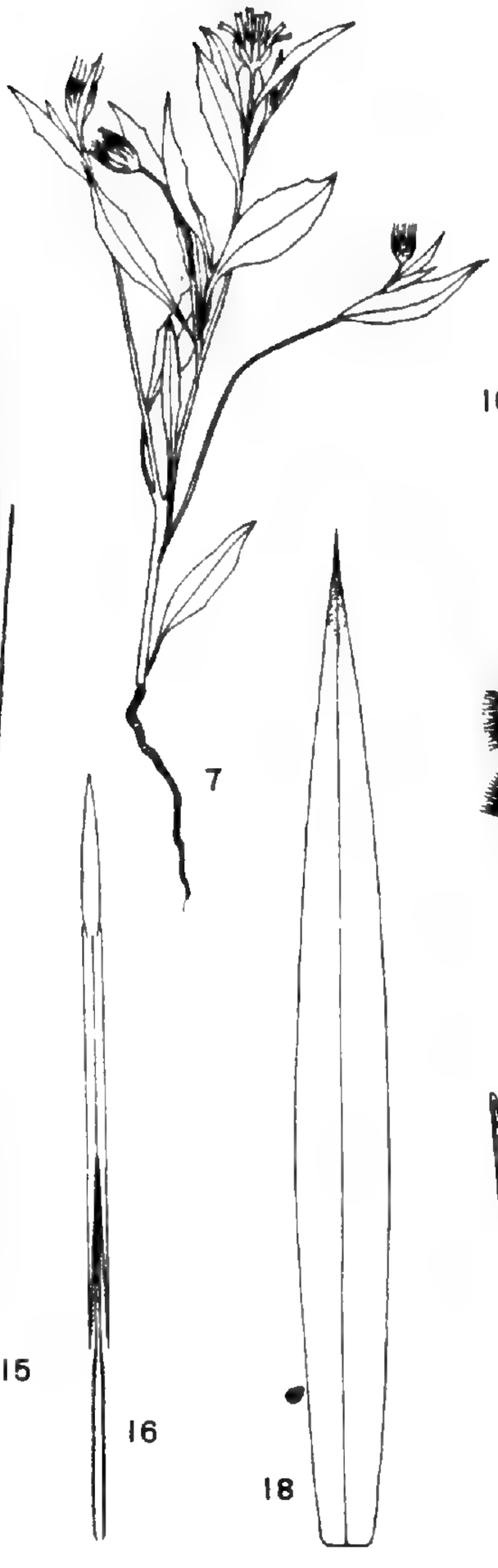
REVISIÓN DEL GÉNERO ONOSERIS

Lámina II

Figs. 1–6. *Onoseris annua* Less., dibujado de *Dombey*: 1. planta, × ⅓; 2. flor del disco, × 5⅓; 3. lóbulos de la flor del disco, dorso, × 5⅓; 4. estambre de la flor del disco, × 5⅓; 5. flor marginal, × 3⅓; 6. bráctea interior del involucro, haz, × 3⅓. Figs. 7–12. *Onoseris minima* Domke, dibujado de *Weberbauer 7440*: 7. planta, × ⅓; 8. flor del disco, × 6⅔; 9. lóbulos de la flor del disco, dorso, × 6⅔; 10. estambre de la flor del disco, × 6⅔; 11. flor marginal, × 5; 12. bráctea interior del involucro, haz, × 5. Figs. 13–18. *Onoseris costaricensis* Ferreyra, dibujado de *Pittier 3312*: 13. hoja, × ⅛; 14. inflorescencia, × ⅓; 15. flor hermafrodita, × 3⅓; 16. estambre, × 3⅓; 17. lóbulos de la flor hermafrodita, dorso, × 3⅓; 18. bráctea interior del involucro, haz, × 3⅓.







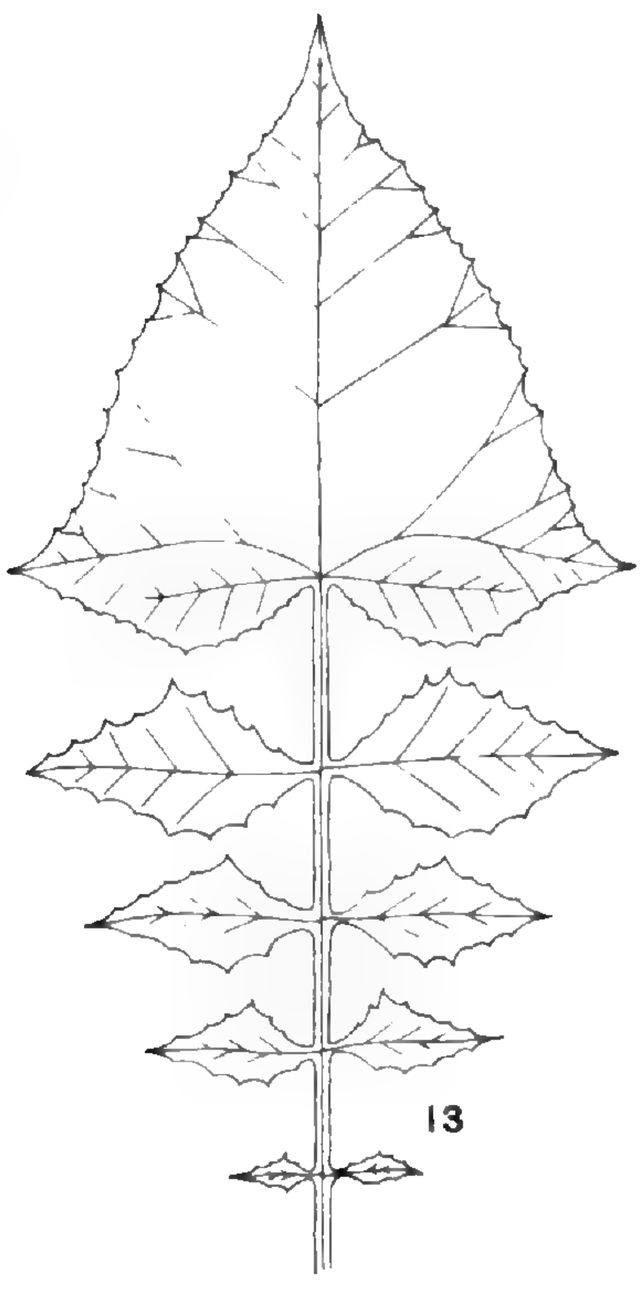
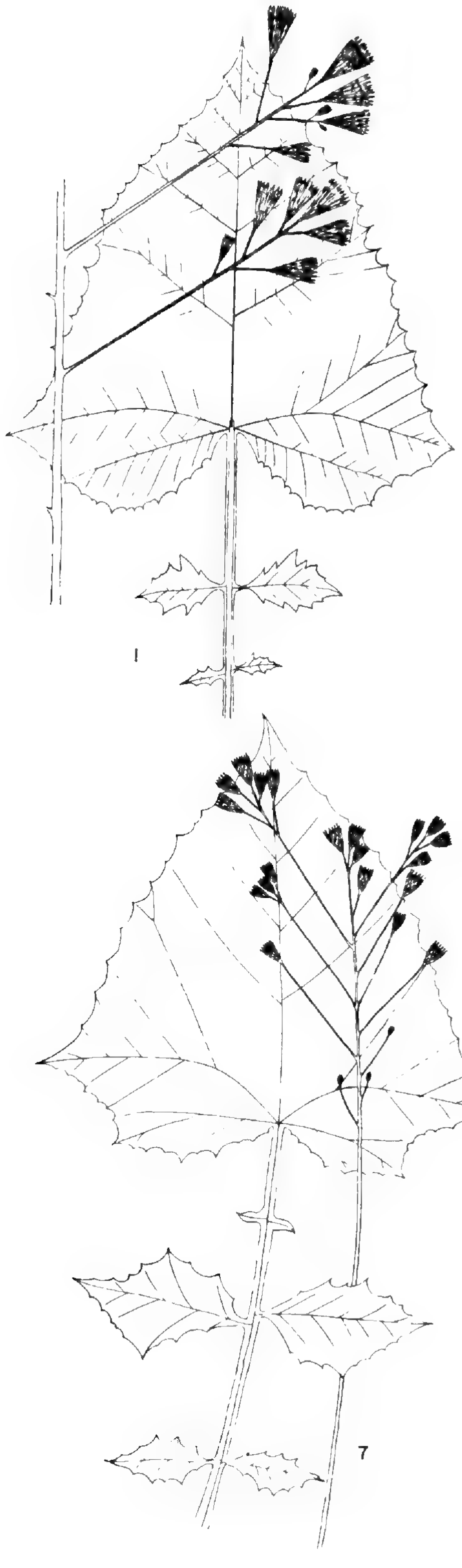


Lámina III

Figs. 1–6. *Onoseris Donnell-Smithii* (Coult.) Ferreyra, dibujado de *Standley 19701*: 1. hoja é inflorescencia, × $\frac{1}{3}$; 2. flor hermafrodita, × $3\frac{1}{3}$; 3. lóbulos de la flor hermafrodita, dorso, × $3\frac{1}{3}$; 4. estambre, × $3\frac{1}{3}$; 5. bráctea interior del involucro, dorso, × $2\frac{1}{3}$; 6. bráctea interior del involucro, haz, × $2\frac{1}{3}$. Figs. 7–11. *Onoseris onoseroides* (H. B. K.) Robinson, dibujado de *Langlassé 759*: 7. hoja é inflorescencia, × $\frac{1}{3}$; 8. flor hermafrodita, × 2; 9. lóbulos de la flor hermafrodita, dorso, × 2; 10. estambre, × 2; 11. bráctea interior del involucro, haz, × 2.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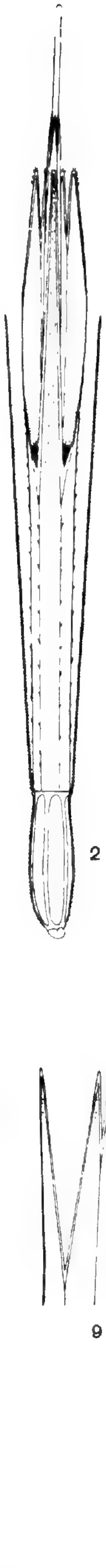
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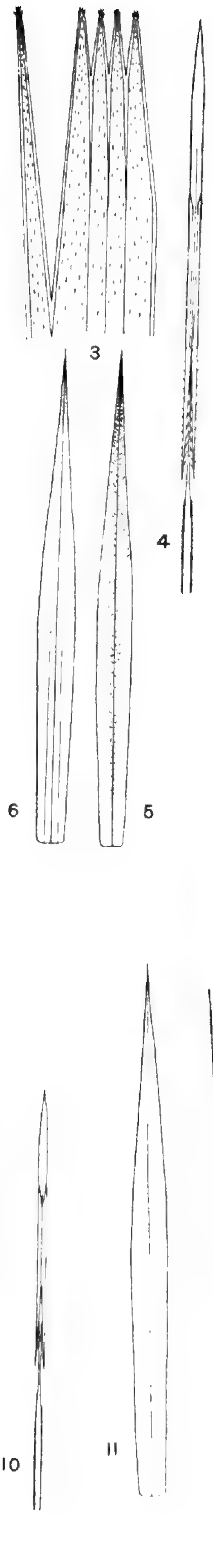
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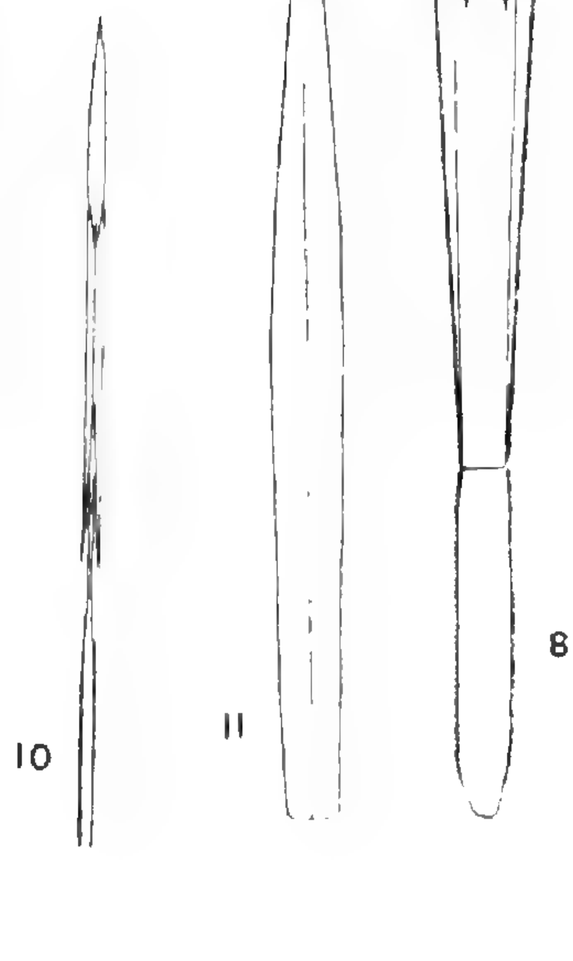
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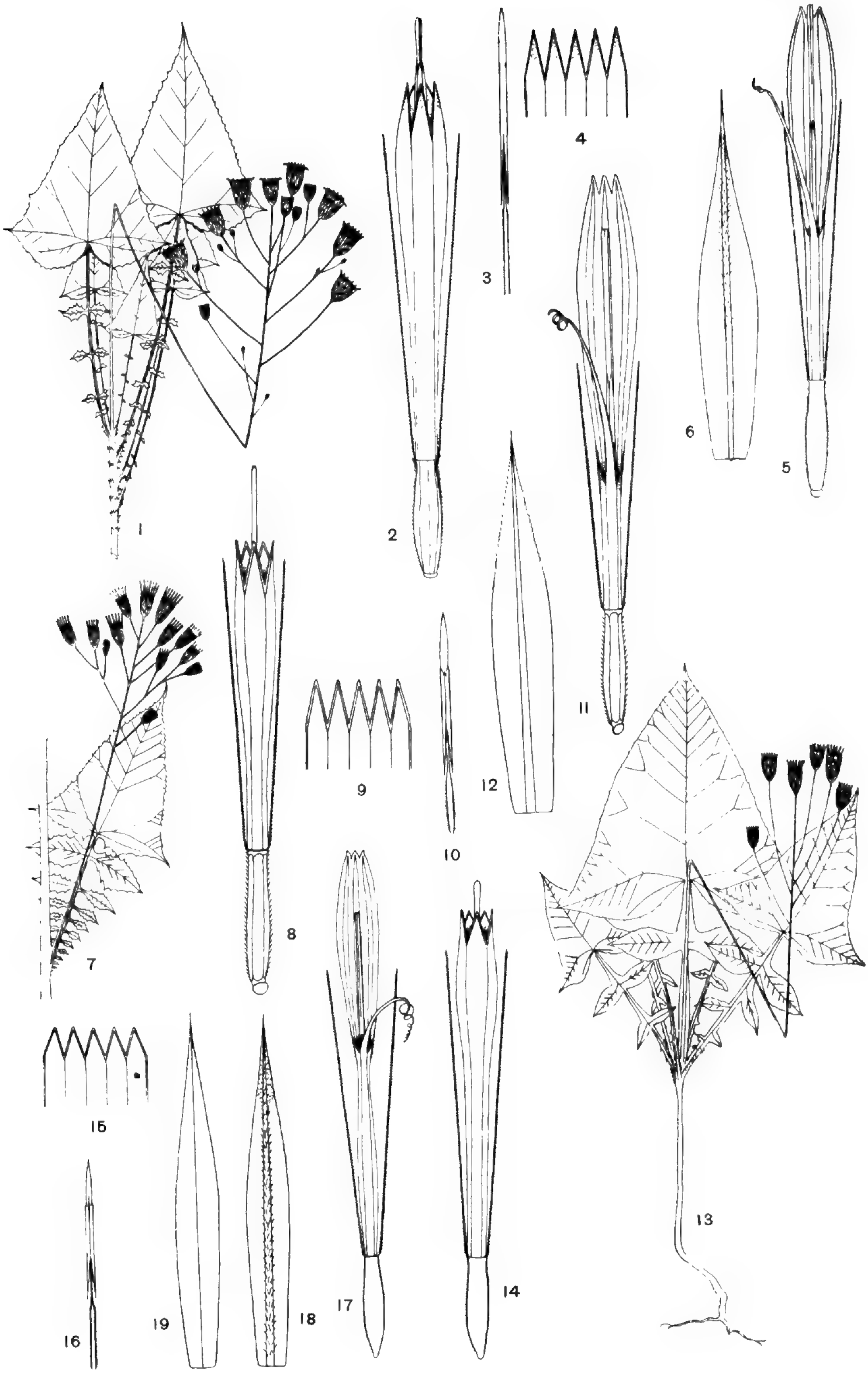
Lámina IV

Figs. 1–6. *Onoseris silvatica* Greenm., dibujado de *Pittier 1622*: 1. planta, × $\frac{1}{8}$; 2. flor del disco, × $2\frac{1}{3}$; 3. estambre de la flor del disco, × $2\frac{1}{3}$; 4. lóbulos de la flor del disco, dorso, × $2\frac{1}{3}$; 5. flor marginal, × $2\frac{1}{3}$; 6. bráctea interior del involucro, dorso, × $2\frac{1}{3}$. Figs. 7–12. *Onoseris silvatica* var. *colombiana* Ferreyra, dibujado de *Killip 34429*: 7. hoja é inflorescencia, × $\frac{1}{8}$; 8. flor del disco, × $2\frac{2}{3}$; 9. lóbulos de la flor del disco, dorso, × $2\frac{2}{3}$; 10. estambre, × $2\frac{2}{3}$; 11. flor marginal, × $2\frac{2}{3}$; 12. bráctea interior del involucro, dorso, × $3\frac{1}{3}$. Figs. 13–19. *Onoseris peruviana* Ferreyra, dibujado de *Macbride 5425*: 13. planta, × $\frac{1}{8}$; 14. flor del disco, × $2\frac{2}{3}$; 15. lóbulos de la flor del disco, dorso, × $2\frac{2}{3}$; 16. estambre, × $2\frac{2}{3}$; 17. flor marginal, × $2\frac{2}{3}$; 18. bráctea interior del involucro, dorso, × $2\frac{1}{3}$; 19. bráctea interior del involucro, haz, × $2\frac{1}{3}$.



REVISIÓN DEL GÉNERO ONOSERIS

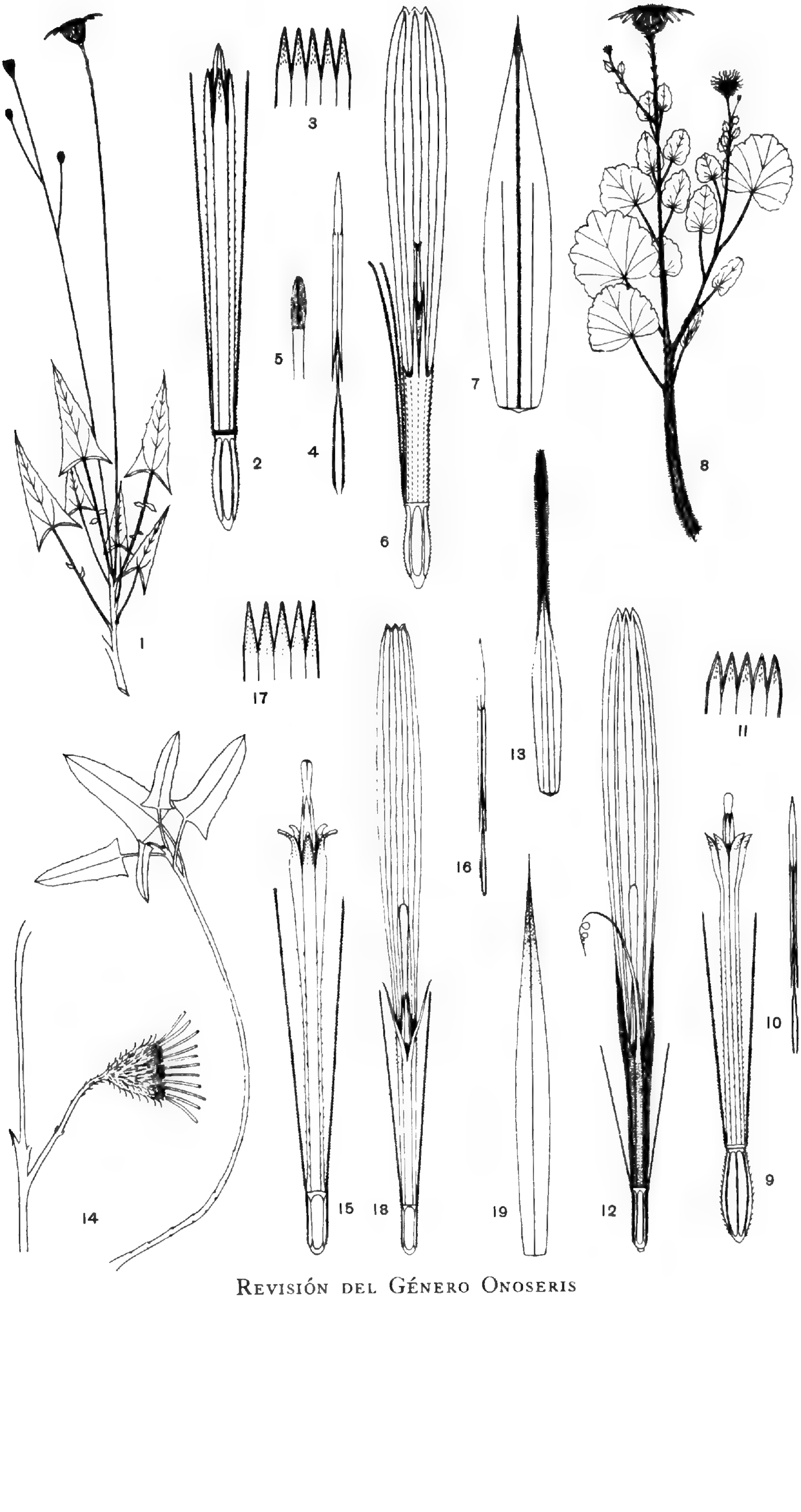
Lámina V

Figs. 1–8. *Onoseris fraterna* Blake, dibujado de *Krukoff 10266*: 1. hoja, × $\frac{1}{3}$; 2. inflorescencia, × $\frac{1}{3}$; 3. flor del disco, × $3\frac{1}{3}$; 4. lóbulos de la flor del disco, dorso, × $3\frac{1}{3}$; 5. estambre de la flor del disco, × $3\frac{1}{3}$; 6. flor marginal, × $3\frac{1}{3}$; 7. bráctea interior del involucro, dorso, × 2; 8. bráctea interior del involucro, haz, × 2. Figs. 9–16. *Onoseris speciosa* H. B. K., dibujado de *Mathews 18*: 9. planta, × $\frac{1}{6}$; 10. capítulo, × $\frac{1}{3}$; 11. hoja, × $\frac{1}{3}$; 12. bráctea interior del involucro, haz, × 2; 13. flor del disco, × 3; 14. estambre de la flor del disco, × 3; 15. lóbulos de la flor del disco, dorso, × 3; 16. flor marginal, × $2\frac{1}{3}$. Figs. 17–22. *Onoseris purpurea* (L. f.) Blake, dibujado de *Lehmann 4755*: 17. planta, × $\frac{1}{3}$; 18. flor del disco, × $2\frac{2}{3}$; 19. estambre de la flor del disco, × $2\frac{2}{3}$; 20. lóbulos de la flor del disco, dorso, × $2\frac{2}{3}$; 21. flor marginal, × $2\frac{2}{3}$; 22. bráctea interior del involucro, haz, × $2\frac{2}{3}$.

REVISIÓN DEL GÉNERO ONOSERIS

Lámina VI

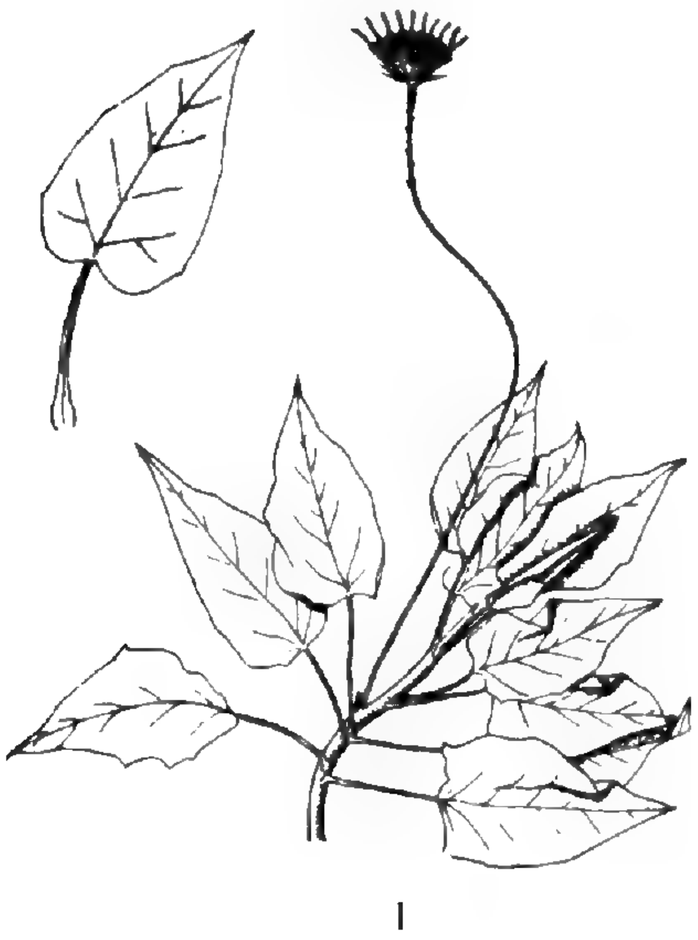
Figs. 1–7. *Onoseris sagittata* (Rusby) Rusby, dibujado de *Bang 1139*: 1. planta, × ⅛; 2. flor del disco, × 3⅓; 3. lóbulos de la flor del disco, dorso, × 3⅓; 4. estambre de la flor del disco, × 3⅓; 5. pistilo de la flor del disco, × 3⅓; 6. flor marginal, × 2⅔; 7. bráctea interior del involucro, haz, × 3⅓. Figs. 8–13. *Onoseris acerifolia* H. B. K., dibujado de *Weberbauer 6203*: 8. planta, × ⅛; 9. flor del disco, × 2⅔; 10. estambre de la flor del disco, × 2⅔; 11. lóbulos de la flor del disco, dorso, × 2⅔; 12. flor marginal, × 2; 13. bráctea interior del involucro, haz, × 2. Figs. 14–19. *Onoseris Castelnaeana* Wedd., dibujado de *Vargas 403* y *404*: 14. capítulo y rama, × ⅓; 15. flor del disco, × 2⅔; 16. estambre de la flor del disco, × 2⅔; 17. lóbulos de la flor del disco, dorso, × 2⅔; 18. flor marginal, × 1⅔; 19. bráctea interior del involucro, haz, × 2⅔.



REVISIÓN DEL GÉNERO ONOSERIS

Lámina VII

Figs. 1–6. *Onoseris Drakeana* André, dibujado de *André 2917*: 1. planta, × $\frac{1}{6}$; 2. flor del disco, × $2\frac{2}{3}$; 3. estambre de la flor del disco, × $2\frac{2}{3}$; 4. lóbulos de la flor del disco, dorso, × $2\frac{2}{3}$; 5. flor marginal, × $3\frac{1}{3}$; 6. bráctea interior del involucro, haz, × $3\frac{1}{3}$. Figs. 7–13. *Onoseris hastata* Wedd., dibujado de *Fiebrig 2380*: 7. planta, × $\frac{1}{6}$; 8. flor del disco, × $2\frac{2}{3}$; 9. lóbulos de la flor del disco, dorso, × $2\frac{2}{3}$; 10. estambre de la flor del disco, × $2\frac{2}{3}$; 11. flor marginal, × $2\frac{1}{3}$; 12. dorso del labio externo de la flor marginal, × $2\frac{1}{3}$; 13. bráctea interior del involucro, haz, × $2\frac{1}{3}$. Figs. 14–20. *Onoseris alata* Rusby, dibujado de *Steinbach 8137*: 14. planta, × $\frac{1}{6}$; 15. flor del disco, × $2\frac{2}{3}$; 16. lóbulos de la flor del disco, dorso, × $2\frac{2}{3}$; 17. estambre de la flor del disco, × $2\frac{2}{3}$; 18. pistilo de la flor del disco, × $2\frac{2}{3}$; 19. flor marginal, × $2\frac{1}{3}$; 20. bráctea interior del involucro, haz, × $2\frac{1}{3}$.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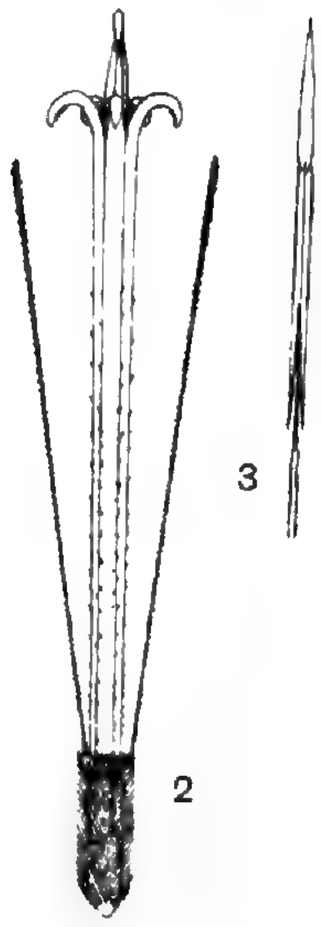
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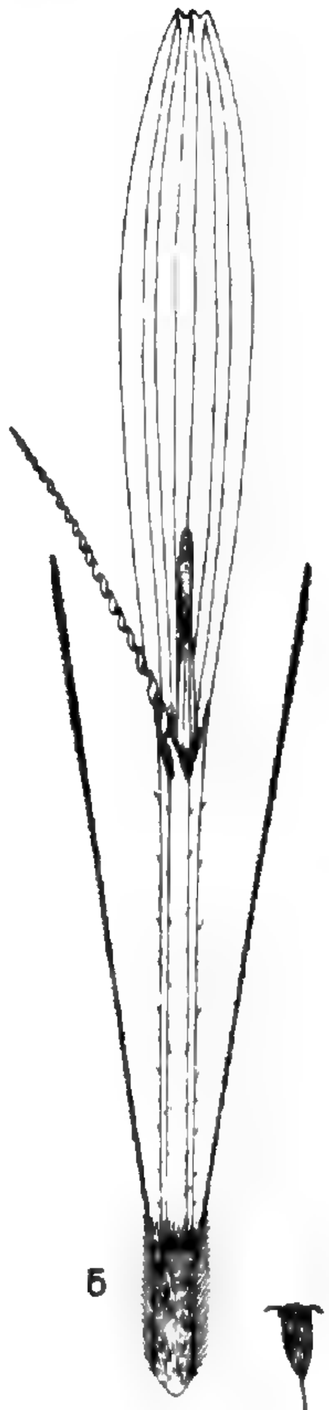
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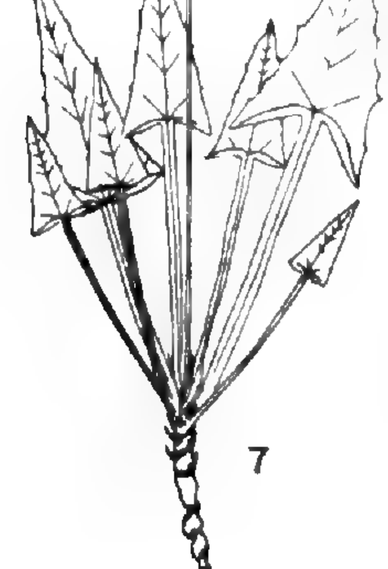
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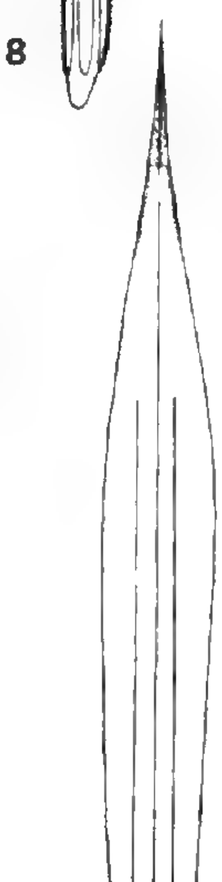
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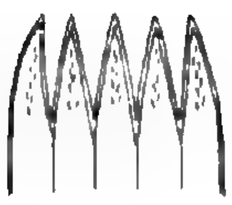
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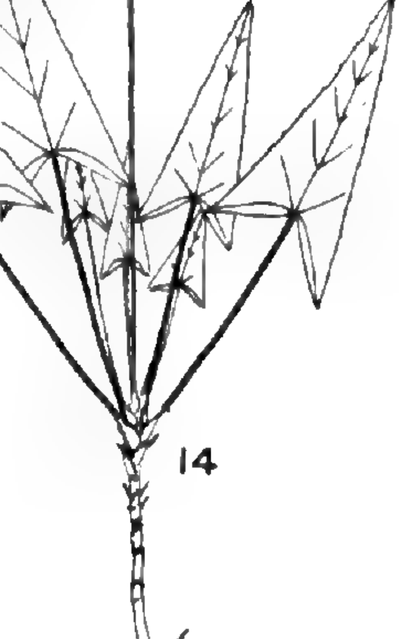
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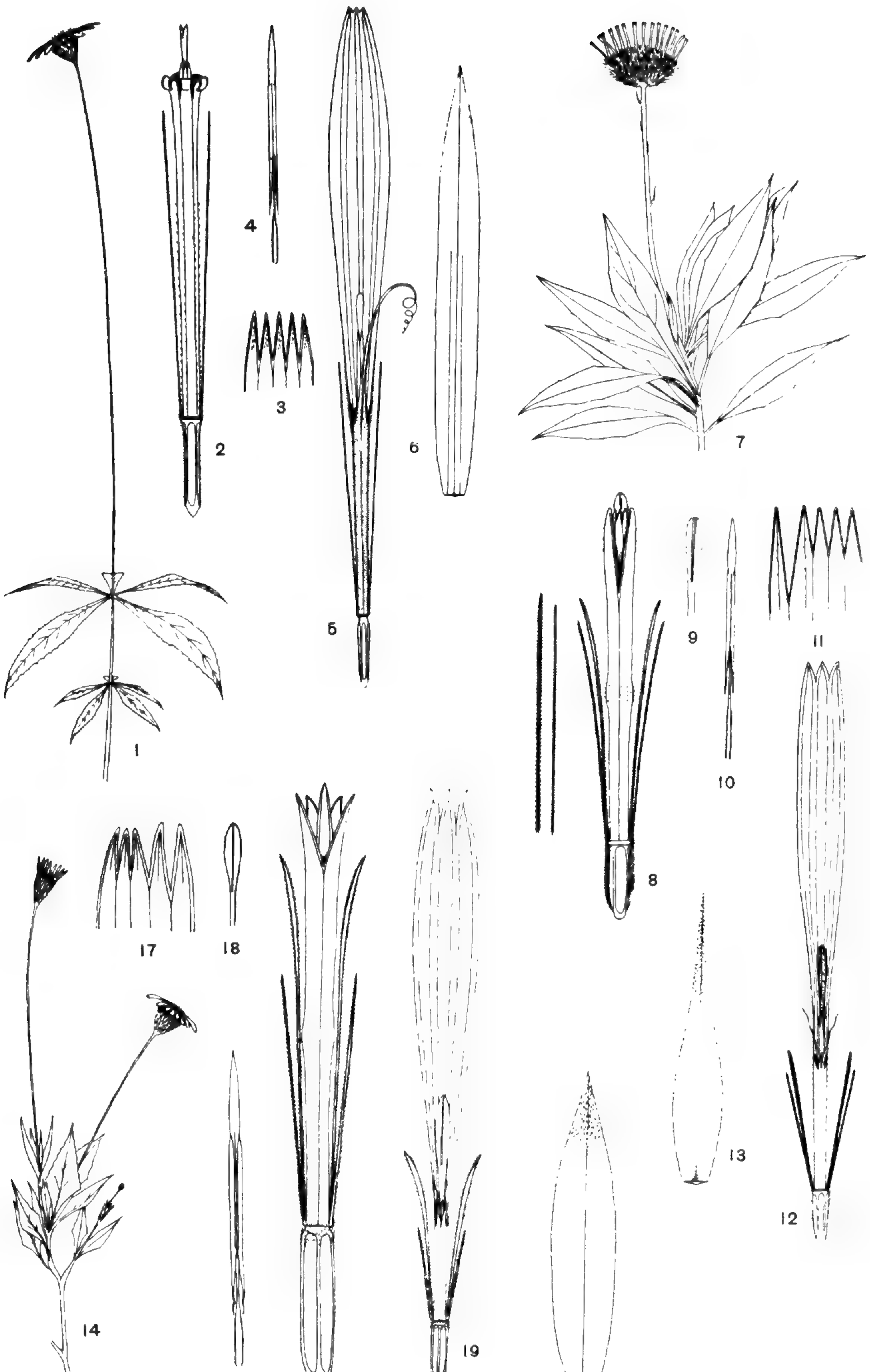
Lámina VIII

Figs. 1–6. *Onoseris Weberbaueri* Ferreyra, dibujado de *Weberbauer 6163*: 1. planta, × ⅛; 2. flor del disco, × 2⅔; 3. lóbulos de la flor del disco, dorso, × 2⅔; 4. estambre de la flor del disco, × 2⅔; 5. flor marginal, × 2; 6. bráctea interior del involucro, haz, × 2⅔. Figs. 7–13. *Onoseris salicifolia* H. B. K., dibujado de *Hitchcock 20624*: 7. planta, × ⅓; 8. flor del disco, × 3; 9. pistilo de la flor del disco, × 3; 10. estambre de la flor del disco, × 3; 11. lóbulos de la flor del disco, dorso, × 3; 12. flor marginal, × 2; 13. bráctea interior del involucro, haz, × 3. Figs. 14–20. *Onoseris albicans* (D. Don) Ferreyra, dibujado de *Pennell 14496*: 14. planta, × ⅛; 15. flor del disco, × 3⅓; 16. estambre de la flor del disco, × 3⅓; 17. lóbulos de la flor del disco, dorso, × 3⅓; 18. pistilo de la flor del disco, × 3⅓; 19. flor marginal, × 1⅔; 20. bráctea interior del involucro, haz, × 3⅓.



REVISIÓN DEL GÉNERO ONOSERIS

Lámina IX

Figs. 1–6. *Onoseris hyssopifolia* H. B. K., dibujado de *Lehmann 636*: 1. planta, × $\frac{1}{3}$; 2. flor del disco, × $3\frac{1}{3}$; 3. estambre de la flor del disco, × $3\frac{1}{3}$; 4. lóbulos de la flor del disco, dorso, × $3\frac{1}{3}$; 5. flor marginal, × $2\frac{1}{3}$; 6. bráctea interior del involucro, haz, × $3\frac{1}{3}$. Figs. 7–12. *Onoseris gnaphalioides* Muschler, dibujado de *Stork, Horton & Vargas 10542*: 7. planta, × $\frac{1}{3}$; 8. flor del disco, × 5; 9. lóbulos de la flor del disco, dorso, × 5; 10. estambre de la flor del disco, × 5; 11. flor marginal, × $3\frac{1}{3}$; 12. bráctea interior del involucro, haz, × $3\frac{1}{3}$.

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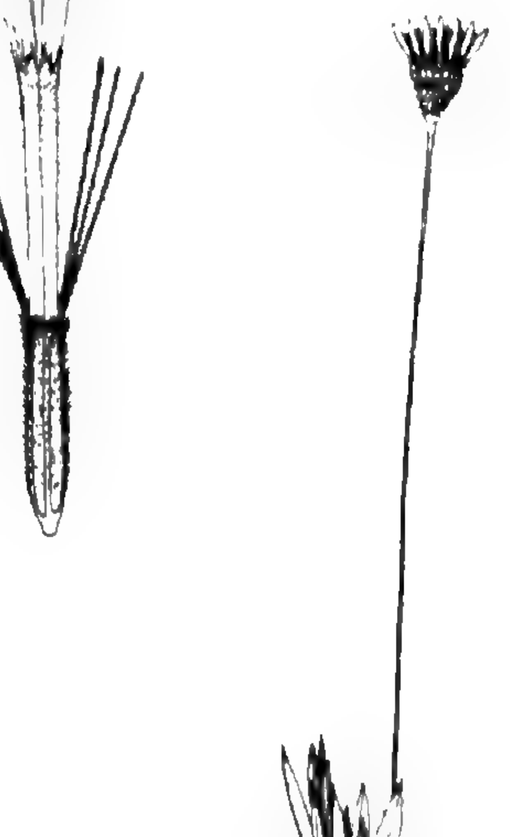

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SUPPLEMENTARY NOTES ON THE ADVENTIVE AND WEED FLORA OF THE LEEWARD COASTS OF FIJI

WILLIAM GREENWOOD

THE present paper has been prepared as a supplement to the writer's recent treatment of the subject in Proc. Linn. Soc. **154**: 92–106. 1943. A number of records of weeds and introduced plants were omitted from the original article, either because the specimens had not been definitely determined when that paper was prepared or because the species had not at that time been discovered in Fiji. In addition to discussing these entities, the present treatment mentions certain range-extensions and includes further notes on a few species previously discussed. This supplement, like the original article, deals only with plants found on the leeward coasts between sea-level and an elevation of about 2000 feet. Families are discussed in the order of Bentham & Hooker's Genera Plantarum.

As in my first treatment, I herewith list a few weeds and introduced plants which have not yet been recorded from Fiji and which are known from other regions than the leeward coasts:

Psidium littorale Raddi (1820) (*P. Cattleianum* Sabine, 1821). Navua region, Viti Levu, *Greenwood,* May 1943.

Borreria laevis (Lam.) Griseb. Nandarivatu, Tholo North, Viti Levu, *Greenwood,* May 1941.

Lindernia anagallis (Burm. f.) Pennell. Navua region, Viti Levu, *Greenwood,* May 1943.

Lindernia diffusa (L.) Wettst. Namosi, Viti Levu, *Greenwood,* May 1943.

Pilea microphylla (L.) Liebm. Namosi region, Viti Levu, *Greenwood,* May 1943.

Cyperus Haspan L. Navua region, Viti Levu, *Greenwood,* May 1943.

Scirpus Purshianus Fernald (*S. debilis* Pursh, non Lam.). Navua region, Viti Levu, *Greenwood,* May 1943.

Echinochloa stagnina (Retz.) Beauv. Navua region, *Greenwood,* May 1943.

Collection numbers found in the text italicized in parentheses refer to the writer's specimens. These are inserted only in cases where the species has not previously been reported from Fiji. Duplicates of most of these are deposited either at the Arnold Arboretum or at the Gray Herbarium.

Some of the plants discussed below were determined by members of the staff of the Royal Botanic Gardens, Kew, for whose coöperation I am grateful. I also wish to thank Dr. E. D. Merrill and Dr. A. C. Smith, of the Arnold Arboretum, for certain identifications and for assistance in the preparation of this supplement.

ANNONACEAE

Cananga odorata (Lam.) Hook. f. & Thoms.

Found naturalized near Lambasa, Vanua Levu, and in the Singatoka district, Viti Levu.

POLYGALACEAE

Polygala paniculata L.

In open places from sea-level up to 1000 ft. in the Lautoka and Nandi districts, Viti Levu. Also common in other parts of the archipelago (see Smith in Sargentia 1: 45. 1942).

PORTULACACEAE

Portulaca quadrifida L.

On islands off the mouth of the Lambasa River, Vanua Levu.

ELATINACEAE

Elatine gratioloides A. Cunn.

Creeping on mud and forming small mats under two or three inches of slowly running water in taro plantations at about 2000 ft. alt., in mountains, Lautoka district, Viti Levu (*952*). This is possibly native to Fiji, as it may have been obtained in 1860 by Seemann and referred by him to *E. ambigua* Wight.

MALVACEAE

Sida microphylla Cav.

On limestone formation near coast, Singatoka district, Viti Levu.

RUTACEAE

Aegle Marmelos (L.) Correa

Sometimes found, but uncommon, in the Lautoka and Rarawai districts of Viti Levu up to 300 ft. alt. and usually near settlements (*970*).

Citrus spp.

The lemon is found on the leeward coasts of both large islands from sea-level up to 2000 ft., usually near watercourses. The shaddock also occurs on both large islands, but usually only above 1000 ft. The orange is found in the Singatoka district, Viti Levu. In view of the uncertainties of the nomenclature of *Citrus*, I refrain from applying binomials to these naturalized forms.

LEGUMINOSAE

Crotalaria mucronata Desv.

As pointed out by Smith (in Sargentia 1: 39. 1942), this plant has been erroneously known as *C. Saltiana* Andr., and as such I have already discussed it (in Proc. Linn. Soc. 154: 96. 1943).

Atylosia scarabaeoides (L.) Benth.

On open grassy hillsides up to 1000 ft., in mountains, Lautoka, Viti Levu, a record from higher elevation than reported by me in Proc. Linn. Soc. 154: 97. 1943.

Indigofera tinctoria L.

Roadside weed, Lautoka, Viti Levu. This record is based on *Degener & Ordonez 13626*, as mentioned in Sargentia 1: 39. 1942.

Mimosa invisa Mart.

On river-bank land on the Government Experimental Farm, Singatoka, Viti Levu. At this locality only one patch of the species was seen and efforts were being made to kill it before it had a chance to spread. Unfortunately it appears to have become established in several places on the wet side of Viti Levu. For additional notes, see Smith in Bull. Torrey Bot. Club 70: 540. 1943.

Leucaena glauca (L.) Benth.

Throughout the leeward coasts of both large islands from sea-level to about 600 ft. alt., locally known as *vaivai*. This South American plant covers large areas on the leeward coasts and may be found just behind the mangrove formation and on low hills up to several miles from the coasts. It is reported that horses which feed on this plant lose the hair of their tails.

The species was collected by Seemann, but not by the botanists of the U. S. Exploring Expedition, indicating that it may have arrived in Fiji during the intervening period, perhaps about 1850.

Albizzia procera (Roxb.) Benth.

Semi-naturalized on low hills near sea-level in the Lautoka district of Viti Levu (*794*).

ONAGRACEAE

Jussiaea erecta L.

Common near sea-level throughout the leeward coasts of both large islands, in drains and other wet places.

PASSIFLORACEAE

Passiflora suberosa L.

Lautoka, near sea-level, Viti Levu. This species first appeared at Lautoka about 1931 and is still not common, showing no tendency to become a pest. It was common near Levuka, Ovalau, when I was there in 1918. Reported from Fiji by Smith in Sargentia 1: 65. 1942.

Passiflora maliformis L.

This species was well established on the leeward coasts of both large islands in 1917. Mentioned in Sargentia 1: 65. 1942, and in Proc. Linn. Soc. 154: 98. 1943.

Passiflora foetida L. var. **hispida** (DC.) Killip.

Nandi district, Viti Levu, near sea-level. This plant was recorded as *P. foetida* in Proc. Linn. Soc. 154: 99. 1943. It is spread by birds and may very possibly become a bad weed throughout the leeward coasts.

CARICACEAE

Carica Papaya L.

The pawpaw is found naturalized on the leeward coasts of both large islands from sea-level to 2000 ft.

CUCURBITACEAE

Citrullus vulgaris Schrad.

The watermelon is sometimes seen in waste places near settlements on the leeward coasts of both large islands.

Cucurbita Pepo L.

The pumpkin is often found growing near settlements on the leeward coasts of both large islands.

Luffa cylindrica (L.) M. Roem.

Near the coast, Lautoka, Nandi, and Singatoka districts, Viti Levu.

Coccinea cordifolia (L.) Cogn.

Near sea-level, Lautoka district, Viti Levu. First noticed about 1940, this species thus far shows no tendency to spread.

AIZOACEAE

Sesuvium portulacastrum L.

On limestone rocks on the seashore in the Singatoka district, Viti Levu. The plants in this unusual habitat had red stems only about 1.5 ft. long, with purplish red flowers. In its usual habitat on the mud-flats just behind the mangrove formation, the species has nearly white stems up to 5 or 6 ft. long and the flowers are also nearly white.

RUBIACEAE

Hedyotis biflora (L.) Lam.

On limestone rocks along coast, Singatoka district, Viti Levu (*918*). Also represented from the same region by *Degener 15111*. Not previously recorded from Fiji.

COMPOSITAE

Elephantopus mollis H. B. K.

To my previous notes on this species (in Proc. Linn. Soc. 154: 99. 1943) should be added mention of the occurrence of the species in the Nandi district, Viti Levu.

Erigeron pusillus Nutt.

Sandy soils near coast, Singatoka district, Viti Levu (*921*). This appears to be a recent arrival, which has not previously been recorded from the Pacific region. Its occurrence in Australia was noted by Robinson in his informative discussion of the status of *E. pusillus* as contrasted with *E. canadensis* L. (in Rhodora 15: 205–209. 1913). The species is now represented by several New Zealand and Australian specimens in the Gray Herbarium and may be expected from other Pacific groups. It occurs, according to Robinson, along the American coast from New England south to northern South America.

Xanthium italicum Moretti

The occurrence of this weed in the Singatoka district, Viti Levu, should be noted in addition to the distribution recorded in Proc. Linn. Soc. 154: 99. 1943.

Mikania micrantha H. B. K.

First recorded under this name from Fiji by Smith, in Sargentia 1: 141. 1942. This common weed has passed as *M. scandens* Willd., having first been reported as a potential pest in Fiji in Kew Bull. 1907: 306. 1907.

SOLANACEAE

Cestrum nocturnum L.

Recorded from the region below Nandarivatu, Tavua district, Viti Levu, alt. 2000 ft., by Gibbs (in Jour. Linn. Soc. Bot. 39: 158. 1909), who states that she was told that the plant was common in other parts of the leeward coast of Viti Levu. In this she was probably misinformed, as there are no other records of it from the leeward coasts and I have never observed it there, although I recently collected it near the Navua River, on the wet side of Viti Levu.

Lycopersicum esculentum Mill.

The tomato is found naturalized in waste places near settlements on the leeward coasts of both large islands.

SCROPHULARIACEAE

Scoparia dulcis L.

Lambasa district, Mathuata coast, Vanua Levu (*525*). Often seen in moist places, but not a bad weed.

ACANTHACEAE

Hemigraphis colorata (Bl.) Hall. f.

Lautoka district, Viti Levu (*983A*). This plant is semi-naturalized in shady places about European houses and Indian settlements. It has also been seen in similar situations in the Navua region in the wet zone of Viti Levu.

Thunbergia fragrans Roxb.

Found in waste places in the Nandi district of Viti Levu. I have already listed this species from the Lautoka district (in Proc. Linn. Soc. 154: 102. 1943).

VERBENACEAE

Duranta repens L.

Lautoka, Viti Levu (*1003*). This species, the seeds of which are spread by birds, is sometimes found in waste places. It is also represented by *Gillespie 2068*, from Fiji but without definite locality.

Stachytarpheta urticaefolia (Salisb.) Sims

In Sargentia 1: 114. 1942, Moldenke records this common weed under the above name. In the literature pertaining to Fijian weeds it has previously gone under the names of *S. indica*, *S. dichotoma*, and *S. jamaicensis* (see Proc. Linn. Soc. 154: 102. 1943). A form with pure white flowers has been seen but is uncommon.

Lantana aculeata L.

In my original article (in Proc. Linn. Soc. 154: 102. 1943) two introduced insects were mentioned as helping to check this plant. Reference should have been made to *Teleonemia lantanae* Dist., which also has a considerable controlling influence. I am indebted to the Government Entomologist, Mr. R. J. Lever, for drawing my attention to this omission. In Sargentia 1: 114. 1942, Moldenke discusses *L. aculeata* as *L. Camara* var. *aculeata* (L.) Moldenke.

LABIATAE

Leucas lavandulifolia Sm.

Singatoka district, Viti Levu (*916*). This weed, which is rather common on sandy soils, is probably a recent arrival, as it has not previously been recorded from the vicinity of Fiji.

NYCTAGINACEAE

Mirabilis Jalapa L.

Already reported from the Lautoka district (in Proc. Linn. Soc. 154: 103. 1943), this weed also occurs near sea-level on sandy soils in the Singatoka district, Viti Levu.

Pisonia aculeata L.

Near Tavua, Tavua district, Viti Levu (*741*). This species is known in Fiji only from a few clumps first seen in this locality in 1927.

POLYGONACEAE

Antigonon leptopus Hook. & Arn.

Found semi-naturalized about settlements in hedges and waste places in the Lautoka district of Viti Levu. Apparently not previously reported from Fiji.

EUPHORBIACEAE

Phyllanthus urinaria L.

Near Penang Mill, Ra, Viti Levu. Found in wet land but not a bad weed.

Euphorbia cf. **australis** Boiss.

On sandy soils near coast, Singatoka district, Viti Levu (*922*). This species, which is referred by Dr. L. Croizat to the relationship of *E. australis*, is becoming troublesome on the Singatoka golf links, where it tends to smother the couch grass (*Cynodon dactylon* Pers.). Each plant spreads out in a cushion close to the ground, has a tap root, and seeds profusely.

AMARYLLIDACEAE

Agave sisalina Perr.

On dry hillsides in the Lautoka and Rarawai districts, Viti Levu. An escape from cultivation and now quite naturalized.

POTAMOGETONACEAE

Diplanthera uninervis (Forsk.) Aschers.

Near low water mark, Thuvu Beach, Singatoka district, Viti Levu (*927*). Guppy, who spent some time in Fiji studying the beach plants, does not mention this, but it is easily overlooked. It has previously been reported from Fiji as *Halodule australis* Miq., but specimens have not been cited.

Ruppia maritima L.

In brackish water, Singatoka district, Viti Levu. Previously reported from the Penang district of Viti Levu (in Proc. Linn. Soc. 154: 104. 1943).

CANNACEAE

Canna indica L.

Lautoka district, Viti Levu. Sometimes found in wet places.

HYDROCHARITACEAE

Hydrilla verticillata (L. f.) Royle

Nandi River, Nandi District, Viti Levu, collected by Mr. G. Dennis (*955*). Very plentiful near the railway bridge across this river (sometimes known as the Tuna River). It forms masses some yards in extent during the dry season when the river level is low, but much of it is swept away when the river rises during the wet season.

CYPERACEAE

Eleocharis geniculata (L.) R. & S.

Depressions near coast containing water after rains, Singatoka district, Viti Levu (*925*). For application of this binomial, see Svenson in Rhodora 41: 50. 1939. In recent years the species has been known as *E. caribaea* (Rottb.) Blake, after having passed for a long time as *E. capitata* R. Br. It has not previously been reported from Fiji.

GRAMINEAE

The grasses of Fiji are discussed by Summerhayes and Hubbard (in Kew Bull. 1927: 18–44. 1927, 1930: 252–265. 1930), and additional notes are recorded by Smith from identifications by Mrs. Agnes Chase (in Sargentia 1: 5–6. 1942, and in Bull. Torrey Bot. Club 70: 534. 1943). For determinations of some of the species discussed below I am indebted to Mrs. Chase.

The majority of the grasses known in Fiji are introduced and can be weeds. Some of these are now known to have a range within the leeward coast areas much greater than that already recorded, and such range-extensions are given below, together with notes on a few species.

Vetiveria zizanioides (L.) Nash

Nandi and Singatoka districts, Viti Levu.

Amphilophis glabra (Roxb.) Stapf

Leeward coasts of both islands from near sea-level to 2000 ft.

Andropogon pertusus (L.) Willd.

Near Lautoka, Viti Levu (*819*). First noticed about 1930. The plants spread out from the base and form flat tussocks, seeding profusely. Stock do not appear to like it. In identifying this plant, Mrs. Chase notes: "One of the many forms, but this agrees with Hackel's *genuinus* better than does most of our material from India, the type locality." The species has not previously been reported from Fiji.

Dichanthium caricosum (L.) A. Camus

Through the leeward coasts of both large islands at low elevations.

Cymbopogon coloratus Stapf

Low hills near Lautoka, Viti Levu. This species, the "lemon grass," is an escape from cultivation and is now quite naturalized.

Heteropogon contortus (L.) Beauv.

Low hills in Nandi and Singatoka districts, Viti Levu.

Themeda quadrivalvis (L.) Kuntze

Plentiful near Lautoka, Viti Levu, but not seen elsewhere. Thus far it has not become a weed in cultivated land.

Digitaria pruriens (Trin.) Buese

Throughout the leeward coasts of both large islands. This is sometimes a bad weed in cultivated land.

Eriochloa procera (Retz.) C. E. Hubbard

On low-lying wet ground near sea-level in the Lautoka and Nandi districts, Viti Levu.

Brachiaria distachya (L.) Stapf

At low elevations throughout the leeward coasts of both large islands.

Paspalum distichum L.

On low dry hills near Lautoka, Viti Levu.

Paspalum paniculatum L.

Lautoka, Viti Levu (*969*). Only a few plants of this grass were seen, for the first time, on roadsides near Lautoka during April, 1943. It has been found near Navua, in the wet zone of Viti Levu, and it will be interesting to see whether it spreads in the dry zone. Seed of this grass was imported from Queensland by the Fiji Department of Agriculture in 1924; *P. Galmarra* F. M. Bailey is a synonym.

Paspalum conjugatum Berg

Throughout the leeward coasts of both large islands.

Paspalum vaginatum Sw.

Near the seashore on the leeward coasts of both large islands.

Paspalum dilatatum Poir.

At low elevations on the leeward coasts of both large islands. In some years this grass is very badly attacked by ergot.

Stenotaphrum secundatum (Walt.) Kuntze

Near Ellington, Penang district, and Thuvu, Singatoka district, Viti Levu. In both these places the species occurs on sandy soil on the seashore. It seems strange that it has not been observed elsewhere on the leeward coasts, while it was noticed growing well near Nandarivatu, Viti Levu, at about 2700 ft. alt. and miles inland.

Echinochloa colona (L.) Link

Throughout the leeward coasts of both large islands.

Sacciolepsis indica (L.) Chase

Near sea-level at Thuvu, Singatoka district, Viti Levu.

Rhynchelythrum roseum Stapf & Hubbard

Leeward coasts of both islands, from sea-level to about 1000 ft. alt.

Pennisetum polystachyon Schult.

From sea-level to about 1200 ft. alt. in the Tavua, Rarawai, Lautoka, and Singatoka districts, Viti Levu. This species seems to be becoming a

widespread grass throughout the leeward coast of Viti Levu, particularly on hill land. In May, 1941, it covered acres of the hills in the Tavua district near Waikumbakumba and was also observed in the Rarawai district. In June, 1941, a few plants were seen at about 1000 ft. alt. on dry rolling hills inland from Lautoka. By June, 1943, these few plants had spread until the species covered several acres. In May, 1943, a small patch was noticed in the Singatoka district.

In Kew Bull. 1930: 260. 1930, the species is described as a tufted annual or perennial up to 4.5 ft. high. In Fiji it is a perennial, dying down in the dry season but always green at the base, and up to 6 ft. high.

Cenchrus echinatus L.

At low elevations throughout the leeward coasts of both large islands.

Sporobolus elongatus R. Br.

From near sea-level to about 600 ft. alt. in the Lautoka and Singatoka districts, Viti Levu. In Kew Bull. 1930: 262. 1930, this grass is recorded from "Rarawai, road from Nursery to Dumtas." The last word is an error for "Quarters" (the buildings where the single men at each sugar mill are housed) and was due to my poorly written herbarium label.

Eragrostis unioloides (Retz.) Nees

Roadside near sea-level, Thuvu, Singatoka district, Viti Levu. Only one small patch was noticed in 1942, and the species appears to be a new arrival in the dry zone of Viti Levu. It was observed on roadsides in the Navua district, in the wet zone of Viti Levu, in 1939.

Cynodon dactylon Pers.

At low elevation throughout the leeward coasts of both large islands.

Eleusine indica (L.) Gaertn.

Leeward coasts of both large islands at low elevations.

Colonial Sugar Refining Co.,
Lautoka, Viti Levu, Fiji.

JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XXV OCTOBER, 1944 NUMBER 4

THE GROUP OF SELAGINELLA OREGANA IN NORTH AMERICA

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With two plates

THE SUBGENUS *Euselaginella*[1] of *Selaginella* is one of those groups in which, apparently, mutation is easy and migration difficult. The result, or, more accurately, the existing condition, is a large proportion of local populations which differ minutely and sometimes rather by recombinations of certain stock characters than by individual and distinctive traits. These populations are difficult to group into sectional divisions or into nexi of species and varieties. They are often widely variable within themselves in such features as length and number of cilia and length of seta, but they show little intergradation with each other. I have seen only one instance of anything which looks like hybridization. Most of them occupy relatively restricted areas. Years ago Professor Fernald and I found similar conditions in *Puccinellia;* now, as then, the only possible taxonomic course is to describe the existing populations as species and make as valiant an effort as one can to arrange and key them out — though a dichotomous key in a group where there are no well marked divisions is no easy assignment.

The group of *S. oregana,* as here limited, is characterized by its lax, prostrate habit, usually elongate, slender stems, relatively distant branches, and appressed to strongly ascending leaves. The plants form loose, intricate mats. So far as can be made out from herbarium specimens, both stems and branches remain horizontal when growing on the ground, only the strobiles tending to assume an upright position.[2] The main stems are

[1] **Selaginella** subg. **Euselaginella** Warb. Monsunia 1: 100 (1900). Subg. *Homoeophyllum* Hieron. in Engler & Prantl, Nat. Pflanzenf. I. 4: 669 (1901). Although Hieronymus's name is derived from Spring's Sect. *Homoeophyllae* (Monog. Lycopod. 2: 53 [1849]), Warburg's is technically preferable as the first to be used in subgeneric rank and in proper form for that rank.

[2] Mr. U. T. Waterfall, however, tells me that in at least one patch of *S. mutica* in west Texas the branches are upright.

usually, with the leaves, not over 1 mm. in diameter; the more densely leafy new branches are often thicker. In dried specimens the leaves are almost always rather closely appressed; their behavior when boiled out, however, suggests that in life they assume an ascending position in wet weather. Standley (Amer. Fern Journ. 5: 78 [1915]) states that they do in New Mexican species. Only in *S. mutica* and *S. cinerascens* do the leaves remain appressed after boiling.

So defined, the group corresponds roughly to *S. rupestris β tropica* Spring, Monog. Lycopod. 2: 57 (1849) — a name under which Spring cited no specimens and which cannot be definitely applied, but under which he placed those portions of the all-inclusive *S. rupestris* of his time which had a lax and sprawling habit. Hieronymus, though using upright habit as the basis of a primary division, made no distinction between species with short, creeping stems and close-set, assurgent branches and those of the present group. I may at once admit that the revival of Spring's division is more a matter of convenience than of obvious affinity. There are nodes of affinity within the group: *S. oregana* and *S. Underwoodii* seem to be related (however far apart they come in the key); so do *S. mutica* and *S. viridissima*. *Selaginella Sartorii*, *S. Hintonii* and *S. Arsenei* quite certainly belong together; in foliar characters, *S. porrecta* seems to go with them, though its spores of both sorts are wholly different. But the group as a whole rests on habit alone and its boundaries have to be drawn more or less arbitrarily.

They may cut across real relationships. *Selaginella mutica*, for instance, is in leaf-characters much more like the short-stemmed *S. Watsoni* Underw. than the species with which it is here associated. On the other hand, *S. Chrismari* Hieron., though prostrate, is in its densely leafy, relatively thick stems, its pattern of branching, and its minute characters, so like the erect *S. rupincola* Underw. that it seems best left in that vicinity. *Selaginella Wallacei* Hieron. and *S. Hanseni* Hieron. occasionally produce long, prostrate stems; they are excluded because in both the strongly prevailing tendency is to form close mats with assurgent branches. Anyone attempting to name specimens by the present treatment should bear in mind that there are such borderline species and that they may not be accounted for here. If this paper adds somewhat to the understanding of the species included, that is all that can be hoped for it.

In any division of *Selaginella* based on habit parallel leaf- and spore-variations will be found in different groups. But in any division based on leaf- or spore-characters parallel variation in habit and other features will be found to quite as great an extent. And, as a primary basis for systematic arrangement, habit has very real and practical virtues — so much so that, within the two great homophyllous and heterophyllous subgenera, it has been used by all taxonomists up to the present time. Moreover, in subg. *Euselaginella* at least, divisions based on it fall into distinctive and reasonable geographic groups. That of *S. rupestris* proper (with short, prostrate stems, assurgent branches and more or less spreading leaves) includes by far the greatest number of species and occurs everywhere in the range of

the subgenus except the extreme north and extreme south. The more specialized small group of *S. Parishii* Underw., like the preceding, but with somewhat dimorphic leaves, is confined to the arid regions of the southwestern United States, from southwestern Texas to southern California, and northern and central Mexico. The present group has a mainly north-and-south distribution in the region of the North American Cordillera from Colorado to southern Mexico, with two outlying species on the Pacific coast, and reappears in southern Brazil, Uruguay, Paraguay and northern Argentina. This holds, whether the border-line species are included or not. The group with upright, shrub-like habit has, on the contrary, a generally east-and-west range, from the Piedmont and Coastal Plain of the southeastern United States in a narrow belt through western Texas, the southern half of New Mexico and Arizona and adjacent Mexico, to southern California.

In the taxonomic treatment which follows, descriptions of individual species are merely supplementary to the key and include no characters mentioned in it. Measurements are intended to give average dimensions; they may not cover extremes. Bibliography is meant to include only references to original descriptions and to literature which adds illustration or further information to the originals. In the key, the characters of number and length of cilia and length of terminal setae, much used by Hieronymus, have been for the most part omitted or stated in general terms. Cilia are easily broken off in dried material, so that an accurate count of them is difficult; and the length both of cilia and setae varies so much within species and even in the same colony that an attempt to find other characters which, even if seemingly incapable of altogether definite statement, could be more easily seen and better relied upon, seemed worth while. The type of cilia, whether narrow-based and hair-like or broad-based and more or less deltiform, their texture, and the texture of the setae, whether hyaline, subtranslucent and somewhat colored, or chalk-white and opaque, may well prove more significant than measurements. In all the species, the leaves are broadly sessile, the sometimes swollen base containing spongy mesophyll through which the single vascular strand makes its way into the blade. The shape and degree of adnation of these leaf-bases and the relative thickness of the blade, as well as its shape, seem also to be significant. Characters of the megaspores need to be used with some caution, since the depth and appearance of their sculpturing varies considerably with age; but its pattern is constant within species and aids greatly in defining them and in fortifying one's confidence in their validity.

The microspores offer equally distinctive characters, but mature ones are not easy to find. Those adhering to herbarium specimens or dissected out of sporangia are often still clinging together in their original tetrads and frequently covered with, and their sculpture-patterns obscured by, a dark, wrinkled membrane, presumably the persistent wall of the mother-cell. Fragments of this membrane often remain attached to the spores after they have separated from the tetrad; Hieronymus says it is permanently persistent in *S. lepidophylla*. In the present group, I have not seen it in

S. Underwoodii or *S. mutica* and scarcely in *S. oregana* and *S. extensa*. In the other species, it is a conspicuous feature; but whether this means that it is really longer persistent in them, or is merely due to accident, I cannot determine.

The key, an experiment in using the characters above indicated, is in part, for practical reasons, artificial. To use it most effectively, material should be examined under magnifications of 20–50 diameters for leaves, etc., 300–400 for microspores.

In addition to the material in the Gray Herbarium (G), I have seen all that in the Herbarium of Yale University (Y), and all the specimens of *S. mutica* and all those from Mexico in the United States National Herbarium (US).

I am much indebted to my wife for the accompanying drawings, to Prof. Hempstead Castle for the loan of specimens from the Eaton Herbarium at Yale University, to Mr. C. V. Morton for friendly and helpful criticism, and to Dr. William R. Maxon for loans from the United States National Herbarium and in many other ways. The attentive reader will observe that at various points I have merely followed in his foot-steps.

KEY TO THE SPECIES AND VARIETIES

a. Leaves soft and thick, strongly convex dorsally, long-adnate (up to ¼ their length) at the cuneate base, with a short, hyaline terminal seta and few, short, mostly dentiform marginal cilia; sporophylls not strongly differentiated from the foliage-leaves; commissural ridges of megaspores connected near base by cross-ridges.....1. *S. oregana*.

a. Leaves short-adnate at the usually rounded or truncate base; sporophylls conspicuously differentiated from the leaves; commissural ridges of megaspores connected at their apices by an equatorial ring or free. *b*.

b. Leaves oblong-, elliptic-, or ovate-lanceolate, thick and strongly convex dorsally, especially at the cucullate apex, at least on new growth mostly 1.6 mm. or less long. *c*.

c. Cilia of the foliage-leaves long, weak and spreading; sporophylls definitely ciliate. *d*.

d. Leaves muticous or at most short-mucronate.....3. *S. mutica*.

d. Leaves with a terminal seta up to 0.4 mm. long....3a. *S. mutica* var. *texana*.

c. Cilia, at least the upper, short, stiff, strongly ascending; sporophylls merely short-fimbriate; leaves with a short (0.2 mm. or less) terminal seta.....3b. *S. mutica* var. *limitanea*.

b. Leaves subulate- or oblong-linear, mostly more than 1.6 mm. long. *e*.

e. Leaves with a short, flat hyaline apex or wholly muticous; cilia few and short. *f*.

f. Leaves bright green, somewhat thickened; stems lax, forming a loose mat; megaspores finely reticulate-rugose. *g*.

g. Leaves oblong-linear, acute or obtusish, quite without modified apex, rounded or narrowed at base, as seen in profile passing obliquely into the stem; megaspores subglobose with short, slender commissural ridges and no equatorial ring.....4. *S. viridissima*.

g. Leaves subulate-linear, acuminate, with a short, flat, outwardly bent hyaline apex, abruptly truncate at base; megaspores flattened, with prominent commissural ridges and a strongly and irregularly tuberculate equatorial ring.....5. *S. extensa*.

f. Leaves glaucous, thin and papery, with an obtusish, minutely serrulate, hyaline or herbaceous apex; stems forming a closely prostrate mat; megaspores coarsely reticulate-rugose on outer face, with a prominent, thin, irregular equatorial ring.....6. *S. cinerascens.*

e. Leaves with a straight, hyaline terminal seta. *h*.

h. Leaves abruptly truncate at base, thin and firm, nearly plane on both surfaces. *i*.

i. Cilia hyaline, 0.1 mm. or less long, ascending. *j*.

j. Leaves glaucous-green; cilia relatively few and distant. *k*.

k. Leaves subulate-linear, long-acuminate, commonly with a tuft of hairs at base; cilia piliform except near apex of leaf; outer face of megaspores coarsely reticulate-rugose.....7. *S. porrecta.*

k. Leaves oblong-linear, short-tapering to apex, usually without hairs at base; cilia reduced to minute teeth; outer face of megaspores very finely and shallowly reticulate.....8. *S. Arsenei.*

j. Leaves green; cilia numerous, piliform, strongly ascending; megaspores finely reticulate.....9. *S. Hintonii.*

i. Cilia chalk-white, subopaque, piliform, laxly ascending or the basal spreading, up to 0.18 mm. long; outer face of megaspores reticulate with areoles of moderate size.....10. *S. Sartorii.*

h. Leaves rounded or abruptly narrowed at base, thickened and dorsally convex, in profile passing obliquely into the stem; megaspores as in no. 10. *l*.

l. Seta 0.3–0.5 mm. long; cilia often reduced to small teeth or nearly obsolete.....2. *S. Underwoodii.*

l. Seta 0.8–1.8 mm. long; cilia tending to become well developed and piliform.....2a. *S. Underwoodii* var. *dolichotricha.*

1. **Selaginella oregana** D. C. Eaton in Wats. Bot. Cal. 2: 350 (1880); Maxon in Amer. Fern Journ. 11: 35 (1921), in Abrams, Ill. Fl. Pacific States, 1: 48. *fig. 103* (1923). PLATE I, 1.

Selaginella struthioloides (Presl) Underw. in Bull. Torr. Bot. Club 25: 132 (1898), as to plant, not *Lycopodium struthioloides* Presl; Frye & Jackson in Amer. Fern Journ. 3: 75. *pl. 3, fig. 4* (1913).

Stems very long, up to 9 dm. (according to Mrs. Summers "1–6 ft.," but this may refer to the dimensions of the mat rather than to individual stems). Leaves green, subulate-lanceolate, 2–2.6 mm. or more long, 0.5–0.6 mm. wide, acuminate, flat on the ventral surface, with a broad, conspicuous dorsal furrow. Seta nearly smooth, 0.3 mm. or less long, whitish or yellowish. Spikes up to 3 cm. long. Sporophylls similar to foliage-leaves, but broader, 2.2–2.4 mm. long, 0.8–1 mm. wide, scarcely biauriculate at base, long-acuminate, the cilia and seta as in leaves. Megaspores yellow, about 0.4 mm. in diameter, more or less flattened, shallowly reticulate on the outer face with areoles of moderate size, somewhat more strongly and less regularly reticulate on the commissural face, without an equatorial ring, but with a band of rather close reticulation, the rugae showing as irregular projections when seen in profile. Microspores about 50 μ in diameter, irregularly rugulose, with an irregular, rather broad wing.—Northern California, Oregon and Washington, near the coast; pendent from trees or on rocks.

LECTOTYPE: Port Orford, Curry Co., Oregon, 1855, *Kautz* in herb. Yale University (dupl. G). After the custom of his time, Eaton designated no type. He cited two collections, that of Kautz and one from Tillamook Valley, Oregon, 1878, *Mrs. Summers 2209*. The former was incidentally designated as type by Maxon, Amer. Fern Journ. 11: 36 (1921), and this designation may stand, though the Summers specimen is better

fruited and has more mature spores. Eaton wrote on his sheet of it: "Macrospores detected March 15, 1880!!! D. C. E." The Kautz specimen is better vegetatively.

The following specimens may be cited as representative. CALIFORNIA: near Adams, Del Norte Co., *Eastwood 12185* (G). OREGON: hanging from moss of trees, Coos River, Oct. 29, 1881, *Pringle* (G, Y); on maple trees by the Trask River, July 12, 1882, *Howell* (G, Y); without locality, 1871, *Hall* (Y). WASHINGTON: shaded ledges, base of Mt. Col Bob, Gray's Harbor Co., *Thompson 9399* (G); rocks, banks of Columbia River at Altoona, Wahkiakum Co., *Suksdorf 6811* (G); Leban, Pacific Co., *Piper 3802* (G); "Observatory Mt.," *Scouler 335* (G).

2. **Selaginella Underwoodii** Hieron. in Engler & Prantl, Nat. Pflanzenf. I. 4: 714 (1901); Underw. in Fern Bull. 10: 11 (1902); Standley in Amer. Fern Journ. 4: 114 (1914), 5: 78 (1915); F. C. Greene, op. cit. 17: 129 (1927); Maxon, op. cit. 27: 111 (1937); Wherry, op. cit. 28: 30 (1938). PLATE I, 2(A–F).

Selaginella rupestris var. *Fendleri* Underw. in Bull. Torr. Bot. Club 25: 127 (1898).

Selaginella Fendleri (Underw.) Hieron. in Hedwigia 39: 303 (1900), not Baker (1887).

Stems mostly less than 15 cm. long. Leaves loosely imbricate, oblong-linear, 2–2.5 mm. long, 0.3–0.4 mm. wide, the dorsal groove not reaching the somewhat thickened and subcucullate, obtusish apex. Seta scabrous. Sporophylls ovate-deltoid, about 2 mm. long and 1 mm. wide, subabruptly narrowed above the broad, widely biauriculate base to the acute, somewhat thickened and cucullate apex; dorsal groove not reaching the apex; seta as in foliage-leaves; margins densely or sparsely ciliolate-serrulate with often dentiform cilia. Megaspores about 0.3 mm. in diameter, somewhat flattened, shallowly and rather regularly reticulate on the outer face with thin ridges forming areoles of moderate size, more closely and irregularly sculptured on the commissural face with thicker ridges; commissural ridges prominent; no equatorial ring. Microspores about 50 μ in diameter, nearly smooth on the commissural face, finely and regularly punctate on the outer, with a narrow, irregular wing. — Wyoming, Colorado, western Oklahoma, southwestern Texas, northern New Mexico and northern Arizona. Presumably on rocks, often associated with *S. mutica*.

TYPE: *Fendler 1024* from near Santa Fe, New Mexico, in herb. New York Bot. Gard.; isotype, G.

The following are representative. COLORADO: Royal Gorge, Fremont Co., July 30, 1888, *Demetrio* (G); Minnehaha Falls, Pike's Peak region, El Paso Co., *Johnston 2421, 2425* (G). TEXAS: Mt. Livermore, Davis Mts., Jeff Davis Co., Aug., 1938, *Hinckley* (G). NEW MEXICO: moist cliffs, Ute Park, Colfax Co., alt. 2200–2900 m., *Standley 14688* (G). ARIZONA: near Flagstaff, Coconino Co., 1921, *Ferriss* (G, US).

2a. **Selaginella Underwoodii** var. **dolichotricha** var. nov. PLATE I, 2(G).

A varietate typica differt seta terminali foliorum 0.8–1.8 mm. longa, ciliis saepius bene evolutis piliformibus.

NEW MEXICO: Mogollon Creek, Mogollon Mts., alt. about 8000 ft., Socorro Co., July 20, 1903, *Metcalfe 276*, TYPE in Gray Herb.; Silver City, Grant Co., alt. 5700 ft., *Metcalfe 711* (US); Lookout Mine, south end of the Black Range, alt. about 8600 ft., Sierra Co., *Metcalfe 991* (G). ARIZONA: Frye Canyon, Pinaleno Mts., Graham Co., alt. 5500 ft., *Maguire, Richards & Moeller 11745* (G); Paradise, Cochise Co., March, 1904, *Ferriss* (G); Santa Rita Mts., Pima Co., *Goodding 5* (US). Specimens from Cave Creek, Chiricahua Mts., Cochise Co., Arizona, *Ferriss* in 1904 (US), and from the Organ Mts., New Mexico, *Wooton*, March 3, 1907 (US), though best placed under the variety, represent phases more or less intermediate in length of seta and in association of long seta and cilia.

Although the variation in length of seta and cilia is no greater than in

some other species, *S. arizonica* for instance, there seems to be here sufficient geographic segregation to justify the recognition of a variety, parallel to *S. mutica* var. *limitanea*. Long setae appear to occur consistently, and only, in the southern part of the range of the species; and long cilia are much more common there, though the association of the two is by no means constant.

3. **Selaginella mutica** D. C. Eaton in Underw. in Bull. Torr. Bot. Club 25: 128 (1898); Underw. in Fern Bull. 10: 10 (1902); Wherry in Amer. Fern Journ. 28: 136 (1938). PLATE I, 3(A–F).

Stems rather short for the group (10 cm.), forming a relatively dense mat. Leaves pale green, variable in size, 1–2 mm. long, 0.4–0.5 mm. wide, obtuse or acutish. Spikes up to 1.5 cm. long. Sporophylls ovate-deltoid, 1.4 mm. long, 0.6–0.8 mm. wide, evenly narrowed from above base to a normally mucronate acute apex. Megaspores subglobose, orange-yellow, finely and irregularly reticulate on both faces or nearly smooth on the outer, with low, short commissural ridges and low, inconspicuous ring or none. Microspores about 50 μ in diameter, very lightly granular or smooth, narrow-winged. — On rocks of various kinds (limestone, basalt and sandstone are mentioned by collectors), montane regions of Colorado, eastern Utah, southwestern Texas, northern and central New Mexico, and northern Arizona, with a single record from the southeastern part of that state.

AS LECTOTYPE I would choose a specimen in herb. Yale University collected in "crevices of rocks, mountains of Colorado, 1871" by *Meehan*. In publishing the species from Eaton's manuscript, Underwood designated no type. Of the specimens in Eaton's herbarium, the only one labelled *S. mutica* is a fragment without data of locality. The cited specimen of the Mexican Boundary Survey is of the phase here treated as var. *texana*. Presumably Eaton overlooked the inconspicuous and fragile terminal seta present in this collection, though often broken off in the older leaves. In any case, his description and the name he chose preclude the choice of a setigerous specimen as type. The cited specimen which he seems especially to have studied and from which he made a drawing of a leaf, is the Colorado one collected by Meehan. I am accordingly regarding that as the type.

The following are representative. COLORADO: Estes Park, Larimer Co., 2250 m., July 20, 1914, *Wooton* (US); Idaho Springs, Clear Creek Co., alt. 13000 ft., *Shear 4616* (US); columnar basalt cliffs southwest of Lyons, Boulder Co., June 20, 1937, *Wherry* (US); Manitou, El Paso Co., Dec., 1924, *Goldsmith* (G); same locality, shallow soil covering limestone, piñon belt, alt. 6600 ft., *Johnston 3871* (US); canyon of Arkansas River, Fremont Co., *Bacigalupi 1015* (G), July 31, 1888, *Demetrio* (G); Canyon City, 1871, *Brandegee* (Y); rocks in canyon, San Miguel River near Gateway, Montrose Co., *Maguire & Piranian 11371* (G); shaded gulch in dry, rocky hills, alt. 5800 ft., Paradox, *Walker 365* (G, US). UTAH: Vernal, Uintah Co., *Graham 7592* (US); under and about rocks, canyon and talus slopes, head of Calf Spring Wash, San Rafael Swell, Emery Co., 6800 ft., *Maguire 18450* (G). TEXAS: Sierra Diablo, Hudspeth Co., Sept. 13, 1921, *Goodding* (US); El Paso, *Mearns* (US); calcareous soil in crevices of limestone ledges, Victoria Canyon, Sierra Diablo, *Waterfall 4811* (G). NEW MEXICO: Sierra Nacimento, Rio Arriba Co., *Goodding 6142* (US); Rio Grande Canyon, west of Taos, Taos Co., *Wilkens 2422* (US); Nambe Creek, Santa Fe, *Arsène 21118* (G); on rocks in woods along Pecos River, Pecos, San Miguel Co., *Drouet & Richards 3311* (G, US); Santa Rosa, Guadelupe Co., 1450 m., *Arsène & Benedict 16643* (US); sandstone cliffs south of Grant's, Valencia Co., May 18, 1939, *Goodding* (US); Magdalena Mts., northwest of Socorro, Oct., 1922, *Ferriss* (US). ARIZONA: near Betatakin ruins, Navajo Co., *Wetherill 536* (US); on and about exposed rocks (sandstone?) near rim of canyon, Grand Canyon, Coconino Co., alt. 6500 ft., Nov. 17,

1905, *Wm. Palmer* (US); Chiricahua Mts., Cochise Co., Sept. 20, 1896, *Toumey* (US, Y).

There is much variation in the leaves of *S. mutica*. Typically, those of the new growth are oblong-lanceolate or even ovate-oblong in outline, closely imbricated, obtuse and not more than 1.4 mm. long. This condition grades into one in which the leaves of the new growth are ovate-lanceolate, rather loosely imbricate, tapering to an acute apex, 1.8–2 mm. long and more often mucronate. The two extremes are striking enough to the eye, but taxonomically are inextricable (though Hieronymus gave a manuscript name to a sheet of the second). Not only are there various intermediates, but the two frequently occur in the same collections and even in the same colonies and have no regional differentiation. Some of the long-leaved plants show a tendency to develop narrowed and lengthened leaf-bases suggestive of hybridization with *S. Underwoodii,* which frequents the same habitats as *S. mutica* and not uncommonly grows intermingled with it. Such hybridization may be an element in the variability of the plants here considered as belonging with typical *S. mutica*.

Two other variants show geographic segregation and may profitably be set apart as varieties.

3a. **Selaginella mutica** var. **texana** var. nov.

A varietate typica differt foliis sporophyllisque seta terminali laevi albescente hyalina ad 0.4 mm. longa praeditis.

TYPE: shaded rocky hillside, ridges south of Emory Peak, Chisos Mts., Brewster Co., Texas, alt. 2300 m., June 23, 1931, *Moore & Steyermark 3196,* in Gray Herb.; isotype, US.

Other specimens seen — TEXAS: "Mexican Boundary" (Y); Pulliam Canyon, *Sperry 428* (US); moist cliffs and crevices, rhyolite cliffs, north exposure, near Mt. Livermore, Davis Mts., alt. 2400 m., *E. J. Palmer 30871* (G); exposed rock crevices, Little Ajuga Canyon, Davis Mts., alt. 1495 m., *Moore & Steyermark 3046* in part (G, US); Limpia Canyon, *Tracy & Earle 275* (G, US; toward var. *limitanea*).

This is a rather indefinite variety, combining the long, spreading cilia of typical *S. mutica* and the terminal seta of var. *limitanea,* and known only from west Texas where the ranges of these two meet. Morphologically, it is little more than a series of intermediates between them, and one may doubt if it represents any established genetic line. Nevertheless, the specimens here brought together have a recognizable association of characters; the terminal seta is generally longer than in var. *limitanea;* and, from the standpoint of practical taxonomy, the recognition of the variety clarifies the arrangement of material.

Wright 2115, distributed with a label-caption reading "New Mexico," but actually collected at Frontera, in what is now El Paso County, Texas, represents an occasional variant of *S. mutica* toward var. *texana*. Some of its leaves have short setae, some do not.

3b. **Selaginella mutica** var. **limitanea** var. nov. PLATE I, 3(G).

A varietate typica differt foliis sporophyllisque seta terminali brevi (ad 0.2 mm. longa) fere laevi albescenti-hyalina praeditis, ciliis sparsis brevibus plerumque minus quam 0.1 mm. longis adscendentibus, sporophyllis eroso-fimbriatis.

TYPE: mountains west of Deming, Luna Co., New Mexico, Oct. 4, 1937, *Goodding* (US).

Other specimens seen — TEXAS: Mt. Franklin, El Paso Co., Dec., 1924, *Slater* (US); Ft. Davis, *Ingram 2723* (US; transitional); exposed rock crevices, Little Ajuga Canyon, Davis Mts., alt. 1890 m., *Moore & Steyermark 3046* in part (G); on sometimes wet ledges and cliffs of porphyritic rock, Mt. Livermore, Davis Mts., *E. J. Palmer 31951* (US), *Hinckley 1155* (US) (the last three localities in Jeff Davis Co.). NEW MEXICO: Van Patten's, Organ Mts., Dona Anna Co., Sept. 10, 1899, *Wooton* (US), June 9, 1906, *Standley* (US); Filmore Canyon, April 8, 1903, *Wooton* (US) and three other collections by *Wooton* from the Organ Mountains without more definite locality. ARIZONA: Paradise, Cochise Co., *Ferriss* (G).

This is a well-marked variant, morphologically and geographically, but it is connected by intermediates with var. *texana* and through it with typical *S. mutica*. I borrow from *Notholaena* Dr. Maxon's very appropriate epithet for a population occurring in a narrow strip of territory along the Mexican border.

The similarity in range between this variety and *S. Underwoodii* var. *dolichotricha,* as also between the typical forms of the two species, is apparent. Evidently there is, at least for these species, a phytogeographic break between northern and southern Arizona and northern and southern New Mexico west of the Rio Grande — a break which follows roughly the line of the mountain-mass which extends westward from the Sierra Mimbres, on the watershed between the Rio Grande and the Gila River, to the vicinity of Prescott, Arizona, and beyond at lower altitudes to the Colorado River valley, and which also forms the southern boundary of Fenneman's Colorado Plateau Province. East of the Rio Grande, where the mountain-ranges run north and south, the northern elements of both species run south to the Davis Mountains of Texas.

4. **Selaginella viridissima** Weatherby in Journ. Arnold Arb. 24: 326 (1943). PLATE I, 4.

Stems of moderate length, up to 10 cm. Leaves somewhat thickened and convex above, especially toward apex, 1.6–2 mm. long, 0.3–0.4 mm. wide, with sparse, very short (0.1 mm. or less long), ascending, mostly dentiform cilia, reduced to teeth toward apex. Spikes up to 1 cm. long. Sporophylls ovate-deltoid, 1.8–2 mm. long, 0.8–1 mm. wide, somewhat dilated above base, thence tapering evenly to the acuminate apex, the margins densely erose-serrulate with very short teeth. Seta none. Megaspores yellow, 0.4–0.5 mm. in diameter, subglobose or somewhat flattened on the commissural face. Microspores very regularly alveolate-punctate (at least on outer face), irregularly winged.

TYPE: shaded cliffs in deep canyon, in hanging mats 1 m. in diameter, Cañon de Calabasa, north wall of Sierra Mojada, Coahuila, Mexico, Oct. 27, 1941, *Stewart 2204,* in Gray Herb.

One other collection has been seen: mats on shaded cliffs, Tinajas del Osos, vicinity of Aguaje del Pajarito, west end of Sierra de la Fragua, 2–3 km. north of Porto Colorado, Coahuila, Sept. 1–8, 1941, *Johnston 8683.*

5. **Selaginella extensa** Underw. in Bull. Torr. Bot. Club 25: 131 (1898). PLATE I, 5.

Selaginella rupestris subvar. *viridis* Fourn. Mex. Pl. 1: 146 (1872), at least in part.

Stems elongate, up to 3 dm. long. Leaves appearing somewhat fleshy,

but not thickened at apex, 1.6–2 mm. long, 0.3–0.4 mm. wide, with few and distant, strongly ascending, very short, thick and dentiform cilia. Spikes 1–2 cm. long. Sporophylls narrowly deltoid, 1.8–2 mm. long, 0.5–0.6 mm. wide, long-acuminate, closely serrulate with short, thick, broad-based, pungent teeth; apex as in foliage-leaves. Megaspores densely and finely rugose on both faces, more strongly on the commissural. Microspores about 35 μ in diameter, coarsely and irregularly punctate, with a narrow, somewhat irregular wing, the mother-cell membrane soon shed, but the spores long adhering in tetrads. — Central Mexico.

TYPE: on rocks and trees, Las Canoas, San Luis Potosí, Mexico, Aug. 21, 1891, *Pringle 3900*, in Herb. New York Bot. Gard.; isotypes, G, US, Y.

Other specimens seen — SAN LUIS POTOSÍ: limestone cliffs, Las Canoas, alt. 900–1000 m., *Pennell 17947* (US). HIDALGO: shallow leaf-mold on dry rock, Jacala, alt. 5000 ft., *Hoogstraal & Chase 7308* (US), *Frye 2537* (US). VERA CRUZ: old trees, Sierra Madre, Naolinco, *Purpus 6052* (G, US); région d'Orizaba, Oct., 1865–66, *Bourgeau 2541* (G, Y); Borrego, Orizaba, June 19, 1865–66, *Bourgeau 2541* (G); ad arborum truncos repens in sylvis umbrosis humidis, Cordoba, Sept., 1856, *Mohr 12* (Y).

Selaginella extensa is a very well marked species, set apart from all others of its alliance by its peculiar flattened and spreading leaf-tips and its equally peculiar, equatorially tuberculate megaspores.

6. **Selaginella cinerascens** A. A. Eaton in Fern Bull. 7: 33 (1899); Maxon in Abrams, Ill. Fl. Pacific States, 1: 47. *fig. 102* (1923); Munz, Man. So. Cal. Bot. 13 (1935); Munz & Johnston in Amer. Fern Journ. 13: 3 (1923); Wiggins, op. cit. 22: 92 (1932). PLATE II, 6.

Stems not greatly elongate (at most 15 cm.) and rather closely branched. Leaves oblong-linear, about 2.4 mm. long and 0.4–0.5 mm. wide. Cilia strongly ascending, mostly few and irregularly spaced, very short (0.1 mm. or less long), but not dentiform. Spikes short, about 5 mm. long. Sporophylls broadly deltoid, about 1.8 mm. long by 1.2 mm. wide, broadly acuminate, without a seta, finely and densely ciliolate with very short ciliola. Megaspores pale yellow, lightly rugose on the commissural face. Microspores up to 50 μ in diameter, with delicate radiating striae on the commissural face, finely granular on the outer face, with a broad, entire wing. — Southern California and adjacent Baja California, on clay-banks, forming closely prostrate mats.

TYPE: National City, San Diego, California, *Miss L. F. Kimball*, in Gray Herb.

The following are representative: Mission Hills, San Diego, *Abrams 3399* (G); Ensenada, Baja California, *Johnston 3004* (US), *Wiggins 4213* (G).

The "prominent spinules" mentioned by A. A. Eaton in his description of the microspores I have observed only at the junction of the body of the spore and the wing; I believe they are to be interpreted as wrinkles in the spore-coat outlined by transmitted light rather than as actual spinules such as occur in *S. selaginoides*.

7. **Selaginella porrecta** sp. nov. PLATE II, 7.

Caules plerumque nec valde elongati, graciles foliis inclusis ca. 1 mm. diametro, prostrati, fere ad apicem radicantes, pinnatim alternatimque ramosi, ramulis vix ultra 1 cm. longis. Folia arcte adpressa, subulato-linearia, longe acuminata, pallide viridia, paginis ambobus plana dorso usque ad apicem sulcata, ea ramulorum ca. 2.5 mm. longa 0.4 mm. lata, ea caulis ad 3 mm. longa 0.5 mm. lata, nonnumquam basi fasciculo ciliorum

ornata, marginibus sparse breviterque ciliata, ciliis ca. 10 vel paucioribus adscendentibus versus apicem folii vel rarius ubique ad denticulos reductis, apice seta subhyalina albescente flavescenteve scaberula usque ad 1 mm. longa praedita. Spicae ad apices ramulorum gestae ca. 1 cm. longae. Sporophylla anguste deltoidea, ca. 2.2 mm. longa 0.8 mm. lata, e ⅓ longitudinis supra basim leviter auriculatam ad apicem acuminatum seta subhyalina albescente flavescenteve fere laevi 0.3–0.8 mm. longa ornatum gradatim angustata, marginibus basim versus dense breviterque ciliolatis ciliolis subdentiformibus 0.1 mm. vel minus longis. Megaspori ca. 0.4 mm. diametro subglobosi aurantiaci vel flavi, latere commissurali tenuius latere altero valde crasseque reticulato-rugosi, exannulati, costis commissuralibus prominentibus. Microspori aurantiaci, ca. 40–45 μ diametro, latere commissurali costis exceptis laeves, latere altero irregulariter plus minusve rugosi, ala crassa irregulari valde rugosa ornati. — Northeastern and north-central Mexico.

TYPE from red sandstone slope, alt. 1650–1700 m., "Alamar," Pablillo, southeast of Galeana, Nuevo León, July 2–3, 1934, *Pennell 17198* in U. S. Nat. Herb., sheet no. 1,685,291.

Other specimens seen — NUEVO LEÓN: La Silla Mt. near Monterrey, *Orcutt 1151a, 1142* (US); Topo Chico, near Monterrey, *Orcutt 1098* (US); Monterrey, *Tharp 1792* (US). SAN LUIS POTOSÍ: *Orcutt 5125* (US); thin soil over limestone, alt. 2100 m., Sierra de Alvarez, *Pennell 17753* (US); in montibus circa urbem San Luis Potosí, *Schaffner 933* (Y). TAMAULIPAS: Cerro de los Armadillos, vicinity of San José, alt. 2600 ft., *Bartlett 10355* (US); Cerro Zamora, vicinity of El Milagro, *Bartlett 11039* (US). DURANGO: Sianori, *Ortega 5319* (US).

Much of the material placed here was long ago indicated by Maxon as belonging to a new species but was not given a name. Its status is somewhat doubtful, for the reason that, of all the specimens cited, only the type has mature spores and on their characters the claim of the group to specific rank largely rests. These characters seem pronounced enough; the wing of the microspores, so wrinkled and folded as to suggest a ruffle on an old-fashioned gown, is particularly distinctive. But, should they prove inconstant or in the case of the microspores abnormal (though aside from the peculiarity of the wing, there is no evidence of abnormality), *S. porrecta* might have to be united with *S. Arsenei,* to which, as noted in the introduction, it is very similar in foliar characters, or reduced to a variety of *S. Sartorii.*

8. **Selaginella Arsenei** sp. nov. PLATE II, 8.

Caules prostrati, cum ramis fere ad apicem radicantes, nec valde elongati (ad 15 cm. longi), foliis inclusis vix ultra 1 mm. diametro, pinnatim alternatimque ramosi; rami bene evoluti ad 7 cm. longi ramulis ad 1.5 cm. longis dense foliosis. Folia glaucescentia tenuia paginis ambobus plana dorso usque ad apicem anguste sulcata, subchartacea, arcte vel sublaxe adpressa, oblongo-linearia, 1.8–2.4 mm. longa, 0.35–0.4 mm. lata, in apicem acutum seta albescenti-hyalina scaberula ad 0.5 mm. longa ornatum subbreviter angustata, marginibus subsparse ciliato-serrulata, ciliis brevissimis plerumque dentiformibus. Sporophylla anguste deltoidea fere e basi levissime biauriculata ad apicem acuminatum seta albescenti-hyalina brevi ornatum gradatim angustata, marginibus dense ciliolato-serrulata. Megaspori subglobosi ca. 0.4 mm. diametro dense leviterque reticulato-rugosi, exannulati,

costis commissuralibus brevibus vix prominentibus. Microspori diametro 40–50 μ aurantiaci (luce transeunte flavi), latere commissurali, ut videtur, radiatim, latere altero irregularius rugulosi, ala angusta plana integra.

TYPE: Queretaro, Mexico, 1914, *Arsène 10641,* in U. S. Nat. Herb., sheet no. 1,000,066. Other specimens, same locality and collector: 1850 m. alt., 1911, *no. 9983;* 1914, *no. 10643,* both US.

This also was indicated by Dr. Maxon as a probable new species.

9. **Selaginella Hintonii** sp. nov. PLATE II, 9.

Caules graciles ad 30 cm. longi, foliis inclusis ca. 1 mm. diametro, repentes, cum ramis fere ad apicem radicantes, pinnatim alternatimque ramosi, ramis ad 8 cm. longis, ramulis plerumque simplicibus vix ultra 1 cm. longis dense foliosis. Folia subulato-linearia in caule ca. 2.5 mm. longa 0.4 mm. lata, in ramis ca. 2 mm. longa 0.3 mm. lata, acuta viridia, paginis ambobus plana, dorso usque ad apicem sulcata, arcte adpressa, marginibus dense ciliata ciliis brevibus numerosis (20 vel pluribus) valde adscendentibus albescentibus subhyalinis, apice seta albescente lutescenteve hyalina scaberula 0.6–0.8 mm. longa praedita. Spicae 1 cm. vel minus longae. Sporophylla anguste deltoidea ca. 1.8 mm. longa 0.8 mm. lata, fere e basi leviter biauriculata gradatim ad apicem acuminatum angustata, marginibus dense ciliolato-serrulata ciliis brevissimis subdentiformibus. Megaspori flavi subglobosi ca. 0.4 mm. diametro levissime reticulato-rugosi vel fere laeves, costis commissuralibus inconspicuis, inter amba latera non, vel non manifeste, annulati. Microspori lateribus ambobus plus minusve subalveolato-punctati, ala lata integra. — Known from the type collection only.

TYPE: cliffs, Ypericones, Dist. Temascaltepec, State of Mexico, Sept. 7, 1935, *Hinton 8423,* in Gray Herb.

Closely related to *S. Sartorii,* from which, however, it seems to differ sufficiently by the characters given in the key.

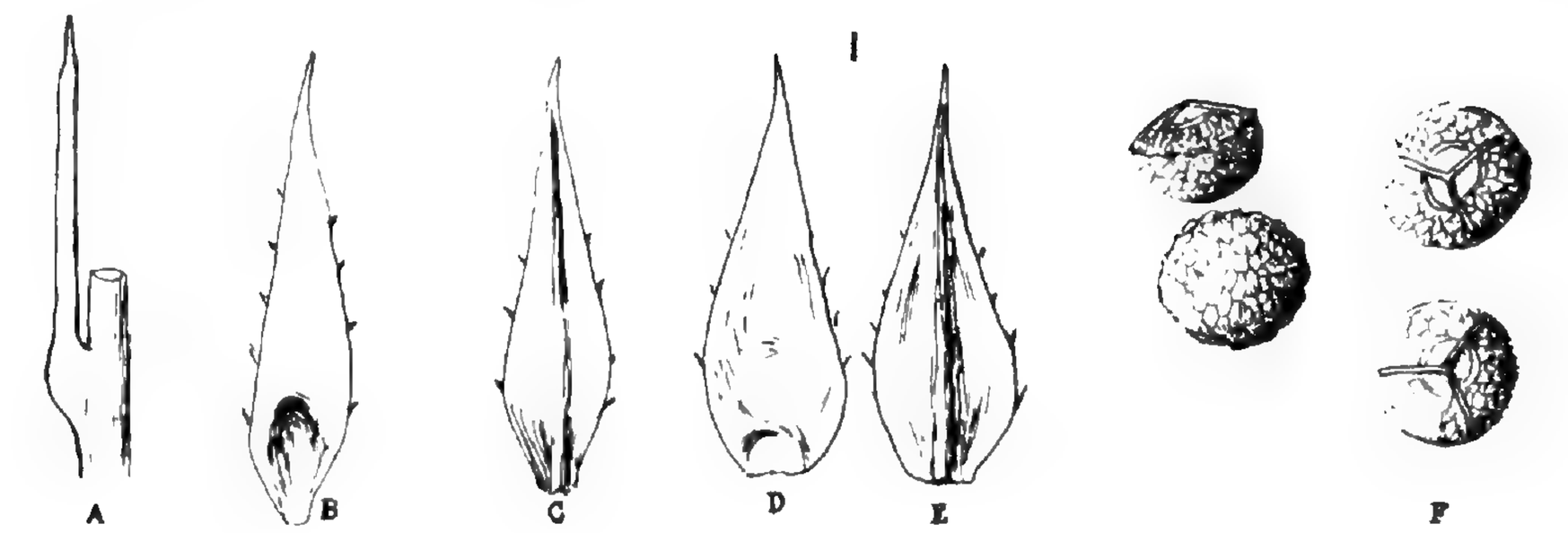
10. **Selaginella Sartorii** Hieron. in Hedwigia 39: 304 (1900). PLATE II, 10.

Stems elongate (in herbarium specimens up to 3 dm. long), lax, the branches mostly distant, forming loose mats. Leaves oblong-linear, acute or acuminate, about 2.2 mm. long on old stems, 1.5 mm. on branches, 0.25–0.3 mm. wide, so far as can be made out from dried specimens gray-green, often turning red. Spikes 1 cm. or less long. Sporophylls ovate-deltoid, 1.5 mm. long, 0.8 mm. wide, evenly acuminate from a point about ⅓ above base, below narrowed to the biauriculate base. Megaspores about 0.3 mm. in diameter, yellow, subglobose, irregularly rugose on the commissural face, rather regularly on the outer, the commissural ridges prominent. Microspores about 40 μ in diameter, minutely punctate or subreticulate on both faces, with a narrow, entire wing. — On rocks, central and southern Mexico.

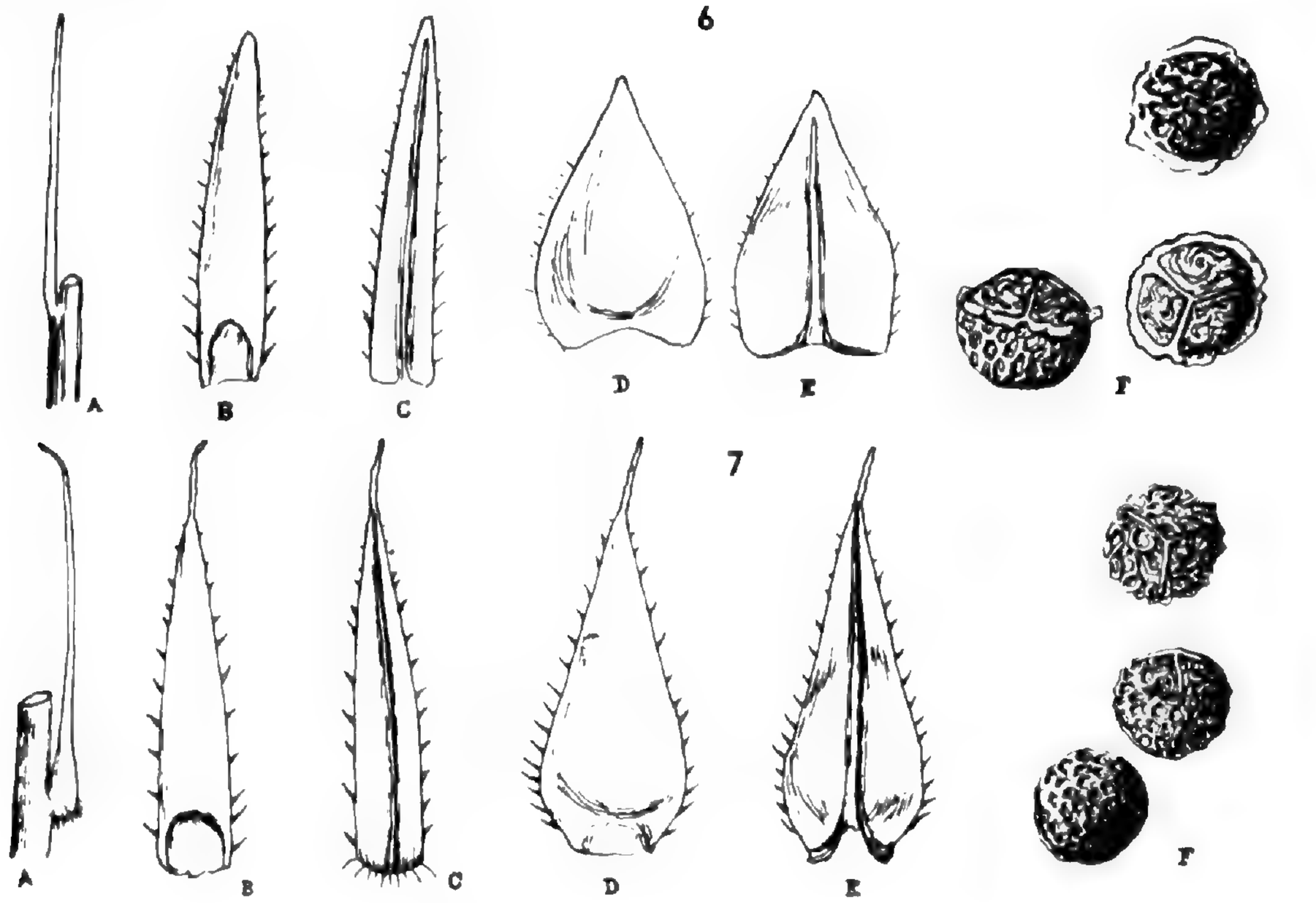
Type not designated; the specimen cited from Mirador, Vera Cruz, Mexico, *Sartorius,* in the Berlin Herbarium (now probably destroyed) should be regarded as TYPE.

Other specimens seen — VERA CRUZ: in rupibus trachyticis prope Mirador, Aug., 1841, *Liebmann* (G); steinige Stellen, oberes Savannen-gebiet, 6–700 m. alt., Palmilla, *Purpus 120* (US), *8463* (G, US). OAXACA: prope Oaxacam, *Andrieux 2* (G).

What *Selaginella Aschenbornii* Hieron. in Hedwigia 39: 305 (1900) may be I do not know; but the description of the leaves as spreading indicates



GROUP OF SELAGINELLA OREGANA



GROUP OF SELAGINELLA OREGANA

that it is none of the species here considered. Similarly, the identity of *S. rupestris* var. *mexicana* Milde, Fil. Eur. 263 (1867), published without citation of specimens, can be determined only by examination of authentic material. Hieronymus seems to have considered it an aggregate, as it very probably was.

Arsène 891 and *10639* from Puebla, *Rose & Painter 6835* from Guadalupe, Valley of Mexico, and *Liebmann 2062* from Mirador, Vera Cruz, very likely represent another species of this group. They were marked as a probable new species by Dr. Maxon. I hesitate, however, to describe it, since all the specimens seen are without strobiles, and, though of distinctive appearance, may be only juvenile individuals.

EXPLANATION OF PLATES

Under each species, A is a foliage-leaf seen, somewhat diagrammatically, in profile; B and C, respectively, are ventral and dorsal surfaces of foliage-leaves; D and E, ventral and dorsal surfaces of sporophylls; F, megaspores, from the commissural face, in profile, and in some cases from the outer face also. The degree of magnification of leaves and sporophylls varies between × 12 and × 15; that of megaspores between × 25 and × 30.

Plate I

Fig. 1. *Selaginella oregana,* from *Eastwood 12185.* Fig. 2. *S. Underwoodii,* from isotype, *Fendler 1024;* G, var. *dolichoptera,* from type. Fig. 3. *S. mutica,* from *Maguire 11371;* G, var. *limitanea,* Cochise Co., Arizona, *Ferriss.* Fig. 4. *S. viridissima,* from type. Fig. 5. *S. extensa,* from *Bourgeau 2451.*

Plate II

Fig. 6. *Selaginella cinerascens,* from type. Fig. 7. *S. porrecta,* from type. Fig. 8. *S. Arsenei,* from type. Fig. 9. *S. Hintonii,* from type. Fig. 10. *S. Sartorii,* from *Purpus 8463.*

Gray Herbarium,
Harvard University.

NOTES ON THE FLORA OF SOUTHERN CHINA[1]

HUI-LIN LI

THE MATERIAL used in preparing these notes is, in part, that assembled through botanical explorations conducted in recent years by representatives of Lingnan University and the Botanical Institute of Sun Yatsen University with the coöperation of the Arnold Arboretum. This paper deals mainly with the flora of Kwangtung Province exclusive of the island of Hainan. Ten species and two varieties from Kwangtung and Kwangsi are herein proposed as new, while a number of previously described species are for the first time credited to one or both of these provinces. Two new species from adjacent parts of southern Kiangsi and southern Fukien are also included. The synonymy of a few other species is adjusted. All types of the new entities herein described are deposited in the herbarium of the Arnold Arboretum.

ROSACEAE

Pyracantha M. Roemer

Pyracantha Fortuneana (Maxim.) comb. nov.

Photinia Fortuneana Maxim. Bull. Acad. Sci. St. Pétersb. **19**: 179. 1873, Mél. Biol. 9: 179. 1873.

Photinia crenato-serrata Hance, Jour. Bot. 18: 261. 1880, syn. nov.

Pyracantha crenato-serrata Rehder, Jour. Arnold Arb. **12**: 72. 1933, cum syn.

A photograph of a duplicate type of *Photinia Fortuneana* Maxim. from Kew (*Fortune A69*, 1845) and fragments of leaves and flowers in the herbarium of the Arnold Arboretum indicate that Maximowicz's species is not only a *Pyracantha* but that it is also the same as the form currently known as *Pyracantha crenato-serrata* (Hance) Rehder. The original descriptions of Maximowicz and of Hance are in full agreement. Among the other synonyms are *Cotoneaster Pyracantha* sensu Pritzel (1900) pro parte, non Spach, *Pyracantha crenulata* sensu C. Schneider (1906) pro parte, non Roemer, *Pyracantha crenulata* var. *yunnanensis* M. Vilmorin (1913), and *Pyracantha yunnanensis* Chittenden (1921). As Maximowicz's name is seven years earlier than that of Hance, a new combination is here effected. The exact locality of Fortune's specimen is not given, but most probably it was from the coastal regions of eastern China. The species is recorded from Shensi, Kansu, Szechuan, Hupeh, Yunnan, Kweichow, and Kwangsi.

Rubus Gressittii Metcalf, Lingnan Sci. Jour. **19**: 25. 1940.

KWANGTUNG: T'sung-hwa District, Sam Kok Shan, Ch'an Woh T'ung Village, *W. T. Tsang 25064*, May 1–25, 1935, a climber 4 ft. high, fairly common in swamps, flowers white, fruit edible; Jen-hwa District, *W. T. Tsang 26403*, May 21–30, 1936, a climber, 3 ft. high, fairly common in thickets, flowers white. Kiangsi. New to Kwangtung.

[1]Prepared with partial support of a grant from the Penrose Fund, American Philosophical Society, to Dr. E. D. Merrill to assist him in working up the accumulated collections of Chinese botanical material in the herbarium of the Arnold Arboretum.

Rubus pinfaensis H. Lév. & Vaniot, Bull. Soc. Agri. Sci. Arts Sarthe 39: 320. 1904, Repert. Nov. Sp. 6: 374. 1909; Focke, Bibl. Bot. 17[Heft 72]: 199. *f. 81.* 1911, et in Sargent, Pl. Wils. 1: 55. 1911; Rehder, Jour. Arnold Arb. 18: 50. 1937.

Rubus erythrolascius Focke, op. cit. 197. *f. 79.* 1911, syn. nov.

This species is of wide distribution in southern China. With a large series of specimens before me, I am convinced that the two supposedly different species are conspecific. The reduction of Focke's species is based on an examination of an isotype (*Henry 10583* of Lunan, Yunnan) in the herbarium of the Arnold Arboretum.

Rubus pinnatisepalus Hemsl. Jour. Linn. Soc. Bot. 29: 305. 1892; Focke, Bibl. Bot. 19[Heft 83]: 29. 1914.

Rubus calycanthus H. Lév. Repert. Sp. Nov. 8: 58. 1910, Fl. Kouy-Tchéou 357. 1915; Focke, Bibl. Bot. 19[Heft 83]: 34. 1914, sub *R. Labbei;* Cardot, Bull. Mus. Hist. Nat. Paris 23: 282. 1917; Hand.-Maz. Symb. Sin. 7: 494. 1913; Rehder, Jour. Arnold Arb. 18: 31. 1937, cum syn., syn. nov.

Rubus laciniatostipulatus Hayata ex Koidzumi, Jour. Coll. Sci. Tokyo 34(2): 154. 1913; Hayata, Ic. Pl. Formos. 3: 91. 1913, syn. nov.

Rubus echinoides Metcalf, Lingnan Sci. Jour. 19: 24. 1940, syn. nov.

An examination of type or authentic material representing all the above species indicates that they represent a single one for which Hemsley's name is the earliest. The species extends from Szechuan through southern China to Formosa. In addition to the type material of Léveillé's species cited by Rehder, who combines *Rubus calycanthus* var. *Buergerifolia* H. Lév., *R. Labbei* H. Lév. & Vaniot, and *R. Darrissi* H. Lév., all from Kweichow, *R. pinnatisepalus* Hemsl. from Szechuan (holotype, *Faber 505*) is represented by a photograph and fragments of flowers, *R. laciniatostipulatus* Hayata is represented by a topotype (*G. Shimada 116*) from Samkakuyu, Formosa, and *R. echinoides* Metcalf is represented by the holotype (*R. C. Ching 6679*) from Kwangsi in the herbarium of the Arnold Arboretum. Among the recent collections, *S. W. Teng 90780* and *90954*, from Kweichow, and *S. P. Ko 55665* from Kwangsi belong to this species.

Rubus kwangtungensis sp. nov. Subgenus *Idaeobatus,* § *Rosaefolii.*

Planta 0.6 m. alta, caulibus aculeatis glabris vel sparse setosis, setis glanduloso-stipitatis, aculeis minutis vix 1 mm. longis; foliis pinnatis, cum petiolis ad 30 cm. longis, petiolis rhachibusque glabris raro 1–2-aculeatis; petiolis circiter 7.5 cm. longis; stipulis linearibus, 3–4 mm. longis, petiolorum basi insertis; foliolis 7–9, sessilibus vel breviter (1–2 mm.) petiolulatis, membranaceis, lanceolatis, 9–10 cm. longis, 2–2.3 cm. latis, longe caudato-acuminatis, basi late acutis vel subrotundatis, margine simpliciter serrulatis, supra sparse minuteque setosis, subtus subscariosis, minute glanduloso-squamosis, venis lateralibus utrinsecus 12–15, arcuato-adscendentibus, venulis obscuris; floribus solitariis axillaribus, circiter 3 cm. diametro; pedicellis 3–4 cm. longis, glanduloso-setosis; calycis tubo 2–3 mm. longo, extus glabro vel sparse glanduloso-setoso, lobis ovato-lanceolatis, 1.5–1.8 cm. longis, 0.4–0.5 cm. latis, longe caudato-acuminatis, utrinque ad marginem puberulis; petalis albidis subcoriaceis obovatis, circiter 1.8 cm. longis et 1 cm. latis; staminibus numerosis; carpellis numerosis, in capitulo elongato-ovato dispositis; fructibus subglobosis, circiter 1 cm. diametro, drupulis parvis numerosis.

KWANGTUNG: T'sung-hwa District, Sam Kok Shan, Ch'an Woh T'ung Village, *W. T. Tsang 25180* (TYPE), May 1–25, 1935, 2 ft. high, fairly common in swamp, flowers white, fruit yellow.

This species is allied to *Rubus rosaefolius* J. E. Smith, differing in the long-lanceolate and simple-serrulate leaflets and the larger flowers.

THEACEAE

Hartia Dunn

Hartia nitida sp. nov.

Frutex circiter 3 m. altus, ramulis teretibus, junioribus leviter villosis; foliis glabris, coriaceis, oblongo-lanceolatis, 10–13.5 cm. longis, 3.5–5 cm. latis, acuminatis, basi rotundatis, margine remote serrulatis, in sicco olivaceis, utrinque subconcoloribus, supra nitidis, nervis lateralibus utrinsecus 10–14, gracilibus, cum venulis supra subimpressis, subtus subelevatis; petiolo 1.5–1.8 cm. longo, 3 mm. lato, leviter villoso vel subglabro; floribus ignotis; capsulis ovoideis, acuminatis, circiter 1 cm. diametro, 5-valvis; sepalis persistentibus orbicularibus, 5 mm. diametro, rotundatis, extus leviter pubescentibus vel glabris, margine ciliatis; pedicellis 4–6 mm. longis.

KWANGTUNG: Ta-pu District, Tai Mo Shan, *W. T. Tsang 21252* (TYPE), July 21, 1932, a shrub 10 ft. high, abundant on dry steep slopes.

In the small fruits, this species is near *Hartia micrantha* Chun, but it can be distinguished by its relatively long leaves, which are shining above.

Adinandra Jack

Adinandra jubata sp. nov.

Frutex circiter 2.3 m. altus, ramulis novellis dense villosis, indumento ad 6 mm. longo, luteo-brunneo, iridescente; foliis subcoriaceis, lanceolatis, 12–15 cm. longis, 3–4.2 cm. latis, acuminatis, basi late acutis, margine integris, supra glabris, subtus dense villosis, indumento ad 6 mm. longo, luteo-brunneo, iridescente, costa supra impressa, subtus elevata, nervis lateralibus circiter 20, supra subconspicuis vel inconspicuis, subtus in tomento fere occultato, venis tertiariis inconspicuis; petiolo 3–5 mm. longo, villoso; floribus ignotis; fructibus solitariis axillaribus ovoideis, circiter 10 mm. longis et 8 mm. latis, dense longe villosis, stylo persistente, 6–7 mm. longo, inferne villoso, superne glabro, stigmate inconspicuo; sepalis persistentibus ovatis, circiter 10 mm. longis, 6–7 mm. latis, extus dense villosis, intus glabris; pedicellis 6–7 mm. longis, villosis.

KWANGTUNG: Hwei-yang District, Lin Fa Shan, Shek Shing Village, *W. T. Tsang 25601* (TYPE), Aug. 25 or 26, 1935, a shrub 7 ft. high, fairly common, fruits black, edible.

An elegant species with the young branches, lower surfaces of the leaves, and the fruits covered by dense villose iridescent brownish hairs. It is apparently near *Adinandra glischroloma* Hand.-Maz., differing chiefly in the longer and relatively narrower leaves and the much denser and longer hairs. On the lower surfaces of the leaves, the pubescence completely obliterates the venation.

Adinandra nitida Merrill in herb. sp. nov.

Frutex 4 m. altus, omnino glaber, ramulis novellis teretibus purpureo-brunneis; foliis subcoriaceis, ovato-oblongis, 10–12.5 cm. longis, 2.5–5 cm.

latis, acuminatis, basi acutis, margine leviter serrulatis, in sicco supra nitidis, atro-olivaceis, subtus pallidioribus, costa supra leviter elevata, subtus distincte elevata, nervis lateralibus utrinsecus 12–16, utrinque subconspicuis, venis tertiariis inconspicuis; petiolo 1–1.5 cm. longo, supra canaliculato; floribus solitariis axillaribus, 2-bracteatis, bracteis ovatis acutis subcoriaceis, 6–7 mm. longis, 4–5 mm. latis, pedicellis 1.2–1.5 cm. longis; sepalis ovatis acutis, 11–14 mm. longis, 7–8 mm. latis, margine integris; petalis ovatis, 16 mm. longis, 8–10 mm. latis; staminibus circiter 10 mm. longis, filamentis glabris, antheris ciliatis, acuminatis; ovario ovoideo, glabro, 5 mm. longo, stylo glabro, 1–1.4 cm. longo, stigmate 3-fido; fructibus ovoideis, 8 mm. longis, acuminatis, rostratis, sepalis persistentibus.

KWANGTUNG: Hwei-yang District, Lin Fa Shan, Lin Fung Monastery, *W. T. Tsang 25656,* Aug. 11–31, 1935, a shrub 20 ft. high, fairly common in thickets, fruit black, edible. KWANGSI: Shang-sze District, Shih Wan Tai Shan, near Iu Shan Village, *W. T. Tsang 22322* (TYPE), May 18, 1933, a shrub 12 ft. high, abundant in thickets, flowers white, fragrant; same locality, near Hoh Lung Village, *W. T. Tsang 22571,* June 26, 1933, a shrub 10 ft. high, abundant in thickets, fruits black; same locality, near Tang Lung Village, *W. T. Tsang 24431,* Oct. 1–16, 1934, a shrub 7 ft. high, abundant, fruits yellow, edible; Yao Shan, Tseung-yuen, *C. Wang 39413,* June 18, 1936, a small tree along stream, flowers white.

A species allied to *Adinandra acutifolia* Hand.-Maz., differing in the much larger flowers with glabrous petals and ovaries.

THYMELAEACEAE

Wikstroemia Endlicher

Wikstroemia pilosa Cheng, Contr. Biol. Lab. Sci. Soc. China 8: 140. *f. 6.* 1932; Chun, Sunyatsenia 1: 276. 1934.

Wikstroemia sericea Domke, Notizbl. Bot. Gart. Berlin 11: 356. 1932; Chun, Sunyatsenia 4: 182. 1940; non Christoph. 1931.

Wikstroemia kulingense Domke, Notizbl. Bot. Gart. Berlin 13: 388. 1936.

Kwangtung, Chekiang, Kiangsi.

Chun (l.c.) adopted *W. sericea* Domke in 1940 instead of *W. pilosa* Cheng, as the former name was nine months earlier, but he overlooked the fact that Domke's specific name was invalidated by Christophersen's species of 1931 from the Cook Islands. Cheng's name is thus the one that should be accepted for the Chinese species, as it in turn is older than *W. kulingense* Domke, 1936.

CORNACEAE

Cornus Linnaeus

Cornus ferruginea Wu, Bot. Jahrb. 71: 199. 1940.

KWANGTUNG: Hwei-yang District, Lin Fa Shan, Lin Fung Monastery, *W. T. Tsang 25632,* Aug. 11–31, 1935. Originally described from Yao Shan, Kwangsi; new to Kwangtung.

This species falls into the subgenus *Benthamia* Lindl., a group containing species with capitate flowers, for which Hutchinson, Ann. Bot. 6(21): 92. 1942, proposed the generic name *Dendrobenthamia*. He overlooked Wu's species, however.

STYRACACEAE

Styrax Linnaeus

Styrax subcrenata Hand.-Maz. Oesterr. Bot. Zeitschr. 80: 342. 1931.

KWANGSI: Pin-lan, *S. P. Ko 55648,* Aug. 27, 1935, a small tree in woods on slopes; Chuen Yuen, *Z. S. Chung 81981,* June 15, 1937, *82058,* June 19, 1937, a tree in woods along streams. KWANGTUNG: Sin-fung District, Ah Po Kai Shan, Ch'a P'ing Village, *Y. W. Taam 721,* May 1–24, 1938, a small tree 20 ft. high, abundant in thickets. Originally described from Hainan; new to Kwangtung proper and Kwangsi. The leaves of the specimens above cited are in general more distinctly crenate than in the Hainan plants.

SYMPLOCACEAE

Symplocos Jacquin

Symplocos Ernesti Dunn, Jour. Linn. Soc. Bot. 39: 499. 1911; Hand.-Maz. Symb. Sin. 7: 806. 1936; Rehder, Jour. Arnold Arb. 18: 233. 1937.

Symplocos Wilsoni Brand, Repert. Nov. Sp. 3: 216. 1906, non Hemsley.

Symplocos coronigera H. Lév. Repert. Sp. Nov. 10: 431. 1912; Rehder, Jour. Arnold Arb. 18: 233. 1937.

KWANGTUNG: Hop-Po District, *H. Y. Liang 69360,* June 5, 1937, a small tree 5 m. high, in light woods. KWANGSI: Shang-sze District, Shih Wan Tai Shan, Tang Lung Village, *W. T. Tsang 24325,* Sept. 22, 1934, a shrub 5 ft. high, fairly common, flowers white, fragrant. Hupeh, Szechuan, Yunnan, Hunan, Kweichow. New to Kwangtung and Kwangsi.

Symplocos lancilimba Merr. Philip. Jour. Sci. Bot. 23: 259. 1923.

KWANGTUNG: Jen-hwa District, Man Chi Shan, Shek Pik Ha Village, *W. T. Tsang 26351,* May 11–20, 1936, a shrub 5 ft. high, fairly common in thickets in sandy soil; Sin-fung District, Ngok Shing Shan, Sai Lin Shan Village, *Y. W. Taam 410,* March 23–31, 1938, a shrub 8 ft. high, abundant in thickets. Hainan; new to Kwangtung proper.

Symplocos kwangtungensis sp. nov. Subgen. *Hopea,* § *Bobua, Lodhra.*

Arbor parva 6 m. alta, ramulis novellis gracilibus teretibus minute pubescentibus; foliis membranaceis breviter petiolatis oblongo-ovatis, 8–11 cm. longis, 3–3.5 cm. latis, acuminatis, basi late cuneatis vel rotundatis, supra subnitidis glabris costa leviter pubescente excepta, costa nervisque supra impressis, subtus elevatis, nervis lateralibus utrinsecus 5 vel 6 valde arcuato-adscendentibus anastomosantibus, venis tertiariis reticulatis, utrinque subconspicuis; petiolis 2–3 mm. longis, fulvo-pilosis; floribus ignotis; infructescentiis fasciculatis axillaribus sessilibus 5–7-fructigeris, bracteis persistentibus late ovatis, 2 mm. longis, extus minute pubescentibus, fructibus globosis, 6 mm. diametro, 1-locularibus, glabris, lobis calycinis persistentibus oblongis obtusis, 2 mm. longis.

KWANGTUNG: Na Leung River, Shih Wan Tai Shan, *H. Y. Liang 69487* (TYPE), July 8, 1937, a tree 6 m. high, in forests along streams.

This species is close to *Symplocos glandulifera* Brand and *S. yunnanensis* Brand, differing from both in the shorter leaves and the spherical fruits.

Symplocos cordatifolia sp. nov. Subgen. *Hopea,* § *Bobua, Lodhra.*

Frutex circiter 2 m. altus, ramis nigris parce pilosis, ramulis teretibus gracilibus dense brunneo-pilosis; foliis membranaceis vel subchartaceis breviter petiolatis oblongo-ovatis, 5–7 cm. longis, 2–2.5 cm. latis, longe

acuminatis, basi valde cordatis, margine serratis, supra viridibus haud nitidis glabris, subtus pallide viridibus pilosis, nervis lateralibus utrinsecus 5 vel 6 utrinque perspicuis arcuato-anastomosantibus, venis tertiaris reticulatis utrinque distinctis; petiolis 2 mm. longis, dense pilosis; inflorescentiis axillaribus, in ramulis hornotinis orientibus, fasciculatis, fasciculis 3-floris breviter pedunculatis, pedunculis circiter 2 mm. longis, pubescentibus; floribus sessilibus, bracteis late ovatis glabris, 1 mm. longis; calycis tubo crasso, circiter 1 mm. longo, lobis 3 late ovatis glabris, 1 mm. longis; petalis 5 albis oblongis, 3.5 mm. longis, glabris; staminibus circiter 15, filamentis liberis glabris, circiter 4 mm. longis; disco inconspicuo; stylo 5 mm. longo.

KWANGTUNG: Hwei-yang District, Lin Fa Shan, Sam Hang Shek T'an Village, *W. T. Tsang 26027* (TYPE), Oct. 1–19, 1935, a shrub 7 ft. high, fairly common in thickets, flowers white, fragrant.

A distinct species, characterized by its distinctly cordate, somewhat membranaceous leaves, which are pilose beneath, and by the few-flowered, short, fascicled inflorescences and the three sepals.

Symplocos spathulata sp. nov. Subgen. *Hopea*, § *Bobua, Lodhra*.

Arbor parva 4 m. alta, ramulis atro-brunneis glabris; foliis subcoriaceis breviter petiolatis oblongo-obovatis, 6–10 cm. longis, 3–4.5 cm. latis, obtusis vel rotundatis, basi attenuatis, margine integris raro ad apicem pauce denticulatis, utrinque glabris, supra atro-viridibus, subtus pallide viridibus, costa supra impressa, subtus valde elevata, nervis lateralibus utrinsecus circiter 10 utrinque perspicuis prope marginem graciliter anastomosantibus, venis tertiariis reticulatis, utrinque subconspicuis; petiolis crassis glabris, circiter 5 mm. longis; floribus ignotis; infructescentiis axillaribus sessilibus vel breviter pedunculatis, pedunculis ad 8 mm. longis, pubescentibus, bracteis late ovatis, 3 mm. longis, pubescentibus, fructibus singularibus vel pauce fasciculatis sessilibus oblongis, 8 mm. longis, 3 mm. crassis, 1-locularibus, indistincte longitudinaliter striatis, lobis calycinis persistentibus late ovatis, 2.5 mm. longis, glabris.

KWANGTUNG: Hop-Po District, *H. Y. Liang 69359* (TYPE), June 5, 1937, a small tree 4 m. high, in light woods; east of Tung Hing City, *H. Y. Liang 69448*, July 7, 1937, a small tree 4 m. high, in forests.

In the glabrous branches, impressed midrib, and the fascicled, elongated, and slightly grooved fruits, this species is close to *Symplocos congesta* Benth. It can be readily distinguished from the latter in the obovate, almost spatulate, usually round-tipped leaves, and the shorter and smaller fruits, single or sometimes clustered on a short, pubescent peduncle.

VERBENACEAE

Callicarpa Linnaeus

Callicarpa integerrima Champ. var. **serrulata** var. nov.

A typo speciei differt foliis serrulatis.

KWANGTUNG: T'sung-hwa District, Sam Kok Shan, Ch'an Woh T'ung Village, *W. T. Tsang 25228* (TYPE), May 1–25, 1935.

Callicarpa rubella Lindl. var. **Dielsii** (H. Lév.) comb. nov.

Viburnum Dielsii H. Lév. Repert. Sp. Nov. 9: 443. 1911, Fl. Kouy-Tchéou 66. 1914.

Callicarpa Dielsii P'ei, Mem. Sci. Soc. China 1(3): 37. 1932; Rehder, Jour. Arnold Arb. 15: 323. 1934.

Callicarpa rubella Lindl. var. *Hemsleyana* Diels f. *subglabra* P'ei, Mem. Sci. Soc. China 1(3): 41. 1932.

CHEKIANG: Siachu, *R. C. Ching 1760* (isotype of *C. rubella* var. *Hemsleyana* f. *subglabra*), June 3, 1924; no precise locality, *S. Chen 414,* July 2, 1932, *793, 795,* Sept. 21, 1932. KWEICHOW: Pin-fa, *J. Cavalerie 385* (HOLOTYPE of *Viburnum Dielsii* H. Lév., photo. and merotype in AA), Sept. 4, 1902; Hsufeng, She-loong-san, *S. W. Teng 90440B,* Jan. 20, 1936. KWANGSI: Ch'uan District, Pai-yun-an, *W. T. Tsang 27598,* June 3, 1937; Ling-chuan District, Ta-ling, Yang-wu Village, *W. T. Tsang 27922,* July 21–30, 1937; Yao Shan, Tseung-yuen, *C. Wang 39374,* June 16, 1936; Ping Nan District, *C. Wang 40371,* Nov. 1, 1936. KWANGTUNG: Mei District, Yam Na Shan, *W. T. Tsang 21319,* Aug. 4–31, 1932.

A glabrescent variety of the widely distributed species.

Clerodendron Linnaeus

Clerodendron kwangtungense Hand.-Maz. var. **puberulum** var. nov.

A typo speciei differt foliis utrinque parce puberulis, inflorescentiis dense puberulis.

KWANGTUNG: Yang-shan District, Yang Shan, *T. M. Tsui 785* (TYPE), July-Sept., 1932, a shrub 9 ft. high, fruit bluish.

Clerodendron elachistanthum Merrill in herb. sp. nov.

Frutex circiter 1 m. altus, ramulis brunneis glabris; foliis chartaceis longe petiolatis ovato-cordatis vel ovatis, 12–15 cm. longis, 7.5–10 cm. latis, acuminatis, basi late truncatis vel subcordatis, 5-nerviis, margine integris, supra glabris, subtus minute puberulis, nervis lateralibus (basalibus inclusis) utrinque 4–6, prominulis, rete venularum utrinque prominulo; petiolis 4–6 cm. longis glabrescentibus; inflorescentiis paniculatis terminalibus minute puberulis, circiter 28 cm. longis pedunculis 3 cm. longis inclusis, ramulis primariis oppositis, utrinque 10, inferioribus ad 13 cm. longis, dichotome ramulosis, bracteis linearibus ad 5 mm. longis; floribus minutis, circiter 4 mm. longis, pedicellis 1 mm. longis, bracteolis ad 1 mm. longis; calycibus campanulatis, 2 mm. longis, puberulis, 5-dentatis; corollae tubo 3–4 mm. longo, extus puberulo, 5-lobato, lobis 1–2 mm. longis; staminibus 4, leviter exsertis; stylis 4–5 mm. longis, stigmate 2-lobato, lobis acutis.

KWANGSI: Ch'uan District, Pai-yun-an and vicinity, *W. T. Tsang 27743* (TYPE), June 26, 1937, a shrub 20 ft. high, fairly common in thickets on steep slopes, flowers white, fragrant. KWANGTUNG: Sin-fung District, Hau T'ong Shan, Fuk Lung Monastery, *Y. W. Taam 824,* June 1–19, 1938, a shrub 10 ft. high, fairly common in thickets, flowers light yellow.

This species is apparently near *Clerodendron cyrtophyllum* Turcz., but it is readily distinguished by the much broader leaves, the more elongated panicles, and the very small flowers.

Clerodendron kiangsiense Merrill in herb. sp. nov.

Frutex circiter 2.5 m. altus, ramulis dense brunneo-puberulis, haud lenticellatis; foliis chartaceis longe petiolatis ovato-oblongis, 9.5–12 cm. longis, 5.5–7 cm. latis, acuminatis, basi subtruncatis, margine integris, utrinque parce puberulis, venis lateralibus utrinsecus 4–6, supra subconspicuis, subtus elevatis, rete venularum supra inconspicuo, subtus prominulo; petiolis 2–4.5 cm. longis, puberulis; inflorescentiis cymoso-paniculatis, ad 10 cm. longis, pedunculis 5.5–6 cm. longis, puberulis, bracteis foliaceis oblongis acuminatis, 8–9 mm. longis, 3–4 mm. latis, puberulis, consperse glandulosis;

floribus plus minusve confertis, pedicellis 1–2 mm. longis, bracteolis linearibus, 2–3 mm. longis; calycibus campanulatis, 5–6 mm. longis, puberulis, consperse inconspicue glandulosis, 5-dentatis; corollae tubo 1.2–1.5 cm. longo, haud 1 mm. lato, gracile, superne consperse puberulo, inferne glabro, lobis plerumque oblongis, 5–7 mm. longis, 1.5–3 mm. latis, extus plus minusve puberulis; staminibus circiter 1 cm. exsertis; stylis 1 cm. exsertis, stigmate 2-lobato, lobis acutis.

KIANGSI: Southern Kiangsi, between Kit-than and Sungwu, *J. L. Gressitt 1554* (TYPE), July 1, 1936, a shrub 2.5 m. high, alt. 400 m., flowers white.

This species is near *Clerodendron kwangtungense* Hand.-Maz., differing in the more compactly arranged flowers, in the puberulent and glandular calyces and bracts, and in the absence of lenticels. *Chung 2021* of Pangyung, Chekiang, referred by P'ei (Mem. Sci. Soc. China 1(3): 152. 1932) to *Clerondendron kwangtungense* Hand.-Maz., undoubtedly represents the same species.

RUBIACEAE

Ophiorrhiza Linnaeus

Ophiorrhiza lignosa Merr. Brittonia 4: 176. 1941.

KWANGTUNG: Shih Wan Tai Shan, *H. Y. Liang 69981,* Aug. 5, 1937. KWANGSI: Nan Tanyuan, *C. Wang 40946,* July 3, 1937. Originally described from Upper Burma. New to China.

Dunnia Tutcher

Dunnia sinensis Tutcher, Jour. Linn. Soc. Bot. 37: 69. 1905, Repert. Nov. Sp. 2: 111. 1906; Chun, Sunyatsenia 4: 260. *f. 45. t. 43.* 1940.

KWANGTUNG: Lung-men District, Nan Kwan Shan, Sheung P'ing Village, *W. T. Tsang 25277,* May 29–31, 1935, *25345,* June 1–19, 1935, a shrub 1½–3 ft. high, fairly common in swampy thickets, flowers yellow.

This species has been previously collected only twice, and, including the type collection, only the fruits have been known. The two numbers cited above represent the first flowering specimens collected.

Inflorescences terminal, cymose, about 9–10 cm. long, finely pubescent, the peduncles 6–6.5 cm. long, shortly 4-branched, the pedicels 2–3 mm. long; calyx-tube 1.5 mm. long, minutely 4- or 5-denticulate; petaloid calyx-lobes about 4 in each inflorescence, ovate, about 4.5 × 1.5 cm., acute at both ends, glabrous, 3-nerved, with a stipe about 1 cm. long; corolla-tube campanulate, about 1.2 cm. long and 2 mm. broad, the upper end enlarged, puberulous without, villose within, the lobes 4 or 5, broadly triangular-ovate, about 2 mm. long and 1.5 mm. broad, acuminate; stamens inserted on the upper half of the tube, the anthers 1.5 mm. long, linear-oblong, the filaments about 1 mm. long; styles about 5–6 mm. long, the stigmas 2-fid.

Mussaenda Linnaeus

Mussaenda kwangtungensis sp. nov.

Frutex scandens 1–2.5 m. altus, ramis brunneis, ramulis teretibus brunneis adpresse cinereo-pubescentibus; foliis petiolatis tenuiter chartaceis lanceolato-ellipticis, 7–9 cm. longis, 2–3 cm. latis, longe acuminatis, basi attenuatis, margine integris, utrinque parce pubescentibus vel glabrescentibus, nervis lateralibus utrinsecus 4–6 arcuato-adscendentibus, utrinque con-

spicuis, venis tertiariis utrinque obscuris; petiolis circiter 5 mm. longis, pubescentibus; stipulis linearibus, 1.5–2 mm. longis, dense pubescentibus, caducis; inflorescentiis terminalibus cymosis paucifloris vix ramosis compactis, pedunculis circiter 5 mm. longis, adpresse pubescentibus; floribus subsessilibus; calycis tubo oblongo, 3 mm. longo, pubescente, lobis normalis 5 linearibus, circiter 2.5 mm. longis, dense pubescentibus, lobis petaloideis in unusquisque inflorescentia 2–4 oblongo-ovatis, 3.5–5 cm. longis, 1.5–2.5 cm. latis, apice acutis, basi cuneatis, 5-nerviis, longe stipitatis, stipite 1.5 cm. longo; corollae tubo circiter 4 cm. longo, 1 mm. lato, superne vix ampliato, extus adpresse pubescente, intus superne dense villoso, lobis ovatis acuminatis, 5 mm. longis; staminibus inclusis, antheris 5 mm. longis, stylis brevissimis bilobatis, 3 mm. longis, glabris.

KWANGTUNG: Lung-men District, Nan Kwan Shan, Sheung P'ing Village, *W. T. Tsang 25263*, May 29–31, 1935, a climber 3 ft. high, fairly common in thickets, flowers yellow; Sin-fung District, Hau T'ong Shan, Fuk Lung Monastery, *Y. W. Taam 891* (TYPE), June 1–19, 1938, a semi-woody climber 7 ft. high, fairly common in swamps, flowers yellow.

A species near *Mussaenda divaricata* Hutchinson, but readily distinguished by its smaller, narrower leaves with fewer nerves, and the more slender, much longer corolla-tubes.

Tarenna Gaertner

Tarenna mollissima (Hook. & Arn.) B. L. Robinson, Proc. Am. Acad. **45**: 405. 1910; Merr. Philip. Jour. Sci. Bot. **13**: 160. 1918; Metcalf, Jour. Arnold Arb. **13**: 29. 1932; Rehder, Jour. Arnold Arb. **16**: 320. 1935.

Cupia mollissima Hook. & Arn. Bot. Beechey Voy. 192. 1833.

Mussaenda kuliangensis Metcalf, Lingnan Sci. Jour. **11**: 527. 1932, syn. nov.

Metcalf, in 1932, reduced *Tarenna incana* Diels and *T. vestita* Diels to the synonymy of *T. mollissima*. In the same year, however, he described a specimen from Fukien as *Mussaenda kuliangensis*, which seems clearly to belong with *Tarenna mollissima*. Fukien specimens in the herbarium of the Arnold Arboretum are: *Chung 2316, 2236, 3731, 3793, 6605, 6687, 8086, Uong Sing Po 12091, Gressitt 1692, J. B. Norton 1474*. The last named specimen is the type of *Mussaenda kuliangensis*.

Randia Linnaeus

Randia Henryi Pritzel, Bot. Jahrb. **29**: 581. 1901.

KWANGTUNG: Ho-yuen District, Kwai Shan, Tsing-lo-kong Village, *W. T. Tsang 28692*, April 1 or 2, 1938, a shrub 10 ft. high, fairly common in thickets, flowers whitish yellow, fragrant. KWANGSI: Yao Shan, Ping Nan, *C. Wang 39072*, April 15, 1936, *39125*, May 8, 1936, *39330*, a shrub or small tree, in dense forests, flowers yellowish white; Yao Shan, Tseung-yuen, *C. Wang 39383*, June 16, 1936, a tree 10 m. high, in mixed woods; Hing-on District, Wah Kong, *Z. S. Chung 83663*, Aug. 29, 1937, a tree in woods, fruit young, deep green. Yunnan, Szechuan, Kweichow. New to Kwangsi and Kwangtung.

Gardenia Ellis

Gardenia stenophylla Merr. Philip. Jour. Sci. Bot. **19**: 678. 1922.

KWANGTUNG: Shih Wan Tai Shan, *H. Y. Liang 69634*, July 14, 1937, *69969*, Aug. 3, 1937, a shrub 2–3 m. high, in woods along streams, flowers white. KWANGSI: Shang-sze District, Shih Wan Tai Shan, *W. T. Tsang 24115*, Aug. 26, 1934, *23806*, July 11–30,

1934, a woody plant, abundant in swampy thickets, fruit yellow. Hainan. New to continental China.

Geophila D. Don, nomen genericum conservandum propositum

The genus *Geophila* D. Don, Prodr. Fl. Nepal. 136. 1825, consisting of about forty species, is widely distributed in the tropics of both hemispheres. Don's name is antedated by *Geophila* Bergeret, Fl. Bass.-Pyrén. 2: 184. 1803, which is a synonym of *Merendera* Ram. (1798) of the Liliaceae. Under the homonym rule now in effect, *Geophila* D. Don is thus invalidated by *Geophila* Bergeret. Inasmuch as Don's name is well known and about forty species are already ascribed to it, it is proposed that the name *Geophila* D. Don (1825), non Bergeret (1803), be included in the list of *nomina generica conservanda.*

Geophila exigua sp. nov.

Herba 8–10 cm. longa, caulibus prostratis, pubescentibus, nodis radicantibus, internodiis ad 2 cm. longis; foliis oppositis, petiolatis, ovato-orbicularibus, ad 1.5 cm. longis et 1.4 cm. latis, acutis vel subrotundatis, basi truncatis, utrinque sparse setosis, venis lateralibus 3 vel 4, supra inconspicuis, subtus elevatis, venulis obscuris; petiolo 6–12 mm. longo; floribus terminalibus solitariis, pedicellis 4–5 mm. longis, bracteis 1 vel 2, linearibus, 3–6 mm. longis; calycis tubo brevi, 1–1.5 mm. longo, 5-lobato, lobis lanceolatis acuminatis, 2.5 mm. longis; corollae tubo 10–16 mm. longo, 1.5 mm. lato, inferne subglabro, superne villoso, lobis 5, valvatis, oblongo-ovatis, circiter 6.5 × 3.5 mm., margine ciliatis; staminibus 5, inclusis vel exsertis, antheris lineari-oblongis, 1.5–2 mm. longis, filamentis 10–15 mm. longis; ovario 2-locellato, stylis inclusis vel exsertis, 15–20 mm. longis, stigmate 2-lobato, lobis late ovatis.

KWANGTUNG: Tseng-shing District, Nan Kwan Shan, *W. T. Tsang 20330,* April 25, 1932, in shady places, flowers white; Jen-hwa District, Man Chi Shan, Shak Pik Ha Village, *W. T. Tsang 26112* (TYPE), April 1–10, 1936, 4 in. high, fairly common in thickets on steep slopes, flowers white, fragrant.

A species bearing perfect but dimorphic flowers with either exserted stamens and short included styles or included stamens and long exserted styles. It can be distinguished from *Geophila herbacea* (L.) K. Schum. by the much smaller leaves and the much larger flowers.

Paederia Linnaeus

Paederia laxiflora Merrill in herb. sp. nov.

Herbacea vel suffruticosa scandens, circiter 2 m. alta, floribus exceptis glabra vel subglabra, caulibus laevibus glabris 3 mm. diametro, ramulis ultimis teretibus glabris 1 mm. diametro; foliis oppositis lanceolatis, chartaceis vel submembranaceis, plerumque 15–19 cm. longis, 1.5–3 cm. latis, graciliter acuminatis, basi subtruncato-rotundatis, in ramulis junioribus minoribus et basi acutis, utrinque glabris, supra subviridibus, subtus pallidioribus subglaucescentibus, nervis primariis utrinsecus 6, gracilibus distinctis adscendentibus; petiolo 1.5–2 cm. longo, glabro; inflorescentiis axillaribus terminalibusque longe (3–7 cm.) pedunculatis laxe paniculatis glabris vel ramulis ultimis parce pubescentibus laxis; floribus candido-purpureis sessilibus vel breviter pedicellatis; calycibus glabris, 1 mm. longis, in sicco

nigris, dentibus brevissimis; corollae tubo 6–7 mm. longo, extus dense breviter pubescente.

FUKIEN: Lung Chou San, south of Shanghang, *J. L. Gressitt 1663* (TYPE), July 21, 1936, in bamboo forests, alt. 750 m., flowers whitish-lavender.

One of the allies of *Paederia scandens* (Lour.) Merr. (*P. tomentosa* Bl.), but with greatly elongated, very narrow, lanceolate, rather slenderly acuminate leaves, which are abruptly subtruncate-rounded at the base, although the smaller leaves on the branchlets are often acute at the base. Its alliance is clearly with *P. stenophylla* Merr.

Lasianthus Jack

Lasianthus cyanocarpus Jack, Trans. Linn. Soc. 14: 125. 1823.

KWANGTUNG: Foo Lung, Shih Wan Tai Shan, *H. Y. Liang 69758*, July 18, 1937, a shrub 1 m. high, in dense woods, flowers white. Sumatra to Borneo, the Philippines, Indo-China, Formosa, and Hainan. New to Kwangtung.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

PLANTS OF COAHUILA, EASTERN CHIHUAHUA, AND ADJOINING ZACATECAS AND DURANGO, IV[1]

IVAN M. JOHNSTON

SAURURACEAE

Anemopsis californica (Nutt.) H. & A. Bot. Beechey Voy. 390 (1841).

Anemopsis californica var. *subglabra* Kelso, Am. Midl. Nat. 13: 112 (1932).

COAHUILA: Parras, 1880, *Palmer 1184.* CHIHUAHUA: Chihuahua, common plant in swamps, with strong peppery smell, 1908, *Palmer 23;* Meoqui, *LeSueur 45.*

Ranging from California to southern Utah, eastern Colorado, and trans-Pecos Texas, and south to central Mexico. An aromatic herb, spreading by stolons and usually forming large colonies in wet soil. It has been collected in the Rio Grande bottoms in El Paso County, Texas.

SALICACEAE

Salix nigra Marsh. Arbust. Am. 139 (1785).

VERNACULAR NAMES: Sauz; Sauce.

COAHUILA: Hermanas, *Marsh 1599;* Monclova, *Marsh 1712;* Monclova, small tree along Rio Monclova, *White 1731;* Cuatro Cienegas, tree 6 m. tall, *White 1926;* Saltillo, tree becoming more than 30 ft. tall, 1898, *Palmer 27;* mountains 6 mi. east of Saltillo, 1880, *Palmer 1286;* San Antonio de los Alamos, tree 30 ft. tall, *Johnston & Muller 917;* Jimulco, medium-sized tree, Oct. 10, 1905, *Pringle 10086½.* CHIHUAHUA: Chihuahua, river-banks and low wet bottoms, tree 20–30 ft. tall, 1908, *Palmer 41, 42;* Jimenez, tree 3 m. tall, along Rio Florido, *White 2111.*

A widely distributed somewhat variable species ranging from northern Mexico northward to Canada. The material from Coahuila falls into var. *Lindheimerii* Schneider and that from Chihuahua approaches and is perhaps referable to var. *vallicola* Dudley (=*S. Gooddingii* Ball), a western phase of the species, which differs from var. *Lindheimerii* in having usually pubescent, rather than glabrous, fruit and pedicels and lighter, usually yellowish, twigs and branchlets. Schneider, Bot. Gaz. 65: 11 (1918), cites collections of var. *Lindheimerii* from Piedras Negras (*Trelease 133*) and from San Bernardo near the Chihuahua-Durango boundary (*Gregg 479*), and collections of var. *vallicola* from Juarez (*Stearns*) and Santa Eulalia Mts., (*Wilkinson*). On the Texan bank of the Rio Grande forms of the species, perhaps best referred to var. *vallicola,* have been collected from El Paso down to the Big Bend.

The plant is the large arborescent willow most common in our area. Usually associated with *Populus,* it is present along streams and rivers and elsewhere about perennial sources of water.

Salix amygdaloides Anderss. Proc. Am. Acad. 4: 53 (1858).

The type of var. *Wrightii* (Anderss.) Schneider, Bot. Gaz. 65: 14 (1918),

[1]The fifth paper in this series, published out of sequence in Jour. Arnold Arb. 25: 133–182 (April, 1944), included the families Loranthaceae to Nyctaginaceae.

was collected by Charles Wright, no. *1877,* in the bottoms of the Rio Grande, in the general vicinity of old Fort Quitman, Hudspeth Co., Texas. The variety, a trivial and vague one distinguished by narrow leaves, has been collected at various points along the river north into New Mexico. The species probably reaches its southern limit along the Rio Grande in northern Chihuahua.

Salix Thurberi Rowlee, Bull. Torr. Bot. Cl. 27: 252 (1900).

VERNACULAR NAME: Taraiz.

COAHUILA: Monclova, 1939, *Marsh 1650;* San Antonio de los Alamos, arroyo bank, one colony, 6–10 ft. tall, *Johnston & Muller 956;* Jimulco, by stream, Oct. 10, 1905, *Pringle 10086.* CHIHUAHUA: Sierra Encinillas, near Fierro, arroyo bank, shrub 3 m. tall, *Stewart 771;* near Pirámide, tree 12–20 ft. tall, along arroyo, *Johnston 8141;* 3 mi. west of Camargo, slender tree, 6 m. tall, *White 2280.*

Ranging from south-central Texas, the Lower Pecos Valley, and the Rio Grande Valley from the mouth of the river to beyond the Big Bend, and south to northern Nuevo Leon and northeastern Durango. In our area the species is usually recognized by its loose elongate aments of strigose capsules and very slender and elongate distinctly dentate leaves. Some forms of *S. Thurberi* from the Big Bend area of Texas have short, though distinctly dentate, leaves, and when represented by staminate plants may be confused with *S. taxifolia* var. *limitanea.* This variety of *S. taxifolia,* however, usually grows at higher altitudes and has shorter, usually entire leaves, and the sericeous capsules are crowded in short aments not much longer than broad. At some undetermined point along the Rio Grande, but presumably above the mouth of the Rio Conchos, *S. Thurberi* is replaced by *S. exigua.*

Salix exigua Nutt. var. **stenophylla** (Rydb.) Schneider, Bot. Gaz. 65: 25 (1918).

CHIHUAHUA: Banks of the Rio Grande near Juarez, May 4, 1885, *Pringle 220;* Bachimba Canyon, May 30, 1885, *Pringle 23.*

Chihuahua and northeastern Sonora northward through Arizona, New Mexico, and trans-Pecos Texas to Wyoming. In trans-Pecos Texas the species is known from the Davis Mts., and from the Rio Grande bottoms in El Paso and Hudspeth Counties. Readily distinguished from *S. Thurberi* by the form and position of the staminate aments, glabrous or nearly glabrous capsules, and entire leaves.

Salix taxifolia H.B.K. var. **limitanea** var. nov.

A varietate genuina differt foliis maturitate evidenter firmioribus pallidioribus glabrescentibus vel pilis albis gracilioribus rectis valde adpressis sericeo-vestitis.

COAHUILA: Arroyo del Tule, Sierra Hechiceros, bush along arroyo, 10 ft. tall, *Johnston & Muller 1367;* 8 km. northwest of El Tule, Sierra Hechiceros, tree along arroyo, 7 m. tall, *Stewart 533.* CHIHUAHUA: Valley near Chihuahua, Oct. 5, 1885, *Pringle 23½;* Majalca, *LeSueur 162;* Chihuahua, river bank where somewhat shady, not common, upright plant 8–10 ft. tall, 1908, *Palmer 39;* Bachimba Canyon, March 23, 1885, *Pringle 95;* 8 mi. north of San Lucas, road to Chihuahua, *White 2329.* DURANGO: Durango, 1896, *Palmer 473.* SONORA: Between San Pedro and Fronteras, *Hartmann 959;* Arroyo Bavispe, 1940, *Phillips 331.* TEXAS: Limpia Creek, Aug. 22 and 24, 1849, *Wright 669* (TYPE, Gray Herb.); Limpia Canyon, 1902, *Tracy & Earle*

210; Limpia Creek, 15 mi. west of Ft. Davis, 1926, *Palmer 30957;* Little Aguja Canyon, Davis Mts., 1931, *Moore & Steyermark 3125;* eastern Jeff Davis County, 1926, *Palmer 30499;* Cibolo Creek, above Shafter, 1942, *Hinckley 2512.* NEW MEXICO: Animas Valley, Hidalgo Co., 1928, *Wolf 2585.* ARIZONA: Rucker Canyon, Chiricahua Mts., *Blumer 1623;* Whitewater Creek, Chiricahua Mts., *Blumer 1247;* Palmerlee, Huachuca Mts., *Goodding 4641;* Swissholm Mts., 1884, *Toumey;* Rosemont, Santa Rita Mts., *Toumey 14;* Davidson Canyon, Santa Rita Mts., 1884, *Toumey;* Rillita River, June 22, 1884, *Pringle;* near Tucson, May 7, 1883 and June 23, 1884, *Pringle;* Rincon Mts., 1930, *McKelvey 1579.*

The var. *limitanea* includes most of the material which Schneider, Bot. Gaz. 65: 23 (1918), treated as referable to typical *S. taxifolia,* a species described from cultivated plants collected at Mexico City, Queretaro, and Celaya, in central Mexico. Our present plant ranges from trans-Pecos Texas to southern Arizona and south into northern Mexico. Intermediate forms, connecting it with the phases of *S. taxifolia* found in central, southern, and western Mexico, come from San Luis Potosi, Durango, southwestern Chihuahua, and eastern Sonora. The commonest form of *S. taxifolia* in central Mexico is var. *microphylla* (S. & C.) Schneider, which has short, proportionately broad leaves with evidently toothed margins. The typical form of *S. taxifolia* appears to be only an ecological variant. It is sporadic within the range of var. *microphylla* and is characterized by having larger more elongate obscurely toothed oblanceolate leaves. In general size and shape of leaves this typical form suggests var. *limitanea,* but it differs in having the leaves thinner and less firm in texture and the indument darker, coarser, and less appressed. Northern material representing var. *limitanea* can be quickly distinguished from the southern plants belonging to typical *S. taxifolia* and to var. *microphylla* by its more finely and closely pubescent leaves, lighter color, and generally cleaner and neater appearance. In addition, the thicker leaves tend to be somewhat larger in size, entire-margined, and in age glabrescent. Schneider suggests that the northern plants differ from the southern ones in having a dorsal as well as ventral gland in the staminate flowers. The material I have cited is variable in this respect.

Salix Bonplandiana H.B.K. Nov. Gen. et Sp. 2: 20 (1817).

CHIHUAHUA: Presa near Chihuahua, 1936, *LeSueur.*

Ranging from Guatemala to central Mexico and north along the western Sierra Madre into southern Arizona and southwestern New Mexico. The northern plants have been referred to var. *Toumeyi* (Britt.) Schneider, Bot. Gaz. 65: 20 (1918), but I have been unable to distinguish them from material collected in central and southern Mexico.

Salix lasiolepis Benth. Pl. Hartw. 335 (1857).

COAHUILA: San Lorenzo Canyon, mountains near Saltillo, 7000 ft., April 12, 1906, *Pringle 10210;* mountain canyon (Cañon Iglesia) southeast of Saltillo, Oct. 5, 1905, *Pringle 13708.* CHIHUAHUA: Sacramento Valley, northeast of Chihuahua, March 29 and Oct. 4, 1886, *Pringle 709.*

Ranging from western United States east to Idaho and trans-Pecos Texas and south into northern Mexico. Material from Chihuahua, Sonora, and Texas agrees well with the typical plants of California. The specimens from Coahuila and Nuevo Leon may represent a separable form and

may possibly be the same as *S. Schaffnerii* Schneider from San Luis Potosi.

Salix irrorata Anderss. Öfv. Svensk. Vet. Akad. Förh. 15: 117 (1858).

This species has been collected on the Texan bank of the Rio Grande opposite Chihuahua, just north of El Paso, by Charles Wright, no. *1873*. It ranges from Arizona to trans-Pecos Texas and north to Colorado. It is closely related to *S. lasiolepis* and appears to differ chiefly in having its stems conspicuously glaucous.

Salix paradoxa H.B.K. Nov. Gen. et Sp. 2: 20 (1817).

COAHUILA: Cañon del Agua, Sierra Madera, tree to 15 ft. tall, trunk 4 inches diameter with smooth tawny bark, sparse on rock slides about heads of canyons, *Muller 3242*.

The above-cited collection is sterile. It closely resembles fertile material from Cerro Potosi in the Sierra Madre of Nuevo Leon, and, like it, appears referable to *S. paradoxa*. The species is otherwise known from the mountains of central Mexico. The type came from Hidalgo.

Populus arizonica Sargent, Bot. Gaz. 67: 210 (1919).

Populus mexicana sensu Sargent, Silva 14: 73. *t. 733* (1902), Man. Trees No. Am. 162. *f. 136* (1905).

VERNACULAR NAMES: Alamo; Alamo cimarron.

COAHUILA: Piedras Negras, 1900, *Sargent;* Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 527;* Saltillo, June 4, 1888, *Pringle 2098;* Saltillo, *Sargent;* San Antonio de los Alamos, *Johnston & Muller 918*. CHIHUAHUA: Sierra Encinillas, near Fierro, tree 6 m. tall, *Stewart 787;* valley near Chihuahua, March 31, 1886, *Pringle 885* (TYPE of *P. arizonica*); 3 mi. west of Camargo, tree 20 m. tall, *White 2258, 2282;* Jimenez, tree along Rio Florido, 20 m. tall, *White 2112*.

This is the common *Populus* on the intermontane plateau of northern Mexico, growing with *Salix* along rivers and streams in the valleys and frequently cultivated about ranch-houses and in the towns when sufficient soil moisture is available. It ranges north into the Big Bend area of Texas and apparently into the valleys of southeastern Arizona. It grows in the valley of the Rio Grande at least as far west as the mouth of the Rio Conchos. Farther up the river, somewhere between Ojinaga and El Paso, the species is replaced by *P. Wislizeni*.

The species is closely related to *P. Fremontii* and particularly to the various forms of that species found in Arizona. It is characterized by its broad ovate-deltoid leaves, which have a truncate or obtuse and only rarely a slightly cordate base. The earliest leaves and those on vigorous shoots are usually rhombic, long-pointed, and with an acute or narrowly obtuse base. The outer bud-scales are usually densely hairy and the twigs pubescent. The short pedicellate capsules, hairy buds, truncate or obtuse leaf-bases, and the less firm texture of the leaves readily distinguish it from *P. Wislizeni,* and the hairy indument and large obtuse or truncate leaf-blades separate it from *P. Fremontii*.

Sargent published the name "*Populus arizonica,*" without accompanying description, as a new name for the plant he had earlier described and illustrated in the Silva as "*P. mexicana* Wesm." For its validity and application, the name *P. arizonica* accordingly rests on the plant which Sargent

had illustrated, described, and discussed as *"Populus mexicana"* in the Silva of North America 14: 73. *t. 733* (1902). A study of this work shows that his illustration and his description apply well to our present Mexican plant and poorly to the slender-stemmed glabrous plant of Arizona which later authors, including Sargent, have accepted as typical *P. arizonica*. The fruiting leafy branch illustrated in Sargent's Silva, and in all editions of his Manual, is drawn from *Pringle 885*, a plant collected near Chihuahua City. The detached large mature leaf portrayed in the Silva is a typical leaf of our Mexican plant. The specimens from which this leaf and the young male aments were drawn can not now be determined. They may have been drawn from Mexican or Arizonan material or a mixture of the two. Sargent cited *Pringle 885*, from Chihuahua, among other Mexican specimens, as representing *P. arizonica* var. *Jonesii* Sargent, Bot. Gaz. 67: 211 (1919). Nevertheless, since the name *"P. arizonica"* was not newly described when published but was based upon *"P. mexicana"* as described and illustrated in the Silva of North America, and since the larger and most distinctive parts of the plate in the Silva of North America are based on Pringle's collections and represent well our present Mexican plant, which is well covered in the accompanying text, I am forced to accept *Pringle 885*, from Chihuahua, as the type of *P. arizonica* Sarg. With the species thus typified the name *P. arizonica* Sarg. is based on very characteristic material of the common *Populus* of our area.

Populus Wislizeni (Wats.) Sargent, Silva No. Am. 14: 71. *t. 732* (1902).

CHIHUAHUA: Banks of the Rio Grande, Juarez, May 31, 1888, *Pringle 1993;* Juarez, 1899, *Rose & Hough 4202.*

Ranging from the Rio Grande Valley, from below El Paso, north through trans-Pecos Texas and New Mexico into southern Colorado. Readily recognized by its very slender and elongate fruiting pedicels and its cordate or reniform, only rarely truncate, leaf-bases.

JUGLANDACEAE

Carya illinoensis (Wang.) K. Koch, Dendr. 1: 593 (1869).

Carya Pecan (Marsh.) Engler & Graebn. Notizbl. Bot. Gart. Berlin, App. 9: 19 (1902).

VERNACULAR NAMES: Nogal liso; Nogal.

Reported as growing wild in northeastern Coahuila along the bottomlands of the Rio San Diego, Rio Rodrigo, and Rio Sabinas, by Pablo Frick, Mexico Forestal 1: 11–14. *fig.* (1923), and by Angel Roldan, Mexico Forestal 3: 30–32. *fig.* (1923). I have been told of pecan-trees which formerly grew about Muzquiz and Nacimiento. I have seen no specimens from Coahuila. However, the species is to be expected in northeastern Coahuila, for pecans have been collected in Val Verde (Devils River) and Uvalde Counties in adjoining Texas. The Arnold Arboretum has several specimens of the species collected near Monterrey, but they have no data indicating whether they were obtained from spontaneous or cultivated trees. The species is widely distributed in central United States and reaches its southern limit in northeastern Mexico.

Juglans microcarpa Berlandier in Berl. & Chovell, Diario Viage Comission de Límites bajo Mier y Teran 276 (1850).

Juglans nana Engelm. Proc. Am. Assoc. Adv. Sci. 5: 226 (1851).

Juglans rupestris Engelm. ex Torr. in Sitgreaves, Rep. Exped. Zuni & Colorado Rivers 171. *t. 15* (1853).

VERNACULAR NAMES: Nogalillo; Nogaillo.

COAHUILA: Hac. Mariposa near Puerto Santa Ana, *Wynd & Mueller 283;* Flores Pasture, Hac. Mariposa, *Marsh 313;* Cañon Bocatoche, becoming 20 ft. tall, *Muller 3120;* 9 mi. north of Hipolito, 10 ft. tall, frequent, *Johnston 7229;* Sierra Encantada, Cañon San Enrique, shrub 4 m. tall, *Stewart 1390;* Sierra del Pino, along arroyos near La Noria, *Johnston & Muller 509;* Sierra Hechiceros, 6 mi. east of El Tule, along dry arroyo, 1–4 m. tall, *Stewart 482;* Sierra Hechiceros, Cañon Indio Felipe, along banks of creek, *Stewart 134a.* CHIHUAHUA: 7½ mi. east of Victoria, bank of arroyo, 12 ft. tall, *Stewart & Johnston 1999.*

A large shrub or low rounded tree, generally less than 15 ft. tall, growing along open arroyos or on dry terraces near watercourses. It reaches its southern limit in our area and extends north into Texas and southeastern New Mexico.

The present species, the dwarf walnut, has generally passed as *J. rupestris.* That species, although attributed to Engelmann, was described and illustrated by Torrey, apparently on the basis of material collected by Bigelow along Devils River, Val Verde Co., Texas. Previous to Torrey's formal description of *Juglans rupestris* Engelm., however, two other binomials had been published for the species. These earlier names, though published without formal descriptions, are accompanied by descriptive comments sufficient to identify them. Since there can be no reasonable doubt as to the application of these early names I have accepted the older, *J. microcarpa* Berl. Berlandier collected *J. microcarpa* on Dec. 7, 1828, in the upper parts of Uvalde Canyon, Texas. He writes concerning it as follows: "A la orilla de los torrentes, y sobre todo, en la del arroyo principal, se encuentran nogales de una especie natural, cuyos frutos muy pequeños, parecidos á una grande avellana, tienen un Endocarpo muy duro, y por esto se ha descrito bajo el nombre de *Juglans Microcarpa.*" Berlandier was a trained botanist. His reference to a wild *Juglans* with a small fruit, the size of a hazelnut, which he found in Uvalde Canyon, is unmistakable. All botanists agree that the small fruit and the dwarf habit of the present species are its obvious distinguishing characters. These are well covered in Engelmann's publication of *J. nana.* In his general discussion of the flora of western parts of Texas, Engelmann writes as follows: "The stately walnut trees of your forests are there reduced to the low *Juglans nana,* a shrub, that bears nuts the size of a musket ball." Since the names *J. microcarpa* and *J. nana* were both published by botanists who mention in their comments diagnostic characters of the species, I believe that the names should compete with *J. rupestris* and that the oldest, *J. microcarpa,* should be taken up as the accepted name of the species.

Juglans major (Torr.) Heller, Muhlenbergia 1: 50 (1900).

Juglans major var. *major* Torr. in Sitgreaves, Rep. Exped. Zuni & Colorado Rivers 171. *t. 16* (1853).

VERNACULAR NAME: Nogal.

CHIHUAHUA: Vicinity of Chihuahua, 1908, *Palmer 141;* 3 mi. west of Camargo, tree 8 m. tall, *White 2284.*

A species ranging from western New Mexico and Arizona south in Chihuahua and Sonora to Durango. It is closely related to the more easterly *J. microcarpa* but is usually separable by its arborescent habit, much larger nuts, and larger, proportionately broader, generally fewer, evidently short-petiolulate leaflets. The bases of the leaflets are strongly oblique, with one side of the blade decurrent on the petiolule for at least a millimeter. The curved more elongate leaflets of *J. microcarpa* are subsessile, with the blade decurrent only very obscurely if at all.

Juglans major var. **Stewartii** var. nov.

A varietate typica differt foliolis 15–21 angustioribus et longioribus 7–12 cm. longis 13–19 mm. latis supra basim latissimis deinde apicem versus gradatim longe attenuatis curvatis.

COAHUILA: Sierra Hechiceros, Cañon Indio Felipe, common along stream in deep watered canyon, tree becoming 45 ft. tall, Sept. 18, 1940, *Johnston & Muller 1358* (TYPE, Gray Herb.); Cañon Indio Felipe, banks of creek, tree 12 m. tall, common, *Stewart 134.*

A plant agreeing with the western *J. major* in its arborescent habit, large fruits, and oblique decurrent leaflet-bases, and resembling *J. microcarpa* in its numerous elongate leaflets.

BETULACEAE

Ostrya virginiana (Mill.) Koch, Dendr. 2^2: 6 (1873).

COAHUILA: Sierra Gloria, July 1939, *Marsh 1878.*

A species of eastern United States that extends south into our area.

FAGACEAE

by CORNELIUS H. MULLER

Quercus Laceyi Small, Bull. Torr. Bot. Cl. 28: 358 (1901).

Quercus breviloba f. *Laceyi* Trel. Mem. Nat. Acad. 20: 102 (1924).

Quercus porphyrogenita Trel. Mem. Nat. Acad. 20: 51. *t. 39* (1924); Muller, Am. Midl. Nat. 18: 844 (1937).

Quercus microlepis Trel. & Muell. in Mueller, Bull. Torr. Bot. Cl. 63: 150 (1936).

Quercus glaucophylla sensu Mueller, Bull. Torr. Bot. Cl. 63: 150 (1936); Jour. Arnold Arb. 17: 162 (1936); non von Seemen (1900).

VERNACULAR NAME: Encino.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 541, 617;* Rancho Agua Dulce, wooded canyon, east slope of Sierra Manuel, *Wynd & Mueller 345, 346;* Hac. Mariposa, ravine near Puerto Santa Ana, *Wynd & Mueller 230;* Hac. Mariposa, Sierra del Puerto Santa Ana, *Wynd & Mueller 262;* Sorpresa Spring, *Marsh 335, 344;* Palm Canyon, *Marsh 368;* Sierra Gloria, *Marsh 1954, 1978, 2002, 2005;* north slope of Sierra del Oso, Bocatoche, shrub to tree 6–30 ft. tall, common on slopes and arroyo-banks, *Muller 3143;* northwest slopes of Sierra San Lazaro, *Wynd & Mueller 170;* San Lorenzo Canyon near Saltillo, Apr. 12, 1906, *Pringle 10228;* Hillcoat Mesa lying west of Encantada Ranch, July 25, 1938, *Marsh 1426, 1432;* west of Buena Vista Ranch, July 14, 1938, *Marsh 2291;* Cañon Milagro, Sierra Guajes, 12 km. west of Hac. Encantada, tree 6–7 m. tall, *Stewart 1507, 1708;* Cañon San Enrique, Sierra Encantada, 5 km. west of Rancho Buena Vista, tree 5 m. tall, fairly common on hillside at mouth

of canyon, *Stewart 1369;* Sierra del Pino, La Noria, sparse on arroyo-banks, becoming 15 ft. tall, *Johnston & Muller 522;* Sierra del Pino, pine forest north of La Noria, scattered along arroyos, up to 30 ft. tall, *Johnston & Muller 559;* Sierra del Pino, high ridge west of La Noria, north-facing slopes below crest, shrub or tree 6–15 ft. tall, common, *Johnston & Muller 616;* west side of Potrero de la Mula, common on escarpment, 10–15 ft. tall, *Johnston 9207;* Sierra Madera, Cañon Pajarito, abundant small to moderate tree along upper arroyo and on slopes, up to 30 ft. tall, *Muller 3192;* Sierra Madera, Cañon del Agua, abundant in oak-pinyon zone of lower canyon, becoming 20 ft. tall, *Muller 3267;* Sierra Madera, Cañon Charretera, common on flats near La Cueva, tree 20 ft. tall, *Johnston 8933.*

Edwards Plateau region of Texas south in the mountains of Coahuila and the Sierra Madre of Nuevo Leon into Tamaulipas and San Luis Potosi. A well marked but polymorphic species usually most common along waterways in limestone mountains. The white scaly bark, the blue-green cast of its somewhat glaucous and rounded-lobed leaves, and the prominently thickened cup-scales are distinguishing characters. Our plants are obviously conspecific with the Texan *Q. Laceyi.* That species, however, seems closely related to southern Mexican plants comprising *Quercus* series *Glaucoides* Trel. and may possibly be conspecific with one of the older species in that assemblage. Our plant, in fact, has been identified with *Q. glaucophylla* von Seemen, a species first described from Oaxaca. For the present, however, it seems best to maintain the northern plants as distinct and to defer any possible change in their status until the southern species can be given a critical study and their precise relations established.

Quercus oblongifolia Torr. in Sitgreaves, Rep. Exped. Zuni & Colorado Rivers 173 (1853).

VERNACULAR NAME: Encino.

COAHUILA: San Antonio de los Alamos, along creek in canyon, tree 30–50 ft. tall with gray scaly bark, trunk 1–2½ ft. thick, locally common, *Johnston & Muller 863, 865, 866, 867, 869, 870.* CHIHUAHUA: Pirámide, about bouldery rock-masses on gravelly plain, spreading tree 25–30 ft. tall with gray scaly bark, *Johnston & Muller 1425;* 7 mi. south of Pirámide, scattered trees on north slope of grassy hills, *Johnston & Muller 1429.*

Arizona south into Sonora and Chihuahua and with outlying eastern stations in our area. The species is superficially very similar to *Q. Laceyi* and at times the exact differences are difficult to describe. *Quercus oblongifolia,* however, has a decidedly westerly distribution, is usually found on igneous soils, and has leaves differing from those of *Q. Laceyi* in being thicker, grayer, and less prominently veined beneath.

Quercus filiformis Muller, Am. Midl. Nat. 27: 473 (1942).

COAHUILA: Sierra Madera, Cañon Pajarito, sprawling shrub 6–24 inches tall, scattered on rocky arroyo-banks in dense moist pine-oak-maple forest in upper canyon, *Muller 3150* (ISOTYPE).

This species is known only from the type collection. Its procumbent habit, very slender stems, and thin leaf-blades distinguish it from *Q. Pringlei,* the species to which it is probably most closely related. It occurs in densely wooded moist canyons at middle elevations.

Quercus Pringlei von Seemen, Bot. Jahrb. 29: 96 (1900).

VERNACULAR NAME: Encino.

COAHUILA: Mountains near Saltillo, 7000 ft., 1–2 m. tall, Apr. 12, 1906, *Pringle 10199;* mountains near Saltillo, 6500 ft., 2–3 ft. tall, Nov. 6, 1905, *Pringle 13609;* Carneros Pass, limestone hills, Sept. 1, 1889, *Pringle 2382;* Carneros Pass, limestone hills, shrub 2–3 ft. tall, May 10, 1891, *Pringle 3702* (ISOTYPE); arroyo 3 km. southwest of Fraile, *Stanford et al. 344;* Sierra del Pino, common bush along high ridge-crest west of La Noria, 4–7 ft. tall, *Johnston & Muller 600;* Sierra Madera, high crest of main ridge east of Picacho Zozaya, low scrub oak 1–2 ft. tall on rocky open crest, *Johnston 9018;* Sierra Madera, Cañon del Agua, common on steep wooded canyon slopes, shrub becoming 10 ft. tall, *Muller 3206, 3222;* Sierra Mojada, Cañon Hidalgo, open hillsides below crest, fairly common, 7–8 m. tall, *Stewart 1084;* Sierra Mojada, Cañon San Salvador, very abundant in upper canyon, becoming 15 ft. tall, bark scaly and gray, *Muller 3300, 3300a, 3300b;* summit of Picacho Jimulco, *Stanford et al. 91, 111.* ZACATECAS: Valley 15 km. west of Concepcion del Oro, tree 7 ft. tall, *Stanford et al. 551.*

Ranging in western and southern Coahuila and northern Zacatecas, and south in western Nuevo Leon to San Luis Potosi. The species is characterized by its small, usually glabrous leaves with thickish blades and acute apices. The undersurface is at times somewhat glaucous. This plant, usually a small dense bush, occurs in mesic or dry situations at moderate and high elevations.

Quercus sinuata Walt. var. **breviloba** (Torr.) Muller, comb. nov.

Quercus obtusifolia var.? *breviloba* Torr. Bot. Mex. Bound. 206 (1859).

Quercus annulata Buckl. Proc. Acad. Nat. Sci. Phila. **1860**: 445 (1860), non Smith in Rees (1819), non Korthals (1839–42).

Quercus san sabeana Buckl. ex Young, Familiar Lessons in Botany 507 (1873).

Quercus breviloba Sargent, Gard. & Forest 8: 93 (1895); Muller, Am. Midl. Nat. 18: 849 (1937).

COAHUILA: Rancho Agua Dulce, lower slopes of Sierra San Manuel, *Wynd & Mueller 308, 309, 311;* Rancho Agua Dulce, wooded canyon on east slope of Sierra San Manuel, *Wynd & Mueller 342, 344;* Sorpresa Spring, *Marsh 336;* Bocatoche, north slope of Sierra del Oso, abundant on slopes, shrub becoming 12 ft. tall, *Muller 3140, 3141.*

Ranging from the Edwards Plateau and from the Big Bend area, Texas, south in the mountains of eastern Coahuila. It has been reported as far south as the vicinity of Monterrey and has been discovered recently in southeastern Presidio County, Texas (Mexican Canyon, just off Fresno Canyon, *Hinckley 2295*), and hence may be expected south of the Rio Grande in northeastern Chihuahua and northwestern Coahuila. Past writers have maintained our plant as specifically distinct from the eastern *Q. sinuata,* but this seems difficult to justify since intermediate forms arise wherever *Q. sinuata* is exposed to xeric conditions or *Q. breviloba* to mesic conditions.

Quercus Greggii (A. DC.) Trel. Contr. U. S. Nat. Herb. 23: 185 (1922), Mem. Nat. Acad. 20: 78. *t. 109* (1924).

Quercus reticulata β *Greggii* A. DC. Prodr. 16^2: 34 (1864).

Quercus Loeseneri Trel. Mem. Nat. Acad. 20: 79. *t. 110* (1924).

VERNACULAR NAME: Encino.

COAHUILA: San Antonio de las Alanzanas, frequent, 30–40 ft. tall, Aug. 31, 1848, *Gregg 380* (ISOTYPE); mountains near Saltillo, 7000 ft., 4–6 ft. tall, Nov. 6, 1905, *Pringle 10120* (isotype of *Q. Loeseneri*); Sierra Madera, Cañon del Agua, shrub up to 12 ft. tall, dominant in chaparral on upper slopes and around peaks, *Muller 3239;*

Sierra Madera, Cañon del Agua, large shrub or tree up to 25 ft. tall, principal constituent of oak forest in moist densely wooded upper canyon, *Muller 3233;* Sierra Madera, Cañon del Agua, shrub or small tree up to 15 ft. tall, with thin gray scaly bark, common in open oak forests on steep canyon slopes, *Muller 3207;* Sierra Madera, common in moist shady coniferous forests on crest of high main ridge east of Picacho Zozaya, shrub 4–8 ft. tall, *Johnston 9022, 9022a.*

Mountains of central and southeastern Coahuila south in the Sierra Madre of Nuevo Leon to San Luis Potosi. A plant of moist canyons and forests in the high mountains.

Quercus Greggii f. **subglabra** Muller, f. nov.

A species recedit foliis subglabratis non revolutis non crassis, venis supra vix impressis.

COAHUILA: Sierra Madera, Cañon del Agua, tree becoming 20 ft. tall, sparse along the moist densely wooded upper arroyos, Sept. 9, 1939, *Muller 3238* (TYPE, Gray Herb.); Sierra Madera, Cañon del Agua, shrub or small tree up to 15 ft., sparse in moist pine oak forest on steep slopes, *Muller 3227, 3227a.*

This form differs conspicuously from typical *Q. Greggii* in having leaves with the lower face devoid of dense fulvous tomentum, the upper face with only weakly impressed veins, and the margins non-revolute. The naming of forms such as this is of doubtful value except when the variant may cause difficulty in delimiting the species. *Quercus Greggii* without its dense tomentum, its revolute leaf-margins, and its veins strongly impressed on the upper leaf-surface presents pronounced differences in aspect, and the relationship of this form to typical *Q. Greggii* might fail to be recognized by those who have not studied it in the field and have only herbarium material before them.

Quercus reticulata Humb. & Bonpl. Pl. Aequin. 2: 40. *t. 86* (1809).
Quercus durangensis Trel. Mem. Nat. Acad. 20: 73. *t. 91* (1924).
Quercus diversicolor Trel. Mem. Nat. Acad. 20: 73. *t. 92–94* (1924); Muller, Am. Midl. Nat. 24: 708. *fig. 3* (1940).
Quercus rhodophlebia Trel. Mem. Nat. Acad. 20: 74. *t. 95–97* (1924).

COAHUILA: Sierra del Carmen, Sept. 12, 1936, *Marsh 829;* Sierra del Carmen, Cañon Sentenela, high slopes with northwest exposure, *Wynd & Mueller 634, 636, 641.*

Arizona, New Mexico, and trans-Pecos Texas and south along the Sierra Madre Occidental to central Mexico. Entering our area in northern Coahuila. The several species described by Trelease are obviously only forms of a very polymorphic species which recur throughout the range of the species regardless of geographical location. The typically obovate leaves mucronately toothed about the apex, the very prominent reticulum of the lower leaf-surface, and the long-stalked fruit with loose thin cup-scales very readily distinguish this species from others within our range.

Quercus pungens Liebm. Overs. Danske Vidensk. Forhandl. 1854: 171 (1854); Muller, Am. Midl. Nat. 24: 710. *fig. 5* (1940).
Quercus undulata δ *Wrightii* Engelm. Trans. St. Louis Acad. 3: 382 (1876).
Quercus undulata var. *pungens* Engelm. Trans. St. Louis Acad. 3: 392 (1877).

VERNACULAR NAME: Encino.

COAHUILA: Sierra del Carmen, Sept. 2, 1936, *Marsh 870;* Bocatoche, north slope of Sierra del Oso, shrub to 12 ft., sparse on slopes, *Muller 3142;* escarpment on west side of Potrero de la Mula, lower and middle slopes, bush 8–12 ft. tall, *Johnston 9197, 9206;*

high ridge at west end of Sierra Fragua north of Puerto Colorado, a few shrubs about rocks on crest, 5–8 ft. tall, *Johnston 8766;* Puerto Colorado, deep ravines about summit of red sandstone cliffs, shrub becoming 12 ft. tall, *Johnston 8699, 8700;* Sierra del Pino, Dec. 1937, *LeSueur 1501;* Sierra del Pino, Cañon Ybarra, fairly common on arroyo-banks, shrub 2–4 m. tall, *Stewart 1810, 1811, 1812;* Sierra Planchada, Cañon Gringo, banks of dry arroyo in upper canyon, common, shrub 2–6 m. tall, *Stewart 1025, 1030;* Sierra Mojada, Cañon San Salvador, common in middle and upper canyons and arroyos, tree with scaly gray bark, becoming 12 ft. tall, *Muller 3299, 3299a;* west side Valle de Delicias, 3 km. southwest of La Botica, common tree on arroyo-banks, 8 m. tall, *Stewart 2863;* 11 km. northeast of Jimulco, 10–12 ft. tall, *Stanford et al. 64.* CHIHUAHUA: Hills between Alamos Chapado and Alamitos, canyon 18 mi. west of San Carlos, waif tree 6 ft. tall on canyon floor, *Johnston & Muller 26;* Sierra San Carlos, lower part of canyon along road to mines, basally branched shrub 6–12 ft. tall, *Johnston & Muller 50;* Rancho Madera, southeastern base of Sierra Rica, arroyo-banks, common shrub 4 m. tall, *Stewart 2484;* Sierra Almagre, deep moist shaded canyon, up to 30 ft. tall, *Johnston & Muller 1151;* Sierra Almagre, common along arroyos, shrub 6 ft. to tree 20 ft. tall, *Johnston & Muller 1166;* Sierra Diablo, Canyon Rayo, fairly common on arroyo-banks, shrub 4–6 m. tall, *Stewart 955;* Sierra Santa Eulalia, March 27 and Sept. 19, 1885, *Pringle 172, 353;* Sierra Santa Eulalia, El Poza, shrub 1 m. tall, *White 2421.*

Ranging from Arizona and New Mexico through trans-Pecos Texas and south in Chihuahua and Coahuila into Nuevo Leon and Tamaulipas, usually confined to dry limestone slopes and along arroyos at lower elevations in the mountains. The leaves have rough almost sandpaper-like surfaces, imparted by their sparse short stiff pubescence. The species may commonly be recognized by this character alone. Although our plant has been treated as a variety of *Q. undulata,* it is not closely related to that species. *Quercus undulata* is related to *Q. Gambelii. Quercus pungens* is related to neither of these two species. When *Q. undulata* and *Q. pungens* occur on the same mountain ranges, the former is confined to the very highest elevations, while the latter occupies the lower belt of woody vegetation, the two being separated by a belt of several thousand vertical feet in which neither occurs.

A few of the specimens here referred to *Q. pungens* were formerly treated as belonging to *Q. Vaseyana* Buckl. Material from Nuevo Leon (including the type of *Q. sillae* Trel.) belongs to *Q. Vaseyana,* but no collections truly belonging to that species are available from Coahuila or Chihuahua. However, the presence of the species near the Rio Grande, along the lower Pecos and Devils Rivers, and in the limestone country of the western Edwards Plateau, in Texas, makes it almost certain that *Q. Vaseyana* will be found in the similar country in adjoining northern Coahuila. *Quercus Vaseyana* and *Q. pungens* are very closely related and frequently rather difficult to distinguish, the most satisfactory differences being the presence of harsh pubescence on the leaves of *Q. pungens* and its absence on the generally less lobed leaves of *Q. Vaseyana,* cf. Muller, Am. Midl. Nat. 27: 712. *fig. 6* (1940).

Quercus invaginata Trel. Mem. Nat. Acad. 20: 87. *t. 137, 138* (1924).

Quercus invaginata f. *Purpusiana* Trel. Mem. Nat. Acad. 20: 87. *t. 138* (1924).

VERNACULAR NAME: Encino.

COAHUILA: Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh*

1276; Hillcoat Mesa lying west of Encantada Ranch, July 25, 1938, *Marsh 1419, 1419a, 1420, 1421, 1428;* Sierra Gloria, 1939, *Marsh 1953, 1955, 1974, 1997;* Bocatoche, north slope of Sierra del Oso, shrub or small tree, 2–12 ft. tall, dominant on lower arroyo slopes and in canyons, *Muller 3136, 3137, 3138, 3144;* Sierra San Lazaro, Puerto San Lazaro, abundant in shrub zone on dry slopes, shrub 3–8 ft. tall, usually in clumps of 6–15 trunks up to 2 in. diameter, *Muller 3066, 3067;* San Lazaro, rocky slopes of Puerto San Lazaro, *Wynd & Mueller 138, 139, 162;* Sierra de la Paila, Oct. 1910, *Purpus 5029* (ISOTYPE); Sierra de la Paila, Oct. 1910, *Purpus 5030* (isotype of f. *Purpusiana*); western escarpment of Potrero de la Mula, large shrub 8–12 ft. tall, on middle slopes, *Johnston 9210;* Sierra San Vicente, Cañon Espantosa, about 20 km. southeast of Cuatro Cienegas, *Schroeder 76, 98;* Sierra del Pino, pine forest in middle of sierra north of La Noria, moist shaded arroyos, abundant, up to 30 ft. tall, *Johnston & Muller 560;* Sierra del Pino, vicinity of La Noria, on flats and adjacent open slopes, bush usually 3–6 but frequently 10 ft. tall, abundant, *Johnston & Muller 439, 440, 520, 668, 710;* Sierra del Pino, near mouth of main south canyon, sparse along arroyo, becoming 20 ft. tall, *Johnston & Muller 378;* west base of Picacho del Fuste, along arroyo in small canyon, *Johnston 8457;* tableland north of Cañon del Cuervo Chico, crest of low rounded limestone hill, rare, small tree 15 ft. tall, *Johnston 8550;* Sierra Madera, Cañon Charretera near La Cueva, rocky flat, element in oak chaparral, bush 4–6 ft., *Johnston 8952;* Sierra Madera, Cañon Charretera near La Cueva, rocky flats, tree 20–30 ft. tall, *Johnston 8934;* Sierra Madera, Cañon Charretera, coarse bush in lower canyon, 8–12 ft. tall, *Johnston 9167, 9168;* Sierra Madera, Cañon Pajarito, common in pinyon and shrub zones of lower canyon, shrubs or small trees, 10–20 ft. tall, *Muller 3148, 3149, 3160, 3161;* Sierra Cruces, Cañon Tinaja Blanca, common on north slopes low on canyon side, small tree 10–15 ft. tall, *Johnston & Muller 300, 301, 302, 304;* Cañon La Luz, 3 mi. south of San José, common tree in canyon, *Johnston & Muller 1005, 1006;* San Antonio de los Alamos, along creek in canyon, tree 30–50 ft. tall, trunk 1–2.5 ft. thick, bark gray and scaly, *Johnston & Muller 864, 868, 871, 872.*

Ranging in middle and western Coahuila, frequent at middle altitudes on the mountains and descending along arroyos to the foothills. The acorn-cups in the type material from Sierra de la Paila described by Trelease have loosely inrolled margins, which give them an inflated appearance. Such invaginate excessively inflated cups are common in the species but individual trees of one population, otherwise identical, may have cups variously inflated and some even indistinguishable from those of *Q. grisea.* As a matter of fact the present species is often very difficult to distinguish from *Q. grisea* in northwestern Coahuila, where the two species meet. However, the broad flat dentate leaf-blades of typical *Q. invaginata,* lacking the dense tomentum of *Q. grisea,* make the separation of the two species obligatory, especially since the similarities between them do not arise from any close genetic relationship.

Quercus intricata Trel. in Standl. Contr. U. S. Nat. Herb. **23**: 185 (1922), Mem. Nat. Acad. **20**: 84. *t. 126–128* (1924); Muller, Am. Midl. Nat. **24**: 710. *fig. 4* (1940).

Quercus microphylla β crispata A. DC. Prodr. 16²: 36 (1864).

Quercus intricata f. *ovata* Trel. Mem. Nat. Acad. **20**: 85. *t. 128* (1924).

Quercus intricata f. *erratica* Trel. Mem. Nat. Acad. **20**: 85. *t. 128* (1924).

VERNACULAR NAMES: Encino; Charasquilla.

COAHUILA: Puerto San Lazaro, abundant on open slopes of Sierra San Lazaro, shrub 1–4 ft. tall, *Muller 3085;* Puerto San Lazaro, Sierra San Lazaro, sparsely scattered in the shrub zone, shrub to 2 ft. tall, much branched at base, *Muller 3065;* San Lazaro, rocky slopes of Puerto San Lazaro, *Wynd & Mueller 163;* Buena Vista, south of Saltillo, shrub-oak 2–5 ft. tall, abundant, July 24, 1848, *Gregg 296* (ISOTYPE of *Q. microphylla β crispata* and *Q. intricata*); San Lorenzo Canyon, southeast of Saltillo,

canyon-sides, forming thick crowded clumps 3–5 ft. tall, 1904, *Palmer 431;* San Lorenzo Canyon, southeast of Saltillo, 1905, *Palmer 552, 553, 554, 555, 556, 557, 745, 746* (isotype of f. *ovata*), *747, 748, 751;* Carneros Pass, limestone hills, 2–3 ft. tall, May 10, 1891, *Pringle 3701;* Carneros Pass, 2 ft. high, Sept. 10, 1889, *Pringle 2862;* Sierra del Pino, 1937, *LeSueur 1502;* Sierra del Pino, Cañon Ybarra, fairly common on arroyo-banks, shrub 3 m. tall, *Stewart 1861;* Sierra del Pino, high western ridge near old log-slide, forming chaparral along rocky arid crest, 1–3 ft. tall, *Johnston & Muller 565;* Sierra del Pino, pine forests north of La Noria, abundant as scrub in open conifer forest, clumps 4 ft. tall, *Johnston & Muller 561;* Sierra del Pino, high ridge west of La Noria, abundant along crest and on adjacent slopes, *Johnston & Muller 610;* Sierra del Pino, vicinity of La Noria, clumps 2–4 ft. tall, *Johnston & Muller 441, 442, 443, 444, 445;* tableland north of Cañon del Cuervo Chico, forming thickets 3–6 ft. tall on low rounded limestone hills, *Johnston 8551;* Sierra Madera, scrub oak on high rocky open crest of main ridge east of Picacho Zozaya, 1–2 ft. tall, common, *Johnston 9018a;* Sierra Madera, Cañon Charretera near La Cueva, low bush 2–4 ft. tall on rocky flats, *Johnston 8951;* Sierra Madera, Cañon Pajarito, abundant on dry open slopes in upper arroyo, shrub 1–4 ft. tall, *Muller 3191;* Sierra Fragua, thickets 2–5 ft. tall with pines on eastern slopes of high ridge north of Puerto Colorado, *Johnston 8779;* Sierra Cruces, Cañon Tinaja Blanca, common on north slopes low down on canyon-side, shrub to 3 ft. tall, *Johnston & Muller 299, 303;* Sierra Cruces, foothills 3 mi. southeast of Santa Elena, sparse on arroyo-banks, 3 ft. tall, *Johnston & Muller 1260;* Sierra Mojada, Cañon San Salvador, crests, dominant shrub becoming 5 ft. tall, *Muller 3310;* Sierra de Parras, Apr. 1905, *Purpus 1137;* Sierra de Parras, *Shreve & Tinkham 9876, 9888;* Sierras Negras, south of Parras, tree 8–10 ft., *Stanford et al. 147.* CHIHUAHUA: Sierra Almagre, sparse in open rocky arroyo, becoming 5 ft. tall, *Johnston & Muller 1182;* Sierra Diablo, common about margins of meadows high on northwest end of sierra, 1–2 m. tall, *Stewart 961.* ZACATECAS: Cedros, 1908, *Lloyd 130.*

Ranging from trans-Pecos Texas (Davis and Chisos Mts.) south in Coahuila and adjacent Chihuahua and Zacatecas into Nuevo Leon. A xeric species characteristic of sunny slopes and flats and exposed dry ridges. It is commonly associated with *Q. invaginata* in central Coahuila and is one of the characteristic species in the Coahuilan oak-chaparral. The small revolute leaves with a dense buff tomentum beneath and the low habit of growth distinguish it.

Quercus arizonica Sargent, Gard. & Forest 8: 92 (1895).
Quercus Sacame Trel. Mem. Nat. Acad. 20: 89. *t. 142* (1924).
Quercus endemica Muller, Am. Midl. Nat. 18: 846 (1937).

VERNACULAR NAME: Encino.

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 540, 565, 638* (isotype of *Q. endemica*); Sierra Cruces, Cañon Encinal, 8 km. southwest of Santa Elena, frequent in shady canyon, deciduous tree becoming 12 m. tall, trunk 75 cm. thick, *Stewart 2273, 2274;* 10 km. southwest of Santa Elena, side of canyon, tree 8 m. tall, trunk 5 dm. thick, *Stewart 1148.* CHIHUAHUA: Sierra Organos, canyon west of Organos, large live oak, tree said to be only one of kind in region, *Stewart & Johnston 2078.* TEXAS: Chisos Mts., Boot Spring, *Mueller 7936* (distributed as *Q. reticulata*).

Ranging from Arizona south in the highland of eastern Sonora and western Chihuahua into Durango and extending eastward in scattered stations into trans-Pecos Texas and Coahuila. The material from our area comes from the ragged eastern edges of the range of *Q. arizonica* where it is a rare relict, and its characters are so masked by aberrations characteristic of such edge-of-the-range individuals that the identity of some specimens has not been immediately evident. Though some plants from the Chisos Mts.,

formerly referred to *Q. endemica*, cf. Muller, Am. Midl. Nat. 24: 706 (1940), are probably best referred to *Q. grisea*, the Chisos specimen cited above, however, seems clearly to belong to *Q. arizonica*. *Quercus arizonica* is characterized by oblong to oblanceolate leaves with the reticulum very prominent beneath. It is distinguished from *Q. reticulata* by its more narrow leaves, its shorter fruiting peduncles, its thickened and tightly appressed cup-scales, and its occurrence at much lower and drier levels.

Quercus cordifolia Trel. Mem. Nat. Acad. 20: 84. *t. 125* (1924).
Quercus striatula Trel. Mem. Nat. Acad. 20: 93. *t. 151* (1924).
Quercus striatula f. *otinapensis* Trel. Mem. Nat. Acad. 20: 94. *t. 152* (1924).

COAHUILA: Carneros Pass area, small tree 20 ft. tall, trunk up to 1 ft. thick, July 1880, *Palmer 1278* (GH, ISOTYPE); Carneros Pass area, 1880, *Palmer 1178* (AA).

Ranges from southern Coahuila into Durango, Zacatecas, and Nuevo Leon. Apparently most abundant in Nuevo Leon. This species is very polymorphic as to leaf-size and -shape and as to habit. It varies from a small tree with moderate-sized leaves, very similar to *Q. grisea,* to a diminutive shrub (3–6 ft. tall) with tiny leaves. Although *Q. cordifolia* is very similar to *Q. grisea* in one of its forms, it is by no means conspecific with that species. Unfortunately the type and other collections from the type locality are all of the large-leaved form. This form, however, is not separable from the diminutive form, there being many intermediates. *Quercus cordifolia* occurs at medium and high altitudes in the larger mountain masses and does not extend down into the shrub and small tree zones as does *Q. grisea* so commonly further north.

Quercus grisea Liebm. Overs. Danske Vidensk. Forhandl. 1854: 171 (1854); Muller, Am. Midl. Nat. 24: 706. *fig. 1* (1940).
Quercus undulata var. *grisea* Engelm. Trans. St. Louis Acad. 3: 393 (1877).
Quercus santaclarensis Muller, Am. Midl. Nat. 19: 583 (1938).

VERNACULAR NAME: Encino.

COAHUILA: Sierra del Carmen, Sept. 6–12, 1936, *Marsh 832, 854;* western slopes of Sierra del Carmen, 8 km. northeast of Hac. Encantada, fairly common on hillsides, tree 5–6 m. tall, *Stewart 1552;* Sierra del Pino, abundant in dense pine forests in middle sections of sierra north of La Noria, tree 45 ft. tall, *Johnston & Muller 572;* Sierra del Pino, La Noria, common along arroyo, becoming 20 ft. tall, *Johnston & Muller 521;* Sierra Hechiceros, Cañon Indio Felipe, spreading tree, becoming 25–30 ft. tall, *Johnston & Muller 1341, 1342;* Sierra Hechiceros, Cañon Indio Felipe, along creek and on hillsides, becoming 15 m. tall, *Stewart 167, 182;* Sierra Hechiceros, Cañon Madera, canyon-bottoms and flats, becoming spreading tree 25–30 ft. tall, *Johnston & Muller 1284, 1285, 1289, 1293;* foothills of Sierra Cruces, along arroyo 2 mi. east of Santa Elena, clumps 10 ft. tall, *Johnston & Muller 798;* Sierra Cruces foothills, Boquilla east of Santa Elena, small colony along arroyo-bank, shrub 3–4 m. tall, *Stewart 2269.* CHIHUAHUA: Sierra Rica, Cañon Madera, open slopes and arroyo-banks, abundant tree 5 m. tall, trunk 4 dm. thick, *Stewart 2463, 2548;* 1½ mi. west of Tepopote, tree along arroyo, 35 ft. tall, *Johnston & Muller 1397;* 1 mi. west of San Salvador, large trees along arroyo, becoming 35 ft. tall, trunk 18 inches thick, *Johnston & Muller 1398, 1399;* about bouldery hills on gravelly plain west of Pirámide, common tree 25–30 ft. tall, *Johnston & Muller 1422, 1423, 1424;* 7 mi. south of Pirámide, tree on north slope of grassy hills, 20–25 ft. tall, *Johnston & Muller 1428, 1429;* canyon north of Mesteñas, broad spreading tree 20–25 ft. tall, common on flats and slopes, *Johnston 7955.*

Ranging from Arizona east to trans-Pecos Texas and south into northern

Mexico. Characterized by a combination of furrowed gray bark, dingy gray pubescent leaf-blades oblong to ovate in outline, and usually short-stalked fruit. In eastern Coahuila at times difficult to distinguish from *Q. Mohriana*. Frequently distinguished with difficulty from *Q. invaginata* and *Q. subcordata* of eastern Coahuila and of central and southern Coahuila.

Quercus chihuahuensis Trel. Mem. Nat. Acad. **20**: 85. *t. 129, 130* (1924).
Quercus undata Trel. Mem. Nat. Acad. 20: 86. *t. 135* (1924).

VERNACULAR NAME: Encino.

CHIHUAHUA: Sierra Organos, large live-oak, 5 m. tall, common on slopes and along arroyos near Organos, *Stewart & Johnston 2068;* rocky hills near Chihuahua, May 8 and Oct., 1885, *Pringle 74, 355* (ISOTYPE).

Ranging along the Sierra Madre in Chihuahua and Sonora south to Durango and Sinaloa and extending eastward into our area. Trelease, l. c., reports a collection (*Pringle 970*) from the Mapula Mts. The species is characterized by its dense covering of long buff-colored pubescence on leaves and twigs. It is rather closely related to *Q. grisea* but is readily distinguished by its soft almost felt-like indument.

Quercus Mohriana Buckl. ex Rydb. Bull. N. Y. Bot. Gard. 2: 219. *t. 31* (1901), exclusive of Mexican specimens cited, which are *Q. intricata* Trel.

VERNACULAR NAME: Encino.

COAHUILA: Rancho Agua Dulce, lower slopes of Sierra San Manuel, *Wynd & Mueller 306, 307;* Santo Domingo, open slope of igneous hill, *Wynd & Mueller 483;* Santo Domingo, limestone hill, *Wynd & Mueller 451;* Palm Canyon, *Marsh 373;* ravines near Puerto Santa Ana, *Wynd & Mueller 232, 233;* Hillcoat Mesa lying west of Encantada Ranch, July 25, 1938, *Marsh 1427, 1431;* Hillcoat Canyon, west of Buena Vista Ranch, July 13, 1938, *Marsh 1295, 1296;* high mesa in the Sierra Encantada about 16 km. northwest of Rancho Buena Vista, common on rocky hillside, shrub 15 dm. tall, *Stewart 1442;* Valle de los Guajes, 10 km. south of Rancho Buena Vista, common on grassy hillside, shrub 2–3 m. tall, *Stewart 1357;* El Berrendo, shrub or small tree, *White 1798, 1858.*

Ranging in Texas from the western Edwards Plateau and The Breaks of the Plains west to the Glass Mts. and south in the trans-Pecos area into northeastern Coahuila. It is characterized by having its oblong leaves rather dark green above and creamy white with dense tomentum beneath, cf. Muller, Am. Midl. Nat. **24**: 708. *fig. 2* (1940). In Coahuila a variety of shade forms are confusing because of their expanded leaves with light tomentum, but even in these the dual coloration is constant, as are also the more fundamental characters of the species.

Quercus undulata Torr. Ann. Lyceum N. Y. 2: 248. *t. 4* (1828).
Quercus Fendleri Liebm. Overs. Danske Vidensk. Forhandl. **1854**: 170 (1854).
Quercus undulata γ *pedunculata* A. DC. Prodr. 16^2: 23 (1864).
Quercus undulata β *obtusifolia* A. DC. Prodr. 16^2: 23 (1864).
Quercus venustula Greene, Ill. West Amer. Oaks 69. *t. 32* (1890).
Quercus obtusifolia Rydb. Bull. N. Y. Bot. Gard. 2: 213. *t. 29* (1901), non Don (1825).
Quercus Rydbergiana Cockerell, Torreya 3: 7 (1903).
Quercus undulata Rydbergiana Cockerell, Torreya 3: 86 (1903).
Quercus confusa Woot. & Standl. Contr. U. S. Nat. Herb. **16**: 116 (1913).
Quercus media Woot. & Standl. Contr. U. S. Nat. Herb. **16**: 116 (1913).

Quercus subobtusifolia A. Camus, Bull. Soc. Bot. France 81: 816 (1934).
Quercus carmenensis Muller, Am. Midl. Nat. 18: 847 (1937).

COAHUILA: Sierra del Carmen, Cañon Sentenela, high slopes with northwest exposure, *Wynd & Mueller 633, 635, 639* (isotype of *Q. carmenensis*).

Ranging from Arizona and Colorado through New Mexico and trans-Pecos Texas into northern Coahuila. There is a possibility that eventually it may be found in the higher mountains of Chihuahua. The species has been variously interpreted and has been one of the most problematic in the southwestern United States and adjacent Mexico. The type collection resembles a form of *Q. grisea* and even looks a bit like *Q. pungens*. Growing in the same locality and radiating out over the entire range of the species are a dozen or more forms of it, some of which have been described as distinct species. The fact that the type collection came from a form of the species characteristic of xeric sites at lower elevations has caused it to be confused with *Q. grisea* and *Q. pungens* and has obscured its true relationships with *Q. Gambelii*. A study of many populations of this variable species in the field (including the type locality) has shown clearly that the form illustrated as *Q. venustula* by Greene is the most common form. It represents a form morphologically about midway between *Q. Gambelii* and the type of *Q. undulata*. *Quercus obtusifolia* is a form of *Q. undulata* even nearer to *Q. Gambelii* than *Q. venustula*. *Quercus carmenensis*, on the other hand, is an even more extreme variant in another direction. A thoroughly conservative treatment permits the recognition of both *Q. Gambelii* and *Q. undulata*, for the two assemblages involved show definite genetic differences; they often occur intermingled in the same habitat without intermediate forms. The narrow shallowly lobed leaves and obligate shrub-habit of *Q. undulata* and its tendency to frequent open drier and lower sites readily distinguish it from the arboreal (sometimes shrubby) *Q. Gambelii*, with its broad deeply lobed leaves.

Quercus Gambelii Nutt. Jour. Acad. Nat. Sci. Phila. n. s. 1: 179 (1848).
Quercus alba β ? *Gunnisonii* Torr. Pac. R. R. Rep. 2[1]: 130 (1855).
Quercus stellata δ *Utahensis* A. DC. Prodr. 16[2]: 22 (1864).
Quercus Douglasii β *Gambelii* A. DC. Prodr. 16[2]: 23 (1864).
Quercus Douglasii γ *Novomexicana* A. DC. Prodr. 16[2]: 24 (1864).
Quercus undulata var. *Gambelii* Engelm. Trans. St. Louis Acad. 3: 382, 392 (1876–77).
Quercus utahensis Rydb. Bull. N. Y. Bot. Gard. 2: 202. *t. 25* (1901).
Quercus submollis Rydb. Bull. N. Y. Bot. Gard. 2: 202. *t. 25* (1901).
Quercus Vreelandii Rydb. Bull. N. Y. Bot. Gard. 2: 204. *t. 26* (1901).
Quercus leptophylla Rydb. Bull. N. Y. Bot. Gard. 2: 205. *t. 26* (1901).
Quercus Gunnisonii Rydb. Bull. N. Y. Bot. Gard. 2: 206. *t. 25* (1901).
Quercus nitescens Rydb. Bull. N. Y. Bot. Gard. 2: 207. *t. 27* (1901).
Quercus novomexicana Rydb. Bull. N. Y. Bot. Gard. 2: 208. *t. 27* (1901).
Quercus Eastwoodiae Rydb. Bull. N. Y. Bot. Gard. 2: 210. *t. 28* (1901).
Quercus pauciloba Rydb. Bull. N. Y. Bot. Gard. 2: 215. *t. 30* (1901).
Quercus utahensis var. *submollis* Sargent, Bot. Gaz. 65: 442 (1918).
Quercus Marshii Muller, Am. Midl. Nat. 18: 848 (1937).

COAHUILA: Sierra del Carmen, Sept. 12, 1933, *Marsh 823;* Sierra del Carmen, Cañon Sentenela, high slope with northwest exposure, *Wynd & Mueller 640* (isotype of *Q. Marshii*).

Ranging from South Dakota to Nevada and south into Coahuila and Chihuahua. A species fully as polymorphic as *Q. undulata*, as its list of synonyms attests. Nomenclatorial recognition for the various forms of *Q. Gambelii* seems impractical, for they occur haphazardly throughout the range of the species and are always connected by intermediates. In the southern part of its range *Q. Gambelii* is confined to very high mesic elevations, being particularly common about talus slopes.

Quercus Muehlenbergii Engelm. Trans. St. Louis Acad. 3: 391 (1877).
Quercus Prinus (*acuminata*) Michx. Hist. Chênes Amer. Sept. (20). *t. 8* (1801).
Quercus castanea Mühl., Neue Schr. Ges. Naturf. Fr. Berlin 3: 396 (1801), non Nees (1801, earlier in the year).
Quercus castanea var. *macrophylla* Hampton, Report Ohio State For. Bur. 1: 195 (1886).
Quercus acuminata Sargent, Gard. & Forest 8: 93 (1895).
Quercus Brayi Small, Bull. Torr. Bot. Cl. 28: 558 (1901); Muller, Am. Midl. Nat. 24: 714. *fig. 8* (1940).
Quercus Muehlenbergii var. *Brayi* Sargent, Bot. Gaz. 65: 442 (1918).
Quercus sentenelensis Muller, Am. Midl. Nat. 18: 849 (1937).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 629* (isotype of *Q. sentenelensis*); Rancho Agua Dulce, wooded canyon on east slope of Sierra San Manuel, *Wynd & Mueller 347;* Sierra Gloria, *Marsh 1905.*

Ranging from the Atlantic region of the United States through central and western Texas (locally) and south in eastern Coahuila into Nuevo Leon. The differences between *Q. sentenelensis* and other forms of *Q. Muehlenbergii* have not proved constant. In fact, any division of the species seems doomed to failure, even though wide differences exist within the species as here accepted. These differences, however, are poorly if at all correlated with geography and with one another. *Quercus Muehlenbergii* is the only member of the series *Prinoides* (Chestnut Oaks) in our range, and its distinction from other species by its evenly repand-toothed leaves, broadly lanceolate to obovate in outline, is readily evident. In our range it is confined to moist stream banks in mesic mountains.

Quercus fusiformis Small, Bull. Torr. Bot. Cl. 28: 357 (1901); Muller, Am. Midl. Nat. 24: 718. *fig. 10* (1940).
Quercus virginiana var. *fusiformis* Sargent, Bot. Gaz. 65: 448 (1918).

COAHUILA: Highway between Muzquiz and Hac. Mariposa, *Wynd & Mueller 285;* Santa Anna Canyon, *Marsh 518;* Monclova, 1880, *Palmer 1274;* Saltillo, single clump, base of hill, 6–8 ft. tall, 1898, *Palmer 299.*

Edwards Plateau, Texas, south into eastern Coahuila, northern Tamaulipas, and Nuevo Leon. In southern Tamaulipas and Nuevo Leon *Q. fusiformis* gives way to *Q. oleoides* without intermediates. On the eastern escarpments of the Edwards Plateau, in Texas, some intermediates occur connecting *Q. fusiformis* and *Q. virginiana* Mill. This transition between *Q. fusiformis* and *Q. virginiana* is not so pronounced and so complete as between *Q. sinuata* var. *breviloba* and *Q. sinuata* and a comparable reduction of *Q. fusiformis* to varietal rank under *Q. virginiana* does not seem to be required. The species occurs on dry limestone slopes and flats and along streams.

Quercus Emoryi Torr. in Emory, Notes Mil. Reconn. 151. *t. 9* (1848); Muller, Am. Midl. Nat. 24: 718. *fig. 11* (1940).

Quercus hastata Liebm. Overs. Danske Vidensk. Forhandl. 1854: 171 (1854).

Quercus Duraznillo Trel. Mem. Nat. Acad. 20: 122. *t. 220, 221* (1924).

Quercus balsequillana Trel. Mem. Nat. Acad. 20: 123. *t. 220* (1924).

Ranging from Arizona east to trans-Pecos Texas and south along the Sierra Madre in Chihuahua and Sonora. Trelease, Mem. Nat. Acad. 20: 121 (1924), reports the species from the "vicinity of Chihuahua (*Palmer 359*)." The apparent absence of this species in Coahuila and eastern Chihuahua is puzzling, for it is abundant in the Chisos Mts. in adjacent Texas, and its common associates in the Chisos, *Q. grisea* and *Q. pungens*, range well south into our area. The small commonly hastate leaves of this species, usually glabrous except for tufts of hair on the lower surface of the blade along the base of the midrib, and its small annual fruits adequately distinguish *Q. Emoryi* from other species of the subgenus *Erythrobalanus* in our area. It is most commonly found on grassy igneous slopes and along waterways in igneous mountains at low elevations.

Quercus saltillensis Trel. Mem. Nat. Acad. 20: 183. *t. 368, 369* (1924).

Quercus carnerosana Trel. Mem. Nat. Acad. 20: 183. *t. 369* (1924).

COAHUILA: San Lorenzo Canyon near Saltillo, April 12, 1906, *Pringle 10229;* Carneros Pass area, up to 30–40 ft. tall, March 1880, *Palmer 1277* (TYPE); Carneros Pass, mountains, Sept. 15, 1889, *Pringle 2802* (isotype of *Q. carnerosana*); Sierra Negras, south of Parras, *Stanford et al. 145.*

Ranging in southern Coahuila and in the Sierra Madre of Nuevo Leon. This shrub is characterized by its annual fruition and by small lanceolate leaves, usually glabrous and entire, or sparsely pubescent beneath and toothed. It is commonly encountered on dry limestone slopes at moderate elevations.

Quercus hypoleucoides A. Camus, Bull. Mus. Hist. Nat. II. 4: 124 (1932); Muller, Am. Midl. Nat. 24: 721. *fig. 13* (1940).

Quercus confertifolia Torr. Bot. Mex. Bound. 207 (1840), non Humb. & Bonpl. (1809).

Quercus hypoleuca Engelm. Trans. St. Louis Acad. 3: 384 (1876), non Miquel (1855).

COAHUILA: Sierra del Carmen, Sept. 12, 1936, *Marsh 831;* Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 533, 564, 637.* CHIHUAHUA: Peña Fea near Chihuahua, *LeSueur 530.*

Ranging from trans-Pecos Texas to Arizona and south into northern Coahuila and along the Sierra Madre in Chihuahua and Sonora. The characteristically narrowly lanceolate leaves, dark green above and densely white-tomentose beneath, distinguish this species. It occurs on moist slopes and along waterways at high elevations.

Quercus hypoxantha Trel. Mem. Nat. Acad. 20: 170. *t. 339* (1924).

Quercus errans f. *graciliramis* Mueller, Jour. Arnold Arb. 17: 169 (1936).

VERNACULAR NAME: Encino.

COAHUILA: Mountains near Saltillo, small tree, 7000 ft. alt., Apr. 12, 1906, *Pringle 10227* (TYPE); 26 km. northwest of Fraile, top of mountain with *Abies, Pseudotsuga* and *Pinus, Stanford et al. 440;* Sierra del Pino, middle of sierra about 10 mi. north of La Noria, scattered in open pine forests and in chaparral on adjacent slopes below ridge-crest, several erect or ascending stems, 4–8 ft. tall, *Johnston & Muller 566, 567;*

Sierra Madera, Cañon del Agua, tree common in moist upper canyons, up to 25 ft. tall, trunk to 10 inches thick, *Muller 3232;* Sierra Madera, Cañon del Agua, shrub or small tree with hard black checkered bark on branches, abundant in dense oak chaparral on steep slopes at 8000 ft., up to 20 ft. tall, trunks becoming 3 in. thick, *Muller 3213;* Sierra Madera, Cañon del Agua, shrub or small tree, to 20 ft. tall, trunk 3 in. thick, dense pine-oak forest, *Muller 3214;* Sierra Madera, high crest of main ridge east of Picacho Zozaya, open forests, common, shrub 5–8 ft. tall, *Johnston 9021;* Sierra Madera, Cañon Charretera, lower parts of conifer-forests, tree or shrub 8–10 ft. tall, *Johnston 9054.* CHIHUAHUA: Sierra Diablo, 12–14 km. up Cañon Rayo, common on banks of dry arroyo, shrub 5–8 m., *Stewart 921, 921a, 924;* 15 km. up Cañon Rayo, Sierra Diablo, common tree on dry hillside, 10 m. tall, *Stewart 931.*

Ranging from southeastern Chihuahua eastward in the higher mountains of central and southern Coahuila into Nuevo Leon. It occurs usually at high elevations in relatively dry mountains. The species is distinguished by its biennial fruition and its coarsely dentate coriaceous leaves with strongly revolute margins and densely fulvous-tomentose lower surfaces.

Quercus Gravesii Sudw. U. S. Dept. Agric. Misc. Cir. **92**: 86 (1927); Muller, Am. Midl. Nat. **24**: 724. *fig. 16* (1940).

Quercus coccinea var. *?microcarpa* Torr. Bot. Mex. Bound. 206 (1859).

Quercus texana var. *chesosensis* Sargent, Bot. Gaz. **65**: 423 (1918).

Quercus texana var. *stellapila* Sargent, Bot. Gaz. 65: 424 (1918).

Quercus stellipila Parks in Cory, Rhodora 38: 405 (1936).

Quercus chesosensis Muller, Am. Midl. Nat. **18**: 850 (1937).

VERNACULAR NAMES: Encino colorado; Encino.

COAHUILA: Sierra del Carmen, Aug. 26, 1936, *Marsh 591;* Jardin del Sur, Sept. 3, 1936, *Marsh 768;* Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 534, 600, 608, 651;* near Piedra Blanca, igneous hills, *Wynd & Mueller 500;* open country between Santo Domingo and Piedra Blanca, *Wynd & Mueller 493;* Rancho Agua Dulce, Sierra San Manuel, *Wynd & Mueller 234, 330, 383;* ravines near Puerto Santa Ana, *Wynd & Mueller 234;* Palm Canyon, *Marsh 369;* Sorpresa Spring, *Marsh 337;* Sierra Gloria, *Marsh 1965, 2001;* Bocatoche, north slope of Sierra del Oso, abundant along arroyo and scattered on slopes, moderate tree up to 30 ft. tall with hard furrowed gray bark and on upper limbs bark in flat plates, *Muller 3135;* Puerto San Lazaro, Sierra San Lazaro, small to moderate tree to 25 ft. tall, trunk 1 ft. thick, abundant on talus slopes, *Muller 3086, 3087;* northwest slopes of Sierra San Lazaro, *Wynd & Mueller 167, 168, 171;* Hillcoat Canyon west of Buena Vista, July 13, 1938, *Marsh 1275, 1297;* Hillcoat Mesa lying west of Encantada Ranch, July 25, 1938, *Marsh 1429;* Cañon San Enrique, eastern side of Sierra Encantada west of Rancho Buena Vista, common on hillsides, shrub up to 4 m. tall, *Stewart 1392, 1403;* Sierra del Pino, La Noria, common along arroyos, in clumps with 10–20 small trunks from one root, 10–15 ft. tall, *Johnston & Muller 438;* Sierra del Pino, central parts of sierra north of La Noria, dense pine forests and along arroyos, becoming 40 ft. tall, trunk 18 inches thick, *Johnston & Muller 558;* Sierra del Pino, Cañon Ybarra, fairly common on arroyo-banks, tree 5 m. tall, *Stewart 1868;* escarpment on west side of Potrero de la Mula, common tree on middle slopes, 10–20 ft. tall, *Johnston 9209;* Sierra Madera, Cañon Charretera, common tree or large shrub on flats and along arroyos below conifer forests, 20–25 ft. tall, *Johnston 8922;* Sierra Madera, Cañon Charrereta, the common large oak along canyons in the lower parts of the conifer forests, tree 30–40 ft. tall, *Johnston 9045;* Sierra Madera, Cañon Pajarito, abundant constituent of upper arroyo forests, tree to 30 ft. tall, trunk 1 ft. thick, *Muller 3172.*

Ranging from the Davis Mts. in trans-Pecos Texas south to central Coahuila. Until 1936 the species was known only from Texas, but its distribution and abundance in Coahuila are greater than north of the Rio Grande. The deeply incised leaves, with scant pubescence except in the

axils of the veins beneath, and the scarlet color of the foliage in the autumn are very suggestive of *Q. texana* Buckl. and *Q. coccinea* Muench. These characters amply distinguish the species from all others in our range. It is common and conspicuous in mesic forests in canyons in both limestone and igneous mountains.

In addition to the twenty-four species listed above, a number of other species probably occur in our area and may be expected about its margins. A large number of oaks are characteristic of the mountains of Nuevo Leon and of the highlands of western Chihuahua and Durango, and some of them are no doubt present in the poorly botanized mountains of southeastern Coahuila and on the hills and mountains along our western border. Trelease has described and illustrated many of these species in his monograph. Notes and descriptions of additional species of this flora have been published by Muller, Jour. Arnold Arb. 17: 160–179 (1936) and Am. Midl. Nat. 27: 470–490 (1942). Among the oaks of western Texas, illustrated, described, and discussed by Muller, Am. Midl. Nat. 24: 703–728 (1940), there are five species which may be expected in northern Coahuila and Chihuahua: *Q. Vaseyana, Q. turbinella, Q. Tharpii, Q. graciliformis,* and *Q. robusta.* The three last-named are known only from the Chisos Mts.

ULMACEAE

Ulmus multinervosa Muller, Am. Midl. Nat. 18: 842 (1937).

COAHUILA: Rancho Agua Dulce, wooded canyon on eastern slope of Sierra San Manuel, small or moderate-sized tree up to 15 m. tall, *Wynd & Mueller 338* (ISOTYPE).

This species of elm is known only from the type locality. It is closely related to *U. divaricata* Mueller of the Sierra Madre south of Monterrey.

In the Sierra Madera, in central Coahuila, just west of Hacienda del Sierra Madera, there is a canyon called "Cañon del Ulmo." I have been informed by local people that the tree giving the canyon its name is not known to grow elsewhere in the region centering about Ocampo. It may possibly represent *U. multinervosa.*

Celtis pallida Torr. Bot. Mex. Bound. 203 (1859).

VERNACULAR NAMES: Granjeno; Acebuche.

COAHUILA: Allende, *Marsh 1807;* 11 mi. south of Allende, *Johnston 7014;* Hac. Mariposa, *Wynd 671;* Rancho Babia, *Marsh 1202;* Santa Anna Canyon, *Marsh 468;* Muzquiz, *Marsh 2106;* Monclova, *White 1752;* San Francisco, about 50 mi. south of Monclova, *Wynd & Mueller 95;* Cuatro Cienegas, *White 1880;* 9 mi. northwest of El Oro, road to Sierra Mojada, *White 1978;* 11 km. northeast of Jimulco, *Stanford et al. 83a.* CHIHUAHUA: Near Lake Santa Maria, 1899, *Nelson 6427;* near Chihuahua, 1908, *Palmer 113;* Meoqui, 1936, *LeSueur 597;* near Ojito, 1847, *Gregg;* Ojo de San Bernardo, 1847, *Gregg.*

A dense bush 2–4 m. tall, with stiff intricate spinescent branches, which is common in rocky soil, especially along arroyos and on the higher slopes of broad valleys. The small orange-colored drupes are edible. The species ranges from south-central Texas to southern Arizona and south in the arid parts of Mexico to Oaxaca, and from southern Florida south in the drier

parts of the West Indies. Benson, Am. Jour. Bot. 30: 236 (1943), has recently taken up the name *C. tala* var. *pallida* (Torr.) Planch. as the proper one for our plant. The North American species is related to the shrub of southern South America, but can be separated by its firmer, scabrid, usually opaque, usually smaller, less toothed leaves and less spinescent branchlets. In a genus in which specific characters are notoriously few and weak, the differences seem reasonably adequate for the continued recognition of our North American plant as specifically distinct. The South American species is much more variable than *C. pallida*. As Baehni, Candollea 7: 202 (1936), has indicated, the proper name for the southern species is not *C. tala* Gillies (1849), but *C. spinosa* Spreng. (1825).

Celtis Lindheimeri Engelm. ex Koch, Dendr. 2: 434 (1872).

VERNACULAR NAME: Palo blanco.

COAHUILA: Hac. Mariposa, *Wynd & Mueller 258;* Yerda Spring, Muzquiz, *Marsh 263;* Monclova, *White 1705;* Sierra Gloria, *Marsh 2218;* Sierra Hechiceros, Cañon Indio Felipe, *Stewart 179.*

A tree distinguished in our area by its ovate leaves, which are distinctly cordate at the base, rough above, hairy beneath, and at times dentate on the margins. The original material of this species, from near New Braunfels, Texas, has its leaves somewhat more abundantly hairy beneath but is otherwise similar to the specimens from Coahuila.

Celtis laevigata Willd. var. **brachyphylla** Sargent, Bot. Gaz. 67: 225 (1919).

VERNACULAR NAME: Palo blanco.

COAHUILA: Allende, *Marsh 1811;* Hac. Mariposa, *Wynd & Mueller 261;* Monclova, *Marsh 1707;* Sierra Gloria, *Marsh 1983;* Cañon Bocatoche, *Muller 3121;* Saltillo, 1898, *Palmer 160;* Sierra Guajes, Cañon Milagro, *Stewart 1727;* Sierra del Pino, Cañon Ybarra, *Stewart 1829;* canyon at San Antonio de los Alamos, *Johnston & Muller 953.*

This is a form of *C. laevigata* differing from the typical form in having shorter and proportionately broader leaves. The usually ovate leaves are bright green, smooth and glabrous above, and glabrous or practically so beneath. The petioles are usually glabrous. It appears to be confined to the western borders of the range of typical *C. laevigata,* in eastern Coahuila and adjacent Texas.

Celtis reticulata Torr. Ann. Lyc. N. Y. 2: 247 (1828).

VERNACULAR NAME: Palo blanco.

COAHUILA: Jardin del Sur, *Marsh 774;* Yerda Spring, Muzquiz, *Marsh 264;* Cañon Bocatoche, *Muller 3121a;* trail between south end of Hillcoat Mesa and Buena Vista, *Marsh 1499, 1500;* Sierra Cruces, Cañon Tinaja Blanca, *Stewart 2256;* 3 km. southeast of Santa Elena, *Stewart 364;* Carrizo, south base of Sierra Cruces, *Stewart 2169.* CHIHUAHUA: Chihuahua, 1908, *Palmer 148;* 32 mi. north of Escalon on road to Jimenez, *White 2074.*

A common and characteristic plant of the plateau, growing singly or in small groves along arroyos. An unkempt tree of rather disconsolate appearance, usually 3–5 m. tall. The cited specimens represent the form of the species found in trans-Pecos Texas. Its pallid thickish rigid leaves vary from lanceolate to ovate. They are scabrid above and hairy beneath. The species intergrades with *C. laevigata* var. *brachyphylla* and *C. Lindheimeri,*

but seems to be a plant of the higher more arid country to the west of these species.

MORACEAE

Morus microphylla Buckl. Proc. Acad. Nat. Sci. Phila. 1862: 8 (1863).

Morus microphilyra Greene, Leaflets 2: 120 (1910).

VERNACULAR NAME: Mora.

COAHUILA: Sorpresa Spring, Hacienda Mariposa, *Marsh 340;* Cañon Milagro, Sierra Guajes, tree 4 m. tall, *Stewart 1712;* San Antonio de los Alamos, watered canyon, tree 10–20 ft. tall, *Johnston & Muller 919, 920, Johnston 8263;* Cañon Indio Felipe, Sierra Hechiceros, tree 3–7 m. tall in watered canyon, *Johnston & Muller 1347, Stewart 162, 1347.* CHIHUAHUA: 1 km. southeast of Rancho Madera, southeast base of Sierra Rica, tree 4 m. tall, *Stewart 2449;* Chihuahua, river bank, bush to small tree, fruit black, edible, 1908, *Palmer 149;* side canyons off Sacramento River northeast of Chihuahua, April 6, 1886, *Pringle 707;* Santa Eulalia hills, Apr. 4, 1886, *Wilkinson;* west of Meoqui, 1936, *LeSueur 598.*

A tree, usually along streams, ranging from central Texas to Arizona and south to northeastern Sonora and northern Nuevo Leon. The species is somewhat variable in leaf-shape. The type of *M. microphilyra* was based on collections from the "Santa Eulalia Plains" collected by Wilkinson in 1885.

Morus alba L. Sp. Pl. 986 (1753).

VERNACULAR NAME: Mora.

COAHUILA: Hermanas, 1939, *Marsh 1600;* Monclova, 1939, *White 1778.*

The above-cited specimens are probably from plants growing under cultivation.

Morus rubra L. Sp. Pl. 986 (1753).

COAHUILA: Saltillo, 1887, *Sargent.*

Morus celtidifolia H.B.K. Nov. Gen. et Sp. 2: 33 (1817).

VERNACULAR NAME: Moral (Gregg).

COAHUILA: Saltillo, March 29, 1844, *Gregg;* Saltillo, 1905, *Palmer 563;* Saltillo, 1887, *Sargent.*

A species of central Mexico extending north to Monterrey and west into Coahuila.

URTICACEAE

Boehmeria cylindrica Sw. var. **Drummondiana** Wedd. in DC. Prodr. 16[1]: 202 (1869).

COAHUILA: Muzquiz Swamp, *Marsh 909.*

Entering our area from Nuevo Leon and eastern and southern Texas.

Parietaria floridana Nutt. Gen. Pl. 2: 208 (1818).

COAHUILA: Sierra del Carmen, Cañon Sentenela, *Wynd & Mueller 623;* Hermanas, *Marsh 1598;* Muzquiz, *Marsh 2114;* 6 mi. east of Saltillo, 1880, *Palmer 1267;* Saltillo, 1898, *Palmer 133;* west end of Sierra Madera, canyon 2 km. southeast of Puertecito, *Johnston 9315;* San Antonio de los Alamos, *Johnston 8267;* Sierra Cruces, Cañon Tinaja Blanca, *Stewart 2260;* arroyo cut in gypsum near Santa Elena, *Johnston & Muller 234;* Sierra Mojada, near head of Cañon Calabasa, *Stewart 2211.* CHIHUAHUA: Sierra Santa Eulalia, 1885, *Pringle.*

A weak, usually sprawling herb growing in sheltered places in arroyos or about cliffs; not common. Widely distributed across southern parts of the United States and in northern Mexico.

Urtica gracilenta Greene, Bull. Torr. Bot. Cl. 8: 122 (1881).
Urtica granulosa Blake, Jour. Wash. Acad. 14: 284 (1924).

COAHUILA: Cañon Calabasa, Sierra Mojada, rocky arroyo in deep canyon, in shade, not common, *Stewart 2196*.

Arizona to trans-Pecos Texas (Davis Mts.) and southward in the Sierra Madre of Chihuahua.

Urtica chamaedryoides Pursh, Fl. Am. Sept. 113 (1814).

COAHUILA: Muzquiz, Dec. 5, 1936, *Marsh 1054, 1056*.

Ranging from the eastern United States south to southern Mexico.

Urtica spirealis Blume, Mus. Bot. Lugd.-Bat. 2: 152 (1856).

COAHUILA: Sierra Gloria, *Marsh 1961*.

Ranging from Tamaulipas and Nuevo Leon south to central Mexico. The type was collected between Tampico and Real del Monte (*Berlandier 349*). The material from Coahuila has few stinging hairs and has the lower leaf-surfaces with fine appressed hairs. Similar forms have been collected in Nuevo Leon and Tamaulipas, as has also the greener typical form with abundant stinging hairs. Some forms of the species seem to differ from *U. chamaedryoides* chiefly in having the aments slender and elongate rather than dense and glomerate.

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THE COMPARATIVE MORPHOLOGY OF THE WINTERACEAE
VI. VASCULAR ANATOMY OF THE FLOWERING SHOOT

Charlotte G. Nast

With four plates and one text-figure

Two previous papers (Bailey and Nast, 2, 3) of this series have dealt with the vascular anatomy of the stamens and carpels of the Winteraceae. In order to complete a floral anatomical study of the family, the present paper will be devoted to an examination of the pedicellar and toral vascular systems and to a discussion of certain implications arising from that examination.

MATERIAL AND METHODS

Herbarium material of twenty-six species of *Drimys, Bubbia, Pseudowintera,* and *Belliolum* was available for dissection and sectioning. *Zygogynum* and *Exospermum* are not included because no adequate floral specimens were obtainable. Although serial sections were indispensable for tracing the details of the intricate vascular system, flowers cleared in a weak solution of NaOH (Bailey and Nast, 2) were helpful in observing the general vascular pattern and for checking with the sectioned specimens. All material was first heated in water and then treated in NaOH before embedding in paraffin. The NaOH not only restores the specimens most nearly to their original size and shape, but also frees the cells from extraneous substances, which interfere with the clarity of the vascular strands. The usual alcohol-xylene-paraffin embedding method was followed. Slides were stained with Haidenhain's haematoxylin and safranin and mounted in clarite.

The vascular cylinder was drawn as if opened and flattened out in *figures 7, 9,* and *12,* and the vascular strands were depicted to show as nearly as possible their approximate size and the size of the interfascicular regions. Some slight distortions occur in order to make room for appendage traces. Small traces are somewhat enlarged for clarity in reproduction. In *figure 11* the toral bundles are represented by xylem and phloem, and the traces by xylem only.

TERMINOLOGY

It will be necessary, before beginning a description of the floral anatomy, to discuss the terminology used in this article. There has been great confusion and looseness in the use of stelar nomenclature. It seems desirable, therefore, to refer to the original use of stelar types to determine the most appropriate term for the many-bundled angiospermic stele. In 1899 Jeffrey (7) used *siphonostele* as referring to a tubular vascular axis in contrast to protostele. He subdivided the siphonostele into *phyllosiphonic* stele, one with foliar gaps, and *cladosiphonic* stele, one with ramular or branch gaps

and no foliar gaps. The siphonostele may be either *ectophloic* or *amphiphloic* (8). When the siphonostelic central cylinder ". . . ceases to be obviously tubular . . ." he referred to it as *adelosiphonic* (9). In 1901 Gwynne-Vaughan (6) defined the term *solenostele* as ". . . a single hollow cylinder with phloem and phloeoterma on either side, the complex continuity of which is interrupted only by the departure of the leaf-traces; the gaps thus produced being closed up in the internode above before the departure of the next leaf-trace." He further stated that "According to Jeffrey's terminology, solenostely would be regarded as a special type of *amphiphloic phyllosiphony*." Thus the tendency to consider solenostele and siphonostele as synonymous is erroneous if original definitions are to be considered. In 1902, Brebner (4) used the term solenostele according to Gwynne-Vaughan's definition and coined the new term *dictyostele*, "A vascular tube with large 'overlapping' leaf-gaps, so that the whole structure becomes a network of vascular strands or meristeles. The meristeles are concentric." He further defined dictyostele ". . . as *siphonic* when the network is simple or tubular and *adelosiphonic* when complex, i. e., ceasing to be obviously tubular." The erroneous use of dictyostele in anatomical articles and in textbooks as a term for a dissected siphonostele with either collateral or bicollateral bundles is unfortunate, since Brebner was very definite in stating that the bundles of a dictyostele are *concentric*. Furthermore he applied dictyostele to a special type of *fern* stele, and used the term *eustele* for vascular cylinders such as are present in most angiosperms. His definition, "It (eustele) consists of a ring of collateral or bicollateral meristeles, and includes the pericylic and medullary ground tissue," very clearly refers to the "dissected" angiospermic type of stele. The inclusion of pericycle in the definition is unfortunate because of the present-day controversy over the true nature of the pericycle. However, eustele seems to be the most appropriate term and will be used in this article.

Recent work has brought out the fact that dicotyledonous steles are composed of the lower extensions of leaf-traces and, except in certain aquatics, are not made up of cauline bundles but of foliar ones. Thus, there is no procambial nor vascular tissue above the last-formed leaf, and there is an increase in the number of bundles of the stele progressively down the stem as the number of leaves attached to the stem increases. If viewed in three dimensions, the *primary* vascular system is a series of leaf-traces, the lower extensions of which form a eustele whose bundles are arranged cylindrically. Within this stele anastomoses of bundles occur in various ways depending upon the species of plant. It is questionable, therefore, whether foliar gaps, comparable to those found in siphonostelic ferns, are recognizably present in a *primary* vascular cylinder of the eustelic type. In any case, the parenchymatous interfascicular parts of such a stele are so diverse and extensive that the limits of hypothetical foliar gaps are not detectable. Clearly definable gaplike structures appear only after the formation of secondary tissue and are then parenchymatous lacunae in the *secondary* body. Since the flower is a shoot whose primary vascular stele is formed by strands

of the appendages in basically the same manner as in a vegetative apex, and since the association of the traces with the interfascicular regions may be very complex, the term gap will not be used. The parenchymatous regions between the bundles will be referred to as *interfascicular regions*.

Leaf-trace has been used as a collective term for all strands "entering" a leaf (European and older workers), and also for each strand to a leaf, or each strand or strands from a single "gap" (American and more recent workers). For reasons which will become apparent in the text, the concept of a single strand as a trace will be followed here, the trace being that part of the strand between the base of the appendage and its point of departure from the stele or from a cortical bundle (see below). Thus, strands which divide in the cortex will be considered *double traces*, whereas stelar bundles which divide and give rise to two or more strands within the stele and then exit as separate strands will be considered as separate traces. Furthermore, bundles which "leave" the stele and later divide in the cortex into two or more traces that "enter" *different* appendages will be called *cortical bundles*.

INFLORESCENCES

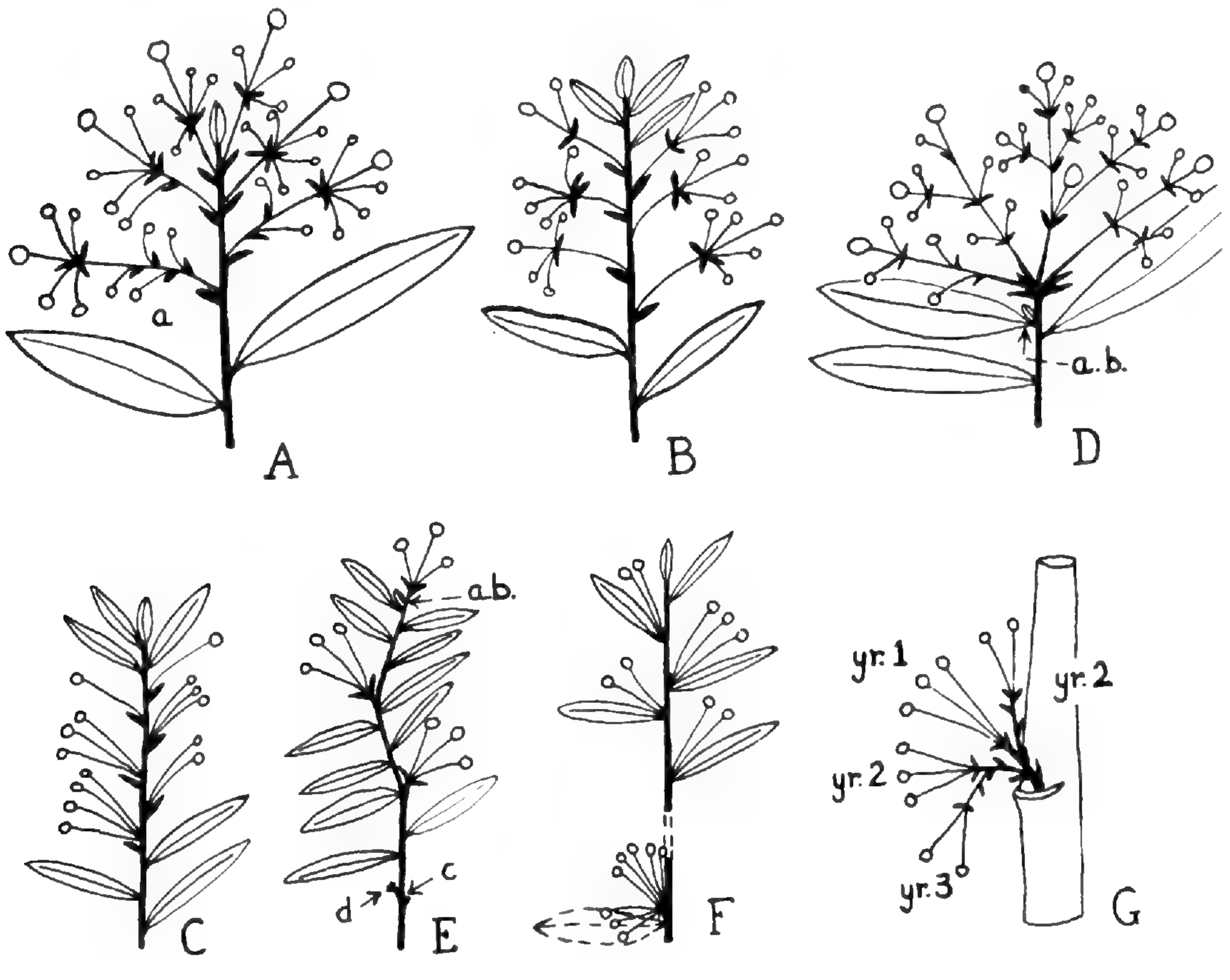
According to Parkin's (10) terminology, the inflorescences of the Winteraceae are either intercalary or pseudoterminal. The latter type gives rise to a sympodial branching system, whereas the intercalary type produces a monopodial branching system. The inflorescences of *Drimys* are intercalary, that is, the inflorescences are borne in axils of bracts (or occasionally leaves) below the terminal bud, which later produces leaves and inflorescences in alternate periods of growth. The flowers of *Drimys* Section *Wintera* are variable in number in each of the cyme-like inflorescences and are usually pedunculate. The whole group of axillary inflorescences may give the appearance of an umbel-like structure, especially before the terminal bud has developed into foliage (*text-fig. A*). In *D. granadensis* var. *grandiflora* Hieron. (*text-fig. A*) each inflorescence consists of an apical flower, below which is a whorl of a variable number of flowers subtended by bracts. The number of these bracts does not necessarily correspond to the number of flowers they subtend. Below this whorl there may or may not occur one to four spirally arranged flowers (*a*), each subtended by a bract. An examination of the American species of *Drimys* reveals that a reduction from this rather complex type of inflorescence evidently has occurred in this group until only two or three flowers remain in the inflorescence (*D. brasiliensis* var. *campestris* (St. Hil.) Miers) (*text-fig. B*).

In the Section *Tasmannia* of *Drimys* the flowers are borne singly or in fascicles of two to four flowers (usually three). A bract (occasionally a leaf, e. g. *D. Brassii*) subtends each flower or fascicle. These flowers are without peduncles (*text-fig. C*).

The inflorescence of *Bubbia* consists of cyme-like pedunculate flower-groups developing in axils of bracts at the terminus of a branch (*text-fig. D*). The branch continues its growth from a bud in the axil of a leaf

immediately below the inflorescence (*a.b.*). It is the pseudoterminal inflorescence as defined by Parkin, who cites species of "*Drimys*" (really species of *Bubbia* and *Belliolum*) as examples. The pseudoterminal inflorescence, according to Parkin, has developed from an intercalary type by the abortion of the terminal bud. In other words, a group of axillary inflorescences are congested at the apex of a stem and the structure as a whole appears to be terminal because the apical bud is absent. The number of flowers in the inflorescences of *Bubbia* varies considerably; thus, there is formed a series of inflorescences from very complex, much branched types to fairly simple types with only a slight amount of branching. Occasionally an inflorescence is borne in the axil of a leaf (e. g. in *B. longifolia* A. C. Sm.) below the pseudoterminal flower-cluster.

Belliolum has pseudoterminal inflorescences very similar to those of *Bubbia* and also with great variation in the complexity of the flower-cluster. However, many species have inflorescences reduced to three non-pedunculate flowers (*text-fig. E*) and with only two bracts present. The inflorescence-bearing shoot persists after the development of the vegetative bud and usually appears to be lateral on older branches (*d*).



FIGS. A–G. Diagrams of inflorescences. A. *Drimys granadensis* var. *grandiflora* Hieron.; B. *D. brasiliensis* var. *campestris* (St. Hil.) Miers; C. *Drimys* Section *Tasmannia;* D. *Bubbia;* E. *Belliolum Kajewskii* A. C. Sm.; F. *Pseudowintera;* G. *Pseudowintera:* short shoot drawn with elongated internodes to show nature of branching. *a.* spiral flowers; *a. b.* axillary buds; *c.* leaf scar; *d.* inflorescence scar; *yr. 1, 2, 3.* seasonal growth of short shoot.

The inflorescences of *Exospermum* and certain species of *Zygogynum* are essentially similar to the more reduced forms found in *Belliolum*. In other species of *Zygogynum* (*Z. Vieillardi, Z. Bailloni, Z. bicolor*) the flowers are solitary and terminal. If Parkin is correct in assuming that the pseudoterminal inflorescences of *Bubbia* and *Belliolum* were derived by the loss of the terminal buds from the intercalary inflorescences of *Drimys*, then the solitary terminal flower of *Zygogynum* must be an evolved form. It could not be a primitive terminal flower as Parkin contends. Growth of the axis is continued by an axillary bud basal to the terminal flower.

In *Pseudowintera* the main axis of the branch bears a terminal foliage bud. The flowers are often described as axillary and fasciculate. However, they are actually borne terminally on extremely compressed short shoots which bear several very small reduced bracts (*text-fig. F*). These short shoots are capable of bearing flowers each year for several seasons. Buds in the axils of the bracts produce in the second year of growth other compressed shoots with flowers and bracts. These secondary shoots in turn produce buds in the axils of their bracts, buds which develop the third seasonal growth of flowers. If this short shoot were elongated as drawn in *text-figure G*, it is apparent that the structure is a branching system so reduced that only flowers and bracts are formed. Each segment of this system is comparable to the reduced pseudoterminal inflorescences of *Belliolum, Exospermum,* and *Zygogynum*. However, a foliage shoot may develop from a bud in the axil of a bract in the second growth season instead of a reduced flower-shoot.

PEDICELS

The peduncles, i. e. primary, secondary, or tertiary rays of the inflorescences, usually have well-developed eusteles of a variable number of bundles. This is especially true of *Drimys*. The bracts subtending the inflorescences of *Drimys* have three traces with distinct lacunae in the secondary body (*fig. 1*) except for occasional bracts with two traces. The bracteoles subtending the pedicels of the flowers in *Drimys* also have three traces in most specimens examined, although bracteoles with one trace are fairly prevalent. In *Bubbia,* however, all bracteoles examined have one trace (*fig. 2, A* and *B*), each trace being extremely minute even in large flowers of *Bubbia Clemensiae* A. C. Sm.. These traces in *Bubbia* arise at a higher level than the bracteoles, necessitating a downward bending of the trace for a short distance (*fig. 2, B* and *A*). In laterally borne fasciculate flowers (*fig. 1*) the vascular cylinder of the branch is greater in diameter at those regions where flowers arise. A single bract subtends each flower (*ped.* in *fig. 1, C* and *D*) or each floral cluster. Extra bracts may be present (*fig. 1, A* and *B*). Each thickened area of the stele breaks up into a number of bundles as it leaves the central cylinder and almost immediately assembles into steles of the floral pedicels (flower cluster 3, *fig. 1, F–I*). These pedicels may contain one or two concentric bundles (*fl. cl. 2, fig. 1, H*) or a cylinder of bundles. The number of bundles present in the base of the pedicel varies greatly.

The formation of pedicels from the rays of the inflorescences and the formation of primary, secondary, and tertiary rays in a flower are similar in both *Drimys* and *Bubbia*. The number of bracteoles for each group of flowers varies from two to five in *Drimys* and is constantly two in *Bubbia*. The number of flowers in the cluster, however, is not indicative of the number of bracteoles. The vascular cylinder of the ray or peduncle separates into the steles of the floral pedicels as depicted in *figure 2*. One flower of the cluster is terminal. The number of bundles entering each pedicel varies from two large bundles to well-dissected eusteles (*figs. 3* and *5*). Distinct cylinders are always present in the pedicels of *Belliolum*, and almost always in *Drimys* Section *Wintera*. In *Drimys* Section *Tasmannia* and in *Pseudowintera* the number of bundles is less. Often there are only one, two, or four. Two wide interfascicular regions, one above the bracteolar trace, the other above the attachment of the bundles to the peduncular cylinder, are often retained for long distances in the pedicel (*lg. rays, figs. 4* and *5*). In flattened pedicels these interfascicular regions are located in the flattened sides of the cylinder and the vascular bundles are grouped in the two narrow arcs of the cylinder (*figs. 3* and *4*). However, all large interfascicular regions are not always identical to these interfascicular regions. The bundles of the stele (*fig. 7*) branch and anastomose throughout the length of the pedicel, thus producing new interfascicular regions and eliminating some of the lower ones (*fig. 6*). Accessory interfascicular regions[1] (*acc. r., fig. 7*) are also produced, interfascicular regions which are not related to any external appendage of the pedicel and which are due to a splitting of the bundle. If the interfascicular regions of the pedicel (*fig. 7*) are followed upward into the torus (*fig. 9*), it will be seen that most of them are closed at some level in the torus. Furthermore, many of the interfascicular regions, as well as the accessory ones, extend several internodes and have no relationship to appendages even in the torus. Interfascicular regions of this nature are most prevalent in *Drimys* but occur also to a lesser degree in flowers of the other genera (*acc. r., fig. 12*). Thus the vascular system of the pedicel and the torus should be considered as a network of branching, rebranching, and anastomosing strands rather than as a stereotyped cylinder dissected by the exit of traces to appendages. This interpretation is substantiated by the examination of cleared flowers where the entire vascular system is seen as a unit. It will be made clearer when the torus is examined in detail.

CALYX

Bubbia and *Drimys* are separated taxonomically by their calyces. *Drimys* has a calyptrate calyx with two lobes, rarely three. In *Bubbia* the calyx does not enclose the flower-bud and the number of lobes is more variable (2–9, usually 3). *Belliolum* has an entire or an inconspicuously

[1]Also known as perforations (F. O. Bower. The Ferns. Vol. I. 1923; O. Posthumus. On some principles of stelar morphology. Amsterdam. 1924. Trans.). However, the term perforation gives a connotation of a hole, to which the author objects.

lobed calyx, while *Pseudowintera* has an entire, crenulate, or bilobed calyx (Smith 11, 12, 13). The calycine traces of the Winteraceae are predominantly branches of bundles and not whole bundles of the central vascular cylinder. The traces usually arise from the sides of the stelar bundles, occasionally from the center. More than one trace may be adjacent to the same interfascicular region (center of *fig. 9*), which is widened when the traces "depart."

The number of traces to the calyptrate calyx of *Drimys* varies from five to eleven. Since three traces are found in the leaves, bracts, and most bracteoles, three traces can be considered the basic number for each part of the calyptra. If this is true, then three-fifths of the calyces of *Drimys* examined would be two-parted or bilobed, and two-fifths would be three-parted or three-lobed. This raises a question regarding Dr. Smith's statement (12:6) that the sepals of *Drimys* Section *Wintera* are usually two, *rarely three* in number. However, in buds where the two free tips of the sepals were unbroken, it was found that one sepal received a greater number of traces, four traces in a seven-trace calyptra, often five in an eight-trace calyptra, and six in a ten-trace calyptra. This condition may be interpreted in two ways: (1) the number of traces in the sepal whose tip overlaps the tip of the other sepal has been increased because of size difference of the sepals, or (2) this "outer" sepal is really a composite of two sepals which through phylogenetic changes has already lost externally all indications of its two-parted nature except in rare instances.

The number of traces in the calyx of *Bubbia* varies from three (often double traces) to twelve. Each lobe of the calyx receives, basically, three traces, so that in the specimens examined a calyx with two lobes has usually six traces, with three lobes nine traces, and with four lobes twelve traces. However, there may be fewer or more than the usual three traces to each lobe. For example, in *figure 12* one of the two calycine lobes has one trace which is a double trace, and the other lobe has one double and one single trace.

In *Pseudowintera axillaris* (J. R. & G. Forst.) Dandy, all specimens examined have two traces which arise on opposite sides of the toral stele. Although externally the calyces of the two varieties, *P. axillaris* var. *colorata* (Raoul) A. C. Sm. and *P. axillaris* var. *typica* A. C. Sm. (13), appear different, the vascular anatomy suggests for both a two-parted calyx, each part with one trace. The reduction of trace-number may be correlated with the reduced size of the flower in this genus.

The toral vascular system of *Belliolum* is much more complex than those of the other three genera. Here cortical bundles arise from the stele and divide in the cortex to form traces which enter appendages borne on different levels of the torus. This complex type of toral system is very similar to the condition found in *Himantandra* (1). In *B. haplopus* (Burtt) A. C. Sm. there are nine cortical bundles, each of which usually divides into three parts. The central branch is a calycine trace. The lateral branches unite with laterals from the adjacent cortical bundles to form petaline

traces. But in *B. Burttianum* A. C. Sm. the calycine traces arise directly from the stele and branch, anastomose, and rebranch at the base of the calyx. However, cortical bundles are formed in the region of the petals. In *B. Burttianum* there are seven to nine calycine traces, which are assembled into two groups on opposite sides of the toral cylinder. As this species has an inconspicuous bilobed calyx, in contrast to the essentially entire calyx of *B. haplopus,* the position and not the number of the traces seems to indicate the apparent number of sepals. The number of traces would indicate either two or three sepals. *Belliolum haplopus,* with nine uniformly spaced traces, can be considered as having three sepals.

PETALS

The number of petals in the Winteraceae varies from two (rarely one or none) to many. The number of principal veins per petal is usually three or five, and the number of traces either one or three. Occasionally the inner small petals of a flower may have one or two traces instead of the usual three. All petals of the examined specimens of *Drimys* Section *Wintera* and most petals of those of *Drimys* Section *Tasmannia* have one trace. An interesting condition occurs in *D. obovata* A. C. Sm., where the two traces, one to each of the two petals, arise from cortical bundles from which calycine traces also are formed. The petals of *Belliolum* and *Pseudowintera* always have three traces, except for occasional one-trace inner small petals of *Belliolum.* As stated previously, *Belliolum* is distinct from the other genera because of the more complex branching system. In *B. haplopus* the lateral branches of the cortical bundles, which also formed the calycine traces, become lateral traces to the lower petals. In both species of *Belliolum* examined, cortical bundles arise in the petaline region and divide once or twice. One of the branches is always a medium petaline trace, the other (or others) may either immediately become a lateral trace for the next or higher petal or may remain as a cortical bundle which forms lateral traces to the succeeding series of petals. The median trace of the most apical petals usually arises directly from the stele, but occasionally it arises from a cortical bundle which also forms a trace to a stamen. In *B. haplopus* there are about four cortical bundles which remain as cortical bundles up to the base of the carpels, where they stop, never entering any appendage. These cortical bundles may be either those that arose in the calycine or in the petaline regions.

The petaline traces, like the traces of the calyx, are branches of the toral bundles (*figs. 9* and *12*). Occasionally a trace may be double (*fig. 12*, trace 1) or a stelar bundle may divide in the stele to form two traces to the same petal (*fig. 12*, trace at *2*) or to different petals (traces 3 and 4). Other complications may arise, such as two small toral bundles uniting in the stele to form one trace (traces 5 and 6). In flowers with three-trace petals, all of the traces may be adjacent to the same interfascicular region or to different interfascicular regions. Furthermore, the traces to one petal may even arise from the same large stelar bundle when the vascular cylinder is composed of a small number of bundles, as in the diagram of *figure 12*.

In flowers with one-trace petals and with many bundles in the toral stele, this congestion of traces does not occur (*fig. 9*). Here, more than one petaline trace is rarely adjacent to the same interfascicular region, although staminal and petaline traces may be adjacent to the same one.

STAMENS

Without exception the stamens in all genera of the family receive one trace. In many places several staminal traces arise from the same interfascicular region, or even from the same one as a petal (*figs. 9* and *12*).

Where many spiral appendages are so congested, as in winteraceous flowers, congestion of the traces will necessarily occur. Also, with more traces to the appendages, the more complex the relation of those traces to the stele becomes. This was shown in the description of the petaline traces of *Bubbia* (*fig. 12*) and also in *Belliolum*. It is also evident in the staminal region, e. g. in *Drimys*, where several traces arise from the same toral bundle and are related to the same interfascicular region. The floral vascular structure, therefore, is really a network of branching and anastomosing stelar strands from which appendicular traces arise in no definite pattern. Because of the shortened internodes and closely-compressed floral appendages, these traces seem to unite to the nearest strands, so that a series of traces may be associated with the same interfascicular region which may extend not only for a couple of nodes but throughout the length of the flower.

CARPELS

The carpels are inconstant in number in the winteraceous genera. In the species studied the variation ranged from one to thirteen. All residual vascular bundles of the central cylinder above the lower appendages enter the carpels (*figs. 8, 9, 11,* and *12*). No "superfluous" tissue remains above the carpellary traces, as Eames (5) figures in *Prunus, Actaea,* and *Bauhinia*. The floral apex, which is quite prominent in some species of *Drimys* (*fig. 8, G,* and also *fig. 6* in reference 3), is, therefore, non-vascularized. In *Drimys* and *Bubbia* there are usually only a few fairly large strands remaining after the stamen-traces have made their exit (*figs. 8, E* and *11, C, D*). Often the appearance of a vascular ring in transverse section is lost. In *Pseudowintera* and *Belliolum* a definite ring consisting of many bundles is present. An anastomosing of bundles occurs below the carpels so that the number of bundles is reduced to a greater or less extent. Concentric bundles (*fig. 8, F*), the number corresponding to the number of carpels in the flower, are formed predominantly in *Drimys* Section *Wintera*. Crescent-shaped bundles, one to each carpel (*fig. 10*), are also quite prevalent. These bundles are located in the torus (*fig. 8, E* and *F*) and in the lower part of the carpellary stipe. Each divides into three collateral bundles (two ventrals and one dorsal trace) slightly below the ovarian cavity, or at the base of the carpellary stipe (*fig. 8, F*). In a few instances two or the usual three traces enter the carpel directly from the toral cylinder without a preliminary union into one large bundle. If two bundles enter the carpel, one eventually divides into the two ventral bundles. All these variations

may occur in the same flower. In *Drimys* Section *Tasmannia* one bundle, either concentric or collateral, enters each carpel in the majority of specimens examined. However, there are more cases (a third of the carpels cut) of two- and three-trace carpels than in Section *Wintera*. A few carpels have four or more traces. The long carpellary stipe of *D. stipitata* Vickery usually has one bundle, sometimes two, in the lower half and always two in the upper part. Since uni-carpellate flowers may have any of these vascular patterns, there is no correlation between the number of carpels in the flower and the type of vascular system present. In *Bubbia* the reorganization of the toral bundles into concentric bundles occurs only occasionally. Two and three traces are quite prevalent (*figs. 11* and *12*). The dorsal traces leave the toral system first when three traces enter the carpel. The ventrals are formed by the branching of the few remaining toral bundles. Many of the carpels have four and five traces. Often in a five-trace carpel the two extra strands are two lateral bundles situated between the ventral and dorsal bundles, one on each side of the carpel. However, when more than three traces are present there may be branching, anastomosing, and reassembling of the bundles in the torus or in the base of the carpel. In those carpels with extra large dorsals, as in *B. megacarpa* A. C. Sm., *B. longifolia* A. C. Sm., and *B. monocarpa* A. C. Sm. (see illustrations in reference 3), a number of bundles may unite in the toral cylinder to form the dorsal trace. In the branching, anastomosing, and reassembling of the toral bundles into carpellary traces, bundles from one side of the torus may cross over and unite with strands on the opposite side (*figs. 11, C* and *12*).

In *Pseudowintera* the number of carpellary traces is usually three, often four, and rarely one or five. Although a definite cylinder is left in the torus after the stamen-traces depart, the cylinder is made up of relatively few bundles. In *Belliolum,* however, this residual cylinder is made up of a greater number of bundles (8–16). The dorsal traces in *B. haplopus* depart from the cylinder first and the remaining bundles divide, when fewer toral bundles than ventral traces are present, or anastomose, when a greater number of toral bundles are present, to form the two ventrals. In *B. Burttianum,* which has one carpel in the flower, several bundles unite in the cylinder to form the dorsal strand. This may occur before all of the stamen-traces have departed. The rest of the toral bundles unite into four or five traces which are ventrals and laterals.

DISCUSSION

The floral vascular system of the Winteraceae should be considered as a network of branching and anastomosing strands, with little uniformity in pattern. It is a vascular system which is appendicular rather than cauline, that is, all the bundles of the stele are downward extensions of the appendicular traces or the composite of these extensions. There are no cauline bundles which extend from the pedicel through the torus and end blindly at the apex of the vascular cylinder. The vascularization of these flowers is very similar to that found in foliar stem-tips where leaf-traces form the

stele. Just as in the foliage-tip, there is no vascular tissue developed above the last-formed appendages in the flower. The vascular system differs from that of the foliage-tip in the haphazard manner of the insertion of the traces in the stele and the irregular association of the traces to interfascicular regions. Interfascicular regions may extend from the apex of the torus to the base of the pedicel (*fig. 9,* interfascicular region between third and fourth carpel bundles), or they may be very short. The number of traces associated with an interfascicular region varies greatly, as does the manner in which the traces or their extensions unite within the stele with extensions of the more apical traces. Furthermore, the traces from different appendages may be associated with the same interfascicular regions. These irregularities are due to the large number of appendages crowded within a small area. In a stem-apex where the internodes are longer, the union of trace-extensions within the stele seems to be of a definite pattern[2] and the interfascicular regions are, therefore, of fairly uniform length and distribution. This vascular instability of the flower may be reflecting the phylogenetic changes that are still occurring in this rather primitive group of plants.

The variation in the number of calycine lobes and in the number of traces to the calyx of the Winteraceae indicates that changes have occurred and are occurring in this region. There is evidence that the apparently two-parted calyptrate calyx of *Drimys* actually consists, or formerly consisted, of three sepals. In both *Drimys* and *Bubbia* three traces to each sepal are predominantly found. However, in the two-lobed calyces of *Bubbia* there is a tendency toward a reduction in the number of traces (*fig. 12*). The culmination of reduction occurs in *Pseudowintera,* where one trace enters each of the two sepals. The number of traces to the petals and to the stamens shows nothing unusual, although their mode of insertion in the stele illustrates again the instability of a changing toral vascular system.

The occurrence of concentric and crescent-shaped bundles in the carpellary system is especially interesting. These bundles are remarkably like the bundles often found in petioles and suggest that a petiole-like structure may have occurred in the lower region of the primitive carpel. Not in all cases are these bundles in the stipe itself, but their occurrence in the torus may mean their gradual loss concomitant with the loss of an external petiole-like region. Their prevalence in *Drimys,* where the carpels are the most primitive of the Winteraceae, is significant. However, their more frequent occurrence in the Section *Wintera* is unexplainable, since *Drimys* Section *Tasmannia* has the more primitive carpels of the genus (3). In the other three genera, where modifications of the *Drimys* Section *Tasmannia* carpel occurs (3), the "normal" three-trace condition (or variations of it) is predominant and the petiole-like vascular region is absent.

[2]Katherine Esau. Vascular differentiation in the vegetative shoot of Linum. II. The first phloem and xylem. Amer. Jour. Bot. 30: 248–254. 1943. Note diagrams in *text-figures 1* and *9*.

Carpels with two traces, one trace for the dorsal and one trace for the two ventrals, may be weakly retaining the petiole-like vascular condition which occurs in *Drimys*.

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EXPLANATION OF PLATES

PLATE I

FIG. 1, A–I. *Drimys piperita* Hook. f., *Griswold 44*. Serial segments of the vascular tissue in a flowering shoot with lateral flower clusters. Stele is drawn as solid cylinder because secondary tissue is present. Approx. × 15. FIG. 2, A–E. *Bubbia semecarpoides* (F. v. Muell.) Burtt, *White*. Serial segments of peduncle with bases of the three terminal floral pedicels. Approx. × 12. Bud scale of terminal bud, *b. sc.;* bract, *br.;* flower cluster 1, 2, 3, *fl. cl. 1, 2* and *3;* pedicel, *ped.;* terminal bud, *t. b.*

PLATE II

FIG. 3. *Drimys piperita* Hook. f., *Ramos 19583*. Transverse section from base of pedicel. Approx. × 35. FIG. 4. *Drimys Brassii* A. C. Sm., *Brass 9536*. Transverse section from base of pedicel. Approx. × 42. FIG. 5. *Drimys insipida* (R. Br.) Pilger, *White 3568*. Transverse section of pedicel slightly below torus. Large rays, *lg. r.* Approx. × 42. FIG. 6, A–D. *Drimys brasiliensis* var. *campestris* (St. Hil.) Miers, *Clausen, F. M. 1024472*. Cross-sections of pedicel at levels designated *a–d* in *figure 7*. Arrows indicate position of bundles from left to right in diagram of *figure 7*. Approx. × 45. FIG. 7. Same as *fig. 6*. Diagram of vascular system in pedicel showing branching and anastomosing of strands. Lightly stippled regions mark part of system omitted. Levels drawn in *figure 6* indicated by *a–d*. Accessory ray, *acc. r.*

PLATE III

FIG. 8, A–G. Same as *fig. 6*. Cross-sections of flower at levels designated *a–g* in *figure 9*. A, base of torus; B, level of calyx; C, level of petals; D, level of stamens; E–G, levels in apex of torus and base of carpels. Arrows indicate position of bundles from left to right in diagram of *figure 9*. Sterile apex, *st. ap*. Approx. × 20. FIG. 9. Same as *fig. 6*. Diagram of vascular system in flower. Heavy broken lines represent branching of calycine traces. Petaline traces not marked. Apical strands are traces to the five carpels.

PLATE IV

FIG. 10. *Drimys Winteri* var. *chilensis* (DC.) A. Gray, *Junge*. Cross-section of torus above stamens, showing types of bundles which will enter the seven carpels. Approx. × 30. FIG. 11, A–E. *Bubbia Whiteana* A. C. Sm., *Kajewski 1495*. Cross-sections of flower at levels designated *a–e* in *figure 12*. Arrows indicate position of bundles from left to right in diagram of *figure 12*. Dorsal veins, *dor.;* ventral veins, *ven*. Approx. × 42. FIG. 12. Same as *fig. 11*. Diagram of vascular system in flower. Lightly stippled regions mark part of system omitted. Accessory ray, *acc. r.*

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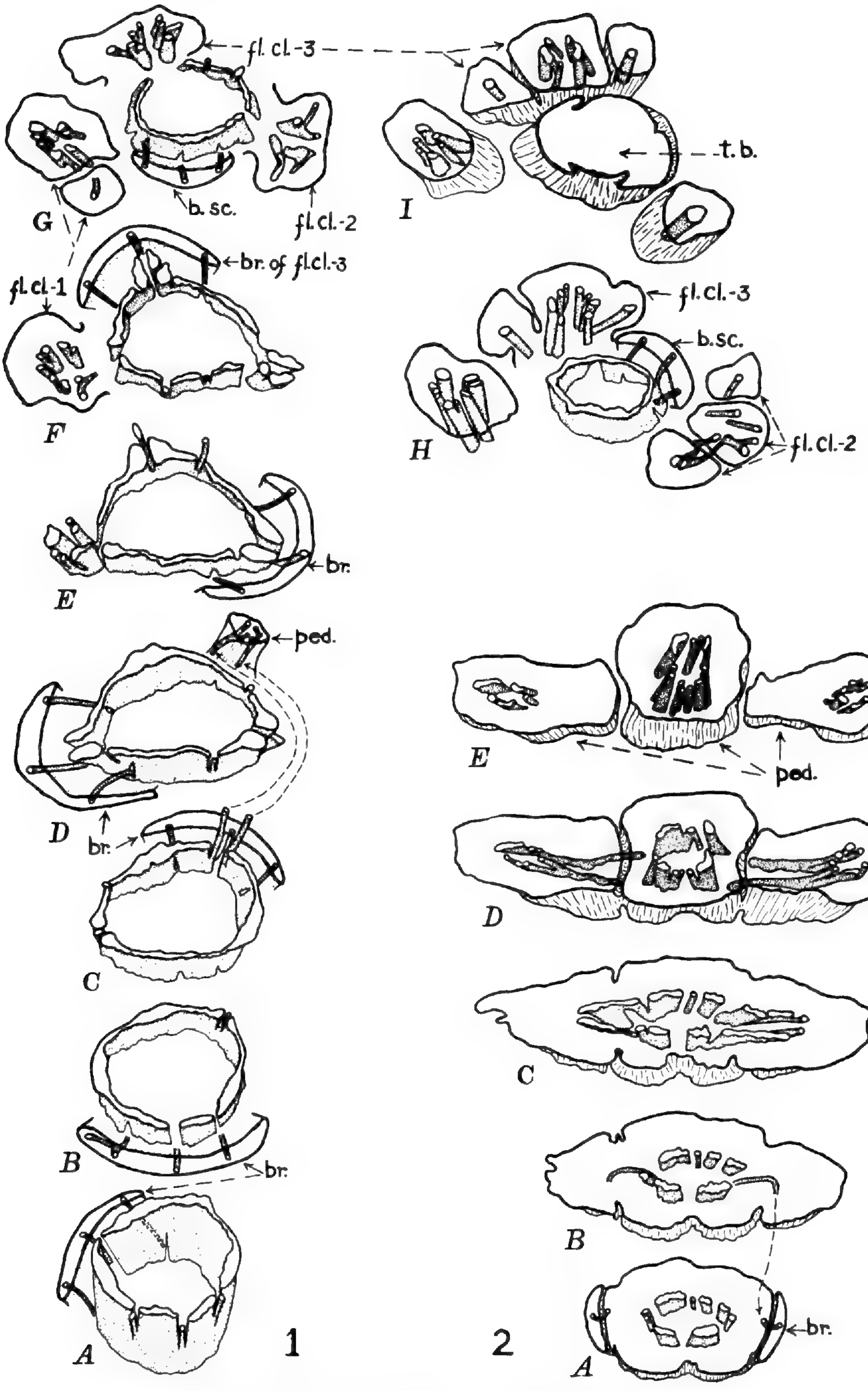

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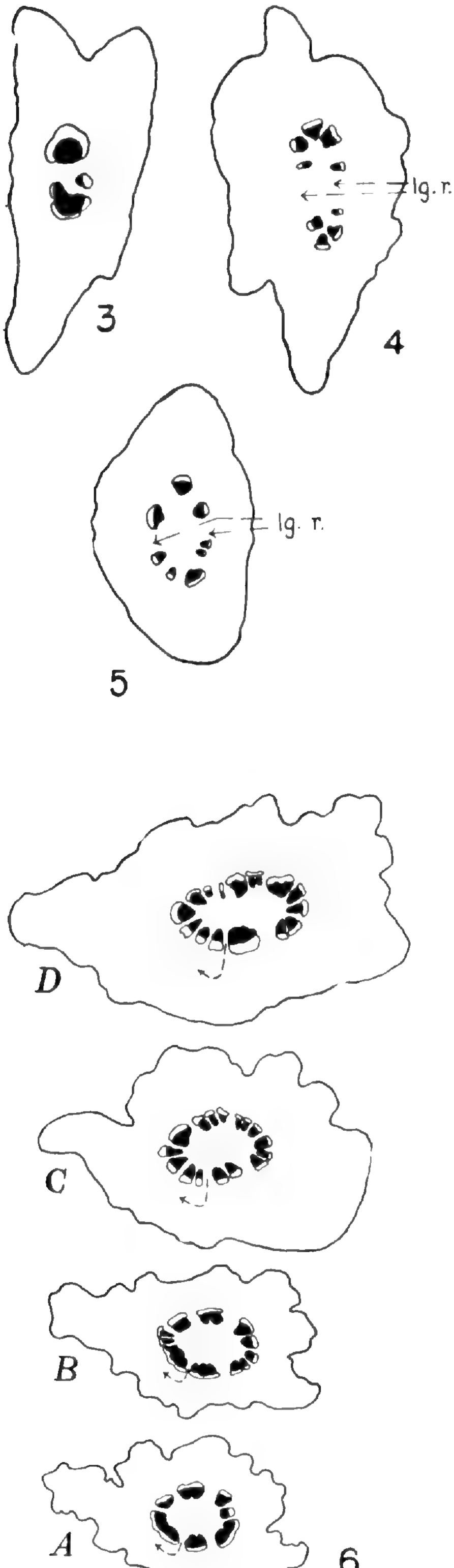

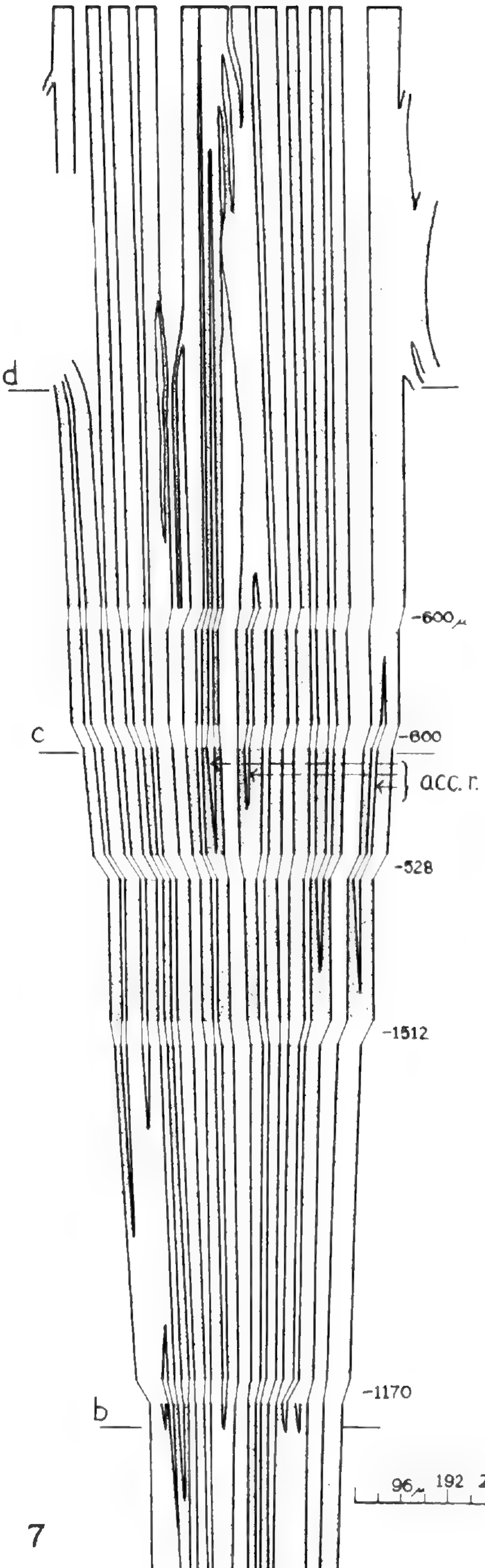

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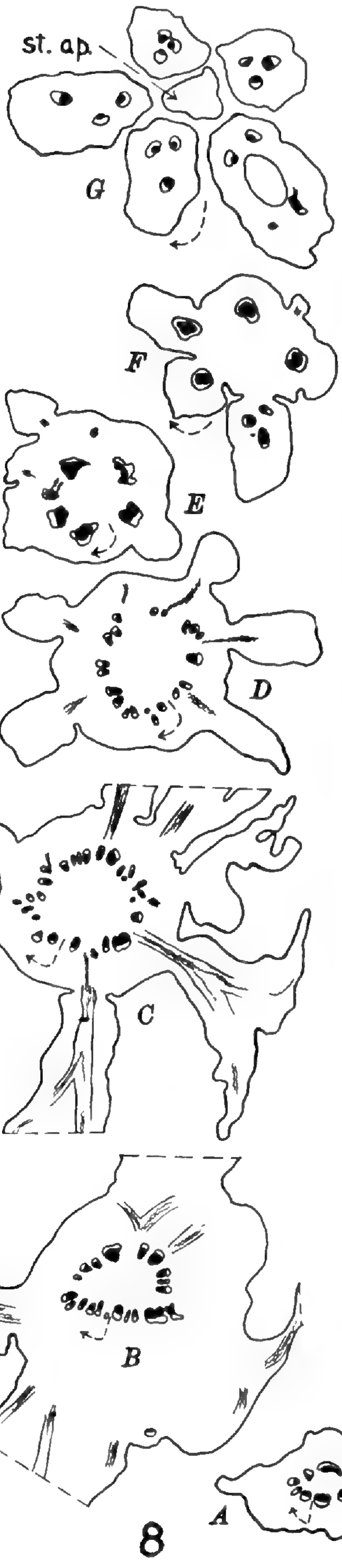

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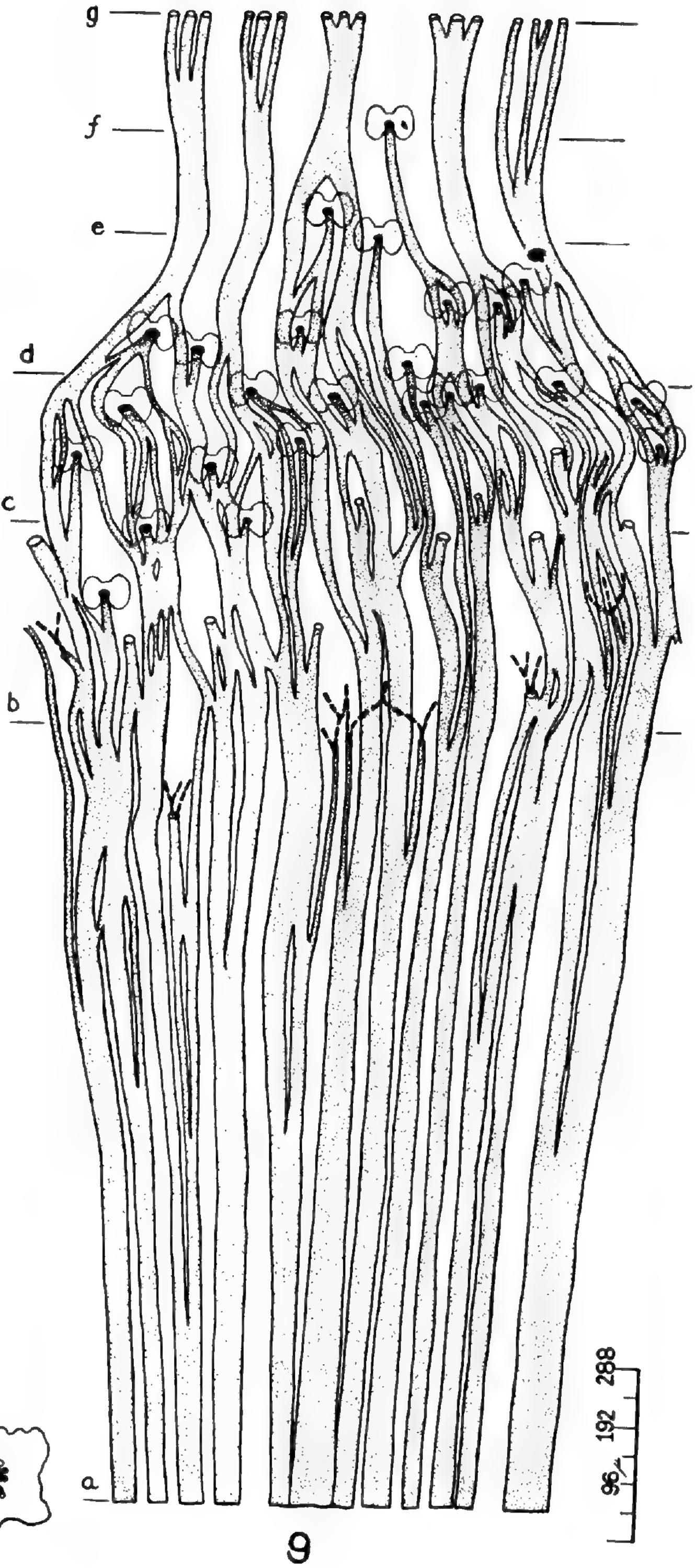

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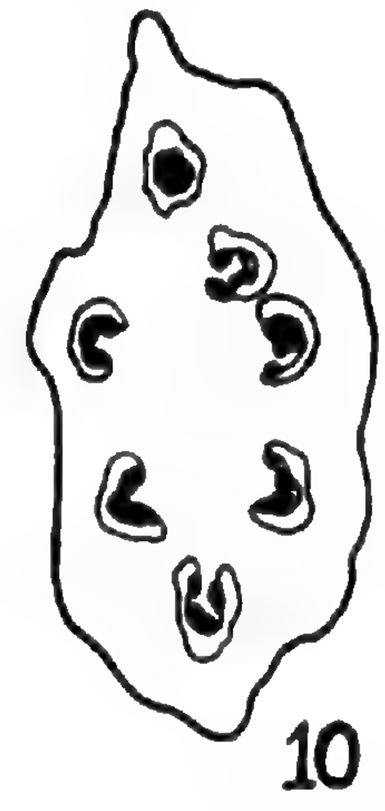

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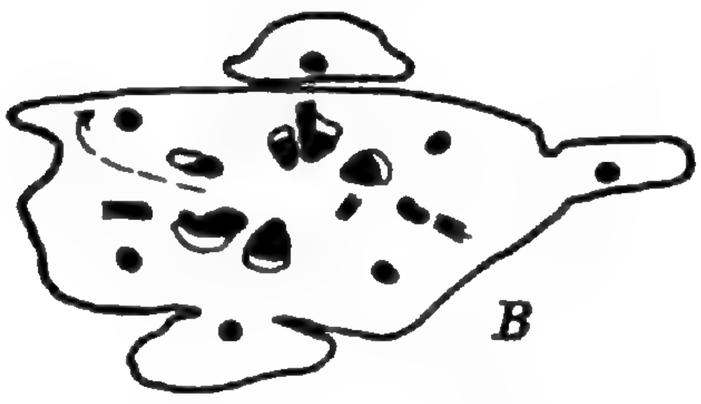

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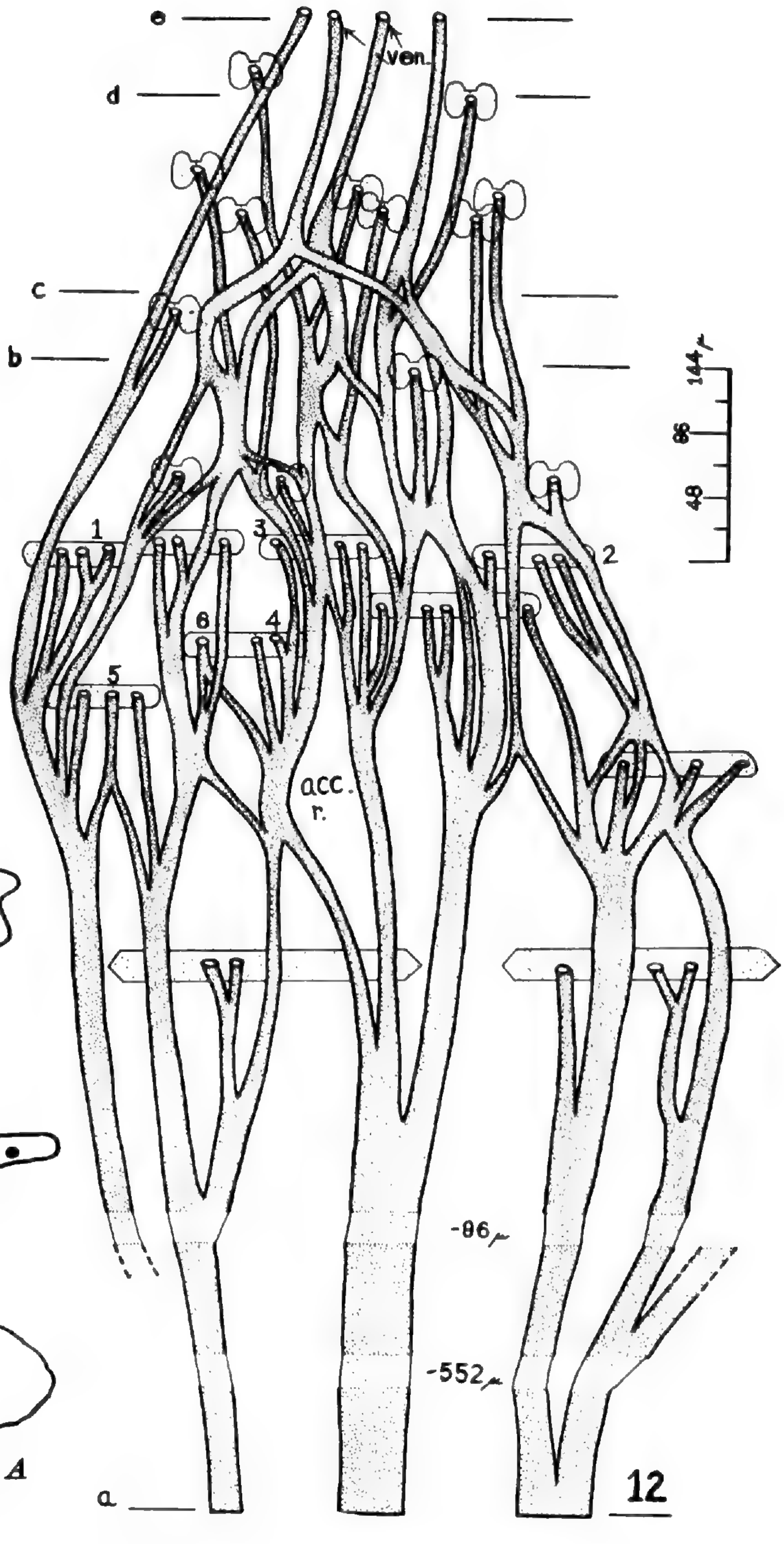

12

EFFECT OF SEED WEIGHT AND SEED ORIGIN ON THE EARLY DEVELOPMENT OF EASTERN WHITE PINE

STEPHEN H. SPURR[1]

With one plate and two text-figures

ALTHOUGH the effect of seed size on the growth and yield of grains and other crop plants has been frequently and intensively studied, little is known about this effect on trees, particularly over a period of more than one growing season. The present experiment was designed to give precise information concerning the effect of seed weight and seed origin on the growth and development of eastern white pine (*Pinus strobus* L.) seedlings over a three-year period. Such information on the factors influencing the growth of an important timber tree is not only of value in amplifying and clarifying existing knowledge of the development and growth behavior of trees, but is also of practical importance, both to the forester growing planting stock, and to the botanist utilizing tree seedlings in precise experiments.

PREVIOUS WORK

Numerous investigations of the relation between seed weight and plant size have been undertaken, mostly on fast-growing, short-lived plants. Investigators have found that seed weight significantly affects plant size during the early stages of plant development. Considerable disagreement exists, however, as to whether this effect of seed weight persists or whether it diminishes in importance, even ultimately disappearing (9).

Seed weight tests involving forest trees have been summarized by Champion (4) and Baldwin (3). Although many of these tests were on a small scale and their results inconclusive when judged by modern statistical standards, they substantially agree that seedling size is influenced by seed size for at least one year. In the few experiments carried on for more than one year, height rather than weight has generally been used as a measure of growth. Furthermore, in several studies, ultimate plant size was related to first-year plant size instead of to seed size. The accumulated evidence, nevertheless, indicates that differences in growth due to varying original seed size tend to disappear within a few years.

In most of the reported tests, the average weight of a group of seeds has been used rather than the weight of individual seeds. McComb (6), however, weighed acorns of chestnut oak (*Quercus montana*) to the nearest

[1]Assistant to the Director, Harvard Forest, Petersham, Mass. This study was suggested by problems on which the author worked under the direction of Dr. P. R. Gast, and was largely supported by the Maria Moors Cabot Foundation for Botanical Research. E. A. Snow and J. W. Wright cooperated in designing and establishing the experiment, while other staff members and graduate students at the Harvard Forest generously advised and assisted the author.

tenth gram and followed the growth of the individual plants through one growing season. He found that acorn weight was clearly correlated with shoot weight ($r = 0.82$), shoot height ($r = 0.79$), and other measures of growth.

Several precise trials have been conducted with pine species by Aldrich-Blake (1, 2), Mitchell (7, 8), and Gast (5). In these studies, a high degree of correlation was noted between seed weight and the weight of the one-year-old seedlings. Gast, in particular, has utilized generalized mathematical growth laws and has developed techniques for adjusting plant weights to eliminate differences due to variations in seed weight.

The present experiment was initiated to examine current conceptions, and to extend to three years our knowledge of the combined effects of seed weight and seed origin on the growth of white pine.

MATERIALS AND METHODS

The experiment consisted essentially of weighing individually one thousand white pine seeds, growing the resulting plants under uniform conditions, keeping an accurate record of each plant, and harvesting one-third of the plants at the close of each growing season. Other variables were introduced by using seed from ten different mother trees growing in four widely separated localities, and by using two growing media: a carefully prepared soil bed and a sand bed subirrigated with nutrient solution.

One hundred seeds of each of ten seed lots were weighed individually to the nearest hundredth of a milligram, disinfected, and stratified at low temperature in specially designed plaster of Paris blocks for two months before planting. Each lot consisted of seed from a single mother tree: three from the Harvard Forest; three from the Pack Forest at Warrensburg, New York; three from the White Mountains of New Hampshire; and one from Uxbridge, Ontario. Empty seed were eliminated at the time of weighing. Individual seed weights varied from 8.2 to 30.8 mg. (Table 1).

TABLE 1.

ORIGIN AND WEIGHTS OF SEED LOTS

Lot	Locality	Seed weight in milligrams[1] Mean	Range
1	Harvard Forest, Petersham, Mass.	14.03	9.0–18.8
2	" " " "	16.36	9.3–21.6
3	" " " "	15.10	10.2–22.2
4	Uxbridge, Ont.	17.20	9.8–26.5
5	Pack Forest, Warrensburg, N. Y.	22.43	16.1–30.2
6	" " " "	13.80	9.6–17.7
7	" " " "	16.30	9.3–12.9
8	White Mountains, N. H.	15.10	8.2–24.1
9	" " "	17.69	11.7–23.3
10	" " "	22.09	10.6–30.8

[1]Germinated seed only.

The soil bed near the headquarters of the Harvard Forest consisted of six inches of gravel for drainage overlain by twelve inches of a mixture of equal parts of nursery soil, sand, and peat, sifted and thoroughly mixed. The sand culture consisted of washed quartz sand ten inches deep in an unpainted galvanized metal box, and was subirrigated three times daily by nutrient solution. The solution used contained 250 parts per million of nitrogen and phosphorus, 125 ppm of potassium and calcium, 100 ppm of magnesium, and 3.4 ppm of iron (ferric citrate) as recommended by Gast (unpublished).

The seed were planted 1½ inches apart in rows spaced at intervals of 1⅝ inches. Seed location was randomized within rows, and the location of the three rows of each seed lot was randomized within the bed.

At the close of each growing season, approximately one-third of the plants was cut off at the ground line, and both fresh and oven-dry weights obtained. As a result of this annual harvest, the remaining plants were left relatively free to grow during the ensuing season. In order to obtain an adequate sample of certain lots that had germinated poorly, all plants of these lots were harvested before the end of the experiment. Thus, lot 4 was completely harvested at the end of the first growing season, and lots 3, 8, and 9 at the end of the second season. Only one harvest was made from the sand culture, as the remaining plants died during the second season due to neglect caused by the illness of the author.

All data were subjected to statistical analysis after methods outlined by Snedecor (10). In particular, analysis of covariance was extensively adopted.

The terms "significant" and "highly significant" are used in the text only in their statistical sense. A significant difference indicates that the probability is less than one out of twenty ($P = 0.05$) that the difference is due to chance; whereas for a highly significant difference, this probability is less than one out of one hundred ($P = 0.01$).

PERCENT GERMINATION

Petri dish germination tests of 100 unweighed seed from each lot were made on unstratified seed, seed stratified one month, and seed stratified two months. These tests, as well as the germination records of the weighed seed in the sand and soil beds, show clearcut differences in viability between the different seed lots. Stratification of 36°F. improved germination in all but one lot (no. 4).

Seed weight also influenced percent germination. The mean weight of the 756 seed that germinated was 17.07 mg., whereas that of the seed that did not germinate was 15.57 mg., a highly significant difference of 1.50 mg. This relationship apparently held true for all seed lots, although too few seed failed to germinate in some lots to permit conclusive tests.

Since empty seed had been eliminated during the weighing process, it would appear that heavy white pine seed germinate better than light seed of the same origin. This conclusion is borne out by investigators working with other forest trees (3).

TIME OF GERMINATION

Not only do heavy seed germinate better than light seed, but they also germinate quicker. This is shown in Table 2. The seed that germinated 11–12 days after planting (on July 7 and 8) averaged 17.49 mg. On succeeding days, the mean weight of newly germinated seed decreased until, for the period following July 18 (22 days after planting), the mean weight reached a low of 14.26 mg.

TABLE 2.

RELATION OF SEED WEIGHT TO TIME OF GERMINATION

Days after planting	No. of seed germinated	Mean dry seed weight in milligrams
11–12	134	17.49
13–14	160	16.96
15–16	217	15.94
17–18	84	15.61
19–20	63	15.30
21–22	55	15.57
23+	43	14.26

The mean date of germination did not vary significantly between the sand and the soil. The period of germination was confined to nine days in the sand culture but lasted sixteen days for most lots in the soil bed, a few seed germinating as late as the second year.

The different lots varied slightly in their mean date of germination, but no correlation was noted between mean date of germination and either mean seed weight of lot or the locality from which the lot was collected. Lots 5 and 7 germinated earliest (July 9) and lots 3 and 9 the latest (July 16 and July 14).

ABNORMAL DEVELOPMENT

Of the 756 seed that germinated, 31, or 4 percent, developed abnormally. All but a few of these died before the end of the first growing season.

The most common type of abnormality was the failure of primary needles to grow after their appearance (12 plants). In two additional plants, the terminal shoots never appeared and the plants soon died.

An abnormality typical of lot 8 was the development of dwarf seedlings from light weight seed. Other types of unusual development, each observed twice, were the failure of the stem to grow in height although the cotyledons developed normally close to the ground, and the inability of the young plant to shed the seed coat, a failure ultimately causing death. Other plants merely developed poorly and ultimately died without any external deformity or attack by insects or fungi.

As the root systems of these abnormal plants were not examined, it is not known whether or not abnormal shoot development was related to abnormal root development.

INSECTS AND DISEASES

Despite disinfectants and other precautions, 35 plants were killed during the first season by insect and disease attack, and nearly as many additional during the next three years.

The nursery disease "damping off" accounted for at least 26 plants during the first few weeks of the first season. An indeterminate additional number undoubtedly damped off during germination before the plant reached the surface. No particular lot seemed to be more susceptible to the disease than any other.

The other external causes of mortality in the first growing season were drought and beetle damage to tender shoots immediately after germination. Two suspected species were identified by the Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, as *Dysidius mutus* Say and *Anisodactylus merula* Germ., both members of the family Carabidae, the ground beetles.

Subsequent mortality was caused by damping off fungi, basal stem girdling by the pales weevil (*Hylobius pales* Boh.), winter consumption of two-year-old seedlings by field mice, and cold injury during the winter of 1942–43.

Mortality during the first growing season from all causes, both internal and external, was correlated with seed weight, the heavier seed having the higher survival. This relationship was true within the individual lots as well as for all lots taken together. The mean seed weight of the 66 plants that died was 14.30 mg., or 2.81 mg. less than the mean seed weight of all plants.

GROWTH OF SEEDLINGS

Each year, the effect of seed dry weight and seed origin on the dry weight of the shoot was studied by analysis of covariance. These analyses differed only in that fewer seed lots were available for sampling in the successive years, and more plants were sampled from each seed lot in each succeeding year (21 in 1943 as against 12 in 1941).

Seed weight was correlated with the size of the resulting plant each year. The regression of shoot weight on seed weight was linear and highly significant in all cases. In each succeeding year, however, the correlation coefficient between seed weight and shoot weight decreased; being 0.73 after the first year, 0.44 after the second, and 0.36 after the third. Thus the evidence is unmistakable that the effect of seed weight on plant weight becomes of less importance as the tree grows older.

External factors such as competition and soil nutrition were relatively uniform. Hence this growing lack of correlation between seed and plant size would appear to be due not to the external conditions of the experiment, but rather to hereditary, physiological, and other internal factors.

As heavy seed tended to germinate earlier than light seed (Table 2), the growing season of plants from heavy seed was materially longer than that of plants from light seed. The effect of this condition was to accentuate differences in size at the end of the first season; that is, the slope of the

regression of shoot weight on seed weight was greatest for one-year-old plants. Such an influence, however, should not affect the correlation coefficient for the regression.

The significance of the downward trend of the correlation coefficients is strengthened by the consistent values of other statistical measures in the three different years. In all cases, variations in mean seed weight and mean shoot weight between seed lots were highly significant and of a similar order of magnitude. Mean shoot weights of the different lots adjusted for variations in mean seed weights were of comparable significance each year. The implication is that hereditary differences in growth rates between the different seed lots were of similar magnitude each year. They did not tend to diminish or become more pronounced as the seedlings aged.

Although the individual seed weights were correlated with the shoot weights of resulting plants, the mean seed weights of the different lots were but poorly correlated with their respective shoot weights. (Statistically, the error of estimate of the regression of mean shoot weight on mean seed weight between the different lots was highly significant throughout). The individual lots, then, not only differed inherently in their mean growth rates, but also this difference was independent of the mean seed weight of the lot. The effects of seed weight and seed origin on growth are not interrelated.

The reduction in error due to the regression of shoot weight on seed weight was highly significant at all times. When this regression was calculated for individual seed lots, it was found in no case to differ from the regression based on the entire experiment. The relationship between seed weight and shoot weight, then, is a true species relationship and does not differ as between different seed origins within the species, at least in the case of white pine.

To compare the relative efficiency of the different samplings, the standard error of estimate of lot mean shoot weights was expressed as a percent of the overall mean shoot weight. This measure, an expression of the precision of the mean shoot weights of the different lots, was comparable for the three years, ranging from 4.6 percent to 6.9 percent.

As the shoot weight of a plant depends upon both its seed weight and its growth rate, the effect of varying seed weight must be removed if the actual growth of the various lots is to be determined. This calculation was made by adjusting the mean shoot weights of the different lots to the weights that might have been expected had all the plants developed from seed of the same weight (16.00 mg.). The adjustment utilized the regression of shoot weight on seed weight derived from the same data, and followed methods outlined by Snedecor (10). The use of this single correcting formula is quite legitimate, as the overall regression did not differ significantly from the regression for any one lot (10).

In Table 3 are given for each year of the experiment the adjusted shoot weights of the various lots arranged in approximate order of decreasing growth rates. The effect of seed weight is demonstrated by a comparison of the unadjusted and adjusted shoot weights for the first year. Actual

TABLE 3.

MEAN SHOOT WEIGHTS OF LOTS BY YEARS

Lot	Mean shoot weight in milligrams			
	Unadjusted first year	Adjusted[1] first year	Adjusted second year	Adjusted third year
7	79	78	1019	4790
1	62	77	1013	4440
5	95	72	918	4310
10	99	73	688	3640
4	71	69	—	—
6	53	69	898	3310
2	59	67	799	3610
3	55	61	818	—
9	73	67	651	—
8	49	59	676	—
Average	71	69	831	4020

[1]Adjusted to a mean dry weight of 16.00 mg., thus removing the effect of varying seed weights between lots.

mean shoot weights of the different lots varied from 49 to 99 mg.; but after the effect of seed weight had been removed, this variation was reduced to from 59 mg. to 78 mg. Much of the apparent variation in plant size between lots is, therefore, due to mere differences in seed weight rather than to actual differences in growth rate. Also, the largest plants (lots 5 and 10) did not grow as fast as lots 7 and 1, but merely started with larger seed. It is obviously necessary to take seed weight variations into account in growth studies of tree seedlings, as has been previously pointed out by Gast (5) and Mitchell (7, 8).

Differences in growth between lots were generally consistent, as between years. Lot 7 was the fastest growing in all three seasons, lot 1 following closely each year. The other lots were more or less consistent in their growth.

Little difference in growth rate between localities is apparent. Seed lots collected from Massachusetts (Harvard Forest) and from New York (Pack Forest) show similar growth. Lots from the White Mountains of New Hampshire are possibly slower growing. This difference may be due to the higher latitudes and altitudes from which the seed were collected. Not enough lots were tested, however, to permit accurate generalizations.

EFFECT OF GROWING MEDIUM

The discussion of growth thus far has been limited to data obtained from the soil bed. The same seed lots were also grown in a subirrigated sand culture.

In the sand bed, the plants were much larger at the end of the first year than were those grown in soil (87 mg. as against 69 mg.). Fewer plants were sampled from the sand, with the result that the data obtained were much less precise than those for the soil grown plants. As a result, the

sand values are less precise and less significant. For instance, the correlation coefficient between seed weight and shoot weight was 0.53 for the sand and 0.73 for the soil. All trends and relationships, however, held for the sand grown plants as well as for plants from the soil bed.

The regression of shoot weight on seed weight for both the sand and soil beds is shown graphically in *Figure 1*. The crooked lines represent the actual data grouped by classes. Both regressions follow similar trends despite the differences in fertility of the two media.

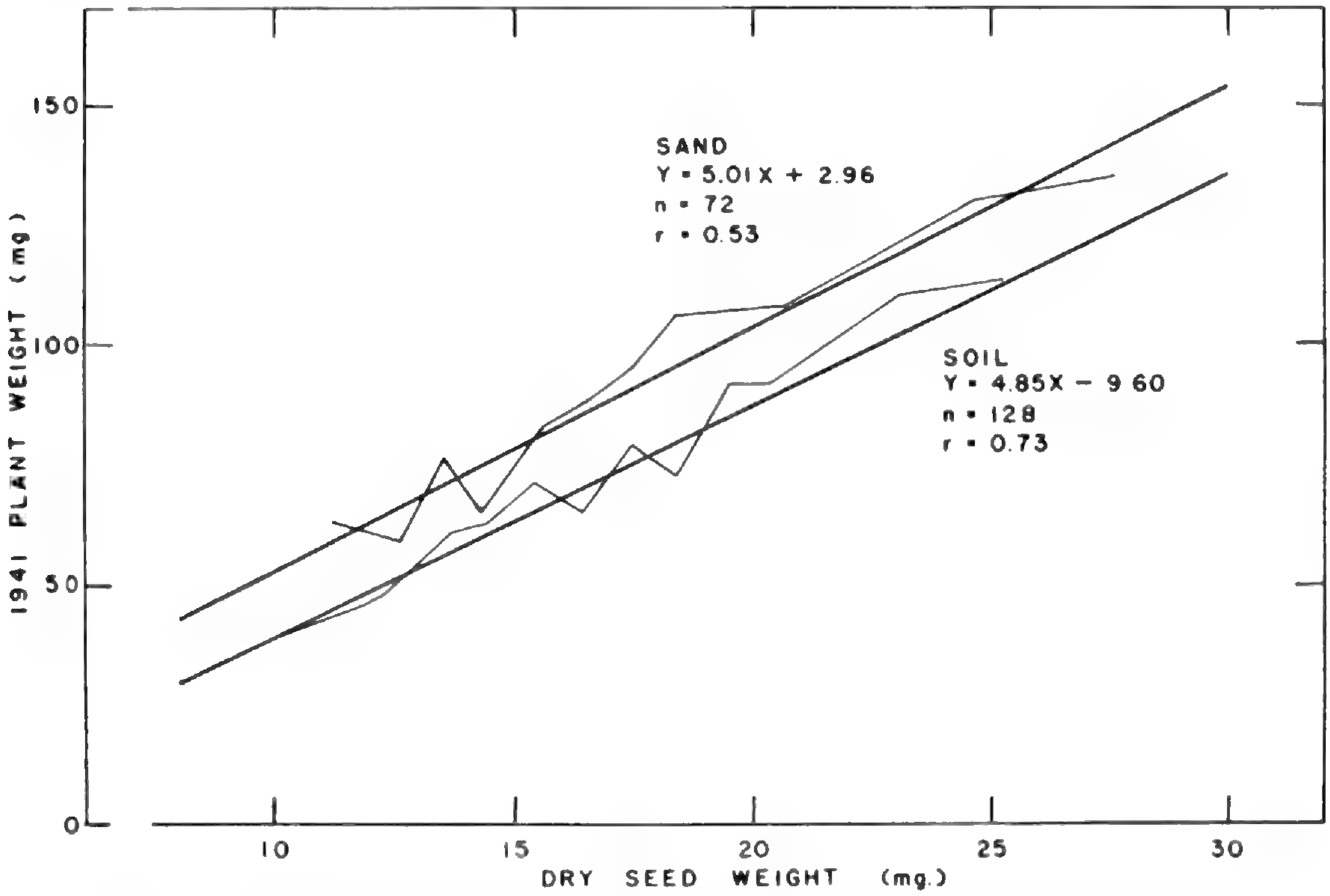

FIG. 1. The effect of seed weight on shoot weight in sand and soil beds.

Although the nutrient sand culture trials gave less precise results (due to poorer sampling) than did the soil bed trials, the evidence is that the effects of seed weight and seed origin on early growth hold for plants grown under varying nutrient conditions.

HEIGHT AS A MEASURE OF GROWTH

During the first two years of growth, the heights of white pine seedlings vary but little. Height is not a reliable measure of growth during this period. At the close of the third year in the present study, however, heights varied considerably. At this time, the effect of seed weight and seed origin on the height of white pine seedlings was studied by analysis of covariance. Trends and relationships were found to be generally the same as when shoot weight was used as a measure of growth, but values were of much less significance. For instance, the correlation coefficient between seed weight and height was 0.22, a barely significant value. The mean heights of the individual seed lots ranged from 5.1 to 7.7 inches.

Height is obviously not a satisfactory measure of growth when pine

seedlings are but three years old. It may, however, be an adequate growth measure of older trees. In hardwoods and other plants where the initial growth is largely linear, height is, in some respects, a satisfactory measure of growth as early as the first year (6).

RESERVE DRY WEIGHT

The seed coat makes up a considerable proportion of the weight of a seed. Since it is shed soon after germination, it does not nourish the seedling. If the dry weight of the seed coat is subtracted from the dry weight of the entire seed, a value is obtained which closely approximates the dry weight of the food reserves in the seed. This value has been variously described as "effective weight" (7) and "reserve dry weight" (5). Such a value is obviously more closely related to subsequent growth than is the dry weight of the entire seed. Nevertheless, the calculation of the reserve dry weight for each seed would appear to be unnecessary wherever it is directly proportional to seed weight.

To test this proportionality, seed coats were collected after germination, oven-dried, and weighed to the nearest hundredth of a milligram. When the reserve dry weight values thus obtained were plotted against seed dry weight, these two factors were found to be highly correlated. This relationship is shown in *Figure 2*, where the two parallel lines define the area in which practically all the 753 individual plotted points fell. Furthermore, similar regressions for each of the ten seed lots showed similar slopes and

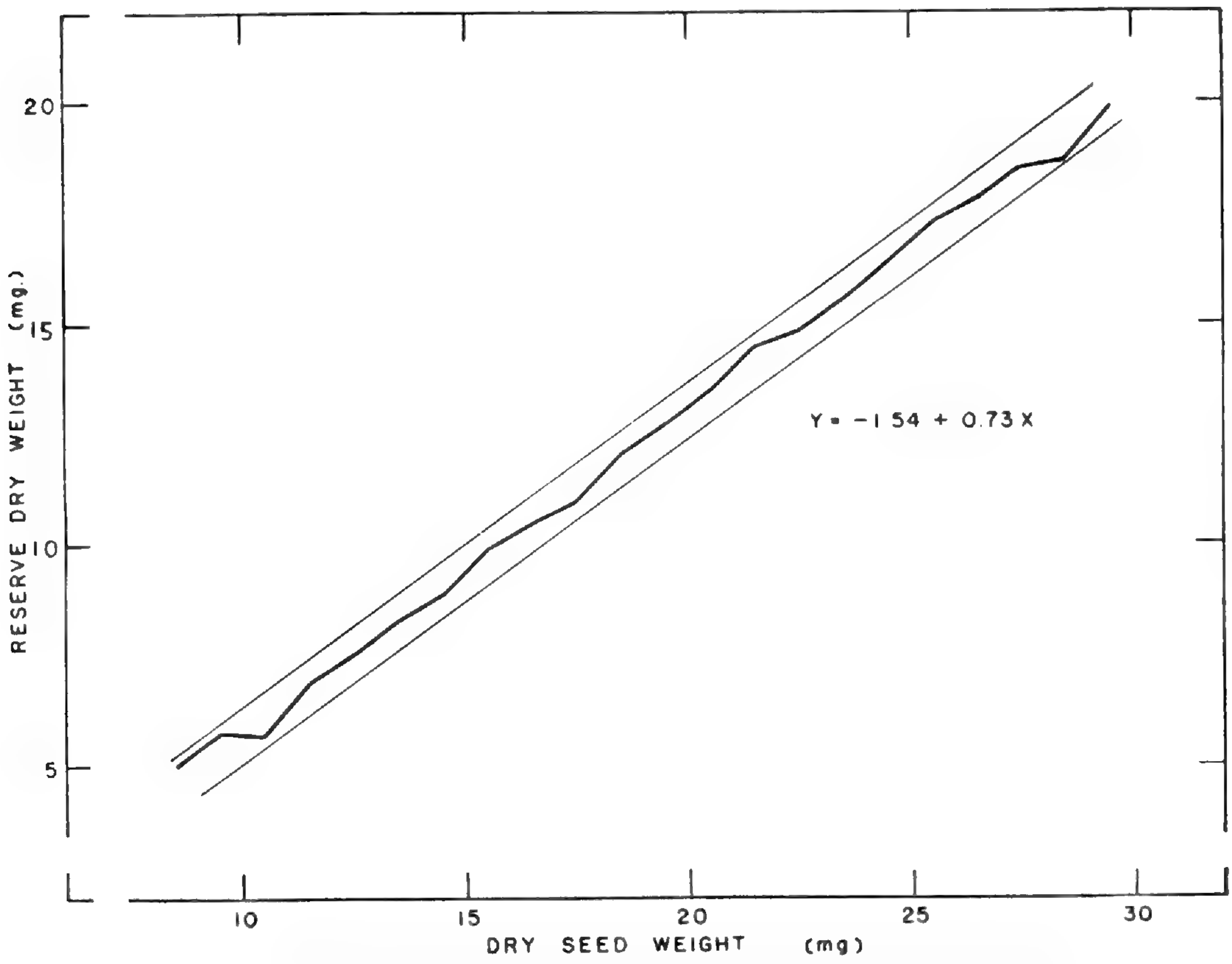

FIG. 2. Relation between reserve dry weight and seed dry weight.

elevations. Reserve dry weight, therefore, is not only highly proportional to seed dry weight, but this relationship also does not vary among various seed origins. The only cases where reserve dry weight was not proportional to seed dry weight occurred in partially filled seed. Several of these seed apparently gave rise to some of the abnormal plants discussed earlier.

Mitchell (7) previously had found reserve dry weight proportional to seed dry weight. The lack of proportionality found in the same data by Gast (5) appears to be due to his use of theoretically smoothed data rather than the actual values.

Twice in the present study parallel analyses of covariance were run, one analysis utilizing seed dry weight and the other, reserve dry weight. On both occasions, the correlation between reserve dry weight and shoot weight failed to differ significantly from the correlation between seed dry weight and shoot weight. Other values and relationships similarly held in the parallel tests. Furthermore, the regression of shoot weight on reserve dry weight was demonstrated to be identical with the regression of shoot weight on seed dry weight by converting the two regressions to similar terms. Since the results obtained from these parallel analyses did not differ significantly, no additional precision was obtained when reserve dry weights were used.

Reserve dry weight, then, is more closely related to subsequent growth because it closely approximates the weight of the food reserves in the seed. On the other hand, it is not necessarily more closely correlated with shoot weight than is seed dry weight. Because of the high degree of proportionality between reserve dry weight and seed dry weight, the calculation of the former is unnecessary, and the use of the latter is just as satisfactory in seed weight studies involving a single species. The use of reserve dry weights, however, is desirable when different species are to be compared, and in special cases such as when the seeds are known to be partially empty.

COMPOUND INTEREST GROWTH

Many formalized mathematical growth laws have been advanced to explain various growth data. A law frequently applied to growth of tree seedlings is the compound interest law (5). Various investigators have presented evidence to show that the size of pine seedlings at the end of the first growing season is roughly determined by the weight of the seed (initial capital) and the total effect of environmental and hereditary factors (interest rate). This follows the compound interest formula:

$$V_n = V_o\ (1.0p)^n$$

in which V_n is the accumulated capital; V_o, the initial capital; p, the interest rate; and n, the number of compounding intervals.

The argument has been advanced that, during a period of juvenile development, a plant increases in size at a constant rate of interest in close agreement with the compound interest law. From the above formula, it can readily be seen that the interest rate is measured by the ratio of accumulated capital to initial capital, provided that the compounding periods are of equal length. It follows that this ratio will remain constant for each

succeeding growing season if the plant is growing at a constant compound interest rate. Using the shoot weight at the end of the season as V_n and the weight at the start of the season as V_o, we find that the resulting ratios express the number of times that the plant increased in shoot weight during each growing season. Thus, the shoots of the white pine seedlings in the present experiment attained a size at the end of the first growing season roughly 8.5 times greater than that part of the dry food reserve of the seed which, on the basis of the shoot-root ratios immediately after germination, could be assumed to have gone into shoot growth (80 percent). During the second season, the shoots increased 12.2 times in weight, and, during the third, 4.5 times. This wide variation in the rate of growth from year to year, particularly the marked decrease during the third year, indicates that white pine seedlings do not consistently increase in shoot weight at a constant compound interest rate during the first three years of growth.

SEED ORIGIN

That seed origin affects the growth of white pine seedlings has already been demonstrated. Not only is seed origin important in its relation to growth, but it also affects other phases of the early development of white pine. It influences both the moisture content and habit of the resulting plants.

At the close of the first growing season, the moisture content of all harvested plants was calculated from their fresh and oven-dry weights. Analysis of covariance revealed that moisture content was completely unrelated to seed weight but that it was influenced both by seed origin and medium of growth.

Plants grown in the sand contained an average of 63.9 ± 0.05 percent moisture, whereas those grown in the soil bed contained an average of only 60.2 ± 0.03 percent moisture, a highly significant difference that was consistent for all lots.

The various seed lots differed in moisture content to a highly significant degree. Lot 3 had the highest moisture content (65.0 percent in sand and 61.8 percent in soil); while lot 2, also originating from the Harvard Forest, had the smallest amount of moisture (62.6 percent in sand and 59.7 percent in soil). The moisture contents of the various lots, while differing considerably, were apparently not related to the regions in which the seed originated, although the sampling from the different regions was insufficient to permit a generalization.

By the end of the second year, differences in appearance between the various seed origins had become quite apparent. These differences were due primarily to variations in needle length, the number of developed laterals, and the spasmodic occurrence of lammas shoots, secondary shoots formed after a mid-season period of dormancy.

To illustrate these differences in form, the largest, median, and smallest plants of each lot were photographed. In *Plate I*, the two fastest growing lots (7 and 1) are illustrated in the top row; the two lots with the largest seed (5 and 10) are in the middle row; and two of the slower growing lots

(6 and 2) are in the bottom row. The long needles and comparative absence of secondary growth give lots 5 and 10 a form quite distinct from that of lots 6 and 7, where the needles are relatively short and well-developed lammas shoots conspicuous.

At the end of the third growing season, few lammas shoots were observed (the late summer was quite dry); but variations in needle length and in the number of laterals resulted in distinct differences in appearance between the various lots. Needles were longest in lots 1 and 5 and shortest in lots 6 and 10. Many more laterals had developed on plants in lot 5 than in lot 1, the other lots having an intermediate number.

These differences in appearance are quite distinct, although somewhat difficult to measure quantitatively. They are obviously related to seed origin and apparently little affected by variation in seed weight.

SUMMARY

In order to study the effect of seed weight and seed origin on the early development of eastern white pine (*Pinus strobus* L.), one hundred seeds of each of ten different origins were weighed individually and grown under uniform conditions. At the close of each of the first three growing seasons, plants were removed, weighed, and their shoot dry weights statistically related to both seed weight and origin.

Heavy seed germinated better, germinated earlier, and survived in a higher proportion than did light seed from the same lot. Seed origin also affected germination and survival.

Shoot weight at the end of the first year was closely correlated to seed weight. As the plants grew older, however, the effect of seed weight on shoot weight diminished, but was still highly significant at the end of the third year. This relationship was the same for all the seed origins. Furthermore, the effect of seed weight on shoot weight was the same whether the plants were grown in a sand culture of high fertility or in a soil bed of moderate fertility. This result suggests that the effect of seed weight is independent of the nutrition of the seedlings.

Each seed lot consisted of seed of a single origin — seed collected from a single mother tree. The variation in growth between these lots was generally consistent from year to year and was highly significant at all times.

The effects of seed weight and seed origin on growth are not interrelated; that is, the mean seed weight of a lot gives no indication of the growth rate of that lot.

Much of the apparent variation in plant size between lots is caused by differences in seed weight rather than by differences in growth. The largest plants are not necessarily the fastest growing, but may merely have originated from the largest seeds. The influence of seed weight must be removed to bring out true differences in growth rate. This adjustment can be made by utilizing the regression of plant weight on seed weight derived from the same data.

The height of three-year-old pine seedlings is not a satisfactory measure of their growth.

Although the reserve dry weight of a seed is more closely related to subsequent growth than is seed dry weight, its use in the present experiment resulted in no increase in correlation between seed and shoot weight because of the high correlation between seed dry weight and reserve dry weight.

Shoot growth over a three year period failed to follow a constant compound interest rate of growth.

Plants grown in the nutrient sand culture contained more moisture than those grown in soil. Moisture content varied according to seed origin, but was independent of seed weight.

As early as the second year, differences in appearance between the various seed lots became noticeable. These differences resulted primarily from variations in needle length, the number of laterals, and the occurrence of lammas shoots.

Briefly, seed weight is related to germination, survival, and the early size of the plant. The correlation between weight and shoot weight diminishes as the plant ages, but is still noticeable after three years. Seed origin is related to germination, appearance, moisture content, and seedling growth. The influence of seed origin on plant size is as strong at the end of the third as at the end of the first growing season, in marked contrast to the constantly diminishing influence of seed weight. Both seed weight and seed origin, then, influence markedly the early development of eastern white pine.

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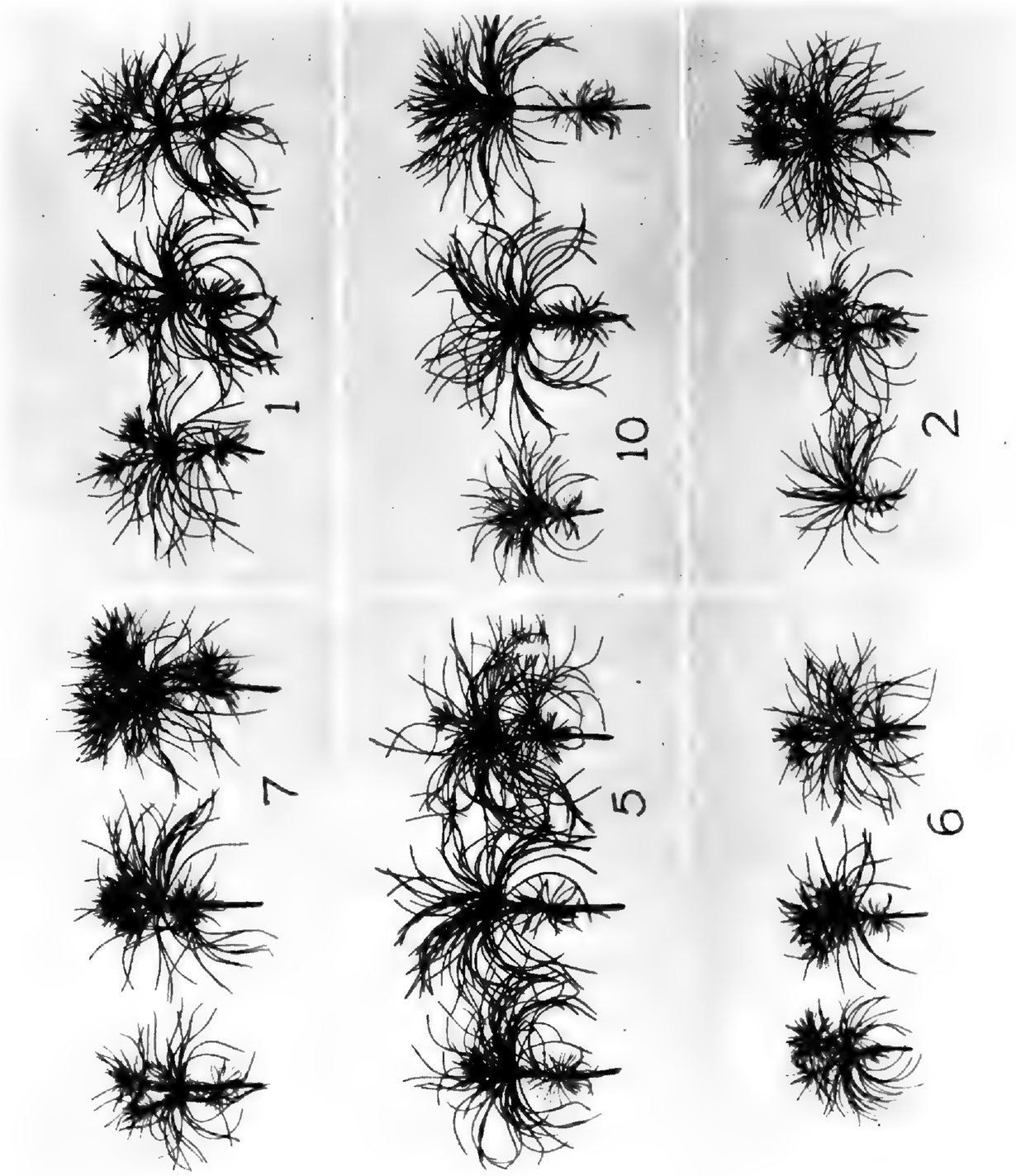
EXPLANATION OF PLATE I

Silhouettes of the smallest, median, and largest plants of selected lots at the end of the second year.

HARVARD FOREST,
PETERSHAM, MASS.



SEED WEIGHT AND SEED ORIGIN

PUBLICATION-DATES OF GAUDICHAUD'S BOTANY OF THE VOYAGE OF THE BONITE

IVAN M. JOHNSTON

THE PRESENT notes apply mainly to the publication-dates of the volume of folio botanical plates representing part of the botanical contributions of Charles Gaudichaud-Beaupré to the series of volumes entitled "Voyage autour du monde exécuté pendant les années 1836 et 1837 sur la corvette la Bonite, commandée par M. Vaillant." These botanical plates are noteworthy for abundance of analytic details, their high quality of execution, and the large number of South American and South Pacific species and genera based upon them. They were intended to illustrate the account of the collections made by Gaudichaud during his voyage on the Bonite. Distracted by controversies concerning his curious theories regarding plant anatomy, and finally hindered by ill health, he never completed the volume of text intended to accompany the volume of botanical illustrations. No descriptions or discussions of the many proposed new species and new genera which he had illustrated were ever published by him, and no information was ever supplied as to who had collected the specimens portrayed or as to exact localities where the specimens had been collected. It seems probable that most of Gaudichaud's plates were based on material he collected during the voyage of the Bonite. However, some of the species illustrated are neither known nor to be expected at the localities which the Bonite is known to have visited (cf. Johnston, Proc. Am. Acad. 71: 13 [1936]); these must have been illustrated from material obtained by Gaudichaud on his previous voyages or from material of other collectors which Gaudichaud found in the herbaria at Paris. There is doubt as to the whereabouts of the specimens serving as the models for Gaudichaud's plates. Few if any of them appear to be in Paris. Brongniart, Ann. Sci. Nat. IV. 1: 263 and 290 (1875), has suggested that they are in the Webb Herbarium, which was available to Gaudichaud in Paris before it was finally sent to Florence, Italy. Although without diagnoses, and lacking precise information as to the specimens on which they are based, the new species and most of the new genera proposed by Gaudichaud in his volume of plates are effectively published according to the Rules of Nomenclature. The Rules state that plates published prior to 1908 shall be considered equivalent to a diagnosis if accompanied with analytic details. Gaudichaud's plates have analytic details in great abundance. Practically all authors have accepted Gaudichaud's species as legitimately published. There has, however, been some difference of opinion as to the validity of the new genera published on the plates. A discussion of this latter matter has been published by Sprague, Kew Bull. **1928:** 395–397 (1928).

Some years ago, while working on a revision of the family Nolanaceae, I had my attention directed to the sixteen plates published in the Botany of the Bonite on which four new genera and nine new species of the Nolanaceae are founded. Matters involving priority forced me to make some attempt to date these plates. Only the most meagre and conflicting information regarding the dates of the work was available. Pritzel, Thesaurus 305 (1851), gives the work as beginning in 1839 and as still incomplete in 1851. Weddell, Arch. Mus. Hist. Nat. 9: 3 (1856), states that it was published between 1839 and 1846. In the second edition of his Thesaurus, p. 118 (1872), Pritzel dates the Botany of the Bonite as 1844–66. A note in the Journal of Botany, 39: 206 (1901), gives the dates of the plates as "1846–49?". Kuntze, Rev. Gen. 1: cxxviii (1891), states that all the plates were published from 1846–49 and, in any case, by 1851. No dates are to be found in the Atlas itself. The information reported in the present paper indicates that the plates began to appear in 1841 and were completely published in 1852.

Below I give all the significant data I have accumulated regarding the dates of publication for the botanical volumes reporting on the voyage of the Bonite. A number of questions are left unanswered, but, since it seems unlikely that I shall be able to add any missing details, it seems best to publish what I have discovered, with the hope that some other worker can complete the story. I have searched for reviews in contemporary literature and have examined nearly a score of copies of the Botany of the Bonite. A search for information at Paris gave few results. At London, however, I was most successful. At the Library of the British Museum (Bloomsbury) I was granted the very great privilege of consulting the old volumes in which the invoices of all books purchased by the Library were formerly pasted. Among these old invoices I found those of T. H. Baillière, who supplied the library with the volumes on the voyage of the Bonite. These invoices mention the livraisons by number and bear the date when they were sent from the London book-importer to the Library. Another source of information is the Bulletin of the Société de Géographie, Paris, which gives lists of books exhibited at sessions of the society. My references to this journal refer to the sessions at which parts of the Botany of the Bonite were exhibited. Unfortunately there are only a few references to the Botany of the Bonite in the Bibliographie de la France; these consist partly of official announcement of issuance (usually within a few weeks of actual publication) and partly of advertisements of the publisher, A. Bertrand. Assembling data from these and other sources, the following information becomes available in dating the livraisons of the botanical volumes of the voyage of the Bonite.

FOLIO BOTANICAL PLATES

Liv. I	Baillière invoice, June 5, 1841.
Liv. II	Bibliog. Fr., advertisement, Sept. 4, 1841. Baillière invoice, Oct. 2, 1841. Bull. Soc. Géogr., Dec. 3, 1841 (liv. 1 & 2).

Liv. III	Bibliog. Fr., advertisement, Dec. 4, 1841 (liv. 1–3). Bibliog. Fr., Dec. 18, 1841. Baillière invoice, March 19, 1842 Bull. Soc. Géogr., June 17, 1842.
Liv. IV	Baillière invoice, April 2, 1842.
Liv. V	Baillière invoice, Aug. 27, 1842. Bull. Soc. Géogr., Dec. 1842 (liv. 4 & 5).
Liv. VI	Baillière invoice, Oct. 8, 1842. Bibliog. Fr., Oct. 15, 1842.
Liv. VII	Bull. Soc. Géogr., Dec. 15, 1843 (liv. 6 & 7).
Liv. VIII	Baillière invoice, Nov. 4, 1843 (liv. 7 & 8).
Liv. IX	Bull. Soc. Géogr., April 12, 1844 (liv. 8 & 9).
Liv. X	——
Liv. XI	Bull. Soc. Géogr., Dec. 20, 1844 (liv. 10 & 11).
Liv. XII	Baillière invoice, May 16, 1844 (liv. 9–12).
Liv. XIII	Bull. Soc. Géogr., Jan. 14, 1848 (liv. 12 & 13). Arch. Sci. Phys. & Nat. Genève 8: 327 (1848) (liv. 11–13).
Liv. XIV	——
Liv. XV	Baillière invoice, March 15, 1845 (liv. 13–15). Bull. Soc. Géogr., April 1852 (liv. 14 & 15).
Liv. XVI	Baillière invoice, Oct. 23, 1847.
Liv. XVII	Baillière invoice, Jan. 16, 1849.
Liv. XVIII	Baillière invoice, Nov. 12, 1850.
Liv. XIX	——
Liv. XX	——
Liv. XXI	Baillière invoice, Jan. 9, 1852 (liv. 19–21).
Liv. XXII	——
Liv. XXIII	——
Liv. XXIV	Baillière invoice, June 8, 1852 (liv. 22–24).

QUARTO TEXT

"Livraison 12 et 13e."	Cryptogams by Montagne, Léveillé, and Spring; title-page dated "1844–46," but the introduction bearing the date May 20, 1846. Nov. Anal. des Voyages 4: 128 (Oct. 1846). Bibliogr. Fr., Nov. 7, 1846. Bull. Soc. Géogr., Dec. 18, 1846. Baillière invoice, Oct. 23, 1847.
Liv. 15 & 16.	Introduction by Gaudichaud, part one (pp. 1–354); title-page dated "1851." Baillière invoice, June 9, 1851. Compt. Rendu Acad. Fr. 33: 72, session of July 14, 1851.
Liv. 17 & 18.	Introduction by Gaudichaud, part 2 (pp. 1–442); title-page dated "1851." Compt. Rendu Acad. Fr. 33: 72, session of July 14, 1851. Baillière invoice, Jan. 9, 1852.
"Liv. complementaire."	Explanation of Plates, Vol. 3; title-page dated "1866." Bibliogr. Fr., Aug. 25, 1866. Accessioned at British Mus. Library Dec. 6, 1866.

The data just given indicate that the botanical publications relating to the voyage of the Bonite appeared as four, mostly double, livraisons of octavo text, and as twenty-four livraisons of folio plates. Most of these livraisons can be dated within six months. Unfortunately I have been able to assemble only fragmentary information as to the contents of the livraisons containing plates.

The only copy of the Botany of the Bonite which I have seen containing what appear to be accession-dates is that in the British Museum. On various plates of this copy are dates, either written or stamped. Accompanying the dates to the close of 1847 are also numbers (given in parentheses following the dates in the subjoined tabulation) which appear to be lot accession-numbers. By correlating the dates found on the plates with the dated itemized invoices of Baillière I had hoped to identify the livraisons to which the dated plates belonged. In three cases only are the dates on the plates definitely associated with the invoices. The red date-stamp on *plate 148* is also found on the invoice for Nov. 12, 1850, the red date-stamp on *plates 101–118* is also on the invoice for Jan. 9, 1852, and the red date-stamp on *plates 119–130* is also present on the invoice of June 8, 1852. The other accession-dates, however, would appear to correlate reasonably well with the dated invoices. The resulting tabulation given below, however, is so puzzling and in places so contradictory of facts which I have established from other sources that I distrust all conclusions to be drawn from it.

PLATE	PLATE MARKED	BAILLIÈRE INVOICE	LIVRAISON
11	Nov. 9, 1841 (186)	June 5, 1841	liv. 1
1	Jan. 5, 1842 (10)	Oct. 2, 1841	liv. 2
21	April 1, 1842 (132)	March 19, 1842	liv. 3
9	April 1, 1842 (152)	April 2, 1842	liv. 4
31	Dec. 8, 1842 (174)	Aug. 27, 1842	liv. 5
41	Dec. 8, 1842 (203)	Oct. 8, 1842	liv. 6
39, 40	Dec. 7, 1843 (294)	Nov. 4, 1843	liv. 7, 8
51	Dec. 7, 1843 (295)		
141	June 5, 1844 (303)	May 16, 1844	liv. 9, 10, 11, 12
71, 77, 79	June 12, 1845 (721–23)	March 15, 1845	liv. 13, 14, 15
81	Nov. 8, 1847 (141)	Oct. 23, 1847	liv. 16
88	July 13, 1849	Jan. 16, 1849	liv. 17
148	Dec. 12, 1850	Nov. 12, 1850	liv. 18
101–118	June 3, 1852	Jan. 9, 1852	liv. 19, 20, 21
119–130, title-page	Nov. 11, 1852	June 8, 1852	liv. 22, 23, 24

I have seen livraison-covers and have complete information as to the contents and livraison-number of all the volumes of octavo text and of six livraisons of quarto plates. I have given this information for the octavo text. The only livraison-covers of the plates seen by me are those in the copies of the folio at the Gray Herbarium and the Arnold Arboretum.

Those at the Arboretum (liv. 7, 8, 10, 11, 12) were purchased by me from a book-dealer in Paris. The livraison-covers in which the plates were distributed are undated and bear pasted on them a printed slip, without date, giving the livraison-number and the name and serial numbers of the plates it contained. The contents of the livraisons of which I have seen covers are as follows:

liv. 7	plates 141–150
liv. 8	plates 61–70
liv. 10	plates 71–80
liv. 11	plates of hydroids numbered 1–6
liv. 12	plates 81–91
liv. 20	plates 107–112

From the few livraison-covers seen it is clear that the plates were not issued in regular serial order, and, furthermore, that some of the livraisons contained only six plates while others contained ten. By extrapolation it is impossible to use the contents of the known livraisons to determine the contents of those unknown. While I am convinced that the Bonite plates will remain a bibliographic puzzle until someone discovers and reports on a complete set of livraison-covers, I believe it is possible by use of information at hand to work out a reasonable and more accurate and detailed dating of the plates than now available.

PLATES 1–30. The first thirty plates are listed in the eighth Heft (August ?) of Oken's Isis for 1842, p. 625. Since we know that the first three livraisons did appear before 1842, it seems probable that the plates listed by Oken represent the first three livraisons, each containing ten plates.

PLATES 31–70. According to Gaudichaud, Ann. Sci. Nat. II. **20**: 208 (Sept. ?, 1843), *plates 42, 43,* and *44* are parts of liv. 5. This is as it should be if the publisher issued the plates serially in lots of ten, for *plates 31–40* would fall in liv. 4 and *plates 41–50* would make up liv. 5. I have seen a cover for liv. 8 which indicates that it contains *plates 61–70*. A cover for liv. 7 indicates that it contains *plates 141–150*. I have no information as to the contents of liv. 6. I suspect it may have contained *plates 51–60*.

PLATES 71–100. A cover for liv. 10 shows that it contained *plates 71–80*. As shown by another cover, liv. 12 contained *plates 81–90*. According to a reviewer, Arch. Sci. Phys. & Nat. Genève **8**: 327 (1848), liv. 12 and 13 were composed of plates showing chiefly new or little-known Urticaceae. All of liv. 12, *plates 81–90,* represents the Urticaceae. The decade of plates numbered *91–100,* except for *plates 99* and *100* (a fern and an aroid), also represents Urticaceae. The style of printing on *plates 91–100* agrees with that on *plates 81–90* and differs from other plates in the volume. It seems very probable, therefore, that liv. 13 contained *plates 91–100*.

PLATES 101–130. At the British Museum *plates 101–118* are all stamped in red ink "3 JU 52." This same abbreviation is also stamped on

the Baillière invoice of Jan. 9, 1852, in which livraisons 19, 20, and 21 are listed. I have seen a cover for liv. 20, listing its contents as *plates 107–112*. This suggests that this group of livraisons probably contained only six plates each, and that liv. 19 contained *plates 101–106*, liv. 20 contained *plates 107–112*, and liv. 21 contained *plates 113–118*. Also at the British Museum, *plates 119–130*, as well as the title-page and table of contents, all bear the red stamp "11 NO 52," as does also the Baillière invoice of June 8, 1852, in which livraisons 22, 23, and 24 are itemized. It seems likely, therefore, that liv. 22 contained *plates 119–124*, liv. 23 contained *plates 125–130*, and liv. 24 contained the title-page and table of contents. *Plates 101–130* were evidently the last parts of the botanical folio to be issued. They were not printed by Bougeard, the printer of the other plates in the volume.

PLATES 131–150. Of this group of plates, *136–150* portray cryptogams and illustrate the reports prepared by Montagne and by Léveillé. These men prepared their reports promptly and were evidently annoyed at the delay in publishing their work. Many of their new species were published in periodicals because of the delay, and it appears that both issued advance privately circulated copies of the text which eventually appeared as part of the Bonite reports. Although numerically they are the concluding plates in the volume, *plates 136–150* were probably issued out of order to satisfy Montagne and Léveillé, whose work was in print. A cover for liv. 7 shows that it contains *plates 141–150*. Montagne, Ann. Sci. Nat. II. 19: 238 (April 1843), complains that the original numbering of these plates, as *1–10*, had against his wishes been changed to *141–150*. Since the plates to illustrate Montagne's work were printed out of sequence, it seems probable that the plates numbered *136–140*, illustrating Léveillé's work, were given similar treatment. The style of headings on Léveillé's plates differs from that on Montagne's. I suspect that the plates of fungi, nos. *136–140*, appeared as liv. 9. This would leave five plates, nos. *131–135*, and five livraisons, nos. 14–18, unaccounted for. Possibly livraisons 14–18 each contained only a single plate.

It should be noted that livraison no. 11 of the botanical series of plates consists of six plates of hydroids. These zoological plates, numbered *1–6*, although issued in the botanical series, belong with the volume of "Zoophytologie" by Laurents. I have seen a cover of liv. 11. The fact that this zoological material appeared among the botanical plates was noted by contemporary reviewers, Arch. Sci. Phys. & Nat. Genève 8: 327 (1848). Kuntze, Rev. Gen. 1: cxxviii (1891), has also noted this fact.

The following tabulation summarizes my conclusions as to the contents of the twenty-four livraisons of folio plates. The dates are those established earlier in this paper.

Livraison	Plates	Date
1, 2, 3	1–30	1841
4	31–40	1841
5	41–50	1842
6	51–60 ?	1842
7	141–150 !	1843
8	61–70 !	1843
9	136–140 ?	1844
10	71–80 !	1844
11	Hydroids (1–6) !	1844
12	81–91 !	1844
13	91–100	1847–48
14, 15, 16, 17, 18	131–135 ?	1845–50
19	101–106	1851
20	107–112 !	1851
21	113–118	1851
22	119–124	1852
23	125–130	1852
24	title-page	1852

Arnold Arboretum,
Harvard University.

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1944

IN THE financial field the Arnold Arboretum closed the year with a substantial addition to its credit balance, this chiefly because of certain positions that were vacant because of the absence of some employees on duties connected with the war, and the fact that balances remained in specified budgetary items because of the impossibility of acquiring supplies and equipment due to current restrictions because of war conditions. In addition to the regular income of the institution, the Gifts for Cultural Purposes Fund received a total of $1835.00 in the form of unsolicited gifts from friends of the institution, while the extra-budgetary restricted Publication Fund was increased by $2858.00, mostly from similar sources; of this amount $700.00 represents a grant from the Board of the Netherlands Indies for use in publishing an English translation of Dr. Lam's "Fragmenta Papuana." A grant of $600.00 from the Penrose Fund of the American Philosophical Society, supplemented by a similar amount from the Milton Fund of Harvard University, was received for the use of the Director in connection with the preparation of a comprehensive *Index Rafinesquianus*. Grants totalling $3400.00 were received from the Milton Fund, the Penrose Fund, the National Academy of Sciences, and the Society of Sigma Xi, to finance a second season's work on the Alaska Military Highway by Dr. Raup and his associates. The only additions to capital were the annual accretions under the terms of gift to the James Arnold and Charles Sprague Sargent funds. The James R. Jewett Prize was awarded in August, but the Vieno T. Johnson prize was deferred.

Staff. — No changes were made in the technical staff, other than the resignation of Dr. Hui-Lin Li at the end of October, 1943. Leave of absence was granted to Dr. C. E. Kobuski, as he still remained in the military service. In the grounds group we are short-handed because several of our employees were drafted for military service, while others resigned to work in war industry plants. In general, as would naturally be expected, the labor situation was critical, and certain types of work had to be deferred or greatly curtailed.

Instruction. — The situation in 1944 approximated that of 1943, but with a further reduction in the number of graduate students. The accelerated instruction program remained unchanged and the limitation of staff members to giving a half-unit course every other year continues to be waived, and will so continue as long as war conditions prevail. The teaching program of staff members continues to be light.

Buildings, grounds, and horticulture. — The usual care has been given to the maintenance of all buildings, but the plantings have suffered,

due in part to a shortage of labor, and in part to the distinctly abnormal weather conditions. The past year was an exceedingly dry one, the rainfall deficiency approximating 12 inches. Because of little rain in November and December, and very little snow cover in the winter months, there was considerable winter injury to the root systems of small shrubs. While from the standpoint of temperature the winter was mild, zero temperatures being experienced but once, injury to various trees was manifest, probably because of the unusual winter dryness of the soil. The unseasonable late frosts of May 17 to 19 did some damage, killing flower buds and even the young leaves of some plants.

Because of the very dry weather the fire hazard in the Arboretum was unusually pronounced during the fall and spring months, about 75 fires occurring within the limits of the Arboretum. This was a decided increase over other years. While most of these were of minor importance, in two cases considerable damage was caused, chiefly among the Chinese spruces on South Street hill and among the dwarf conifers adjacent to the horseback trail. Regardless of the precautions taken during the spring and fall months in posting wardens, fires will occur, and unfortunately some do considerable damage. It is hoped that during the fall and winter months of the coming year some fire lanes can be established to prevent further damage in certain sections.

During the past year 179 species and varieties of woody plants were planted in the collections, many of these representing species not previously grown on the grounds. A total of 600 living plants, 18 lots of cuttings, and 22 packets of seeds were received. In the same period 1150 living plants, 65 lots of cuttings, and 16 packages of seeds were distributed.

It having been repeatedly demonstrated that certain varieties of Ghent azaleas are hardy under New England conditions, some 80 plants representing 40 different varieties were acquired and established on the Case Estate in Weston, and seedlings of 20 additional forms are being grown in the propagating house. While many of the desirable forms have long been grown in the Arboretum collections, many of the better varieties are rare or unavailable in the nursery trade, and it has seemed to us highly desirable to attempt to increase the supply. The favorable conditions at Weston have enabled us to initiate work on this task, and once the plantings are well established it is our plan to propagate the better varieties and to attempt to develop new ones by selection and hybridization. Furthermore, at Weston a collection of our new hybrid crab apples and ornamental cherries has been established by transfer of selected stock from the Arboretum nursery.

The Arnold Arboretum is very widely and favorably known for its extensive living collections of hardy ligneous plants. The original objective was to grow as many different forms as possible that are hardy under our climatic conditions. It now seems to be highly desirable to select the more outstanding horticultural forms. It is believed that the institution is now in a position to make an important contribution to American horticulture by

undertaking comparative studies in such groups as the lilacs, mock oranges, weigelas, roses, and others important in horticulture. The objective here would be to determine and to list the more outstanding forms or varieties from the large number of available ones and contrast these with the larger number which have proved to be of secondary importance. Such tasks take considerable time, but by concentrating on group after group, it will be possible to consider the various genera within a reasonable length of time. As an example, there are 108 *Philadelphus* plants in our collections with different names. A careful study of this group shows that only 35 of them can be considered as worthy ornamentals, although a very much larger number of named forms are offered in the trade. As studies of individual groups are completed, our findings can be passed on to both the amateur and the professional plantsmen, and thus we can increase the service of the institution to American horticulture.

Like all institutions of its type, the Arboretum has suffered from a shortage of labor. It has been necessary to curtail certain seasonal operations and to postpone other projects that involved much labor. The results are evident to the observer, but an improvement can scarcely be expected until conditions become more normal. One great need is a trained and experienced pruner, as many of the older trees on the grounds need attention and intelligent care. On the whole, in spite of the adverse labor conditions, much of the normal seasonal work has been accomplished.

In connection with the war effort the number of Victory gardens was considerably increased, as the use of the South Street nursery site, which was reconditioned last year, was granted to the Boston Victory Garden Committee, and all of the available space was utilized under the supervision of city authorities.

That the Arnold Arboretum strongly appeals to the general public is attested by the continued very large number of visitors, particularly at the height of the flowering season in May and early June. It is estimated that in spite of transportation restrictions there were at least 50,000 pedestrians in the grounds on lilac Sunday (May 21), and on the preceding Sunday approximately 35,000.

The War Effort. — Staff members have continued to render services important in one way or another to the prosecution of the war. The work of the Harvard Camouflage Committee, on which staff members of the Arnold Arboretum served, was concluded. The practicable and easily applied principles in reference to the selection of plant material for use in camouflage work were made available to the use of camoufleur schools in the form of two reports, the findings proving to be of distinct value. As one result of the publication and wide distribution of Technical Manual 10–420, "Emergency Food Plants and Poisonous Plants of the Islands of the Pacific," many inquiries have been received from service men operating in the Orient, scattered from Assam and Upper Burma to New Caledonia. Collections of botanical material are being received from the southwestern

Pacific, and so far it has been possible to report on each lot within a day after specimens were received. During the year the preliminary lists of species were prepared for a projected publication by the Navy Department on native woods for construction purposes in the western Pacific region, which was compiled in Washington. All of the illustrations were prepared at the Arnold Arboretum by an artist sent to Boston by the Navy Department, as the only comprehensive collections of specimens from the region covered in any United States botanical institution is in our herbarium. Our files of photographs, representing scenery in New Guinea, the Solomon Islands, China, Japan, Formosa, and other active and potentially active areas have been made available to representatives of the War and Navy Departments. Much assistance has been rendered to searchers for information, calling attention to maps, illustrations, topographical, climatological, and other data incorporated in technical botanical papers appertaining to Japan, the Bonin Islands, Formosa, the Philippines, the Netherlands East Indies, Papuasia, Micronesia, and Polynesia. The extensive bibliographic researches, carried out in the past, on the botanical publications appertaining to eastern Asia and the Pacific basin enabled us promptly to locate much needed information regarding specific areas. I have continued to lecture at the Army Medical School in Washington to each incoming group of trainees in the two months intensive refresher courses on tropical medicine.

During the year I prepared a chapter on plant life for "The Pacific World," edited by Fairfield Osborn, President of the New York Zoological Society. The volume was published in June, 1944, and a very large special edition is to be issued for distribution to service men throughout the Orient. The objective was a popular work on various phases of natural history, and about 30 individuals coöperated in supplying the data. The idea behind the preparation and publication of the volume was to give service men, particularly those who would have to remain in relatively quiet areas on garrison duty, some knowledge of their surroundings, indicating how they might utilize their spare time in developing interest in this or that phase of natural history. Now a series of volumes is projected on such subjects as animals, birds, insects, fishes, shells, plants, etc., each volume to be the work of an authority in each field. I undertook the preparation of the copy and illustrations for the projected "Plant Life of the Pacific World," and this is now nearly completed.

Botanical Survey of the Alaska Highway. — This project was mentioned in the last annual report. The field work in the summer of 1943 was eminently successful, and some of the results were of such a practical nature and of such special interest to the military engineers that it was suggested that the campaign be continued over a second season. In the summer of 1943 only a part of the road could be covered, the party going as far north as Whitehorse. The authorities wished to have that part of the road from Whitehorse to Fairbanks covered in a manner corresponding to the stretch from Edmonton to Whitehorse. The same privileges were granted for 1944

as attained for 1943, namely free transportation on the road and commissary privileges. Accordingly, Dr. Raup planned a field trip to northern Canada to cover the summer season of 1944, with the coöperation of the military authorities. This year the party consists of Dr. H. M. Raup of the Arboretum staff, with Mrs. Raup and their two sons, Dr. S. K. Harris of Boston University, these being the botanical members of the expedition, Mr. John H. H. Sticht, glacial geologist, and Mr. Frederick Johnson, archeologist. The party left Boston at the end of May, 1944, and will return about the middle of September. This year the botanical aspects of the expedition were financed by a second grant of $1500.00 from the Milton Fund of Harvard University, $1000.00 from the Penrose Fund of the American Philosophical Society, $500.00 from the Joseph Henry Fund of the National Academy of Sciences, and $400.00 from the Society of Sigma Xi. The expenses of Mr. Sticht are covered by a $900.00 grant from the American Geological Society, and those of Mr. Johnson by a grant of $1000.00 from the Peabody Foundation, Andover Academy. Details regarding field operations will not be available until next year, and this does not appear to be the time to discuss the practical results of the first season's operations, because of the nature of the case. Among the botanical results of the 1943 campaign was the preparation of approximately 15,000 botanical specimens, and it is anticipated that the collections to be made in 1944 will equal or exceed those secured last summer. The combined collections of the two season's campaign will be studied and reported upon as a unit when the determinations are completed. The extensive series of duplicates will be distributed to the larger botanical institutions of the United States, Canada, and Europe, as a part of our general exchanges. The construction of the emergency Alaska Military Highway made accessible a vast stretch of territory not previously explored from a botanical standpoint, and it was most fortunate that we had on our staff a widely experienced taxonomist and ecologist thoroughly familiar with northern Canada from his eight previous expeditions, who could take the lead, organize the two expeditions, and thus be the first botanist to visit the region traversed by this long highway that extends through the wilderness for a distance of 1500 miles. The 1944 trip is Dr. Raup's tenth botanical expedition into northern and western Canada.

Plant breeding. — The breeding work has resulted in a number of ornamental shrubs which have been selected for propagation and further tests. Among these is a semi-dwarf flowering cherry of the *subhirtella* type which blooms over a long period, a dwarf form of *Forsythia*, and a very compact globular form of *Malus*. Six of the better types of hybrid flowering crab apples have been propagated. Several of these have large purple flowers and attractive red fruits. Two spreading white-flowered segregates also have been selected for further tests. A few hybrids between American and Asiatic species of *Malus* have been obtained, but these have not yet flowered.

Breeding and cytological work with the Persian lilacs and their hybrids

has cleared up the taxonomic status of this group of lilacs and is of horticultural interest. As Mrs. McKelvey has suggested, *Syringa persica* and most of its varieties are of hybrid origin and are allied with *S. chinensis*, which is recognized as a hybrid between *S. vulgaris* and a Persian lilac. The only fertile true breeding Persian lilac is *S. persica laciniata*. This lilac crosses freely with *S. vulgaris* and with *S. pinnatifolia*. The first cross produces generally weak progeny, but the second cross produces hybrids of great vigor.

The artificially induced tetraploids of *Forsythia* and *Philadelphus* continue to show considerable promise. The tetraploid *Forsythia* is very hardy and has very large deep yellow flowers. Both tetraploids have been crossed with diploids to obtain sterile triploid forms.

Much of the breeding work at present involves wide species crosses which usually do not produce mature seed. If, however, the young embryos are cultured in nutrient agar, some of the crosses can be made to produce progeny. The culture technique has been part of our breeding program for the past five years. This work is now being done by Dr. Hally J. Sax.

Wood Anatomy. — Professor Bailey and Dr. Nast have continued their coöperative investigations of woody ranalian families with Dr. Smith. The last of seven papers dealing with the comparative morphology of the Winteraceae is now complete. A series of investigations dealing with the morphology and relationships of the much discussed ranalian genera *Trochodendron, Tetracentron, Illicium, Euptelea,* and *Cercidiphyllum* is nearing completion. Dr. Genevieve Dawson and Miss Lillian L. Nagel are studying the comparative morphology of the Escalloniaceae and Monimiaceae.

The Herbarium. — During the year 17,345 specimens were mounted — a number smaller than the annual average, due to the fact that inter-institutional exchanges have decreased because of the war, while our residue of unmounted old collections has been essentially eliminated. Of this number, 9,212 were inserted into the herbarium, which now includes a total of 617,944 specimens.

Because of the slackening of pressure upon our mounting staff, an arrangement was made with the Gray Herbarium whereby some of their accumulated Old World material was mounted at the Arboretum. Of the sheets mounted under this arrangement, 2,280 were returned to the Gray Herbarium, while 3,164 were retained at the Arboretum and accessioned as a transfer. Sections of the Arboretum herbarium were systematically examined by the mounters and desirable repairs were made.

A total of 26,822 specimens was received from other institutions or from individuals, by exchange, gift, subsidy, purchase, or for identification. As might be expected, the greater part of these came from North and South America. Important acquisitions include the 3,164 specimens mentioned above as transferred from the Gray Herbarium (among which are important

collections from the Belgian Congo, the Philippines, and Borneo), 2,518 Mexican specimens collected by G. B. Hinton, received from the New York Botanical Garden (subsequently transferred to the Gray Herbarium for selection of numbers lacking in the Hinton series at that institution), and 2,130 miscellaneous plants from the U. S. Department of Agriculture (including 870 specimens from the Canton region of China collected by E. D. Merrill but not previously distributed). Periodical shipments of Australian specimens continue to be received from Mr. C. T. White of the Brisbane Botanic Gardens, and Mr. William Greenwood continues his collecting for the Arboretum in Fiji. The largest and most important accession during the year, however, was the item of about 15,000 specimens of Canadian plants collected by Dr. Raup and his party along the Alaska Highway, as discussed in detail in a preceding paragraph.

The Arboretum distributed 11,745 specimens to other American institutions. Of these, 6,715 were sent in exchange and 4,378 were transferred to the Gray Herbarium, the remainder having been sent either as gifts or for identification by specialists. To the Gray Herbarium and the Ames Orchid Herbarium at the Botanical Museum were sent 412 illustrations for incorporation into the herbaria. Microfilm was distributed, under a special exchange arrangement, to the equivalent value of 177 specimens. The total number of specimens or their equivalent in mounted illustrations and microfilm distributed by the Arboretum was, therefore, 12,334. This number does not compare favorably with the usual annual figure, partly because of wartime restrictions on shipping.

Specialists and students in 13 American institutions called on the Arboretum for 21 loans, totalling 1,066 specimens. For the use of members of our own staff, 50 loans with a total of 1,758 specimens were received from 14 institutions.

To the catalogue of references to new species and other important literature dealing with woody plants, 3,266 cards were added; this catalogue, which is constantly consulted not only by our own staff members but also by visitors from other institutions, now contains 136,998 cards. No negatives were added to the collection representing types and other critical species during the year, the total number of such negatives remaining at 4,211.

As in recent years, routine herbarium work has been limited to the incorporation of clippings, typed descriptions, and illustrations, only a comparatively few specimens being added to the general collections because of the critical space situation. Mounted specimens are stored in family and generic order in cardboard boxes—an arrangement which must be continued until additional storage space in the herbarium is available. Although far from satisfactory, this arrangement permits staff members to consult newly mounted specimens with reasonable efficiency.

In addition to the usual number of routine identifications and reports, members of the herbarium staff continued studies in their special fields. Professor Rehder devoted a large part of his time to his Bibliography of

Cultivated Trees and Shrubs; for the purpose of checking various entities he visited libraries in New York, Philadelphia, and Washington. Dr. Smith continued his studies of tropical plants, completing a summary of the Elaeocarpaceae of New Guinea and working on various ranalian families in collaboration with Professor Bailey and Dr. Nast. Dr. Johnston devoted most of his time to a study of his very extensive collections from the plateau region of north central Mexico and adjacent parts of Texas. Four parts of his comprehensive catalogue were published during the year, and the manuscript on the families from the Caryophyllaceae to the Rosaceae is in an advanced state of preparation. Dr. Raup nearly completed his report on the extensive collections made by him in the Mackenzie Mountains, Alberta Province, in 1939, and has continued his work on mapping the ranges of species in Canada. Much time was of necessity devoted to the completion of plans for his 1944 trip along the Alaska Military Highway above noted. Mr. Palmer, continuing his studies of special groups in North America, devoted special attention to the genus *Crataegus* in the northeastern states. Dr. Allen, in connection with her work on the American Lauraceae, prepared revisions of certain Central American groups. Dr. Perry, in addition to continuing her studies of the New Guinean material of the Richard Archbold Expeditions, prepared a translation from the Dutch of Professor H. J. Lam's important "Fragmenta Papuana"; this translation will be published in a forthcoming number of Sargentia. Dr. Croizat devoted most of his time to a study of various groups of the Euphorbiaceae. Dr. Li left his position at the Arboretum in October to undertake work at the Philadelphia Academy of Sciences, having been the fortunate recipient of a Harrison Graduate Fellowship at the University of Pennsylvania. Previous to this he completed his study of several families of our large Chinese and Indo-Chinese collections. His project at Philadelphia will be an intensive study of the very large and complex genus *Pedicularis* as represented in China. My own work has been largely confined to checking the very extensive Index Rafinesquianus, reporting on current collections from the southwestern Pacific area, supplying information of various types to representatives of the armed forces, and the preparation of the manuscript for a projected semi-popular volume on the plant life of the Pacific region. Some work has been done in association with Dr. Perry on our accumulated collections of Papuasian plants, and certain assistance was rendered to Dr. Perry in connection with her translation of Dr. Lam's "Fragmenta Papuana" from the original Dutch version.

Linnaean microfilms. — This accession was discussed in the last annual report. Those films covering the Linnaean publications and manuscripts have been arranged so that they are now available for consultation. The task of preparing enlarged prints from the exposures representing herbarium specimens has been completed, there being approximately 16,000 of these prints. Their arrangement for purposes of consultation depends upon the completion of the new catalogue of the herbarium, the manuscript of

this being under preparation in London. A second set of prints is now being prepared for exchange purposes.

Bibliography. — Dr. Verdoorn has continued his work on the master file of the projected *Index Botanicorum,* and a booklet describing the aims and the scope of the project is in preparation. This is especially intended to supply basic information for foreign collaborators. Many references, including the names listed in the older botanical literature, were added during the year. He also completed and edited the extensive "Plants and Plant Science in Latin America" and "Science and Scientists in the Netherlands Indies." In the preparation of the data included in these two volumes, he had the coöperation of 170 individuals. He also edited volumes 12, 13, and 14 of his new series of plant science books, and has continued to be responsible for the central depository library for the Netherlands Indies in New York. Volume eight of his Chronica Botanica is dedicated to Charles Sprague Sargent, first Director of the Arnold Arboretum, whose unswerving interest over a period of 54 years resulted in the institution as we know it today. One of Dr. Sargent's prime interests was the library, which he consistently enriched, and which Dr. Verdoorn has found to be a veritable mine of information for the basic data needed in connection with the extensive *Index Botanicorum* project. The dedication is: "Arborum librorumque amatori Carolo Sprague Sargentio in arboreto arnoldiano bibliothecaque locupletissima pia anima pervigilanti hic chronicorum botanicorum tomus octavus dedicatur."

The Library. — Accessions to the library during the past fiscal year amounted to 250 bound volumes and 140 pamphlets, making the total number of bound volumes 45,563, and of pamphlets 13,462. Approximately 595 cards were added to the main catalogue, 250 of them containing bibliographical data, and some 622 slips were added to the files which supplement the printed author and subject catalogue of the library. Interlibrary loans continued to be very numerous, and many orders for photostats and microfilms were received. Most of our forestry periodicals, numbering about 3,600 volumes, were deposited in the library of the Harvard Forest in Petersham. Our large collection of photographs was carefully checked through by the Navy Department, and many were sent on loan to Washington to be reproduced.

Atkins Institution of the Arnold Arboretum. — The limitations mentioned last year still prevail in reference to this unit, so that about all that could be done was to maintain and extend the plantings at Soledad. Difficulties have been encountered because of the impossibility of securing certain supplies and because of the extremely dry weather that characterized the past year, as well as the preceding one, and because of the necessity of increasing wages. The small stream which supplied water for irrigation purposes failed in two successive years at the height of the dry season, but

spring sites were known to be present in the cane fields assigned to the use of the garden in 1939, and three wells developed on these sites have provided sufficient water for present needs. It became necessary, however, to rearrange certain pipe lines and pumping installations. Additional plantings have been made in the palm section. During the year 195 living plants and 346 packages of seeds were distributed, and 20 living plants and 176 packages of seeds were received from abroad.

Publications. — Four numbers of the Journal appeared as usual, and a fourth number of Sargentia, including papers by Dr. A. E. Porsild (National Herbarium of Canada, Ottawa) on the flora of the continental Northwest Territories of Canada and by Dr. Raup on the willows of the Hudson Bay region and the Labrador Peninsula, was published. A fifth number of Sargentia, containing Dr. Perry's translation from the Dutch of Professor Lam's "Fragmenta Papuana," is now in press. Arnoldia was issued as usual. A bibliography of the published papers by staff members and students follows.

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Staff of the Arnold Arboretum
1943—44

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Synonyms are printed in *italics;* new names in **bold-face** type.