# Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

REED CLARK ROLLINS, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
CARROLL EMORY WOOD, JR.
IVAN MACKENZIE LAMB

Associate Editors

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The New England Botanical Club, Inc.

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# Rhodora

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## SYNOPSIS OF THE GENUS LEPANTHES IN MEXICO


RICHARD EVANS SCHULTES
and
GORDON W. DILLON


Prior to 1938, only four species of the orchidaceous genus *Lepanthes* were known to be native to Mexico. In 1938, Schultes described *Lepanthes Rekoi* from a Oaxacan collection and began a study of the numerous Mexican specimens of the genus in the Orchid Herbarium of Oakes Ames. The study was later carried out jointly by the two writers of this paper. Subsequent collections referable to *Lepanthes* were made in Mexico by Dr. H. Emery Moore of the Bailey Hortorium and by Dr. Robert L. Dressler, now of the Missouri Botanical Garden; several undescribed species were discovered in the Moore and Dressler collections and are herein described by Mr. Charles Schweinfurth and by Dr. Dressler.

Many of the specimens of Mexican *Lepanthes* are from the valuable collection of the late Mr. Erick Ostlund of Colonia del Valle, D. F. and Cuernavaca, Mexico. Four new species were found in the Ostlund collection, and sundry sterile specimens also preserved in his herbarium (now a part of the Orchid Herbarium of Oakes Ames) indicate that botanical explorations in central and southern Mexico, especially in Guerrero, Oaxaca and Chiapas, may yet increase the number of Mexican species.

In this paper, an enumeration of the Mexican representatives of *Lepanthes* is given, together with a key to the recognised species, of which there are sixteen. Nine are herein described as new. The material on which the paper is based is preserved in the Orchid Herbarium of Oakes Ames.

*Lepanthes tridentata* Sw., a West Indian species, has been reported from Mexico, but we have omitted it in our enumeration, believing the report to have been based on the misidentification of a Galeotti specimen of *Pleurothallis disticha* (Linnaea 22 (1849) 820), a concept which, in this paper, is transferred to *Lepanthes*.

*Lepanthes turialvae* has sometimes been credited to the Mexican flora. This binomial refers to an extremely confused concept, so confused that the rejection of the name as a *nomen confusum* has been suggested (Schultes, R. E. in Rhodora 60 (1958) 97). No matter which of the several ways in which the binomial has been used be adopted, *Lepanthes turialvae* is definitely not represented in our material from Mexico.

Species of *Lepanthes* are found in both the Atlantic and the Pacific watersheds of Mexico in relatively high regions of the following states: Hidalgo, Mexico, Pueblo, Vera Cruz, Oaxaca, Guerrero and Chiapas. It is noteworthy that, so far as is known, all the Mexican species are endemic with the exception of *Lepanthes acuminata* Schltr., *L. oreocharis* Schltr. and *L. Pristidis* Rchb.f. In general, the Mexican species show relationships with the Middle American representatives of the genus. In some cases, however, West Indian affinities are apparent.

It is very probable that additional species will still be discovered in Mexico. *Lepanthes* is well represented in Middle and South America and occurs throughout much of the West Indies. The number of species-concepts represented in Middle America is very large in comparison with the number in Mexico: in Costa Rica, for example, forty or more are recognised.

The northern limit of the genus in Mexico appears to be the State of Hidalgo, where Moore collected *Lepanthes avis* and *L. Moorei*.

KEY TO THE MEXICAN SPECIES OF LEPANTHES

1. Peduncles conspicuously overtopping leaves.
  2. Sepals conspicuously ciliate ........................ (15) *L. Schiedei.*
  2a. Sepals eciliate.
    3. Leaves three or more times longer than wide ...... (9) *L. oreocharis.*
    3a. Leaves suborbicular to ovate-elliptic.
      4. Flowers large, almost equal to leaves (over 1.5 cm. long). Sepals, when spread, forming ellipse .. (16) *L. tenuiloba.*
      4a. Flowers much smaller than leaves. Sepals, when spread, noticeably constricted at junction of dorsal with laterals.
        5. Lip trilobate ............................ (14) *L. Rekoi.*
        5a. Lip bilobate.
          6. Lobes of lip oblong and divaricate.
            7. Petal-lobes very unequal, without an apicule in sinus between them ............ (3) *L. avis.*
            7a. Petal-lobes subequal, with definite apicule in sinus between them ........ (4) *L. congesta.*
          6a. Lobes of lip cuneate and incurved ... (10 *L. orizabensis.*
1a. Peduncles shorter than leaves.
  8. Lip trilobate (middle lobe small, often an apicule).
    9. Petal-lobes conspicuously unequal.
      10. Petal-lobes with an apicule in sinus between them. Anterior lobe of petal obliquely deltoid .... (2) *L. ancylopetala.*
      10a. Petal-lobes without an apicule in sinus between them. Anterior lobe of petal semiorbicular .... (6) *L. Moorei.*
    9a. Petal-lobes subequal.
      11. Petal-lobes glabrous. Sepals ciliate .......... (12) *L. parvula.*
      11a. Petal-lobes papillose, especially along margin. Sepals not ciliate .................... (11) *L. papillipetala.*
  8a. Lip bilobate.
    12. Sepals usually long-acuminate. Lateral sepals recurved.
      13. Petal-lobes subequal ........................ (1) *L. acuminata.*
      13a. Petal-lobes unequal.
        14. Posterior lobe of petal oblong; anterior lobe acuminate, shorter than posterior .. (8) *L. Oestlundiana.*
        14a. Posterior lobe of petal falcate; anterior lobe suborbicular, larger than posterior .... (13) *L. Pristidis.*
    12a. Sepals acute or obtuse, not long-acuminate. Lateral sepals not recurved.
      15. Petals ciliate; anterior lobe minute ....... (7) *L. nigriscapa.*
      15a. Petals eciliate; anterior lobe long ......... (5) *L. disticha.*

1. **Lepanthes acuminata** Schlechter in Fedde Repert. 10 (1912) 355. Range: Guatemala, Honduras and Mexico (Chiapas). MEXICO: *Dressler 1439.*

2. **Lepanthes ancylopetala** Dressler, sp.nov.

Herbae epiphyticae, caespitosae, usque ad 4.5 cm. altae. Folia elliptica, usque ad 18 mm. longa. Inflorescentiae folio breviores. Flores succedanei, in racemis brevibus. Sepalum dorsale deltoideo-lanceolatum vel ovato-lanceolatum, acutum, 2-nervium; sepala lateralia usque ad medium vel ultra connata. Petala transverse bilobata, plusminusve sigmoidea; lobis posterioribus ligulatis vel lanceolatis, ca. 1 mm. longis, lobis anterioribus oblique deltoideis, quam posterioribus multo brevioribus. Labellum cum apiculo infracolumnari, lobis lateralibus ovatis, acuminatis, columnam amplectentibus.

Plant epiphytic, caespitose, 1.5–4.5 cm. tall. Secondary stem erect, monophyllous, 8–25 mm. tall, bearing 4–7 closely appressed sheaths, each with an ovate, acute, infundibuliform mouth; sheaths more or less hispidulose along nerves and margin. Leaves short petiolate, elliptic, tridenticulate apically, 3–5 mm. wide, 8–18 mm. long. Inflorescences 1–several per growth, 3–10 mm. long (peduncle 1.5–5 mm.), rarely equalling the leaf, flowers alternate, 2-ranked, successive. Bracts of inflorescence infundibuliform, .5–1.1 mm. long, acute, carinate, more or less hispidulose or hispid-villous; pedicel .6–1 mm. long, jointed to ovary which is .5–.8 mm. long. Flowers rose-pink. Dorsal sepal deltoid-ovate, acute, somewhat concave, 1.2–1.6 mm. wide, 2.2–2.5 mm. long, 3-veined; lateral sepals 2-veined, obliquely deltoid-lanceolate to ovate-lanceolate, acute, .8–1.3 mm. wide, 2.2–2.8 mm. long, connate for 1.1–1.6 mm. Petals transversely bilobed, with a tooth more or less conspicuously developed at the junction of the lobes, the posterior lobe much the larger, each lobe somewhat bent near the base, so that the petal is often somewhat sigmoid in form; posterior lobe .8–1 mm. long, .25–.45 mm. wide, ligulate to lanceolate, sometimes slightly falcate, acute to obliquely obtuse; anterior lobe obliquely deltoid, .2–.5 mm. long, acute or obtuse. Midlobe of lip an upcurved apicule beneath column, .15–.25 mm. long, lateral lobes clasping column, ovate, acuminate and incurved anteriorly (more or less comma-shaped), .35–.6 mm. wide, .7–.8 mm. long. Column .6–.85 mm. long, dilated above.

MEXICO: Estado de Chiapas, Municipio de Ocosingo, Laguna Ocotál Grande, about 25–30 km. southeast of Monte Líbano. Alt. about 950 m. "Karst topography. Epiphytic on small mossy trees in pine forest, also (but less common) on trees along lake shore and in upper branches of tall tropical evergreen forest; flowers rose-pink." July 20–August 20, 1954. *Robert L. Dressler 1475* (TYPE in Herb. Ames 69093).

This species is similar in habit to *Lepanthes stenophylla* Schltr. and *L. oreocharis Schltr.*, but it is readily distinguished by its very unequal petal-lobes; it is also a smaller plant. Other species, such as *Lepanthes nigriscapa* and the related *L. inaequiloba* A. & S., have very unequal petal-lobes; but the petals of these species are of a different shape, and the plants are of quite different habit.

The specific epithet refers to the "bent petal" which is characteristic of the species.

3. **Lepanthes avis** Reichenbach f. Xen. Orch. 1 (1856) 144, tab. 50, II, 5–7.

Range: Mexico (Vera Cruz, Hidalgo). MEXICO: *Moore 5288; Smith 341; von Kirchmar s. n.* (Record from the Reichenbach Herbarium (TYPE)).

4. **Lepanthes congesta** R. E. Schultes, sp. nov.

Herbae epiphyticae, caespitosae, usque ad 4 cm. altae. Caules secundarii erecti, numerosissimi, vaginarum ostiis et nervis minute hispidulis. Folium rotundato-ellipticum, leviter marginatum, obtusum vel subacutum. Inflorescentiae folium multo superantes, congestiflorae. Flores minimi, succedanei. Sepalum dorsale valde cucullatum, late ovatum, acuminatum, 3-nervium. Sepala lateralia usque ad medium connata, ovata, apice subacuminata, 2-nervia. Petala transverse bilobata, inter lobos cum apiculo; lobi posteriores oblongi, margine integri; lobi anteriores minores sed similes. Labellum bilobatum, lobo utroque oblongo vel obovato; apice rotundato, incurvato. Columna superne dilatata.

A caespitose, epiphytic herb up to 4 cm. high. Secondary stems erect, very numerous, concealed by several closely appressed hyaline sheaths, each of which terminates in an infundibuliform mouth; sheaths hispidulous along the nerves and on the thickened margin of the mouths. Leaves round-elliptic, marginate, obtuse or subacute, 8–9 mm. long, 6–7 mm. wide. Peduncles much longer than the leaves. Flowers many, borne in succession in very congested racemes. Lateral sepals about 2 mm. long, 1.1 mm. wide, connate for more than half their length, ovate but apically acuminate-acute, 2-nerved. Dorsal sepal cucullate, about 2 mm. long, basally 1.2 mm. wide, broadly ovate, 3-nerved. Petals transversely bilobed, with an apicule between the lobes; the posterior lobes oblong, the margin entire, 1 mm. long, 0.5 mm. wide; the anterior lobes about 1 mm. long, 0.3 mm. wide. Lip bilobed, each lobe oblong or obovate with an incurved, rounded apex, 0.8 mm. long, 0.3 mm. wide. Column 1–1.2 mm. long.

MEXICO: Estado de Vera Cruz, Orizaba. "On oak trees". May, 1905, *C. A. Purpus 1355* (TYPE in Herb. Ames 67044).

There has long been indecision as to the proper identification of *Purpus 1355.* Mr. A. A. Eaton, in the first decade of this century, studied the collection, made a sketch of the flower and wrote that the plant "agrees in essentials with *Lepanthes avis* but usually has more than one or two peduncles and there are discrepancies in detail of the flower; but as Reichenbach's drawings in Xenia are evidently poor, drawn apparently by someone who did not know just what to represent, I think this may safely be called *L. avis.* Column agrees well."

In 1939, Schultes studied the collection and expressed doubt that it could be referable to *Lepanthes avis.*

There can be little uncertainty that, in *Purpus 1355,* we are dealing with a concept hitherto undescribed. There are a number of points of disagreement with *Lepanthes avis,* to which it seems to bear closest affinity. *Lepanthes congesta* has longer spikes, very much exceeding the leaves and usually has many more flowers. There are, furthermore, three or four inflorescences arising together, not, as in *Lepanthes avis,* singly or rarely in pairs. *Lepanthes congesta* has flowers which are yellow, not red and white as in *L. avis.* The lip of *Lepanthes congesta* is not divaricate but is, on the contrary, very strongly inturned at the tip of the lobes. Perhaps the difference of greatest degree is to be found in the petal, for while *Lepanthes avis* has (according to Reichenbach's figure) very unequal lobes, those of *L. congesta* are subequal with a definite apicule in the sinus between them.

5. **Lepanthes disticha** (Rich. & Gal.) Garay & R. E. Schultes, comb. nov.

*Pleurothallis disticha* Richard & Galeotti in Ann. Sci. Nat., sér. 3, 3 (1845) 16.

For more than a century, this obscure concept was included in the genus *Pleurothallis.* Recent investigation, however, has shown it to belong definitely to *Lepanthes.*

The accompanying plate of *Lepanthes disticha* was prepared from *Nagel et Monzón 6754.*

6. **Lepanthes Moorei** C. Schweinfurth, sp. nov.

Herba epiphytica, pusilla, caespitosa. Caules tenues, plusminusve erecti, vaginis pluribus arcte tubulatis omnino obtecti. Folium breviter petiolatum; lamina elliptica vel ovato-elliptica, subacuta vel subacuminata, basi cuneata. Inflorescentia saepissime unica, supra dense pauci- vel multiflora, quam folium brevior. Flos parvus, ut in genere membranaceus. Sepalum dorsale late ovatum, abrupte acutum. Sepala lateralia oblique ovata, abrupte acuta, per medium inferiorem connata. Petala transversa, in circuitu oblique ovato-lanceolata. Labellum trilobatum, comparate magnum, lobis lateralibus triangulari-lanceolatis, incurvis, columnam excedentibus.

Plant epiphytic, small, slender, caespitose, up to 7 cm. high. Roots fibrous, glabrous, relatively stout. Rhizome abbreviated. Stems congested, very slender, erect or lightly arcuate, entirely concealed by 8 or less close tubular sheaths which are finely muriculate along the nerves and terminate in an ovate marginate hispid mouth, up to 5.5 cm. long (very variable in height). Leaf solitary, terminal, erect, spreading, shortly petioled; lamina elliptic or ovate-elliptic, sub-acute to short acuminate with a tridenticulate apex (when mature), cuneate at base, up to 2.1 cm. long and 1 cm. wide, chartaceous in the dried specimen. Inflorescences solitary (very rarely paired), more or less shorter than the leaf, densely 2- to many-flowered, up to 1.8 cm. long. Floral bracts congested, distichous, infundibuliform. Flower very small, membranaceous, column orange with red blotches. Sepals connate as in the genus, glabrous. Dorsal sepal broadly ovate, abruptly acute, 3-nerved below the middle, about 3 mm. long and 2.4 mm. wide. Lateral sepals obliquely ovate, abruptly acute, connate up to the middle, 2-nerved, about 2.8 mm. long (from the apex to the base of the column) and 1.8 mm. wide where broadest. Petals transverse, obliquely ovate-lanceolate in outline, minutely cellular-pubescent on the margins, about 1 mm. long and 2 mm. wide; posterior lobule relatively large, obliquely ovate-triangular, obtuse; anterior lobe very short, semiorbicular. Lip adnate to the lower part of the column, 3-lobed; lateral lobes relatively large, obliquely triangular lanceolate, incurved, obtuse, peltate, about 1.8 mm. wide above; mid-lobe minute, hirsute, apparently deciduous. Column arcuate-decurved, shorter than the lip, with an enlarged, subquadrate, 3-dentate rostellum.

MEXICO: Estado de Hidalgo, Distrito de Zacualtipán. "Slopes of ravine with pine-oak and moss-covered beech-magnolia woods. To the left of road beyond Rancho El Reparo, about 6.1 miles on road from Zacualtipán to Tlahuelompa." Alt. about 2000 m. October 14, 1949, *H. E. Moore, Jr. 5289* (TYPE in Herb. Ames No. 65879).

This species differs from *Lepanthes inaequiloba* A. & S. in its slender aspect, with differently proportioned petals and larger lip.

7. **Lepanthes nigriscapa** R. E. Schultes & Dillon, sp. nov.

Herbae epiphyticae, caespitosae, usque ad 15 cm. altae. Caules secundarii erecti, plusminusve septemvaginati, vaginarum infundibuliformium ostiis hispidulis. Folia elliptica, obtusa, apice tridentata. Pedunculi foliis breviores vel subaequales. Flores pauci in racemis abbreviatis. Sepalum dorsale late lanceolatum, obtusum, 3-nervium. Sepala lateralia usque ad medium connata, late lanceolata, obtusa, 2-nervia. Petala late elliptica, transverse bilobata; lobi posteriores late elliptici, ciliati in margine exteriore; lobi anteriores minuti, obtuse triangulares. Labellum bilobatum, lobo utroque dolabriformi, apice rotundato incurvo, in sinu incisura triangulari. Columna sursum dilatata.

A caespitose, epiphytic herb up to 15 cm. high. Secondary stems up to 11 cm. long, strong, erect, concealed by about 7–8 closely appressed, somewhat coriaceous sheaths, each of which terminates in an infundibuliform mouth. Sheaths hispidulose along the prominent nerves and on the thickened margins of the mouths. The uppermost sheath enclosing the petiole of the leaf. Leaves 4.5 cm. long and 1.5–2 cm. wide, elliptic, obtuse, tridentate at the apex. Peduncles not over-topping the leaves. Flowers few, borne in succession in abbreviated racemes. Lateral sepals 2.3 mm. long, about 1–1.3 mm. wide, connate for more than half their length, broadly lanceolate, obtuse, 2-nerved, the inner nerve more prominent. Dorsal sepal broadly lanceolate, obtuse, 2.5 mm. long, 1.5 mm. wide, 3-nerved. Petals transversely bilobed, broadly elliptic in outline, 2.2 mm. wide; the posterior lobe broadly elliptic, 1.9 mm. wide and 1 mm. long, ciliate along the outer margin; the anterior lobe very minute, 0.3 mm. wide, obtusely triangular. Labellum bilobed, each lobe dolabriform with a rounded, strongly incurved apex, 1 mm. long, with a slight triangular indentation in the sinus. Column dilated upwards. The sepals are yellow, and the petals and lip are red.

MEXICO: Estado de Oaxaca, Pacific slopes, northwest of Pluma Hidalgo. "Epiphytic on trees along river near the coffee plantation Copalita." Alt. about 1100 m. October 19, 1936, *Nagel & Juan G[onzález] 6441.* (TYPE in Herb. Ames 51713).

Future collections may indicate that *Lepanthes nigriscapa* should be treated as a variety of *L. inaequiloba* A. & S. The former has flowers which are only half as large as those of the latter and petals which are ciliolate, not glabrous.

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PLATE 1235. LEPANTHES NIGRISCAPA Schultes & Dillon. 1, plant, natural size. 2, flower, enlarged five times. 3, petal, enlarged ten times. 4, lip, enlarged fifteen times. — LEPANTHES OESTLUNDIANA Schultes & Dillon. 5, plant, natural size. 6, flower, enlarged five times. 7, petal, enlarged ten times. 8, lip, enlarged twenty times. DRAWN BY G. W. DILLON.

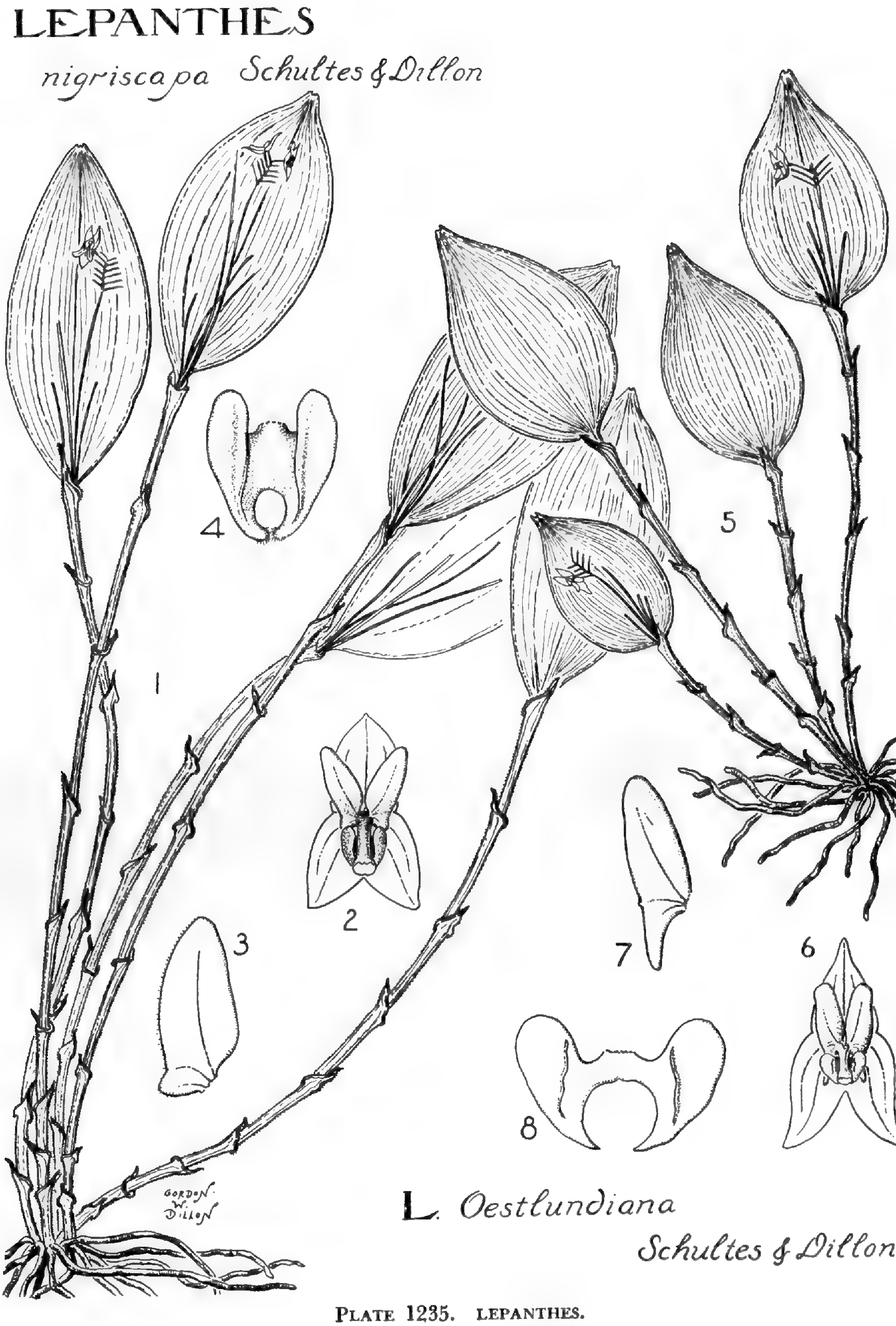


PLATE 1235. LEPANTHES.

*Lepanthes nigriscapa* seems to be related to *L. hondurensis* Ames of Honduras, differing from it in part by having smaller flowers with obtuse (instead of acuminate) sepals. The petals of the two species differ very markedly. The structure of the column is similar in both species. While the lips are similar, that of *Lepanthes nigriscapa* lacks the apicule in the sinus which is found in *L. hondurensis*. Vegetatively, *Lepanthes nigriscapa* and *L. hondurensis* are very similar, but the latter has more numerous and more closely placed sheaths than the former, and its leaves tend to be acuminate.

The lip of *Lepanthes nigriscapa* resembles that of *L. cascajalensis* Ames of Costa Rica in being deeply bilobed with inturned apices, but the lobes of *L. cascajalensis* are flat, bearing no thickened ridge. The petals of *Lepanthes cascajalensis* are broader, while the sepals are broader and more acuminate. The column differs markedly. Vegetatively, the two species are very distinct. With the exception of the lip, there is little to point to a relationship between *Lepanthes nigriscapa* and *L. cascajalensis*.

8. **Lepanthes Oestlundiana** R. E. Schultes & Dillon, sp. nov.

Herbae epiphyticae, laxe caespitosae, usque ad 14 cm. altae. Caules secundarii erecti vel leviter patuli, multivaginati, vaginarum infundibuliformium ostiis hispidulis. Folia ovato-elliptica, acuminata, apice tridentata. Pedunculi foliis breviores vel subaequales. Flores pauci in racemis abbreviatis. Sepalum dorsale ovatum, valde acuminatum, 3-nervium. Sepala lateralia ovata, usque ad medium connata, acuminata, 2-nervia. Petala eciliata, transverse bilobata, late lanceolata, lobis posterioribus oblongis, lobis anterioribus multo minoribus. Labellum unguiculatum, bilobatum, lobo utroque malleoliformi, eciliato, ovato, apice acuminato. Columna tenuis, sursum dilatata.

Plants loosely caespitose; epiphytic herbs up to 14 cm. high. Secondary stems erect or slightly spreading, up to 9.5 cm. long, concealed by about 6–9 closely appressed, more or less coriaceous, blackish sheaths each one of which terminates in an infundibuliform mouth. Sheaths hispidulose along the prominent nerves and on the thickened margin of the mouth; uppermost sheath enclosing the petiole of the leaf. Leaves broadly elliptic-ovate, abruptly acuminate, prominently tridentate at the apex, up to 4.5 cm. long and 2 cm. wide. Peduncles not overtopping the leaves. Flowers few, borne in succession in abbreviated racemes. Dorsal sepal 3 mm. long and 1.5 mm. wide, broadly ovate, strongly acuminate, 3-nerved. Lateral sepals 3 mm. long and about 1.2 mm. wide, connate for about half their length, ovate, strongly acuminate, 2-nerved with the inner nerve more prominent. Petals 2.4 mm. wide, transversely bilobed, broadly lanceolate in outline, eciliate. Anterior lobe of petals 0.7 mm. long, 1.5 mm. wide, oblong. Posterior lobe much smaller, 0.9 mm. wide. Labellum 1 mm. wide, unguiculate, bilobed, each lobe malleoliform, eciliate, ovate in outline, with a prominent central ridge or fold, the apex acuminate and slightly incurved. Column very slender, dilated upwards. Sepals and labellum pale green; petals yellow and red.

MEXICO: Estado de Vera Cruz, Zacuapam. "Epiphytic on trees in damp and shady places near a brook in virgin forest." Alt. about 2925 m. February 12, 1932, *Otto Nagel 2657* (TYPE in Herb. Ames, 51708).

*Lepanthes Oestlundiana* seems to be related to Schlechter's *L. scopula,* a native of Middle America. There is a drawing of the type of *Lepanthes scopula* in the Ames Herbarium. The leaves of *Lepanthes Oestlundiana* are more constantly acuminate, the sepals are more acuminate, the lip has broader lobes of a slightly different shape than the corresponding parts of *L. scopula.* The posterior lobe of the petals of *L. scopula,* furthermore, is strongly retrorse, while that of *L. Oestlundiana* is characteristically retrorse. However, the relationship between these two species, is close.

*Lepanthes Oestlundiana* is related also to *L. nigriscapa* from the Pacific slopes of Oaxaca. The petals of both species have the same general pattern. The posterior lobes of the petals of *Lepanthes Oestlundiana* are oblong and eciliate, while those of *L. nigriscapa* are broadly elliptic and ciliate on their outer margin. The anterior lobe of the petals of the former is oblong, of the latter obtusely triangular. The sepals of *Lepanthes Oestlundiana* are ovate and strongly acuminate, those of *L. nigriscapa* are elliptic and obtuse. The lips, while of the same general pattern, differ in that the lobes of the lip of *Lepanthes Oestlundiana* bear a central ridge or fold while in *L. nigriscapa* the ridge is almost marginal. The apices of the lobes of the lip of the former are acute and eciliate, those of the latter are obtuse and coarsely ciliate. *Lepanthes Oestlundiana* has broadly elliptic-ovate leaves with prominently tridentate apices, while in *L. nigriscapa* the leaves are elliptic with the tridentation of the apices less marked. These differences, though constant and certainly of specific importance, nevertheless are not great, and it is clear that the two species are very closely related. This close relationship assumes additional significance when it is emphasized that *Lepanthes Oestlundiana* is a plant of the Atlantic watershed of Vera Cruz, while *L. nigriscapa* grows on the Pacific watershed of Oaxaca.

We take pleasure in naming this species in memory of the late Mr. Erik Ostlund from whose large herbarium of orchids this collection came.

9. **Lepanthes oreocharis** Schlechter in Fedde Repert. 10 (1912) 483.

Range: Guatemala and Mexico (Chiapas, Guerrero). MEXICO: *Matuda 1688; Juan G[onzález] 1060; G. B. Hinton 1744; Wendt s. n.* (TYPE).

10. **Lepanthes orizabensis** R. E. Schultes & Dillon, sp. nov.

Herbae epiphyticae, caespitosae, usque ad 5 cm. altae. Caules secundarii erecti, plusminusve septemvaginati, vaginarum infundibuliformium ostiis hispidulis. Folia suborbicularia vel elliptica, marginata, obtusa, apicibus tridentatis. Inflorescentiae folium superantes. Flores pauci, succedanei, in racemis brevibus. Sepalum dorsale late lanceolatum, acuminatum, 3-nervium. Sepala lateralia lanceolata, usque ad medium coherentia, apicibus acuminatis recurvis, 2-nervia. Petala eciliata, transverse bilobata, lobis anterioribus oblongis cum apicibus rotundatis, lobis posterioribus cuneatis, apicibus obliquis. Labellum bilobatum, lobo utroque triangulari, apice acuminato incurvato. Columna tenuis, sursum dilatata.

Plants epiphytic, caespitose, up to 5 cm. high. Secondary stems erect, 1.5–3.5 cm. long, concealed by about 7 closely appressed hyaline sheaths, each terminating in an infundibuliform mouth; sheaths hispidulose along the prominent nerves and the thickened margin of the mouth. Uppermost sheath enclosing the petiole of the leaf. Leaves suborbicular to elliptic, marginate, obtuse, 0.8–1.3 cm. long, about 0.7 cm. wide, apex inconspicuously tridentate. Peduncles overtopping the

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PLATE 1236. LEPANTHES REKOI R. E. Schultes. 1, plant, natural size. 2, flower, enlarged five times. 3, petal, enlarged ten times. 4, lip, enlarged sixteen times. — LEPANTHES TENUILOBA Schultes & Dillon. 5, plant, natural size. 6, flower, enlarged two and one half times. 7, lip, enlarged ten times. 8, 9, petals showing variation, enlarged five times. — LEPANTHES DISTICHA (Rich. & Gal.) Garay & Schultes. 10, plant, natural size. 11, flower, enlarged five times. 12, lip, enlarged fifteen times. 13, petal, enlarged ten times. — LEPANTHES ORIZABENSIS Schultes & Dillon. 14, plant, natural size. 15, flower, enlarged five times. 16, lip, enlarged ten times. 17, petal, enlarged ten times. DRAWN BY G. W. DILLON.

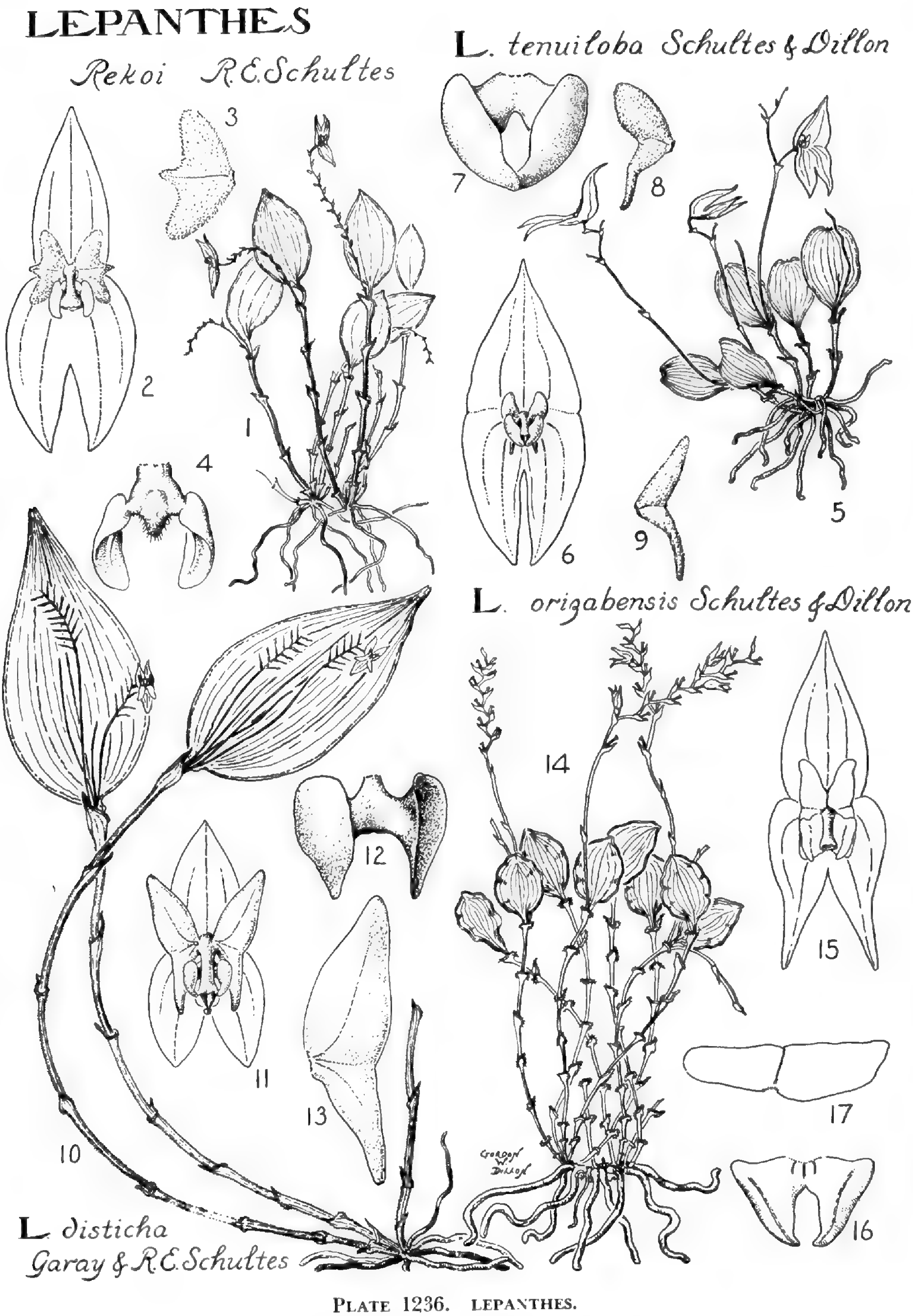


PLATE 1236. LEPANTHES.

leaves. Flowers few, borne in succession in abbreviated racemes. Dorsal sepal broadly lanceolate, acuminate, 4.5 mm. long, 2.25 mm. wide, 3-nerved. Lateral sepals coherent for almost half their length, lanceolate, narrowing to a recurved, acuminate tip, 4.5 mm. long, 1.5 mm. wide, 2-nerved, the inner nerve more prominent. Petals about 2.7 mm. wide, eciliate, transversely bilobed. Anterior lobe oblong with rounded apex; posterior lobe cuneate with oblique apex. Lip 1.8 mm. wide, enfolding the column, bilobed, each lobe more or less triangular with a central ridge, the apex acuminate and slightly incurved. Column slender, dilated upwards.

MEXICO: Orizaba, Vera Cruz, 1855, *Müller s. n.* (TYPE in N. Y. Bot. Gard.); Sierra de Agua [Vera Cruz?], May 1854, *Müller 982.*

*Lepanthes orizabensis* seems to be allied to *L. avis,* being similar vegetatively, in the shape of leaf, in the lax inflorescence and in general aspect. *Lepanthes orizabensis* is larger, however, and differs from *L. avis* (according to Reichenbach's rather sketchy drawings) in the shape of the petals, the shape of the lip and the relative size of the flowers.

Another ally of *Lepanthes orizabensis* is *L. Schiedei,* the type specimen of the former having been originally determined as the latter species. The absence of cilia on the sepals of *Lepanthes orizabensis* and the differently shaped lip, however, make these two species quite distinct.

*Lepanthes orizabensis* is likewise very closely allied to *L. fractiflexa* A. & S. of Cuba, from which it can be separated by its smaller flowers and sepals of a different shape.

11. **Lepanthes papillipetala** Dressler, sp. nov.

Herbae parvulae, caespitosae, epiphyticae, usque ad 22 mm. altae. Folia petiolata; laminae orbiculares vel ellipticae, usque ad 12 mm. longae. Inflorescentiae folium breviores. Flores succedanei, in racemis brevibus. Sepalum dorsale deltoideo-ovatum, acutum, 3-nervium. Sepala lateralia oblique ovato-lanceolata, acuta, 2-nervia, usque ad medium connata. Petala transverse bilobata, pilis minutis papillatis ornata; lobis posterioribus ligulatis, apicibus obtusis, ca. 1 mm. longis; lobis anterioribus angustioribus ligulato-lanceolatis. Labellum cum apiculo infracolumnari, lobis lateralibus ovatis, acuminatis, hispidulis, columnam amplectentibus.

Plant epiphytic, caespitose, 10–22 mm. tall. Secondary stem erect, monophyllous, 4–10 mm. tall, bearing 3–4 closely appressed sheaths, each with an ovate, acute, infundibuliform mouth; sheaths more or less hispidulose along nerves and margins. Leaves petiolate, petiole ca. 2 mm. long, blade orbicular to elliptic, apically tridenticulate, with a pronounced submarginal vein, 3–5 mm. wide, 5–12 mm. long. Inflorescences one to several per growth, 3–5 mm. long (peduncle 1–2.5 mm.), flowers alternate, 2-ranked, successive: bracts of inflorescence infundibuliform, ca. 1 mm. long, acute, carinate, more or less hispidulose. Pedicel 1–1.5 mm. long, jointed to ovary, which is ca. 1 mm. long. Flowers light pink, dorsal sepal deltoid-ovate, acute, 1.75–2.2 mm. wide, 2–2.7 mm. long, 3-veined, midvein with few minute papillae externally, margin sometimes very minutely papillate-serrulate. Lateral sepals 2-veined, obliquely ovate-lanceolate, acute 1.1–1.25 mm. wide, 2–2.9 mm. long, connate for ca. 1.8 mm., apices slightly divergent. Petals transversely bilobed, with a tooth (the apex of the petal) more or less developed at the junction of the lobes; posterior lobe ligulate, obtuse, .8–1.1 mm. long and .4–.55 mm. wide, bearing minute papillate hairs, especially on inner margin (these hairs ca. .04–.05 mm. long); anterior petal lobes narrower, ligulate-lanceolate, obtuse, with a tuft of minute papillate hairs at tip, .2–.3 mm. wide, .65–1 mm. long. Mid-lobe of lip an apicule beneath column, ca. .2 mm. long; lateral lobes clasping column, ovate, acuminate and incurved anteriorly (more or less comma-shaped), hispidulose, especially on posterior margin, .75–.8 mm. long, .3–.5 mm. wide. Column ca. .75 mm. long, dilated above.

MEXICO: Chiapas, Municipio de Ocosingo, Laguna Ocotál Grande, about 25–30 km. southeast of Monte Líbano. Alt. about 950 m. "Karst topography. Flowers light pink, epiphytic on small mossy trees in pine forest, also (but less common) on trees along lake shore and in upper branches of tall tropical evergreen forest." July 20–August 29, 1954. *Robert L. Dressler 1476* (TYPE in Herb. Ames 69092).

This dwarf species is at once distinguished from all its allies, except *L. parvula,* by the papillate hairs of its petals. Various species, such as the *Lepanthes Lindleyana* Oerst. & Reichb. f.—complex and *L. Rekoi* have ciliate petals, but papillate petals are not common in the genus. In habit, this species resembles *Lepanthes avis,* but the lateral lobes of the lip in the latter species are divergent rather than closely enclasping the column as in the former. *Lepanthes papillipetala* is closely related to *L. parvula* but is distinguished by its entire sepal-margins, its hispidulose lip and its larger flowers.

12. **Lepanthes parvula** Dressler, sp. nov.

Herbae parvulae, caespitosae, epiphyticae, usque ad 22 mm. altae.

Folia orbiculari-elliptica, usque ad 10 mm. longa. Inflorescentiae folio breviores. Flores succedanei, in racemis brevibus. Sepala ciliata. Sepalum dorsale deltoideo-ovatum, acutum, 3-nervium. Sepala lateralia oblique ovata, acuta, 2-nervia, usque ad medium vel ultra connata. Petala transverse bilobata, papillis minutis ornata, lobis falcatis, apicibus obtusis. Labellum cum apiculo infracolumnari, lobis lateralibus ovatis, acuminatis, minutis, papillatis, columnam amplectentibus.

Plant epiphytic, caespitose, 7–22 mm. tall. Secondary stem erect, monophyllous, 3–12 mm. tall, bearing 3–5 closely appressed sheaths, each with an ovate, acute, infundibuliform mouth; sheaths more or less hispidulose along nerves and margins. Leaves petiolate, petiole ca. 1 mm. long, blade orbicular-elliptic, apically tridenticulate, with a somewhat pronounced submarginal vein, 2.5–6 mm. wide, 3.5–10 mm. long. Inflorescences one to several per growth, 2–5 mm. long (peduncle .5–2 mm.), flowers alternate, 2-ranked, successive; bracts of inflorescence infundibuliform, ca. .7 mm. long, carinate, acute, hispidulose. Pedicel ca. .8 mm. long, jointed to ovary, which is ca. .5 mm. long. Flowers light pink, sepals ciliate on margins and slightly papillate on exterior of midveins; dorsal sepal deltoid-ovate, acute, 1.3–1.6 mm. long, .9–1.1 mm. wide, 3-veined (lateral veins very weakly developed); lateral sepals 2-veined (only inner vein well developed), obliquely ovate, acute, ca. .6 mm. wide, 1.3–1.6 mm. long, connate for ca. .9 mm. Petals minutely papillate, transversely bilobed, with a deltoid tooth more or less developed at the junction of the lobes; lobes more or less equal, falcate from a deltoid base, obtuse, .45–.6 mm. long, whole petal lunate with central, deltoid tooth on concave side. Mid-lobe of lip a pubescent apicule ca. .15 mm. long beneath column, lateral lobes minutely papillate, ovate, acuminate, ca. .6 mm. long, clasping column. Column ca. 1.6 mm. long, dilated above. Capsule ca. 2 mm. long.

MEXICO: Chiapas, Municipio de Ocosingo, Laguna Ocotál Grande, about 25–30 km. southeast of Monte Líbano. Alt. about 950 m. "Karst topography. Flowers light pink, epiphytic on small mossy trees in pine forest, also (but less common) on trees along lake shore and in upper branches of tall tropical evergreen forest." July 20–August 20, 1954. *Robert L. Dressler 1477* (TYPE in Herb. Ames 69094).

In its ciliate sepal-margins and general habit, this species resembles the larger *Lepanthes Schiedei* Reichb. f. but differs in several characters: the short inflorescence, the much smaller flowers and the more or less papillate petals and lip, which are differently shaped. From *Lepanthes papillipetala* Dressler, this species may be distinguished at once by its ciliate sepals, its less strongly papillate petals, its papillate lip and its smaller flowers.

These species grow together in pine forests and, without the aid of a lens, can be separated only on the basis of a marked difference in flower size. It is interesting that three distinct new species of *Lepanthes* should be found growing together in the same habitat, especially so when two of the species appear to be rather closely related.

13. **Lepanthes Pristidis** Reichenbach f. in Linnaea 22 (1849) 820; Xen. Orch. 1 (1856) 151, t. 50, figs. IV, 11–14; in Walpers Ann. Bot. 3 (1852–53) 156.

Range: Cuba and Mexico (Vera Cruz). MEXICO: *Liebold s. n.* (Record from the Reichenbach Herbarium) (TYPE); *Sartorius s. n.* (Record from the Reichenbach Herbarium); *Schaffer 51* (Record from Reichenbach Herbarium).

Reichenbach's drawings of this concept are so inadequate that it is not clear from them just what are the affinities of *L. Pristidis.* A study of the type drawings and of Reichenbach's description, however, indicate that it is distinct from the other species of Mexican *Lepanthes.* It is probably related to *Lepanthes disticha.*

*Lepanthes Pristidis* occurs also in Cuba (Acuña, "Cat. descr. orquid. Cub." (1939) 145).

14. **Lepanthes Rekoi** R. E. Schultes in Bot. Mus. Leafl. Harvard Univ. 6 (1938) 193.

Range: Mexico (Puebla and Oaxaca). MEXICO: *Juan G[onzález]* 2415; *Schultes 817; Schultes & Reko 336* (TYPE).

This exceptional little orchid, known only from one station in northeastern Oaxaca and one station in northeastern Puebla, shows unmistakably clear relationships with *Lepanthes Dawsonii* Ames of Honduras. The two have in common a trilobate lip which is apparently of rare occurrence in the genus.

It has been thought that *Lepanthes* is a genus in which considerable latitude should be allowed in the identification of specimens, because intraspecific variation has been thought to be rather great. Since colonies of *Lepanthes* are usually small and frequently isolated, collections of species of this genus seldom contain sufficient material to permit a study of intraspecific variations. Fortunately, Schultes was enabled to study a number of living specimens for variation within the species at the type locality of *Lepanthes Rekoi.*

In August 1938, the type of *Lepanthes Rekoi* was collected on an oak tree on the eastern slopes of the great Cerro de los Frailes in the District of Teotitlán in northeastern Oaxaca. Diligent search yielded only one flowering and one fruiting specimen. The characters of this species were so striking and sharp, however, that Schultes described the plant as new. A collection by Juan G[onzález] from Puebla, though differing in some slight details from the type, was cited with the type.

In July, 1939, Schultes revisited the type locality and found in full flower the colony from which the type came. Again, search within a 150-yard radius failed to reveal another colony. Nearly thirty flowers were closely examined before pressing and were compared with a drawing of the type. Very little deviation from the type was noticed. More flowers were critically examined in the laboratory with the type at hand; almost no variation in floral parts and no variation in specific characters was in evidence.

15. **Lepanthes Schiedei** Reichenbach f. in Linnaea 22 (1849) 820; Xen. Orch. 1 (1856) 144, t. 50, figs. I, 1–4; in Walpers Ann. Bot. 3 (1852–53) 524.

Range: Mexico (Vera Cruz and Chiapas). MEXICO: *Matuda 1595; Schultes 1012; Schiede s. n.* (Record from Reichenbach Herbarium (TYPE).

16. **Lepanthes tenuiloba** R. E. Schultes & Dillon, sp. nov.

Herba parvula, caespitosa, epiphytica. Caules secundarii erecti, tenues, monophylli, plusminusve trivaginati, vaginarum infundibuliformium ostiis hispidis. Folium ovatum vel ovato-ellipticum, coriaceum, apice tridenticulatum, basi cuneatum. Pedunculi folium superantes. Flos grandis, usque ad 15 mm. longus, purpureo-ruber. Sepala connata, glabra, in circuitu elliptica; sepalum dorsale elongato-triangulare, acutum, prominenter 3-nervium; sepala lateralia triangulari-lanceolata, acutiuscula, 2-nervia. Petala parvula, glabra, transverse bilobata; lobis anterioribus lanceolatis longo cum angusto, abrupte acuminato, lineare apice; lobis posterioribus oblongo-lanceolatis. Labellum bilobatum; lobis lateralibus in circuitu oblique oblongo-ellipticis, in sectione abrupte malleoliformibus. Columna tenuis, apice dilatata, inter labelli lobos circumdata.

Plant very small, 2.5–3 cm. tall to the tip of the leaf, caespitose, epiphytic. Roots fibrous, short, stout. Secondary stems slender, erect, monophyllous, from 3–10 mm. long, concealed by about 3 hyaline, close-tubular sheaths which end in infundibuliform mouths; sheaths pubescent on the longitudinal nerves and on the margins of the mouth; the uppermost sheath largest, enclosing the petiole of the leaf. Leaf ovate or ovate-elliptic, 8–12 mm. long, 4–7 mm. broad, tridenticulate at the apex, cuneate at the base, coriaceous, marginate, short-petiolate. Peduncles conspicuously overtopping the leaf, very slender, bearing near the middle one tubular sheath with an infundibuliform mouth, up to 30 mm. long, few-flowered (usually only one expanded at a time). Flowers very large for the plant, when spread out up to 1.5 cm. long from the tip of the dorsal sepal to the apex of the lateral ones, borne in succession on a raceme. The sepals glabrous, purplish-red, when spread out forming a perfect ellipse in outline; lateral sepals connate to about the middle, asymmetrically triangular-lanceolate, acutish, 2-nerved, about 7 mm. long, 2.5 mm. wide at the base; dorsal sepal elongate, triangular, acute, prominently 3-nerved, about 7 mm. long, 5 mm. wide at the base. Petals very small, purplish-red, glabrous, transversely bilobed; the anterior lobe lanceolate, 0.7 mm. wide at the base, with a long narrow, abruptly acuminate, linear apex; the posterior lobe oblong-lanceolate, 2 mm. long, 1 mm. wide or less. Labellum bilobed; the lateral lobes obliquely oblong-elliptic in outline, 1.6 mm. long, 0.5 mm. wide, in section abruptly malleoliform, tightly enclasping and partially obscuring the column. Column slender, slightly dilated at the apex.

MEXICO: Estado de Chiapas, Siltepec, August 9, 1937, *E. Matuda 1595a*. (TYPE in Herb. Ames, No. 46731; Duplicate Type in Herb. Univ. Michigan).

*Lepanthes tenuiloba* is not closely related to any known Central American species of *Lepanthes,* unless it be with *L. guatemalensis Schltr.* The two species agree in floral size and in general habit, but there are significant structural differences in the flowers. It is easily distinguished from other species by the flowers which are exceedingly large, considering the size of the plant, and by the connate sepals which, when spread out, form a perfect ellipse in outline instead of being constricted at the junction of the dorsal with the lateral sepals. The relative minuteness of the petals in comparison with the large sepals is a feature which cannot be found in many species. Distinctive also is the shape of the petals with their curiously attenuated anterior lobes and the shape of the labellum which tightly enfolds the very slender column. *Lepanthes tenuiloba* has the largest flowers among the Mexican species, although several species are larger vegetatively.

*Matuda 1595* was a mixed collection. It contained several excellent specimens of *Lepanthes Schiedei* Reichenb. f. The half dozen or more specimens of the much larger flowered *Lepanthes tenuiloba* have been renumbered *Matuda 1595a.*

— Botanical Museum of Harvard University and American Orchid Society, Cambridge, Mass.

# NOTES ON THE FLORA OF A GORGE OF ESOPUS CREEK, NEW YORK

Henry F. Dunbar

The object of this paper is to record evidence of a changing flora: (1) remnants of a flora of a colder climate which is presumed to have preceded the present time but followed the last glacial period, (2) presence of species characteristic of a warmer climate and which may be the vanguard of a gradual plant migration into this area.

## DESCRIPTION OF THE AREA

This study covers the slopes immediately adjacent to Esopus Creek and creek bed, Ulster County, N. Y. from the Ashokan Reservoir to the flood plain at Marbletown. Through most of this area the creek flows rapidly with very little quiet water over a stony or gravelly bottom. The shores, mostly heavily wooded, rise steeply, and, in some places consist of sheer cliffs of Devonian sandstone often 100 ft. high. Frequent sand terraces and gravel bars occur with a flora characteristic of such places. The elevation of the study area lies between 200 and 500 feet above sea level. The average rainfall is about 43 in. per year and the temperature range is from a minimum of –25° F to a maximum of about 100° F.

The predominating trees on the sand, gravel or silt shores are poplars *(Populus deltoides* and *P. grandidentata),* sycamore *(Platanus occidentalis),* and both the gray and speckled alders *(Alnus serrulata* and *A. rugosa).* The steep slopes adjacent to the creek are heavily covered with hemlock and white pine *(Tsuga canadensis* and *Pinus Strobus),* the three birches *(Betula lenta, B. lutea, B. papyrifera),* and the maples *(Acer rubrum, A. saccharum. A pensylvanicum).* On the higher slopes various oaks *(Quercus alba., Q. Prinus, Q. rubra, Q. velutina,* and *Q. coccinea*) complete with the pines and the hemlocks. The more conspicuous shrubs along the shore are the ninebark (*Physocarpus opulifolius*), the dogwood (*Cornus Amomum*), and various willows (*Salix spp.*).

Of outstanding interest is the occurrence of species usually found further north or at higher elevations. Their presence here in cool, shady, moist situations suggests that they may be relics of a time when a colder climate favored their more general distribution. Such a condition doubtless followed the last glacial period, and, as warming up progressed, plants requiring a damp and cool environment failed to survive in the territory surrounding the gorge.

## SIGNIFICANT PLANTS OF THE AREA

The species listed below seem to be noteworthy, judging from published ranges available to me — chiefly those of the 8th edition of Gray's Manual, which, except where otherwise indicated, is the basis for remarks on ranges. The nomenclature used follows that of the Manual. Specimens of all of the plants mentioned have been collected by me, unless otherwise indicated, and are deposited in the herbarium of the New York State Museum in Albany, N. Y.

### HIGH NORTHERN

BRYUM MUHLENBECKII. This moss, of circumpolar distribution, has previously been reported in the northeastern U. S. only from northern parts of New York and New England.[1]

MYURELLA JULACEA. Grout describes this species as a "subalpine moss, south to Conn." Ketchledge collected both of these mosses on the gorge. He also reports the Myurella from northern New York.[2]

LYCOPODIUM SELAGO, var. PATENS. Only three or four plants of this clubmoss were found in the gorge growing on rocks close to the creek. This boreal species occurs in the Catskill Mountains in Greene Co., about 25 miles away, and recently I found a large stand of it in the Shawangunk Mts. about 15 miles south of the study area.

WOODSIA ALPINA. This fern of "arctic regions", has not previously been reported from New York State south of Essex Co. in the northern Adirondacks,[3] but it has been recorded from both northern Vt. and Me. About 25 plants were found scattered along a northeast-facing cliff.

CRYPTOGRAMMA STELLERI. A circumboreal species, reaching locally in northeastern North America into Penn. and N. J. In New York State

[1] GROUT, A. J. Moss Flora of North America. Vol. 11. p. 234.

[2] KETCHLEDGE, EDWIN H. Checklist of Mosses of New York State. New York State Museum Bulletin number 363.

[3] Map files of the Botany Office, New York State Museum, Albany, N. Y.

there are four known stations in Greene Co. and one in Delaware Co. Thus this station becomes the southernmost one reported in the state.

SEDUM ROSEA. The occurrence of this plant in the gorge is the fifth New York station. Usually growing in arctic regions, it has been found in Madison, Yates, Greene and Schuyler Cos., N. Y. It has also been collected in northeastern Penn. and on Roan Mountain in North Carolina. Uhl has reported 11 gametic chromosomes in plants from the Esopus Gorge.[4]

ACHILLEA BOREALIS. (*A. Millifolium* L. var. *nigrescens* E. Mey.) Identified by S. J. Smith who believes that it should be given varietal status, following the treatment of Cronquist in the Britton and Brown Illustrated Flora. According to Smith, these specimens are identical with those found in some of the Adirondack gorges, near Elmira and in the Delaware Water Gap.

## CANADIAN ZONE

The following plants exhibit more or less isolated extensions of range from the cooler valleys of the Catskills.

POLYSTICHUM BRAUNII. This fern common in the Catskills at elevations from 1500 to 2200 feet, is rare at other altitudes. One plant was observed on a wet, north-facing cliff. It was subsequently washed away during a flood and hence was not collected.

PICEA RUBENS AND ABIES BALSAMEA. Three or four depauperate specimens of each were found on the wooded slopes. Abundant stands of both occur in the Catskills above 3500 ft. some 15 or 20 miles to the west.

TRISETUM SPICATUM var. MOLLE. This grass was collected in the gorge by S. J. Smith.

EPILOBIUM CILIATUM. Smith identified this species also growing in the same area.

LOBELIA KALMII. Fernald reports this plant as growing from Newfoundland to central Maine, northern New Jersey and southeastern Pennsylvania. Here it occurs in several locations on wet cliffs.

The following might be designated as Appalachian rather than Canadian.

ILEX MONTANA. But one (male) plant has been found in the area.

VIOLA ROTUNDIFOLIA. This violet occurs sparsely in moist, shady ravines.

VIBURNUM ALNIFOLIUM. This shrub, growing in similar places to the violet, is even more scarce.

## SOUTHERN

The following plants suggest that they may have moved into this

[4] Heteroploidy in Sedum Rosea (L) Scop. Evolution 6: 81–86. 1952.

area as the climate warmed up. It is true that in each case there are instances of their occurrence even further north, but they are scarcely expected to be found associated with those listed above and are offered as possible evidence of post-glacial northward migration.

CORALLORHIZA ODONTORHIZA. The range for this orchid is from southwestern Maine to Georgia and Alabama.

TEPHROSIA VIRGINIANA. This species is recorded from Florida north to southern New Hampshire.

GALIUM PILOSUM. This bedstraw occurs in the Finger Lakes region of New York and sparsely in the Hudson Valley, but is not reported from the mountain regions of New York State.[3]

SOLIDAGO ODORA. With a distribution much like that of the Tephrosia, this plant is equally unexpected in the gorge.

### ACKNOWLEDGMENTS

I wish to express my appreciation of help in preparing this paper to the following persons: Dr. R. T. Clausen, Dept. of Botany, Cornell Univ. for data on Sedum; E. H. Ketchledge, Department of Botany, N. Y. State School of Forestry for data on mosses; Stanley J. Smith, New York State Museum for permission to examine the Botany Office files and for many helpful suggestions; Professor G. S. Torrey of the Univ. of Conn., and Charles Schweinfurth of the Botanical Museum of Harvard University, for a critical reading of the manuscript and many constructive thoughts.

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# PLANTS NEW TO ILLINOIS AND TO THE CHICAGO REGION

JULIAN A. STEYERMARK AND FLOYD A. SWINK

Since the last publication by the authors and Dr. Thieret[1], the following new records have come to light. All specimens are deposited in the herbarium of the Chicago Natural History Museum.

### PLANTS NEW TO ILLINOIS

BUTOMUS UMBELLATUS L. This species was found growing spontaneously and aggressively spreading in a small pond south of 87th Street and east of Kean Avenue near Buffalo Woods Forest Preserve, Cook Co., Aug. 6, 1957, *Swink 3007*.

BETULA PUMILA L. var. GLABRA Regel. This variety is not given for Illinois in the 8th Edition of Gray's Manual. The following collection belongs to this variety: Low mound in swale, north of Waukegan, Lake Co., June 8, 1908, *Frank C. Gates 2500*.

PODOPHYLLUM PELTATUM L. f. DEAMII Raymond. This color form of the May Apple, previously known in this country only from Indiana and Missouri, has recently been collected in the Chicago area, as follows: Tinley Creek Woods along bridle path east of Harlem Avenue, 1½ miles south of Highway 143, May 15, 1957, *Herbert Pahnke s.n.*

Podophyllum peltatum L. f. polycarpum Clute. This form was reported by Pepoon[2] from the Chicago area but no specimens are extant. The data for the only herbarium record for Illinois are as follows: Woods bordered by Mill Creek Road, Kelly Road, and Dilleys Road, on property of Dr. and Mrs. L. F. Yntema, northwest of Wadsworth, about 5 miles southwest of Zion, Lake Co., August, 1956, *Jean Yntema* s.n.

Rubus occidentalis L. f. pallidus (Bailey) Robins. The data for the collection of this form with cream- or amber-colored fruit are as follows: Open borders of *Quercus alba-Quercus rubra-Carya ovata* woodland bordering swampy meadow, on property of Dr. and Mrs. L. F. Yntema, west of Highway 41, northwest of Wadsworth, about 5 miles southwest of Zion, Lake Co., July 18, 1956, *Steyermark 81982.*

Rosa micrantha Sm. This adventive species has become established at the following locality: Natural prairie overlying glacial gravel moraine on crest of slope just east of Highway 173 and north of Forest Hill Golf Course, T44N, R2E, Sect. 8, 0.8 mile northeast of junction of Highways 51 and 173, just northeast of Rockford, Winnebago Co., Oct. 1, 1955, *Steyermark 80289.*

Rhamnus frangula L. var. angustifolia Loud. This unusual narrow-leaved variety is not recorded in any of the principal floras of the United States; it was found growing with typical *Rhamnus frangula.* The narrow elongate *Salix*-like leaves have irregularly undulate-scalloped margins. The data are as follows: Near a small pond west of 104th Avenue south of Longjohn Slough approximately ½ mile south of 95th Street in Palos Forest Preserve south of Willow Springs, Cook Co., July 2, 1957, *Swink 3001.*

Oxydendrum arboreum (L.) DC. Three trees of this species, of differing sizes and ages, have been located near each other in southern Cook County. They have certainly become naturalized at this locality, where they were growing with the native flora. The data are as follows: In a quaking aspen thicket at the north end of Sweet Woods Forest Preserve south of Thornton, Cook Co., Sept. 29, 1956, *Swink 2787.* In addition, there is a specimen of this species in the Chicago Natural History Museum Herbarium collected by Robert Ridgway on Sept. 7, 1920, with the following location: 9½ miles northeast of Olney, on Corn Ford Road, Richland Co. In his Ligneous Flora of Richland County, page 30, Ridgway states that the specimen "had long been misplaced and was with a lot of herbaceous material sent to the Missouri Botanical Garden, where identified by Mr. J. M. Greenman. There is some reason for suspecting that the original label had slipped from the corner and had been replaced by one which may not have belonged to the specimen in question, a memorandum to that effect having been inserted. However, whether this suspicion is correct or not, there can be no question that the specimen was collected in Richland County, the only doubt being as to the locality and date". This tree probably was introduced.

VERBENA STRICTA Vent. f. ROSEIFLORA Benke. The first collection for this rose-colored form for Illinois is as follows: Dry pasture, Starved Rock State Park, La Salle Co., July 27, 1940, *George D. Fuller 2299.*

GALEOPSIS LADANUM L. f. PARVIFLORA (Lam.) Koch. This is a small-flowered form with corolla only 3–4 mm. long, equalling or only slightly exceeding the calyx. This form is not mentioned in any of the principal manuals of the flora of the central or eastern states. The data are as follows: Along Midway Plaisance, Chicago, Cook Co., Aug. 10, 1956, *Juan V. Poncho 7020.* The only other species of the genus recorded for Illinois by Jones *et al.*[3] is *Galeopsis tetrahit*, which is recorded from Boone County, where collected by E. W. Fell, and from Cook County, on the basis of the report by Higley & Raddin[4]. The following additional specimens of *Galeopsis tetrahit* are to be found in the herbarium of the Chicago Natural History Museum: *H. N. Patterson*, from the vicinity of Oquawka, Henderson Co., in 1897; and *W. C. Ohlendorf*, from Lawndale, Cook Co., in August, 1885.

VIBURNUM LANTANA L. This shrub was collected in woods of York Forest Preserve south of Elmhurst, Du Page Co., November 5, 1955. It was found in a secluded area of the preserve far from any habitation and growing among native species; *F. A. Swink 2782.*

SOLIDAGO ULIGINOSA Nutt. var. LINOIDES (T. & G.) Fern. *Solidago uliginosa* var. *linoides* has not been recorded for Illinois either in the 8th Edition of Gray's Manual or in Jones *et al.*[3] The following collection may be cited: Lake Co., natural swampy meadow fringed by *Salix* spp., *Cornus stolonifera*, and *Betula pumila*, on east side of Highway 59, north of Miller Road, T43N, R9E, Sect. 12, 4 miles north of Barrington, October 1, 1955, *Steyermark 80305.*

## PLANTS NEW TO THE CHICAGO REGION

HOLCUS LANATUS L. This Old World grass, reported from Champaign and Crawford counties by Jones *et al.*[3] has been collected in a lawn at 9800 Willow Springs Road in the Palos Forest Preserve area, where it was growing spontaneously, *F. A. Swink 3004*

PARONYCHIA FASTIGIATA (Raf.) Fern. var. PALEACEA Fern. This species

[1] Steyermark, J. A., Swink, F. A., and Thieret, J. W. Plants New to Illinois and Indiana and the Chicago Region. RHODORA 59:31–33. 1957.

[2] Pepoon, H. S. Flora of the Chicago Region. Chicago Academy of Sciences. 1927.

has been reported by Jones *et al.*[3] from central and southern Illinois only, but is found to be rather frequent in several of the Cook County forest preserves. Collections were made from two of these localities, as follows: Open woodland just east of Hidden Pond in Hidden Pond Woods Forest Preserve, August 14, 1957, *F. A. Swink 3009;* and open woodland near picnic area of Wolf Road Woods, *F. A. Swink 3010,* August 15, 1957.

STELLARIA PUBERA Michx. var. SILVATICA (Béguinot) Weath. This plant, previously known in the state only from Cook County, was collected in shaded ground of Warrenville Forest Preserve, Du Page Co., June 2, 1956, *F. A. Swink 2789.*

AGRIMONIA ROSTELLATA Wallr. This species is locally abundant in open wooded areas of Cantigny Woods Forest Preserve near La Grange, Cook Co., as the following collection shows: *F. A. Swink 3011.* Previous localities, as recorded in Jones *et al.*[3], show its distribution in central and southern Illinois.

LOTUS CORNICULATUS L. On a sandy knoll beside a small creek in a cow pasture 2 miles south of the Kankakee River, 1/4 mile west of Illinois-Indiana state line, 2 miles north of Hopkins Park, Kankakee Co., August 4, 1957, *Karl E. Bartel 6.* Previously known in Illinois only from Champaign, Iroquois, and Jo Daviess counties (Jones *et al.*[3], p. 286).

HYPERICUM SPATHULATUM (Spach) Steud. In a roadside ditch 1/2 mile south of the Will-Kankakee county line, 3 miles northeast of Essex, Kankakee Co., August 2, 1953, *F. A. Swink 2380.* Previously known only from the southern and west-central portions of the state.

EPILOBIUM HIRSUTUM L. In rich black soil along the Santa Fe Railroad south of Argonne National Laboratory at the southwest end of Rocky Glen Forest Preserve, Du Page Co., July 21, 1957, *Karl E. Bartel 7.* Previously known only from Cook Co., where first reported by Steyermark and Swink (RHODORA **51**: 147–149, 1949).

SWERTIA CAROLINIENSIS (Walt.) Ktze. At edge of woods near picnic area, Pioneer Woods Forest Preserve, 107th Street and Willow Springs Road, Cook Co., July 29, 1956, *J. W. Thieret 2137.* This plant was reported by Pepoon[2], who stated that the station had been destroyed in the construction of a paved highway. Although reported and accompanied by a photograph on page 427 of Pepoon's Flora, there has apparently been no authentic specimen kept of this original discovery. The collection by Dr. Thieret represents a new and different location for this species.

[3] Jones, G. N., Fuller, G. D., Winterringer, G. S., Ahles, H. E., and Flynn, A. A. Vascular Plants of Illinois. 1955.

[4] Higley, W. K. and Raddin, C. The Flora of Cook County, Illinois, and a part of Lake County, Indiana. Bull. Chi, Acad. Sci. 2, no. 1: 94. 1891.

A MILESTONE IN BOTANICAL CARTOGRAPHY.[1] — Geobotanical investigations in general and studies on the distribution of taxa in particular were instrumental in forming one of the main pillars on which the theory of evolution rests. Likewise, this approach has greatly affected the development of taxonomic botany during the past one hundred years. It has also strongly influenced the understanding of the need for extensive collections and large herbaria wherever taxonomical and geobotanical studies are to be performed. It has been said that over-confidence in some of the hypotheses, advanced by this important school of thought has sometimes resulted in unnecessary splitting of species because of some geographical distinctiveness; a typical case may seem to be the thick volume XII of the magnificent Flora SSSR with its 849 species of *Astragalus*. There are also instances when too strong adherence to an originally fruitful hypothesis has counteracted further research on details seemingly offsetting these ideas. As a whole, however, the geobotanical approach to taxonomy and evolution has been one of the most prolific ones in botany in the past and it will certainly continue to be so for a long time to come.

In studying the distribution of species and their past history, different approaches have been tried. They have developed from the very schematical descriptions of areas given by Linnaeus and his predecessors, through the more elaborate outlines of Willdenow, Wahlenberg, and von Humboldt, to the more or less detailed maps of present-day publications. The distribution maps seem to have originated with DeCandolle, who used a few such outlines in his "Géographie botanique raisonné" in 1855. They were, however, developed further by the influential Austrian school of geobotany, and then notably by its greatest representatives, Kerner von Marilaun and his son-in-law, Richard Wettstein. In later years, Scandinavian followers of this school improved considerably the methods of mapping and stressed the necessity of greater exactitude. As a direct result of this, the so-called dot-maps, on which small dots represent every collection or locality, have been employed in Scandinavian geobotanical and taxonomical works for many years. This scientific art has recently reached fulfillment in the well-known "Atlas of the distribution of vascular plants in N.W. Europe," worked out and published by Professor Eric Hultén of Stockholm in 1950. That Atlas gives exact maps of the known distribution in Fennoscandia (in its wider sense) of almost all the species occurring within the area. It is based on records in literature and on detailed studies in the main herbaria in these countries, which certainly are better known botanically than any other comparable area in the world.

[1] ERIC HULTEN: The Amphi-Atlantic Plants and Their Phytogeographical Connections. Kungliga Vetenskapsakademiens Handlingar. Fjarde Serien. Band 7. Nr. 1. Stockholm 1958. pp. 1–340.

In addition, more schematical maps show the general distribution of the species, but these are in no way detailed and are sometimes incorrect; they were never intended to be more than approximative.

Although Professor Hultén knows more about the distribution of the higher plants in the entire northern hemisphere than does anybody else, his interest has been focused on certain problems of past dispersals involving plants of Scandinavia and of the Beringian region. His studies on the flora of the latter area effected his coining of the now universally accepted theory of equiformal progressive areas, which may perhaps be regarded as an outgrowth of the age and area hypothesis. He was able to demonstrate, in 1937, that this theory could explain most distribution areas of plants on the continents, and also that it could give distinct indications as to the place of origin, or rather place of survival, of the different species. At that time, Professor Hultén tried to press this hypothesis to explain the distribution of all plants in the boreal zone, and especially those confined to a limited area in northwestern Europe and to a larger area in eastern North America. These are the truly amphi-Atlantic plants in the restricted meaning of the term, but Professor Hultén stressed that they could only be properly studied in connection with plants having larger areas, or what others have named bis-Atlantic distribution. Scandinavian botanists had long regarded the strictly amphi-Atlantic distribution as an indicator of a former trans-Atlantic land connection, but Professor Hultén maintained that if they were seen from his wider point of view these areas could more appropriately be explained as being remnants only of a formerly circumpolar area. Despite several indications to the contrary, recently reviewed in a good article by Dr. Eilif Dahl in the Norwegian journal *Blyttia,* Professor Hultén has vindicated this point of view in several articles and also in his Atlas, but the lack of adequate maps of the total extent of the species under discussion has made it almost impossible to consider the entire problem on a fully scientific basis.

In a recent book on "The amphi-Atlantic plants and their phytogeographical connections," Professor Hultén has published a group of 279 maps of species which apparently are selected with the above-mentioned explanation in mind. These are the most accurate maps of general distribution ever published of so many species at the same time, and their reproduction and exactness are such that most remarks on them must be regarded as vague comments only. When all the boreal flora has been so mapped with the same care as given to these maps for Europe, this method of indirect inquiry into the history and dispersal of the boreal species will be exhausted and the hypotheses based on them will then have to be tested by aid of other and more exact approaches.

In the new book, Professor Hultén starts with a very readable and concise introduction, stating in a nutshell the present knowledge of the distribution of boreal plants in general and of his opinions as to the explanation of their areas in particular. This fascinating chapter is followed by information about the material on which the maps are based, and also about the plants included and excluded. In this connection it must be said that comparing the reasons given for the exclusion of some species, and the maps given of some others to which the same principles could have been applied, indicates that the selection has been somewhat arbitrary, but this cannot be avoided as long as all the species are not mappable. And the reader must keep in mind that there is a distinct tendency behind the selection, as stated in the introductory chapter. The bulk of the book consists of a short text about the individual species, on the left hand page, and detailed maps of two species or taxa, in dark-brown and greyish blue, on the right hand page. The book concludes with a list of references, a comprehensive, though far from complete, bibliography, and an index.

A detailed description of the maps is not possible; they have to be seen and studied to be fully appreciated. There is no doubt that future geobotanists will long draw upon the wealth of information here collected, and the book is likely to influence plant geographers in such a way as no other recent publication can do. American readers will probably be able to find a lot of "mistakes" or "omissions" in the areas of many species, whereas European botanists will have less opportunity to add to the information collected by the author. The reason for this discrepancy between the American and European parts of the distributions mapped is evidently caused by the fact that our present knowledge of the American flora is considerably more restricted than that of the European plants. Not only can this be seen by comparing the vast number of flora lists and treatments (both past and present) of small regions in Europe with the low number of such articles printed in America (and the difficulties in getting such treatments printed here), but it is perhaps best seen by comparing the number of specimens in European and American herbaria. European herbaria contain over 77 million specimens, whereas the herbaria in the United States and Canada, an area twice as large as Europe, contain only about 32 million specimens. Still more relevant to the present study is the fact that less than 2 million specimens of herbarium plants are available in Canada as a whole, and vast regions here are almost devoid of collections. Therefore, criticism of the maps for possible mistakes in this very essential part of the area should be made with this in mind, at the same time as caution in the hypothesizing is required just for the North American parts of the areas.

A rather common misunderstanding may seem to have affected the author when he tries to explain the fact that considerably more species have been introduced into North America from Europe than the reverse way. He regards this as connected with the much greater disturbances by cultivation in the New World. Certainly, some weeds may have got an unexpectedly wide distribution in a short period because of this fact, whereas ecological and climatical conditions may counteract this to a certain extent. In order to get weeds established, however, even the most favourable conditions for dispersal within the country are of no significance if seeds are not carried over the ocean, and the main reason for the difference in number of introduced species must be the fact that considerably more seeds were transported westward than eastward. All the settlers brought with them effects of different kinds and seeds from their homelands, including many weeds. In addition, the fishing vessels carried fish only towards Europe but ballast westwards, and this ballast was very often soil which was carried ashore in the new country. The whole problem of introduction of plants and animals has recently been excellently studied in a book by a compatriot of Professor Hultén, namely in "The faunal connection between Europe and North America" by Professor C. H. Lindroth, the eminent entomologist. In that book the elimination of introduced species, before discussing possible dispersal routes of other plants or animals, is done more thoroughly than plant geographers have ever done with their material. Professor Hultén has excluded most introduced species, and he has mapped some others to show areas of no significance to the geobotanical problems aimed at. But although there is no doubt that the author has been very critical and correct in his selection in most cases, others are occasionally somewhat irrelevant, since only palynological studies can demonstrate with certainty the age of some of these plants in the flora. It is hardly very logical to regard a species as introduced in North America solely because it is introduced in New Zealand, but it is to be hoped that this kind of reasoning has not been employed on other species than *Juncus subnodulosus.*

Naturally, the species concept of Professor Hultén is based on that of the classical geobotanical school, but it may sometimes seem to be unnecessarily wide and other times it is unduly narrow. Because of his careful differentiation of what he believes are intraspecific races, this does not matter, since taxa which others may regard as species are usually shown with different signs. In a few cases, however, the usual caution has broken down, with worthless maps as a result. Examples of such inadequate maps are, e.g., those of *Molinia coerulea* and *Myrica Gale*. It does not matter that the map of *Eriocaulon septangulare* shows no distinctions between the endemic British species and the American *E. pellucidum* with which it has long been misidentified, but the map of what the author calls *Sisyrinchium montanum* is a complete mess, including a mixture of *S. albidum, S. Bermudianum, S. montanum* s.str., and a still undescribed endemic species from Ireland. This last mixture is, perhaps, the very best demonstration of the fact that the morphological-geobotanical method, though excellent, is by no means sufficient for exact studies of this kind, since it cannot always prevent evolutionary heterogeneity being included into a single taxon.

Professor Hultén should be excused for ignoring recent biosystematic data which in fact would have added considerable strength to the arguments the maps are intended for, though not always in support of his own ideas. Also, unfamiliarity with cytogenetics alone is responsible for his attempts to use terms and explanations from this branch of botany to enhance his views on some species: his "cytogenetical" explanations of *Antennaria Porsildii, Draba fladnizensis* and *D. lactea*, and a few other groups are not supported by available cytogenetical evidence. Only in a very few cases does this affect the maps slightly, and the data in the maps are much more important than the good or bad judgments we may pass upon them now or later.

It is pity that all new combinations proposed, on pp. 16, 38, 52, 74, 96, 106, 146, 174, 204, 246, 262, 294, and perhaps elsewhere, are illegitimate since the author does not follow the old-fashioned rule for references to the basionyms in the text, as required by the International Code. It is to be hoped that at least some of these combinations will be legitimized elsewhere.

There are a few printing errors, none of them essential. The dot in Iceland for *Luzula pallescens* ought to be erased, and some mix-up has caused a dot on the same island for *Carex Hartmani* — the same dot is correctly placed for *Carex adelostoma* based on the same original information. Löve 1951 on p. 96 should be Löve & Löve, and Rousseau on p. 152 is probably an error for Rouleau. The specific epithet of *Carex macloviana* is everywhere capitalized by mistake. And several of the references mentioned in the text are not met with in the bibliograhy, which, nevertheless, is rather comprehensive and invaluable as a source for further literature on boreal geobotany.

In conclusion it must be said that this most recent one of the many outstanding contributions to boreal geobotany by Professor Hultén is a worthy addition to his long list of books and the most valuable map collection ever published. It is the very best basis available for discussions on the amphi-Atlantic plants. However, the problem of the origin of these areas cannot be properly discussed before maps are available of all the boreal and arctic flora, a task nobody can fulfill better than Professor Hultén himself. Even when such maps are available for the entire flora of the northern zone, they will have to be complemented by detailed evolutionary studies of each species and by extensive palynological investigations before all doubts are removed.

Although the present maps by no means can be regarded the final step towards the solution of this delicate and important geobotanical problem, they are undoubtedly a very important step in the correct direction. In this connection it does not matter if the explanation these maps are intended to support will prove to be right or wrong, since the main object of the compiler is, after all, not to vindicate his own old opinions but to get the correct explanation of the facts expressed in the peculiar areas of the relatively few species of plants with true amphi-Atlantic distribution.

ASKELL LOVE,
INSTITUT BOTANIQUE DE L'UNIVERSITE DE MONTREAL.

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# THE PRESENT STATUS OF THE RECENTLY DESCRIBED GENUS, TEUSCHERIA

Leslie A. Garay

It was only recently that I established the genus *Teuscheria* in the American Orchid Society Bulletin on the basis of a collection from Ecuador by Mr. Henry Teuscher. While this paper was in the proof-reading stage, another new species, *T. venezuelana* which is described herewith, came into flower in Caracas in the collection of Mr. G. C. K. Dunsterville. This second species at once reminded me of a taxon described by Schlechter as *Bifrenaria Pickiana.* When I examined critically our material of *B. Pickiana* in the Orchid Herbarium of Oakes Ames, I was surprised to find that it also has the characters of my new genus. Thus within a few months our knowledge of the monotypic genus *Teuscheria,* through the discovery of two additional species, was enlarged both as to number of species and as to their distribution.

All species of *Teuscheria* are epiphytic in habit. The primary stem or rhizome is elongated and completely beset with imbricating sheaths which at an early stage break down into numerous, fibrous segments. The pseudobulbs are either aggregated or more or less remote and are hidden by three layers of scarious cataphylls. These cataphylls tightly enclose the developing pseudobulbs and, as was observed by Mr. Teuscher, they expand together with the pseudobulbs. During the process of expansion, the outer two layers soon wither and also break up into fibres, giving a brush-like appearance to the pseudobulbs. The innermost layer seems to remain persistent and it encloses not only the pseudobulb but the basal portion of the petiolate leaf as well. The pseudobulbs are relatively small, pyriform in shape and are terminated by a single leaf. It is noteworthy to mention that the pseudobulb is not articulate with the petiole of the leaf but is continuous with it. The persistent leaves are rather thin in texture, elongate with a prominent petiole. The blade itself is distinctly but not prominently plicate, oblong-ligulate, with a sharply acute or subacuminate apex. The inflorescence is always one-flowered and borne laterally at the base of the pseudobulb, either of the recent year's growth or that of the previous year. The slender peduncle is either erect or pendent and adorned with a number of remote sheaths. The relatively large flowers are exceedingly interesting because they are not resupinate, i.e. the lip is uppermost in position during anthesis. The non-resupinate position is attained through a 45° bend of the ovary, an unusual method seldom seen in the orchid family. The flowers, which are open only for 24 hours, show a few morphologically interesting points. The fleshy sepals and petals are either connivent or spreading; the lateral sepals are shortly connate just above the column-foot and form a small spur-like structure where the free tip of the column-foot, to which the base of the lip is firmly adnate, is enclosed. This free prolongation of the column-foot is apparently very prominent in *T. venezuelana*, while in *T. Pickiana* it is hardly produced. The large lateral lobes of the flabellate lip enfold the short, cylindrical column. The four pollinia are unequal in size, without a stipe, and are held together by a small amount of viscose matter at the tip of the rostellum.

When *Teuscheria* was published, a colleague wrote me that he considers *T. cornucopia* to be synonymous with *Bifrenaria Pickiana*, and that *Teuscheria* does not belong to the Phajeae,

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TEUSCHERIA CORNUCOPIA GARAY. Fig. 1. general habit of plant, slightly less than natural size; fig. 2. front view of flower, x 1¾; fig. 3. side view of flower with dorsal sepal, petals and one lateral sepal removed, x 1¾; fig. 4. lip expanded, x 2; fig. 5. the apex of the column, much enlarged; fig 6. dorsal sepal, x 1¾; fig 7. petal, x 3½; fig. 8. pollinia, much enlarged.


TEUSCHERIA
cornucopia
Garay
8
6
2
5
4
7
3
1
E.W.Smith

as I proposed, but rather to the subtribe Lycasteae. In the generic description of *Teuscheria*, of course, I gave a clear description of the nature of pollinia: "Pollinia 4, cerea, inaequalia, visco parco cohaerentia, sine glandula". *Bifrenaria* is known to have a well developed stipe and gland. When I examined our material of *B. Pickiana*, I was unable to locate any stipe or gland. In one collection from Ecuador (Drew E-634), however, I found the reason for Schlechter's decision to refer this taxon to the genus *Bifrenaria*. *Bifrenaria Pickiana* has a large, triangular rostellum which breaks off very easily. When one examines Schlechter's original drawing, the prominent, triangular gland of the pollinia is clearly seen. The stipe, as depicted by Schlechter, is surely imaginary, and represents, very probably, only the viscid matter.

*Bifrenaria Pickiana* has always been perplexing to orchid taxonomists. It was described from cultivated material and was assumed to be native to Colombia. For a long while, nothing more was known about this species; then, unexpectedly, it appeared in a collection from Honduras. Later it was collected on a number of occasions in Costa Rica as well as in Mexico, Colombia and Ecuador. Dr. L. O. Williams, having seen living material of it from Costa Rica, decided that it should be included in the genus *Xylobium*, and he made the indicated transfer. This transfer, however, did not solve the placement problem of the species, because one of the generic requirements of *Xylobium* is that the inflorescence is always several-flowered. If the inflorescence is one-flowered only, the species would ordinarily be referable to the genus *Lycaste*. However, both *Xylobium* and *Lycaste* have pollinia with a very prominent stipe. *Bifrenaria Pickiana* was, therefore, still misplaced. With the detection of *Teuscheria cornucopia* and the additional species described in this paper, we at the Ames Herbarium believe that the proper disposition of *B. Pickiana* is in the genus *Teuscheria*.

**Teuscheria** Garay, in American Orchid Society Bulletin **27**: 820, 1958.

Sepalum posticum inferum, a sepalis lateralibus omnino liberum; sepala lateralia lata, basi pedi columnae adnata, mentum fornicatum vel erectum calcariforme formantia. Petala sepalis inclusa et angustiora. Labellum sepalis inclusum, superum, involutum, trilobum, ad apicem pedis columnae incurvum adnatumque et cum eo non articulatum. Columna brevis, crassa, basi in pedem longissimum apice incurvum producta; clinandrium vix evolutum, marginatum; rostellum valde productum, late triangulum. Pollinia 4, cerea, inappendiculata, visco parco cohaerentia, sine glandula. Ovarium genuflexum. — Herbae epiphyticae rhizomate abbreviato, nunc elongato. Pseudobulbi oblique pyriformes, unifoliati. Folium plicatum, angustum, petiolatum. Inflorescentia singula, lateralis, uniflora. Flos satis conspicuus, non resupinatus, a latere visus nonnunquam cornucopiam in mentem revocans.

CLAVIS SPECIERUM

1 Lobus intermedius labelli lobis lateralibus aequilongus vel brevior; pseudobulbi aggregati ........ 2
1* Lobus intermedius labelli lobis lateralibus duplo vel triplo longior; pseudobulbi remoti ........ *T. Pickiana*
2 Petala oblaneolata; margo labelli antice crenulata ........ *T. venezuelana*
2* Petala oblongo-lineares; margo labelli antice integra ........ *T. cornucopia*

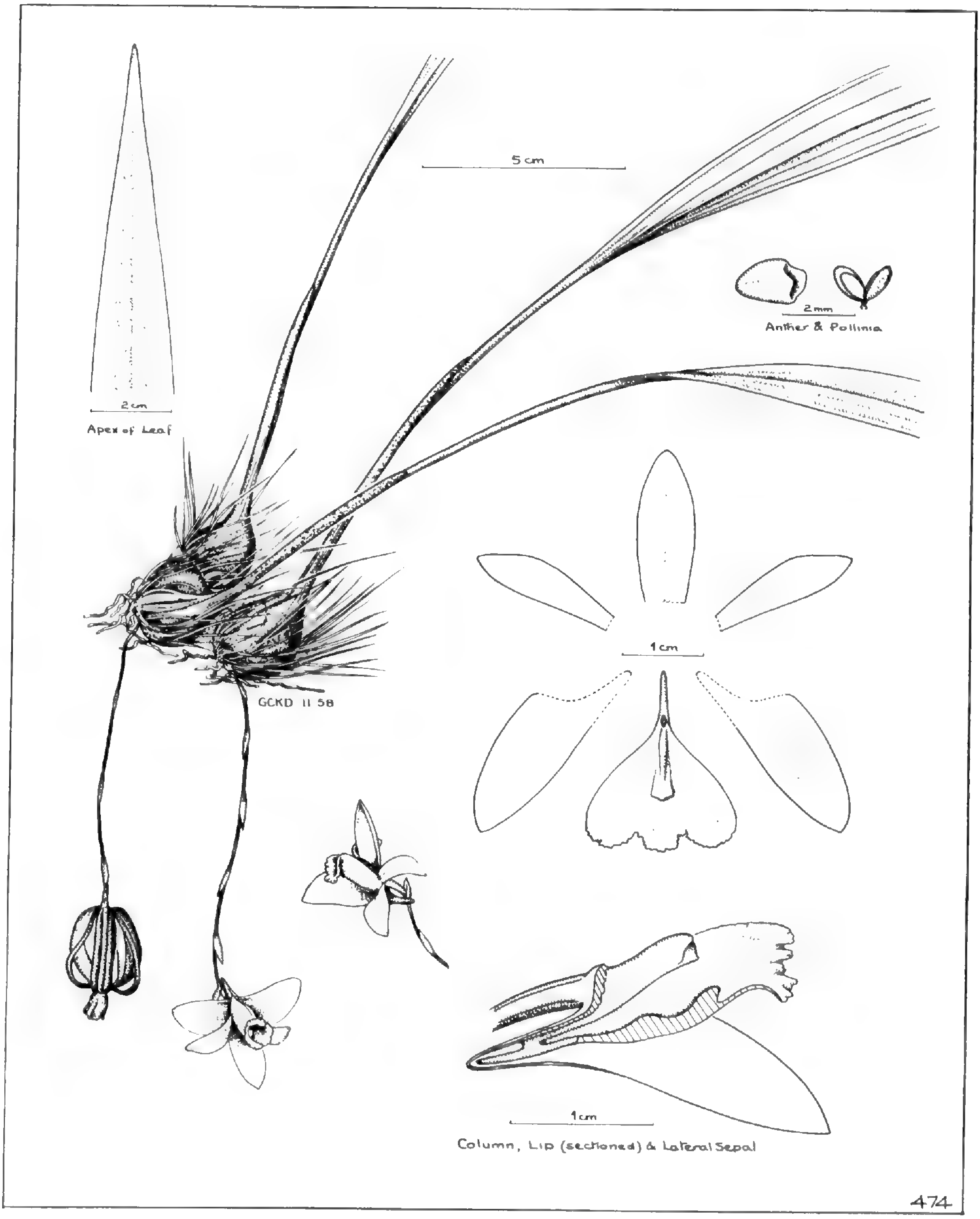
**Teuscheria cornucopia** Garay, in Amer. Orch. Soc. Bull **27:** 820, 1958.

Epiphytica, caespitosa, usque ad 20 cm. alta; rhizomate valde abbreviato; pseudobulbis aggregatis, oblique pyriformibus vel ovato-pyriformibus, monophyllis, ca. 2 cm. altis; folio lineari-oblongo, plicato, prominenter 3-nervio, 15 cm. longo, 1 cm. lato; inflorescentia singula, erecta vel paulo arcuata, gracili, in medio univaginata, 4 cm. longa; flore nutanti, satis conspicua, a latere visu cornucopiam in mentem revocante; sepalo postico elliptico vel obovato-elliptico, apice obtuso, 5-nervio, 14 mm. longo, 7 mm. lato; sepalis lateralibus obliquis, oblongo-ovatis, apice acutis, 5-nerviis, 16 mm. longis, basi 9 mm. latis; petalis lineari-oblongis, apice acutiusculis, 5-nerviis, 10 mm. longis, 4 mm. latis; labello cuneato-flabellato, antice 3-lobo, lobis lateralibus rotundatis, lobo terminali reniformi, in medio leviter retuso, disco supra medium callo 3-dentato ornato, toto labello 16 mm. longo, 15 mm. lato; columna humili, crassa, dorsaliter 4 mm. alta, basi in pedem longissimum producta; ovario cum pedicello ca. 1.5 cm. longo.

**Ecuador:** Western slopes of the Andes. 100 km. from Guayaquil. Altitude about 3,000 ft., *H. Teuscher s.n.* (TYPE in the Ames Orchid Herbarium no. 69,265.) The plant from which the type was taken is cultivated in the collection of the Montreal Botanical Garden. The above description was prepared from living material.

**Teuscheria venezuelana** Garay, sp. nov.

Epiphytica, caespitosa, usque ad 35 cm. alta; rhizomate valde abbreviato; radicibus filiformibus, flexuosis, glabris; pseudobulbis oblique pyriformibus, unifoliatis, ca. 2.5 cm. altis; foliis lineari-oblongis, plicatis, apice acutis vel subacuminatis, basin in petiolum angustatis, usque ad




Teuscheria venezuelana Garay

35 cm. longis, 2.5 cm. latis; inflorescentia singula, pendula, uniflora; pedunculo satis gracili, leviter arcuato, vaginis bracteiformibus remotis obsesso, ca. 7 cm. longo; sepalo postico oblongo-obovato, apice acuto

vel obtusiusculo, concavo, satis carnoso, 19 mm. longo, 7 mm. lato; sepalis lateralibus obliquis, oblongo-ovatis, apice acutis vel obtusiusculis, basi oblique decurrentibus, 25 mm. longis, 8 mm. latis; petalis oblique oblanceolatis, satis carnosis, apice acutis, 18 mm. longis, 5 mm. latis; labello cuneato-flabellato, antice trilobo, lobis lateralibus suborbicularibus, lobo intermedio haud producto, rotundato, disco a basi usque ad medium callo elevato, farinoso ornato; margine labelli antice crenulata; toto labello 22 mm. longo, antice 18 mm. lato; columna satis humili, crassa, basi in pedem longum producta.

**Venezuela:** Choroni Road, seaward slopes. Altitude about 5,000 ft., *G.C.K. Dunsterville 474* (TYPE in the Ames Orchid Herbarium no. 69,206.)

This description was prepared from living material. The color of the fleshy sepals and petals is bronze with a light maroon tinge; the lip is white with a diffused pink flush near the margin.

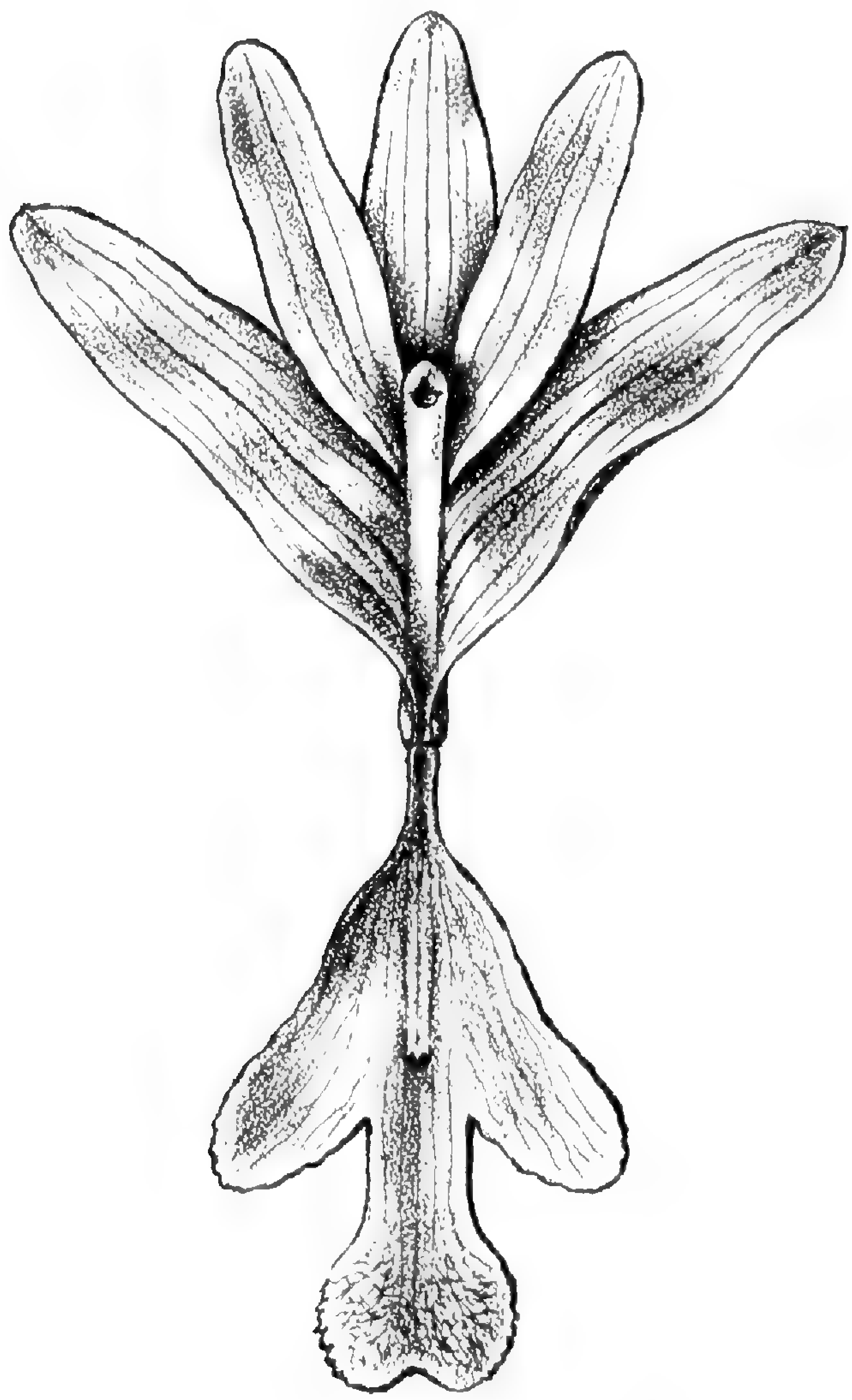
**Teuscheria Pickiana** (Schltr.) Garay, comb. nov.

Based on *Bifrenaria Pickiana* Schltr. in Orchis **6:** 8, fig. 1, 1912. See also Mansf. in Fedde Rep. Beih. **58:** t.49, Nr.196, 1930.

*Xylobium Pickianum* (Schltr.) L.O.Wms. in Ceiba **4:** 271, fig., 1955; ibidem **5:** 187, 1956.

Epiphytica, usque ad 65 cm. alta; rhizomate lignescente, elongato, flexuoso, cataphyllis imbricatis, jam emarcescentibus, fibrosis omnino obtecto; radicibus filiformibus, flexuosis, glabris; pseudobulbis satis distantibus, ovoideis vel oblique pyriformibus, cataphyllis scariosis demum fissis omnino obtectis, unifoliatis, 1.5–3 cm. altis; folio oblongo-ligulato, plicato, apice acuminato vel acutiusculo, basi in petiolum angustato, petiolo incluso 15–60 cm. longo, 1–3 cm. lato; inflorescentia singula, uniflora; pedunculo gracili, leviter arcuato, interdum reflexo (valde post anthesin), ca. 3 cm. longo; sepalo postico satis carnoso, oblongo-elliptico, apice obtuso, 5–7-nervio, 12–15 mm. longo, 4–5 mm. lato; sepalis lateralibus oblique ovato-oblongis vel triangulari-oblongis, apice acutis vel obtusis, 5–7-nerviis, cum pede columnae mentum conicum, obtusum formantibus, 13–18 mm. longis, 5–7 mm. latis; petalis oblongo-ligulatis, obtusis, 3–5-nerviis, 12–16 mm. longis, 4–5 mm. latis; labello e basi cuneata trilobo, lobis lateralibus oblique oblongis, apice obtusis, lobo intermedio cuneato-subquadrato vel cuneato-flabellato, apice breviter exciso, lobis lateralibus duplo vel triplo longiore; disco in medio callo 3-dentato ornato; toto labello 15–25 mm. longo, inter lobos laterales 13–18 mm. lato; columna humili, crassa, basi in pedem longissimum producta; ovario cum pedicello ca. 4–5 mm. longo.

**Mexico:** Chiapas; limestone area, near Laguna Ocotal Grande. Altitude about 950 m., *R. L. Dressler 1629* (AMES). **Honduras:** in moist forest near Nacimiento del Río Lindo, Dept. Cortés. Altitude about 600



Teuscheria Pickiana (Schltr.) Garay

m., *Williams & Molina 14555* (EAP); Santa Cruz de Yojoa, Dept. Cortés. Altitude about 2000 ft., *Edwards 541* (AMES, NY). **Costa Rica:** region between Río Esquinas and Palmar Sur de Osa, vicinity of Esquinas Station, Prov. Puntarenas. Altitude ca. 30 m., *P. Allen 5584* (EAP); forested hills near Esquinas Station, vicinity of Río Esquinas, Prov. Puntarenas. Altitude ca. 60 m., *P. Allen 5688* (EAP); Río Blanco, North-east Cordilleras. Altitude ca. 1000 m., *F. C. Lehmann 1219* (AMES, G.). **Colombia:** Dept. del Valle, Cordillera occidental, Hoya del Río Digua. Altitude 900–1180 m. *J. Cuatrecasas 14901* (AMES). **Ecuador:** Prov. Imbabura, Cordillera occidental. Above Río Chalguayaco. Altitude about 4300 ft., *W. B. Drew E–634* (AMES). — ORCHID HERBARIUM OF OAKES AMES, BOTANICAL MUSEUM, HARVARD UNIVERSITY.

# A REVISION OF BARTONIA AND OBOLARIA (GENTIANACEAE)[1]

John M. Gillett

## I. THE GENUS BARTONIA MUHL.

The generic history of *Bartonia* Muhl. (named in honor of Professor Benjamin Smith Barton, 1766–1815, of Philadelphia, as was *Bartonis* Sims of the *Loasaceae),* has been rather thoroughly reviewed by Fernald and Weatherby (1932) in an amusing little paper entitled "*Bartonia*, a Comedy of Errors." Briefly, these authors argued in favor of retention of the name and provided a list of generic synonymy with bibliography. *Bartonia* was subsequently conserved just twenty years later in order to avoid confusion with Sims's genus.

Willdenow credited Muhlenberg with the discovery of the genus and provided a description in 1801 but the single species *B. tenella* ascribed to it is usually credited directly to Willdenow. Michaux independently described *Centaurella* in 1803 with two species, *C. verna* and *C. paniculata.* Britton, Sterns and Poggenberg found that *B. tenella* Willd. had been described previously as *Sagina virginica* by Linnaeus and made the combination *B. virginica* (L.) BSP.

Persoon in 1805 erected the genus *Centaurium* (not Hill, 1756) describing *C. autumnale* based on *Centaurella paniculata* Michaux. Muhlenberg then made the combinations *Bartonia verna* (Michx.) Muhl. and *B. paniculata* (Michx.) Muhl. in his Catalogue of 1813. Robinson then made a superfluous combination *B. paniculata* (Michx.) Robins. when he decided that Small's *Bartonia lanceolata* described in 1903 was synonymous with it.

Pursh did not simplify the situation when in 1814 he recognized three species and one variety employing Michaux's genus *Centaurella.* These were *C. vernalis* and a β *uniflora, C. aestivalis*

[1] Contribution No. 1748 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture, Ottawa, Ontario.

and *C. autumnalis.* The first two entities are perhaps segregates of *Bartonia verna* but their identities are still in doubt because the types have not been located. I have included them in the synonymy of *C. verna* based on the description. Again the type of *C. aestivalis* has not been located and Pursh's description is inadequate to establish its position. The last, *C. autumnalis,* included both *C. paniculata* Michx. and *Sagina virginica* L. because the type of the latter, *Clayton 649,* is cited. Pursh made no mention of Persoon's earlier *Centaurium autumnale.*

Grisebach in his Species Gentianearum of 1839 employed Michaux's *Centaurella* containing three species, *C. autumnalis* Pursh, *C. verna* Michx. and a *C. moseri* Steudel & Hochstein. He also described a β *brachysepala* of *C. autumnalis.* Grisebach's treatment is similar for De Candolle's Prodromus of 1845.

Asa Gray in the Synoptical Flora employed *Bartonia* as the generic name recognizing two species *B. tenella* and *B. verna. C. moseri* he regarded as synonymous with *B. tenella* saying, ". . . an occasional form, with leaves or scales and branches mostly alternate."

*Centaurella moseri* was subsequently transferred to *Bartonia,* the combination attributed to Robinson & Schrenk by Gilg in the Pflanzenreich in 1895. The Pflanzenfamilien treatment of the Gentianaceae by Gilg placed *Bartonia* between *Canscora* and *Obolaria* in his Erythraeinae, enumerating three species, *B. tenella, B. verna* and *B. moseri.*

Three years after the Robinson & Schrenk transfer, Robinson described *Bartonia iodandra* from Newfoundland and promoted a rash of investigation by Fernald. In 1921 Fernald described *B. iodandra* var. *sabulonensis* from Sable Island, Nova Scotia, and in the following year he transferred both *B. iodandra* and his own variety *sabulonensis* to the status of varieties of *B. paniculata.* Following a tremendous amount of field work in Nova Scotia, Fernald found so many specimens that could not be placed in either *B. paniculata* or var. *iodandra* that he created a variety *intermedia* to take care of them. Except for a form of *B. virginica* described by Victorin in 1919, the genus has remained relatively untouched until now.

Chromosome counts have been made by Rork (1949) of *Bartonia paniculata* from her own preparations and a count was obtained for *B. virginica* by the same worker from a slide supplied by Uhl. A count of n=26 was obtained for both species. From material collected in the field by the author at St. Pierre de Howick, Quebec, R. J. Moore of this Division obtained a count of 2n=ca. 52 from a squash of ovary tissue. This material, of course, was *B. virginica*. No count has been obtained from Newfoundland or Nova Scotian material. No chromosome count has been recorded for *Bartonia verna*.

Flowering and fruiting dates taken from herbarium specimens are presented in Table 1. These are actually collection dates but since the species flower for long periods they are indicative of the flowering time for each population. Evidently these dates coincide for *B. virginica* and *B. paniculata* but differ widely for *B. verna*.

*B. verna* exhibits the typical distribution of a southern coastal plain species. *B. paniculata* and *B. virginica* are sympatric over a large portion of their ranges. The former extends further west in the southern portion of the coastal plain and further north in the northern portion than the latter. *B. virginica* on the other hand, tends to extend farther inland into the Great Lakes region. The disjunction in distribution between Maine and Nova Scotia can be explained by post-glacial flooding of the coastal plain so that migration northward must have followed in the wake of the receding glacier before this area was inundated. This theme has been discussed by Fernald.

Morphologically *B. verna* is a clear-cut species while the others are not. The *paniculata* and *iodandra* populations intergrade quite freely; occasional intermediates occur between *B. paniculata* and *B. virginica*. Although the two species are sympatric over a

TABLE 1. PHENOLOGY OF BARTONIA

| *Month* | *Week* | *B. virginica* | *B. paniculata* ssp. panic. | *B. paniculata* ssp. iodandra | *B. verna* |
|---|---|---|---|---|---|
| July | 1 | FL | — | FL | — |
| | 2 | FL | — | — | — |
| | 3 | FL | — | — | — |
| | 4 | FL | FL | — | — |
| August | 1 | FL | FL | FL | — |
| | 2 | FLR | FL | FL | — |
| | 3 | FLR | FL | FL | — |
| | 4 | FLR | FL | FLR | — |
| September | 1 | FLR | FL | FLR | — |
| | 2 | FLR | FL | FLR | — |
| | 3 | FLR | FLR | FR | — |
| | 4 | FLR | FLR | FR | — |
| October | 1 | FR | FR | FR | — |
| | 2 | FR | — | FR | — |
| | 3 | FR | FR | — | — |
| | 4 | FR | — | — | — |
| November | 1 | — | FR | — | — |
| | 2 | FR | — | — | FL |
| | 3 | — | — | — | FL |
| | 4 | — | — | — | — |
| December | 1 | — | — | — | — |
| | 2 | — | — | — | — |
| | 3 | — | — | — | — |
| | 4 | — | — | — | FL |
| January | 1 | — | — | — | FL |
| | 2 | — | — | — | — |
| | 3 | — | — | — | — |
| | 4 | — | — | — | FL |
| February | 1 | — | — | — | FL |
| | 2 | — | — | — | FL |
| | 3 | — | — | — | — |
| | 4 | — | — | — | — |
| March | 1 | — | — | — | FL |
| | 2 | — | — | — | FLR |
| | 3 | — | — | — | FLR |
| | 4 | — | — | — | — |
| April | 1 | — | — | — | FR |
| | 2 | — | — | — | — |
| | 3 | — | — | — | — |
| | 4 | — | — | — | — |

FL — in flower; FR — in fruit; FLR — in both flower and fruit.

considerable portion of their range, intergrades are more or less restricted to the coastal plain area. On the other hand the two species frequently remain quite distinct in the same region, due perhaps to restricting habitat factors. Herbarium sheets bearing a number of plants may contain occasional intermediates. These plants may show *B. virginica*-type flowers or fruits with *B. paniculata*-type leaf arrangement or other character combinations.

The following specimens may serve to illustrate: *Bissell & Graves 22294,* Port Mouton, N. S. — somewhat intermediate between the *virginica* and the *iodandra* type; *Fernald & Long 24356,* Shelburne, N. S. — most are *B. virginica* but a few have alternate leaves; *Torrey Herb.* N. Y. — a mixture: #1 and #3 sterile intermediates, #4 *B. virginica,* #5 *B. paniculata; Seymour 1996,* Martha's Vineyard — 3 of 4 plants *B. virginica,* the other intermediate; *Tracy s.n.,* Ocean Springs, Mississippi — some plants of *B. paniculata* approaching *B. virginica; Chapman Herb.* Apalachicola, Florida — plant #1 intermediate, #2 *B. paniculata,* #3 and #4 *B. virginica; Ferguson 5208,* Speonk, N. Y. — *B. virginica,* some approaching *B. paniculata.*

However, the following sheets have both species on the same sheet with no intermediates: The MO sheet of the *Gray Exsiccatae 390* — *B. virginica* but one plant of the *iodandra* group; *Lighthipe s.n.,* Ocean Beach, N. J. — left-hand plant *B. paniculata,* right hand plant, *B. virginica; Chickering s.n.,* Kennebunk, Maine — 1 plant of *B. virginica,* 3 of *B. paniculata.* Only a selected number of examples are given here.

With both species having similar chromosome numbers and, according to Rork's sketches, similar chromosome morphology and with similar flowering times and sympatric distribution, it would seem likely that hybridization is within the realm of possibility. Since the actual percentage of such intermediates is low with respect to number of collections and extremely low with respect to the total number of plants examined, I feel that the species are best treated as separate at least until such time as mass sampling can be made and crossing experiments carried out to clarify the situation.

Species relationships would be placed on a firmer basis by further cytological studies. Obviously a chromosome count is immediately required for *B. verna.* Morphologically, the poorly developed corolla tube, decurrent stigmas and variable position of leaf scales would suggest that this species is the more primitive;

the distinct corolla tube, distinct stigmas and definite position of leaf scales would indicate that the other two species are more advanced. Of the two it is difficult to set one above the other. It would appear that the northern subspecies of *B. paniculata* has evolved by selection from occasional crosses and backcrosses between *B. virginica* and *B. paniculata*. The presence of pointed anthers in the northern group rather suggests this. A biometrical study employing anther shape as a character may lend support to this idea.

This study has been based on the collections of most of the eastern North American herbaria. The smaller herbaria were added in order to try to fill out the range of the species in more detail. Thanks are due to the curators of the herbaria listed and to those of the British Museum of Natural History and the Paris Museum for their assistance in obtaining photographs of type material. I should like to thank Dr. B. Boivin of this Division for reading the manuscript. Material from the following herbaria has been seen: DAO, GH, NY, CAN, TRT, US, TENN, MO, OKLA, FSU, GA, TEX, NCU, FLAS, SMU, BUS, NEBC. Although a formidable list, this does not represent a very large number of specimens. Material of the genus *Obolaria* is included.

Selected representative specimens of each species are cited and a few selected intermediate sheets have been discussed. For each entity a list of the counties per State or Province is given to supplement the distribution maps. The publication of an Index of Exsiccatae is impractical.

## Systematic Treatment

**Bartonia** Mühl. ex Willd. Ges. Naturf. Freunde Berlin Neue Schr. **3:** 444. 1801, *nomen conserv.*

*Agina Neck.* Elem. Bot. **2:** 153. 1790, nom. rejic.

*Centaurella* Michx. Fl. Bor. Amer. **1:** 97, 98 t. 12. f. 1 & 2. 1803.

*Centaurium* Pers. Synops. **1:** 137. 1805, non Hill, 1756.

*Andrewsia* Spreng. Syst. **1:** 368 & 428. 1825; non *Andreusia* Vent., 1804.

Filiform, erect saprophytic annuals. Leaves reduced to minute, opposite or alternate subulate scales. Inflorescence cymose or racemiform, frequently 1–flowered. Calyx with a short tube or the lobes nearly free, the outer overlapping the inner. Corolla deeply 4–lobed, marcescent, campanulate, each lobe with a single vascular strand. Stamens 4, alternate with the lobes of the corolla, the filaments short, attached at the sinuses of the corolla lobes, the dart-shaped to blunt anthers introrse and frequently deciduous after anthesis. Ovary sessile, unilocular, bicarpellate, the placenta parietal, the ovules covering the entire inner surface. Fruit an ovoid, thin-walled capsule, dehiscent along the sutures. Seeds very numerous, minute, ellipsoid, smooth to minutely reticulate. —Type species: *B. tenella* Mühl. ex Willd.

KEY TO THE SPECIES

A. Aestival to autumnal flowering. Corolla slightly longer to twice as long as the calyx, the lobes 2–4 mm. long, lanceolate to oblong.
- B. Leaf scales essentially opposite, the numerous nodes progressively more crowded towards the base; corolla lobes oblong, the apex apiculate, erose to entire; capsule dehiscing below the elongate style ........ 1. *B. virginica.*
- BB. Leaf scales essentially alternate, the few nodes but slightly closer towards the base; corolla lobes lanceolate, the apex inapiculate, entire, acute; capsule dehiscing by terminal separation of the short style ........ 2. *B. paniculata.*

AA. Vernal flowering. Corolla three times the length of the calyx, the lobes 6–11 mm. long, obovate to spatulate ........ 3. *B. verna*

1. **Bartonia virginica** (L.) BSP. Prel. Cat. N.Y. Pl. 36. 1888

*Sagina virginica* L. Sp. Pl. 2: 128. 1753. (*Clayton 649* BM type, photo DAO!). *Bartonia tenella* Mühl. ex Willd. in Ges. Naturf. Freunde Berlin, Neue Schrift 3: 444. 1801. (*Muhlenberg s.n.* B. Willd. Herb. *2991* type, photo DAO!). *Centaurella autumnalis* Pursh, Fl. Amer. Sept. 1: 100. 1814, pro parte typ. incl. based on *Sagina virginica* L. *Andrewsia autumnalis* (Pursh) Spreng. Syst. Veg. 1: 428. 1825. *Centaurella moseri* Steudel & Hochstein ex Griseb. Gen. et Sp. Gent. 308. 1839. *Centaurella autumnalis* Pursh β *brachysepala* Griseb. Gen. et Sp. Gent. 308. 1839, ex char. (*Drummond s.n.* type presumably London). *Bartonia moseri* (Steud. & Hochst. ex Griseb.) Robins. & Schrenk ex Gilg in Engl. & Prantl Nat. Pflanzef. 4, abt. 2: 76. 1895. *Bartonia virginica* (L.) BSP. forma *abortiva* Vict. in Roy. Soc. Can. Proc. & Trans. Ser. III. Sect. V. 13: 113. 1919. (*Victorin 19570* MT type!).

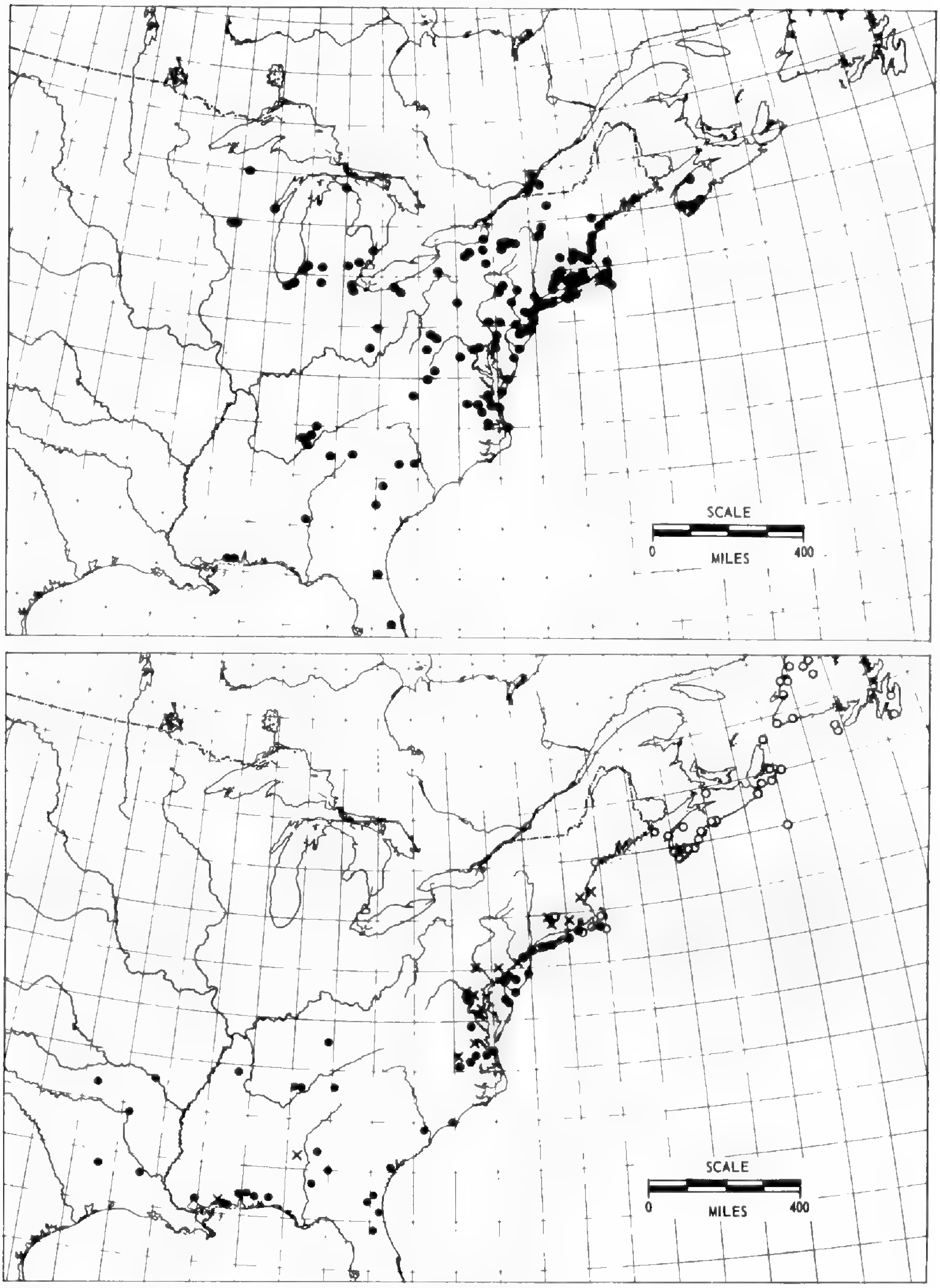
Annuals 0.4–4.5 (av. 2.2) dm. tall, erect, simple or branched above, the stem slender, wiry or stout, terete or angled, occasionally slightly winged, frequently twisted, the nodes numerous and becoming progressively closer together towards the usually purple base. Leaves 0.9–4.7 (av. 2.4) mm. long, scale-like, subulate, decussate, usually opposite or subopposite, the lowermost occasionally alternate. Flowers in simple terminal cymes with solitary flowers or branches in the lower axils. Calyx lobes 0.4–1.1 (av. 0.74) mm. wide, 2.0–3.5 (av. 2.7) mm. long, almost distinct, subulate-lanceolate, carinate. Corolla 2.4–4.2 (av. 3.4) mm. long, greenish-yellow, the petals united in the lower third, the lobes 0.75–1.2 (av. 1.1) mm. wide, oblong, obtuse, mucronate, erose or entire, with a prominent nerve. Stamens 1.5–3.5 (av. 2.53) mm. long (measured from the base of the corolla), flattened, the anthers 0.6–1.2 (av. 0.91) mm. long, oblong, mucronate, frequently purple. Pistil 2.5–4.5 (av. 3.6) mm. long, ovate, the style 1.0–2.0 (av. 1.3) mm. long, the stigmas decurrent. Capsule 4.0–5.5 (av. 4.8) mm. long, ovate, dehiscence below the persistent style. Seeds averaging 0.14 x 0.08 mm., extremely numerous, light brown with a testa of irregular cells.

*Corema* barrens, sphagnous bogs, margins of swamps, peaty and sandy lake shores, openings in brush and in dry thickets. Flowering from early July until late September; fruiting from early August until November.

Common Names: Virginian Bartonia; Virginian Screwstem.

Representative specimens: N.S. Queens County, Louis Lake, Port Joli, *Gray Exsiccatae 390, Fernald, Linder & Long s.n.* (DAO, GA, GH, MO, TENN, NY, TEX, TRT, US). Que. Terrebonne County, Ste. Therese, *Victorin, Rolland & Meilleur 45750* (DAO, GH, US). N.Y. Cattarangus County, Steamberg, *Alexander & House 12979* (GH, US). Va. Northampton County, Eastville, *Fernald & Long 5420* (MO, NY, US). Wisc. Brown County, *Shuette s.n.* (NY, US).

Distribution by Counties: CANADA. NOVA SCOTIA: Annapolis, Lunenberg, Queens, Shelburne and Yarmouth. QUEBEC: Chambly, Chateauguay, Huntingdon and Terrebonne. UNITED STATES. ALABAMA: Lee. CONNECTICUT: East Haven, Hartford, New Haven, New London, Southington and Stratford. DELAWARE: Sussex. DISTRICT OF COLUMBIA. FLORIDA: Brevard, Gulf, Nassau and Osceola. GEORGIA: Bartow, Chatham, Jenkins and Miller. INDIANA: Lake, Porter and Steuben. LOUISIANA: St. Tammany. MAINE: Cumberland, Hancock, Oxford and York. MARYLAND: Anne Arundel, Cecil, Frederick, Garrett, Prince Georges, Queen Annes and Worcester. MASSACHUSETTS: Barnstable, Dukes, Essex, Hampden, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk and Worcester. MICHIGAN: Berrien, Kalamazoo, Oakland, Presque Isle, St. Clair, Van Buren and Washtenaw. MISSISSIPPI: Harrison and Jackson. NEW JERSEY: Atlantic, Burlington, Camden, Cape May, Cumberland, Essex, Hudson, Middlesex, Monmouth, Morris, Ocean, Passaic and Sussex. NEW YORK: Cattaraugus, Cayuga, Herkimer, Madison, Nassau, Oneida, Ontario, Oswego, Putnam, Richmond, Seneca, Suffolk, Tompkins, Warren, Washington, Wayne and Westchester. NORTH CAROLINA: Chowan, Dare, Durham and Macon. OHIO: Cuyahoga, Jackson, Licking, Lucas, Summit and Wood. PENNSYLVANIA: Center, Chester, Lackawanna, Lancaster, Monroe, Philadelphia and Pike. RHODE ISLAND: Newport, Providence and Washington. SOUTH CAROLINA: Aiken, Darlington and Kershaw. TENNESSEE: Coffee, Cumberland, Marion, Morgan and Sequatchee. VERMONT: Chittenden. VIRGINIA: Accomac, Augusta, Bath, Dinwiddie, Fauquier, James City, Nansemond, Norfolk, Northampton, Princess Anne, Southampton and Sussex. WEST VIRGINIA: Preston, Raleigh, Randolph and Tucker. WISCONSIN: Brown, Jackson, Munroe and Vilas.




MAP 1. Distribution of *Bartonia virginica*. MAP 2. Distribution of *Bartonia paniculata:* solid dots: ssp. *paniculata.* open circles: ssp. *iodandra.* crosses: putative intermediates between *B. virginica* and *B. paniculata.*

The original description of *Centaurella moseri* gave "Cymis racemiformibus, ramis alternis!", and "foliis non oppositis!" Other characters given seem to fit *B. paniculata* quite closely. The specimens cited are: "Salzburg Township Pennsylvaniae (*Moser!*); Covington (*Drummond!*). — Fl. Septembri!-".

Grisebach gave the source of the material as "ab Union. Würtemburg," which may mean that the holotype material is at Stuttgart if it still exists. However, there is a collection at the New York Botanical Garden labelled, "Salzburg Taunship Pennsylvaniae, Unio itiner C. J. Moser Jul. Aug. 1832." This has both a printed and handwritten label. There is a duplicate of this at the Missouri Botanical Garden. In addition to these sheets I have seen the Drummond specimen from Covington, Louisiana. Both collections are undoubtedly *B. virginica* in spite of the description, but Grisebach stated so clearly the characters of his plant that it is quite possible that he had a mixed collection. Until the type comes to light it is pointless to select a lectotype. For the present I am placing *C. moseri* provisionally in the synonymy of *B. virginica*.

2. **Bartonia paniculata** (Michx.) Muhl. Cat. 16. 1813.

*Centaurella paniculata* Michx. Fl. Bor. Am. 1: 98. f. 1. 1803. (*Michaux s.n.* P type, the sheet from the Richard Herb. (see explanation below), photo DAO!).

Annuals, 0.3–3.9 dm. tall, the green or purple angled stems strict to twining, simple or branched above with curved ascending branches. Leaf-scales 0.5–3.0 mm. long, alternate, subulate. Flowers solitary or in simple cymes with or without axillary ones below. Calyx tube evident or the frequently crinkle-keeled, ovate to lanceolate lobes barely united at the base, the lobes 1.5–3.2 mm. long, 0.5–1.1 mm. wide, the outer lobes shorter and wider than the inner. Corolla white to somewhat erubescent, the lobes oblong to tapered oblong, acute to slightly mucronate with a single nerve or with two lateral ones sometimes evident. Stamens 2.2–5.0 mm. long (measured from the base of the corolla), the anthers varying from 0.3–0.6 (av. 0.4) long in the typical subspecies to 0.5–1.0 (av. 0.7) mm. long in the northern subspecies, usually with a rounded apex. Pistil ovate, with an evident style, the stigmas decurrent along the whole length. Capsule ovate, the style persistent, dehiscence apical by separation of the stigmas. Seeds very small, light brown with a testa of inflated cells, extremely numerous.

I select the Michaux collection from the Richard herbarium in the main collection at Paris as the holotype of *Centaurella paniculata* Michx. The first and last lines of the handwritten label are in Richard's handwriting; the central portion is in Michaux's hand. The separate Michaux collection labelled *C. paniculata* I was surprised to find is perfectly good *B. virginica.*

KEY TO THE SUBSPECIES OF B. PANICULATA

A. Plants slender, lax, frequently twining, green or essentially so; anthers usually yellow, about 0.5 mm. long, rounded at the apex. ........ 2a. *B. paniculata* ssp. *paniculata.*

AA. Plants strict or stout, the stem frequently thickened upwards and purple throughout; anthers usually purple or if yellow, the filaments frequently purple, 0.5–1.0 mm. long, rounded or apiculate. ........ 2b. *B. paniculata ssp. iodandra*

2a. **Bartonica paniculata** (Michx.) Muhl. ssp. **paniculata**

*Centaurium autumnale* Pers. Syn. Pl. **1**: 137. 1805, ex char. *Bartonia tenella Muhl. ex. Willd.* β *brachiata* Wood, Class-book, ed. 2. 586. 1866, ex char. excl. syn. *Bartonia lanceolata* Small, Fl. SE. U.S. 932, 1336. 1903. (*Chapman s.n.* NY, type!). *Bartonia paniculata* (Michx.) Robinson in RHODORA **10**: 35. 1903, superfluous comb.

Plants 1.0–3.9 (av. 2.5) dm. tall, the slender usually green but rarely purple stem erect or twining. Flowers in simple cymes and with axillary flowers below. Calyx lobes slightly united at the base, frequently crinkle-keeled, the sinuses acute, the lobes 1.5–2.8 (av. 2.1) mm. long, 0.5–1.0 (av. 0.75) mm. wide, ovate-lanceolate to lanceolate. Corolla 3.0–5.0 (av. 3.8) mm. long, white, the tube $\frac{1}{3}$–$\frac{1}{2}$ the length of the corolla, the tapered oblong lobes 1.0–1.5 (av. 1.1) mm. wide, acute. Stamens 2.2–3.8 (av. 2.8) mm. long (measured from the base of the corolla), the yellow anthers 0.3–0.6 (av. 0.4) mm. long, the tips rounded. Pistil 2.0–5.0 (av. 3.3) mm. long, the style 0.5–1.5 (av. 0.9) mm. long. Capsule 3.5–5.8 (av. 4.2) mm. long. Seeds averaging 0.19 x 0.12 mm., 1000 to 1500 per capsule (actual count).

Sandy and sphagnous bogs, grassy swamps, cedar swamps, wet open woods, sandy and peaty shores of ponds. Flowering from late July until late September, fruiting from mid-September until November.

Common Name: Screwstem.

Representative specimens: Mass. Nantucket Island, Bicknell s.n. (NY). N. J. Middlesex County, Cheesequake State Park, *Alexander & Gilly 428* (NY). N. Y. Suffolk County, Bridgehampton, *Ferguson 6277* (NY). Tenn. Coffee County, Manchester, *Svenson 9124* (GH). Va. Greenville County, Dahlia, *Fernald & Long 9403* (GH, NY, US).

Distribution by counties: ALABAMA: Mobile. ARKANSAS: Hempstead and Pulaski. CONNECTICUT: Hartford, Litchfield. DELAWARE: Sussex. DISTRICT OF COLUMBIA. FLORIDA: Duval, Okaloosa, Putnam, Santa Rosa and Walton. GEORGIA: Camden, Chatham, Fannin, Randolph, Screven, Sumter, Talbot. KENTUCKY: Laurel. LOUISIANA: Rapides. MARYLAND: Prince Georges. MASSACHUSETTS: Barnstable, Duke and Nantucket. MISSISSIPPI: Harrison and Simpson. NEW JERSEY: Atlantic, Burlington, Camden, Cape May, Gloucester, Middlesex, Monmouth, Ocean and Salem. NEW YORK: Kings, Nassau, Queens, Suffolk. NORTH CAROLINA: Brunswick. OKLAHOMA: Leflore. PENNSYLVANIA: Location unknown. TENNESSEE: Carroll, Coffee, Fentress and Grundy. TEXAS: Houston. VIRGINIA: Caroline, Greenville, Nansemond, Prince George, Southampton and Sussex.

2b. **Bartonia paniculata** (Michx.) Muhl. ssp. **iodandra** (Robins.) stat. nov.

*Bartonia iodandra* Robins. in Bot. Gaz. **26:** 47. 1898 (*Robinson & Schrenk 5* GH type, *isotypes* MO, NY, US!). *Bartonia paniculata* (Michx.) Muhl. var. *iodandra* (Robins.) Fern. in RHODORA **23:** 288. 1922. *Bartonia iodandra* Robins. var. *sabulonensis* Fern. in Proc. Bost. Soc. Nat. Hist. **36:** 89. 1921. (*St. John 1307* GH type, isotypes NY, US!). *Bartonia paniculata* var. *sabulonensis* Fern. in RHODORA **23:** 288. 1922. *Bartonia paniculata* var. *intermedia* Fern. in RHODORA (**23:** 287. 1922. (*Fernald & Long 22299* GH type, isotype NY!).

Plants 0.3–2.5 (av. 1.2) dm. tall, the usually purple angled stems occasionally stout. Flowers in simple cymes or solitary or with axillary flowers below. Calyx tube frequently well-developed, slightly winged at the base, the sinuses rounded, the lobes 1.5–3.2 (av. 2.4) mm. long, 0.5–1.1 (av. 0.8) mm. wide, ovate to lanceolate. Corolla 3.0–6.2 (av. 4.4) mm. long, white to somewhat erubescent, the tube shorter to about equal to the lobes, the oblong lobes variable, 0.8–2.0 (av. 1.3) mm. wide, acute to slightly mucronate with usually an evident nerve. Stamens 2.4–5.0 (av. 3.6) mm. long, the frequently purple filaments broadened below, the usually purple anthers variable with or without an apiculate tip. Pistil 3.0–5.5 (av. 3.9) mm. long, the style 0.6–1.5 (av. 0.95) mm. long. Capsule 4.0–6.0 (av. 5.0) mm. long. Seeds averaging 0.15 x 0.10 mm.

Wet peaty barrens, sphagnous bogs, peaty margins of lakes and boggy depressions. Flowering from about mid-July to mid-September; fruiting from September to late October.

Representative specimens: Nfld. Head of Exploits River system, *Fernald & Wiegand 6082* (GH, NY); Avalon Peninsula, *Fernald & Long 26987* (GH, NY). N. S. Cape Breton County, Gabarus, *Rousseau 35627* (GH); Digby County, Central Grove, *Gray Exsiccatae 388* (GH, GA, DAO, NY, TENN, US).

Distribution by counties and districts: ST. PIERRE & MIQUELON: Island of St. Pierre; Island of Miquelon. CANADA. NEW BRUNSWICK: Charlotte. NEWFOUNDLAND: Green Bay, Burgeo and La Poile, Harbour Main-Belle Isle, Humber, Gander Falls, St. Barbe, St. Marys and St. Georges-Port au Port Districts. NOVA SCOTIA: Cape Breton, Cumberland, Annapolis, Digby, Guysborough, Halifax, Inverness, Lunenburg, Pictou, Queens, Richmond, Shelburne, Yarmouth and on Sable Island. MASSACHUSETTS: Barnstable and Nantucket. NEW YORK: Suffolk. RHODE ISLAND: Newport. VIRGINIA: Greensville.

3. **Batonia verna** (Michx.) Muhl. Cat. 16. 1813.

*Centaurella verna* Michx. Fl. Bor. Amer. 1: 98. t. 12. f. 2. 1803. (*Michaux s.n.* P, type the sheet from the Richard Herb. in the general herbarium, photo DAO!). *Centaurium vernum* (Michx.) Pers. Syn. Pl. 1: 137. 1805. *Centaurella vernalis* Pursh, Fl. Amer. Sept. 1: 99. 1814, ex char. *Centaurella vernalis* β *uniflora* Pursh. l.c. 100, ex. char. *Andrewsia verna* (Michx.) Spreng. Syst. Veg. 1: 428. 1825.

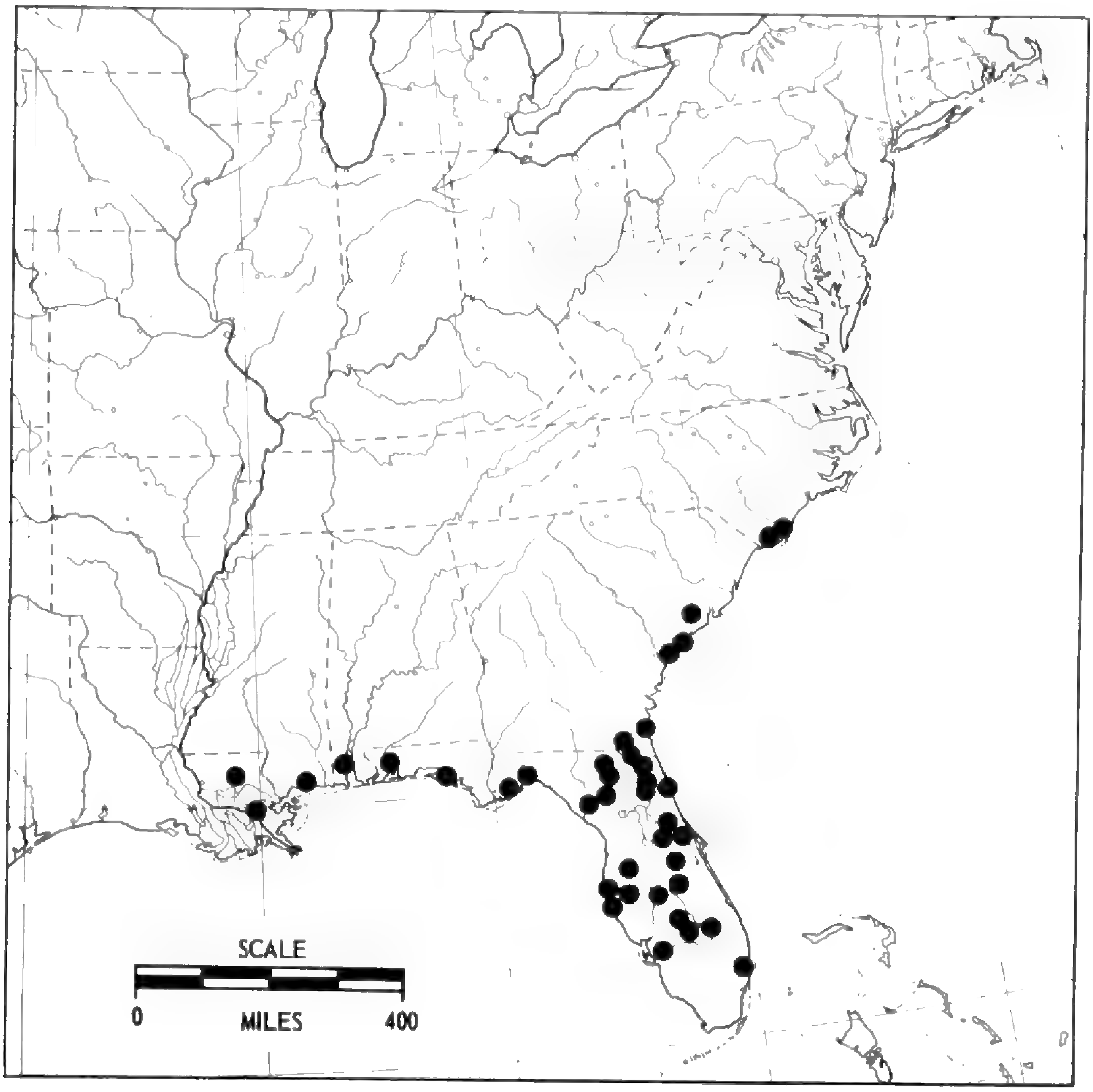
Annuals, 0.3–2.3 (av. 1.3) dm. tall, erect, simple, rarely branched above, the stem slender, angled but not winged, with few nodes, frequently purple. Leaves 0.6–3.0 (av. 1.9) mm. long, those subtending the upper flower to 3.5 mm. long, scale-like, usually opposite or subopposite, lanceolate to subulate. Flowers solitary, in terminal cymes, or with additional axillary flowers. Calyx lobes united only at the base, the lobes 0.9–2.8 mm. long, up to 1.5 mm. wide, lanceolate. Corolla white, the petals united only at the base, the lobes, 4.8–8.0 (av. 5.8) mm. long, 1.5–3.5 (av. 2.4) mm. wide, widely spreading, spatulate to obovate, obtuse, entire, with a single nerve. Stamens 3.0–4.8 (av. 3.6) mm. long, the filaments about 0.5 mm. wide at the base, flattened, tapering towards the apex, the anthers 0.5–1.1 (av. 0.8) mm. long, oblong, slightly incurved, dorsifixed, occasionally contorted after dehiscence. Pistil to 7.5 mm. long, ovate, the style about 2 mm. long, stout, the stigmas decurrent as far as the upper part of the ovary. Capsule ovate, slightly shorter than the marcescent corolla, the style persistent, dehiscence septicidal in the center of the capsule only. Seeds averaging 0.15 x 0.12 mm., light brown with a testa of round inflated cells, extremely numerous, over 1000 per capsule.

Moist pine barrens, sandy soil, edge of ponds, ditches and grassy depressions. Flowering from the first week of November until the first week of April. Seldom collected in mature fruit.

Common Names: White or Spring Bartonia.

Representative specimens: N.C. Brunswick County, Southport, *Godfrey 48001* (DAO, NY, US). S.C. Beaufort County, Fluffton, *Mellichamp in 1875* (NY). Ala. Damp pine barrens, *Mohr in 1898* (US). Fla. Bradenton, *Tracy 7540* (DAO, GH, NY, US); Hibernia, *Canby in 1869* (GH, NY, US).

Distribution by counties: ALABAMA: Mobile. FLORIDA: Alachua, Brevard, Broward, Clay, Columbia, Duval, Franklin, Glades, Gulf, Hardee, Highlands, Hillsborough, Lake, Lee, Levy, Manatee, Orange, Osceola, Pasco, Pinellas, Polk, Putnam, Santa Rosa, Seminole, St. Johns, Volusia, Wakulla and Walton. GEORGIA: Camden and Charleston. LOUISIANA: Orleans and Tangipahoa. MISSISSIPPI: Harrison. NORTH CAROLINA: Brunswick. SOUTH CAROLINA: Dorchester and Jasper.




MAP 3. Distribution of *Bartonia verna*.

There are two sheets of *Centaurella verna* Michx. in the Paris herbarium. I select the Richard collection in the General Herbarium as the type rather than the separate Michaux collection because it is more like the figure in the Flora Boreali-Americana (t. 12. f. 2.). Actually it is of little consequence which sheet is selected for they are both the correct plant but the selection should be made in order to establish a single sheet as the type.

Doubtful and Excluded Species

BARTONIA ALBESCENS Gill. & Arn. in Edinb. Geogr. Jour. [illegible]
 =*Nuttallia albescens* (Gill. & Arn.) Standl. in Jour. Wash. Acad. Sci. **6:** 239. 1916.

BARTONIA AUREA (Nutt.) Lindl. Bot. Reg. 22; **t. 1831.** 1836.
 =*Mentzelia aurea* Nutt. Gen. Am. Pl.

BARTONIA DECAPETALA Sims Bot. Mag. 36: t. 1487. 1812 (incorrectly attributed to Pursh by authors).
 =*Mentzelia decapetala* (Sims) Urb. & Gilg in Engl. & Prantl, Nat. Pflanzenf. 3. Abt. 6a: 111. 1894.

BARTONIA LAEVICAULIS Dougl. ex. Hook. Fl. Bor.-Am. **1:** 221. t. 69. 1834.
 =*Mentzelia laevicaulis* T. & G., Fl. N. Am. 535. 1840.

BARTONIA MICRANTHA (T. & G.) Hook. & Arn. in Bot. Beech. Voy. 343. t. 84. 1841.
 =*Mentzelia micrantha* T. & G., Fl. N. Am. 535. 1840.

BARTONIA MULTIFLORA Nutt. in Jour. Acad. Sci. Phil. n.s. **1:** 180. 1847.
 =*Mentzelia multiflora* (Nutt.) A. Gray in Mem. Am. Acad. n.s. **4:** 48. 1849.

BARTONIA NUDA Pursh, Fl. Am. Sept. **1:** 328. 749. 1811.
 =*Mentzelia nuda* (Pursh) T. & G., Fl. N. Am. 535. 1840.

BARTONIA ORNATA Nutt. Gen. N. Am. Pl. **1:** 297. 1818.
 =*Mentzelia ornata* (Nutt.) T. & G., Fl. N. Am. 534. 1840.

BARTONIA PARVIFLORA Dougl. ex Hook. Fl. Bor.-Am. **1:** 221. 1845.
 =*Touterea parviflora* (Dougl. ex Hook.) Rydb. in Bull. Torr. Bot. Cl. **30:** 276. 1903.

BARTONIA PUMILA (T. & G.) Nutt. ex Jackson, Ind. Kew. 276. 1895.
 =*Mentzelia pumila* T. & G., Fl. N. Am. **1:** 535. 1840.

BARTONIA SINUATA Presl. Rel. Haenk.
 (no other known combination in the Loasaceae).

BARTONIA WRIGHTII (Gray) Gray ex Jackson, Ind. Kew. 276. 1895.
 =*Mentzelia wrightii* A. Gray, Pl. Fendl. 48, 1849.

CENTAURELLA AESTIVALIS Pursh, Fl. Am. Sept. **1:** 100. 1814. The type has not been located and the description is inadequate to establish identity. This name is later than any employed in this treatment.

## II. THE GENUS OBOLARIA L.

Although this monotypic genus has no specific problem, it seemed desirable to assemble the history and taxonomy because there has existed in the past a conflict over the family position and also because this information may assist in an understanding of generic relationships. In the following study, the range has been established, the type specimen sought out and the description amplified. A separate generic description has been drawn up which will emphasize those characters considered to be comparable with other gentianaceous genera. No direct relationship with *Bartonia* is implied by this arrangement.

*Obolaria* was described by Linnaeus in his Hortus Cliffortianus in 1737 under the spelling "Obularia" but was later redescribed and respelled *Obolaria* in the Species Plantarum and in the sixth edition of the Genera Plantarum. According to Article 74 (1) of the International Code, 1956, the latter spelling should be retained as the preferred spelling of Linnaeus.

Linnaeus considered that he was describing a relative of the genus *Orobanche* for in his Mantissa he wrote: *"folia suprema extus purpurea. Flores pallide rubentes. Orobanches affinis."*

The unfortunate association with the *Orobanchaceae* begun by Linnaeus was continued by later authors, particularly by Grisebach, who ignored the genus completely in his treatment of the Gentianaceae in De Candolle's Prodromus. In a later volume of the work, however, Reuter included *Obolaria* in his treatment of the *Orobanchaceae*. Grisebach also omitted *Obolaria* from his Species Gentianearum. George Don placed it in the tribe OBOLARIEAE, the "terrestrial, not parasitical" *Orobanchaceae*.

The species was assigned to the genus *Shultzia* by Rafinesque in 1808. The earlier pre-Linnaean *Obolaria* of Siegesbeck was taken up for *Linnaea* L. of the Caprifoliaceae by Otto Kuntze in 1891 in his Revisio Generum Plantarum. In the same volume Kuntze adopted Rafinesque's name for the plant, recognized its position in the Gentianaceae and pointed out the need to distinguish it from *Schulzia* Spreng. of 1813 (Umbelliferae) named after Professor I. H. Schulz of Halle. Acording to Kuntze, Sprengel's name had been spelled "Schultzia" by many authors.

Gilg, in Die Pflanzenfamilien assigned *Obolaria* to the *Gentianaceae* subfamily *Gentianoideae*, under the group *Gentianeae-Erythraeinae* of unspecified rank. Gilg's grouping is a somewhat heterogeneous one having *Enicostemma*-like pollen as the chief feature in common. Of Gilg's list, *Sabatia* is the only genus that has been recently monographed, *Lapithea* being merged with it

(Wilbur, 1955). Beck-Mannagetta in his thorough treatment of the *Orobanchaceae* in Das Pflanzenreich (1897), omitted the genus *Obolaria* from the family and made no reference to it.

The uncertainty of family position has stemmed from Linnaeus's description and from the gross appearance of the plant. Although most of the *Orobanchaceae* are parasitic, there is no definite evidence that this is true for *Obolaria*.

The following characters will serve to establish a Pennywort as a member of the *Gentianaceae:*

| OBOLARIA | OROBANCHACEAE |
|---|---|
| Placentae from the sutures with 1 lateral lamella per carpel (2) | Placentae non-sutural; 2 lateral branched lamellae per carpel (2–3) |
| Plants glabrous | Plants frequently pubescent |
| Autophytic or saprophytic with evident chlorophyll | Parasitic without chlorophyll |
| Actinomorphic corolla | Zygomorphic corolla with labellate lobes |
| Opposite leaves or bracts | Alternate leaves or scales |
| Stamens equal, 4 rarely 2 by abortion of the opposing pair; anther sacs normally developed. | Stamens didynamous; one anther sac frequently aborting. |

## Systematic Treatment

**Obolaria** L. Sp. Pl. **2:** 632. 1753, non *Obolaria* Siegesb. Prim. Fl. 79. 1736, ex Ktze. Rev. Gen. 275. 1891 = *Linnaea L.* (Caprifoliaceae). *Shultzia* Raf. Med. Repos. II. **3:** 422. 1806, nom.; **5:** 356. 1808 descr. & Jour. Bot. (Paris) **1:** 219. 1809.

Perennial herbs with mycorrhizal fleshy corolloid bitter roots. Leaves opposite, decussate, sessile. Flowers in terminal dichasia or simple cymes and axillary. Calyx of two free sepals, usually with two decussate leafy bracts except in inner flowers of congested inflorescences, the sepals similar to the cauline leaves but more slender. Corolla 4–lobed, campanulate to urceolate, delicate but marcescent, without internal fimbriae or glands. Stamens 4, rarely 2, inserted at the sinuses of the corolla lobes, frequently appearing didynamous by partial abortion of the opposing pair, anthers 2–celled, introrse. Ovary unilocular, the parietal placentae sutural and with an additional lamellate intrusion on each of the two carpel walls. Stigmas two. Capsule unilocular, thin-walled, rupturing irregularly rather than by a terminal separation of the carpels. Seeds numerous.

1. **Obolaria virginica** L. Sp. Pl. 1: 632. 1753. (*Clayton 286* BM, TYPE, photo DAO!).

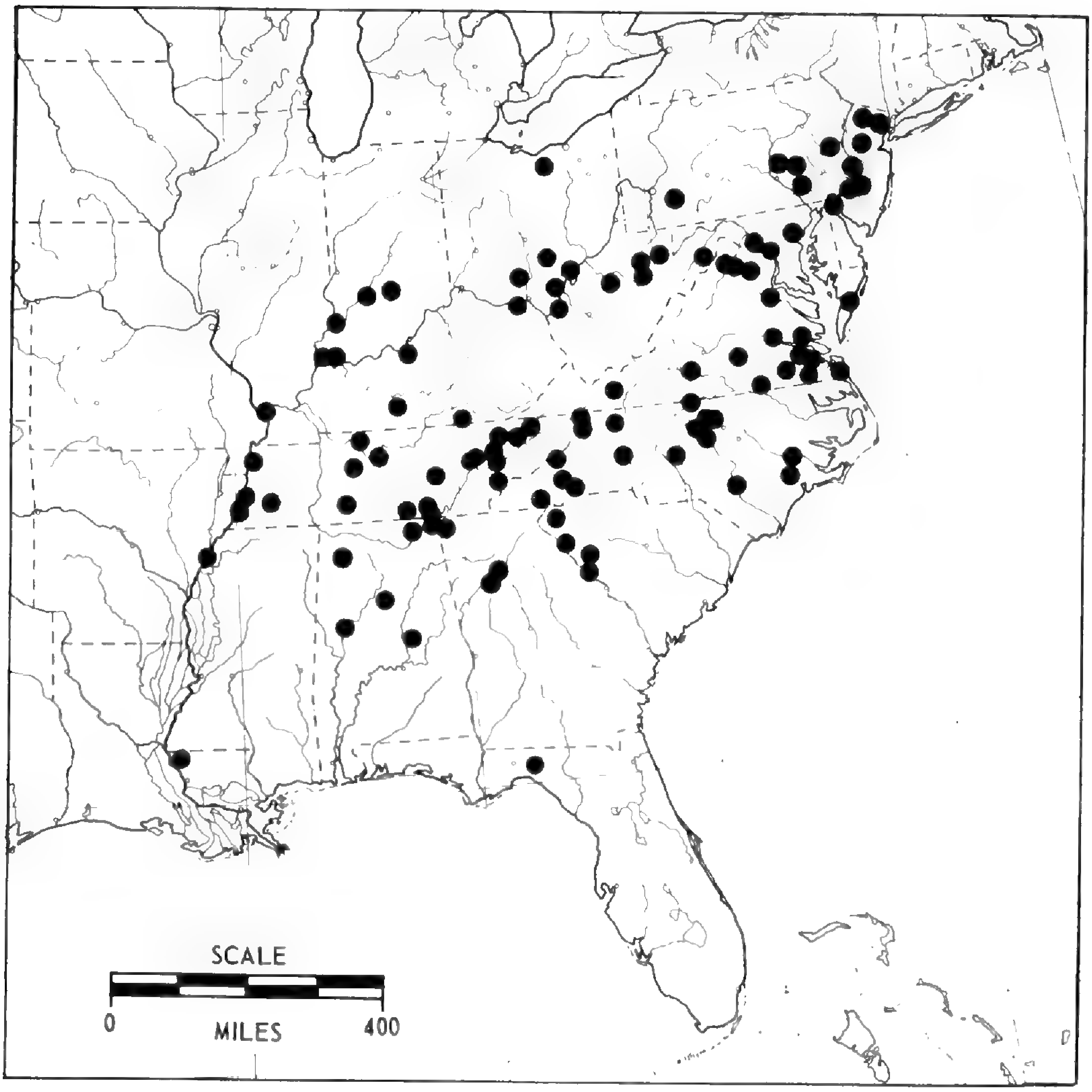
*Shultzia obolarioides* Raf. Med. Repos. II. 5: 356. 1808. *Shultzia virginica* (L.) O. Ktze. Rev. Gen. 2: 430. 1891.

Herbs 0.4–1.7 dm. tall, simple or strictly branched, the stem stout, fleshy and somewhat angled, frequently stouter above than below, occasionally fasciated. Lower cauline leaves 0.4–1.5 cm. long, 0.3–1.0 cm. wide, lunate, scale-like, loosely appressed, upper leaves becoming foliaceous or bract-like, closely subtending the flowers, fleshy, oblong to obliquely spatulate or soleaeform, truncate, abruptly acuminate, with numerous dichotomous veins anastomosing towards the tip, yellow to purple-green. Flowers short-pedicellate, the pedicels 0.5–2.0 mm. long. Corolla 0.6–1.2 cm. long (av. 0.9), white, campanulate with the lobes ascending, the tube 2.0–4.5 mm. long (av. 4.0), the lobes 4.5 mm. long, 2 mm. wide, oblong to slightly obovate, acute or strongly erose or irregular with entire margins, with three veins dichotomizing towards the apex. Stamens included, the short filaments 0.25 mm. wide, 1.0 mm. long, flattened, slightly tapered, the anthers 0.5 mm. long, dorsifixed, the thecae facing sideways after dehiscence. Pistil sessile, the ovary 3.0–3.5 mm. long, somewhat flattened, the style 1.0 mm. long, straight, the two stigmas 0.25 mm long, oblong and spreading. Capsule 5.5 mm. long, 3.5 mm. wide, ovoid, somewhat angular. Seeds averaging 0.23 mm. long, 0.16 mm. wide, light brown, ovoid, the surface minutely striate under X 60 magnification, approximately 1600 per capsule.

Rich woods, bottom lands, river banks, shrubby slopes, but chiefly in deciduous forest. Flowering from early March until late May; fruiting in late May and early June.

Distribution by Counties: ALABAMA: Blount, De Kalb, Franklin, Jackson, Tuscaloosa. ARKANSAS: Phillip. DELAWARE: New Castle. DISTRICT OF COLUMBIA. FLORIDA: Jefferson. GEORGIA: Dade, Fulton, Gwinnett, Rabun. ILLINOIS: Pulaski. INDIANA: Brown, Greene, Knox, Posey. KENTUCKY: Bullitt, Edmonson, Whitley. LOUISIANA: East Feliciana. MARYLAND: Baltimore. NEW JERSEY: Essex, Mercer, Somerset, Sussex, Union. NORTH CAROLINA: Buncombe, Caldwell, Craven, Cumberland, Durham, Henderson, Iredell, Jones, Macon, Madison, Orange, Polk, Wilkes. OHIO: Fairfield, Highlands, Jackson, Orain, Meigs, Scioto. PENNSYLVANIA: Berks, Bucks, Delaware, Chester, Lancaster, Lebanon, Montgomery, Northampton, Westmoreland. SOUTH CAROLINA: Anderson, Greenwood, Laurens, Oconee. TENNESSEE: Anderson, Blount, Carter, Cheatham, Davidson, Franklin, Grainger, Grundy, Hamilton, Hawkins, Jefferson, Knox, Lake, Lewis, Madison, Marion, Roane, Shelby, Sullivan, Tipton, Union, White. TEXAS: Location unknown. VIRGINIA: Accomac, Arlington, Bedford, Brunswick, Fairfax, Fauquier, Gloucester, Henrico, Isle of Wight, James City, Madison, Pittsylvania, Prince Edward, Prince William, Princess Anne, Southampton, Spotsylvania, Surry, Wythe. WEST VIRGINIA: Barbour, Cabell, Calhoun, Hardy, Upshur.

Linnaeus in his Species Plantarum gave a reference to the Hortus Cliffortianus where he wrote: "Crescit in Virginia, unde translatum communicavit DD. Gronovius." He also cited Gronovius' Flora Virginica. In this flora, *"Clayton n. 286"* is cited as it was by the younger Gronovius in the second edition of 1762. *Clayton 286* then may be considered as the type.




MAP 4. Distribution of *Obolaria virginica*.

There is no possibility of confusion with *Orobanche virginiana* L. Sp. Pl. 2: 633. 1753, because *Clayton 604* was cited by both Gronovius and by Linnaeus. This specimen located at the British Museum is the type of *Orobanche virginiana* L.

A total of 236 sheets have been seen from the herbaria listed in

Part I. Since there can be no confusion of species identity, no specimens have been cited.

EXCLUDED SPECIES

OBOLARIA CAROLINIANA Walt. Fl. Car. 166. 1788.
=*Monniera caroliniana* (Walt.) O. Ktze. Rev. Gen. 2: 463. 1891 (Labiatae).

OBOLARIA BOREALIS (L.) Kuntze, Rev. Gen. 1: 275. 1891.
=*Linnaea borealis* L. Sp. Pl. 2: 631. 1753. (Caprifoliaceae)

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Elsholtzia ciliata in Essex County, Massachusetts — In September of 1958 Mr. Francis C. Wade gave me a specimen of a small weed which Mrs. Ralph Foster had found growing in her flower garden on Main Street in Rowley, Massachusetts. While taking out some class material from the Labiatae covers in the herbarium a few days later I happened on to a specimen from Japan of the same plant so that identification was much easier than is often the case with adventives. Elsholtzia ciliata (Thunb.) Hylander is a native of Asia which has become naturalized in Temiscouata County, Quebec. In the Gray Herbarium and the Herbarium of the New England Botanical Club there are only five collections from the United States: Devil's Lake, Wisconsin; New Limerick, Maine; Chelsea, Vermont; and Fitchburg and Revere, Massachusetts. It is an annual with peculiar one-sided spikes of very small flowers which are almost hidden by broad bracts. A specimen has been deposited in the herbarium of the New England Botanical Club. Weed in garden, Main Street, Rowley, Essex County, Massachusetts, *Francis C. Wade 18774* (22 September 1958); same locality, *Francis C. Wade, Stuart K. Harris 18799* (26 September 1958). — Stuart K. Harris, boston university.

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# THE NORTHERNMOST STATION OF MAGNOLIA VIRGINIANA, ITS HISTORY AND PRESENT STATUS

Stuart K. Harris

The most northern station of *Magnolia virginiana* L. is located in the town of Magnolia situated on the mainland of Cape Ann and in the township of Gloucester, Essex County, Massachusetts. The nearest known station to the South is on Long Island, New York. The presence of the plant in Massachusetts has elicited a great deal of interest since the time of its discovery and a number of articles have been written concerning the history and condition of the plants at this station. The best historical account of the species was published in 1916 by Dr. George G. Kennedy in Rhodora vol. 18. In 1928 Richard J. Eaton reported on the status of the species in Rhodora vol. 30. Because over thirty years have elapsed since the appearance of Mr. Eaton's article it seems time to review once more the past history of the Sweet Bay in Massachusetts and report on its present condition. Much of the historical data has been taken either directly from Dr. Kennedy's paper or from the references given in that paper.

In the past there was confusion as to who discovered the Sweet Bay and when it was discovered. John Robinson in his Flora of Essex County, Massachusetts (1880) states, "First brought to notice by Rev. Manassah Cutler during the last century." Prof. John G. Jack (1889) says, "Here it has been known for over a hundred years, having been first brought to notice by the Rev. Manasseh Cutler." Mr. T. Otis Fuller (1890) quotes a marginal note made by Judge John Davis of Boston in his copy of the first edition of Bigelow's Florula Bostoniensis (1814) to the effect that the first specimen was obtained by Chief Justice Parsons in the summer of 1805. None of these is correct as to the date of the discovery.

In volume two of Cutler and Cutler's Life Journals and Correspondence of Rev. Manasseh Cutler, LL.D. (1888) is information which leaves no doubt as to the discovery. The magnolia was first noticed on Tuesday 22 July 1806 by Chief Justice Theophilus Parsons while riding through the woods in Gloucester during a shower of rain! I regret I have been unable to ascertain whether it was in the morning or the afternoon. Specimens were collected by him on the following Friday. He promptly wrote a letter to the Rev. Manasseh Cutler, the outstanding botanist in Essex County at the time, who set out in search of the plant on Monday, July 28, the day after he received the letter. While having dinner with Captain Ingolson at Kettle Cove a Mr. Goldsmith brought in specimens of the magnolia without being aware that Rev. Cutler was looking for it. In the afternoon Cutler found that the plant was abundant in two swamps close to the road from Manchester to Gloucester.

Being more familiar with *Magnolia stellata* and *M. soulangeana* which blossom in the spring, the last half of July seemed a late date to me to find magnolia in flower. However, in checking all the dated specimens I have seen, all collections bearing blossoms have been taken in July and Jack says that the first week in July is the best time to go and see the shrubs.

A note by an unsigned correspondent appears on page 612 of Garden and Forest vol. 2 and again as a quotation in Kennedy's article suggesting that *Magnolia virginiana* is not really native to Gloucester but was introduced there from a more southern state by the early settlers. As far as I know there is not a shred of evidence to support this interesting theory. This note is the major portion of a letter dated 21 November 1889 and sent to John Robinson at the Peabody Academy of Science at Salem by M. A. Walton, "Hermit." This letter is attached to one of the sheets of Magnolia in the herbarium of the Peabody Museum of Salem. Mason A. Walton, the Hermit of Gloucester, was suffering from very poor health and about 1884 decided that continued life in the city would soon prove fatal, so he moved to the woods of Cape Ann and lived first in a tent and later in a cabin and nursed himself back to health. He was an untrained nature lover with a keen eye, as is evidenced by the contents of this letter and by the book he published in 1903, A Hermit's Wild Friends, which is full of observations he made of the plants, birds and mammals of the region.

The note in Garden and Forest terminates as follows, "It must be evident to any careful observer that Magnolia glauca is here struggling in an unnatural climate. The primary roots grow straight down into the muck and in the fall are thickly covered with succulent rootlets, snowy white in color. In the spring these rootlets are mostly dead, and the greater part of the young shoots die down to the moss, and a certain per cent of the old plants winter kill, which goes to show that there is no harmony between shrub and climate." There is more pertinent information in the unpublished portion of the letter. "Magnolia glauca, does not extend into Essex, so far as I know. I have traveled through many of the swamps of that town without discovering it, and persistent enquiry of Essex people, long ago convinced me that it did not extend beyond West Gloucester. I believe the shrub is confined wholly to Ward 8, City of Gloucester. Below I give the names of some of the swamps where it grows: 'Magnolia Swamp'; 'Barrel Swamp'; 'Rust's Swamp'; 'Cedar Swamp'; 'Bray's Swamp' and several other minor swamps. During the time I have lived here, five years, Magnolia glauca has increased in Magnolia Swamp. I do not think it has noticeably increased in other swamps, but certainly, it has not decreased."

This brings us to a consideration of the range of *Magnolia virginiana* in New England. In the Trees and Shrubs of Massachetts, ed. 2 (1875), George B. Emerson states, "It is said to have been found, in a single spot, in the county of York, Maine." Since no specimen is known to support this claim and no botanist has reported finding the Sweet Bay in Maine since 1875, this report can be eliminated. Thus the range can be confined to Cape Ann, Massachusetts. Emerson (1846) reports it from a swamp in deep woods in Essex but there are no specimens to substantiate the claim. Walton, as noted above, believed that the species grew only in West Gloucester and I think this is essentially correct. However, there are two collections in the Gray Herbarium, one made by William Oakes and the other by Charles E. Faxon, which give the adjoining town of Manchester as the locality.

The location of the Magnolia Swamp became well-known soon after its discovery and great numbers of the magnolia were dug and moved to private gardens. During the season when the shrub was in flower large numbers of the blossoms were picked, with little or no regard for the welfare of the plants, and sold on the streets of Salem and Boston. In the herbarium of the Peabody Museum are two sheets of blossoms purchased from small boys in 1878 and 1879. As early as 1846, Emerson expressed the fear that the station would soon become extirpated but nothing was done to remedy the situation. Kennedy quotes a letter written in 1916 by Charles E. Faxon to Walter Deane which states that forty-five years before he had found plenty of good specimens fifteen feet tall or more and that it was easy to find them because the boys who sold the flowers on the Boston trains had made trails from one plant to another all over the swamp. However, when he visited the place two years previously (July 1913) in the company of Dr. Kennedy and the local Tree Warden, they could find only two little plants a few feet high. This must have been the low point of the stand. It is possible that they happened to make their visit at a time when most of the plants had been killed back to the ground by a severe winter and the young shoots had not yet appeared.

Eaton in 1928 notes that the Magnolia Swamp had been made a part of Ravenswood Park in the early 1920's and that the magnolia was at last protected. Along the paths constructed across the swamp he saw about a dozen species. In talking with him recently he told me that he has counted over twenty-five plants close to the paths.

All my visits to Magnolia Swamp have been made in the winter which is not as illogical as it first seems because the ground is then frozen and progress is easy in the swamp and the magnolias being evergreens are easy to spot because they are about the only woody plants there holding their leaves. Besides I would rather fight chilblains than mosquitoes. As Walton states the swamp contains several hundred acres and is long and relatively narrow, ten to over one hundred rods wide. In late February of this year I made a rough census of the distinct plants seen during twenty or twenty-five zigs and zags across the swamp. I was able to count eighty clones and I am sure that I missed some so that it is probably safe to say that at least one hundred still exist. The length of the stems varied from less than a foot to about fifteen feet. I saw no evidence of fruit on any of the plants and this was also true on two previous visits made during the past seven years. This leads me to wonder if the magnolias are now being killed by kindness through being shaded out by the red maples and other taller trees in the swamp which are also being protected. In the fall of 1957, Miss Frances L. Burnett of Manchester told me of another apparently natural stand of *Magnolia virginiana* in a swamp near the Manchester line and at least a mile and one half from the Magnolia Swamp. I have visited this twice. The swamp itself is small and contains only five or six plants but these represent the only wild magnolias outside of Magnolia Swamp of which I am aware. In 1957, I found several fruit on this group but I saw none this February. — DEPARTMENT OF BIOLOGY, BOSTON UNIVERSITY, BOSTON, MASS.

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# ALLIUM SPECULAE, A NEW SPECIES OF THE ALLIUM CANADENSE ALLIANCE FROM ALABAMA[1]

MARION OWNBEY AND HANNAH C. AASE

The *Allium canadense* alliance comprising ten North American species has recently been revised by the authors.[2] Scarcely was this monograph off the press than there appeared in our living collection an undoubted eleventh member of this group. We are indebted to Dr. Carroll E. Wood, Jr., for supplying bulbs and later herbarium specimens of this novelty which we describe below.

**Allium speculae,** sp. nov. Bulbus ovoideus non bulbuliferens saepe unus ex pugno, tunicis interioribus albidis, cellulis cuticulae indistinctis recte elongatis regularibus, tunicis exterioribus fuscis persistentibus anguste fibroso-recticulatis, maculis vacuis; foliis aliquot canaliculatis in sectione transversa concavo-convexis 1–2 mm. latis integris scapo brevioribus in flore viridibus; scapo uno tereti 2–3 dm. alto; spatha membranacea caudata, bracteis plerumque tribus lanceolatis attenuatis plusminusve connatis plerumque uninervatis; umbella pauci (10–15–) flora erecta, pedicellis tenuibus demum subaequilongis, perianthio plerumque 2–3–plo longioribus; perianthii segmentis 5–6 mm. longis ellipticis obtusis ad apicem involutis pallide roseis late patentibus non valde reflexis in fructu marcescentibus super ovarium conniventibus; staminibus perianthii segmentis paulo brevioribus ascendentibus, filamentis subulatis basi dilatatis coalitisque, antheris oblongis obtusis versatilibus; ovario turbinato trilobato 6-caniculato distincte cristato, cristae processis

[1] This investigation was supported in part by funds provided for biological and medical research by State of Washington Initiative Measure No. 171.

[2] OWNBY, M., AND H. C. AASE. 1956. Cytotaxonomic Studies in *Allium*. I. The *Allium canadense* alliance. Research Studies of the State College of Washington. Monographic Supplement, No. 1. 106 pp.

6 binis complanatis horizontalibus, stylo lineari filamentis subaequilongo, stigmate capitato; seminibus ignotis; $2n = 14$.

Bulb ovoid, without basal bulbets, often one of a cluster, inner coats whitish, with the epidermal cells indistinct, vertically elongate and regular or nearly so, outer coats persisting as a series of grayish or brownish very fine meshed open recticula, usually enclosing only a single bulb; leaves several per bulb, channeled, concave-convex in cross section, 1–2 mm. broad, entire, shorter than the scape, green at anthesis; scape 2–3 dm. tall, terete, solitary (or sometimes a second one appearing in cultivated plants); spathe membranaceous, caudate, breaking at anthesis into usually 3, lanceolate, attenuate, partially united, mostly 1-nerved bracts; umbel comparatively few (10–15) — flowered, erect, pedicels slender, becoming subequal in length, mostly 2–3 times that of the perianth; perianth segments 5–6 mm. long, elliptic, obtuse, involute at apex, pinkish, widely spreading, but not strongly reflexed, remaining thin and withering over the ovary; stamens a little shorter than the perianth, ascending, filaments subulate, dilated and united into a ring at the base, anthers oblong, obtuse, versatile; ovary turbinate, 3-lobed, but 6-grooved, each lobe with a pair of flattened horizontal processes which together form the distinct crest; style linear, about as long as the filaments, stigma capitate; seeds unknown; $2n = 14$.

The type specimen (WS) was collected in bud April 25, 1955, in black sandy soil (wet at this season) with *Schoenolirion croceum* on an open expanse of flat sandstone surrounded by *Pinus-Quercus-Carya* woods at the northwest rim of Little River Canyon, about 1.3 miles from the northeast end of Little River Canyon Parkway, Lookout Mountain, southeast of Fort Payne, De Kalb County, Alabama, by Carroll E. Wood, Jr. (No. 8695). The plants were allowed to flower, and specimens prepared May 4. A selected isotype is in the Gray Herbarium. Additional data were obtained from plants of this collection (WS) grown in the greenhouse at Pullman, Washington, in 1956. The species is abundant at the type locality, and several isotypes obtained remain to be distributed by the collector. In cultivation, the plants did not survive beyond the first year.

*Allium speculae* habitally resembles the widespread *A. canadense* var. *mobilense* of the Gulf states, and if it has been collected before the specimens will probably be found under this name or one of its synonyms. It differs from var. *mobilense*, however, in its prominently crested ovaries, its mostly 1-nerved bracts, and its more widely spreading perianth segments. Its nearest relationship is probably not with that variety and, if this is true, it has no close relatives. The only other species of this alliance with crested ovaries in eastern North America is *A. Cuthbertii*, which is at once so conspicuously distinct from *A. speculae* that they could not be confused. *A. Cuthbertii* has only two leaves per scape, the processes of the conspicuous crest are contorted, the perianth segments reflexed, and the bracts mostly 5-nerved. Yet, *A. Cuthbertii* seems to be the closest relative of *A. speculae*. Among the western species of this alliance, only *A. Geyeri* seems to be a possible relative. This species, however, has urceolate-campanulate flowers, and the processess of the crest are little more than inconspicuous knobs. The relationship with *A. Geyeri* cannot be close. It seems, therefore, that *A. speculae* represents an eleventh distinct evolutionary line in the *A. canadense* alliance, or that it stands ancestral to *A. Cuthbertii*. The later hypothesis is particularly appealing. Morphologically, *A. speculae* is intermediate between *A. Cuthbertii* and the less specialized western species, such as *A. Geyeri*. Furthermore, its present distribution fits this hypothesis, inasmuch as it is apparent that the *A. canadense* alliance as a whole radiated from the Southwest. One cannot overlook, however, some resemblance between *A. Cuthbertii* and *A. Plummerae* and the possibility that the latter, although tetraploid, might be the most primative surviving member of the alliance. This might imply an early separation of the lines which gave rise to *A. speculae* and *A. Cuthbertii*, respectively, so that the former could not stand as ancestral to the latter.

— STATE COLLEGE OF WASHINGTON, PULLMAN.

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# AN ALTERNATIVE EXPLANATION OF SUBSPECIATION IN ASCLEPIAS TUBEROSA

C. W. JAMES

*Asclepias tuberosa* L. (Woodson, 1954) is represented in the southeastern United States by a relatively extensive Appalachian subspecies and a somewhat more restricted Coastal Plain representative, a relationship which has been observed repeatedly in many species and genera for some time. It is easily conceived how many such Coastal Plain forms could have originated from Appalachian species some time after the close of the Cretaceous and differentiated in response to ecogeographical factors present in the newly emerging Coastal Plain. However, in such instances, unless isolating mechanisms other than those of ecogeographical character have since become established or unless the ecological barrier is sharply delimited, intergradation is expected between such forms. Yet, Woodson's (1947b) detailed statistical analyses of leaf variation in *Asclepias tuberosa* revealed that this intergrading zone presently evident between the Coastal Plain subsp. *Rolfsii* and the Appalachian subsp. *tuberosa* is due to hybridization between the two subspecies and not to an ecogeographical differentiation into a cline. This led Woodson (1947a) to conclude that *Rolfsii* must have originated independently in more or less complete isolation from *tuberosa*. To account for this, Woodson then postulated that *Rolfsii* evolved on Orange Island, a hypothetical island or archipelago in north Florida during Oligocene times. Since Woodson's account of the supposed origin of *Rolfsii* has been considered biological evidence substantiating the existence of a functioning Orange Island Refugium by Woodson, Thorne (1949), and others, it seems highly desirable to explore other ways in which this subspecies could have originated lest we find ourselves relying too freely and perhaps unjustifiably at times on this Island as a refugium.

Granted the occurrence of hybridization between the subspecies of *Asclepias tuberosa*, how then can one account for this apparently independent origin of *Rolfsii* by means of the known processes of ecogeographical subspeciation? As Woodson pointed out, "*Rolfsii*, surely, could not have maintained a separate existence with *tuberosa* upon the Appalachian upland, later migrating to Florida only to return in panmixy with its sister subspecies."

The Coastal Plain today is a geographical province differing considerably from the adjacent and generally more mesic Piedmont and Appalachian provinces. Since the habitats of the Coastal Plain presumably developed gradually through a successional series over a period of time, it seems reasonable to assume that these differences (notably the edaphic ones) could only have been more striking when the Coastal Plain was in its initial phase of exposure. This would mean that the genetic system of the pioneering Coastal Plain element of *tuberosa* would have been selected under much more rigorous and quite different conditions from those prevailing today. It possibly required considerable time for a genetic system to evolve from the parental species which was sufficiently adapted to be aggressive in this newly available environmental complex. But once such biotypes had evolved, they could migrate southward as rapidly as the successional stages and dispersal would permit since environments characteristic of the succeeding portions of the Coastal Plain would be very similar to the first to which the invading element must necessarily have been adapted. The rapidity with which this genetic element migrated away from the parental stock would result in a progressively more effective geographical isolation, thus accounting for the apparently independent evolution of *Rolfsii* in more or less complete isolation. (Although not the case in *Rolfsii,* this could provide conditions facilitating the evolution of other isolating mechanisms). The basis of the reasoning employed here is dependent upon the following tenets:

The less favorable a newly available area is for occupancy and invasion by organisms of an adjacent area,

1. the less the probability of the presence of existing biotypes which can immediately invade the new area,
2. the greater the difference there will be in the genosystem of a derived race which can invade the new area,
3. the greater the probability of a longer period of time required for the evolution of this genosystem,
4. the greater the differential in rate of migration between the best adapted and the least adapted biotypes of this genosystem,
5. the greater the degree of morphological and physiological differentiation and/or specialization of the invading race,
6. the greater the effectiveness of ecogeographical isolation (if such isolating mechanisms are involved.)

7. the longer the newly evolved race can maintain a separate identity from the parental species.

The genetic system of *Rolfsii* is presumably a specialized one derived from only a part of the broader genetic system of *tuberosa,* and one which, perhaps, has become even further specialized. There would then be little or no pressure on a northward movement of *Rolfsii* genes into *tuberosa.* There would be, however, continued forces operating at the juncture of subspecific differentiation on a flow of *tuberosa* genes southward just as there had been since the time of exposure of the Coastal Plain. Furthermore, as the Coastal Plain became more mature it offered more variety and less severity in habitat; consequently, many *tuberosa* genes and gene complexes which previously were insufficiently adapted to that environment could then flow southward in addition to some of the previous ones. This would result in an invasion of the Coastal Plain *Rolfsii* by increasingly less differentiated biotypes of *tuberosa* which could then hybridize with the remaining *Rolfsii* element in that area of the Coastal Plain where subspeciation was first initiated. This progression of secondary invasion elements of *tuberosa* would then tend to absorb *Rolfsii* and could then account for the present hybridization occurring between the two subspecies.

If *Rolfsii* were ever present in the Carolinas and northward it has apparently since been absorbed by *tuberosa.* It is of interest to note in this connection that geological evidence suggests that a considerable portion of the Carolina Coastal Plain has been exposed and available to plants since the end of the Cretaceous. At the present time, *Rolfsii* appears to be losing its identity throughout the remainder of the Coastal Plain with the exception of peninsular Florida which is farthest from the presumed point of origin.

This analysis, of course, does not disprove the possible existence of an Orange Island Refugium. It is merely an attempt to offer an alternative explanation of subspeciation in *Asclepias tuberosa* which could account for the hybridization presently occurring between the subspecies without having to rely on an Orange Island Refugium.

The author expresses his appreciation to Drs. R. E. Woodson, R. C. Rollins, J. J. Westfall, and C. E. Wood for reading and evaluating the manuscript.

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# NOTES ON THE DISTRIBUTION OF OHIO COMPOSITAE: II. EUPATORIEAE, SENECIONEAE, CYNAREAE, CICHORIEAE

ROBERT W. LONG

This is the second paper of a series of three that presents some results of a recent study of Ohio Compositae. In part I[1] it was noted that plants discussed in these reports are ones whose occurrence in Ohio is questionable, judging from information given in Gray's Manual (1950) and The New Britton and Brown Illustrated Flora (1952). For the present, the nomenclature is derived chiefly from Gray's Manual, but this does not imply it is necessarily the best treatment for the taxa listed.

All specimens and county records cited here are deposited in the Herbarium of The Ohio State University, and the identifications have been verified by the writer.

## EUPATORIEAE

**Eupatorium album** L. var. **glandulosum** (Michx.) DC. This variety is easily separated from the typical one by the occurrence of minute, dark glands on the phyllaries; thus, the variety is quite distinct. Its presence in southern Ohio represents a northward extension of the range given by Fernald. COLLECTION DATA: Jackson Co., Liberty Twp.,

[1] ROBERT W. LONG. Notes on the distribution of Ohio Compositae: I. Heliantheae, Anthemidae. RHODORA 60:125-128. 1958.

Big Rock, *Leslie Pontius and Floyd Bartley,* August 27, 1933. Other collections from Scioto County.

**Eupatorium rotundifolium** L. var. **rotundifolium.** The distribution of this plant is apparently limited to the southeastern quarter of the state on the Allegheny Plateau. These collections, however, are evidently from the northwestern edge of the range for the species, judging from accounts in the manuals. COLLECTION DATA: Scioto Co., Nile Twp., *Conrad Roth,* August 26, 1956. Other collections examined from Fairfield and Hocking counties.

**Eupatorium rotundifolium** L. var. **ovatum** (Bigel.) Torr. That there are two recognizable varieties of this species in Ohio is clearly apparent from the specimens examined. Both manuals agree that two can be distinguished, with *E. pubescens* Muhl. being a synonym for var. *ovatum.* Recent collections place both varieties in southcentral counties and for var. *ovatum* this record will be a range extension. COLLECTION DATA: Hocking Co., "Neotoma", *Gareth Gilbert,* August 12, 1955. Also, collections from Jackson County.

**Liatris borealis** Nutt. The collections of this plant are very near *L. scariosa* (L.) Willd. If they are correctly identified, then Ohio records constitute a westward range extension. The following are provisionally placed in this species. COLLECTION DATA: Adams Co., Andrews School Prairie, *H. R. DeSelm,* September 18, 1952. Other county records for Erie, Henry, Pike, Ross, and Wood counties.

**Liatris punctata** Hook. The single collection suggests that the species occurs only rarely. This is considerably east of its chief distribution, that being in the dry prairies from Canada to Texas. The specimen does not appear to be of var. *nebraskana* Gaiser. COLLECTION DATA: Franklin Co., Clintonville, *John H. Schaffner,* October 3, 1903.

**Liatris scariosa** (L.) Willd. Ohio plants appear to be relatively abundant, but predominantly in the southern counties which extends the range of the species westward. Intergrades to *L. borealis,* and *L. aspera* Michx. were found. The following collections have been provisionally traced to *L. scariosa* as described in Gray's Manual. COLLECTION DATA: Vinton Co., Vinton Twp., Sec. 22, roadside on ridgetop, *Janice Beatley,* August 30, 1952. Other collections from Adams, Athens, Erie, Fairfield, Franklin, Fulton, Jackson, Meigs, Perry, Pike, Ross, and Scioto counties.

### SENECIONEAE

**Senecio antennariifolius** Britt. The presence of this species in Ohio is a significant westward range extension from the general area of distribution, as given in both manuals. Schaffner does not give it in either the Revised Catalogue or in The Field Manual of the Flora of Ohio. All collections examined had been made since 1950. Three collections intergrade to *S. plattensis* Nutt. COLLECTION DATA: Hocking Co., Cedar Falls, *Floyd Bartley and Lawrence E. Hicks*, June, 1956.

**Senecio Smallii** Britt. Although this is a southern species, ranging into Kentucky and Pennsylvania, collections have been seen from several parts of the state. Possibly the species has migrated only recenlty into Ohio, or has been introduced as a weed. Schaffner does not list it and all collections examined were made since 1949. One specimen (Geauga Co.) intergrades to *S. pauperculus* Michx. in stem and inflorescence characteristics. COLLECTION DATA: Lawrence Co., in old field 2 mi. west of Oak Ridge Furnace, *Lawrence Hicks and Floyd Bartley*, May 30, 1954. Also, specimens were examined from Adams, Cuyahoga, Geauga and Summit counties.

### CYNAREAE

**Centaurea repens** L. This is a distinctive star-thistle, with bushy branches bearing small, linear leaves abundant to the numerous heads that terminate the branches. It is represented in Ohio by at least a single collection and this is an important eastward range extension. COLLECTION DATA: Clinton Co., collected along railroad tracks near New Vienna, a large patch, *Katie M. Roads*, June 27, 1939.

**Cirsium arvense** (L.) Scop. var **integrifolium** Wimm. and Grab. Two collections have been made in widely-separated parts of the state. According to published accounts, these locales are considerably west and south of the usual range for the variety. COLLECTION DATA: Cuyahoga Co., North Olmstead, *Freda Detmers*, August 4, 1925. Also, a collection was seen from Logan county.

**Cirsium carolinianum** (Walt.) Fern. and Schub. The omission of this species from Schaffner's published accounts of the flora was owing to his identification of Ohio collections as *C. virginianum* (L.) Michx. The specimens seen, however, clearly belong to *C. carolinianum* judging from the size of the involucre and number of leaves. Two county records extend the range of the species into central Ohio. COLLECTION DATA: Pike Co., *Floyd Bartley and Leslie Pontius*, June 7, 1945. Other collections examined from Franklin, Madison, and Scioto counties.

**Cirsium Hillii** (Canby) Fern. This species is distinguished from the common Ohio thistle *C. pumilum* (Nutt.) Spreng. by the presence of short prickles on the outer phyllaries that also have a dark band present running the length of the phyllary. Schaffner includes it in his Field Manual of the Flora of Ohio, but not in the Revised Catalogue. The single head of the specimen examined was unusually large. COLLECTION DATA: Coshocton Co., in dry open fields, leaves green beneath, location N. A. E. W., *Harold N. Moldenke 13232*, July 15, 1942.

### CICHORIEAE

**Krigia Dandelion** (L.) Nutt. Ohio records result in a northward and eastward range extension. The single collection, however, comes from an area that several authors have commented on as being a peculiar mosaic of prairie and Allegheny vegetation which is not typical for the state. The specimen appeared not unusual, morphologically, judging from the description. COLLECTION DATA: Adams Co., sw. corner Oliver Twp., post oak-white oak woods, *E. Lucy Braun*, May 18, 1954.

**Leontodon autumnalis** L. var. **autumnalis.** The plant has become established as a weed of northern counties, and its occurrence represents an eastward and southward range extension. COLLECTION DATA: Summit Co., lawn weed, Cannon road ¾ mi. e. of Twinsburg, *Ervin M. Herrick*, August 28, 1955. Other specimens examined from Ashtabula, Franklin, Lake, and Medina counties.

**Leontodon autumnalis** var. **pratensis** (Link) Koch. A single collection was seen of this variety, although one might expect to find it to be more abundant, especially in the northern part of the state. COLLECTION DATA: Ashtabula Co., Trumbull, *L. E. Hicks*, June 10, 1931. — DEPARTMENT OF BOTANY, OHIO WESLEYAN UNIVERSITY, DELAWARE, OHIO.

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# THE BALANOPHORACEAE IN THE CARIBBEAN FLORA[1]

RICHARD A. HOWARD

This small family of root parasites is represented in the Antilles by two genera, *Scybalium* and *Helosis*. One species of *Scybalium*, *S. jamaicense*, has been found in Cuba, Jamaica, Hispaniola and Puerto Rico.

The second genus, *Helosis*, consists of three species known from South America and Central America. Sandwith (Kew Bull. 1931:59. 1931.) and Harms in his monograph (Pflanzenfam. 2nd ed. 16b:321. 1935.) suggest that one of them, *H. cayennensis*, may possibly occur in Guatemala and Cuba as well as in northern South America. Standley and Steyermark (Flora of Guatemala, Fieldiana, Bot. 24:93. 1946.) refer the Guatemalan specimens to *Helosis mexicana*, but state that "three species have been described, all of them perhaps to be reduced to *H. cayennensis* (Swartz) Spreng. of northern South America. Only the following [*H. mexicana*] is known from Central America." The specific differences suggested by Harms for the three species of *Helosis* do not appear to be substantial taxonomic characters. However,

[1] Work on the flora of the Lesser Antilles is supported by a grant from the National Science Foundation.

as a group, the plants have been poorly collected and have not received careful comparative study for taxonomic classification.

The earliest record of *Helosis* from the West Indies appears in Grisebach, Flora British West Indies (309. 1860.), when he reports *Helosis guianensis* from Trinidad. In his Catalogue Plantarum Cubensium (118. 1866.) Grisebach lists *"Helosis mexicana* Liebm.", citing the Charles Wright collection 2636 (GH). This plant has not been recollected. Leon and Alain (Flora de Cuba 2:84. 1951.) change this identification to *Helosis guianensis* L. C. Rich. Two additional collections of *Helosis* from the Lesser Antilles are now on hand, and allow further consideration of this peculiar root parasite.

Dr. Walter Hodge, in the course of his field work in Dominica, received a report that Helosis was "quite abundant on Morne Anglais". He did not personally encounter the plant, but received a specimen from Mrs. Alastair Forbes collected on the banks of the Laurent River near the western base of Morne Negre Maron (*Hodge 1206*, GH). This specimen has been unidentified since 1940. More recently, Mr. George Proctor made an excellent collection (*Proctor 17764*, GH), including material preserved in alcohol, from the mossy montane forest between 2500 and 3000 feet on the northwest spur of Morne Gimie in St. Lucia.

The three collections from the West Indies can now be examined together and compared with material from South and Central America. All specimens are small, with nearly globular heads. None exceeds 5 cm. in height in mature condition. The heads range from 1–2 cm. in length and 1–1.5 cm. in thickness. The deciduous hexagonal scales of the anthophore are only 1.5–2 mm. in diameter, and the apex is extended in a setaceous tip. Both male and female flowers are borne in the head. The pistillate flowers remain smaller than the abundant paleae, with only the styles protruding. The bilabiate perianth is represented by two triangular appendages, 0.1–0.2 mm. long. The perianth of the staminate flowers is well developed by contrast with a tube 2.5 mm. long and three ovate lobes 1.5 mm. in length. The perianth lobes are valvate and strongly concave. The three filaments are stout but cylindrical, and in specimens preserved in alcohol these are free throughout their length. The short anthers, however, are completely connate.

This description agrees in the main with the excellent diagnosis given by Sandwith for *Helosis cayennensis* (Kew Bull. 1931: 58–9. 1931.). It differs in the smaller size of all parts and in the description of the free filaments.

In a key by Leon and Alain *Scybalium* is distinguished from *Helosis* by the former genus having three stamens and the latter two. Standley and Steyermark also describe the staminate flower as having two stamens. Both of these pairs of workers refer to fused filaments. Apparently their descriptions have been based on dried herbarium material where the filaments seem to adhere tightly. The report of only two stamens is apparently an error, for a reëxamination of the Wright collection from Cuba and of several specimens from Central America reveals three stamens in all specimens.

The West Indian specimens are referred to *Helosis cayennensis* (Sw.) Spreng. *Helosis guianensis* L. C. Rich. is regarded by Harms and Sandwith as a synonym. All the West Indian material is of smaller size, has longer setaceous tips to the hexagonal scales of the head, and a more obvious bilabiate development of the perianth of the pistillate flowers. Until additional collections are available from the Lesser Antilles and from Cuba it is not worth while to use these minute characters in an obviously reduced and specialized plant as distinctions for a new species.

While Harms uses ovule characteristics to distinguish between *Scybalium* and *Helosis,* the single species of each in the West Indies can be separated on the basis of the numerous overlapping scales of the peduncle of *Scybalium* and the naked peduncle of *Helosis* which may have a single annulus of short but broad scales. The bracts of the flower head of *Scybalium* are broadly triangular, flat and imbricated, while those of *Helosis* are peltate, hexagonal in outline, valvate, and extended to a setaceous tip.

— ARNOLD ARBORETUM, HARVARD UNIVERSITY.

# NEW NAMES WITHIN THE SECTION TRIDENTATAE OF ARTEMISIA[1]

Alan A. Beetle

A study of the ecotypes of big sagebrush and its relatives was made over a three-year period in the eleven western states as well as in adjacent portions of Mexico and Canada. Comparison of morphological characteristics, ecological development, and distribution of species has resulted in the discovery of one new subspecies and two new species within Section *Tridentatae* Rydb. of Artemisia. All of the types will be treated in detail in a forthcoming Wyoming Agricultural Experiment Station bulletin.

While the use of *Seriphidium* for a subgenus grouping involving both Old World and New World types (having homogamous heads) may yet have to be proved natural, there is much evidence that the use of Section Tridentatae Rydberg embodies a closely knit group of species endemic to the North American continent. These species may be outlined as follows:

1. **A. bigelovii** Gray (*A. petrophila* Wooton & Standley)
2. **A. nova** Nelson
3. **A. pygmaea** Gray
4. **A. rigida** Gray
5. **A. tripartita** Gray (*A. trifida* Nutt.)

5 (a). **A tripartita** subsp. **rupicola** Beetle, subsp. nov. Affinis **A. tripartita** subsp. *tripartita* sed nana, ad 1–1.5 dm. alta, foliis ad 3 cm. longis, singuli parte 1 mm. lata.

Type collection: Wyoming, Albany County, Medicine Bow National Forest, Pole Mt., Sept. 7, 1958, *A. A. Beetle 13185*. TYPE in the Rocky Mountain Herbarium: duplicates in Gray Herbarium, Chicago Natural History Museum, U. S. National Herbarium, and the herbarium of the University of California, Berkeley.

*A. tripartita* subsp. *rupicola* is a dwarf plant rarely over 1.5 dm. tall. Its leaves are often 3 cm. long, with both the basal portion and each lobe at least 1 mm. wide. In contrast *A. tripartita* subsp. *tripartita* is an erect plant up to two meters tall, with leaves seldom over 2 cm. long, both the basal portion and each of the three lobes about 0.50 to 0.75 mm. wide. *A. tripartita* subsp. *rupicola* occupies rocky knolls from 8,000 to 9,000 feet elevation

[1] Published with approval of the director, Wyoming Agricultural Experiment Station, as Journal paper no. 126.

from the Owl Creek Mountains and from South Pass in Central Wyoming to the Laramie Range in southeastern Wyoming. *A. tripartita* subsp. *tripartita* occupies the deeper soils at the base of foothills from 5,000 to 7,000 feet elevation and occurs from southern British Columbia, Canada, southward through Washington, Idaho, and Montana to western Wyoming and northern Utah.

6. **A. tridentata** Nutt.

6 (a). **A. tridentata** subsp. **vaseyana** (Rydb.) Beetle, comb. nov.

Based on *A. vaseyana* Rydb. North American Flora 34 (3):283. 1916.

*A. tridentata* subsp. *vaseyana* has a range geographically distinct from that of *A. tridentata* subsp. *tridentata*. It differs mainly in the characters emphasized by Rydberg, namely broader involucre, more flowers per head, and broader, and more truncate or cuneate leaves.

6 (b). **A. tridentata** subsp. **vasyana** (Rydb.) Beetle, f. **spiciformis** (Osterhout) Beetle, comb. nov.

Based on *A. spiciformis* Osterhout, Bull, Torrey Club **27**:507. 1900.

This plant is an extreme form, always occurring at the upper elevational limits of the subspecies and always in close proximity of *A. cana* subsp. *viscidula,* leading to the speculation that it may partially represent crossing between *A. tridentata* subsp. *vaseyana* and *A. cana* subsp. *viscidula.*

6 (c). **A. tridentata** subsp. **tridentata**, f. **parishii** (Gray) Beetle, comb. nov.

Based on *A. parishii* Gray, Proc. Am. Acad. **17**:220. 1882.

While *A. tridentata* subsp. *tridentata* f. *parishii* is an eye-catching form in the field because of its strikingly reflexed branches of the inflorescence (in addition to having somewhat hairy achenes), it occurs sporadically throughout the range of *A. tridentata* subsp. *tridentata* in many more localities than have been reported previously. It has not been reported occurring within the range of *A. tridentata* subsp. *vaseyana.*

7. **A. arbuscula** Nutt.

7 (a) **A. arbuscula** subsp. **thermopola** Beetle subsp. nov. Affinis *A. arbuscula,* arbuscula sed planta gracile, cum foliis filiformibus, tripartitis profunde.

Type collection: Wyoming, Teton County, along banks of Snake River near south entrance to Yellowstone National Park, August 10, 1957, *A. A. Beetle 12631.* TYPE in the Rocky Mountain Herbarium.

This is the variation described by Ward (Contrib. from the

Dudley Herbarium 4 (8):180, 1953) as having "deeply trifid leaves" with the exception that its distribution seems to be confined to the area from Yellowstone National Park, Wyoming, south to Salt Lake City, Utah.

8. **A. longiloba** (Osterhout) Beetle, comb. nov.

Based on *A. spiciformis longiloba* Osterhout, Muhlenbergia 4:69. 1908.

While this plant has usually been treated as a part of *A. arbuscula,* it occurs on different sites, preferring the most strongly alkaline and highly impermeable soils. It also blooms approximately a month earlier and morphologically is distinguished by its larger, many-flowered heads.

9. **A. rothrockii** Gray

10. **A. cana** Pursh

10(a). **A. cana** subsp. **bolanderi** (Gray) Ward

10(b). **A. cana** subsp. **viscidula** (Osterhout) Beetle, comb. nov.

Based on *A. cana* var. *viscidula* Osterhout, *Bull.* Torrey Club 27:507. 1900. *A. viscidula* (Osterhout) Rydberg. Bull. Torrey Club 33:157. 1906.

This subspecies has a distinct geographical range from *A. cana* subsp. *cana.* It occurs in the high mountain valleys of the Rocky Mountains and is distinguished by the smaller, dark-green leaves, which are frequently asymmetrically lobed.

11. **A. argilosa** Beetle sp. nov. Planta inter *A. cana* subsp. *viscidula* et *A. longiloba* intermedia; rami erecti, ad 1 m. alti; foliis ad 4 cm. longis, tripartitis profunde singuli parte 2–3 mm. lati; florum 5–10, 3.0–3.5 mm. longum; achenium 1.8 longum.
mm. longum; achenium 1.8 mm. longum.

Type collection: Colorado, Jackson County, Coalmont, July 31, 1957, *A. A. Beetle 12872,* TYPE in the Rocky Mountain Herbarium.

This plant has deeply three-lobed leaves, very much of the general appearance of those of *A. tripartita.* They are, however, commonly up to 4 cm. long, and not only the basal portion but each lobe is 2–3 mm. broad. The plants occur on strongly alkaline soil associated with greasewood (*Sarcobatus vermiculatus*) and saltsages (*Atriplex* spp.). The plants are erect in habit and approximately 1 m. tall. All the collections of this plant are from a very limited area in the vicinity of Coalmont. A detailed study of the morphological characters of this plant indicates that they are intermediate between those of *A. cana* subsp. *viscidula* and those of *A. longiloba,* both of which occur in the vicinity. This new species supposedly of hybrid origin does not now occur mixed with its theoretical parents, and intergradation of the kind so common in this group of species of *Artemisia* does not occur in the area.

The work reported here was sponsored by the regional research program, W-25, entitled Ecology and Improvement of Brush Infested Range Lands.

— WYOMING AGRIC. EXPER. STA., LARAMIE, WYOMING

A NEW VARIETAL COMBINATION IN OXYBAPHUS. — In a prepublication review of the writer's mss. on west-American range forbs the eagle eye of Dr. S. F. Blake has detected an improperly published new combination in *Oxybaphus,* a defect which this note assays to correct:

**Oxybaphus linearis** var. **subhispida** (Heimerl) Dayt., comb. nov. *Mirabilis linearis subhispida* Heimerl, Ann. Conserv. & Jard. Bot. Genève **5**: 186. 1901. *Allionia linearis subhispida* Standl., Contrib. U. S. Nat. Herb. **12**: 342. 1909. *A. gausapoides* Standl., Contrib. U. S. Nat. Herb. **13**: 406. 1911. *A. subhispida* (Heimerl) Standl., Contrib. U. S. Nat. Herb. **16**: 120. 1913.

This plant's hairiness seems to rate hardly more than varietal relationship to typical *Oxybaphus linearis* (Pursh) Robins. (syn. *Allionia linearis* Pursh), as Heimerl indicated when he first described this entity. The generic status of *Oxybaphus* seems now to be widely recognized; its fruit and floral characters suggest a closer relationship to *Mirabilis* than to *Allionia. O. linearis* var. *subhispida* occupies rather dry to medium moist sandy or gravelly soils but sometimes also heavy clays and moist rich loams, from "desert" areas to the ponderosa pine type, often partly protected such as under mesquite bushes or canyon cottonwoods. Its range, not too well known, is from extreme southwestern Colorado, New Mexico and western Texas south into Mexico. As a rule it is eaten little, if at all, by domestic livestock. However, there appear to be some exceptions. It is reported as common on shale banks about 9,000 feet on the Montezuma National Forest (southwestern Colorado) and there eaten with some relish by cattle. — WILLIAM A. DAYTON, ARLINGTON, VA.

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## THE GENUS PIRICAUDA (DEUTEROMYCETES)


ROYALL T. MOORE


In a previous paper (9) the genus *Piricauda* was emended and set in sharp contradistinction to other genera that had been immixed under the names, sensu Saccardo, *Sporidesmium* and *Stigmella*. This current report is limited to a monographing of those species that are considered to fall within this reestablished concept of *Piricauda*. The nearly 250 fungi that have been given the name of *Sporidesmium* range from ?insect eggs or feces (*Sp. epicoccoides*) to a Phycomycete (*Sp. aurantiacum*) to a lichen (*Sp. scutellare*) to a very heterogeneous mixture of Deuteromycetes. Of this last named group the species of *Sporidesmium* and allied Phragmosporae have been monographed by Ellis (1). These and a number of other species can readily be excluded from *Piricauda*, but there are certain forms that require close scrutiny in order to be distinguished. These include the similitudes of the closely appressed conidia of *Cheiromyces* and *Dictyosporium*, the sorosporoid "conidia" and bulbils of such *Mycelia Sterilia* as *Papulospora*, disrupted, intercalary chlamydospores of old somatic hyphae, certain alternarioid fungi, and the genus and subgenus *Stemphylium* and *Pseudostemphylium*[1] respectively, but which are unique in their manner

[1] ". . . The subgenus *Pseudostemphylium* of *Stemphylium* . . . is not a true *Stemphylium* in the original sense. Continued growth of the conidiophore after production of the first spore is *not* up through the first scar (as in *Stemphylium*) but laterally so that the older conidiophores are geniculate with a spore-scar more or less at the side of each bend." (E. G. Simmons, personal communication.)

of conidiation (*e.g.*, cf. Fig. 14). Further, colony morphology is paramount and serves to distinguish *Piricauda* from *Berkleasmium* and *Steganosporium*. However, these considerations have already been extensively dealt with and here we are concerned only with the genus *Piricauda*. Of the about 160 species of *clavisporum* for *P. stigia* and *Hysterium karstenii* for *P. nitens;* ined, only 32 are considered to properly belong within *Piricauda,* and to this number are added six new species. Perfect stages are known for only two of the species presented here: *Glonium clavisporum* for *P. stigia* and *Hysterium kastenii* for *P. nitens;* Lohman (6) also figures a *Piricauda* sp. stage for *Hysterium hyalinum*.

Several additional, general, remarks should be made about the genus. Unlike *Stemphylium, Alternaria, Sporidesmium* and *Papulospora* there appear to be no real parasites in the genus. In the few instances where parasitism is suggested it is very mild and the fungus may very well be acting only as an epimycete. Another distinguishing feature is that in most of the species the conidia are formed as modified hyphal termini and in contradistinction to the above and other similitudinous genera an abscission septum is not formed, but rather the conidia break off irregularly and not infrequently are subtended by a remnant of fertile hypha. A notable exception to this is observed in *P. serendipita* in which the side walls of the penultimate cell of the conidiophore break down and the discharged spore bears with it the ultimate conidiophore cell. While *Piricauda* is of little terrestrial economic importance, it is "very abundant in the northern marine area"[2] and may be another of those Deuteromycetes that are believed to be primary in the initial softening of woods prior to marine borer invasion, (but also cf. Ray and Stuntz (11)).

This monograph has been divided into three main sections:

I. A key to species that provides in its flow a complete description of each species and to which is appended a glossary providing the interpretation of certain terms as used in the key.

[2] S. P. Meyers, personal communication.

II. In this part is to be found the formal taxonomy, figure references and any additional notes or comments. In brackets on the line below each species name is a formula setting forth the key steps that encompass the description of the species so that for any given species the description may be read through with ease. For further convenience the species have been compiled alphabetically. It is worth noting here that three of the new and several of the other species are in culture and grow and sporulate readily on a number of media. One can not but feel a sense of loss that other species are not also in culture, particularly such exquisite forms as *P. ulmicola, P. paraguayensis* and *P. curvata.* Since most are saprobes and the few, at most, weak parasites, it is believed that most could be established in culture. Further, living material of *P. fusus* would provide a most interesting study to determine whether the crystals are indigo. There are only, to my knowledge, four other instances of fungi producing similar crystals: *Helicoma asperothecum, Helicoma recurvum, Helicosporium elinorae* and a mutant strain each of *Schizophyllum commune* and *Sch. umbrinum,* belonging to the collections of Prof. J. R. Raper. Only in the last two species is it known for a fact that the metabolite is indigo, the other three species being represented solely by herbarium specimens.

In an appendix to this section, *Species Inquirendae,* are listed those species of *Sporidesmium* and *Stigmella* which have not been available for study and whose final taxonomic placement is not, therefore, possible at this time.

III. This part is limited to the plates of figures. Attention is drawn to the fact that these are all to the same scale, serving to emphasize the wide divergency in specific morphology, particularly size, and, further, it stresses the previously made observation (9) that the overall taxonomy of this group is best served by a unitary approach. Most of these photomicrographs were taken with an Exa camera using a Bellowscope attachment and Kodak Panatomic-X film with several different filters. Further, a number of the slides were stained with phloxine or lacto-fuchsin to emphasize hyaline structures. Therefore, one is cautioned that the apparent degree of darkness observed in the plates is not necessarily a true index of the degree of pigmentation.

### I. KEY TO SPECIES

1. Mature conidia, by transmitted light, translucent, melleous to fuscous . . . . . . . . 19
*1.* Mature conidia, by transmitted light, opaque to subopaque . . . . 2
2. Conidia up to about 15-celled . . . . . . . . 12
*2.* Conidia multi-cellular, sessile . . . . . . . . 3
3. Conidial profile crenulate . . . . . . . . 11
*3.* Conidial profile regular . . . . . . . . 4
4. Conidia subglobose to elliptical to obovate to ovate to oblong to oblong-ellipsoid, glabrous to asperate, never striate . . . . . . 8
*4.* Conidia spherical to globose, laevigate, or, if obovate to oval, striate . . . . . . . . 5
5. Conidia with hyaline basal cells or with translucent subtending cells . . . . . . . . 7
*5.* Conidial base consistent with the rest of the spore . . . . . . . . 6
6. Conidia laevigate, spherical, opaque, 44.5–58 (–63) μ diameter . . . . . . . . *P. globifera*
*6.* Conidia closely covered with raised longitudinal wavy and dark ridges, obovate to oval, subopaque, 23.5–35 × 44.5–52.5μ. . . *P. striata*
7. Conidia with hyaline basal cells, globose to subglobose to pyriform, subopaque, 16–20 × 20–26.5μ . . . . . . . . *P. suffulta*
*7.* Conidia subtended by a few to several translucent, supernumerary cells; primary portion spherical to globose, opaque, (15.5–) 18.5–23.5μ diameter . . . . . . . . *P. melanopus*
8. Conidia scabrous, cellulation imperceptible, regular in form though the bilateral halves may be subequal, umbilicus stout, centric . . . . . . . . 10
*8.* Conidia laevigate or asperate, conspicuously cellular, tending to be irregular of form, subglobose to elliptical to oval to obovate, umbilicus stout, may be obcentric . . . . . . . . 9
9. Conidia glabrous, oblong to elliptical to obovate to subglobose, umbilicus frequently obcentric, 15.5–36.5 × (25.5–) 29–39.5 (–42–52.5) μ . . . . . . . . *P. putredinis*
*9.* Conidia and umbilicus papillose to subtuberculate, subglobose to oval (to obovate to pyriform), (23.5–) 29–43 (–47.5) × (26–) 33.5–58 (–71) μ . . . . . . . . *P. aspera*
10. Conidia 52–83 × 104–155 (–192) μ, (X71.2 × 135.2μ), (obovate to) oblong to oblong-ellipsoid (to ovate) . . . . . . *P. stygia*
*10.* Conidia (23.5–) 31.5–36.5 (–53) × 31.5–79μ, (X 35.1 × 50.5μ),

(globose to) ovate to oval .................... *P. bogoriensis*

11. Basal and distal ends truncate, conidia oval, deep fuscous to opaque, cells very consistent, 23.5–35 × (34–) 44.5–50μ *P. elliptica*

*11.* Basal and distal ends rounded, conidia globose to oval, cells quite variable in size, 23.5–68.5 × 26.5–79 (–108) μ, (X 45.5 × 59.2μ) .............................. *P. composita*

12. Conidia borne on prominent conidiophores, glabrous ........ 18

*12.* Conidia sessile or nearly so .............................. 13

13. Conidia not at all constricted at the septa, tending to be polymorphic .......................................... 17

*13.* Conidia in some degree constricted at the septa, regular and consistent in shape ................................ 14

14. Mature conidia differentially pigmented, pyriform, the upper, spherical portion opaque to subopaque, the lower or basal cells fuscous; colonies at maturity with both sessile conidia and those which are borne on conidiophores of several cells; marine .......................................... 16

*14.* Mature conidia uniformly pigmented, depressed or subglobose, not pyriform; terrestrial ............................ 15

15. Conidia depressed, composed generally of 4–6 radially arranged cells, early dark-translucent and 18.5–26.5μ diameter, at maturity opaque, up to 40μ diameter and not infrequently somewhat laterally compressed, borne acrogenously upon short laterals of the net-like somatic mycelium which also produces peltate hyphopodia ................ *P. manilensis*

*15.* Conidia subglobose, not depressed, composed of about 10–15 cells, dark-translucent, 18.5–26.5 × (21–) 24–34μ . . *P. vernoniae*

16. Somatic hyphae thin walled, subhyaline with a greenish-gray cast, producing abundant intercalary chlamydospores, phragmous to dictyous; conidia 5–10 celled, opaque to subopaque in the globose portion, fuscous below, 12.5–20 × 21–24.5 (–27.5) μ ........................... *P. arcticoceanorum*

*16.* Somatic hyphae thick walled, fuscous, without chlamydospores; conidia 5–10 celled, opaque except for the basal, fuscous cells, (17–) 19–22 (–31) × (34–) 36–41 (–44) μ ...... *P. pelagica*

17. Somatic mycelium fuscous, monilioid with cells spherical or bacilliform to regular, walls smooth to scrupose to, in places, up to 2μ thick and scrobiculate; conidia opaque to dark-translucent, reddish-brown by strong transmitted light, subglobose to suboval, 10.5–18 × 13.5–19μ, (X 14.4 × 16.7μ); growing saprobically on old coniferous wood ....... *P. nodosa*

*17.* Somatic mycelium hyaline, regular, thin walled (in the hair cells) or (on the leaf surface) forming rough, thick walled, intercalary chlamydospores that are a translucent gray-green

(Storm Gray of Ridgway); conidia opaque to a dark-translucent, dull green (Deep Slate-Green of Ridgway) by strong transmitted light, subglobose to obovate to oblong (to clavate), frequently subtended by a single proliferating cell, borne on a short conidiophore of a couple of cells, or sessile, 9.5–13.5 (–17) × (10.5–) 12–25 (–30) μ, (X 12.2 × 17.7μ); hollowing out, and conidiating profusely on, the leaf hairs of *Anona cherimolia,* on which it is a ?casual parasite . . . . *P. trichophila*

18. Conidiophores long-flexuous, 50–90μ high, tapering from about 5μ thick distally to about 2.5μ basally; conidia globose to pyriform, paucicellular, 18.5–24 × 24–31.5μ . . *P. paraguayensis*

*18.* Conidiophores 21–31.5μ high, about 5μ broad throughout their length; conidia somewhat obovate, multicellular, the basal one or two tiers of cells tending to remain translucent until maturity, 13–18.5 × 21–26.5μ, disjuncting by the dissolution of the penultimate cell of the conidiophore . . . *P. serendipita*

19. Conidia multicellular, glabrous . . . . . . . . . . 33

*19.* Conidia paucicellular, up to 15 cells . . . . . . . . . 20

20. Conidia laevigate . . . . . . . . . . 29

*20.* Conidia asperate . . . . . . . . . . 21

21. Conidia staphyloid, each cell partially spherical . . . . . 28

*21.* Conidia regular, with very little or no constriction . . . . 22

22. Conidia with single distal and basal cells, walls thick, may be produced on conidiophores . . . . . . . . . . 27

*22.* Conidia without distinct terminal cells, sessile . . . . . . 23

23. Conidia generally bearing distally 3 prominent hyaline papillae, the rest of the spore glabrous, up to about 15 cells, globose to broadly oval, 10.5–14 × 11.5–16(–19)μ, width may exceed length . . . . . . . . *P. trigonella*

*23.* Conidia uniformly asperate . . . . . . . . . . 24

24. Conidia fuscous, composed generally of up to 5 or 6 quite regular cells, walls thin and aculeolate or thick and papillate, umbilicus centric . . . . . . . . . . 26

*24.* Conidia melleous, composed of up to 10 or so somewhat irregular cells, walls scrupose . . . . . . . . . . 25

25. Conidia subglobose, 17–25 (–33) × 17–28.5 (–39) μ, breadth may exceed length, umbilicus left variously on the thick walls . . . . . . . . . . *P. quadrata*

*25.* Conidia subglobose to obovate to suboval, 8.5–12 × (10.5–) 12.5–18μ, linear, umbilicus seldom present, walls thin. . . . . . . . . . . *P. tumulosa*

26. Conidial walls thin, aculeolate; conidia obovate to subovate

to oval to subglobose, 11.5–17 × 16–24.5μ, initially aseptate, becoming phragmous and late paucidictyous ...... *P. sarkara*

*26.* Conidial walls becoming very thick, papillate; conidia pyriform, early dictyous, 21–32 × 26–40μ ................ *P. damonis*

27. Conidiophores absent; conidia globose to oval, subfuscous, scrupose, tending to become glabrous with age, 6–8 cells, may be undulant at the septa, walls up to 5.5μ thick and may in places be perimetrically cracked, 17–27.5 × 22.5–30μ ............ *P. sacchari*

*27.* Conidiophores present, hyaline, up to 4 cells long, 2–4μ broad, stoutly attached to the tending-to-be-somewhat-squarish basal cell; conidia oval, submelleous, aculeolate, 5–8 cells, tending to become notched at the septa, particularly the mesial, walls up to 3μ thick, 10.5–15 × 21–28.5μ ............ *P. chartarum*

28. Conidia strongly tuberculate, subglobose to pyriform, about 5 cells, tapering into the fertile hyphae, 9.5–16 × 6.5–20μ, width may exceed length .................... *P. exasperata*

*28.* Conidia spiculate to papillose, subglobose, 5–10 cells, not basally tapered but rounded, umbilicus often obcentric, 12.5–19 × 12.5–24.5μ, width may exceed length .......... *P. funerea*

29. Conidia broadly oval, or fusiform, seldom constricted at the septa ........................................ 32

*29.* Conidia subglobose, or elliptical to oval to clavate, generally constricted at the septa .............................. 30

30. Conidia subglobose, about 3–5 cells, (7.5–) 10.5–14 × 12.5–17 (–23.5) μ ................................ *P. apheles*

*30.* Conidia oval to elliptical to clavate, 6–10 cells.............. 31

31. Conidia basally and distally didymous, centrally dictyously quadri-, rarely hexa-, partite, elliptical to slightly clavate, (13.5–) 18.5–21 × (34.5–) 47.5 (–52.5) μ ........ *P. scorobylos*

*31.* Conidia elliptical to oval to clavate, may be partially curved, 6–8 cells, 8.5–16 × (13.5–) 21–24.5 (–32) μ ......... *P. viticola*

32. Conidia fusiform; terminal cells difficult to distinguish, conic, hyaline; 15.5–18.5 × 60.5–76.5μ, 10–15 cells..... *P. pulchella*

*32.* Conidia broadly oval, median septum most prominent, 3–5 cells, 6–8.5 (–9.5) × (7.5–) 9.5–13μ, uni- and bi-cellular spores common ............................ *P. subcuticularis*

33. Length up to half again the width, generally less; conidia glabrous, globose to oval-ellipsoid, melleous to fuscous, perimetric cells tending to be integumentoid and somewhat constricted at the septa, 18.5–37 × 26.5–45μ. (X 25.2 × 35.6μ) ............ *P. nitens*

*33.* Conidia elongate, length no less than twice the width........ 34

34. Conidia conspicuously constricted at one or more of the prominent horizontal septa, cylindrical-ellipsoid to oblong-ellipsoid, frequently with a slight distal tapering, may be slightly curved, strongly undulate to constricted at the up to 6 primary horizontal septa, 18.5–26.5 × (44.5–) 58–68.5μ ............... *P. heteromera*

34. Conidia not conspicuously constricted at the septa, though profile may be slightly undulate ........................ 35

35. Conidia fusiform ........................................ 37

35. Conidia lageniform or oblong, sessile ..................... 36

36. Conidia tending to be lageniform, the wider, muriform base developing first, followed by the growth of the slenderer rostrum that may become paucidictyous and strongly bent, up to 80–110 × 10.5–18.5μ at the base, 7.5–10.5(–13) μ distally. ............ *P. curvata*

36. Conidia oblong, multicellular, 18.5–21 × 55–60.5μ .... *P. itochna*

37. Conidia sessile, covered by a thin separable layer of purplish iridescent crystals, 29–34.5 × (73.5–) 84–97.5μ ........ *P. fusus*

37. Conidia borne on slender conidiophores, 15–30μ high, that enlarge continuously into the spore base, without crystals, tapering terminally into a short, hyaline rostrum, initially hyaline, phragmous, upon maturation expanding from the width of the fertile hyphae to broadened, fuscous, dictyous, 13.5–16 × 44.5–76μ ................................ *P. ulmicola*

GLOSSARY

asperate — bearing projections or points; (n.b: all terms applying to the conidial surface are applied as that surface is seen by oil-immersion magnification, × 1500).
- aculeolate — having somewhat spine-like processes.
- papillose — having minute nipple-shaped projections.
- scrupose — covered with very small points.
- spiculate — bearing minute slender pointed projections.
- tuberculate — bearing wart-like processes.

-ellipsoid — sides parallel and ends almost hemispherical.
lageniform — (florence) flask-shaped.
scrobiculate — pitted, furrowed.
staphyloid — resembling a compact bunch of grapes.
umbilicus — the attachment or remnant of the fertile hyphae of sessile conidia.
X — the statistical mean.

II. TAXONOMY

PIRICAUDA Bubák.
*Stigmella* sensu Saccardo, Michelia 1: 264. 1878.

*Sporidesmium* sensu Saccardo, Michelia 2: 23. 1882.
*Monodictys* Hughes, Can. Jour. Bot. 36: 785. 1958.

**Piricauda apheles** sp. nov. Fig. 28

[1, *19*, 20, *29*, 30]

Conidia in mycelio sessilia, cellulis paucis (circ. 3–5) composita, subglobosa, mellea, ad septa saepe nonnihil constricta, (7.5–) 10.5–14.0 × 12.5–17.0 (–23.5) μ.

In ligno putrido, Herb. K. Holotypus; preparatio microscopica RTM I:195[d1], Isotypus.

(Etym. αφελης — even, smooth, simple, in reference to the conidia.)

Herb. K has a number of specimens labeled *Sporidesmium Lepratia,* none of which is labeled or recognizable as the type. These collections are composed of a great variety of fungi—Dematiaceous, acervulate with monacrogenous conidia, and sporodochial with catenate conidia. However one collection, probably a Cooke specimen, is on a small card and bears two pieces of wood. It carries as its only notation *"Sporidesmium Lepraria,"* and, between the two pieces, sketches of a few spores. Of these two pieces the lower bears only what appears to be old hyphae, but the upper bears a good *Piricauda.* This is given a separate name because 1) the figure of *Sp. Lepraria* var. *nigerrima* (which is stated to differ only in its darker color) is multicellular, 2) *Sp. Lepraria* Berkeley is a *nomen confusum* and 3) this material is not part of the typification of *Sp. Lepraria.*

**Piricauda arcticoceanorum** sp. nov. Fig. 47

[*1*, 2, *12*, *13*, 14, 16]

Coloniae nigrae; hyphae praesertim subterficiales, parietibus tenuibus, sed chlamydosporeas intercalares copiose proferentes quae primum parietibus incrassatis indutae sunt; mycelium fuscescens, e cellulis subglobosis deinque phragmoideis, dictyoideis et subopacis; conidia pyriformia, primum fuscidula, e cellulis 5–10 composita, maturitate parte terminali sphaerica opaca et parte basali fuscescenti, saepe e cellula singula inflata oriunda; 12.5–20.0 × 21.0–24.5 (–27.5) μ, sessilia aut ad conidiophoros paucicellulares enata.

In ligno putrido in mare immerso, Argentia, Terra Nova. Cultura dessicata et preparationes microscopicae in Herb. FH, Holotypus; cultura viva, S. P. Meyers F-30 et preparatio microscopica RTM I:259, Isotypi.

(Etym. *arcticus* + *oceanorum* — of the northern seas, in reference to its habitat.)

This species was communicated by Dr. S. P. Meyers and it is considered to be conspecific with three other cultures communicated from him: F-23 from Nanaimo, British Columbia, F-65 from Kodiak, Alaska and F-73 from Halifax, Nova Scotia. All were isolated from submerged wood taken from the sea.

**Piricauda aspera** (Corda) comb. nov. Fig. 24

[*1*, *2*, *3*, 4, *8*, 9]

*Sporidesmium asperum* Corda, Icones Fung. 2: 6. 1838.

*Clasterosporium asperum* (Corda) Saccardo, Syll. Fung. 4: 383. 1886.

*Stemphylium phaeosporum* de Notaris, Comm. Soc. Crit. Ital. 2 (1): 81. 1864. [Ex descript.; non vidi.]

*Sporidesmium phaeosporum* (de Not.) Saccardo, Syll. Fung. 4: 497. 1886.

Material examined: PR, 155653, (Corda coll.), Type, on fallen twigs of *Fagus silvatica*, Brezina, Czechoslovakia, (slide RTM I:144). PAD (Saccardo coll. 1448), on defunct wood of *Populus tremula*, Riva, Valdobbiadene, Italy, (slide RTM I:216).

**Piricauda bogoriensis** (Penz. & Sacc.) comb. nov. Figs. 30, 31

[*1*, *2*, *3*, 4, 8, *10*]

*Sporidesmium bogoriense* Penzig & Saccardo, Malpighia 15: 248. 1901.

*Monodictys bogoriensis* (Penz. & Sacc.) Hughes, Can. Jour. Bot. 36: 785. 1958.

Also present, but rare, on this material are clavate phragmospores (Fig. 31); from the evidence of this mount the hypothetical relationship that suggests itself is that the abundant spores described and figured by Saccardo are actually pedicelled sclerotia of a *Sporidesmium* type fungus.

Material examined: PAD (Saccardo coll.), Type, Bogor, Java, on defunct petioles and blades of palm (slide RTM I:211).

**Piricauda chartarum** (B. & C.) comb. nov. Figs. 19, 20

[1, *19*, *20*, *21*, 22, *27*]

*Sporidesmium chartarum* Berkeley & Curtis, apud Berkeley in Grevillea 3: 50. 1874.

*Sporidesmium bakeri* [var. *bakeri*] H. & P. Sydow, Ann. Myc. 12: 204. 1914.

The combination *Sporidesmium bakeri* var. *maydicum* [*Clasterosporium maydicum* Sacc.] was made by Hughes (3) and he cites C. F. Baker's *Fungi Malayana* 217 as the type. However, the type cited by Saccardo is material collected by Baker from Los Baños, Philippines, and numbered 3733. Hughes does not mention this collection and whether 217 is a part of it is not known. Hughes's drawings, though, of conidia of 217 in his Fig. 38A are virtually identical with those sketched by Saccardo on his packet. Both are uniformly biseptate, but Saccardo records his conidia as 14–15 $\times$ 6μ while Hughes records those of 217 as being 15–20 $\times$ 6–10μ. It is very disconcerting, then, that numerous mounts of 3733 have totally failed to elicit any conidia of this type. The material does have a fair quantity of amerospores of the type Hughes depicts in his Fig. 38B & C and very rarely these are didymous. These spores are about half the size noted by Saccardo, but they could be immature. Also present on this material are 1) long, dark, mycelial processes, ?conidiophores, emerging from the stomata, 2) an immersed, fuscous, pycnidial fungus that produces abundant, melleous, acerous phragmospores, and 3) small patches of a *Curvularia*. If 217 is part of 3733 these latter fungi should also be present. While 217 as reported by Hughes bears only tricellular conidia, Hughes considered it a *Sporidesmium* (sensu Saccardo) because other collections that bore comparable conidia upon aging become dictyous by a single, medial, vertical septum. Further, Hughes based the conspecificity of var. *maydicum* with var. *bakeri* on the characteristics of two 1949 collections identified as var. *bakeri* on leaves of *Bridelia ferriginea* (Euphorbiaceae) and *Zea mays* from Hohoe and Bisba respectively. But the type collection, made in 1913, is on leaves of *Musa sapientum* from Los Baños, Philippines. Examination of the Sydows' type material presents a fungus quite different from that figured by Hughes and Saccardo, both in its larger size and different shape. Further, it is not satisfactorily distinct from the earlier *Sporidesmium chartarum* with which it is here synonymized. While a disposition of *Cl. maydicum* is not presently possible, it can not be maintained with *Piricauda chartarum*. Hughes (4) in his recent paper transfers this species as *Scheleobrachea maydica*.

Material examined: FH (Curtis coll, Car. Sup. 6419). Type, on decayed paper, Hillsborough, N. C. (slide RTM I:11). S (Sydow coll.)

on defunct leaves of *Musa sapientum*, Los Baños, Philippines, C. F. Baker 1728, type of *Sp. bakeri* (slide RTM I:105). PAD (Saccardo coll. 3733), on defunct leaves of *Zea mays*, Los Baños, Philippines, type of *Cl. maydicum* (slide RTM I:217). QM numbers QM7051, QM7102 and QM7140 are identified as *P. chartarum*.

**Piricauda composita** (Berk. & Rav.) comb. nov. Fig. 44
[*1, 2, 3, 11*]

*Sporidesmium compositum* Berkeley & Ravenel, apud Berkeley in Grevillea 3: 17. 1874.

*Sirodesmium compositum* (Berk. & Rav.) Saccardo, Syll. Fung. 4: 517. 1886.

Material examined: FH (Curtis coll.), on defunct wood of *Catalpa cordifolia*, Santee Canal, S. C. (Rav. 1801); on defunct wood of oak, Cotoos Springs, Hendersonville, N. C. (Rav. Car. Sup. 4441): Syntypes (slides RTM I:13a/b resp.).

**Piricauda curvata** (B. & C.) comb. nov. Figs. 32, 33, 34
[1, 19, *33, 34, 35,* 36]

*Sporidesmium curvatum* Berkeley & Curtis, apud Berkeley in Grevillea 3: 50. 1874.

*Clasterosporium curvatum* (B. & C.) Saccardo, Syll. Fung. 4: 385. 1886.

Hughes (2) has designated material in Herb. K. labeled by Currey "*Sporidesmium curvatum* B. & C. — on *Crataegus* — Ex herb. Berkeley" as the specific lectotype. His examination of this material showed it to produce 2-armed conidia representative of *Hirudinaria macrospora*. However, examination of holotypic material evidences lageniform conidia basally attached which clearly places the species in *Piricauda*.

Material examined: FH (Curtis coll.), car. Sup. 2561, Holotype, on *Crataegus* leaves, mountains of North Carolina (slide RTM I:14).

**Piricauda Damonis** sp. nov. Fig. 25
[1, *19, 20, 21, 22, 23,* 24, *26*]

Conidia fuscidula, papillata, ovoidea, obovoidea vel pyriformia, e cellulis circ. 6 composita, parietibus crassis (usque ad 3μ), sessilia et e mycelio prostrato copiose prolata, 21–32 × 26–40μ.

In cultura (agar-agar) contaminata in Herb. QM. Cultura dessicata et preparatio microscopica in FH, Holotypus; cultura viva QM 646 et preparatio microscopica RTM I:255, Isotypi.

(Etym. In honor of Samuel C. Damon, Deuteromycetologist.)

**Piricauda elliptica** (Cke.) comb. nov. Fig. 21

[*1*, *2*, 3, 11]

*Sporidesmium ellipticum* Cooke, Grevillea 12: 28. 1883.

*Sirodesmium ellipticum* (Cke.) Saccardo, Syll. Fung. 4: 517. 1886.

As noted by Cooke, the production of conidia is concentrated around the eruptions of *Diatrype disciformis,* perhaps because the wood is more degradated in these areas. I would not say that the one is the imperfect stage of the other.

Material examined: NY, on defunct wood of *Magnolia glauca,* Pinopolis, S. C., Rav. *Fung. Amer. exs.* 562, Isotype (slide RTM I:32).

**Piricauda exasperata** (Ellis & Barth.) comb. nov. Fig. 42

[1, *19*, *20*, 21, 28]

*Sporidesmium exasperatum* Ellis & Bartholomew, Erythea 4:29. 1896.

Material examined: BPI, on wood from an oak barrel-bottom in a cellar, Rockport, Kansas, Barth. 1461, Type (slide RTM I:63).

**Piricauda funerea** (Ellis & Langl.) comb. nov. Fig. 9

[1, *19*, *20*, 21, *28*]

*Sporidesmium funereum* Ellis & Langlois, apud Ellis and Everhart in Jour. Myc. 4: 124. 1888.

Material examined: BPI, on rotten pieces of an old coffin taken from a brick tomb, Pointe a la Hache, Louisiana, Langl. 1456, Type (slide RTM I:64).

**Piricauda fusus** (B. & C.) comb. nov. Fig. 35

[1, 19, *33*, *34*, 35, 37]

*Sporidesmium fusus* Berkeley & Curtis, apud Berkeley in Grevillea 3: 50. 1874.

Material examined: FH (Curtis coll. 3322), Type, on defunct wood of *Magnolia acuminata,* Virginia mountains (slide RTM 1:16).

**Piricauda globifera** (B. & C.) comb. nov. Fig. 10

[*1*, *2*, *3*, *4*, *5*, 6]

*Sporidesmium globiferum* Berkeley & Curtis, apud Berkeley in Jour. Linn. Soc., London 10: 354. 1869.

Material examined: FH (Curtis coll.), on rotten logs, Cuba, C. Wright 566 (=B. & C. Fung. Cuba 579), Type (slide RTM I:21).

**Piricauda heteromera** (Kirsch.) comb. nov. Figs. 17, 18

[1, 19, *33*, 34]

*Sporidesmium heteromerum* Kirschstein, Hedwigia 81: 202. 1944.

Material examined: B, on *Juncus filiformis,* upper valley of the Eder near Lützel, Siegen County, Germany, Type, (slide RTM I:84).

**Piricauda itochna** sp. nov. Fig. 27

[1, 19, *33, 34, 35, 36*]

Conidia in mycelio sessilia, oblonga, cellulosis numerosis composita, laevigata, mellea, 18.5–21.0 × 55.0–60.5μ.

In ligno putrido una cum *Helicoma acrophalerium* Moore, Porto Rico, 24 January ad 5 April 1923, Fred J. Seaver et Carlos E. Chardon 580, Typus, in Herb. NY; preparatio microscopica RTM I:128, Isotypus.

(Etym. ιτον + χνος — fungal porous substance, in reference to the conidia.)

**Piricauda manilensis** (Sacc.) comb. nov. Fig. 29

[*1*, 2, *12*, *13*, *14*, 15]

*Stigmella manilensis* Saccardo, Ann. Myc. 11: 320. 1913.

*Stigmella palawanensis* H. & P. Sydow, Philip. Jour. Sci. Bot. 9: 189. 1914.

The Sydows state that *palawanensis* differs from *manilensis* "by the thinner and longer hyphae provided with numerous hyphopodia, and net-like mycelium on black, patch-like colonies that translucent it is probable that it is not as mature as *manilensis* which has opaque conidia. As further evidence of this the conidia of *palawanensis* are not observed to have more than 5 lobes per spore while there are conidia on *manilensis* with 6 lobes. Both collections produce morphologically comparable conidia, hyphopodia, and net-like mycelium o nblack, patch-like colonies that are readily separated from the substrate as small plaques.

Material examined: PAD (Saccardo coll. 256), FH (Bartholomew coll., Sydow — *Fung. Exotici exs.* 198), Syntypes, on dead pods of *Cassia tora*, Manila, Luzon (slides RTM I:214, I:215 resp.). S. on living leaves of *Celastrus paniculatus*, Taytay, Palawan, Merrill 8832, Type of *St. palawanensis* (slide RTM I:103).

**Piricauda melanopus** (B. & Br.) comb. nov. Fig. 36

[*1*, *2*, *3*, *4*, 5, *7*]

*Sporidesmium melanopum* Ach. ex Berkeley & Broome, Ann. & Mag. Nat. Hist. 5 (2 ser.): 459. 1850.

*Spiloma melanopa* Acharius, Methodus qua omnes detectos Lichenes, p. 10. 1803.

The Herb. K folder has two sheets bearing seven collections each that in all consist of one acervulate and several different Dematiaceous fungi. The type, though, is limited to one identifiable collection on apple bark on the label of which appears the name of W. Borrer, corresponding, thus, to the type description's statement that the fungus is "Common on the bark of Apple-trees" and further to the mention that "We are indebted to Mr. Borrer for authentic specimens." Finally, the several sketches accompanying this material agree with the characteristics set forth in the type description. The sheet bearing the type has two additional collections that are comparable, both on apple bark and identifiable by their collection localities — "Kings Cliff" and "Essex" respectively. The second sheet likewise has two comparable collections, also on apple bark, and identifiable by their respective collector and locality — "Bloxam" and "Orchard Gopsal."

Material examined: K, on apple bark from Sussex, leg. W. Borrer, Type; on apple bark, Kings Cliff, England; on apple bark, Essex; "fungus 23" from hills above Port Louis, Mauritius; specimen labeled "*Lepraria nigra* E. B."; Car. Sup. 4448 identified as *Halysium atrum* Corda; specimen numbered 5829, on apple wood, New England, (slides RTM I:191a-g resp.). K, on apple bark, leg. Bloxam, England; on apple bark, leg. Bloxam, England; on apple bark, Gopsal, Leicestershire; "fungus 23" from hills above Port Louis, Mauritius; specimen labeled "*Sporidesmium melanopum* M. B"; two collections of Ravenel's Fungi — North America 3051, on rotting pine logs, Aiken, S. C.; specimen labeled "69 Victoria," (slides RTM I:192a-g resp.).

**Piricauda nitens** (Schw.) comb. nov. Figs. 11, 13

[1, 19, 33]

*Sporidesmium nitens* Schweinitz, Amer. Phil. Soc. Trans. II 4: 306. 1832.

*Clasterosporium nitens* (Schw.) Saccardo, Syll. Fung. 4: 392. 1886.

*Monodictys nitens* (Schw.) Hughes, Can. Jour. Bot. 36: 786. 1958.

*Sporidesmium paradoxum* Corda, Icones Fung. 2: 6. 1838.

*Stemphylium paradoxum* (Corda) Fuckel, Fung. Rhen. 1515, 1865.

*Coniosporium paradoxum* (Corda) Mason & Hughes, CMI Myc. Pap. 37: 16. 1951.

*Monodictys paradoxa* (Corda) Hughes, Can. Jour. Bot. 36: 786. 1958.

*Stigmella nemopanthis* Dearness, Mycologia 16: 174. 1924.

The three species placed together here present the following ranges in spore sizes:

| | |
|---|---|
| *nitens* | 18.5–21.5 × 29.0–39.5μ, X 20.4 × 34.4μ; |
| *paradoxum* | 18.5–25.0 × 26.0–34.0μ, X 21.8 × 29.8μ; |
| *nemopanthis* | 21.5–37.0 × 26.5–45.0μ, X 28.8 × 38.3μ. |

Considering that the collections are from different substrates and that they were inevitably subjected to different environmental conditions, *e.g.*, moisture and temperature, it is felt that the combined measurements of 18.5–37 × 26.5–45μ, X 25.2 × 35.6μ are more meaningful than trying to establish dubious criteria for maintaining them separately. Hughes (4) has not examined the type of *Sp. paradoxum* but bases his judgment on Fuckel's material and lists *St. nemopanthis* among its synonyms. He maintains *nitens* and *paradoxum* separate in Subgenus 2 of his *Monodictys* for reasons unstated, though on the type material of the former species, in Herb. PH, he has written the following comment: "This is congeneric with *Sporidesmium paradoxum* Corda and only critically distinct from it."

Lohman (8) in his elaboration of *Hysterium karstenii* mentions and figures a conidial stage, then assigned as *Sporidesmium* species. Using the measurements and characteristics apparent in his Fig. 2A to run the species through the key we readily arrive at *P. nitens;* a particular confirmatory character that shows up in these drawings is the integumentoid nature of the perimetric cells.

Material examined: PH (Schweinitz Syn. Fung. 3082), Type, on the denuded stems and branches of *Spirea opulifolia,* Bethlehem, Penn., (slide RTM I:72). PR, 515145, (Corda coll.), type of *Sp. paradoxum,* on old birch bark, Brezina, Czechoslovakia, (slide RTM I:138). DAOM (Dearness coll. 3825), type of *St. nemopanthis,* on bark of defunct branches of *Nemopanthes mucronata,* (slide RTM I:82 (=slide E. G. Simmons IX-45)).

**Piricauda nodosa** (Preuss) comb. nov. Fig. 43

[*1*, 2, *12*, 13, 17]

*Sporidesmium nodosum* Preuss, Linnaea 24: 103. 1851.

Material examined: B, 4294, Preuss 1475, Type on wood of *Abies* from near Hoyerswerda, Silesia. FH, Klotzsch *Herb. Viv. Myc.,* (authentic), from near Hoyerswerda, Silesia. (Slides RTM 1:89, 1:204 resp.)

*Piricauda paraguayensis* (Speg.) Moore (9).

[*1*, 2, 12, 18]

*Piricauda pelagica* Johnson (5).
[*1*, 2, *12*, *13*, 14, *16*]

**Piricauda pulchella** (Sacc.) comb. nov. Fig. 22
[1, *19*, 20, 29, 32]

*Sporidesmium pulchellum* Saccardo, Atti, Accad. Sci. Veneto-Trent-Istr. 10: 87. 1919.

Material examined: PAD (Saccardo coll. 4445), on defunct branches of *Sapindus saponaria,* Los Baños, Philippines, (slide RTM I:208).

**Piricauda putredinis** (Wallr.) comb. nov. Fig. 37
[*1*, *2*, *3*, 4, *8*, 9]

*Melanconium putredinis* Wallroth, Fl. Crypt. German. 2: 181. 1833.

*Monodictys putredinis* (Wallr.) Hughes, Can. Jour. Bot. 36: 785. 1958.

*Sporidesmium polymorphum* Corda, Icones Fung. 1: 7. 1837.

*Stemphylium polymorphum* (Corda) Bonorden, Handb., p. 83. 1851.

*Sporidesmium fumagineum* Saccardo, Nuovo Giorn. Bot. Ital. 24: 42. 1917.

Material examined: STR, on worked wood on *Abies,* Type, (slide RTM I:256). PR, 155661, (Corda coll.), type of *Sp. polymorphum,* on defunct wood of *Betula alba,* Reichenberg, Czechoslovakia, (slide RTM I:140). PAD (Saccardo coll.), type of *Sp. fumagineum,* on dying branches of *Populus tremula,* Piccolo, S. Bernardo, Italy, (slide RTM I:221).

**Piricauda quadrata** (Atk.) comb. nov. Figs. 45, 46
[1, *19*, *20*, *21*, *22*, *23*, *24*, 25]

*Sporidesmium quadratum* Atkinson, Cornell Univ. Bull. 3: 40. June, 1897.

*Scheleobrachea quadrata* (Atk.) Hughes, Can. Jour. Bot. 36: 802. 1958.

*Stigmella crataegi* Ellis & Everhart, Torrey Bot. Club Bull. 24: 475. October, 1897.

*Stemphylium crataegi* (E. & E.) Höhnel, Ber. deutsch. Bot. Ges. 36: 316. 1918.

Material examined: CUP (Atkinson coll.), two collections on *Crataegus* leaves, Highland Park, Montgomery, Ala., Holotype (*scr.*), and Isotype *(typ.)* respectively, (slides RTM I:234b/a resp.). NY (Ellis coll.), on leaves on *Crataegus parvifolia,* Newfield, N. J., type of *St. crataegi,* (slide RTM I:61).

**Piricauda sacchari** (Speg.) comb. nov. Fig. 15
[1, *19*, *20*, *21*, 22, 27]

*Stigmella sacchari* Spegazzini, Rev. Facultad Agron, y Veterin., La Plata 2: 251. 1896.

*Sporidesmium bakeri* Syd. var. *sacchari* (Speg.) Hughes, CMI Myc. Pap. 50: 69. 1953.

Material examined: LPS, 13054, (Spegazzini coll.), Type, on leaves of *Saccharum officinarum*, Tucumán, Argentina, (slide RTM I:98).

**Piricauda sarkara** nom. nov. Figs. 6, 7

[1, *19*, *20*, *21*, *22*, *23*, 24, 26]

*Sporidesmium sacchari* Spegazzini, Anal. Museo Nacion. Buenos Aires 20: 443. 1910.

*Scheleobrachea sacchari* (Speg.) Hughes, Can. Jour. Bot. 36: 802. 1958.

(Etym. *sarkara* — Sanskrit paronym of *sacchari*.)

Material examined: LPS, 13006, (Spegazzini coll.), Type, on old culms of *Saccharum officinarum*, in fields near Ledesma, Argentina, (slide RTM I:97).

*Piricauda scorobylos* Moore (10).

[1, *19*, 20, *29*, *30*, 31]

**Piricauda serendipita** sp. nov. Figs 3, 4

[*1*, 2, 12, *18*]

Conidia cellulis numerosis composita, nonnihil obovata, laevigata, maturitate opaca vel subopaca (praeter series basales 1–2, quarum cellulae hyalinae manent), 13.0–18.5 × 21.0–26.5μ, singulatim ad extremitates conidiophorum longit. 21.0–31.5μ prolata, et solutione cellulae penultimae conidiophori disjuncta.

In cauli putrido *Zea mays*, in vasculo humido, Iowa City, Iowa, G. W. Martin 6454a, Holotypus, in Herb. IA; preparatio microscopica RTM I:257 et cultura viva QM 7165, Isotypi.

(Etym. Serendipity — the finding of valuable things not specifically sought for, in recognition that the desire for a specific determination led to, among other things, the ordering of its congeners.)

**Piricauda striata** (Petch) comb. nov. Fig. 26

[*1*, *2*, *3*, *4*, *5*, *6*]

*Sporidesmium striatum* Petch, Ann. Royal Bot. Gard. Peradeniya 6: 249. 1917.

Material examined: K, on *Hevea brasiliensis* from Peradeniya, Ceylon, Cotype, (slide RTM I:246).

**Piricauda stygia** (B. & C.) comb. nov. Figs. 2, 5

[*1*, *2*, *3*, 4, 8, 10]

*Sporidesmium stygium* Berkeley & Curtis apud Berkeley in Grevillea 3: 17. 1874.

Perfect stage: *Glonium clavisporum* Seaver, (Lohman (7)).

Material examined: FH (Curtis coll. 3972), from a maple log, Pennsylvania, Michener 1243, Type, (slide RTM I:28).

**Piricauda subcuticularis** (McAlp.) comb. nov. Fig. 38
[1, *19*, 20, 29, *32*]

*Sporidesmium subcuticulare* McAlpine, Fungus diseases of stone-fruit trees in Australia, and their treatment. Agric. Dept. Victoria, p. 116. 1902.

Material examined: Dept. Agric. Victoria, on defunct twigs of apricot, Armadale, Victoria, Australia. Type, (slide RTM I:107).

**Piricauda suffulta** (Pound & Clem.) comb. nov. Fig. 1
[*1*, *2*, *3*, *4*, 5, 7]

*Sporidesmium suffultum* Pound & Clements, Bot. Surv. Univ. of Nebraska, p. 6. 1896.

Material examined: NEB, on decorticated cottonwood, Memphis, Neb., Type, (slide RTM I:254).

**Piricauda trichophila** (H. Syd.) comb. nov. Fig. 12
[*1*, 2, *12*, 13, *17*]

*Sporidesmium trichophilum* H. Sydow, Ann. Myc. 23: 428. 1925.

Material examined: CUP, FH (Bartholomew coll.), Sydow, *Fung. exotici exs.* 716, on leaves of *Anona cherimolia,* La Caja near San José, Costa Rica, Lectosyntypes, (slides RTM I:1, I:205 resp.).

**Piricauda trigonella** (Sacc.) comb. nov. Fig. 16
[1, *19*, *20*, *21*, *22*, 23]

*Sporidesmium trigonellum* Saccardo, Michelia 2: 641. 1882.

Material examined: PAD (Saccardo coll.), on defunct bark of *Ailanthus,* Libert 432, Type, (slide RTM I:212).

**Piricauda tumulosa** (Sacc.) comb. nov. Fig. 23
[1, *19*, *20*, *21*, *22*, *23*, *24*, *25*]

*Sporidesmium scutellare* B. & Br. subsp. *tumulosum* Saccardo, Michelia 2: 289. 1881.

Material examined: PAD (Saccardo coll.), Type, on defunct wood of *Fagus sylvatica,* woods, Cansiglio, Italy, (slide RTM I:213).

**Piricauda ulmicola** (Sacc.) comb. nov. Figs. 39, 40
[1, 19, *33*, *34*, 35, *37*]

*Sporidesmium ulmicolum* Saccardo, Syll. Fung. 4: 501. 1886.

Saccardo states that this is supposed to be the "*Cucurbitariae ulmicola* stat. conid. Fkl. Symb. [Myc., p.] 172" that Fuckel refers to in his diagnosis. However, *F. rh.* 2170, which Fuckel cites as the type, has been examined (Herb. FH) and this particular exsiccatum shows neither an Ascomycete nor *P. ulmicola,* though at least two other Deuteromycetes are present. Though Saccardo's fungus seems to fit the "fungus conidiophorous" described by Fuckel, there remains considerable doubt if they are related.

Material examined: PAD (Saccardo coll.), Type, on dry elm twigs, Rhenogovia, Italy, (slide RTM I:220). FH, *F. rh.* 2170, syntype of *Cucurbitaria ulmicola,* on dry branches of elm, Reichartshausen, (slide RTM I:227).

**Piricauda vernoniae** (Dearn. & Barth.) comb. nov. Fig. 8
[*1*, 2, *12*, *13*, *14*, *15*]

*Stigmella vernoniae* Dearness & Bartholomew apud Dearness in Mycologia 21: 330. 1929.

Material examined: DAOM (Dearness coll. 5384, (Barth. 8474)), Type, on leaves of *Vernonia gigantea,* Williamsville, Missouri, (slide RTM I:78).

**Piricauda viticola** (Sacc.) comb. nov. Fig. 41
[1, *19*, 20, *29*, *30*, *31*]

*Sporidesmium viticolum* Saccardo, Michelia 2: 289. 1881.

Material examined: PAD (Saccardo coll.), on defunct ?grape stems, Selva, Italy, (slide RTM I:223).

SPECIES INQUIRENDAE

There are 47 species of *Sporidesmium* and one species of *Stigmella* which have not been definitively examined, either in this present study or by other recent workers. These can be assigned to three categories:

[–] those which are not to be found in the expected and known herbaria housing collections of the respective authors, or belong to collections that were destroyed by war;

[?] those described by authors the location of whose collections is unknown;

[!] species of the first two categories but which from the presumptive evidence of the published figures most probably belong to other genera.

SPORIDESMIUM

-*agapanthi* Thuem.
?*alytospori* Richon
?*bulbophilum* West.
-*carpineum* Schulzer
-*caulincola* Fries
?*cavernarum* Laub.
-*celastri* Thuem.
!*celatum* Welw. & Curr.
-*cellulosum* Fries
-*ciliatum* Fries

[3] Abbreviations of author names are as listed by Wright and Lois (12).

*-clavaeforme* Preuss
*!clavatum* Lév.
*-congestum* Preuss
*?cucumis* Niessl
*-dolichopus* Pass.
*?effusum* P. Henn
*-elegans* Corda
*!epiphyllum* Lév
*!eremita* Corda
*-fasciculare* Preuss
*-fuscum* Bon.
*-fusiforme* Fries
*-griseum* McAlp.
*-hyalopus* Pat.
*-hydrangeae* Thuem.
*-ignobile* Karst.
*?lambottei* Roum.
*-linguaeforme* Preuss
*?lycii* Niessl
*-melongenae* Thuem.
*-microscopicum* Bon.
*-phytolaccae* Thuem.
*-populi* Crouan
*-pulvinatum* Fries
*-punctatum* Lév.
*?punctatum* Woron
*?scleroticola* P. Henn.
*!scorzonerae* Aderh.
*!sparsum* Fres.
*-sporotrichi* Corda
*-sterculiae* Tassi
*?syntrichiae* Racov.
*-tenellum* Penz. & Sacc.
*!tripartitum* Bagnis
*-triseptatum* McAlp.
*!vermiforme* Riess.
STIGMELLA
*?rubicola* Bres.

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The directors and personnel of the world's herbaria are gratefully acknowledged for their kindness and assistance in providing on loan the many collections cited herein, for without the availability of such material Taxonomy would hardly be possible. In particular I would like to thank Drs. Albert Pilát *(PR)*, D. P. Rogers (ex *NY)* and G. Taylor *(K)* for the loan of materials from the Corda collection, the Cooke and Ellis collections, and the Berkeley and Cooke collections respectively, and Dr. C. Cappelletti *(PAD)* for the repeated loans from the Saccardo collection.

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— DEPARTMENT OF BIOLOGY, HARVARD UNIVERSITY.

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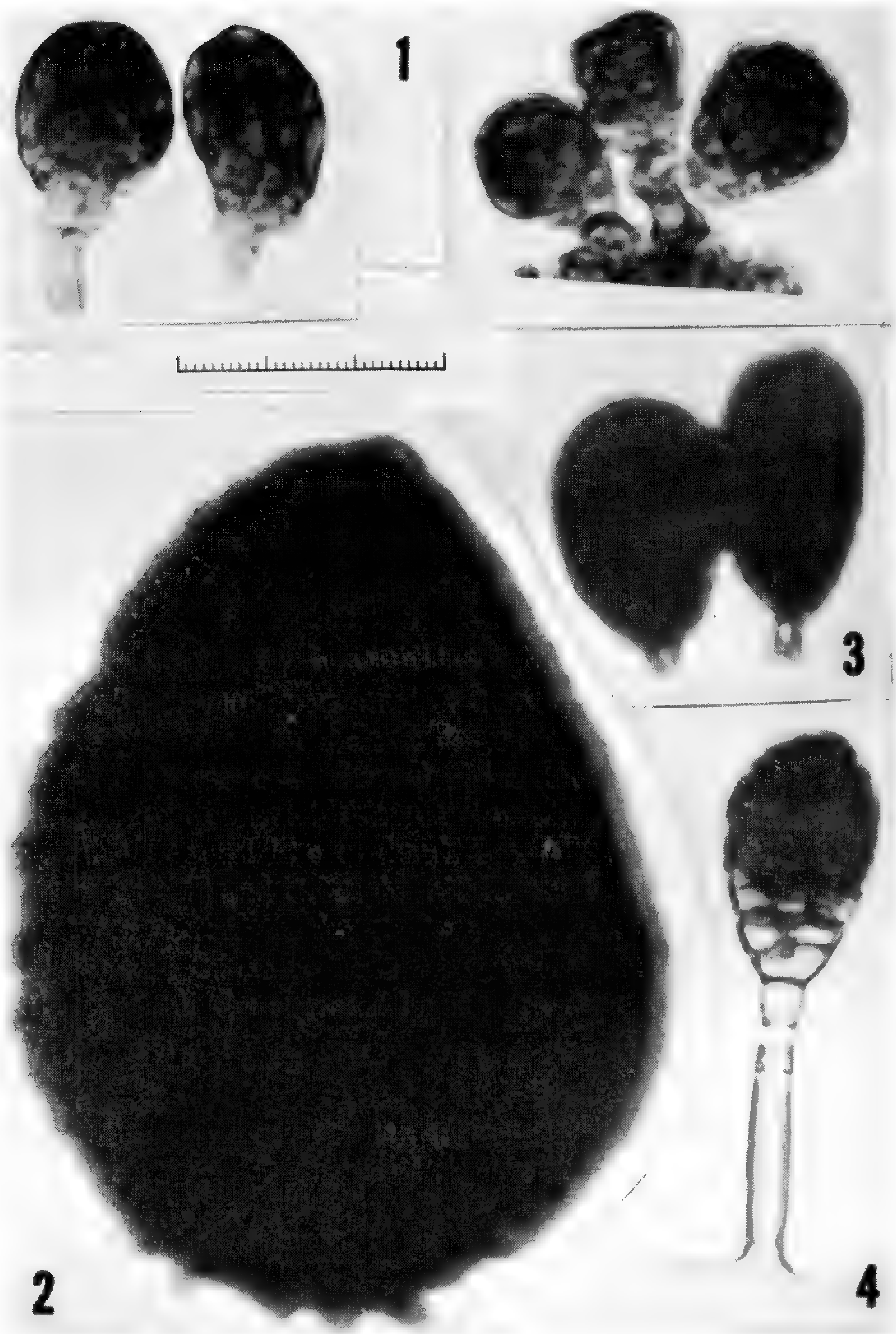


PLATE 1237. PIRICAUDA. Fig 1. *P. suffulta*, conidia and habit. Fig. 2. *P. stygia*, conidium. Figs. 3, 4. *P. serendipita*: 3. Discharged conidia bearing attached ultimate conidiophore cells. 4. Habit, note how the wall of the penultimate conidiophore cell is partially dissolved. Scale in micra.

PLATE 1238. PIRICAUDA. Fig. 5. *P. stygia*, conidium. Figs. 6, 7. *P. sarkara*, conidia. Scale in micra.

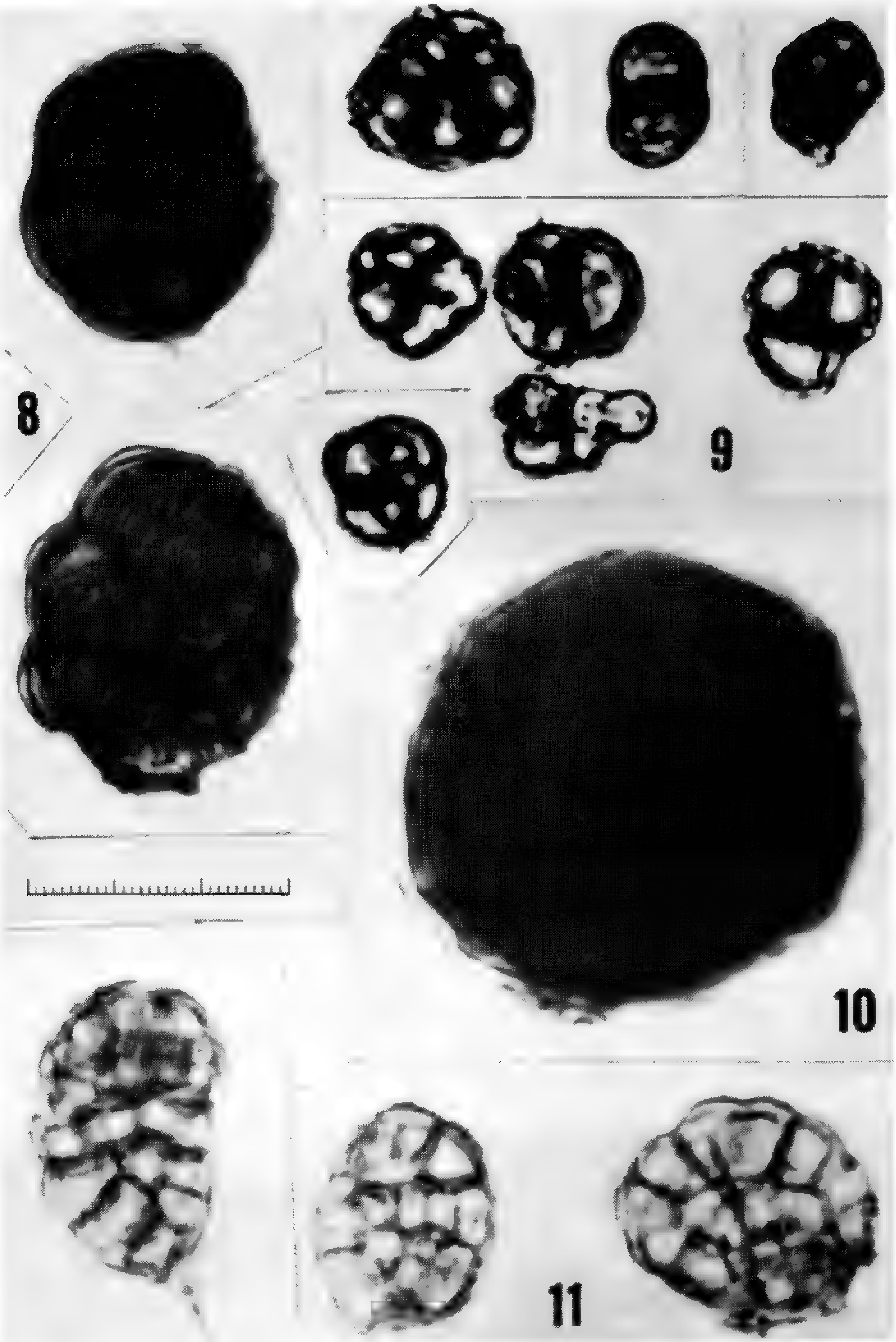


Plate 1239. Piricauda. Fig. 8. *P. vernoniae*, conidia. Fig. 9. *P. funerea*, conidia; note the asperate nature of the cell wall. Fig. 10. *P. globifera*, conidium. Fig. 11. *P. nitens*, conidia; note the integumentoid nature of the perimetric cells, (RTM I:138). Scale in micra.

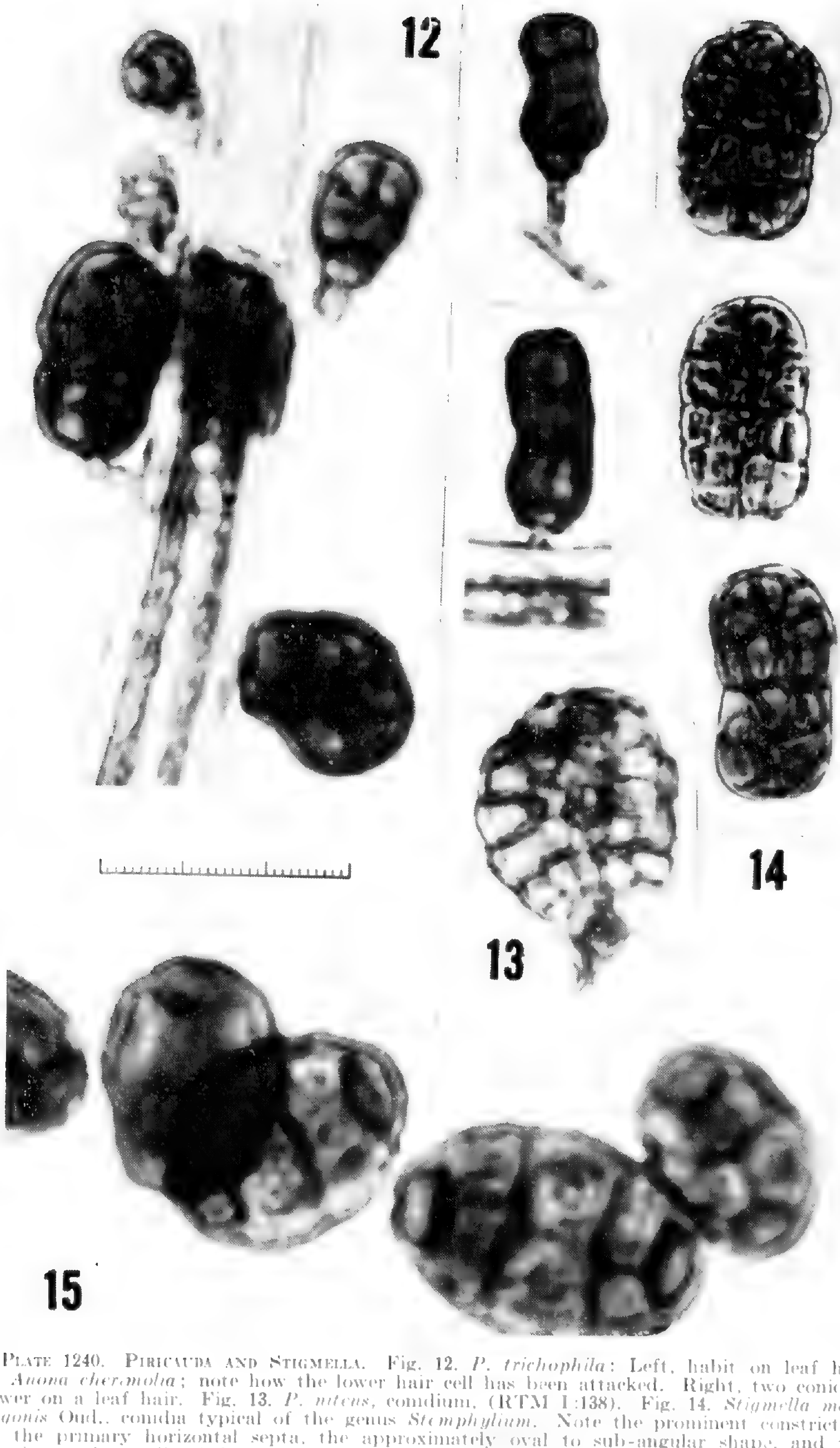


PLATE 1240. PIRICAUDA AND STIGMELLA. Fig. 12. *P. trichophila*: Left, habit on leaf hair of *Anona cheromolia*; note how the lower hair cell has been attacked. Right, two conidia, lower on a leaf hair. Fig. 13. *P. nitens*, conidium, (RTM I:138). Fig. 14. *Stigmella martagonis* Oud., conidia typical of the genus *Stemphylium*. Note the prominent constriction at the primary horizontal septa, the approximately oval to sub-angular shape, and the continuous base, dimpled at the point of attachment of the protoplasmic thread. In the lowermost conidium the characteristically prominent basal scar is discernible. (Herb. GRO, Type, on *Lilium Martagon* leaves, slide RTM I:94). Fig. 15. *P. sacchari*, conidia; note the extensive thickening of the walls. Scale in micra.

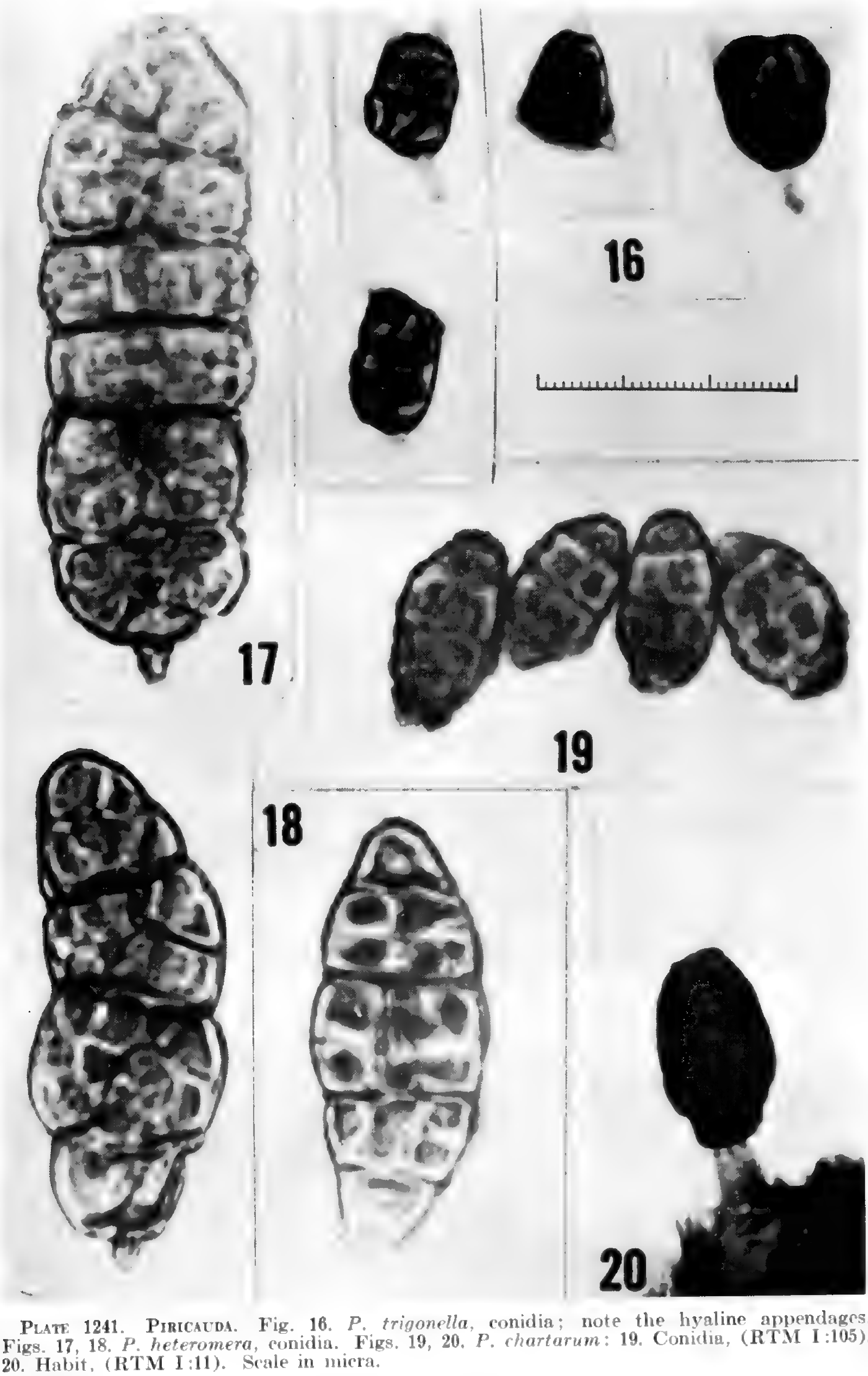


Plate 1241. Piricauda. Fig. 16. *P. trigonella*, conidia; note the hyaline appendages. Figs. 17, 18. *P. heteromera*, conidia. Figs. 19, 20. *P. chartarum*: 19. Conidia, (RTM I:105). 20. Habit, (RTM I:11). Scale in micra.

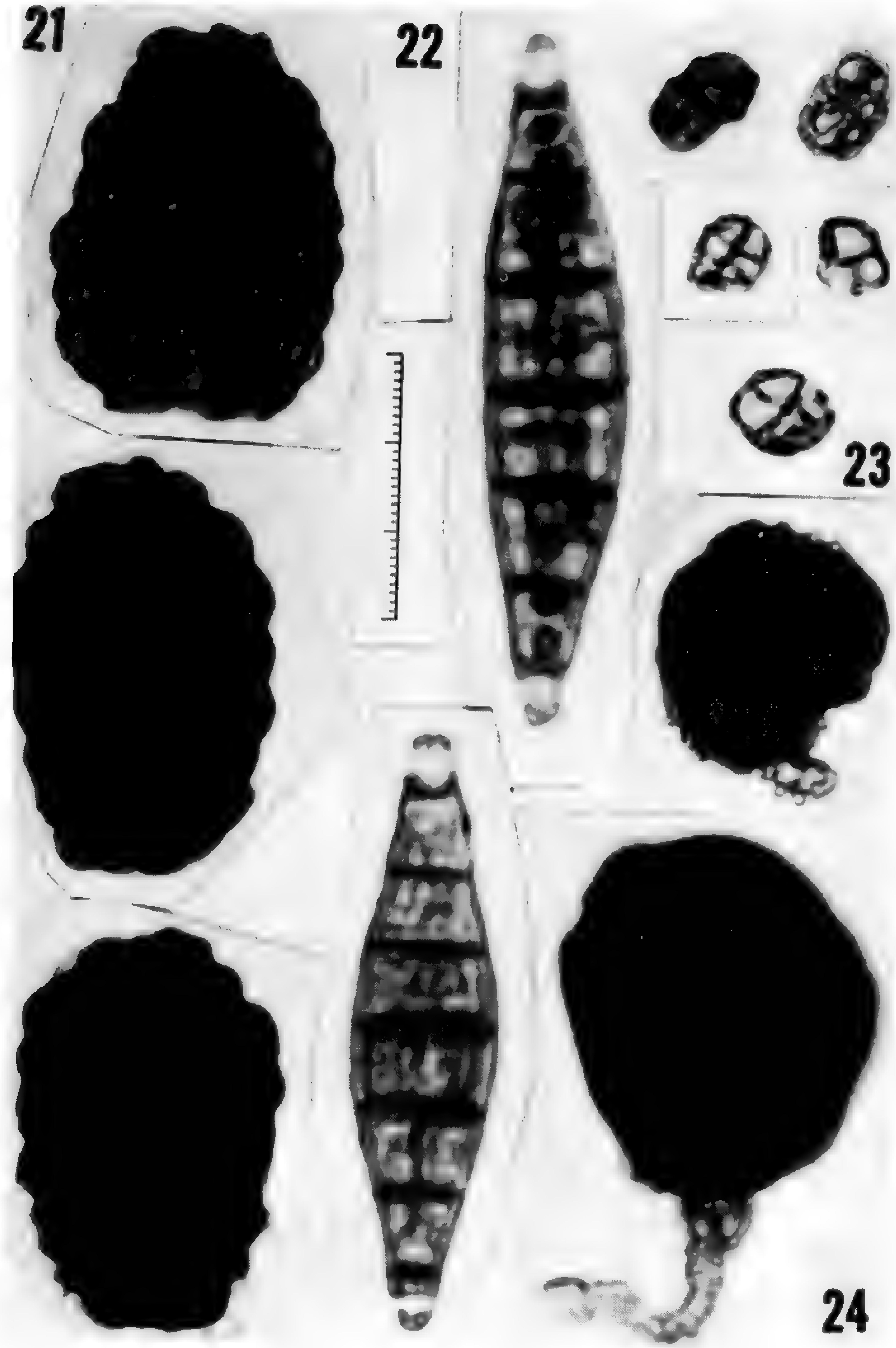


PLATE 1242. PIRICAUDA. Fig. 21. *P. elliptica*, conidia. Fig. 22. *P. pulchella*, conidia; note the light colored terminal cells. Fig. 23. *P. tumulosa*, conidia asperate. Fig. 24. *P. aspera*, conidia; note the conspicuous asperate condition. Scale in micra.

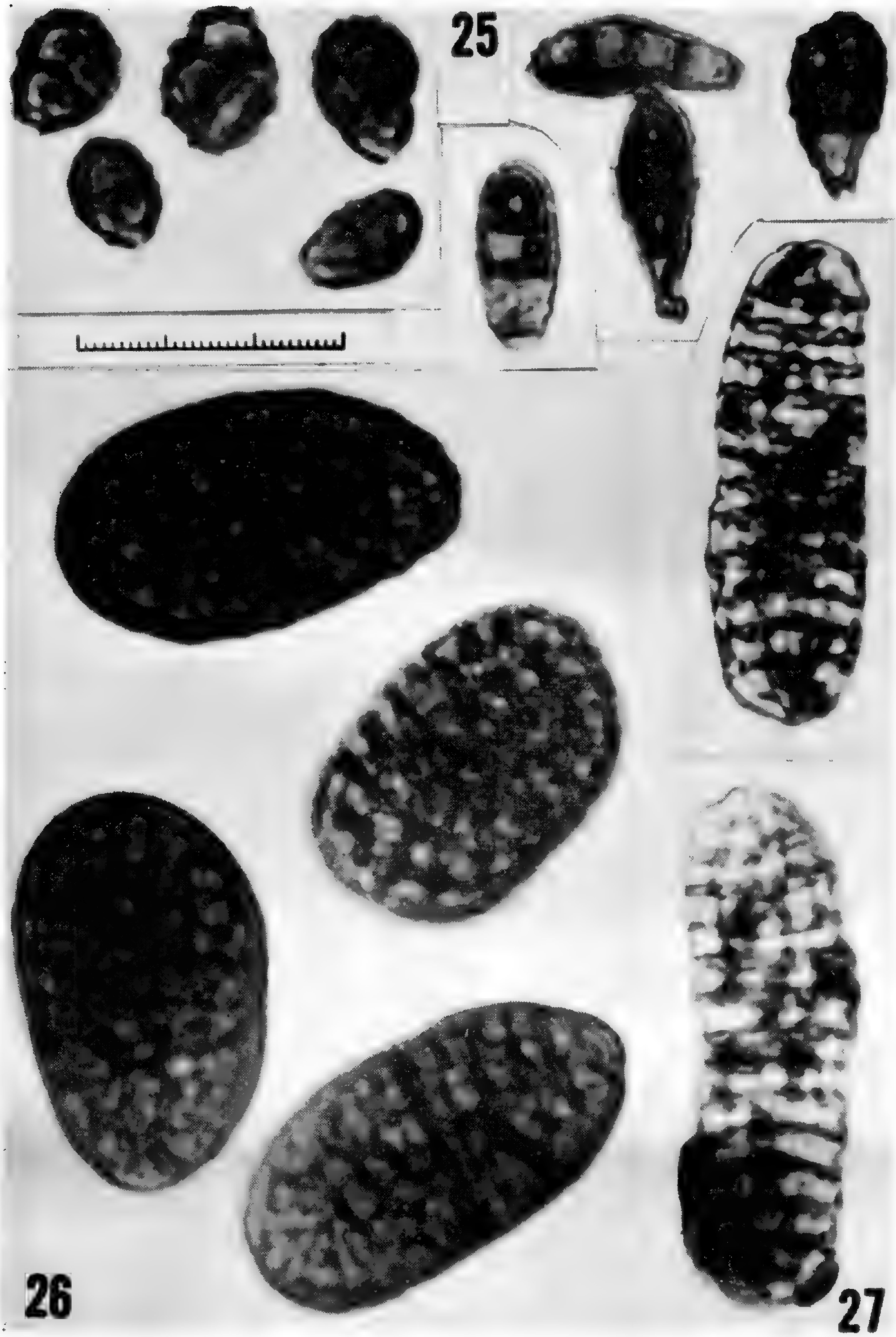


PLATE 1243. PIRICAUDA. Fig. 25. *P. damonis*, conidia. Fig. 26. *P. striata*, conidia. Fig. 27. *P. itochna*, conidia. Scale in micra

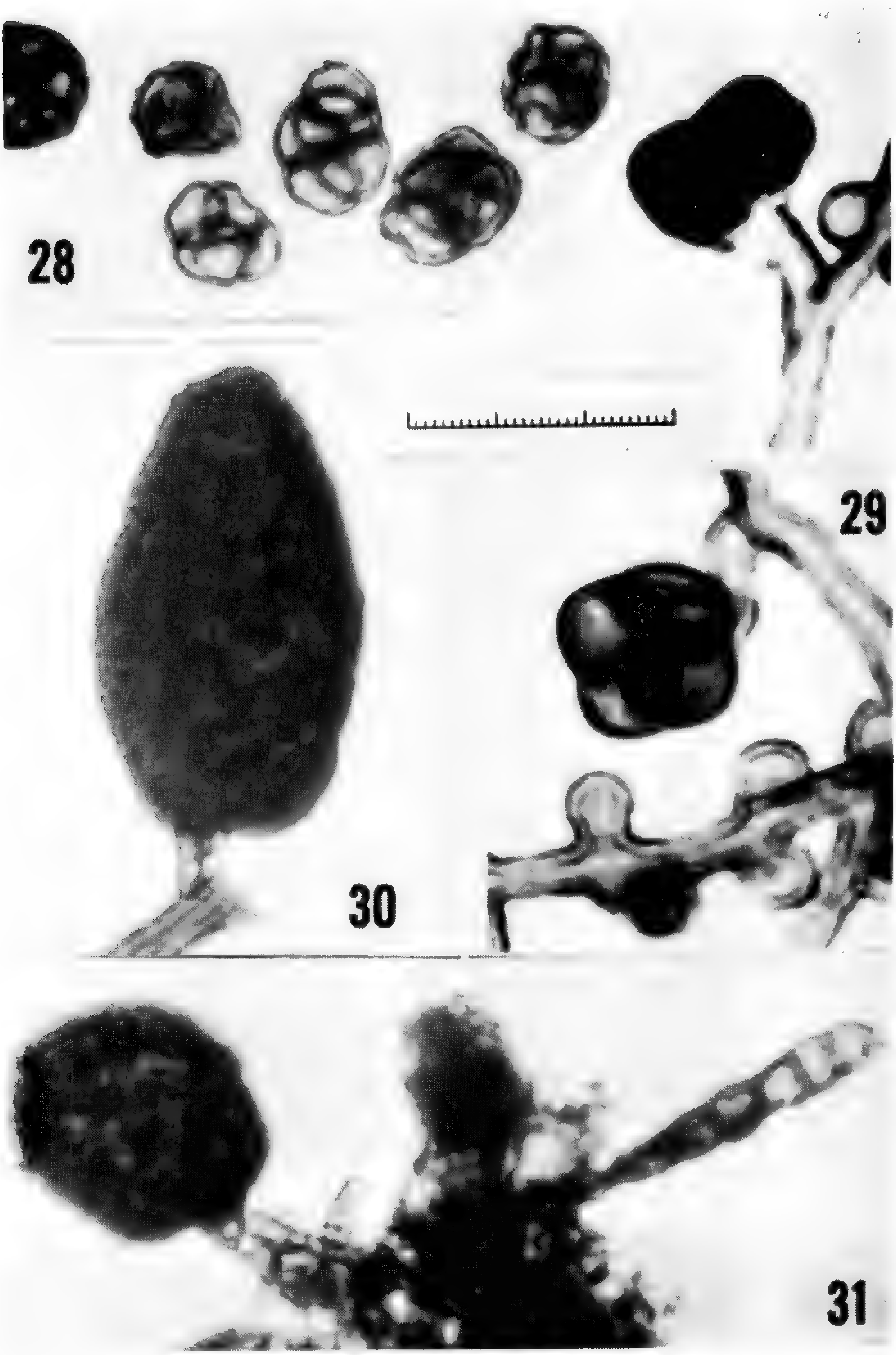


PLATE 1244. PIRICAUDA. Fig. 28. *P. aphcles*, conidia. Fig. 29. *P. manilensis*, habit; note the peltate hyphopodia, (RTM I:103). Figs. 30. 31. *P. bogoriensis*, habit; note in Fig. 31 the *Sporidesmium*-like ?conidium. Scale in micra.

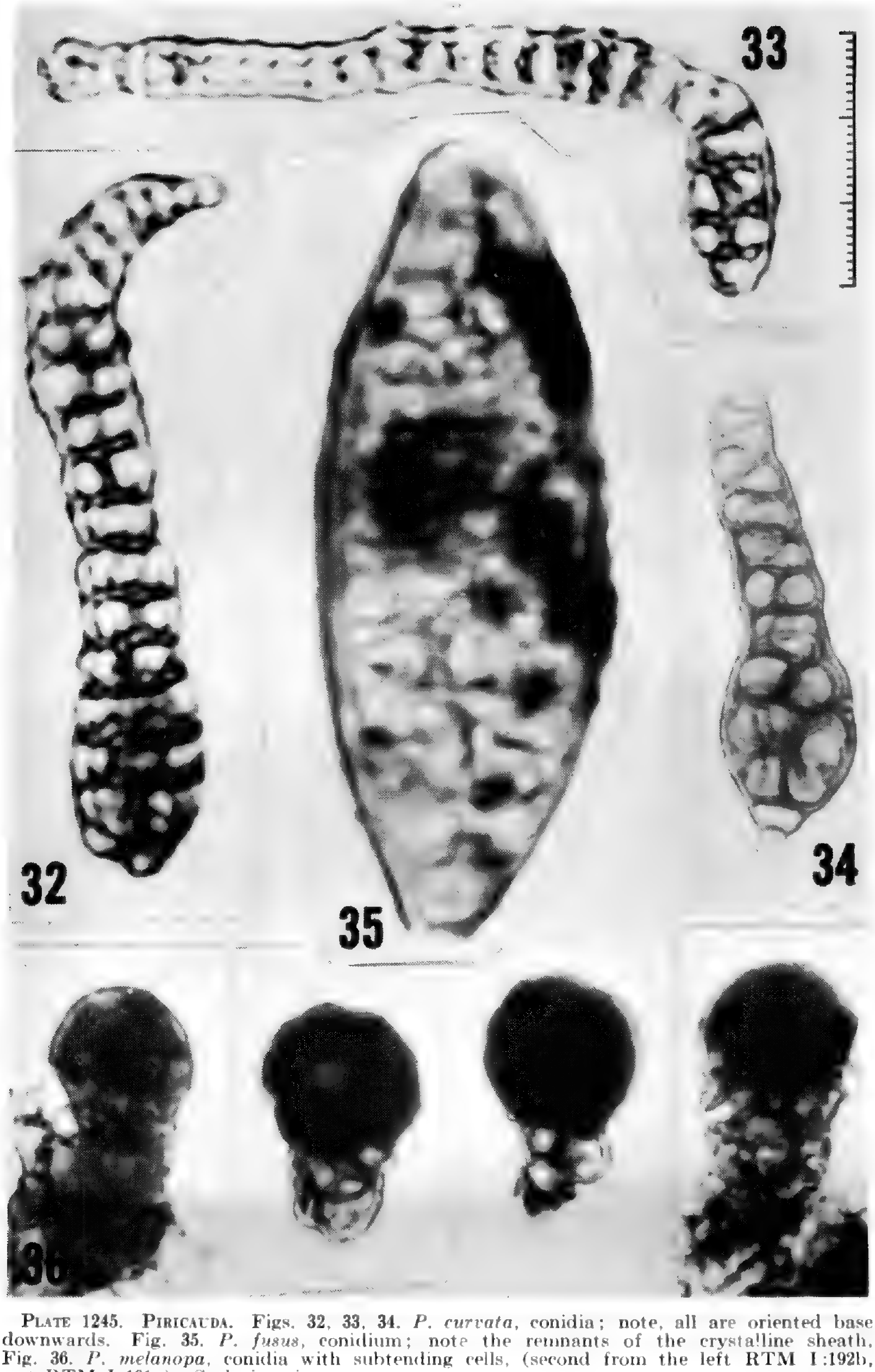


PLATE 1245. PIRICAUDA. Figs. 32, 33, 34. *P. curvata*, conidia; note, all are oriented base downwards. Fig. 35. *P. fusus*, conidium; note the remnants of the crystalline sheath. Fig. 36. *P. melanopa*, conidia with subtending cells, (second from the left RTM I:192b, rest RTM I:191a). Scale in micra.


PLATE 1246. PIRICAUDA. Fig. 37. *P. putredinis*, conidia. (RTM I:256). Fig. 38. *P. subcuticularis*, conidia. Figs. 39, 40. *P. ulmicola*: 39, left to right, conidial ontogeny. 40. Mature conidia. (RTM I:220). Scale in micra.

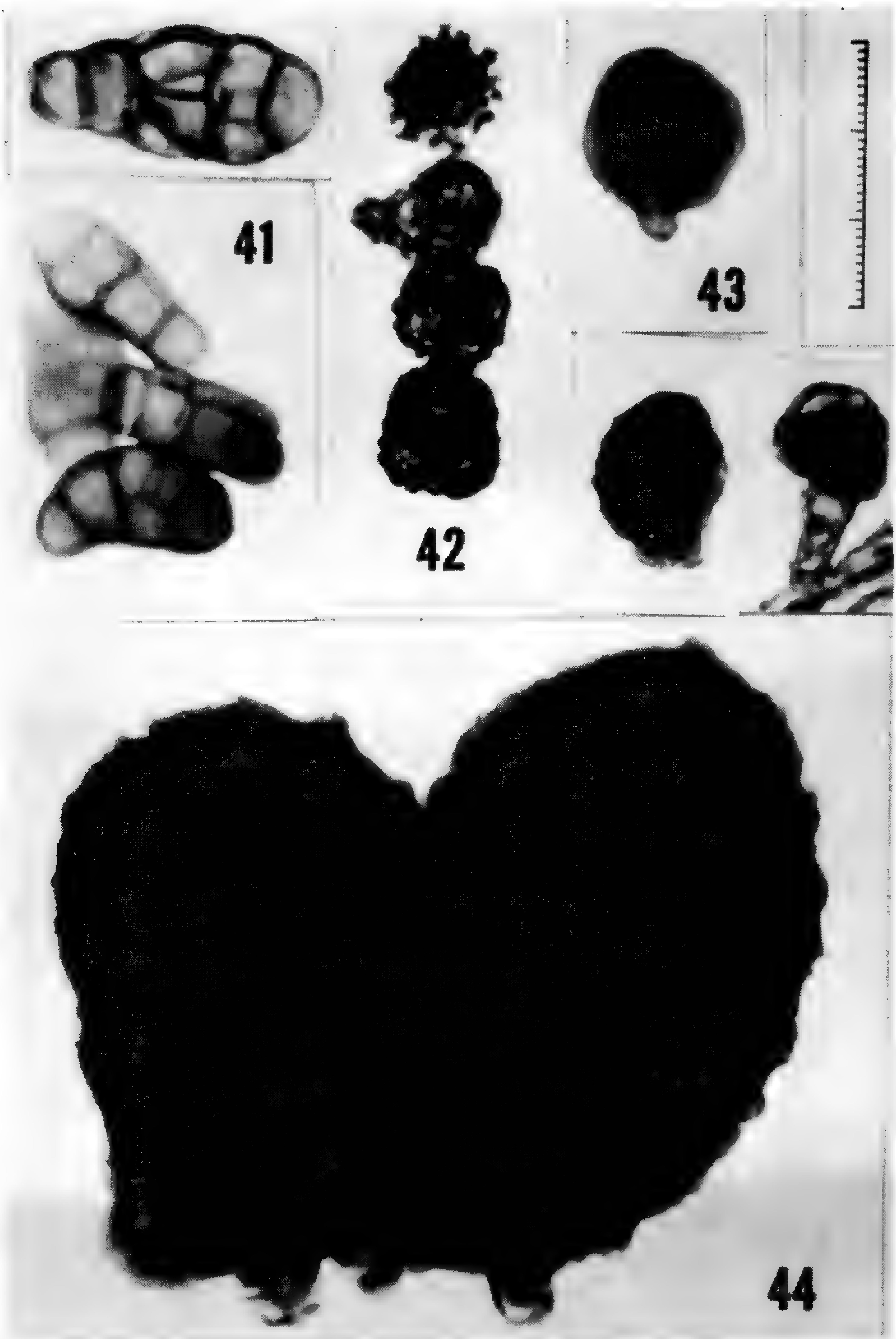


PLATE 1247. PIRICAUDA. Fig. 41. *P. viticola*, conidia. Fig. 42. *P. exasperata*, conidia; note the asperate condition. Fig. 43. *P. nodosa*, conidia, (RTM I:89). Fig. 44. *P. composita*, conidia, (RTM I:13a). Scale in micra.

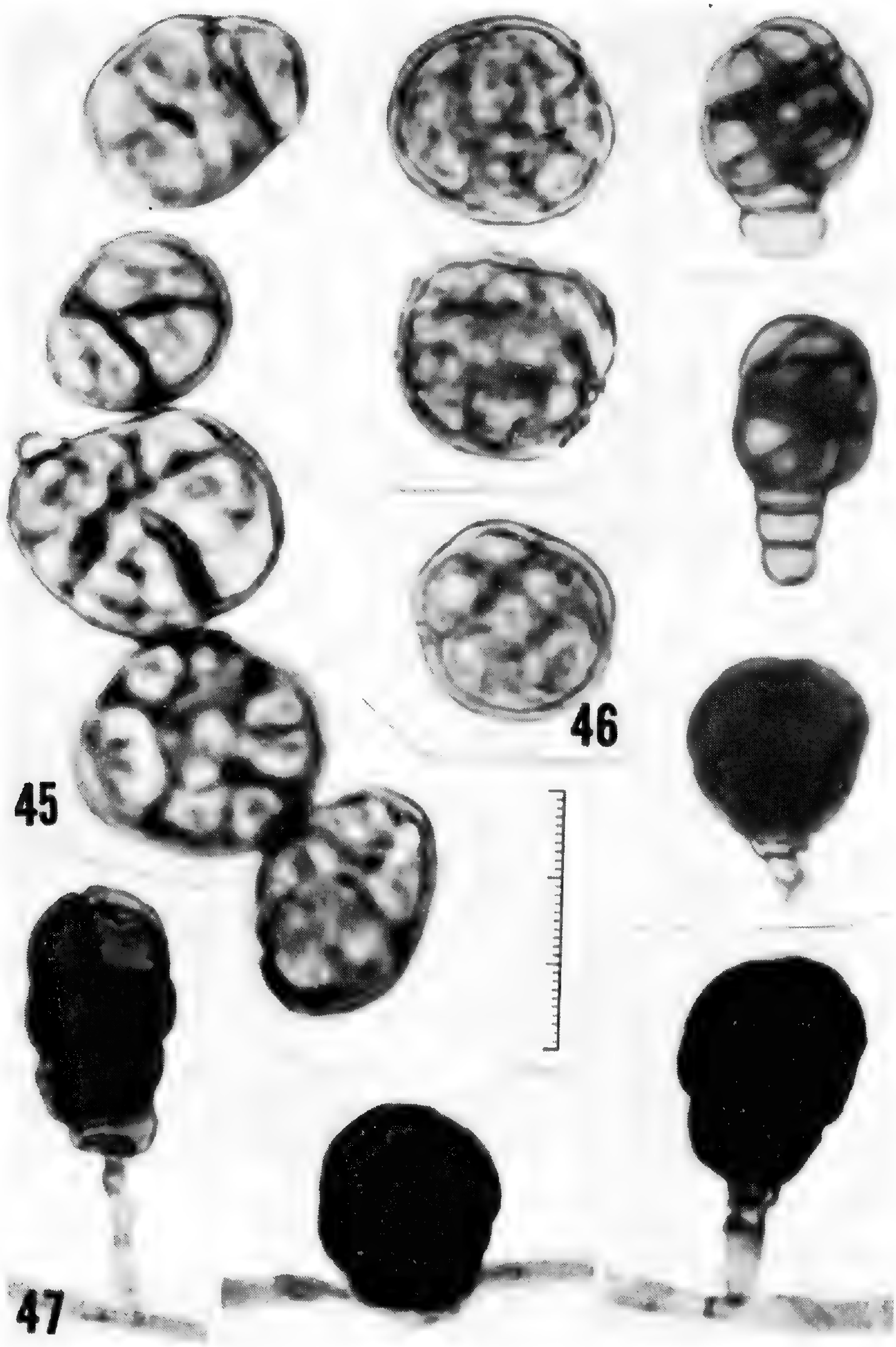


PLATE 1248. PIRICAUDA. Figs. 45, 46. *P. quadrata*, conidia, (RTM I:61, I:234b respectively. Fig. 47. *P. arcticoceanorum*, conidia, (bottom and right margin). Scale in micra.

# NATURALIZED MUGO PINE IN NEW HAMPSHIRE[1]

Radcliffe B. Pike & A. R. Hodgdon

The senior author has been aware for a number of years of a pasture in which the mugo pine (*Pinus mugo* Turra.) has become naturalized. So far as we are aware this is the first report of this species becoming adventive in North America. Spontaneous naturalization of any non-native species is always of interest as a matter of record. It would seem in this case to be of special interest to foresters and farmers of Northern New England as a possible new weed tree of forest lands and pastures.

This pasture is located in the town of Shelburne, Coos County, New Hampshire, approximately 44° 20′ N. It is just south of the Androscoggin River and U. S. Highway #2 a few miles from the Maine border. The property adjoins the grounds of the Shelburne public school and is directly across the highway from the former Aston estate, now the Shelburne Motel and Inn.

It was on the grounds of this former estate that mugo pines were planted as ornamentals fifty years ago. A number of the original plants are still in existence and are now very large specimans yet still retain the typical mugo form of multiple trunks and bushy growth. Whether any of these pines were planted across the highway is not known but there are certainly none at the present time on the pasture site that approach the size or apparent age of those of the original planting.

This is a sloping pasture with uneven drainage conditions and is 5-10 acres in extent. It is well occupied by mugo pines of various sizes and ages from seedlings to plants 12 ft. or more high and as much in breadth. All the plants observed had multiple trunks and the typical mugo form. None was found with a single central upright main trunk (of the montana type). Seedling mugo pines were observed in the highway ditches and on graded banks on both sides of the highway as well as on a steep raw gravel bank next to the school grounds. This tendency to colonize a variety of sites with different drainage bears

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out Shaw's[2] statement that "it grows indifferently in bogs and on the rocky slopes."

Associated with the mugo pines were two native pines, *Pinus strobus* L. and *Pinus resinosa* Ait. as well as scattered poplars (*Populus tremuloides* Michx.) red maples (*Acer rubrum* L.) and gray birch (*Betula populifolia* Marsh), the usual invaders of abandoned pasture land in this area.

Considerable variation was displayed in the general outline and proportions of these shrub pines from flattish ovoid to upright ovoid. The foliage also showed variation in depth of green and general density. Needle length on the collected specimens varies from 2½ cms. to 6½ cms. Cones showed the great variation in size and shape that is characteristic of this polymorphic species. Shaw[2] emphasizes the variations in the cones by calling attention to the "elaborations that may be seen in Tharand Jahrbüch of 1861 and" — also "Hartigs' Specifications of 60 forms of this species each dignified with a Latin name." Cone specimens were collected which agreed with the three types illustrated in Shaw[2], p 57. Specimens of cones and foliage are deposited in the University of New Hampshire herbarium.

One other site of spontaneous colonization of mugo pine has been casually observed in the State of Maine. This is at the east end of the Waldo-Hancock bridge on Verona Island in the town of Verona in Hancock County. About 30 years ago mugo pines were used, as landscape material on the approaches to this bridge and are the obvious source of these spontaneous seedlings. However no detailed examination has been made or material collected.

A recent report indicates another probable area in northern New Hampshire where this pine has become naturalized; however we have not yet made personal observations to confirm this.

These observations indicate that some caution should possibly be exercised in the use of the mugo pine for landscape purposes in areas where it can easily escape to wild or unused lands because under some conditions it is capable of spontaneous nat-

[2] SHAW, G. R. The Genus Pinus. Publ. Arn. Arb. No. 5. 1914.

uralization. Such caution is probably only necessary in Northern New England where the mugo pine is generally free of insect infestation that further south could be a deterrent to its successful spread. — DEPT. OF HORTICULTURE AND DEPT. OF BOTANY, UNIV. OF NEW HAMPSHIRE, DURHAM.

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DISCOVERY OF ARENARIA MARCESCENS IN THE UNITED STATES. — While botanizing in northern Vermont this past summer the writer collected a species of *Arenaria* which he at first thought to be *A. groenlandica,* known from alpine areas in the state. However, upon subsequent examination the specimens were found to be distinctly different from *A. groenlandica,* closely resembling the description of *A. marcescens* given in the 8th edition of Gray's Manual. Additional material was later collected and sent to Dr. Marcel Raymond of the Montreal Botanical Garden who kindly confirmed the identification of the plant as *Arenaria marcescens* Fern.

The station for the plant is at an altitude of about 3200 ft. on Haystack Mountain in the town of Lowell, Orleans County. Here a series of north-facing serpentine ledges is moistened by seepage from the top of the mountain and provides a habitat suitable for plants of arctic-alpine affinities. *A. marcescens* is found growing abundantly in crevices and shelves of the ledges, often trailing down thus giving a hanging basket effect. Other species associated with it are *Lycopodium Selago, Agrostis borealis, Scirpus caespitosus* var. *callosus, Empetrum nigrum, Vaccinium uliginosum* var. *alpinum, Houstonia caerulea,* and *Campanula rotundifolia.* Of these, *Agrostis borealis* and *Empetrum nigrum* were previously reported in the state only from the summits of Mt. Mansfield and Camels Hump.

The distribution of *Arenaria marcescens* as given by Fernald in Gray's Manual of Botany, 8th edition, is western Newfoundland and Mt. Albert, Gaspé Co., Quebec. Its occurrence in northern Vermont represents a notable extension south of its previously known range as well as being an interesting addition to the flora of the United States. Specimens have been deposited in the writer's own herbarium *(P. W. Cook, 556, 584)* and in the Pringle Herbarium at the University of Vermont *(L. A. Charette, 2231).*

—PHILIP W. COOK, DEPARTMENT OF BOTANY,
UNIVERSITY OF VERMONT.

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NEW FORMS OF TRILLIUM RECURVATUM. — As in *Trillium grandiflorum* (Michx.) Salisb. and *T. erectum* L., variations in color and number of floral parts, with various modifications, occur in *T. recurvatum* Beck and other species of the genus.

The recent examination of the herbarium of the Southeast Missouri State College at Cape Girardeau, Missouri, has revealed two additional variations in *T. recurvatum* which merit recognition. Both of them are apparently not uncommon in Houck's Woods, an area located about three and one-half miles west-southwest of Cape Girardeau, Cape Girardeau County, Missouri.

**Trillium recurvatum** Beck, forma **petaloideum** Steyermark, f. nov., a f. *recurvatum* sepalis submembranaceis petaloideis vinaceo-purpureis recedit. — Houck Woods, Bloomfield Road, Cape Girardeau Co., Missouri, April 6, 1949, *Wayne Adams*, HOLOTYPE, in Herb. Southeast Missouri State College. In this form the three sepals have become petaloid in texture, shape, and color, their color being entirely maroon-colored or nearly so. They have the same thin texture as the petals. An extra sepal may be present, and, if so, is foliar in appearance.

**Trillium recurvatum** Beck, forma **foliosum** Steyermark, f. nov., a f. *recurvatum* staminibus carpellis sepalis petalisque viridibus foliosis recedit. — Houck Woods, Bloomfield Road, Cape Girardeau Co., Missouri, April 6, 1949, *Wayne Adams,* HOLOTYPE, in Herb. Southeast Missouri State College. In this form the sepals and petals, as well as the stamens and carpels, have become foliar in appearance, producing an entirely leafy, completely sterile plant. Mr. Adams notes on the label that both variations are "not rare." They were found with normal populations of the species.

— JULIAN A. STEYERMARK.

A Modern Style in Floristic Studies.[1] — Recent generic monographs and revisions are frequently based on gross morphology and newer systematic techniques. From time to time floristic studies report chromosome numbers or other bits of biological information, but the ordinary flora still gives little more than descriptive morphological treatments of species. This recent publication by Olov Hedberg is an outstanding example of the application in a floristic study of some newly developed taxonomic methods. Although the author calls his publication a taxonomic revision, it is floristic in treating the alpine plants of seven equatorial East African mountains. Its format, however, is more like a collection of good generic monographs. For each species, subspecies, and variety treated there is synonymy, type data, taxonomy (often including chromosome numbers), ecology (including altitudinal records), and distribution (with extensive specimen citations).

The taxonomist making a floristic study often is faced with a frustratingly difficult task because he must cover large numbers of species which, along with their relatives, could be better understood if studied over their whole range rather than by geographic segments. Since the African alpine region is a relatively homogeneous physiographic unit where it is "summer every day and winter every night", it offers fewer such difficulties than would be encountered in floristic studies in areas delimited by political boundaries. Many of the afroalpine species are most closely related to geographically distant species that are not included in the treatment. The lack of an overall evolutionary relationship among the components of the flora prevents full comparison between this investigation and a generic monograph.

Afroalpine Vascular Plants is introduced by a short historical sketch, ecological notes, taxonomic concepts and methods, and notes on the nomenclature and material used. The preliminary ecological discussion is brief, but this aspect was treated in an earlier publication[2] and additional notes are given under each taxon in the revision. Other related papers, including a pollen-analytical study, a cytological investigation of afroalpine grasses, and generic revisions, also preceded this major contribution. A chapter on vicarious taxa provides a review of the pertinent literature, cites examples of vicariads in the flora, and discusses the significance of vicariads in the understanding of evolution, especially evolutionary rates.

The largest portion of the work is in two sections of one chapter "The Flora". The first part (233 pages) of this chapter treats 44 families, 125 genera, and 298 species (some with subspecies or varieties);

[1] Afroalpine Vascular Plants: A taxonomic revision. Symbolae Botanicae Upsalienses 15 (1), 411 pp., 12 pl. 1957.

[2] Hedberg, Olov. Vegetation belts of the East African mountains. Svensk Bot. Tidsk. 45: 140-208. 1951.

42 new taxa, names, and combinations are included. Nine species hybrids are reported but not named. The second part (125 pages) is an appendix of taxonomic comments. Here the monotony of ordinary floristic presentation is relieved by nomenclature revisions, miscellaneous comments, and population analyses illustrated by tables, histograms, and scatter diagrams. Keys to families and genera are not provided. This omission restricts the floristic usefulness of the paper to persons with considerable taxonomic training. In future years the African mountains will be visited by investigators who could profitably use keys to families and genera, and it seems that the additional cost of printing keys would have been justified by extending the utility of the flora.

Afroalpine Vascular Plants is illustrated by 22 figures of line drawings, 30 figures of graphs, 15 tables, and 12 very clear half-tone plates of afroalpine plants. The line drawings adequately serve their purpose but are not artistic masterpieces. The tables, histograms, and scatter diagrams give detailed analyses of population variation. A map could have been helpful, although one is provided in the author's previous ecological paper.[2]

Field studies on the seven mountains were made in 1948. Most previous investigators had visited only one or two mountains. A minimum amount of time was spent by the author in field work, but it is evident that he made efficient use of his field opportunities. A majority of the herbarium studies were made when the author had access to Kew, the British Museum, and the Linnean Herbarium. Specimens in 15 other herbaria were also examined. The study was supported by several grants and obviously required large investments in money and time.

In investigating the afroalpine flora, Dr. Hedberg's ultimate goal is to develop a thorough phytogeographic understanding of these plants. He has now provided the taxonomic treatment upon which phytogeographic analyses can be based. He also has produced an exemplary model for floras of the future. A great array of taxonomic projects lying dormant in the high mountains of America could profitably be studied in the style of Alfroalpine Vascular Plants. — JOHN H. BEAMAN, DEPARTMENT OF BOTANY AND PLANT PATHOLOGY, MICHIGAN STATE UNIVERSITY, EAST LANSING.

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# Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB



Vol. 61 May, 1959 No. 725

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# Rhodora

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## INTERESTING FUNGI FROM MASSACHUSETTS [1]

HOWARD E. BIGELOW

During the summer and fall of 1958, climatic conditions were especially favorable for the growth of fleshy fungi in western Massachusetts and a number of rare or unusual species appeared. Among these were several agarics about which there is little information in the literature since the original descriptions. *Amanita cinereoconia, Clitocybe fellea, C. socialis, Hygrophorus basidiosus* and *H. flavodiscus,* are described here in order to complete the data omitted by the authors. Two gasteromycetes, *Pisolithus tinctorum* and *Pseudocolus schellenbergiae,* are of interest because of their occurrence in this region.

The colors cited in quotation marks are from Ridgway (1912).

### HYMENOMYCETES

**Amanita cinereoconia** Atkinson, Ann. Mycol. 7: 366. 1909. Plate 1249

Pileus 2.5–7 (–11) cm. broad, convex to broadly convex at first, soon expanding to plane, at times with a broad obtuse umbo, margin appendiculate with whitish, cottony fibrils from a partial veil, becoming appressed, surface dry, with numerous pyramidal warts (up to 2 mm. high) ± in concentric rings, texture soft and rather cottony, points finally eroded and leaving only irregular floccose patches, appressed near margin, color "fuscous," "hair brown," "smoke gray" on warts and patches, whitish to "pale smoke gray" between warts and patches; flesh thick on the disc, tinted pale fuscous near the pileus surface, whitish below, odor and taste not distinctive.

[1] Acknowledgment is made to the Faculty Research Council, University of Massachusetts, for financial support of my 1958 field program, and for bearing the cost of photographic plates in this paper.

Lamellae free but closely appressed to stipe, broad (up to 7 mm.), rounded at cap margin, narrowed at stipe, close, white, edges straight, fimbriate under a lens.

Stipe 3.5–17 cm. long, apex and medial portions 0.6–2.5 cm. in diameter, base napiform, bulbous portion 1–3 cm. broad, becoming ± equal in age, radicate portion 3–6 cm. long, central, solid (interior whitish), pale "fuscous" to "fuscous" at bulb, gradually paler to the whitish apex, apex and medial portions fibrillose to somewhat scabrous; volval remains evident as "fuscous" warts in three to five ± concentric rings on the bulb surface, finally appressed; annulus apical, thick, soft and cottony, white, usually adhering to stipe apex and cap margin, becoming appressed.

Spores 8.5–10 × 4.5–6.5 μ, usually elliptical (polymorphic at times and then oblong, pyriform, obovate, lacrymoid, 6.5–12 × 5–6.5μ), smooth, amyloid; basidia 27.5–42(–60) × (6.5–)9–11 (–12) μ, four-spored; cystidia not distinct from the numerous basidioles; pileus tissue: surface with numerous globose cells, 19–60 μ in diameter, contents brownish in KOH, wall smooth, slightly thickened, originating as cystidioid end cells, clavate at first, but finally inflated to globose and becoming free, cuticular hyphae cylindrical, 2–4.5 μ in diameter, hyaline in KOH, interwoven, appearing slightly gelatinous in KOH, tramal hyphae cylindrical to inflated, 5–17 μ in diameter, clamp connections present; gill trama divergent, hyphae cylindrical to inflated, 6–20 μ in diameter.

Solitary or gregarious, on soil in mixed woods or under conifers. Leverett, Amherst. August and September. *Bigelow 7360, 7543, 7650, 7756.*

This distinctive *Amanita* is well-known in more southerly regions. It was originally described from Chapel Hill, North Carolina. More recently, Hesler (1937) has collected the species in Great Smoky Mountains National Park.

In the field, the distinctive features of expanded specimens are: the gray warts and patches on the pileus and bulb of the stipe, the lack of membranous annulus or volva, the napiform and radicating stipe.

Dr. A. H. Smith of the University of Michigan has kindly confirmed the identity of my material.

**Clitocybe fellea** Peck, Ann. Rep't N. Y. State Mus. 51: 284. 1898.

Pileus 6–21 mm. broad, hemispherical at first, becoming convex, finally subplane and somewhat depressed, dry and somewhat shining, radiate-fibrillose to matted-fibrillose under a lens, finally minutely diffracted-scaly, a yellowish-tan to putty color (dingy "cream buff" to "chamois"); flesh thin, whitish, odor farinaceous, taste bitter but soon fading.

PLATE 1249. *Amanita cinereoconia*, × ⅔.

Lamellae broadly adnate for some time, finally short decurrent, close to nearly subdistant, broad (3–5 mm.), not forked or intervenose, whitish, edges even and straight.

Stipe 1.5–3.5 cm. long, 1–2 mm. thick at apex, equal or the base slightly enlarged, often curved and somewhat flexuous, solid, central, surface fibrillose-striate for some time, finally appressed, concolorous with the pileus.

Spores 6–8 (–9) × 4.5–5.5 μ, broadly elliptical, smooth, hyaline in KOH, not amyloid, white in mass; basidia 25–38.5 × 6.5–8 μ, four-spored; cystidia not differentiated; pileus tissue: cuticle yellowish in KOH, pigment present as very fine encrustations or in slightly thickened but smooth walls, hyphae cylindrical to somewhat inflated, 4.5–8 (–11) μ in diameter, surface often with projecting end cells but not organized into a distinct turf, trama hyaline, hyphae cylindrical to slightly inflated, (2–) 4.5–8 μ in diameter, clamp connections present; gill trama regular to subparallel, hyaline, hyphae cylindrical to slightly inflated, 3–13 μ in diameter.

Solitary, scattered to gregarious. On bare soil, Polytrichum, or in grass. In the open near conifers. Amherst, Sunderland, Leverett. June to September. *Bigelow 6514, 6515, 6605, 6714, 7191, 7488, 7576, 7630, 7731, 7804.*

Peck's (1898a) colored plate of *C. fellea* is an accurate representation. My material is similar in all respects with the illustration and description. Through the courtesy of Mr. Stanley J. Smith, I have also had the opportunity to make an examination of the type collection from Gansevoort, N. Y.

It is unusual that there are so few records of this species. The abundance of it throughout the collecting season of 1958 would certainly seem to indicate that this agaric is not rare. Possibly, the distribution is restricted to the northeast. Smith's (1944) report of *C. fellea* from Oregon is of another species, at present undetermined.

**Clitocybe socialis** (Fr.) Gillet, Lest Hyménomycètes, p. 159. 1874.

Pileus (0.5–) 1.5–4 cm. broad, convex to broadly convex at first with the margin incurved and slightly inrolled, edge white pubescent, expanding to plane with the margin remaining decurved for some time, in age becoming subrepand to elevated, rarely undulate, disc flat to somewhat umbonate or broadly depressed, surface dry and opaque, moist-appearing in wet weather but not hygrophanous, dull, innately subsilky-pulverulent, finally glabrous, color dark red at first ("dragon's-blood"), fading with age to dull pinkish (dull "coral pink," dull "flesh pink," sordid "onion pink," "Japan rose"); flesh white, rather thin, odor and taste mild to rather disagreeable or subfarinaceous.

Lamellae short decurrent at first, finally moderately decurrent, close, thin, narrow, not easily separable from the pileus trama, rather brittle, at times forked and anastomosing, not intervenose, color whitish ("cartridge buff") at first, becoming buff ("cream color," "ivory yellow") in age, edges even and straight at first, becoming torn and undulate in age.

Stipe 1.5–4 cm. long, 2.5–5 (–11) mm. broad at the apex, tapering downward from a slightly enlarged apex, bases often connate by a tomentose-mycelioid covering and strigosity which is intergrown with grass and humus, usually slightly curved, solid (white and spongy within), central, surface with a faint bloom at first, becoming glabrous or innately fibrillose-striate, scurfy-lacerate in age, pale buff at base, concolorous with cap at apex.

Spores 4.5–5.5 × 2.5–3 μ, elliptical, smooth, not amyloid, white in mass; basidia 13–26 × 4–6 μ, four-spored; cystidia not differentiated; pileus tissue: surface of young specimens with a few cystidioid end cells, clavate-pedicellate, ± 15 × 7 μ, pigment evident in cell contents, becoming appressed in expanded specimens, cuticular hyphae cylindrical, 2–3 (–5) μ in diameter, tramal hyphae cylindrical to inflated, 3–12 (–18) μ in diameter, clamp connections present, a few scattered laticiferous hyphae present; gill trama regular to subparallel, hyphae cylindrical to inflated, 4–16.5 μ in diameter.

Gregarious to subcespitose on lawn. August and September. Amherst. *Bigelow 7591, 7760, 7722.*

The only other authentic specimens of *C. socialis* known previously in this country are those collected at Ann Arbor, Michigan by A. H. Smith and C. H. Kauffman. While a graduate student at the University of Michigan, I had the opportunity to examine this material. The Amherst collections cited above are identical in all respects except habitat with those from Michigan. Smith's and Kauffman's collections were made under pine or in a mixed stand of black locust and pine.

**Hygrophorus basidiosus** (Peck) Peck, Bull. N. Y. State Mus. 116: 57. 1907.

Pileus 1.5–4 cm. broad, convex to plane, subumbonate at times, glabrous, hygrophanous, grayish-brown when moist, fading to pale gray (no comparable colors in Ridgway), radiate-streaked in fading; flesh whitish, odor and taste not distinct.

Lamellae adnate to short decurrent, subdistant, broad, arched, thick, pale gray, edges even.

Stipe 3.5–5 cm. long, 4–7 mm. thick at apex, tapering downward to a slender base, solid becoming hollow, surface glabrous, white.

Spores 4–5.5 (–6) × 3–4.5 μ, subglobose, smooth, hyaline in KOH, not amyloid; basidia 31–45 × 5–6.5 μ, four-spored, sterigmata 5–9 μ long, curved; cystidia not differentiated; pileus tissue: surface not gelatinous in KOH, cuticular hyphae cylindrical, 1–3 μ in diameter, tramal hyphae mostly cylindrical, 2–6 μ in diameter, clamp connections present; gill trama interwoven, hyphae cylindrical, 2–4.5 μ in diameter.

Gregarious in sphagnum in bog. Leverett. August. *Bigelow 7503.*

Peck's (1887) orginal description of *Clitocybe basidiosa* states the lamellae are "whitish with a violaceous tint." When fresh, the lamellae of no. 7503 were pale gray without a violaceous tint. Peck further describes *C. basidiosa* as possessing a depressed pileus adding in his notes following that the pileus is "rarely slightly umbonate." The pilei of my collection were plane and subumbonate at times. As dried, my specimens are pale grayish not the very pale buff of Peck's type. In other respects, there is agreement. I found the spores of the type specimens to be slightly larger, 4.5–5.5(–6) × 4.5 μ, than the measurements reported by Smith and Hesler (1942).

*Hygrophorus basidiosus* is most closely related to *H. albipes* Peck. As described by Peck (1898b), *H. albipes* is a smaller agaric, with pileus 1.2 cm. broad, stipe 2.5–3.5 cm. × 3–5 mm. The gills are narrow, not broad as in *H. basidiosus.* Smith and Hesler found that the type specimens of *H. albipes* possessed a thin gelatinous pellicle. The surface of *H. basidiosus* is merely filamentous. Other features of the two species are nearly identical.

**Hygrophorus flavodiscus** Frost, in Peck, Ann. Rep't N. Y. State Mus. 35: 134. 1884. Plate 1250.

Pileus 2–6 cm. broad, convex at first with an incurved margin, expanding to broadly convex, finally plane and shallowly depressed, margin with white fibrils of partial veil, not striate, surface glutinous from the universal veil, gluten finally drying in radiating streaks, "orange buff" on the disc, paler toward margin and "pale orange buff" to "cream buff," edge whitish; flesh white, firm, odor and taste not distinctive.

Lamellae adnate to short decurrent at first, becoming moderately or long decurrent, subdistant to distant, moderately broad (2–6 mm.), occasionally forked and anastomosing, usually intervenose and the sides

PLATE 1250. *Hygrophorus flavodiscus*, × 1.

of the lamellae venose, a distinct pinkish flush present at first ("pale pinkish cinnamon") fading to whitish, edges even and straight.

Stipe 3–7.5 cm. long, 6–14 mm. thick at the apex, equal or tapering downward, solid (whitish and firm inside), eccentric at times, sheathed nearly to apex with glutinous universal veil and ending in an obscure annulus, whitish with pale orange-yellow tint, fibrillose to somewhat scabrous above the gluten, innately fibrillose beneath the gluten.

Spores 6–8 × 3–4 (–4.5) μ, elliptical to elliptic-oblong, smooth, hyaline in KOH, not amyloid; basidia 32–52 × 6–8 μ, four-spored; cystidia not differentiated; pileus tissue: pellicle gelatinous, thick, yellow in KOH, pigment intercellular and intracellular, hyphae cylindrical, 2–4 μ in diameter, trama hyaline, hyphae cylindrical to inflated, 5.5–18.5 μ in diameter, clamp connections present throughout; gill trama divergent, hyaline, hyphae cylindrical to slightly inflated, 2.5–8 (–13) μ in diameter.

Gregarious to cespitose under white pine. Leverett. November. *Bigelow 7957, 7958, 7974.*

The study of abundant material of this species both in the fresh and dried conditions confirms the observations of Smith and Hesler (1939), which were based upon a study of the type. I have also had the opportunity to examine Peck's type at Albany.

Smith and Hesler also indicate that *H. flavodiscus* should be compared with *H. melizeus* Fr. I have not had the opportunity to examine authentic material of *H. melizeus.* However, *H. flavodiscus* does not become pallid ochraceous throughout as Fries (1836-1838) emphasizes for *H. melizeus.* Only the pileus of *H. flavodiscus* becomes ochraceous in drying. The lamellae fade from pinkish to white, and remain so in drying. The stipe is tinted with pale orangish-yellow when fresh. At times this color remains when the specimens are dried, but often the stipe fades to whitish like the lamellae. Kühner and Romagnesi (1953) describe *H. melizeus* from unpublished notes of J. Favre. They state that this agaric has a pileus which is pale alutaceous, beige or beige-chamois, recalling a small Hebeloma; gills and stipe tinted with the same colors; stipe dry; flesh becoming sordid brown in KOH. These characters do not apply to *H. flavodiscus.* Kühner and Romagnesi suggest that *H. chrysaspis* Métrod is close to *H. flavodiscus.* The two species are perhaps related, but certainly not identical. *H. flavodiscus* does not become reddish-brown as the other. Habitat and the spore width do not agree either.

*H. flavodiscus* seems most closely related to *H. gliocyclus* Fr. for both species show indications of a partial veil. I believe the two can be separated most easily on characters of the gills and spores. *H. gliocyclus* has yellowish, narrow gills and spores 7–9 (–11) × 5–6 μ, as described by Smith and Hesler (1939).

### Gasteromycetes

**Pisolithus tinctorum** (Pers.) Coker & Couch, Gasteromycetes of the eastern United States and Canada, p. 170. 1928.

Three fruiting bodies (*Bigelow 7774*) were found near one another on an old sawdust pile at Mt. Toby, the University reservation in Leverett and Sunderland.

This unusual fungus is fairly common in the Pacific northwest and in the southeastern United States, but is apparently rare in the northeast. Specimens found on Cape Cod are deposited at the Farlow Herbarium, but there are no previous records of this fungus occurring in western Massachusetts.

**Pseudocolus schellenbergiae** (Sumstine) Johnson, Bull. Ohio Biol. Survey 4: 338. 1929.

On two occasions single fruiting bodies were discovered on the same site near the University campus. These were growing in mixed woods on wet soil and humus. *Bigelow 6950* was collected July 19; *Bigelow 7723* on September 11. The field characteristics and microscopic features are typical of the species.

As far as I can determine, the Amherst collections represent the most northern occurrence of the species reported thus far. According to Snell and Dick (1956), Mrs. Sybil Curtis found *P. schellenbergiae* near Worcester.

This fungus is well discussed in the literature, and has been reported previously from Pennsylvania, New York, New Jersey, and Rhode Island. Some investigators believe *P. schellenbergiae* to be identical with *P. javanicus* (Penzig) Lloyd. If this is true, the latter name has priority. — DEPT. OF BOTANY, UNIV. OF MASSACHUSETTS, AMHERST.

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## SEPAROTHECA, A NEW GENUS (COMMELINACEAE) FROM MEXICO

U. T. WATERFALL

While collecting in Mexico in August 1956, the author found in pine woods in the Sierra Madre southwest of El Salto, Durango, a dwarf member of the Commelinaceae only 3-7 cm. high, growing from small, succulent, elongate, tuber-like roots. It has few flowers, with the inflorescence subtended and enfolded by opposite, or subopposite, ovate-falcate to ovate-attenuate foliaceous bracts which are longer than the few cauline leaves.

Examination showed it to have separate sepals which are nearly hyaline, with a few long hairs at their apices and along the outside of the upper parts of their midribs. The corolla is sympetalous with a tube 6-8 mm. long, and lobes 5-8 mm. long, ovate to ovate-lanceolate. The 6 stamens are fertile, with filaments 1–3 mm. long, filiform to flattened, sometimes somewhat spiralled or twisted, inserted on the lower part of the corolla lobes. The connectives are 1-6 mm. long, flattened, wider than the filaments, sometimes longer.

In Woodson's key to the genera of the Commelinaceae (1942) the combination of sympetalous corollas, leafy-bracted cymes and separate sepals could indicate only *Setcreasea*. However, it could not be any of the species of that genus as treated by E. Matuda (1955). It seemed possible that it might be an anomalous new species of that genus, but, in a family in which generic circumscriptions have been drawn as diversely as in the Commelinaceae, it was thought advisable to check related genera before describing a new species. In so doing, reference was found to *Zebrina* (?) *pumila* described by Greene (1888) from the Sierra Madre west of the city of Durango. This description fits fairly well the species under consideration. An examination of the type, *A. Forrer, s. n.,* from the Sierra Madre west of Durango, altitude 8100 ft., Sept. and Oct. 1881 (ND), shows that it is the same taxon as the one under consideration.

The genus *Treleasea* was erected by Rose (1899) to include three species, previously referred to *Tradescantia,* which have "petals tapering into a claw, forming a tube . . . ", epipetalous stamens and stipitate fruits (actually they seem to be pedicellate, not stipitate). He believed its affinities to be "perhaps nearest Zebrina . . . "

Greene (1888) in describing *Zebrina pumila* stated, "This curious little plant must surely be a congener of . . . *Tradescantia leiandra,* Torr., which Mr. C. B. Clarke (DC. Monogr. III:318) has referred, with a doubt, to the Central American genus, *Zebrina.*" Following the erection of *Treleasea* by Rose, Greene (1900) transferred *Zebrina pumila to Treleasea,* stating "This plant, which I, twelve years since, was strongly inclined to make the type of a new genus, certainly falls into Mr. Rose's genus *Treleasea* newly established. It may even be identical with one or the other of the two species recognized by Mr. Rose. But my specimen is not now to be found, unless at the University of California."

Rose later (1903) substituted the name *Neotreleasea,* stating that *Treleasea* had already been used by Spegazzini for another genus. He included the same species as he had done previously. Then he appended a note concerning *Treleasea pumila* (Greene) Greene (*Zebrina pumila Greene*). He excluded it from his genus *Neotreleasea*, stating that he had seen the type and that " . . . its relationships are more nearly with true *Zebrina*. The two have in common a terminal cluster of flowers subtended by a two-leaved spathe, a narrow tubular corolla, and widely separated anther-cells, etc."

Thus we find Greene transferring his species to Rose's genus, and Rose subsequently excluding it. Woodson places *Neotreleasea* in *Setcreasea* while Matuda (1955) does not mention this species in his treatment of *Setcreasea*, but he does exclude it from *Zebrina*. From Matuda's treatment it would seem that he does not know the species through actual study, but only through reference to the literature. It seems probable that it has not been recollected until found by the author in 1956. No material has been found at the Gray Herbarium, the U. S. National Herbarium or the Chicago Natural History Museum according to their respective curators to whom the author is grateful for aid.

This taxon has separate sepals as does *Setcreasea*, but has a long, strongly-united corolla tube and long connectives similar to *Zebrina*, and glabrous filaments, sometimes shorter than the connectives, which is characteristic of neither.

Four possibilities seem to occur for the disposition of this species: (1) to place it in *Setcreasea* (*sen. lat.*) as a distinct species; (2) to place it in *Zebrina* as a distinct species; (3) to consider it a connecting link between the two genera and unite them; and (4) to create for it a new genus. The author has concluded that the latter alternative seems to be a logical one.

**Separotheca**, gen. nov. Commelinacearum. Herbae erectae; caulibus annuis ex radicibus succulentis perennibus; foliis ovato-attenuatis vel linearibus; sepalis 3, distinctis, hyalinis vel subhyalinis; corollae tubo et lobis aequalibus vel subaequalibus; staminibus 6, ad basim corollae lobis affixis; filamentis glabris; connectivis quam filamentis latioribus, nunc brevioribus, nunc longioribus; fructibus siccis, stylis filiformibus, stigmatibus capitatis; seminibus 5, angulatis.

**Separotheca pumila** (Greene) Waterfall, comb. nov. based on **Zebrina**

(?) **pumila** Greene, Pittonia 1: 157–158. 1888: **Treleasea pumila** (Greene) Greene, Pittonia **4**: 225. 1900.

Stems short, 3–7 cm. tall, annual from elongate tuberous roots; stems and leaves glabrous; stem simple, or branching from the first or second node; first leaf 8–15 mm. long, ovate to ovate-lanceolate; second leaf 2–4 cm. long, ovate-caudate to linear-lanceolate; sometimes a longer third leaf present; bracteal leaves 1.5–5 cm. long, usually longer than the leaf below it, ovate-attenuate to ovate-caudate; flowers few; sepals distinct, subhyaline to hyaline, especially on their margins, pilose along midribs and at apices; corolla pink, 11–15 mm. long, basal half united into a tube, lobes ovate to ovate-lanceolate; stamens 6, fertile; filaments 1–3 mm. long, filiform to flattened, inserted on lower part of corolla lobes; connective 1–6 mm. long, flattened, wider than the filaments, inverted V-shaped, sometimes longer than the filaments; styles filiform; stigmas capitate; fruit a capsule; seeds 5, ca. 2 mm. long and 1.5 mm. wide, more or less angulate, dark brown.

In addition to the type, the following collections have been seen, all from the Sierra Madre; **Waterfall 12673**, shallow soil on rock strata in pine forest, 5 miles west of El Salto, Durango, Aug. 11, 1956; **Waterfall 12704**, open pine woods, wet flats, 24 miles west of El Salto, Durango, Aug. 12, 1956. — DEPARTMENT OF BOTANY AND PLANT PATHOLOGY AND THE RESEARCH FOUNDATION, OKLAHOMA STATE UNIVERSITY, STILLWATER, OKLAHOMA.

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# NATURAL HYBRIDIZATION OF HELIANTHUS LONGIFOLIUS WITH H. ATRORUBENS AND H. OCCIDENTALIS[1]

DALE M. SMITH AND WILLIAM C. MARTIN

Several studies of natural hybridization between species of *Helianthus* have been made in recent years. Many natural hybrids have been reported and most of them have been substantiated by controlled crossing. In general, whenever two diploid species grow in close proximity under disturbed conditions, local hybrid swarms result. The gene flow may be restricted as in the case of *Helianthus divaricatus* × *H. microcephalus* (Smith and Guard, 1958), or extensive introgression may occur as in *H. annus* × *H. bolanderi* (Heiser, 1949). Regardless of the extent of hybridization, all of the previously described examples have dealt with pairs of species.

In September of 1957, a mixed population consisting of four species of *Helianthus* was found one mile northeast of Albertville, Alabama. These species were *H. microcephalus, H. longifolius, H. occidentalis,* and *H. atrorubens.* Putative hybrids of *H. longifolius* × *H. atrorubens,* and *H. longifolius* × *H. occidentalis* were discovered, but *H. microcephalus* apparently had not hybridized with the other species. The area in which the mixed population was found was a relatively new highway embankment bordering a small scrub-oak woodlot. The four species were more or less aggregated at specific places within the area, and hybrids were found only at the zones where two species overlapped. At the west end of the population there were a few scattered individuals of *H. occidentalis,* and approximately 200 yards distant at the east end of the area was a large population of *H. atrorubens* with scattered individuals of *H. longifolius* between these first two species. *Helianthus microcephalus* was found at the edge of the oak woodlot adjacent to the plants of *H. atrorubens* and *H. longifolius.* While mixed populations of *H. atrorubens* and *H. microcephalus* are quite commonly en-

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countered in many places, the other two species are rarely ever seen in the southeast much less being found in mixed populations. *Helianthus occidentalis* is a common plant of the prairies and sand hills of the midwest from Michigan to Texas, and is occasionally encountered in the southeast. *Helianthus longifolius* is one of the rarest species of *Helianthus,* and its range covers only a small area in the northern parts of Alabama and Georgia, where it typically grows on or near rock outcroppings. *Helianthus atrorubens* and *H. microcephalus* are widely distributed throughout the southeast in a variety of habitats. The reasons for this unusual occurrence of four species in such a limited area are somewhat obscure at the moment, but it seems possible that the plants could have been introduced into the area along with fill material which was used in constructing the embankment, since the plants are perennials and their underground parts could be transported along with soil very easily.

## Procedures

Herbarium specimens and living plants, as well as flower buds for cytological examination were taken from the population. Selected individuals and a random mass collection were pressed for later study. Whole plants were pressed, since the basal material as well as the upper parts of the plants possessed important morphological features for comparison. Herbarium specimens have been deposited at Indiana University and the University of Kentucky. The cytological material was fixed in a mixture of 3 parts ethyl alcohol to 1 part acetic acid for 24 hours, and transferred to 70% ethyl alcohol for storage. Anthers of the appropriate age were squashed in acetocarmine for study.

## Morphology

The species occurring in this population are quite distinct and are not easily confused, although *H. atrorubens, H. occidentalis,* and *H. longifolius* all have the upper cauline leaves reduced, giving the plants a decidedly scapose aspect. The leaves of *H. microcephalus* are essentially similar along the length of the stem except in the inflorescence where they are reduced. The leaves and stems of *H. longifolius* are completely glabrous, so that it too is quite distinct. Actually, only *Helianthus occidentalis* and *H. atrorubens* present a somewhat similar aspect, but the purple disk corollas and obtuse phyllaries of *H. atrorubens* serve to distinguish it quite adequately. The outstanding morphological features of the four species are presented in Table 1. The morphology of the putative hybrids will be considered individually.

### Helianthus longifolius × H. occidentalis

One putative hybrid of this combination was discovered and appeared to be essentially intermediate between the two parents. Especially evident were the modifications of leaf shape and pubescence, the hybrid having narrowly lanceolate leaves which were setaceous on the margin.

### Helianthus longifolius × H. atrorubens

The many usually well defined differences between these two species are, in this population, bridged by hybrid individuals. Considerable variation was encountered in leaf width, phyllary shape, head diameter, disk color and leaf pubescence, which were analyzed in this study, and are summarized in Table 2. The lower stature and more prominent basal rosettes of *H. longifolius* are usually sufficient to separate it from *H. atrorubens* but were not used here because of the great environmental modification of these two characteristics in this population.

LEAF SHAPE. The basal leaves in *H. longifolius* are generally numerous, elongate and linear or narrowly obovate, rarely exceeding one centimeter in width. In *H. atrorubens,* the leaves show considerable variability in shape, but are always many times broader than one centimeter. In this population the hybrids bridge the gap between these two extremes.

LEAF PUBESCENCE. Trichomes are completely lacking in *H. longifolius* except for a few at the tips of the receptacular bracts. In contrast to this, *H. atrorubens* is usually rather harshly pubescent over most of the plant. The leaves of the putative hybrids are characterized by the presence of a few scattered trichomes.

PHYLLARY SHAPE. One of the most outstanding features of *H. atrorubens* is the presence of broad, obtuse phyllaries. Those of

TABLE 1

Comparison of Morphological Features of *Helianthus atrorubens*, *H. occidentalis*, *H. longifolius*, and *H. microcephalus*

| | *H. atrorubens* | *H. occidentalis* | *H. longifolius* | *H. microcephalus* |
|---|---|---|---|---|
| STEM PUBESCENCE | Spreading-hirsute | Strigose | Glabrous | Glabrous |
| LEAF<br>Arrangement | Largely basal | Largely basal | Largely basal | Distributed along stem |
| Shape | Broadly ovate, narrowed to broadly winged petiole | Ovate, narrowed to slightly winged petiole | Linear to linear-lanceolate, gradually tapering to base | Ovate-lanceolate with attenuate tip. petiole distinct |
| Pubescence | Scabrous to hirsute | Scabrous to strigose | Glabrous | Scabrous above, tomentulose beneath |
| Width | 3.5-5.5 cm. | 2.5-4.0 cm. | 0.9-1.5 cm. | 2.5-5.0 cm. |
| PHYLLARY SHAPF | Short, broad, tips obtuse | Narrowly attenuate | Narrowly attenuate or acuminate | Narrowly attenuate or acuminate |
| DISK<br>Diameter | 1.2-1.5 cm. | 0.8-1.3 cm. | 0.9-1.3 cm. | 0.5-1.0 cm. |
| Corolla color | Lobes purple | Lobes yellow | Lobes yellow | Lobes yellow |

*H. longifolius* are linear attenuate while the hybrids' are merely acute.

DISK DIAMETER. The differences here are not pronounced but, in general, the disks of *H. longifolius* are about 1.0 centimeter in diameter whereas those of *H. atrorubens* range up to 1.5 centimeters.

DISK COLOR. A clear cut difference exists here in that *H. longifolius* has disk corollas which are yellow throughout, while *H. atrorubens* has purple-tipped corollas. In the field the putative hybrids appear to have yellow corollas but an examination under the microscope reveals that the hybrids have purple pigmentation on their tips. The pictorialized scatter diagram in figure 1 points out the discordant pattern of variation encountered in the population.

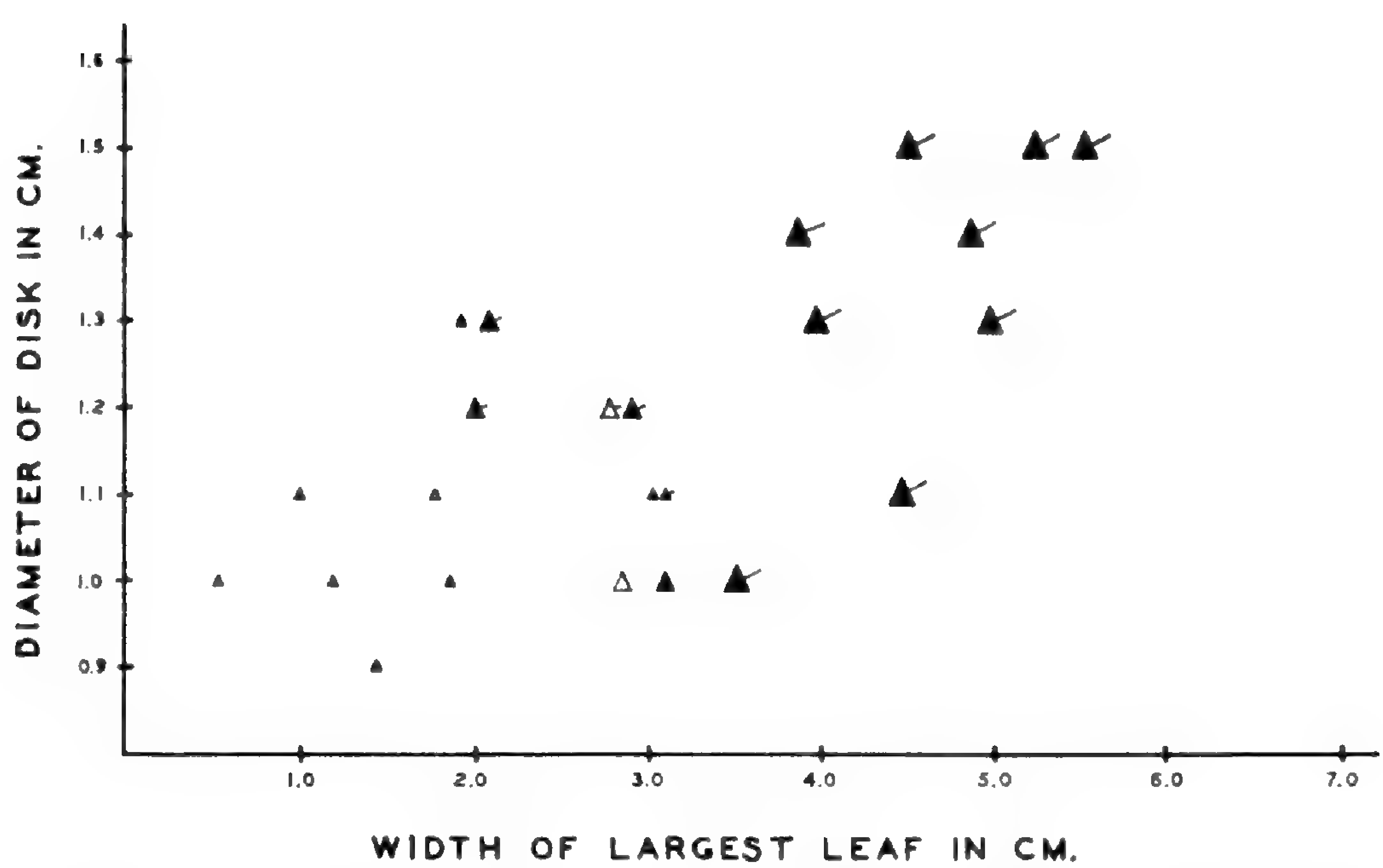


FIGURE 1. Pictorialized scatter diagram of a population sample including *Helianthus longifolius*, *H. atrorubens*, and putative hybrids. The smallest triangles = attenuate phyllaries, largest triangles obtuse phyllaries, intermediate triangles = acute phyllaries. Open triangles = yellow disk corollas, solid triangles = purple-tipped disk corollas. Triangles without a diagonal line on right side = glabrous leaves, with a long line = scabrous or hirsute leaves, with a short line = remotely setaceous leaves.

## Cytology

The chromosome numbers of the species, with the exception of *H. longifolius*, which is reported here for the first time as N=17, have been presented by Heiser and Smith (1955), and are diploid (N=17). Meiosis in the parental species has been reported as normal in all except *H. atrorubens*, in which Jackson and Guard (1957) have reported numerous abnormalities. Plants of *H. atrorubens* which have been grown in the experimental garden have occasionally failed to produce pollen or viable seed, which may be an expression of an abnormal chromosomal condition. This is further suggested by the occurrence of low pollen fertilities in plants from the Alabama population which appear to be "good" *H. atrorubens.*

Table II

Comparison of Morphological Features of *Helianthus atrorubens*, *H. longifolius*, and their Putative Hybrid

| | *H. atrorubens* | Intermediates | *H. longifolius* |
|---|---|---|---|
| LEAF | | | |
| Pubescence | Scabrous or hirsute | Remotely setaceous | Glabrous |
| Width | 3.5-5.5 cm. | 1.6-3.4 cm. | 0.9-1.5 cm. |
| PHYLLARY SHAPE | Short, broad, tips obtuse | Short, broad, tips acute | Narrowly attenuate or acuminate |
| DISK | | | |
| Diameter | 1.2-1.5 cm. | 1.1-1.3 cm. | 0.9-1.3 cm. |
| Corolla color | Lobes purple | Tips of lobes purple | Lobes yellow |

However, in all the plants from this population which have been examined cytologically, parental species and putative hybrids, meiosis was essentially normal. Buds of several putative hybrids were examined, and of 65 microsporocytes examined, 63 showed perfect pairing and only 2 showed abnormal associations in the form of a single chain of 4 chromosomes.

## Discussion

This report of natural hybridization in *Helianthus* is especially interesting in that four potentially hybridizing species are represented in a mixed population. Even though the evidence suggests that only three of the four species have actually hybridized, the stage is nevertheless set for the formation of bizarre types of individuals incorporating genetic material from all four species. That such a phenomenon is theoretically possible, has been verified by three and four species hybrids which have been produced experimentally (Smith, unpublished). The actual discovery of hybrids of this type in nature would have special significance relative to the problems concerning the origin of polyploid species of *Helianthus*. There are several polyploids which show no close resemblance to extant diploid species or to the $F_1$ diploid interspecific hybrids which have thus far been produced. Consequently, it is suggested here that certain polyploid species may have originated from hybrids involving more than two species.

The relatively high fertility and the high degree of chromosome homology of the hybrids of *H. atrorubens* × *H. longifolius* serves to point up the lack of great barriers to crossing between the diploid perennial species of *Helianthus,* even in the presence of a high degree of morphological distinction. Furthermore, the very narrow distribution of *H. longifolius* contrasts sharply with the extensive range of *H. atrorubens,* and ecological differences probably also exist, so that the two species are not found in mixed populations unless they are brought together by disturbing influences. It would appear that genetic barriers have been of minor importance in speciation in this group; therefore, with a complete breakdown of the external barriers separating these species, it is conceivable that an amalgamation of them could occur. As yet, there is little evidence that this is happening even in such a disturbed area as that described here.

## Summary

A mixed population of diploid (N=17) perennial sunflowers composed of *Helianthus atrorubens, H. occidentalis, H. longifolius* and *H. microcephalus* was found in September, 1957, near Albertville, Alabama. One putative hybrid between *H. occidentalis* and *H. longifolius* was found, and no hybrids involving *H. microcephalus* were evident but a large hybrid swarm of *H. atrorubens* × *H. longifolius* was present. These plants were quite variable, with leaf and phyllary characteristics showing

outstanding variation. Very little meiotic abnormality was encountered in the population, although the occurrence of low pollen fertilities in some of the plants suggests that cryptic structural differences in the chromosomes exist. Speciation has apparently proceeded without the development of the sterility barrier, but the external barriers which ordinarily separate them have in this instance been partially broken down by the influence of man. However, even under these conditions there is little indication of the amalgamation of the species in this population.

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Wallpaper Cleaner in the Herbarium. — In a well-kept herbarium, specimen sheets are handled in such a manner that they do not become excessively dirty. However, where collections have been neglected for long periods or are housed in poor cases they may become badly soiled by dust and smoke. This was the case with a rather large number of sheets in the Herbarium of Yale University, most of which had come as gifts and were dirty when received. Specimens of little value may be discarded but valuable collections should, of course, be preserved even though soiled. If the plant is not glued too tightly it may sometimes be removed and mounted on a clean sheet. However, where this is impossible without severe breakage some other method must be sought.

Since most of the soiled areas are usually near the margin of the sheet, it might be feasible to remove it with an art gum eraser. Actually, this tends to smudge and leaves the paper streaked rather than clean.

The idea of using wallpaper cleaner of the pliable putty type occurred to me, and this was tried with very good results. This material can be purchased from most paint or hardware stores and comes in vacuum sealed tins. Several different brands have been used and all proved to be equally satisfactory. When the can is opened, the unused cleaner may be stored in screw-top glass jars to prevent it from drying out. For cleaning a specimen, we use a small portion (about the size of a golf ball) and this is also stored in a screw-top jar. In use, the cleaner must be kneaded thoroughly to keep it pliable and to work the dirt in. It gives satisfactory results until the ball is quite black, when it is discarded for a fresh piece. If there is dust close to the specimen, the cleaner may be rolled into a small cylinder and used like a pencil. Care must be exercised, however, since hairs, flower parts, etc., will adhere to the cleaner and thus be removed.

This method has been used in the Yale Herbarium for the past six months with excellent results. The idea is offered here in the hope that it may be found equally useful by others who have similar problems. — JOHN EBINGER, OSBORN BOTANICAL LABORATORY, YALE UNIVERSITY.

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RHODODENDRON MAXIMUM IN NEW HAMPSHIRE.[1] — The valuable paper by the late C. H. Knowlton (5) on *Rhododendron maximum in New England* unfortunately contains some errors and omissions for New Hampshire. Recently Iltis (4) has quite understandably accepted Knowlton's data and has included his stations on a map covering the range of the species.

In the past few years we have tried to visit all recorded New Hampshire colonies of *R. maximum* and thus have become aware of the faults in recent publications. But before reporting on these, we have wanted to check all possible clues to new stations.

[1] Published with the approval of the Director of the New Hampshire Agriculture Experiment Station as Scientific Contribution No. 232.

Our first comment relates to the colony, chiefly in the township of Pittsfield, which was first reported by R. J. Eaton (2). It was assumed both by Eaton, and until recently, by the senior author of this paper, that a small part of the stand was in Strafford County in the township of Strafford, the remainder or larger part being in Pittsfield. Knowlton, loc. cit. counted this colony as two separate stations presumably because it was reported from two townships and Iltis has perpetuated the error by showing two dots on his map in the vicinity of Pittsfield, New Hampshire. The senior author has visited this area at least a half-dozen times in the years since June 29, 1931 when he was first shown the plants by Robert Varney of Barrington, New Hampshire. These visits, including our most recent one on July 7, 1954, have shown no significant expansion or contraction of the colony in 23 years. In 1954 we made a very careful comparison of map-details with the local topography. It is evident that the plants are not in Strafford County at all and that the nearest plant is somewhat more than 100 feet from the line as shown on the Alton Quadrangle. But it is interesting to note that the colony does extend westward along the hemlock-shaded shore of Adams Pond into the township of Barnstead in Belknap County. Near Adams Pond 3 townships and 3 counties converge and this single small colony of *Rhododendron,* covering possibly half an acre, almost stretches into all of them.

Recent authors have lost sight of the Manchester Rhododendrons though at certain times during the past 60 years they may have been more numerous there than in any other part of New Hampshire. W. E. Moore (6) reported the presence of a tremendous area of Rhododendrons about 2 miles northwest of Amoskeag Falls. Then on December 11, in the same year (1897) F. W. Batchelder wrote an article for the "Manchester Union" entitled "A Day In My Arboretum" in which he commented on the occurrence in Manchester of *Rhododendron,* White Cedar and other interesting species of woody plants. Two years later Batchelder (1), this time, for a more critical audience, discussed the local Rhododendrons. Thus, there is good evidence, in the literature, that our plant occurred in Manchester in some abundance at the turn of the century. More recently the late Reverend Hubert Sheehan, OSB of St. Anselm's College collected material from Black Brook Cedar Bog in Manchester and before this in 1935, Dr. Maurice Provost of Vero Beach, Florida, then a student at St. Anselm's College, discovered another stand from which he collected specimens. The authors of this paper singly or together have now visited both of these stations and in addition have found *Rhododendron* in one other locality within the confines of Manchester. At least 2 of these 3 colonies probably have been separate for a long time. The other 2 occur in distant parts of the same swamp and quite possibly were joined 60 years ago.

With one exception (the Albany station on Mt. Chocorua) we have succeeded in relocating all of the New Hampshire stations listed by Knowlton loc. cit. The evidence is reasonably good in this instance that there was a colony on Mt. Chocorua (3) but from the drastic changes that we have noted taking place in other stands as a result of lumbering operations, swamp-flooding, browsing by deer, etc., it is quite likely that the Rhododendrons there may have been completely destroyed or reduced to a few inconspicuous individuals.

Specimens from all stations visited by the authors have been collected and are to be found either in the Herbarium of the University of New Hampshire or that of the New England Botanical Club. — A. R. HODGDON AND R. PIKE, DEPARTMENT OF BOTANY AND DEPARTMENT OF HORTICULTURE, RESPECTIVELY, UNIVERSITY OF NEW HAMPSHIRE, DURHAM.

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CLAUDE FAVARGER. F:ore et vegetat on des Alps. I. Etage alpin. II. Etage subalpin. 271 & 274 pp., with 32 + 32 planches and 35 + 41 drawings by Paul A. Robert. Delachaux & Niestle S.A., Neuchatel & Paris 1957 & 1958. Price Swiss Fr. 30.00.

FLORA AND VEGETATION OF THE ALPS.[1] — The Alps are among the regions most botanists and all those interested in the vegetation of mountains and northlands want to visit and study, although only a few of those living in distant countries ever get an opportunity to climb the lofty peaks and enjoy the multitude of flowers. The majority has to be content with descriptions by others and they also must study the

[1] CLAUDE FAVARGER. Flore et vegetation des Alps. I. Étage alpin. II.Étage subalpin. 271 & 274 pp., with 32 + 32 planches and 35 + 41 drawings by Paul A. Robert. Delachaux & Niestlé S.A., Neuchâtel & Paris 1957 & 1958. Price Swiss Fr. 30.00.

flora by aid of manuals, pictures, and herbarium material only, adding life just through imagination. This is sometimes a little difficult, especially because of the fact that descriptive books by botanists tend to be as dry as are their herbarium plants. Botanists with the ability to write literary works, leaving their interest in details for a more general and descriptive treatise, are as rare in the Alps as they are elsewhere on the globe.

Recently, one of the best botanists of Switzerland, a man with a wide reputation in modern and classical approaches, has given others of his time and knowledge by writing two delightful volumes on the flora and vegetation of the Alps. This reviewer knows few books which unite botanical correctness with literary language to such a high degree. The many nice pictures, in black and white and color, make it easy for the reader to follow the author, Professor Claude Favarger of the University of Neuchâtel, into the field and study with him the variable flora of these best known and most attractive mountains of Europe.

Although both the volumes are intended for the interested layman rather than for the specialist, there is hardly another treatment available which at the same time gives a more scientific approach to the subject. In the first volume, the alpine milieu is described in detail and the terminology explained, at the same time as the reader is informed about the climate and different kinds of soil to be expected. The typical characteristics and biology of alpine plants in general are masterly reviewed before the Alpine flora and the origin of its elements are discussed in another chapter. Thereafter, the fundamentals of the phytosociological approach to studies on vegetation are given, followed by a description of the particular communities of Alpine plants connected with different kinds of high-alpine conditions, from the rocks to the meadows and mires. The descriptions of these associations are based on their quantitative and qualitative floristic composition, and numerous colored pictures and pen-drawings in the text explain the main features of each community. The last part of the first volume reviews the principal families of Alpine plants, with representative examples.

In the second volume, which is devoted to the subalpine regions, the characteristics and limits of this less easily defined zone are discussed, and the transition zones are considered in a concise but very clear chapter. The subalpine zone in the strict meaning of the term is then described in the same detail as were the communities of the alpine zone in the first volume, with a strong emphasis on climax associations and on some pioneering and specialized communities typical of the somewhat more favorable regions. A short chapter on the Jura Mountains and the western Alps completes the descriptions of the vegetation, while the floristic review covers many of the most interesting subalpine species typical of these parts of the Alps. The volume is completed with a chapter on botanizing in the Alps, in which a plea is made for caution lest rare species be eradicated, and on the protection of the nature of the Alps so that future generations also will be able to enjoy the same beauty observed by present visitors. There is a short bibliography and good indices to both volumes at the end of the second volume.

Although the descriptions in these volumes are based on the flora and vegetation of the Alps, they are of great interest also to those who are concerned with the plants of American mountains, notably those in New England. Naturally, the species are rarely the same, and the communities are also very different and never as colorful here as in the Alps, but the general character of the vegetation is rather similar and its history may also be somewhat comparable in these formerly periglacial mountain complexes.

The delightful volumes by Professor Favarger are a great tribute to the many botanists of the region he treats past and present. The literary abilities of the author and his deep knowledge of the flora and vegetation of his Alps greatly enhance the value of the books. The artist, P. A. Robert, is also worthy of praise, and so is the printer and publisher. The books are to be recommended not only to those interested in mountains in general and the Alps in particular, but also to botanists and botanically minded tourists visiting the Alps. A careful study of the volumes before such a visit will greatly increase its value and also open one's eyes to the many features in botany which nowhere are more distinct and better studied than in the Alps in Switzerland. —

ÁSKELL LÖVE,
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POTENTILLA ANGLICA IN NEW YORK. — For over eight years I have observed in the Bronx and in Brooklyn, New York City, a creeping *Potentilla* that answers to the description of *P. anglica* Laicharding (*P. procumbens* Sibth.). In November, 1956 I observed, but did not collect, the same species in a yard at Great Neck, Nassau County, Long Island. My collections, deposited in the Herbarium of The New York Botanical Garden, are *Monachino s.n.* (6–22–50), formerly the grounds of The New York Botanical Garden, near the Allerton Avenue entrance, June 22, 1950; *s.n.* (10–28–53), (N. Y.), south of the Conservatory, on a lawn near Juniper plantings, at least two major patches, Oct. 28, 1953; *622,* same station, June 30, 1958; also two fragments collected as vouchers and placed in packets are from the Brooklyn Botanic Garden, N. Y. C., on a lawn, June 30, 1956, and June 7, 1958. The species has flowers chiefly 4-petaled and stem leaves predominantly 3-foliolate. It forms a conspicuous, low, dense colony; the repent stems branch and they often root at the nodes; the basal leaves are 5-foliolate, the stem leaves most 3-foliolate. The petioles in the plants examined are up to 3.5 cm. long; the corolla is 10–15 mm. across, the petals are a little longer than the sepals, obovate, slightly emarginate at the apex, bright yellow on the upper side, orange-yellow at the base; the carpels are about 20–25 in number. Many achenes in no. *622* have become enlarged and plump, but are not fully matured. Our plant is the small-flowered form named f. *parviflora* Domin in Wolf's monograph (1908). Clapham et al. (1952) describe the diameter of the flower of *P. anglica* as (10–) 14–18 mm. and the number of carpels as 20–50; they call the plant trailing tormentil. The 4-merous flower (4 petals, 4 sepals, 4 epicalyx segments) easily identifies the species in the standard floras. Rydberg (1908) has it in the small group *Tormentillae,* characterized by the flowers solitary, axillary, on long pedicels, leaflets not tomentose beneath. *P. canadensis* is a neighboring species and from a distance *P. anglica* appears similar, until one approaches and notices that the bright yellow corolla is 4-merous. The colony is conspicuous enough, but "merely a yellow flower on the lawn" does not invite investigation, and it may well pass as any low cinquefoil or even a lady-sorrel or a buttercup.

In Canada the species is known from Labrador, Newfoundland, Cape Breton Island and Nova Scotia, according to Fernald (1950). For the United States it has been reported from only two states. Rydberg (1908) cited it as introduced in California. Dix (1949) was the first to report it from the East. He collected it near Lake Shehawken, Wayne Co., Pa.; he wrote that its identity was confirmed by Fernald, that it was abundant and grew on a somewhat wet rocky slope with the usual pasture grasses and adventives, that it blossomed late in the fall and that the flowers were 10–13 mm. broad. He added that another locality about a quarter of a mile south was discovered in Sept. 24, 1949. The species was again mentioned for Lake Shehawken, as seen on the Torrey Botanical Club trip to the area, by Louis E. Hand in Bull. Torrey Club (1950) 77: 408.

Gleason (1952) does not cite the eastern Pennsylvania station. He persists in using the binomial *P. procumbens* Sibthorp (published in 1794) instead of the earlier *P. anglica* Laicharding (published in 1790); but I have not looked into the matter of nomenclature. Until recently when Laicharding's earlier, but obscure, binomial was revived, the name *P. procumbens* was in uniform use everywhere. Incidentally, in his key Gleason distinguishes the species by its 4-merous flowers from *P. reptans* L. with flowers "all 5-merous" but the illustration of the latter in the same work shows clearly four petals. Also, for one described as having "leaflets 5 or 7" the figure of *P. reptans* too much suggests some trifoliolate leaves. I could not trace the actual specimens from which the illustrations of *P. reptans* and *P. anglica* were drawn for the New Illustrated Flora, but if they were drawn from the proper species, the widely spreading hairs as shown on stems and pedicels of both must have originated in the artist's unchallenged imagination.

As unquestioned as the identity of the species appears from description, I could not check my specimen of *P. anglica* with authenticated European material, and such a comparison would be desirable. It has already been hinted how the trailing tormentil may be overlooked as a common cinquefoil or some other low-growing yellow-flowered plant. I would predict that interested persons thus alerted will discover *P. anglica* elsewhere, particularly on lawns, and will eventually prove it to be fairly widespread in its eastern range. — JOSEPH MONACHINO, NEW YORK BOTANICAL GARDEN.

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Hymenopappus filifolius var. alpestris (Maguire) Shinners, comb. nov.—*H. nudipes* var. *alpestris* Maguire, Amer. Midl. Nat. **37**: 144. 1947. *H. filifolius* var. *nudipes* (Maguire) Turner, Rhodora **58**: 219. 1956. (Illegitimate combination, based on *Hymenopappus nudipes.)* Dr. Maguire published *H. nudipes* and its var. *alpestris* simultaneously. If these are considered to be a single taxon and treated as a variety, it must bear the earliest available epithet in that rank, which is *alpestris.* Dr. Turner insists (personal communications) that since the Code regulation regarding automatic epithets for varieties including the type of the species is retroactive, an automatic var. *nudipes* was also published simultaneously with var. *alpestris.* His new combination is then to be regarded as based on the automatic but hitherto unlisted var. *nudipes.* This is hardly in keeping with the spirit of the regulation which states that automatic epithets have no author. It is definitely contrary to the intention of Dr. Gleason's original proposal (for different wordings see Brittonia **7**: 17, 1949), whose explicit statement that automatic epithets could not be transferred was unaccoutnably omitted from both the Stockholm and Paris versions of the Code. Even if Dr. Turner's contention is accepted, his combination remains illegitimate because he designated *Hymenopappus nudipes* and not var. *nudipes* as basinym. — Lloyd H. Shinners, southern methodist university, dallas, texas.

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# Rhodora

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## A REVISION OF THE HOUSTONIA PURPUREA GROUP (RUBIACEAE)[1]


EDWARD E. TERRELL


The *Houstonia purpurea* group or species-complex includes seven named species: *H. purpurea* L., *H. canadensis* Willd. ex R. & S., *H. tenuifolia* Nutt., *H. longifolia* Gaertn., *H. lanceolata* (Poir.) Britt., *H. montana* (Chickering) Small, and *H. setiscaphia* Carr. These form a unit of closely related species distinct from all others in the genus. Fosberg (1954) placed *H. floridana* Standl. in this group (as a variety of *H. purpurea*), but its stout, woody tap root and "stalked" anthers indicate a much closer relationship to the *H. nigricans* group.

*H. tenuifolia* is occasionally confused with *H. nigricans* (Lam.) Fern. Although both have narrow cauline leaves, they may be distinguished easily by other characters. The former species has many small roots from a short, erect or horizontal, rootstock (a rhizome) and sessile anthers due to adnate filaments; the latter has a stout, woody tap root and anthers stalked by the freedom of the filaments from the corolla-tube.

Fosberg stated in 1937 that the genera *Houstonia* L., *Hedyotis* L., and *Oldenlandia* L. should be merged under *Hedyotis*. He reaffirmed this view in later papers (1941a, 1941b, 1943, 1954). Shinners (1949) accepted these conclusions and transferred Texas


[1]Parts of this study were aided by a Grant-in-Aid from the National Science Foundation administered through the Highlands Biological Station during the summer of 1957, also by the tenure in 1952-53 of a Mary S. Muellhaupt Postdoctoral Scholarship in Botany at the Ohio State University. Appreciation is expressed to Dr. R. T. Clausen (Cornell University) for guidance in early parts of this study, to the curators of herbaria from which loans were granted, and to my wife, Bessie Z. Terrell. Dr. G. M. Schulze (Botanical Museum, Berlin) supplied photographs of the type of *Houstonia canadensis*. Dr. H. L. Blomquist and Dr. R. L. Wilbur (Duke University) made certain suggestions regarding the manuscript.

species of *Houstonia* to *Hedyotis*. In contrast, Fernald (1950) and Gleason (1952) maintained *Houstonia* as a separate genus. In the present paper it is retained as a separate genus, a course I prefer to follow until further evidence is obtained on the many, diverse species comprising the large genus *Hedyotis* (sens. lat.). I have not studied these generic relationships in detail, but my concern has been with relationships within the group that forms the subject of the present paper.

## Morphology and Cytology

Morphological evidence about the *Houstonia purpurea* group has come from herbarium and field studies and the growing of plants in pots and in gardens. Field work was most intensive in the central and southern Appalachians and in southern Ohio. All taxa have been collected and observed in the field over parts or most of their respective ranges. Certain collections have been transplanted and grown for short periods. One outdoor transplant of *H. purpurea* has been observed at intervals over a period of several years. Although it has not been possible to transplant all taxa to the same uniform garden, enough transplants have been made to indicate that morphological differences are primarily genetic rather than primarily environmental. That this is true is borne out by field observations: where two species grew together in nature they maintained their differences.

Many morphological characteristics were investigated to determine how the species differ. About a dozen characteristics turned out to be diagnostic, and these are more or less important, depending on the taxa involved. The species differ slightly in certain floral characters, but these are often inconstant and differ within a species from one population to another. In cases in which more constant floral differences exist these are no better than or are inferior in taxonomic usefulness to vegetative characters.

Over 4000 specimens were examined from the following herbaria (abbreviations from Lanjouw and Stafleu, 1956): University of Cincinnati (CINC); Wiegand Herbarium of Cornell University (CU); Duke University (DUKE); Chicago Natural History Museum (F); Florida Agricultural Experimental Station (FLAS); Florida State University (FSU);

University of Georgia (GA); Gray Herbarium of Harvard University (GH); State University of Iowa (IA); Indiana University (IND); University of Michigan (MICH); Missouri Botanical Garden (MO); North Carolina State College (NCSC); University of North Carolina (NCU); Tulane University (NO); New York Botanical Garden (NY); Oberlin College (OC); Ohio State University (OS); Philadelphia Academy of Natural Sciences (PH); University of Tennessee (TENN); U. S. National Herbarium (US); University of Wisconsin (WIS); West Virginia University (WVA). Other herbaria examined include that of the Great Smoky Mountains National Park and those of Dr. E. Lucy Braun, Mr. C. C. Deam, and Mr. E. J. Palmer.

Cytological data on this genus are largely lacking. For *H caerulea* (not in the *H. purpurea* group) Stevens (1912) reported a gametic number of 16. Fagerlind (1937) corrected this number to 18, and believed this species to be tetraploid since the basic number in the genus is 9.

Chromosome counts made by the writer in 1948 from immature anthers yielded the following data:

| Species | Collection Number | Locality | Chrom. No. |
|---|---|---|---|
| *H. purpurea* var. *purpurea* | 1974 | Black Mountain, Harlan Co., Ky. | g=ca. 9<br>s=ca. 18 |
| | S. J. Smith 5157 | Tuscaloosa Co., Alabama | s=ca. 18 |
| *H. purpurea* var. *calycosa* | 2057 | Clinton Co., Ohio | g=ca. 8–12 |
| Var. *calycosa* (typical) | 1926 | cedar glades, Wilson Co., Tenn. | s=ca. 18 |
| *H. canadensis* | 2058 | Chautauqua Co., N. Y. | s=ca. 18 |
| Intergradant, *H. tenuifolia* — *H. longifolia* var. *compacta* | 1990 | Morgan Co., Ky. | g=ca. 9 |

These data suggested that at least three of the taxa in this complex are diploid.

Sizes of guard cells are sometimes correlated with polyploidy. It was thought that determination of these cell sizes in *Houstonia* might provide an indication of polyploidy. In 1958 measurements of stomatal guard cells were made on dried specimens by the method described by Celarier and Mehra (1958). One to four different collections of the taxa accepted here were tested. Cell sizes were about the same in all taxa except the following: *H tenuifolia* varied from about the same as other taxa to about 30% larger; *H. purpurea* var. *montana* was slightly smaller. The general constancy of cell size was impressive. These results merely suggest further that polyploidy may not be involved in this complex; obviously, no more definite conclusions can be reached.

### Taxonomy of the Group

The most recent revision of this genus was that of Standley (1918), in which the six then known species of the *H. purpurea* group were considered to be separate species. Robinson and Fernald (1908) and Fernald (1950) maintained those in the Gray's Manual range as distinct, although Fernald previously (1940) had questioned whether they should not all be considered as variations of one species, after seeing intergradation in the field in southeastern Virginia. Gleason (1952) upheld their separation, except in the case of *H. lanceolata*. Asa Gray in his Manuals had merged them as varieties of one species. Fosberg (1941a) advocated three species, but later (1954) combined them as Gray had done. The present writer (unpublished M. S. Thesis, Cornell University, 1949) tentatively recognized three species.

That two extreme viewpoints — each a separate species, or all one species — have been held in regard to this complex, is indicative of the nature of the problem it presents. If only typical specimens are examined the extremes are so different that many taxonomists would recognize three or four, or possibly even seven, species. On the other hand, if several hundred specimens of all kinds from throughout the respective ranges are examined, boundaries between taxa become indistinct and their circumscription difficult. In reference to this group in Indiana, C. C. Deam wrote (in correspondence) that generally the collector with a few specimens is able to identify them, but with a larger number, "then it is that you learn that the set are a bunch of renegades and do not conform to any rule or law."

Apparently with the tacit assumption that all of nature is basically orderly, the writer several years ago began studying this problem. After initial attempts at statistical and graphical methods to tame the renegades, the procedures employed evolved into what has been termed the morphological-geographical method. When the group is studied state by state, region by region, local area by local area, and the spatial continuity in morphology is followed, it can be seen that some order obtains and part if not all is not chaotic. Field study has been an important adjunct to this method, for differences and resemblances show up more clearly in the field than in the herbarium.

The present revision is of the basic taxa and does not include details on putative hybrids except where knowledge of these bears directly on taxonomy. A subsequent paper is planned to deal with such plants in more detail and to consider what evidence they provide concerning the origin and recent evolution of this group. Any taxonomic treatment of a species-complex must consider intergrading specimens and putative hybrids. They are what make this a complex; if all species were distinct and non-intergrading, this study would have been completed earlier, the taxonomy being obvious. The intergradant populations are now well enough understood so that future findings about them are not likely to change the taxonomic treatment as presented here.

Present evidence indicates that much of the variation is the result of hybridization. However, two species seem to cross in some localities but not in others, according to observations in the field. Where they do not cross there may be intermediate types of habitats available for intermediate kinds of plants; therefore, there seem to be genetic barriers, or at least non-ecological barriers, present which prevent crossing. All members of this group are heterostylous, a condition which in some other plant groups has been said to favor outcrossing.

In this treatment four species are recognized. Two of these have three varieties each and the other two are merely extremely variable. All species vary irregularly or clinally over their ranges and must be studied throughout their ranges before valid conclusions are forthcoming. Each species intergrades with the others, but not all varieties intergrade.

The term, intergrade, is used here as either a noun or a verb;

when used as a noun it is preferred over the noun intermediate, to indicate not intermediacy but complete intergradation (usually in several characters) between two taxa.

In order to determine how many intergrading specimens there actually are, a check was made of the writer's records of collections in two large eastern herbaria, the U. S. National Herbarium and the Gray Herbarium. From a total of 676 sheets, 78 sheets or 11.5% represent intergrades (to various degrees) between *H. purpurea* and *H. longifolia* var. *compacta.* Such collections are far more numerous than all other kinds of intergrades combined, which are only 3 or 4% of the total; in view of their obvious importance they are discussed in detail below. These percentages are only approximate, as these two herbaria do not contain by themselves a really complete or accurate statistical representation. Comparable figures from herbaria in North Carolina would show more than 11.5% of the kind of intergrade mentioned, and herbaria from certain northern states would show a lower figure. Using the available figures, one arrives at a total figure of 14-15% for intergrades of all kinds. This, however, is misleading, since some collections assigned to definite taxa are atypical, or have minor signs of presumed introgression, or are problematical in some other way.

The more significant kinds of intergrades are as follows (certain other kinds not listed here are cited in the systematic treatment):

1. *H. purpurea* var. *calycosa* — *H. canadensis.* Scattered and local in southern Ohio, central and western Kentucky, and southernmost Indiana.

2. *H. purpurea* — *H. tenuifolia.* Putative hybrids are rather frequent in Missouri and Arkansas, but rarer in the Appalachians. Distribution on Map 4.

3. *H. canadensis* — *H. longifolia* var. *longifolia.* Intermediates occur in northern Illinois (see Map 3 and citations under *H. canadensis*).

4. *H. tenuifolia* — *H. longifolia* var. *compacta.* Occur in eastern West Virginia, eastern Kentucky, and western Virginia (cited under former species).

5. *H. purpurea* — *H. longifolia* var. *compacta.*

These populations, constituting at least 11.5% of the total complex, range from Ohio south into Georgia and Alabama (see Map 4). They are especially numerous in the southeast, where they recur again and again over a continuous land area in South Carolina and Georgia. This regional race may deserve some sort of formal taxonomic recognition, but it seems best to defer such action until more exact data are available on this morphologically heterogeneous group. Plants of these populations vary through the entire gamut of variation from intermediates into both supposed parental taxa. Leaf shapes vary from ovate, like *purpurea,* to narrow-elliptic, like *compacta.* Lower internodes of stems may have long, scattered hairs of the *purpurea* type, or fine, dense, grayish puberulence of the *compacta* type, or both types of vestiture may be intermixed on one plant. Mass collections from South Carolina and Georgia often include plants with a variety of leaf shapes and stem vestitures. Plants from the sandhills of the Carolinas and Georgia tend to be more like var. *compacta* and grade into it imperceptibly, while plants from the piedmont tend to be more like *H. purpurea* and likewise grade into it. All of these kinds of populations usually occur in disturbed or secondary habitats. In populations from locations north of the Carolinas it is sometimes very difficult to judge whether intermediate types of plants may not actually be apparent hybrids between *H. purpurea* and *H. tenuifolia,* but it is unlikely that these would constitute more than 20% of all collections placed in the present grouping. (Intergrades in this present grouping have been annotated generally by the writer in the past as between *H. purpurea* and *H. tenuifolia,* because it was earlier believed that *H. longifolia* var. *compacta* should be considered a subspecies of *H. tenuifolia.*).

The various types of intergrades listed above and those cited elsewhere are not the only kinds of problematical populations in this complex. To assign a certain collection to one taxon is sometimes arbitrary; in some of these cases the plants appear to be introgressants — more variable due to the influence of genes from another taxon. Certain other populations suggest hybrid derivation among three basic taxa. The solution of all such problems posed by this complex would seem to depend ultimately on the use of detailed graphical and statistical methods along with transplant experiments and cytological studies.

It may be asked whether the *H. purpurea* group should not, as has been done by Gray and by Fosberg, be treated as one extremely variable species with several subspecies or varieties. To the present writer the following reasons are to be included among those favoring treatment of the extremes as separate species:

1. The four species in their extremes differ from each other by several well-marked morphological characters.

2. Many populations of the basic taxa occupy large extents of land over which they retain their essential distinctness in spite of a certain amount of intergradation.

3. Two species seem to cross in some geographic areas but not in others; therefore, isolating mechanisms exist between them under certain circumstances.

4. Certain taxa occur sympatrically. In this case they usually occupy somewhat different habitats but may occasionally grow together.

The situation in the *H. purpurea* group is comparable to that in the *Gilia tenuiflora-latiflora* group, as described by Grant (1957). The latter aggregate is a syngameon, a term which according to Grant (p. 67) "is the sum total of species or semispecies linked by frequent or occasional hybridization in nature; a hybridizing group of species; the most inclusive interbreeding population." In the case of the *Houstonia purpurea* complex we do not know definitely that hybridization is the cause of the variation. However, the general similarity of its patterns of variation to those in the *Gilia* group is striking. Grant stated (p. 63) that "treatment of *Gilia tenuiflora*, *G. latiflora*, and *G. cana* as a single species would obscure rather than accurately portray their relationships". The present writer feels that the same is true of the *Houstonia purpurea* group.

## Systematic Treatment

The following description includes the more fundamental characteristics of the *Houstonia purpurea* group as well as the less fundamental ones which all four species have in common.

The taxonomic status of this group in the genus as a whole is in doubt until other species have been studied.

Flowers heterostylous. Corollas funnelform. Anthers sessile or with filaments free from corolla-tube as much as 1 mm.; anthers linear to oblong, 0.7–1.6 mm. long in thrum[2] flowers, 0.3–1.2 mm. long in pin flowers. Styles 1.3–2.2 mm. long in thrum flowers, 3–8 mm. long in pin flowers. Stigmas linear to oblong, 0.2–1.0 mm. long in thrum flowers, 0.5–1.30 mm. long in pin flowers. Capsules subglobose, slightly compressed, (¼–) ½ (–¾) inferior truncate or rounded or emarginate at apex. Seeds few — 35 per capsule, subcrateriform, oblong or roundish or angular, black, reticulate-pitted; hilum centered in concavity and ¼–¾ as long as entire seed.

KEY TO THE HOUSTONIA PURPUREA GROUP[3]

A. Median cauline leaves ovate or lanceolate, widest toward the base or at the middle: if ovate then 6–34 mm. wide and 1–3.2 times longer than wide; if lanceolate (4–10 mm. wide and L/W ratio 3.3–6) *then with calyx-lobes 4–7 mm. long.*

B. Calyx-lobes 1–3.9 mm. long; median cauline leaves broad-ovate to ovate-lanceolate, 1–3.2 times longer than wide.

C. Lowest internodes sparsely to densely pubescent (with hairs usually at least 0.4 mm. long) or hirsutulous or glabrate; median internodes 2–9 cm. long; median cauline leaves 10–60 mm. long, 6–34 mm. wide; corollas light purple or white.
1a. *H. purpurea* var. *purpurea.*

CC. Lowest internodes glabrous or stems only slightly pubescent on lower nodes; median internodes 0.5–4 cm. long; median cauline leaves 8–30 mm. long, 6–13 mm. wide; corollas deep purple; plants from summits of Roan Mt., N.C.-Tenn., and Grandfather Mt., N.C.
1b. *H. purpurea* var. *montana.*

BB. Calyx-lobes 4–7 mm. long; median cauline leaves varying from narrow-lanceolate to broad-ovate, 1–6 times longer than wide.
1c. *H. purpurea* var. *calycosa.*

AA. Median cauline leaves elliptic or obovate or linear, widest at the middle or near the apex or about equally wide for most of their lengths, or if narrow-lanceolate then calyx-lobes less than 4 mm. long; these leaves 1–6 (–8.5) mm. wide.

D. Basal leaves definitely ciliolate and pubescent above (glabrate in plants occurring locally in southcentral Ohio), present during flowering and fruiting; stems with 3–6 internodes; lower and/or middle internodes usually much longer than upper ones; median cauline leaves oblonceolate, obovate, or elliptic, 2.5–6 times longer than wide; calyx-lobes 1.6–3.5 (–4.5) mm. long . . . . . 2. *H. canadensis.*

[2]In heterostylous flowers, thrum refers to exserted anthers and included style and stigma; pin flowers have exserted style and stigma and included anthers.

[3]Excluding intergrading specimens.

DD. Not as above in all particulars.

E. Lowest internodes densely and finely cinereous-puberulent, with all hairs uniformly less than 0.4 mm. long, or densely papillose-puberulent, or if glabrous then median cauline leaves 9 or more times longer than wide.

F. Stems with 3–9 (–11) internodes; median internodes 3–8 cm. long; median cauline leaves linear to narrow-elliptic, 7–20 or more times longer than wide; fertile branches usually with only 1–3 nodes and elongate (to 20 or even 28 cm. long); inflorescence very diffuse and open; calyx-lobes usually less than 2 mm. long and not or scarcely exceeding capsules; mature capsules 1.5–2.5 mm. long . . . . . . . . 3. *H. tenuifolia.*

FF. Stems with 6–13 internodes; median internodes 1–4.5 cm. long; median cauline leaves narrow-elliptic, narrow-lanceolate, narrow-oblong, to linear, 4–11 times longer than wide; fertile branches usually with 2–several nodes and to 12 cm. long; inflorescence not diffuse and open; calyx-lobes 0.5–3.1 mm. long, always exceeding mature capsules; mature capsules 1.8–3.0 mm. long. 4b. *H. longifolia* var. *compacta.*

EE. Lowest internodes not as above.

G. Stems with 4–7 internodes, glabrous to somewhat pubescent or scabrous; New England, Great Lakes region, and Canada. 4a. *H. longifolia* var. *longifolia.*

GG. Stems with 6–13 internodes, glabrous or short-pubescent only at nodes; southwestern North Carolina and adjacent Georgia and South Carolina . . . . 4c. *H. longifolia* var. *glabra.*

NOTE: *H. longifolia* var. *compacta* and var. *glabra* in most of the herbaria examined in the present study have been annotated by the writer as *H. tenuifolia* (see discussion of relationships under the systematic treatment of the last species).

1. **Houstonia purpurea** L. Sp. Pl. 1:105. 1753.

Perennial herbs. Rhizomes simple or branched, horizontal or erect, sometimes subligneous, shortened or longer and more slender, to 5 cm. long, bearing many small roots. Stems erect or ascending, one-many, tetragonal and slightly winged, 0.4–4.5 dm. high, sparsely to densely pubescent to villous-pubescent below, especially at nodes, with multicellular hairs to 1.5 mm. long, or stem glabrous. Internodes numbering 4–12; median internodes 0.5–9.5 cm. long. Stipules lanceolate to deltoid, entire, irregularly toothed, or erose, often with dark glands at apices of teeth, obtuse, acute, or acuminate, to 5 mm. long, to 5.5 mm. wide. Basal leaves forming a rosette in winter, usually withered at time of flowering, rarely present, varying from oval to spatulate, tapering into petiole shorter than to rarely longer than blade, to 3.8 cm. long, to 1.3 cm. wide, glabrous below, pubescent or glabrous above, sometimes ciliolate. Cauline leaves 3–7 nerved; lower leaves sessile or short-petiolate, oblanceolate to ovate; median leaves sessile, broad-ovate and subcordate to narrow-lanceolate, 0.8–6.3 cm. long, 0.4–3.4 cm. wide, 1–6 times longer than wide, glabrous or pubescent on nerves below, pubescent to glabrous above, ciliolate to glabrous on margins; upper leaves similar to median leaves, reduced in size and becoming bract-like in inflorescence. Branches ascending to spreading, to 19 cm. long, usually arising from uppermost 1–4 nodes, forming an open to rather compact, few to many flowered inflorescence. Pedicels slender, less than 8 mm. long. Calyces glabrous to sparsely pubescent or hirtellous; calyx-lobes erect or spreading, linear-lanceolate to ovate, 1.0–7.0 long, 0.3–3.0 mm. wide, 1/4 as long to slightly exceeding corolla-tubes, equalling to considerably exceeding mature capsules. Corollas purplish to white or deep purple, 4–12 mm. long, granular to densely pubescent within; corolla-tubes 2.0–6.8 mm. long, 1.5–4.0 mm. wide distally; corolla-lobes 1.5–5.0 mm. long, 1.0–2.5 mm. wide. Mature capsules longer than wide, wider than long, or equal, 2.0–4.0 mm. long, 2.0–4.0 wide. Seeds 0.70–1.65 mm. long, 0.50–1.20 mm. wide.

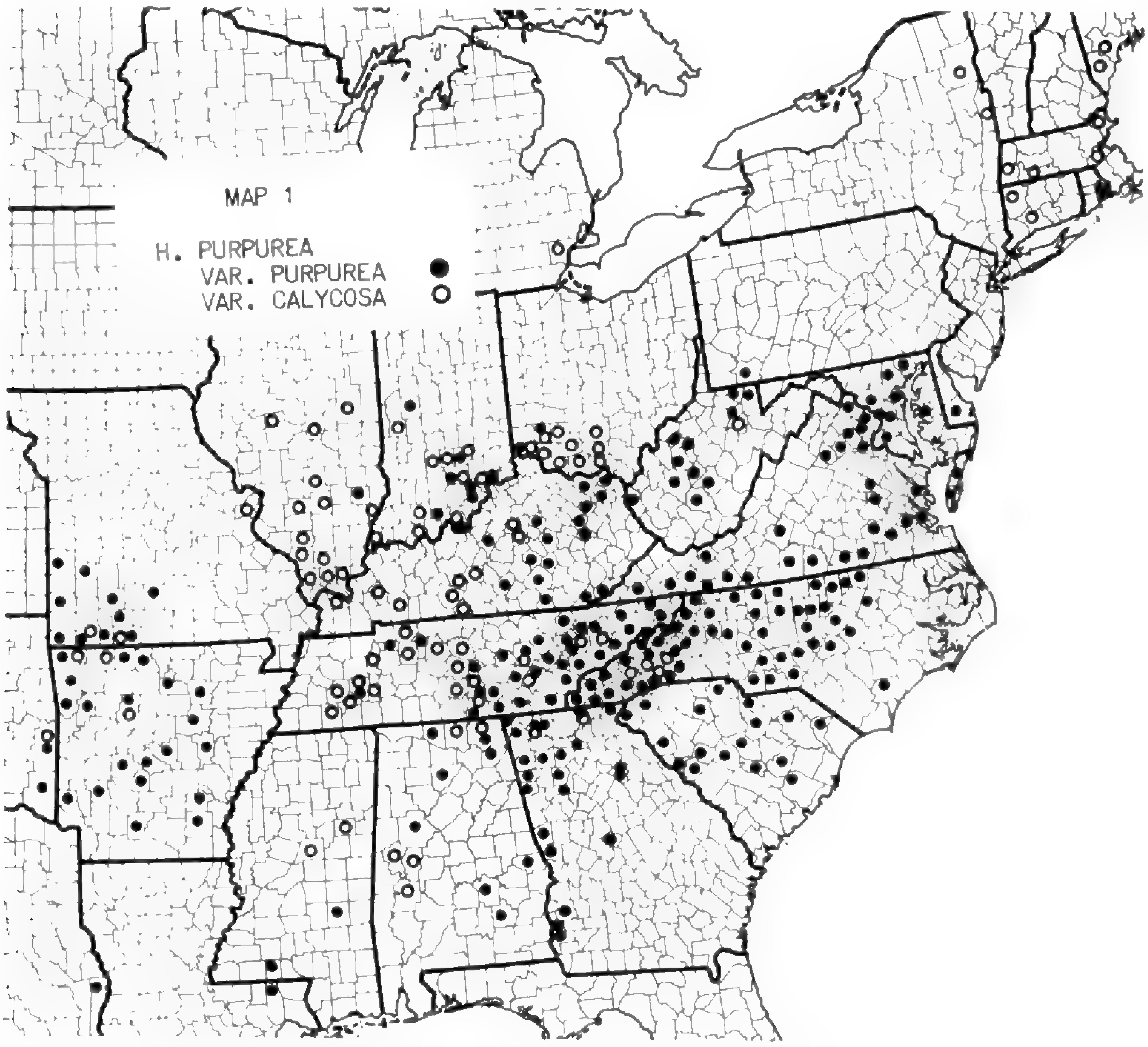
A discussion of the relationships among the three varieties of this species appears below under the individual varieties.

### 1a. **Houstonia purpurea L. var. purpurea**

*Hedyotis umbellata* Walt. Fl. Car. 85. 1788.
*Houstonia varians* Michx. Fl. Bor. Am. 1:86. 1803. (in part). (Type in Mus. d'Hist. Nat., Paris; photograph of type in Gray Herbarium).
*Knoxia purpurea* (L.) Lam. ex Poiret, Lam. Encyc. Meth., suppl. 3:225. 1813.
*Houstonia latifolia* Willd. ex Roem. & Schult. Syst. Veg. 3:527. 1818.
*Anotis purpurea* (L.) G. Don, Gen. Hist. 3:535. 1834. (in part).
*Hedyotis purpurea* (L.) T. & G. Fl. N. Am. 2:40. 1841.
*Oldenlandia purpurea* (L.) Gray, Man. ed. 2. 173. 1856.
*Houstonia purpurea* L. var. *pubescens* Britton, Mem. Torr. Bot. Club 4:125. 1894.
*Chamisme purpurea* (L.) Nieuwl. Am. Midl. Nat. 4:92. 1915.
*Houstonia purpurea* L. f. *pubescens* (Britt.) Fern. Rhod. 38:444. 1936.
*Hedyotis purpurea* (L.) T. & G. var. *purpurea* f. *pubescens* (Britt.) Fosberg, Castanea 19:33. 1954.

Rhizomes to 2.5 cm. long. Stems 1.0–4.5 dm. high, sparsely to densely pubescent (or rarely glabrate), with hairs (0.3–) 0.4–1.0 (–1.5) mm. long. Internodes numbering (4–) 5–8 (–9); median internodes (1.8–) 2.0–5.5 (–9.5) cm. long. Median cauline leaves broad-ovate and subcordate to lanceolate-ovate, (1.0–) 2.5–5.0 (–6.3) cm. long (0.6–) 1.2–3.0 (–3.4) cm. wide, 1–3.2 times longer than wide, pubescent to rarely glabrate above, ciliolate to glabrate on margins. Calyx-lobes linear-lanceolate to ovate-lanceolate, (1.0–) 2.0–3.9 mm. long, 0.3–1.2 mm. wide, usually less than 3/4 as long as corolla-tubes, equalling or slightly exceeding mature capsules. Corollas purplish to white, (4–) 5–8 (–10) mm.

long. Mature capsules 2.0–3.5 mm. long, 2.0–3.5 wide. Seeds 0.70–1.20 mm. long, 0.50–1.00 mm. wide.




MAP 1. Distribution of two varieties of *Houstonia purpurea.*

*Time of flowering:* April or May through July or August, sometimes continuing into September.

*Type locality:* "Habitat in Virginia."

*Type:* Linnaean Herbarium. Sketch of type in Gray Herbarium; of two plants on the type sheet only the one on the right side is considered to be the type of var. *purpurea.*

*Habitats and distribution:* Moist and dry woods, openings, and borders of woods; roadsides; banks; cliffs; meadows; other secondary habitats. Ranges from Fayette County, Pennsylvania and Maryland south to southwestern Georgia, west across Alabama and Mississippi to Arkansas and easternmost Oklahoma, north into southwestern Missouri, east to southern Ohio. Within these boundaries it occurs in all states and all physiographic provinces. There are very few collections, however, from the Mississippi Embayment. It is centered in the Appalachians and Ozarks, where it is present in more abundance than elsewhere. (Map 1).

In its typical form var. *purpurea* is unique in its ovate or broadly ovate leaves and short calyx-lobes. It is the most abundant and widely distributed variety in this complex. Other comments about it are noted under var. *calycosa*.

REPRESENTATIVE SPECIMENS: **Pennsylvania.** FAYETTE: Ohiopyle, *Ricker 1225* (US). **Maryland.** TALBOT: 5 mi. NE of Easton, *Tatnall 2964* (GH). **Virginia.** BRUNSWICK: S of Lawrenceville, *Fernald 14855* (GH, PH, US). GRAYSON: near Troutdale, *Gleason 8773* (NY). SUSSEX: SW of Burt, *Fernald & Long 6399* (GH, NY, US). **West Virginia.** CLAY: 1 mi, N of Clay, *Core 6343* (WVA). ROANE: Spencer, *W. Va. Bot. Exped.*, 21 June 1928 (GA, WVA). **North Carolina.** ALAMANCE: E of Burlington, *Oosting 33544* (DUKE). DURHAM: 5 mi. SW of Durham, *Wiegand & Manning 2999* (CU, GH); Eno River, *Oosting 3383* (OC). JOHNSTON: 2 mi. N of Clayton, *Fox & Godfrey 1668* (GH, IA, NCSC). PENDER: 10 mi. N of Burgaw, *Godfrey 6591* (GH, US). **South Carolina.** CLARENDON: 14 mi. S of Manning, *Godfrey & Tryon 984* (F, GH, MO, NY, US). EDGEFIELD: 4 mi. WSW of Owdoms, *Radford 22640* (NCU). MARION: S of Britton Neck, *Bell 7833* (NCU). **Georgia:** CHEROKEE: W of Canton, *Duncan 8387* (GA, IA, MO, NCSC). EARLY: W of Hilton, *Thorne 3881* (CU, IA). **Alabama.** CULLMAN: *Biltm. Herb. 519m.* (US). **Indiana.** JACKSON: ½ mi. E of Chestnut Ridge, *Deam 33524* (IND). **Kentucky.** CARTER: near Cascade Caverns, *Smith et al 3535* (GH, US). **Tennessee.** BLOUNT: Abrams Creek Ranger Station, *Sharp 17482* (TENN). COFFEE: Rutledge Falls near Tullahoma, *Sharp et al 4713* (TENN). KNOX: Knoxville, *Ruth 3598* (NY). **Missouri.** BARRY: Eagle Rock, *Bush 45* (F, MO, NY, US). CHRISTIAN: 3 mi. SW of Chadwick, *Steyermark 23155* (F, MO, NY, TENN, WIS). **Arkansas.** DREW: Monticello, *Demaree 19111* (CU, FSU, MO, NY, TENN, WIS). LINCOLN: Star City, *Demaree 19164* (GH, NY). **Louisiana.** TANGIPAHOA PARISH: 10 mi. E of Kentwood, *Ewan 18704* (NO). **Oklahoma.** LEFLORE: near Page, *Palmer 21593* (NY, Palmer). **Texas.** NEWTON: 24½ mi. NW of Deweyville, *Cory 22373* (GH).

1b. **Houstonia purpurea** L. var. **montana** (Small), n. comb.
*Houstonia montana* Small, Fl. S.E. U.S. 1325. 1903.
*Houstonia purpurea* var. *montana* Chickering, ibid. (as synonym).
*Hedyotis purpurea* (L.) T. & G. var. *montana* (Small) Fosberg, Castanea 19:33. 1954.

Rhizomes to 5 cm. long. Stems 0.4–2.1 dm. high, glabrous or short-pubescent at nodes. Internodes numbering (4–) 5–8 (–9); median internodes 0.5–3.0 (–4.4) cm. long. Median cauline leaves ovate, 0.8–3.0

cm. long, 0.6–1.3 cm. wide, 1–2.5 times longer than wide, glabrous to slightly pubescent above, glabrate or glabrous on margins. Branches less than 4 cm. long. Calyces glabrous; calyx-lobes ovate-lanceolate, lanceolate, or ovate, 1.0–3.1 (–4.5) mm. long, 0.6–1.2 (–3.0) mm. wide, usually less than three-fourths as long as corolla-tube, equalling or slightly exceeding mature capsules. Corollas deep purple, 8–12 mm. long. Mature capsules 2.0–4.0 mm. long, 2.0–4.0 mm. wide. Seeds (from one collection) 1.40–1.65 mm. long, 0.90–1.20 mm. wide.

*Time of flowering:* June through August or September.

*Type locality*: Roan Mountain, North Carolina.

*Lectotype:* J. W. Chickering, Jr., September 12, 1877. (NY!). Duplicates: (F!, PH!)

*Habitats and distribution:* Crevices of exposed rocks and in moist loam on rhododendron bald, Roan Mountain, N. C.-Tenn., and among rocks on Grandfather Mountain, N. C. Known only from summits of these two mountains, at altitudes of about 6000 feet (1829 meters).

The specimen I have chosen as lectotype appears to be the original collection by Chickering, which led Small to publish on this taxon. Chickering's collection label bears the identification, *H. purpurea* L. var. *montana.* He "proposed" the epithet but did not ever publish it in any combination. Small considered the taxon a species and published the varietal combination only as a synonym, which did not constitute valid publication (Art 37, Paris rules). In regard to the correct citation for the varietal combination Fosberg's comments (1954, p. 33) are pertinent.

Var. *montana* differs from var. *purpurea* as follows: stems are glabrous or nearly so; internodes are shorter; leaves smaller; corollas larger and colored deep purple; calyx-lobes, capsules, and seeds are larger. It is obvious that var. *montana* may, in most characteristics, be merely a high altitude, dwarfed form of var. *purpurea.* However, until this is proven by transplant experiments or by other means, it seems preferable to retain it as a variety. The rarity of occurrence also tends to favor the present course; there are a number of other mountain tops with high altitude balds and exposed rocks — why does not var. *montana* occur on these? Var. *purpurea* is common at such altitudes on other mountains in the southern Blue Ridge, but has not been seen by the writer in habitats as exposed as those on Roan and Grandfather Mountains.

REPRESENTATIVE COLLECTIONS: **Roan Mountain.** (summit is on border, Mitchell Co., N. C.–Carter Co., Tenn.). Some early collections are: *Gray & Carey,* July 1841 (GH) (first known collection); *Vasey,* 1878 (NY, US); *Gray, Sargent, Redfield, & Canby,* 19 June 1879 (GH, NY, PH); *Chickering,* 5 July 1880 (F, MO, NCU, US); *Porter,* 9 July 1880 (PH); *J. D. Smith,* 10–16 July 1880 (F, US). Some later collections include: *Ball,* 15–17 Sept. 1884 (IA, OC, PH, WIS); Lyon's Bluff, elev. 6350 ft., *Small & Heller,* 16 July 1891 (F, MO, NY, PH, US); summit, *Blomquist 4961* (DUKE); near Roan High Bluff, *Shanks 3008* (FSU, TENN, US). **Grandfather Mountain.** (summit on border, Avery-Watauga Cos., N. C.). *Heller,* 11 Aug. 1890 (F, MO, NY); *Small & Heller 72,* 6 Aug. 1891 (CU, F); *Churchill,* 18 June 1899 (GH, TENN); *Stewart,* 6 July 1938 (NCU, NY).

1c. **Houstonia purpurea** L. var. **calycosa** Gray, Syn. Fl. 1 (2) :26. 1884.
*Hedyotis lanceolata* Lam. ex Poiret, Lam. Encyc. suppl. 3:14. 1813.
*Anotis lanceolata* (Poir.) DC. Prodr. 4:433. 1830.
*Houstonia macrosepala* Nutt. ex T. & G. Fl. N. Am. 2:40. 1840. (as synonym of an unnamed variety of *Hedyotis purpurea*).
?*Diodia Frankii* Steud. & Hochst. Abh. Böhm. Ges. Wiss. V. 3:86. 1843. (as synonym; this publ. not seen).
?*Spermococe lanceolata* (Poir.) Frank, ibid. (as synonym).
?*Hedyotis Frankii* Presl, Bot. Bemerk. 86. 1844. (as synonym; publ. not seen).
*Hedyotis calycosa* Shuttlew. ex Gray, Pl. Wright. 1:81. 1852. (as synonym).
*Houstonia calycosa* (Shuttlew. ex Gray) C. Mohr, Contr. U. S. Nat. Herb. 6:739. 1901.
*Houstonia lanceolata* (Poir.) Britton, Man. 861. 1901.
*Houstonia lanceolata* f. *albiflora* Standl. Rhod. 34:177. 1932.
*Hedyotis purpurea* (L.) T. & G. var. *calycosa* (Gray) Fosberg, Castanea 19:33. 1954.
*Hedyotis purpurea* var. *calycosa* f. *albiflora* (Standl.) Fosberg, loc. cit. 34. 1954.

Rhizomes to 2.5 cm. long. Stems 1.0-4.5 dm. high, pubescent to glabrate, usually sparsely pubescent. Internodes numbering 5–12: median internodes (1.8–) 2.0–5.5 (–9.5) cm. long. Median cauline leaves 3–5 nerved, lanceolate to narrow-lanceolate, 1.7–3.3 cm. long, 0.4–1.0 cm. wide, 3.3–6 times longer than wide, pubescent to glabrate above, ciliolate to glabrate on margins. Calyces glabrous to pubescent: calyx-lobes linear-lanceolate to lanceolate, 4.0–7.0 mm. long, 0.3–1.2 mm. wide, one-half as long to slightly exceeding corolla-tubes, considerably exceeding mature capsules. Corollas purplish to white, (4–) 5–10 mm. long, tending to be pubescent within; corolla-tubes tending to be more widely flared than in var. *purpurea*. Mature capsules 2.0–3.5 mm. long, 2.0–3.5 mm. wide. Seeds 0.70–1.20 mm. long, 0.50–1.00 mm. wide.

*Time of flowering:* April or May through June or July, rarely August.

*Type and type locality:* The lectotype, collected by Rugel, is inscribed, "Hedyotis calycosa Shuttl. n. sp. In montibus prope Huntsville, Alabama, legit Rugel, Oct. 1843." (GH!; duplicate in NY!).

*Habitats and distribution*: Cedar glades, barrens, dry or somewhat mesic woods, rocky open places, fields. Scattered and local in New England; Wayne County, Michigan; Barbour County, West Virginia; southern Ohio south to northern Georgia, and Alabama, west to Missouri, Oklahoma, and Arkansas, north to central Illinois and central Indiana. Centered in the Interior Low Plateau (Fenneman) and adjacent Provinces. (Map 1)

In the treatment of this complex all names relating to white-flowered forms have been reduced to synonymy. It seems desirable to recognize color forms only when there is discontinuity in color. In all taxa of this group corolla color varies among colonies or within one colony or even among different flowers on the same plant. Color varies imperceptibly from purple or pink-purple to white through various intermediate degrees of purplish tinges and lines on a white background color. White-flowered plants are of frequent occurrence. The name, *H. purpurea,* is a misnomer, since this species often has white flowers.

In regard to the nomenclature of the present variety, it seems clear that under Art. 60, Paris rules, the combination adopted here is correct as it is the earliest in the rank of variety. Although the name, *Hedyotis calycosa,* is invalid (it was published only as a synonym, that does not mean that the combination, *Houstonia purpurea* var. *calycosa,* is illegitimate (Arts. 69 and 72 seem to bear on this point). Gray's description of this variety is adequate. In choosing a type specimen it seems desirable to fix the application of the epithet, *calycosa*, by going back to the original specimens to which this epithet (in an invalid specific combination) was applied. For this reason the lectotype listed above was chosen; it is rather typical of the natural populations included in the present variety.

Gray's Manual, 8th edition, states that the capsules of var. *purpurea* are broader than high, those of var. *calycosa* as high as broad, but this distinction does not hold when large numbers of specimens are examined. The Manual also states that calyx-lobes in the latter variety range in length from 5 to 9 mm. The longest lobes seen during the present study were not more than 7 mm. long.

The main differences between these two entities are in length of calyx-lobes and in shape of median cauline leaves; the former character is the more important. To deal with the former character it is preferable to use the absolute length of lobes rather than the ratio, calyx-lobe length to corolla-tube length, because corolla length may vary considerably as a result of environmental influence, whereas lobe length is much less subject to such influence. In addition to the two main differences in these varieties, other lesser differences also exist: var *calycosa* tends to have more internodes, to be sparsely pubescent rather than ranging from densely pubescent to glabrate, and to have wider, more flaring, corollas which may be more pubescent within. These and other more minor differences are most noticeable in plants from the Cedar Glades of the Nashville Basin.

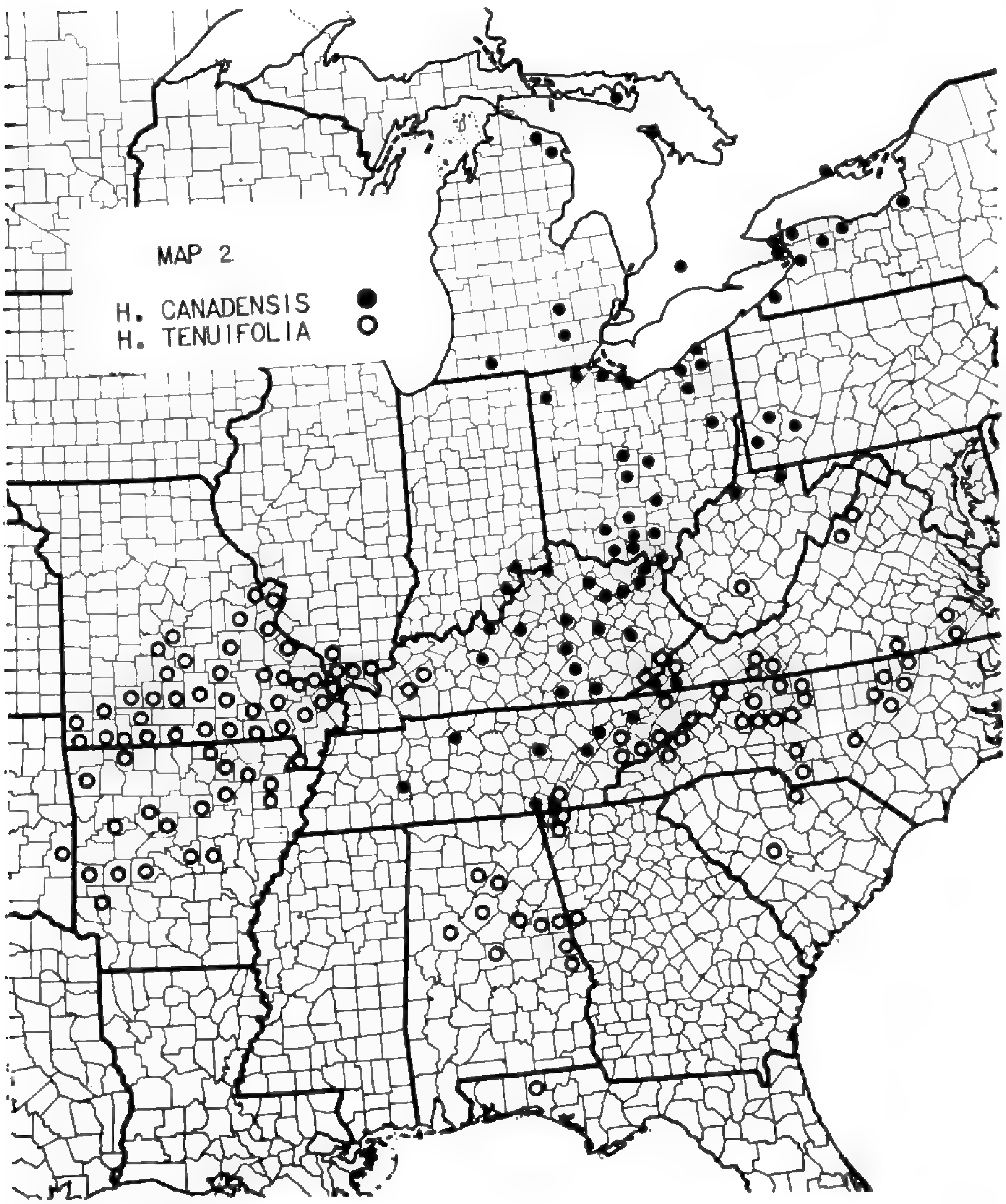
Specimens of typical var. *purpurea* have short calyx-lobes and ovate leaves. They occur in mesic woods throughout much of the eastern United States (see map). Typical specimens of var. *calycosa* have long calyx-lobes and lanceolate leaves. They occur primarily in cedar glades, barrens, and dry woods in the Cedar Glades of the Nashville Basin and in other parts of Tennessee, in central and western Kentucky, in northern and west-central Alabama, in at least two counties in central Mississippi, and in southwestern Missouri and adjacent Arkansas.

The preceding paragraph refers to typical specimens. When all available specimens referable to these two varieties are examined, it is evident that intergradation in the two primary diagnostic characters is complete. Plants with long calyx-lobes predominate from Ohio, Indiana, and Illinois south into Alabama and Mississippi. These plants may have leaves ranging from narrow-lanceolate to broad-ovate; therefore, lanceolate leaves are not always correlated with long calyx-lobes. If we were to designate var. *calycosa* as the variety with lanceolate leaves and long lobes, this would leave unclassified many collections with long lobes and ovate leaves (the latter a feature of var. *purpurea*). In this study it has been determined that length of lobes is the more important of the two primary characteristics; accordingly, this characteristic is used to provide positive separation. This reflects the definite regional distinction in lobe length: plants with long lobes are primarily midwestern; plants with short lobes have a much wider distribution and tend to grow in more mesic habitats.

It is believed that gene flow between these two varieties has been quite extensive in the Middle West. The populations in southern Ohio, Indiana, and Illinois are thought to be almost entirely "weedy" biotypes, the result of introgression among "purer" populations in Kentucky and Tennessee. Following introgression these "impure" biotypes may have spread northward onto the glaciated Central Lowland. In southern Ohio such plants resemble var. *purpurea* superficially because of their ovate leaves, but their longer calyx-lobs show the influence of genes from var. *calycosa*. This intervarietal introgression could have been facilitated by "hybridization of the habitat" after destruction of the original forest cover, and is assumed to have been accelerated since white settlement. Obviously, this theory to explain the existence of the "impure" populations in the Middle West relies heavily on aspects of the rather extensive and well known literature on introgression.

New England populations resembling these two varieties are a separate problem in themselves from the standpoint of origin. In morphology nearly all of these fall within the present circumscription of var. *calycosa*, but are not really typical of this variety. They are completely disjunct from other populations of both varieties. Apparently, they represent remnants of a formerly more widespread extension of var. *calycosa*. This may not necessarily vitiate the above theory on origin of midwestern forms. Further opinions on their origin is pure conjecture. Some New England plants vary in the direction of *H. longifolia*. One collection from Wayne County, Michigan, resembles New England plants.

In summary, vars. *purpurea* and *calycosa* are distinct in their




MAP 2. Distribution of *Houstonia canadensis* and *H. tenuifolia*. Florida collection of later species is atypical.

extremes — they have in the past been considered separate species — but intergrade so greatly that they may only be separated statistically on one character difference — length of calyx-lobes. This probably reflects a regional difference in gene frequency. They are sympatric, with different centers of distribution but with overlapping ranges. Where they occur in the same region they usually occupy different habitats. The intergradation in morphology and in habitat may be the result of introgressive hybridization.

Representative collections from New England include the following: **Maine.** CUMBERLAND: Huston's field, Cumberland Center, *Chamberlain 1086* (US). YORK: North Berwick, *Parlin 797* (US). **Massachusetts.** BERKSHIRE: Sheffield Plain, *Townsend,* 10 Aug. 1896 (CU). **Connecticut.** OXFORD: Oxford, *Harger,* 14 June 1896 (GH). **New York.** ESSEX: N of Schroon River P.O., *House 27763,* 17 Sept. 1941 (CU, GH).

Plants with broad-ovate leaves and long calyx-lobes are exemplified by the following: **Indiana.** HARRISON: 2 mi. SE of Corydon, *Deam 16331* (IND) (lobes to 6.9 mm. long). POSEY: 9 mi. SW of Mt. Vernon, *Hermann 6655* (MICH, US).

The following represent typical var. *calycosa,* with lanceolate or ovate-lanceolate leaves and long calyx-lobes: **Tennessee.** DAVIDSON: Mt. View, *Svenson 10006* (DUKE, GH, TENN). KNOX: 1 mi. E of Mascot, *Cain et al,* 2 June 1937, Plantae Exs. Grayanae 870, (CU, DUKE, F, GH, IA, MICH, MO, NCSC, NCU, NY, PH, TENN, US, WIS, WVA). RUTHERFORD: cedar glade near Lavergne, *Harper,* 17 May 1923 (GH, NY, US). WILSON: near Lebanon, *Shanks 1540* (TENN). **Illinois.** MACON: *Clokey 2424* (F, GH, MICH, MO, NY, US). **Missouri.** BARRY: Eagle Rock, *Bush 3148* (F, NY, US). **Arkansas.** CARROLL: near Elk Ranch, *Palmer 39458* (GH).

2. **Houstonia canadensis** Willd. ex R. & S. Syst. 3:527. 1818.

*Houstonia ciliolata* Torrey, Fl. N. & Mid. U.S. 1:173–174. 1824.
*Hedyotis ciliolata* (Torr.) Spreng. Syst. 4: cur. post. 40. 1827.
*Anotis ciliolosa* G. Don, Gen. Hist. 3:535. 1834.
*Oldenlandia purpurea* (L.) Gray var. *ciliolata* (Torr.) Gray, Man. ed. 2. 173. 1856.
*Houstonia longifolia* Gaertn. $\gamma$ *ciliolata* (Torr.) Wood, Class-Book, ed. 1861. 403. 1861.
*Houstonia purpurea* L. var. *ciliolata* (Torr.) Gray, Man. ed. 5. 212. 1868.
*Chamisme ciliolata* (Torr.) Nieuwl. Am. Midl. Nat. 4:92. 1915.
*Hedyotis canadensis* (Willd. ex R. & S.) Fosberg, Va. Jour. Sci. 2:110. 1941. (in part)

*Houstonia setiscaphia* Carr, Rhod. 46:309. 1944.

*Hedyotis purpurea* (L.) T. & G. var. *ciliolata* (Torr.) Fosberg, Castanea 19:34. 1954.

*Hedyotis purpurea* (L.) T. & G. var. *setiscaphia* (Carr) Fosberg, loc. cit. 35. 1954.

Perennial herbs. Rhizomes branched or simple, slender, usually more or less horizontal, to 8.3 cm. long, bearing many small roots. Stems erect or ascending, one to several, tetragonal and sometimes slightly winged, 0.4-2.5 dm. high, glabrous to pubescent below, especially at nodes, with multicellular hairs to 0.7 mm. long. Internodes numbering 3-5 (-6); median and lower ones 1-8 cm. long, longer than upper ones. Stipules deltoid to ovate-lanceolate, rounded to acute to short-acuminate or uppermost ones irregularly lobed or erose, often with dark glands on margins, to 4 mm. long, to 5 mm. wide; stipules of median nodes usually more or less ovate, rounded above, and about as wide as long. Basal leaves forming winter rosettes or in northern part of range forming short offsets, persisting through fruiting stage, varying from oval to spatulate, attenuate below into petioles shorter than to slightly longer than blade, to 3.9 cm. long, to 0.8 cm. wide, glabrous below, hirtellous to pubescent above, ciliolate (sparsely ciliolate to glabrate in certain populations in south central Ohio). Cauline leaves 1-nerved, oblanceolate, obovate, elliptic, or narrowly elliptic, (0.5–) 0.8–2.3 (–3.1) cm. long, 0.15-0.85 cm. wide, usually 2.5-6 times longer than wide, glabrous or pubescent on midrib below, pubescent to glabrous above, ciliolate to glabrate on margins. Branches ascending or spreading, less than 8 (rarely to 12) cm. long and usually arising from uppermost 1–3 nodes, forming a rather open, few-many flowered, inflorescence. Pedicels slender, to 7 mm. long. Calyces glabrous to hirtellous; lobes erect or spreading, linear-lanceolate to lanceolate, 1.6–3.5 (–4.5) mm. long, 0.5–1.0 mm. wide, one-fourth as long to nearly equalling corolla-tube, equalling or exceeding mature capsules. Corollas white to purplish, (3–) 4–9 (–11) mm. long, granular to pubescent within; corolla-tubes 2–7 mm. long, 1.5–4 mm. wide distally; corolla-lobes 1.5–5 mm. long, 1–2.5 mm. wide. Mature capsules 2–3.5 mm. long, 2–3.2 mm. wide. Seeds 0.70–1.30 mm. long, 0.50–0.90 mm. wide.

*Time of flowering:* April to June, rarely into August.

*Type locality:* "E. Canada".

*Type:* Willdenow no. 2684, Botanical Museum, Berlin.

*Habitats and distribution:* Dry to moist woods; openings; cliff tops; banks and roadsides; sandy shores; often in rocky soil over shale or limestone. Bruce Peninsula, Manitoulin Island, and Northumberland County, Ontario, southward through Michigan, Ohio, western New York, southwestern Pennsylvania and adjacent West Virginia, southernmost Indiana, central and eastern Kentucky, southwestern Virginia, Tennessee, to Lookout Mountain area of Tennessee-Georgia. Distribution generallv rather disjunct. (Map 2)

The locating of the type specimen in the Berlin herbarium establishes that *H. canadensis*, not *H. ciliolata*, is the correct name. Two photographs of the type specimen were forwarded to the writer and clearly represent the present species.

The relation between this species and *H. longifolia* was discussed by Standley and by Fosberg. Standley (1936) in a note on the apparent breakdown of characters separating these two species in specimens from Indiana, advocated either the reduction of *H. canadensis* to synonymy under *H. longifolia* or else the recognition "as a rather poorly marked variety *H. longifolia* var. *ciliolata* (Torr.) Wood". Fosberg (1941a) combined the two species, finding it necessary to adopt a new combination under *Hedyotis*. Fosberg (1954) made all species of this complex varieties of *H. purpurea*.

The two species in question are as distinct as any in this complex. Comparison of them in Indiana is rather misleading because *H. canadensis* occurs in only two counties in southernmost Indiana and *H. longifolia* in its typical form does not occur in the state at all. Specimens seen of *H. longifolia* from Indiana include two groups: collection from two Ohio River counties not quite typical of var. *compacta*; a larger number of collections from several central and nothern counties regarded here as "atypical" var. *longifolia*.

*Houstonia setiscaphia* was described by Carr (Rhod. 46:306-310. 1944) from cedar glades in southwestern Virginia (Type in Gray Herbarium; isotype in herb. Univ. of Pa.; *Lloyd G. Carr 1110*, dry glades or barrens among the cedars ca. ½ mile west of Jonesville, "The Cedars", Lee Co., Va., July 10, 1942). Located in the Ridge and Valley Province just south of the Cumberland Mountains, these glades are small in area but very similar ecologically and floristically to the well-known glades in the Nashville Basin, Tennessee, where only *H. purpurea* var. *calycosa* occurs. In company with Dr. R. W. Barbour the writer made two collections of Carr's new species, one collection five and one-half, the other eight miles southwest of Jonesville, on June 22, 1948.

Carr's published comparison of *H. setiscaphia* with its nearest relative, *H. canadensis,* stated that the two species differed in the following characters: height of plants; vestiture of stem-angles (*H. setiscaphia* has a grayish aspect due to greater amount of vestiture); compactness of inflorescence; shape of cauline and basal leaves; vestiture of calyx; size of corollas.

In the present writer's M. S. thesis (Cornell University, 1949) a tabular comparison was made of two of my collections of *H. setiscaphia* with sixteen collections of *H. canadensis* from throughout its range. This comparison demonstrated that very little difference exists between the two taxa in regard to the first three characters listed above as well as in the shapes of cauline leaves. Average sizes of corollas differ somewhat, the average length being 4.7 mm. in Carr's new species, and 6.4 mm. in *H. canadensis.* This difference, however, is thought to be due to environmental modification. In all taxa of the *H. purpurea* complex later-flowering plants have smaller corollas, caused perhaps by reduced precipitation in summer. Both Carr and the writer collected *H. setiscaphia* in later-flowering condition. Environmental influence in strong, also, on the density of inflorescences.

Shapes of basal leaves in *H. setiscaphia* are usually oblanceolate but vary to elliptic or oval; in *H. canadensis* shapes are more commonly oval or elliptic but may vary to spatulate, oblanceolate, or obovate. This difference overlaps so much that it is judged not to be significant.

The most important characteristic of *H. setiscaphia* is its "hispid" (or hirsutulous) calyces. The type specimen, examined while on loan from the Gray Herbarium, proved to be slightly more hirsutulous than other collections. Calyces of plants of *H. setiscaphia* are usually hirsutulous but vary to glabrous. Specimens of *H. canadensis* are usually glabrous but four out of sixteen collections vary from glabrous to pubescent, one collection varies from glabrous to hirsutulous, and one collection consists entirely of hirsutulous plants.

Carr's interpretation of *H. canadensis* was based apparently on a preponderance of northern collections. Southern collections are more hairy than northern ones, and are, therefore, more like *H. setiscaphia*. The three available collections of *H. setiscaphia* demonstrate more variability than Carr's report suggested. This taxon may even have glabrous calyces, and both taxa overlap in other characters as well.

An additional collection, (*Carr 775*, clinging in crevices of limestone, Natural Tunnel, Scott Co., Va.) from a county adjacent to Lee, was seen among specimens on loan from the Gray Herbarium. It includes plants with glabrate to rather densely short-pubescent calyces; therefore, it falls within the range of variation possessed by both taxa.

Besides the Scott County, Virginia, collection, perhaps more nearly referable to *H. canadensis* than to the other presumed taxon other collections show that the two are not well-separated geographically. Collections of *H. canadensis*, which is likely to be disjunct anyway, from Grainger County, Tennessee, and Whitley County, Kentucky, are only forty and fifty miles, respectively, from Lee County, Virginia. (see Map 2).

It is concluded that morphological differences between the two taxa are not even sufficient to maintain *H. setiscaphia* as a variety of *H. canadensis*. The former may be thought of as a local extreme or local race which is genetically slightly different. Not giving it formal taxonomic recognition is consistent with the treatment here of the remainder of the *H. purpurea* complex.

Dr. E. Lucy Braun has called attention (in correspondence) to local populations of *H. canadensis* which have glabrate basal leaves. These occur in unglaciated south central Ohio in Adams, Highland, and Ross Counties. My own sampling of these populations indicated that they represent a local extreme which overlaps rather extensively in the single character with ordinary *H. canadensis*. Glabrate plants did not seem to be restricted to any one geological formation. Collections consisted of varying proportions of glabrate, ciliolate, and intergradant plants. Considering the great variability in *H. canadensis* as a whole this local extreme is not worth taxonomic recognition.

(*to be concluded*)

PEUCEDANUM PALUSTRE, AN INTERESTING ADDITION TO THE FLORA OF ESSEX COUNTY, MASSACHUSETTS. On July 9, 1958, while leading a flower walk on Pike Bridge Road in the Artichoke Region of West Newbury, Massachusetts, one of the participants asked me to name a fairly large flowering umbellifer growing under apparently natural conditions near the water and I was somewhat embarrassed to confess that I was unable to do so. In September, Mr. Henry Lewis brought me good fruiting material of what was obviously the same taxon which he had found on Rogers Street about half a mile from where the flowering specimen was collected. Even with the fruit I still was unable to name the plant and I turned to Mrs. Claude Weber and Dr. Lincoln Constance for help. They were finally able to identfy it as *Peucedanum palustre* (L.) Moench., of Europe. Apparently this is the first North American record of the species. The long slender involucral bracts of the compound umbels are a very striking feature of the inflorescence. The specimen has been deposited in the Gray Herbarium and I hope to obtain additional material next year. Roadside, Pike Bridge Road, West Newbury, Essex County, Massachusetts, *Stuart K. Harris 18059* (9 July 1959). — STUART K. HARRIS, BOSTON UNIVERSITY.

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CORRECTION FOR MAY ISSUE. — The literature cited portion of the article on *Rhododendron maximum* by A. R. Hodgdon and R. Pike was inadvertently omitted. This matter is as follows:

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# Rhodora

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## A NEW SPECIES OF JUSTICIA FROM FLORIDA

Joseph Monachino and Emery C. Leonard

A rich collection of plants gathered in the southeastern United States by John K. Small and co-workers has lain in storage at The New York Botanical Garden for about twenty-five to forty or more years. It has suffered moderately from the ravages of time and neglect. The specimens were originally well-prepared and duplications are frequently ample. Unfortunately they are unnamed and they are often without collection-number or label, and the field-data is poor.

Through the support of George R. Cooley, and the intermediation of Bassett Maguire, it is now possible to process this material so that it can be placed in circulation. The first set will be deposited in the herbarium of The New York Botanical Garden.

The first author has been assigned the task of preparing this long-neglected "Small Collection" for herbaria. He is not studying it taxonomically, but in the way of naming he is merely suggesting the genus for each specimen so that it can be filed in the proper approximate position in the herbarium. Naturally, it is impossible to shut the eyes of a taxonomist completely. Instances of apparently new state-records were seen: e.g. *Oxytropis Lambertii* Pursh var. *abbreviata* (Greene) Barneby and *Senecio plattensis* Nutt from Louisiana, determined by Rupert Barneby and Theodore Barkley, respectively; *Rhynchosia galactioides* (Nutt.) Endl. from Apalachicola, Florida. There was revealed a good ample collection of *Clitoria fragrans* Small bearing locality and date of collection identical with those given for the type. As hitherto there was neither type nor any other specimen of this species in the herbarium of The New York Botanical Garden (at least since 1945), the discovery is important. Quite astonishing too was the discovery of a species of *Nyssa* from the Florida Keys! It is a fruiting specimen with coriaceous narrow leaf-blades suggesting an extreme form of *N. biflora* Walt., or *N. ursina* Small. The label reads: J. K. Small and N. L. Britton, hammock, Lignum Vitae Key, Monroe County, December 13, 1919.

The most interesting discovery was the new species of *Justicia* published herewith. One of the old collections, *Small 12682*, although clearly a *Justicia*, did not appear to be known from Florida. Search in the herbarium revealed its identity with *Cooley 5481* from the same area. Comparisons with other material also proved that the species was undoubtedly a novelty for Florida, and subsequently Mr. Leonard ascertained it to be altogether new to science and he supplied the accompanying description. It is named in honor of George R. Cooley, not only for his collection of the type, but mainly in acknowledgment of his continued generous support both in the present and in other work dealing with the flora of the southeastern United States. The illustration was drawn by Dorothy H. Marsh under the supervision of Carroll Wood at Harvard University from preserved material collected at the same time as *Cooley 6334*.

**Justicia Cooleyi** Monachino & Leonard, sp. nov.

Herba erecta vel ascendens, usque ad 40 cm. alta, caulibus ramosis, subquadrangularibus vel basi teretibus, 2 mm. crassis, pilis plus minusve bifariam pilosis, pilis retrorsis vel aliquando patulis, usque ad 0.75 mm. longis, albidis; laminae foliorum oblongo-ovatae, usque ad 7.5 cm. longae et 3 latae, apice breviter acuminatae (apice ipso subobtuso), basi acutae, in petiolum decurrentes, submembranaceae, integrae, parce vel mediocriter pilosae, pilis usque ad 1 mm. longis, albidis, costa et venis (3– vel 4– paribus) et venulis crasse reticulatis aliquando pormінentibus, cystolithis obscuris; petioli usque ad 1.5 cm. longi, dense pilosi, pilis rectis et patulis vel curvatis, usque ad 1 mm. longis; spicae erectae vel ascendentes, usque ad 6 cm. longae, laxae, rectae vel leviter curvatae, internodiis usque ad 13 mm. longis, puberulis, pilis patulis vel retrorsis, 0.13 ad 0.32 mm. longis, pilis alteris longioribus glandulosis, paniculam terminalem formantes, pedunculis usque ad 23 mm. longis, teretibus, puberulis, pilis brevioribus eglandulosis et pilis longioribus glandulosis intermixtis; flores sessiles; bracteae lineares, 2.5–3 mm. longae, 0.5–0.75 mm. latae, acutae, costa prominente, intus glabrae, externe pilosae, pilis 0.18–0.48 mm. longis, paucis, aliquando glandulosis; bracteolae bracteis similes; calycis segmenta 4, lanceolata, 5 mm. longa, 1 mm. lata, apice subacuta, intus glabra, externe pilosa, pilis patulis vel ascendentibus, pilis eglandulosis et glandulosis intermixtis; corolla 7–8 mm. longa, externe parce pilosa, pilis usque ad 0.16 mm. longis, patulis, intus glabra, pallide purpurea, labio inferiore intus fusco-purpureo, medio oblique albido vittato excepto, tubo 4.5 mm. long, basi 1.5 mm. lato, apice 2.5 mm. lato, labio superiore erecto, ovato, ca. 0.3 mm. longo, basi 2 mm. lato, apice angustato, labio inferiore trilobato, patulo, 4 mm. longo, lobis rotundatis, 2 mm. longis, 1.5 mm. latis, marginibus plus minusve crispatis; stamina supra orem tubi corollae ca. 3 mm. exserta, lobis antherarum 0.75 longis, superpositis, obliquis, connectivo 0.25 mm. longo, lobo inferiore caudato, cauda plana, spathulata, ca. 0.5 mm. longa; capsulae clavatae, 12 mm. longae, 3 mm. latae, ca. 1 mm. crassae, hirtellae, pilis rigidis, retrorsis, usque ad 0.25 mm. longis, pilis eglandulosis et glandulosis intermixtis; retinacula curvata, 2 mm. longa, 0.25 mm. lata, apice tenuia, truncata, erosa, nitida; semina plana orbiculata, ca. 2 mm. diam., villosa, pilis patulis, usque ad 0.32 mm. longis, apice ancoraeformi.


FIG. 1. *Justicia Cooleyi* Monachino & Leonard. a, flower and bud, lateral view, × 4; b, opened corolla with one stamen removed, × 4; c, stamen (portion of filament omitted, × 10; d, immature fruit and flower from which corolla has fallen, × 2..

Type in the Herbarium of the New York Botanical Garden, collected in a wet woods on Indian Hill, two miles nw. of Chinsegut Hill, Hernando Co., Florida, November 20, 1957, by George R. Cooley (No. *5481*). Paratypes: Low hammock near Mascotte, Lake County, Florida, December 4, 1925, *John K. Small 12682* (NY, US); Brooksville, Hernando Co., Florida, September 5, 1934, *Small, West & McFarlin s.n.* (NY); common in high hammock on Indian Hill, two miles nw. of Chinsegut Hill, Hernando Co., Florida, December 1, 1958, *George R. Cooley 6334* (NY). Carroll Wood informs us that another sheet of the same plant in the Gray Herbarium is from "roadside on US 98, 2.7 mi. north of Brooksville, Hernando Co., Florida, *Ray Garrett*, 11 Aug. 1953."

*Justicia Cooleyi* differs from *J. ovata* (Walt.) Lindau, which it superficially resembles, and can be easily separated by the thinner leaf blades, these regularly oblong-ovate; by the dense, spreading or retrorse pilosity of the entire plant with more or less of the hairs gland-tipped; by the dark velvety color of the inner surface of the lower lip of the corolla; and by the densely villous seeds, their hairs anchor-tipped.

The true relationship of *Justice Cooleyi* is, however with *Justicia Pringlei* Rob., of Mexico, and *Justicia galapagana* Lindau, of the Galapagos Islands, Ecuador. These three species are extremely close, having in common the ovate to oblong leaf blades, the secund flowers, the mixed glandular and eglandular hairs more or less clothing the entire plant, and the anchor-tipped hairs of the seeds. Compared with *J. Pringlei* the leaf blades of that species are usually smaller, averaging about 3 cm. in length, the spikes are more spreading, shorter, (averaging 3 cm.) with the rachis hairs practically all gland-tipped and the corolla deep lilac instead of purple. The spreading hairs of the stems are usually more numerous and longer (up to 2.5 mm. long). In *J. galapagana* the corolla is broader, the spikelets fewer, shorter, usually producing only 3 flowers instead of 6, and more heavily and densely glandular puberulous. Lindau, in his description of *J. galapagana*, states that the seeds are smooth (laevis) and brown-tomentose in contrast with those of *J. Pringlei* which are foveolate and pubescent. The seeds of *J. Cooleyi* are pilose with spreading whitish hairs arising from thickened papilliform bases. This series of *Justicia* deserves further study with more abundant material available.

Writing from Chinsegut Hill near Brooksville, the type locality of the endemic *Campanula Robinsiae* Small, and making reference to the precise geographical station of the type of *Justicia Cooleyi*, George R. Cooley provided the following information: where Sections 15, 16, 21, and 22, T 21S, R 19E, meet, the land rises from an elevation of 100′ toward the east to a height of 240′, dropping to 80′ one-half mile to the west. This rise is locally known as Indian Hill. It is part of a great area of broad-leaved trees known as Annutteliga or Annuttalagga Hammock. Limerock mining has destroyed almost all of this extensive wood in which John K. Small and the St. John's found many endemic plants, particularly ferns. In the hammock on Indian Hill evidences can be found of lumbering operations many years ago. Probably this wood has been untouched for thirty years. Oaks, hickories, magnolias, and sweet gum trees predominate. Lower trees include *Ostrya* and *Carpinus*. The undercover is rather dense and in places is the result of earlier clearings. Perhaps the most abundant of the shrubby plants is *Ilex vomitoria* Ait., the Yaupon. Among the grasses and herbs grows *Justicia* attracting attention by its small rich purple flowers. Rarely more than three or four blossoms appear on a plant at one time and usually scattered. The flowering season is long, at least from November to March. — The New York Botanical Garden, New York and U. S. National Museum, Washington.

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TWO CRUCIFERS NEW TO ESSEX COUNTY, MASSACHUSETTS. During September 1958 I found two uncommon introduced crucifers which were new to the county flora. *Alliaria officinalis* Andrz. has not yet become abundant in New England. It is well established in the plantings around the mansion of the Crane Estate on Castle Hill in Ipswich with *Galium verum* L. which is not common in the country. Castle Hill, Ipswich, Francis C. Wade and *Stuart K. Harris 18784* (26 September 1958).

The extensive dump off the Salem Turnpike in Saugus contains a large number of garden escapes and adventive weeds. Here I found a few plants of *Rapistrum rugosum* (L.) All. which has a curious transversely two-jointed silique, the upper joint being almost spherical and bearing eight longitudinal ribs while the lower joint is much smaller, unribbed and looks like a peduncle. The species was previously known from Massachusetts from two specimens collected in the 1880's on the old ballast flats in South Boston. Dump off Salem Turnpike, Saugus, *Stuart K. Harris 18716* (16 September 1958).

Specimens have been deposited in the herbarium of the New England Botanical Club.—STUART K. HARRIS, BOSTON UNIVERSITY

# A REVISION OF THE HOUSTONIA PURPUREA GROUP (RUBIACEAE)

Edward E. Terrell

*(Continued from page 180)*

One of the more striking examples of differences between geographically distant colonies was observed in a few plants transplanted from Chautauqua County, New York, to southern Ohio. The plants were grown for several months and overwintered. In winter they produced a number of short, erect, basal offsets. In contrast, plants from southern locations have merely a basal rosette in winter. There are, also, a few other differences between northern and southern plants. Either the differences vary gradually and apparently clinally from north to south, or else they vary in an irregular manner; the natural existence of races and ecotypes is not apparent. For such reasons, it seems desirable to leave *H. canadensis* as a heterogeneous species without recognizing within it any infraspecific taxa.

This species intergrades with *H. purpurea* var. *calycosa* in southern Ohio, in Clark County, Indiana, and in central and western Kentucky. It is believed that these are actual hybrids. That the two species may occur together without producing intergrades was suggested by one observation made in Rowan County, Kentucky. Like other members of the *H. purpurea* group, the two taxa may sometimes cross, sometimes not. A lack of suitable intermediate habitats ("hybridization of the habitat" of Anderson) may not be the factor restricting survival of intermediates.

*H. canadensis* in its typical form is distinct from all other taxa and may usually be distinguished by the following combination of characters: stem with 3-6 internodes; lower and/or middle internodes conspicuously longer than upper ones; basal leaves conspicuous, pubescent above and ciliolate, persisting through the fruiting stage; cauline leaves oblanceolate, elliptic, or obovate, usually on one plant at least one pair of the middle and upper cauline leaves are widest near the apex, and often most of the leaves are widest near the apex; calyx-lobes 1.6-3.5 mm. long.

General differences between this species and *H. longifolia* var. *longifolia* were illustrated rather well by John Torrey in his Flora of the State of New York, Vol. 1, Plate 44, 1843.

The following collections from northern Illinois are intermediate between *H. canadensis* and *H. longifolia* var. *longifolia:* KANE: Aurora, *Boyce,* June 1885 (GH). LASALLE: Starved Rock, *Greenman et al,* 1–7 June 1909 (F, GH, IA, NY); Starved Rock, *Umbach,* 29 May 1901 (F, WIS). WILL: Joliet Mound, *Skeels 214* (F, GH, NY, US). In Ogle County one collection from Oregon, *Gates 2723* (MICH), is closer to *H. canadensis,* but other collections from this county cited under var. *longifolia* are typical of that taxon. The writer collected (*Terrell 2308*) at Starved Rock State Park in LaSalle County in 1951, and confirmed to his own satisfaction that this population is intermediate. Two other collections from other states definitely suggest intermediacy between these same two taxa: **New York.** GENESEE: LeRoy, *Hill,* 7 July 1893 (F). **Michigan.** ST. JOSEPH: Three Rivers, *Wheeler* & *Yoohida,* 5 June 1890 (US).

One Wisconsin specimen of nearly typical *H. canadensis* is believed to be an error in location; in spite of intensive collecting in this state no later records exist: MONROE: Sparta, *Hale,* 1861 (F). Another sheet in herb. WIS with an identical inscription is var. *longifolia.*

REPRESENTATIVE COLLECTIONS: — **Ontario.** BRUCE: damp sandy shores of Lake Huron, Red Bay, *Stebbins et al 209* (CU, GH, WVA); Frog Island no. 16, *Grassl 4954* (MICH); Stokes Bay, *Krotkov 9416* (NY, US); Sauble Beach, *Gleason,* 20 June 1934 (DUKE). LINCOLN: Queenstown Hts., *Wilkinson,* 12 June 1886 (OC). NORTHUMBERLAND: *Marie-Victorin et al 46014* (F, GH). **New York.** CHAUTAUQUA: Chautauqua Gorge, *Muenscher* & *Brown 21709* (CU). MONROE: gorge of Genesee R. at Rochester, *Matthews 2807* (NCU). NIAGARA: Niagara Falls, *Lorenz,* June 1916 (NCSC). **Pennsylvania,** WESTMORELAND: Big Pucketa Cr. near Parnassus, *Patterson,* 19 May 1915 (MO). **West Virginia.** TYLER: Middlebourne, *Core 4126* (WVA). **Michigan.** ALPENA: stony flat, Thunder Bay Island, *Ehlers 3172* (MICH, WIS). PRESQUE ISLE: Thompson's Harbor, *Hinshaw,* 14 June 1931 (MICH). WASHTENAW: Ypsilanti, *Billington,* 19 May 1919 (MICH). **Ohio.** ERIE: Castalia, *Moseley,* 28 May 1922 (GH, MICH, OS). FRANKLIN: Georgesville, *Osburn,* 4 May 1895 (OS). LAKE: Madison, *Werner,* 25 May 1885 (NY, OS). **Indiana.** CLARK: 3 mi. NW of Henryville, *Deam 55770* (IND.) **Kentucky.** CARTER: Tygarts Creek, *Braun 1707* (BRAUN); near Carter Caves, *Gilbert,* 20 May 1939 (GH). JESSAMINE: High Bridge, *King 47* (F); Camp Nelson, *McFarland 110* (MO, US). LINCOLN: 3 mi. SE of Crab Orchard, *Wharton 2085* (NCSC); near Stanford, *Biltm. Herb. 7899b* (US). PULASKI: just N of Burnside Bridge, *Terrell 1915* (CU). **Tennessee.** MARION: below Hales Bar Dam, *Fairchild et al 48–93* (TENN). WHITE: W of DeRossett, *Weatherby & Weatherby 6257* (GH, NY, TENN).

3. **Houstonia tenuifolia** Nutt., Gen. 1:95. 1818.

*Hedyotis longifolia* (Gaertn.) Hook. β *tenuifolia* (Nutt.) T. & G. Fl. N. Am. 2:40. 1841.

*Oldenlandia purpurea* (L.) Gray var. *tenuifolia* (Nutt.) Gray ex Chapman, Fl. S. U. S. 181. 1860.

*Houstonia longifolia* Gaertn. β *tenuifolia* (Nutt.) Wood, Class-Book, ed. 1861. 403. 1861.

*Houstonia purpurea* L. var. *tenuifolia* (Nutt.) Gray, Syn. Fl. N. Am. 1 (2):26. 1884.

*Chamisme tenuifolia* (Nutt.) Nieuwl. Am. Midl. Nat. 4:92. 1915.

*Houstonia tenuifolia* Nutt. f. *leucantha* Standley, Rhod. 34:177. 1932.

*Hedyotis Nuttalliana* Fosberg, Va. Jour. Sci. 2:111. 1941.

*Hedyotis purpurea* (L.) T. & G. var. *tenuifolia* (Nutt.) Fosberg, Castanea 19:35. 1954.

*Hedyotis purpurea* var. *tenuifolia* f. *leucantha* (Standl.) Fosberg, l. c. 36. 1954.

Perennial herbs. Rhizomes simple or branched, erect or horizontal, shortened or to 3.5 cm. long, bearing many small roots. Stems erect or ascending, one–several, round-tetragonal, (0.8–) 1–4 (–5.7) dm. high, densely cinereous-puberulent below, especially at nodes, with hairs on internodes usually less than 0.2 mm. long, or varying to glabrate. Internodes numbering (3–) 4–9 (–11); median internodes 3–6 (–8) cm. long. Nodes usually swollen. Stipules broad-ovate or broad-deltoid to ovate-lanceolate, entire, erose, or few-toothed at apex, often with dark glands at apices of teeth, obtuse, acute, or acuminate, to 4 mm. long, to 3 mm. wide; upper stipules often irregularly lobed. Basal leaves forming a rosette in winter, sometimes withered at time of flowering or sometimes persisting through flowering and fruiting (especially in plants of Missouri and Arkansas), varying from oval to spatulate, tapering into petioles shorter than to rarely longer than blades, to 3 cm. long, to 1 cm. wide, glabrous below, glabrous or sparsely pubescent above, sometimes sparsely ciliolate. Cauline leaves 1-nerved; lower leaves sessile or short-petiolate, oblanceolate to elliptic to linear; median leaves sessile, linear to narrowly elliptic or very narrowly oblanceolate, 1.3–4.7 cm. long, 0.5–4.0 (–5.0) mm. wide, usually at least 7 times longer than wide, glabrous below, glabrous or scabrous-pubescent above; upper leaves similar, smaller. Branches ascending, spreading, divaricate, or deflexed, slender and often ultimately filiform, usually with 1–4 remote nodes bearing reduced leaves, to 20 (–28) cm. long, usually arising from uppermost 3–6 nodes and forming a very diffusely open, few-very many flowered inflorescence; often main stem equal in thickness to its branches, each node therefore appearing to give rise to 3 fertile branches. Pedicels filiform or slender, to 14 (–20) mm. long. Calyces glabrous; calyx-lobes erect, lanceolate, linear-lanceolate, or deltoid-lanceolate (0.5–) 0.8–2.4 (–3.0) mm. long, 0.2–0.9 mm. wide, less than one-half as long as corolla-tube, equalling or slightly exceeding mature capsules. Corollas purplish to white or variously purplish-tinged, (5–) 6–9 mm. long, granular to puberulent (rarely villous-pubescent) within; corolla-tubes 3–6 mm. long, 1.5–3.0 mm. wide distally; corolla-lobes 1.5–3.0 mm. long, 1.2–2.0 mm. wide. Mature capsules 1.5–2.5 (–3.0) mm. long, 1.5–2.5 (–3.0) mm. wide. Seeds 0.50–1.20 mm. long, 0.35–0.90 mm. wide.

*Time of flowering:* Late April or May through July. Earliest recorded flowering date is in late April; latest date is in late August. Fruits from the earliest flowers mature in July or August and continue to mature in order of development through summer and autumn.

*Type locality:* "Near the confluence of Pidgeon river, and the French Broad, Tennessee, on dry gravelly hills".

*Type:* Not seen.

*Habitats and distribution:* Dry or somewhat mesic woods of oak, oak-hickory, oak-pine; thin soil over various kinds of rocks; talus slopes; crevices in cliffs; openings and woodland borders. Commonly in open or lightly shaded places in well-drained, xeric-mesic habitats. Northwestern, southeastern, and southwestern Virginia; Fayette County, West Virginia; in North Carolina locally abundant in the Piedmont (where often around granite outcrops) and in French Broad drainage in Madison and Haywood Counties (Great Smokies); scattered and local in Piedmont of South Carolina; frequent in Cumberland Mountains of southeastern Kentucky and in Great Smokies of Tennessee; northwestern Georgia and adjacent Tennessee south to Heard County, Georgia; central Alabama; southern half of Missouri, northern half of Arkansas, and Leflore County, Oklahoma (mainly in Ozarks and Ouachitas); Ozark Hills of southern Illinois and adjacent westernmost Kentucky. (Map 2)

Nuttall's description is unequivocal for this species. His type has not been located, although specific attempts were made to check the herbaria of the Philadelphia Academy of Natural Sciences, the New York Botanical Garden, and the British Museum.

This species has two main centers of distribution — the Appalachians and the Ozarks-Ouachitas. It appears to be absent from the territory between these centers. In the Appalachians it is locally disjunct and is absent in some areas which seem to have suitable habitats for it. It was reported from Texas and Mexico by Standley (1918), but no specimens have been seen from either. Shinners (1949) stated that he had not seen any specimens from Texas.

Within this species typical Appalachian and typical Ozark-Ouachita plants differ as follows:

| *Ozark-Ouachita* | *Appalachian* |
|---|---|
| Internodes 4–7 | Internodes 4–9 |
| Basal leaves often conspicuously large and sparsely ciliolate | Basal leaves usually smaller and glabrous |
| Middle cauline leaves averaging slightly wider-narrow-elliptic | Averaging slightly narrower-linear or very narrowly elliptic |
| Branches usually less than 10 cm. long, erect or ascending | Usually 9–20 cm. long, more often spreading to divaricate |
| Pedicels less than 8 mm. long | Less than 14 mm. long |
| Calyx-lobes longer, 1–2.4 (–3.0) mm. long | Shorter, 0.8–1.5 (–2.3) mm. long |
| Capsules larger, 1.5–3 mm. long | Smaller, 1.5–2.5 mm. long |

This comparison is based on typical plants. Plants from Alabama and Georgia tend to be somewhat more like the Ozark plants. A number of collections from the two centers are very similar, e.g., collections from Rich Mountain, Arkansas, have filiform branches or pedicels like many Appalachian collections. Some piedmont, North Carolina, collections are very similar to Ozark collections. In general, the degree of overlap is so great that I have preferred not to distinguish plants of the two centers as separate subspecies, but consider them all part of one variable species. In addition, it is possible that some of the differences may be environmental. It appears that populations in these two centers have been isolated from each other for a rather long time, long enough for certain differences to have arisen.

In the past collectors have not always been sure whether Ozark-Ouachita plants should be identified as *H. tenuifolia* or as *H.*

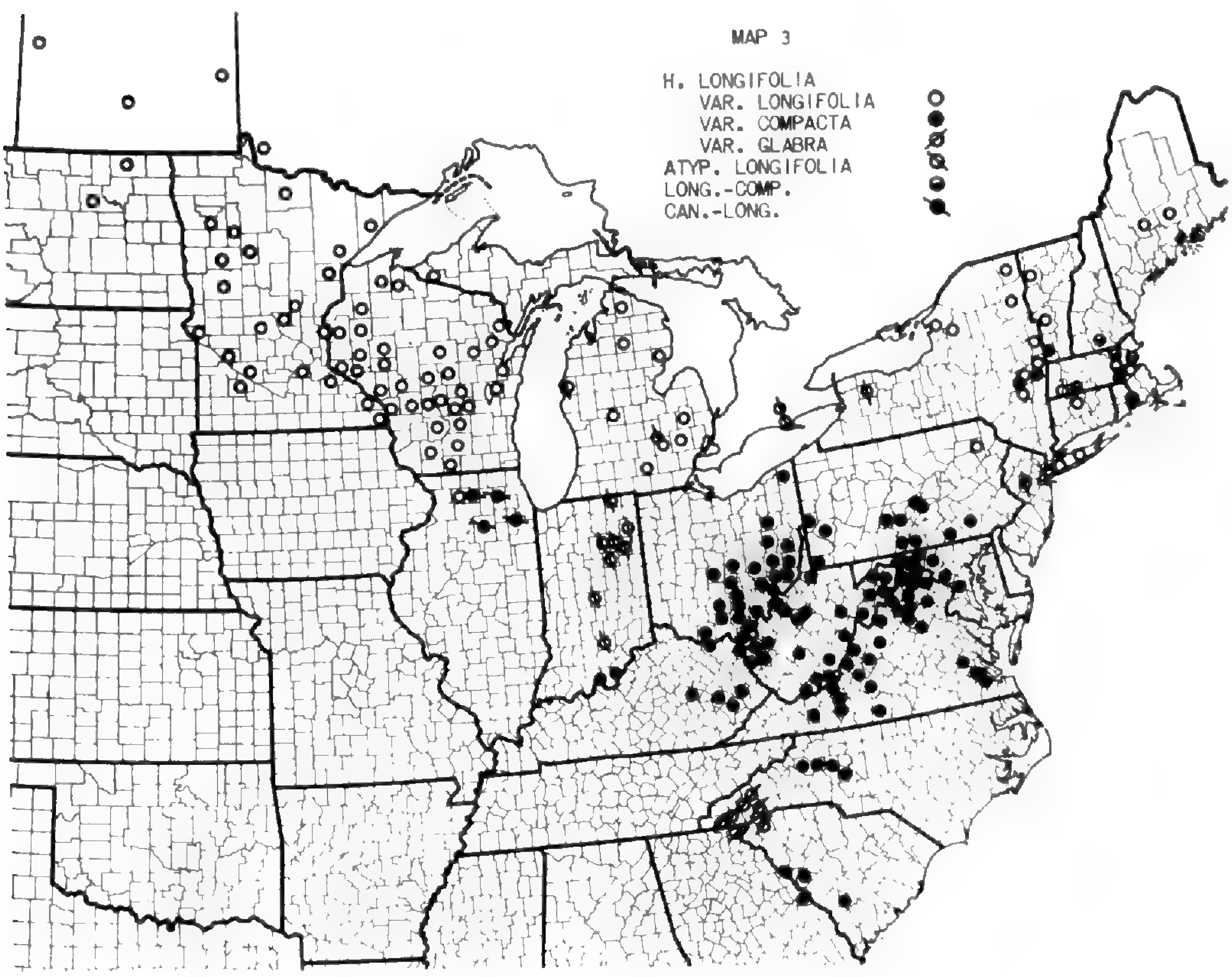
*longifolia*. That the plants have been more often referred to the latter is due, apparently, to their wider leaves and shorter branches as compared with the narrower leaves and "setaceously pedunculate" flowers (as described by Nuttall) of the Appalachian group. Within each group populations vary considerably from locality to locality; some of this may be environmental, while chance isolation of certain biotypes in certain local areas may explain other variation.

A collection from Walton Co., Florida, is quite atypical, being almost intermediate between this species and *H. longifolia* var. *compacta.* Since its characteristics are slightly more than those of *H. tenuifolia,* it has been placed in this species.

The relationship between this species and *H. longifolia* var. *compacta,* is another source of confusion in the *H. purpurea* group. It is sometimes very difficult to separate them, especially in herbarium collections which are not adequate samples of the population. At other times they appear quite distinct. It was formerly believed by the writer that they were two subspecies of the same species, *H. tenuifolia,* and on several occasions they were so annotated. Both taxa have densely cinereous-puberulent stems, and the cauline leaves seem basically similar although different in average length/width ratios. The writer was impressed, also, by the way they intergrade as one travels north from the Cumberland Mountains into the transitional counties of the Appalachian Plateau in eastern Kentucky. Two collections from Floyd and Morgan Counties seemed to indicate introgression into var *compacta,* while collections from Breathitt and Knott Counties indicate introgression into the other species. This is now interpreted as actual introgression, as originally supposed. Putative hybrids occur, also, in West Virginia and Virginia (cited below). However, introgression has not broken down the distinctness of these two taxa over large parts of their ranges. After observing how basically different they are in Alexander and Iredell Counties, western North Carolina, and in parts of southwestern Virginia, it was concluded that they should be placed in separate species. One of the more impressive differences is in time of initiation of flowering — this may differ by one to four weeks, with two to three weeks being an average. In Alexander-Iredell counties they occur within 2½ miles of each other in rather similar habitats, but were not found growing together. In this area they appeared as different species, being different in as many as 6-10 characteristics.

Intergrades between *H. longifolia* var. *compacta* and *H. tenuifolia* include the following collections: **Virginia.** PAGE: roadside, Skyline Drive, 0.7 mi. s of Lewis Mt., *Walker 2923* (US). ROCKINGHAM: Swift Run, *Boettcher 501* (US). **West Virginia.** FAYETTE: Kimberly near mouth of Armstrong Cr., *Smithson*, 14 July 1936 (WVA). GREENBRIER: open upland woods, White Sulphur, *L. F. & F. R. Randolph 1291* (CU,GH). MCDOWELL: open woods between Barrenshe Cr. and Dry Fork, alt. 1350–1800 ft., *Morris 1162* (US)

REPRESENTATIVE SPECIMENS: **Virginia.** CARROLL: along New R. at mouth of Brush Creek, *Small*, 12 July 1892 (F, GH, MO, NY, PH, US). MECKLENBURG: 6 mi. N of Clarksville, *Fosberg 15141* (GH, TENN, WVA).




MAP 3. Distribution of the three varieties of *Houstonia longifolia;* atypical collections of var. *longifolia;* intergrades between var. *longifolia* and var. *compacta;* intermediates between var. *longifolia* and *H. canadensis.* Canadian collections of typical var. *longifolia* from vicinities of McKague, Saskatchewan, and Edmonton, Alberta, are not shown on map

SOUTHAMPTON: SW of Applewhite Church, *Fernald & Long 10431* (F, GH). **North Carolina.** ALEXANDER: 2½ mi. W of Vashti, *Radford 13868* (NCU). FRANKLIN: Cedar Rock, near Castalia, *Blomquist 13245* (DUKE). GRANVILLE: Oxford, *Godfrey 5473* (DUKE, NCU, US); 1 mi. S of Bullock, *Fox 4894* (NCSC). SURRY: Pilot Mt., *D. S. & H. B. Correll 14502* (DUKE). **South Carolina.** LANCASTER: Forty Acre Rock, *Ahles & Haesloop 27461* (NCU). **Georgia.** HEARD: 4 mi. SW of Franklin, *Pyron & McVaugh 1766* (GA). **Alabama.** CHAMBERS: *Earle*, 22 June 1897 (GH, NY). TUSCALOOSA: 15 mi. above Tuscaloosa, *Harper 3498* (GH, NY, US). **Kentucky.** HARLAN: near Harlan Court House, *Kearney*, Aug. 1893 (GH, MO, NY, US). HOPKINS: near Dawson Springs, *Palmer 17692* (MO, PALMER). **Tennessee.** BLOUNT: Cades Cove, *Anderson 1297* (GH, IA, MO). COCKE: Wolf Creek, *Kearney 736* (CU, MO, NY, US); vicinity Cosby, *Raper & Jennison 3296* (TENN). **Illinois.** JACKSON: 1½ mi. SE of Gorham, *Bauer 2698* (F). JOHNSON: 1.5 mi. S of Goreville, *Winterringer 984* (NCU). **Missouri.** BARRY: Eagle Rock, *Bush 100* (US, WVA); same loc., *Bush 15411* (WIS). HOWELL: Willow Springs, *Palmer 6228* (CU, F, MO). SCOTT: between Chaffee & Rockview, *Steyermark 5011* (F, MO). STODDARD: 2½ mi. W of Puxico, *Steyermark 66133* (F). **Arkansas.** CARROLL: Eureka Springs, *Palmer 5553* (CU, F, MO). LAWRENCE: Imboden, *Demaree 30444* (US). LOGAN: Magazine Mt., *Clausen 7661* (CU). **Oklahoma.** LEFLORE: Rich Mt., *Stevens 2667* (GH, MO, NY, US).

4. **Houstonia longifolia Gaertner**, Fruc. 1:226. 1788.

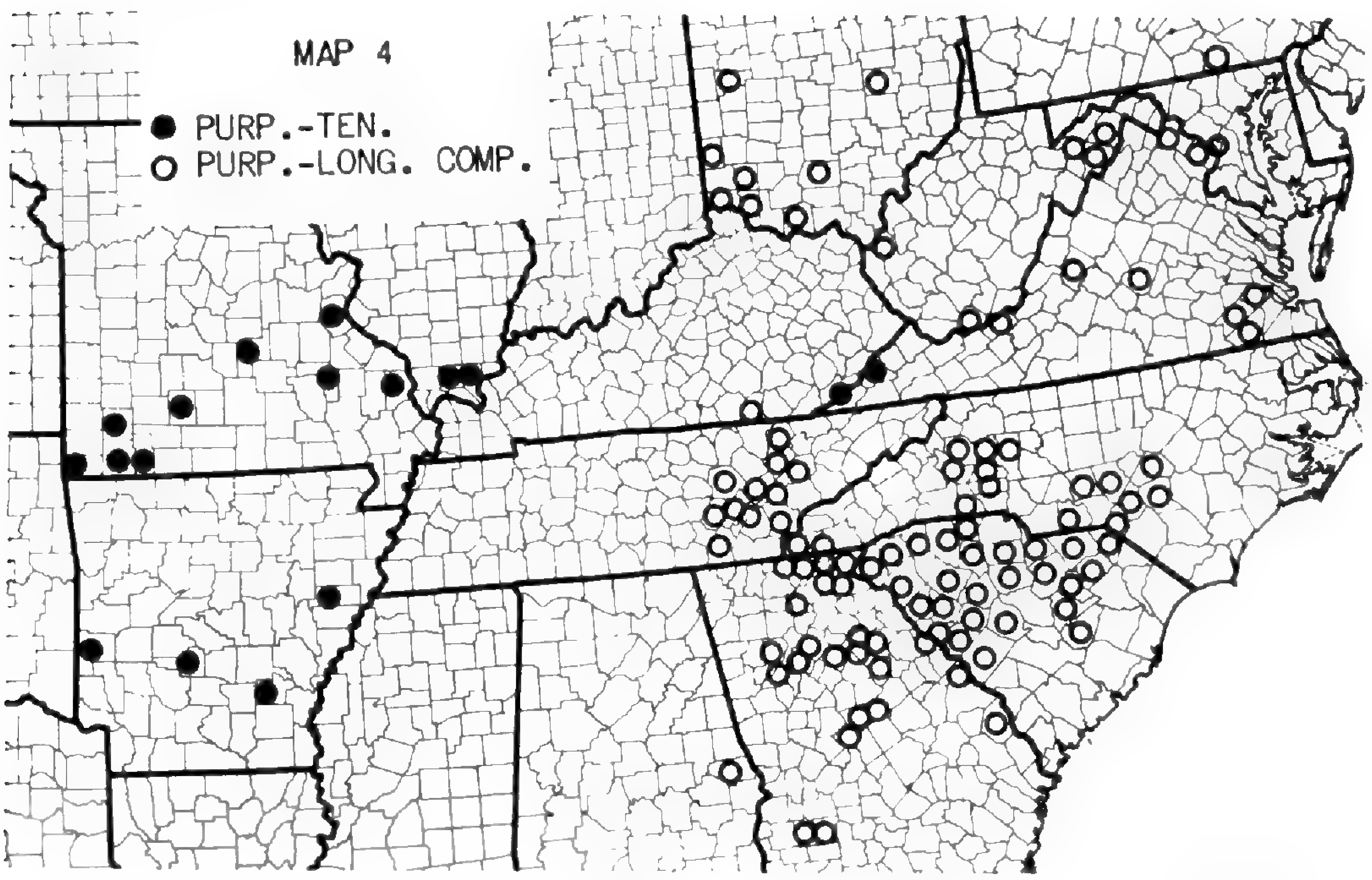
*Houstonia longifolia* Willd. Sp. Pl. 1 (2):583-584. 1798.
*Houstonia longifolia* Michx.; Torr. Fl. N. & M. U.S. 173. 1824.
*Hedyotis longifolia* (Gaertn.) Hook. Fl. Bor. Am. 1:286. 1834.
*Anotis longifolia* (Gaertn.) G. Don, Gen. Hist. 3.535. 1834. (in part)
*Oldenlandia purpurea* (L). Gray var. *longifolia* (Willd.) Gray, Man. d. 2. 173. 1856. (in part)
*Houstonia purpurea* L. var. *longifolia* (Willd.) Gray, Man. ed. 5. 212. 1868. (in part)
*Chamisme longifolia* (Gaertn.) Nieuwl. Am. Midl. Nat. 4:92. 1915.
*Hedyotis canadensis* (Willd. ex R. & S.) Fosberg, Va. Jour. Sci. 2:110. 1941. (in part)
*Hedyotis purpurea* (L.) T. & G. var. *longifolia* (Gaertn.) Fosberg, Castanea 19:34. 1954. (in part)

Perennial herbs. Rhizomes branched or simple, horizontal or erect, sometimes subligneous, to 7 cm. long, bearing many small roots. Stems erect or ascending, one-many, tetragonal or roundish-tetragonal, sometimes slightly winged, 0.5–3.5 dm. high, densely cinereous-puberulent or pubescent or scabrous-pubescent below, especially at nodes, or glabrous. Internodes numbering (3–) 4–11 (–13); median internodes 1–5 (–6) cm. long. Nodes sometimes rather swollen. Stipules lanceolate to ovate, entire, erose, toothed (teeth often tipped with dark glands), or irregularly lobed, rounded above or varying from obtuse to acuminate, to 3.3 mm. long, to 3.5 mm. wide. Basal leaves forming a rosette in winter, sometimes persisting through flowering and fruiting or sometimes withered, oval, elliptic, or oblanceolate, tapering into petioles shorter or longer than blades, to 3.9 cm. long, 0.2–1.0 cm. wide, glabrous below, glabrous to sparsely pubescent above, sometimes sparsely ciliolate. Cauline leaves 1-nerved, lower ones sessile or short-petiolate; median leaves sessile, varying from narrowly elliptic to oblong to linear or very narrowly lanceolate or oblanceolate, 0.6–3.4 cm. long, 0.15–0.60 cm. wide, about 4-11 (–14) times longer than wide, glabrous below, glabrous to somewhat pubescent above, margins glabrous to sparsely ciliolate; upper leaves similar, smaller. Branches ascending or spreading, slender, less than 12 cm. long, forming a rather open to rather compact, few-many flowered inflorescence. Pedicels slender, less than 8 mm. long. Calyces glabrous; calyx-lobes erect or spreading, linear-lanceolate to ovate-lanceolate, (0.5–) 1.0–2.5 (–3.1) mm. long, 0.3–0.9 mm. wide, less than two-thirds as long as corolla-tube, equalling to somewhat exceeding mature capsules. Corollas white to purplish or variously purplish-tinged, (4–) 5–8 (–9) mm. long, granular to puberulent within; corolla-tubes 3–6 mm. long, 1.5–4.5 mm. wide distally; corolla-lobes 1.5–3.5 mm. long, 1.2–2.5 mm. wide. Mature capsules 1.7–3.8 mm. long, 1.7–3.3 mm. wide. Seeds 0.50–1.40 mm. long, 0.35–1.00 mm. wide.

Gaertner described only fruits and seeds of *H. longifolia*. None of the included drawings or descriptions can be applied with certainty to any particular member of the present group. One drawing was of calyces with rather short lobes and could not have depicted *H. purpurea* var. *calycosa*. The phrase, "Ex herbario Banksiano", was the only hint as to the source of Gaertner's plants. This suggested to the present writer that Joseph Banks was the collector, and that the type might be located either in the herbaria of Gaertner or Banks.

The location of Gaertner's herbarium apparently is unknown even to taxonomists in Europe. Correspondence with the British Museum, which has the herbarium of Banks, elicited the reply that no specimen resembling the type was to be found there. The remaining possibility is that the type may yet be found in other collections by Banks, which are known to exist in two other herbaria in Europe.

Although the original description is ambiguous and cannot be applied with certainty, I prefer to retain Gaertner's name until all possibilities of finding the type material are exhausted. To replace this name with a new one would seem now slightly premature and would upset established nomenclature perhaps unnecessarily.




MAP 4. Distribution of intergrades between *Houstonia purpurea* and *H. tenuifolia* and between *H. purpurea* and *H. longifolia* var. *compacta*.

Willdenow's description in 1798 cited Gaertner's publication and followed the citation with a question mark, from which it appears that Willdenow was uncertain whether his plants were taxonomically equivalent to those of Gaertner. This implies, also, that Willdenow never saw the specimen described by Gaertner. Although included above as a synonym, Willdenow's description is hardly adequate. I consider it *probable* that he referred to the plants included by modern authors in *H. longifolia.*

The second synonym listed is believed to have resulted from Torrey's having erroneously ascribed the name to Michaux. Torrey cited Willdenow's publication first; perhaps he intended to put his name in place of "Mich." In his Flora Boreali-Americana Michaux did not mention *H. longifolia,* and no other mention of this name by him has been found. Torrey cited as another synonym, *H. angustifolia* Michx., but we now know that this name is a synonym of *H. nigricans* (Lam.) Fern., a species outside the present complex.

In Hooker's description the mention of certain northern locations (Lake Huron, Lake Winnipeg, and Saskatchewan) leaves little doubt that he was describing *H. longifolia* in its strictest modern sense (group 1, as listed below).

The first part of Don's description was the same as Hooker's. An added series of phrases applied to *H. nigricans,* except that no member of the genus has "flowers scarlet."

In Gray's Manual, ed. 2, the concept is much like that of modern authors, except that Gray added, "A narrow-leaved slender form is *H. tenuifolia* Nutt." In edition 5 the same description was repeated under a new combination.

Fosberg (1941) used the name, *Hedyotis canadensis,* as including both that species and *H. longifolia.* Fosberg's (1954) combination was based on the judgment that the species of the *H. purpurea* complex were all varieties of one species.

*H. longifolia* Gaertner has in recent usage been so circumscribed as to include a variety of elements. These have seemed to intergrade in such a closely interwoven way that there is little wonder that they were never separated. This motley assortment has included what are believed to be hybrids and *H. longifolia* has served as a receptacle for many specimens that could not be referred to another species. After examination of herbarium specimens and after field observations and study of the populations region by region, it is possible to break down the conglomeration into the following morphological-geographical groups:

Group 1. A variable and heterogeneous series of populations ranging from New England across the Great Lakes states west to North Dakota and southern Canada to Alberta. These are restricted entirely to glaciated territory. Certain populations seem to intergrade with other taxa. This group along with groups 2 and 3 really constitute the main body of traditional *H. longifolia.*

Group 2. Alleghenian and central Appalachian populations ranging south to South Carolina and Georgia. These are superficially somewhat like group 1 although less variable. Occasional specimens have been identified by collectors as *H. tenuifolia,* with which it intergrades. It intergrades also with group 5.

Group 3. Essentially very similar to group 2. Restricted to southern Blue Ridge.

Group 4. Ozark and Ouachita populations. Usually referred to *H. longifolia* but sometimes to *H. tenuifolia.*

Group 5. Variable populations in southeastern Virginia, North and South Carolina, Georgia, and Tennessee. Mainly in coastal plain and piedmont.

Group 6. Scattered miscellaneous populations elsewhere which resemble one of the other groups closely but have no definite continuous ranges.

TABLE 1 — Comparison of three varieties of *Houstonia longifolia.*

| var. *glabra* | var. *compacta* | var. *longifolia* |
|---|---|---|
| Stems glabrous or glabrate | Densely puberulent | glabrous to pubescent |
| No. of internodes: 7–10 | 6–13 | 4–7 |
| Stipules often lanceolate, acuminate, smaller | same as *glabra* | ovate, rounded or obtuse, larger |
| | These two differ by other "tendencies" | |
| In aspect, much like *compacta* | | |
| These two allopatric, but only 50–75 miles apart; both southern and Appalachian; non-intergrading | | |
| | These two with slightly overlapping ranges and a few intergrading populations; otherwise occupying large territories and well-separated geographically; one southern, one northern in glaciated territory | |
| Higher altitudes; mesic habitats in s. Blue Ridge | Lower altitudes; xeric-mesic; centered in Appal. Plateau and Ridge and Valley | Northern low alt.: xeric-mesic |
| Least variable | Rather variable; Intergrades with *H. purpurea* and locally with *H. tenuifolia* | Quite variable and heterogeneous, due to suspected former hybridization |

In the present classification these groups are dealt with as follows: Group 1 — *H. longifolia* var. *longifolia;* Group 2 — *H* *longifolia* var. *compacta;* Group 3 — *H. longifolia* var. *glabra;* Group 4 — part of *H. tenuifolia;* Groups 5 and 6 designated as putative hybrids or hybrid races, in most of which the parental taxa are believed to be *H. purpurea* x *H. longifolia* var. *compacta* (these discussed in Introduction).

Table 1 points out the nature of the three varieties as well as the differences by which they can be distinguished. The status of var. *glabra* and its relation to var. *compacta* are further elucidated under the former variety. These two varieties are not as well differentiated from each other as are vars. *compacta* and *longifolia*. The latter two are almost subspecifically distinct.

4. **Houstonia longifolia** Gaertn. var. **longifolia.**

Stems 0.5–2.5 dm. high, glabrous to sparsely pubescent or sparsely scabrous-pubescent below, rarely somewhat puberulent. Internodes numbering (3–) 4–7; median ones 1–5 cm. long. Stipules of median nodes more or less ovate, rounded above, or varying from obtuse to acuminate, to 3.3 mm. long, to 3.5 mm. wide. Median cauline leaves narrowly elliptic, oblong, narrowly lanceolate, narrowly oblanceolate, or sublinear, (0.6–) 0.8–2.3 (–3.1) cm. long, 0.2–0.6 cm. wide, 4–10 times longer than wide. Mature capsules 1.7–3.8 mm. long, 1.7–3.3 mm. wide.

*Time of flowering:* late May or June through July or August.

*Type locality:* unknown.

*Type:* not seen.

*Habitats and distribution:* Secondary, xeric-mesic, well drained habitats in open or lightly shaded places, usually where relatively free of competition. Sandy soil or thin soil over various kinds of rock strata; openings or lightly shaded places in woods; rock ledges; fields and roadsides; dry prairies. Maine and other New England states, south to Long Island, northern New Jersey, and northeastern Pennsylvania, west across New York, southern Ontario, Michigan, Indiana (atypical), northern Illinois, Wisconsin, and Minnesota, west-northwestward to northern North Dakota, Manitoba, Saskatchewan, and Alberta. (Map 3)

Despite considerable variability and heterogeneity in var. *longifolia,* it seems impossible to break down this group any further. The variant populations seem to intergrade imperceptibly. This taxon does not have any "new" characteristics but its elements have in common a *combination* of characteristics which serve to unite them. Although each characteristic may be present in at least one other species or in intergradants between species, no other taxon has the same combination of characteristics so consistently expressed in many populations.

Plants of central and western Canada and the north shore of Lake Superior may resemble *H. canadensis* superficially, but may usually be clearly distinguished. Actual intergrades are cited under that species. In much of Minnesota, Wisconsin, Michigan, western New York, Vermont, and Maine, the more or less typical forms of the variety predominate. On Long Island a depauperate, possibly environmental, form occurs. Certain collections from southeastern and eastern New York, southern Vermont, New Hampshire, and parts of Massachusetts intergrade with var. *compacta*. A very few other New England collections grade toward the New England segment of *H. purpurea* var. *calycosa*. Atypical collections from Indiana, Ontario, and elsewhere are cited below.

Collections representing intergrades with var. *compacta* include the following: **New Hampshire.** HILLSBORO: Sharon, *Blake,* 24 July 1909 (US). **Massachusetts.** HAMPDEN: Westfield, *Seymour,* 16 June 1914 (DUKE, GH, MO). MIDDLESEX: Reading, *Pease 1243* (GH). **New York.** ALBANY: Glenmont, *House 6586* (GH, NY).

The following are rather atypical, and suggest introgression: **Ontario.** NORFOLK: Charlotteville Twp., *Soper 2618* (GH); Saint Williams, *Marie-Victorin et al 46424* (CU, F, GH); Normandale, *Marie-Victorin et al 46377* (GH). OXFORD: Tilsonburg, *Herriot 48* (GH); Tilsonburg, *Macoun,* 22 June 1901 (GH, NY). **New Jersey.** SOMERSET: Watchung, *Moldenke 2516* (NY). **Michigan.** LIVINGSTON: Portage Lake, *Ehlers 3851* (CU); Edwin S. George Reserve, *Evans,* 6 June 1951 (MICH). MASON: Hamlin Lake, Ludington, *Chaney 9* (F, NY, US).

A series of populations present in several counties of central and northern Indiana are atypical and are exemplified by the following (locality of coll. omitted): ALLEN, *Deam 1012* (NY); *Deam 1145* (F, IND). HUNTINGTON: *Deam 45845* (IND). LAGRANGE: *Deam 15904* (F, IND). WABASH: *Deam 49102* (CU). WELLS: *Deam & Gleason,* 1 Sept. 1904 (GH); *Deam,* 26 June 1904 (IND, MICH, US, WVA).

REPRESENTATIVE SPECIMENS: — **Alberta.** county unknown, near Edmonton, *Moss 2855* (GH). **Saskatchewan.** county unknown, 6 mi. sw of

McKague, *Breitung*, 2 Aug. 1936 (NY). **Manitoba.** MARQUETTE: Birtle, *Macoun & Herriot*, 26 June 1906 (CU, NY). PORTAGE LA PRAIRIE: Portage la Prairie, *Macoun & Herriot*, 5 June 1906 (F, NY). WINNIPEG: Pointe du Bois, *Love & Love 5546* (US). **Ontario.** SIMCOE: Wasaga Beach, *Marie Victorin et al 46216* (CU, GH, OC). **Maine.** PENOBSCOT: Veazie, *Knight*, 10 June 1905 (WVA); Veazie, Penobscot R. valley, *Fernald 14586* (F); Bangor, *Mackenzie 3216* (NY). SOMERSET: Fairfield, *Fernald & Long 14589* (PH, US); banks of Kennebec R., Carratunk, *Norton*, 10 July 1925 (WIS). **Vermont.** CHITTENDEN: Rock Point, Burlington, *Grout*, 9 June 1894 (F, US). **Massachusetts.** MIDDLESEX: Stoneham, *Bean*, 13 June 1904 (US); spur of Horn Pond Mt., Woburn, *Moore 2700* (GH). **New York.** CLINTON: Clintonville Sandplain, *Rudd 790* (US). ESSEX: Lower Jay, *House 10267* (US). JEFFERSON: Limerick, *Crockett 7560* (GA); Brownsville, *Redfield*, 19 July 1873 (MO, NY). LEWIS: Natural Bridge, *House 7141* (GH). **Pennsylvania.** LACKAWANNA: 2 mi. NE of Moosic, *Glowenke 349* (GH). **Michigan.** CHEBOYGAN: S of Burt Lake, *Gates 15520* (F, MO, TENN); *Ehlers 4636* (CU); Indian R., *Gleason*, 23 June 1935 (DUKE); 5 mi. S of Indian R., *Erlanson 443* (MICH). CRAWFORD: vic. of Grayling, *Piper*, July 1922 (US); 10 mi. E of Grayling, *Voss 2161* (MICH). **Illinois.** OGLE (all Oregon): *M. B. Waite*, 29 June 1885 (DUKE); *C. B. Waite*, 23 June 1885 (NY); *M. B. Waite*, 23 June 1885 (US). **Wisconsin.** ASHLAND: *Fasset & Wilson 10137* (WIS). POLK: St. Croix Falls, *Schuette*, 11 July 1888 (F, GH); *Burglehaus*, 4 July 1892 (US). WAUSHARA: *Stearns 715* (WIS). **Minnesota.** CARLTON: Jay Cooke Park, *Wiegand & Wiegand 2234* (CU, GH). CLEARWATER: Desoto Lake, Itasca Park, *Buell*, 3 July 1938 (DUKE, NCSC). HOUSTON: 3 mi. W of Houston, *Moore 15991* (GH, IA). ST. LOUIS: about 6 mi. N of Palo, *Lakela 2604* (GH, NY); sandy shore of Esqusgama Lake, *Lakela*, 4 Aug. 1944 (DUKE); *Lakela 14208* (WIS). **North Dakota.** BENSON: Butte, *Lunell*, 1 July 1914 (F); *Lunell*, 23 June 1907 (NY); Leeds, *Lunell*, 10 June 1911 (US). CAVALIER: Langdon, *Rider 200* (F).

4b. **Houstonia longifolia** Gaertn. var. **compacta,** var. nov.

Caules dense cinereo-puberuli infra. Internodia (6–) 7–11 (–13); media internodia (1.0–) 1.5–3.5 (–4.4) cm. longa. Stipulae mediorum nodorum semper fere acuminatae vel acutae.

Stems 0.7–3.5 dm. high, densely cinereous-puberulent below (sometimes minutely so), with hairs on internodes rarely more than 0.4 mm. long, or rarely glabrate. Internodes numbering (6–) 7–11 (–13); median ones (1.0–) 1.5–3.5 (–4.4) cm. long. Stipules of median nodes usually more or less lanceolate or deltoid, sometimes ovate, usually acuminate or acute, sometimes obtuse or rounded, to 3 mm. long, to 2.5 mm. wide. Median cauline leaves narrowly elliptic, narrowly lanceolate, or sublinear, (0.8–) 1.6–3.0 (–3.4) cm. long, 0.15–0.5 (–0.6) cm.

wide, 4–11 (–14) times longer than wide. Mature capsules 1.8–3.0 mm. long, 1.8–3.0 mm. wide.

*Time of flowering:* early June through August or September. Earliest date is in late May, latest in Mid-October. Fruits usually mature from September through October.

*Type:* *F. A. Gilbert* July 9, 1937; June 1939; dry field, Roland Park, Cabell County, West Virginia (GH!). Duplicates of this collection (as *H. longifolia* Gaertn.) are widely distributed to a number of herbaria as Plantae Exsiccatae Grayanae #987, (CU, DUKE, F, GA, IA, MICH, MO, NCSC, NCU, NY, PH, TENN, US, WIS, WVA).

*Habitats and distribution:* In openings and lightly shaded places in dry woods (usually oak, oak-pine, oak-hickory, red cedar); thin soil over shale, sandstone, or igneous rocks, rock ledges, talus slopes, shale barrens; fields and roadsides. It ranges from central Pennsylvania (and disjunct to eastern New York and adjacent Vermont where very local) and eastern half of Ohio (disjunct to southernmost Indiana — an atypical form), southward through Maryland, West Virginia, eastern Kentucky (except Cumberland Mountains), Virginia, inner piedmont of western North Carolina, to, where very local, inner Coastal Plain in South Carolina and adjacent Georgia. (Map 3)

Except for a very few collections, this variety is confined to unglaciated territory. It is most frequent and abundant in the Appalachian Plateau and in the Ridge and Valley Province and more or less replaces *H. tenuifolia* in similar habitats northward in the central Appalachians.

The type collection was chosen because it is typical and is also widely distributed to a number of herbaria.

The relation of this taxon to *H. tenuifolia* is discussed under the latter species.

The first two collections, cited below, are of this variety but occur well within the range of var. *longifolia*. In the same area of southern New England intergrades of these two taxa are found (cf. Map 3 and citations under latter variety).

The epithet, *compacta*, refers to the compact appearance of the present variety as compared with var. *longifolia*. This compactness results from shortened internodes. At the same time this variety has a greater number of internodes.

REPRESENTATIVE SPECIMENS: **Vermont.** BENNINGTON: slope of Red Mt., Arlington, *Blanchard 24* (GH). **New York.** RENNSELAER: Curtis Mt., n. of Brainerd, *House 21472* (GH). **Pennsylvania.** BEAVER: Brady's Run Valley, *Bright 6712* (WIS). FRANKLIN: dry woods, *Drushel 8626* (MO, US). FULTON: 1.5 mi. s of Needmore, *Wahl 2580* (GH). HUNTINGTON: Stone Valley, *Muenscher*, 12 June 1920 (CU, US). JUNIATA: near Cocolamus, *Jennings*, 18 July 1908 (CU). **Maryland.** MONTGOMERY: Little Falls Brook, *Pennell 2437* (GH). **Virginia.** AUGUSTA: vicinity, Elliott Knob, *Allard 3264* (US). BATH: Va. Hot Springs, *Hunnewell 4800* (GH). ORANGE: Orange, *Killip 13241* (US). SHENANDOAH: shale barrens, *Allard 11777* (US). **West Virginia:** CABELL: Roland Park, 15 July 1935, *Gilbert 376* (CINC, CU, GH, TENN, US, WIS). HARDY: open thicket, *Allard 9401* (US, WVA); near Wardensville, *Hunnewell 12438* (GH). **North Carolina.** ALEXANDER: 1 mi. s of base of Rocky Face Mt., *Terrell 3122* (NCU). ROWAN: 3 mi. NE of Spencer, *Radford 14302* (NCU). **South Carolina.** BAMBERG: W of Denmark, *Ahles & Haesloop 25985* (NCU). **Ohio.** HARRISON: *Kellerman*, 5 July 1902 (OS). MEIGS: Salem Twp., *Jones*, 29 June 1935 (NY, OS). **Kentucky.** ESTILL: Estill Springs, *Anderson 333* (GH, IA). LEWIS: Kinniconick, *Fulford*, 6 Aug. 1931 (CINC); Ohio-Kinniconick divide, *Braun 4395* (BRAUN, NY).

4c. **Houstonia longifolia** Gaertn. var. **glabra**, var. nov.

Caules glabri vel pubescentes solum ad nodos inferiores. Internodia 7–10; media internodia (1.1–) 2.0–4.5 (–6.0) cm. longa. Alia sicut var *compacta*.

Stems glabrous or short-pubescent at nodes only of lower parts of stems. Internodes numbering 7–10; median ones (1.1–) 2.0–4.5 (–6.0) cm. long. Otherwise as described for var. *compacta*.

*Time of flowering:* June through August.

*Type:* *E. E. Terrell 3095*, crevices of rocks in exposed places and in moist loam in woods, summit of Whitesides Mountain, alt. 4900 feet, about 5 mi. northeast of Highlands, Jackson Co., North Carolina, July 1, 15. (GH).

*Habitats and distribution:* On or around moist, wet, or dry rock outcrops, ledges, cliffs, usually over granite; sometimes in moist woods or openings but then usually not far from rock outcrops. Southern Blue Ridge in southwestern North Carolina, adjacent Georgia, and adjacent South Carolina. Known from Macon, Jackson, Transylvania, Haywood, Clay Counties, North

Carolina; Rabun County, Georgia; Pickens County, South Carolina. This variety is restricted entirely to the Blue Ridge at higher elevations. It has been collected at elevations ranging from 2800 feet (854 meters) to 5700 feet (1738 meters). (Map 3)

Var. *glabra* was collected extensively during the summer of 1957, and the limits of its presently known range were ascertained. The areas of its greatest abundance in North Carolina are eastern and central Macon County, parts of Jackson County, and the higher sections of the Balsam chain in Transylvania and Haywood Counties (where abundant along the Blue Ridge Parkway). The westernmost station is near the summit of Standing Indian Mountain along the border of Clay and Macon Counties. The southernmost stations appear to be the summits of Blackrock Mountain, Rabun County, Georgia, and Table Rock Mountain, Pickens County, South Carolina. The limiting factor in distribution may be the presence or absence of exposed rock (commonly granite) at higher altitudes. The Highlands area of Macon County and certain parts of neighboring counties have such habitats in abundance, but other sections of the southern Blue Ridge and Great Smokies either lack such habitats, or when such habitats are present var. *glabra* is absent.

Where the peaks of the southern Blue Ridge give way to the Piedmont Province in Rabun and Pickens Counties, plants judged to be hybrids of *H. purpurea* x *H. longifolia* var. *compacta* are present (see Map 4). These occur only at lower elevations and have not been seen growing with var. *glabra;* the two kinds of Houstonias seem to be isolated by altitudinal and habitat differences. At higher elevations in the Blue Ridge *H. purpurea* is widely distributed and often abundant. Although it and var. *glabra* were observed growing together at a number of places, no definite evidences of hybridization were seen. That one species may cross or has crossed with one variety of another species but not with the other variety of the second species is presumed to be explainable by the existence of much greater opportunity to cross with the first variety.

Various environmental modifications of var. *glabra* have been observed. In high altitude, exposed habitats it is more compact and bushy. In shaded, sheltered places it is more elongate, with wider leaves, and whiter corollas. Differences in lengths of stems in two such contrasting habitats involve a change in lengths of internodes but no change in their total number.

As shown in Table 1, var. *glabra* differs from var. *compacta* by one morphological characteristic. The former variety is glabrous or nearly so — in plants growing on sunny, exposed rocks the lower internodes are so smooth they appear to have been polished. The latter variety has on the lowest internodes and nodes a dense covering of very short, grayish hairs which may be reduced to papillose protuberances visible at magnifications of 10-20 times. The single character difference is on the basis of nearly complete discontinuity: all plants within the geographic range of var. *glabra* are glabrous or short-pubescent only on the lower nodes; over 90% of plants within the range of var. *compacta* are densely puberulent or densely papillose. Those rare glabrate plants of the latter variety are sporadic and occur well to the north of var *glabra*, there being no evidence at all of a lessening of the degree of puberulence southward.

Were the morphological difference the only difference in the two varieties, it would hardly be enough to set them apart as varietally distinct. They differ, also, in habitat: var. *glabra* grows generally in moist, humid places at higher altitudes, the other variety in dry places at lower altitudes. In addition, they are allopatric (cf. Map 3 and Table 1). The three kinds of differences setting var. *glabra* apart from var. *compacta* — morphological, ecological, geographic — are considered to indicate that it deserves status as a variety.

It may be questioned whether the morphological difference is an environmentally-induced one. Although this evidence is inconclusive, it may be noted that plants of var. *glabra* which were transplanted to about 1000 feet altitude in piedmont North Carolina in the fall of 1957 were glabrous in the summer of 1958.

REPRESENTATIVE SPECIMENS: **North Carolina.** HAYWOOD: top of Devils Courthouse, Beech Gap, *Corbin & Wyatt*, 14 Aug. 1954 (NCU). JACKSON: moist granite w of Cashiers, *Wherry & Pennell 14167* (DUKE); cliffs, Wild Cat Ridge, *Smith*, 21 August 1882 (GH). MACON: top of Fodder Stack, Highlands, *Sharp & Underwood 2877* (MO); Wild Cat Cliff

Highlands, *Oosting 1785* (DUKE, F, PH); Scaly Mt., *Godfrey 51413* (NCSC, US); Satulah Mt., *Biltm. Herb. 3974i* (NY, US); on Mt. Satula, Highlands, *Sharp 1369* (TENN); trail to Mt. Satulah, *McLean 110* (GA); trail and top of Mt. Satulah, *Oosting 34131* (OC); rock outcrop 5 mi. SE of Highlands, *Wilbur 1179* (DUKE). — Guilford College, North Carolina.

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## THE DISCOVERY AND NAMING OF THE GENUS NYSSA


Richard H. Eyde


*Nyssa* is a small genus of woody plants, mostly trees, of eastern North America and southeastern Asia. The American nyssas, with which this paper is concerned, include *N. sylvatica,* found in forested areas throughout the eastern United States; *N. sylvatica* var. *biflora* and *N. uniflora,*[1] both dominant trees in inundated forests of the Coastal Plain; and *N. ogeche,* a species which is confined almost entirely to eastern Georgia and northern Florida. *N. biflora* is treated by some taxonomists as a separate species from *N. sylvatica. Nyssa* wood is of some slight commercial importance in the making of furniture, boxes, and paper pulp, and the nectar from flowers of *Nyssa ogeche* is a source for honey of excellent quality.

The fruits of *Nyssa* species are drupes of various sizes. The stone which each contains bears a distinctive valve which is pushed open by the root end of the growing embryo during germination of the single seed. The presence of this germination valve enables one to recognize a member of the genus in the absence of any plant part save the stony endocarp. Since *Nyssa* endocarps are easily preserved, as well as easily recognized, it is not surprising that this group of plants possesses a well established fossil record.

The occurrence of fossil *Nyssa* endocarps, and often *Nyssa* pollen, in divers Cenozoic strata of western North America, Japan, Siberia, England, and Central Europe leaves no doubt that *Nyssa*

[1] This is the *Nyssa aquatica* of Gray's *Manual,* 8th ed. (See Rickett, 1945)

trees formerly flourished in all temperate regions of the northern hemisphere. Evidence from many sources indicates that the range of this genus, like that of many others, gradually decreased during some tens of millions of years as a result of the long climatic cooling which preceded Pleistocene glaciation. The disappearance and later reappearance of *Nyssa* pollen at successively higher levels in early Pleistocene deposits of southern Poland (Szafer, 1954) show that nyssas had not been completely exterminated from that region at the end of the Pleistocene epoch and that they were able, moreover, to re-establish themselves from refugia during a warmer interval which followed the first onslaught of Pleistocene ice. Re-establishment was temporary, though, and *Nyssa* had become extinct in Europe by the time the last great glaciatian came to an end. With the retreat of the continental ice sheet, habitats favorable to the growth of these plants were restored. This assertion is corroborated by the observation of Franz Kirchheimer (1957, p. 570) that *Nyssa sylvatica* has propagated itself by seed in the vicinity of Heidelberg, Germany. The earliest occurrence of a member of the genus on European soil in recent time, however, was due to human agency, not to any migratory aptitude of the plant itself.

While engaged in research on the fossil ancestry of *Nyssa*, I became interested in the details of its discovery and subsequent introduction into Europe and in the origin of the name. The remarkable collection of original sources contained in the library at the Harvard University Herbarium has supplied information regarding these matters which is unavailable in later literature. The observations assembled in the present account are presented for the pleasure of any who, like myself, take delight in particulars from the history of botany.

### THE FIRST DESCRIPTIONS AND COLLECTIONS OF NYSSA

Only a few of our American woody plants, e.g., *Thuja occidentalis*, were introduced into Europe at a very early date (Wein, 1930, 1931). This is doubtless due to the crassly exploitative attitude of the first adventurers to reach the New World. It is unbelievable that the vast numbers of *Nyssa* trees growing near the Gulf of Mexico could have gone unnoticed by the 16th century Spanish explorers, but in their treasure-seeking the Spaniards had neither the time nor taste for collecting new and unusual plants or even for describing such plants in their journals. In scanning the writings of the first French settlers of Louisiana, I have likewise found little mention of trees and nothing at all relating to the genus *Nyssa*.

The intellectual atmosphere among the English of this period was quite different from that of their French and Spanish contemporaries. Visitors and settlers who could describe the climate, the geography, the ethnology, or the wildlife of the English colonies were encouraged to communicate their observations to members of the Royal Society for reading at the meetings of that young and vigorous organization. Accordingly, lists of New England plants were prepared during the 1600's by the visitor John Josselyn and by Governor Winthrop of Connecticut. The missionary John Banister of Virginia sent several notices of new plants to the "natural philosophers" back in London toward the end of the 17th century, and John Lawson, Surveyor General of North Carolina, compiled a delightfully perspicacious natural history of his own colony during the first decade of the 18th (Lawson, 1714).

Lawson included in his list of North Carolina trees and their uses a number of "Gum Trees". Following his description of "Sweet Gum" (clearly *Liquidambar*) we find this passage (p. 97-98):

> Of the Black Gum, there grows with us two sorts, both fit for Cart-Naves. The one bears a black, well tasted Berry, which the Indians mix with their Pulse and Soups, it giving them a pretty Flavour and Colour. . . . The other Gum bears a berry in shape like the others, though bitter and ill tasted. This Tree, (the Indians report) is never wounded by Lightning. It has no certain Grain, and it is almost impossible to split or rive it.

I shall not attempt to identify the first of Lawson's black gums, but the second is surely a *Nyssa,* probably *Nyssa sylvatica* or *biflora*. These trees are still commonly called black gum or sour gum in reference to the color and taste of the fruits. The fourth and last of Lawson's gum trees is a "White Gum" which I cannot recognize from his description, but it is not a *Nyssa*.

It is understandable that the zealous botanists of England could not long be satisfied with mere verbal descriptions and brief catalogues of New World plants. When Mark Catesby, while visiting his relatives in Virginia, sent actual specimens of plants to apothecary Samuel Dale of Essex, it caused such a stir among Dale's fellow collectors that they persuaded Catesby to make a second trip at their expense. Thus sponsored, Catesby traveled from 1722-1726 in Carolina, Florida, and the Bahamas, collecting and painting the wild things which he encountered.

Upon his return to England, Catesby published the descriptions and paintings which he had assembled. Volume I (1731) of this work contains readily recognizable illustrations of *Nyssa sylvatica* (plate 41) and *Nyssa uniflora* (plate 60), each of which is carefully described in French and in English. To these plants Catesby applied the names tupelo tree and water tupelo, respectively, the word tupelo being derived from the Indian name (Creek Indian for "swamp tree," according to *Webster's New International Dictionary*, 1957). These illustrations of Catesby's are the earliest pictures of *Nyssa*,[2] and it is likely that the Catesby collections in the Sloane Herbarium of the British Museum (Dandy, 1958) contain the first *Nyssa* specimens sent from the New World.

The eagerness with which the English received "curiosities" from America was fully shared by a number of Dutch enthusiasts. Perhaps the chief among these was Dr. J. F. Gronovius, Senator of Leyden. Gronovius' correspondence with the American collector John Clayton enabled him to obtain specimens and seeds of many plants previously unknown in Holland, and it was the Senator's practice to assign descriptive Latin polynomials to these new plants. When young Carl Linnaeus arrived in Leyden in 1735 with the manuscript of *Systema Naturae*, Gronovius became so impressed by the new classification method that he and his friend Isaac Lawton paid for its publication. It was

[2] Linnaeus, in Species Plantarum and elsewhere, cited Leonard Plukenet's *Cynoxylum americanum* (Plukenet, 1769, Vol. I, plate 172, fig. 6) as a synonym of *Nyssa*. Plukenet's sketch and description were first published in 1696, but they are insufficient for identification of the plant; therefore I have not given credence to the synonymy.

in this work that the name *Nyssa* was first applied to a genus of plants. Linnaeus placed the letter G. after the name, thus giving credit to Gronovius as its author, as he did in all of his subsequent systematic works. The name appeared next in Linnaeus' *Hortus Cliffortianus* (1737), where he stated that *Nyssa* was grown in George Clifford's garden from seeds supplied by Dr. Gronovius and that it had died the same year. No illustration of *Nyssa* was included in the *Hortus* but reference was made to Catesby's plate 41; therefore we know that Linnaeus considered this plant to be the same as Catesby's tupelo tree, even though he did not use the name which Catesby had given it. The *Nyssa* seeds which were unsuccessfully planted in Clifford's garden had surely been sent to Gronovius by John Clayton, for Gronovius later included two species of *Nyssa* in *Flora Virginica* (1739), his systematic treatment of Clayton's collections.

### THE INTRODUCTION OF NYSSA INTO EUROPE

The first successful cultivation of an American *Nyssa* in the Old World took place in England, in the garden of Peter Collinson, a Quaker merchant of London. According to Aiton (1810-1813), *Nyssa denticulata* (= *uniflora*) was introduced by Collinson in 1735. Aiton's information regarding Collinson's garden came from Collinson's son, and is supported by evidence later discovered in the elder Collinson's catalogue of that garden (Dillwyn, ed., 1843). There are two species of *Nyssa* listed in the catalogue, however, each being referred to a different one of Mark Catesby's illustrations. I judge from Dillwyn's notes on the Collinson catalogue that *Nyssa sylvatica* and *Nyssa uniflora* were introduced at about the same time. Further evidence for this inference may be found in Aiton (1810-1813), where it is stated that a second species of *Nyssa* was "cult. 1739 by Mr. Ph. Miller", a friend of Collinson.

Peter Collinson is best known to us through his fond and fraternal correspondence with the Philadelphia plant collector John Bartram (Darlington, 1848). Beginning in the 1730's and continuing for a period of thirty years, Bartram supplied the merchant and his English acquaintances with specimens of every natural curiosity which could be boxed and put on a ship.

Collinson responded always with financial support, occasionally with straightforward advice on the management of Bartram's affairs, and eventually with the arrangement of Bartram's appointment as botanist to the king. Regarding his passion for collecting, Collinson confided to his friend, "My inclination to natural productions of all kinds is agreeable to the old proverb: *Like the parson's barn, — refuses nothing.*" (Darlington, p. 80) The Englishman was conversant with accounts of New World wonders written by Josselyn, Lawson, and others, and he frequently asked Bartram to collect curiosities which were mentioned in these accounts. It was probably the reading of Lawson's book which aroused Collinson's desire to see the plant called black or sour gum. On May 2, 1738, he wrote Bartram, "Pray forget not a specimen of the Black Gum in flower and in leaf for we are at a loss to know what it is." (Darlington, p. 118). Passages relating to this request which appear in Collinson's subsequent letters offer some solace to others of us who have wondered how *Nyssa* could possibly have acquired "gum" as a common name. The following excerpts are from Darlington, pp. 135, 143, and 152:

June 10, 1740 . . . And please to remember a lump of Sweet Gum; Sour Gum; Allspice Gum if it bears any . . .

July 21, 1741 . . . In answer to thine of December 4, 1740; and March 22 ult. The specimens of Sweet and Sour Gum I received; but I want the *Gum* of each sort. . . .

March 3, 1742 . . . I thank thee for the Sweet Gum, or Liquid Ambar, as we call it . . . It is odd to call a plant sour Gum, or Black Gum, and it not produce any . . .[3]

Since Peter Collinson had introduced *Nyssa* into England in 1735, he must unknowingly have had a "black gum" under cultivation when he first asked for this plant from Bartram. Sometime after the requested specimens arrived, their identity was recognized, and Bartram was referred by Collinson to *Flora Virginica* for the name of the genus. The introduction date indicates that Collinson's first *Nyssa* seeds, like those planted in

[3] Sudworth and Mell (1911) have suggested that the name "gum" for *Nyssa* trees, none of which produces a gum, goes back to a time when all hollow trees might be used for hives and called "bee-gums" by country folk. I have encountered no evidence for or against such an explanation, but it is plain from Lawson's book, quoted in this article, that several quite different trees were called gums by early settlers.

George Clifford's garden, were supplied by Dr. Gronovius.

It is not known whether Clifford again planted *Nyssa* after his first attempt failed. That Nyssas were soon introduced successfully into Holland, however, is shown by the inclusion of an American *Nyssa* in the catalogue of the Utrecht Garden for the year 1747 (*fide* Wein, 1931). A century later the director of the Berlin Garden wrote that he had seen nyssas growing in many European gardens and that he himself had successfully cultivated four species (Otto, 1849).

### DERIVATION OF THE NAME NYSSA

The reason that Gronovius and Linnaeus substituted the name *Nyssa* for Catesby's "tupelo" is not difficult to divine. We are informed by Linnaeus in his *Critica Botanica* (1737) that names which are barbarous in origin, he cannot accept (§ 229). Names of classical origin were quite acceptable, and *Nyssa* is such a name.

In attempting to explain the classical derivation of this word, dictionaries and botanical works have offered a variety of etymologies. According to *Webster's New International Dictionary* (1957), *Nyssa* is a Latinization of a Greek word meaning a goal or turning-post. A similar etymology is given by Dr. Roland Brown in his *Composition of Scientific Words* (1954). Other sources, including several botanical lexicons, list *Nyssa* as the name of a nymph. This nymph has been described as the nurse of Bacchus (Wittstein, 1852; *Century Dictionary and Cyclopedia,* 1911; *Funk & Wagnall's New Standard Dictionary,* 1935), or simply as a water-nymph (Beckmann, 1801; deTheis, 1810; Paxton, 1840; Gray, 1856), or both water-nymph *and* nurse of Bacchus (Lyons, 1900). There is even disagreement between the derivation given in Prof. Gray's *Field, Forest and Garden Botany* (1868), and that in his *Manual!*

Much of this etymological confusion is due to Gronovius' choice of an unusual spelling for Nysa, a word which appears occasionally in classical writings[4] as a personal name and as a geographical name (*Lexicon Totius Latinatis. Onomasticon,*

[4] I am grateful to Mr. G. Fitzgerald, Dept. of Comparative Literature, Harvard, for aid in locating and translating the Latin references cited in this paper.

1920). The Greek νυσσα indeed meant "a turning post", or "a goal" — it is used that way in the Iliad (Book 23, line 332) — but Gronovius had no such meaning in mind when naming his new genus. We may be sure of this, for *Nyssa* appears on the list of names of mythological deities retained by Linnaeus when he developed his system of nomenclature. In that list the name *Nyssa* is accompanied by the brief explanation *"Nyssa Nympharum una"* (*Critica,* § 237). Gronovius, who regularly read proof for Linnaeus' publications, would not have permitted such an explanation if it were not the correct one.

Etymologies describing *Nyssa* as the nurse of Bacchus are based on a brief passage by Diodorus of Sicily, a contemporary of Julius Caesar, who recorded several tales regarding the rearing of the motherless Dionysus (Bacchus). In one version, the infant is taken by his father Zeus to a city Nysa and given in charge of a girl Nysa. This Nysa is not a nymph, though, just "one of the daughters of Aristaeus" (Diodorus, 1935, book III, chapt. 70).

Nysa appears as the name of a nymph in the somewhat fragmentary fable number 182 of Hyginus (Rose, ed., 1934), probably written in the second century (*Oxford Classical Dictionary,* 1949). Here there are listed some Naiads, daughters of Oceanus, one of whom is named Nysa. Doubtless a classical scholar could cite additional uses of the name Nysa, but these should suffice to explain the multiplicity of meanings which have been attributed to *Nyssa* by our lexicons.

It would not be possible to choose between these somewhat obscure classical references, were it not for Linnaeus' statement that *Nyssa* means *"Nympharum una".* Linnaeus also spared us from conjecture as to *why* these trees were named for a nymph, when he wrote in *Hortus Cliffortianus, "Nyssa dicitur cum in aquis crescat."* Not all nyssas are aquatic, to be sure, but neither Linnaeus nor Gronovius had seen the trees growing in their native habitat. They had before them, however, the two polynomials previously applied to Catesby's tupelos, each of which began, *"Arbor in aqua nascens . . . "* In short, the explanation given in Gray's *Manual,* that *Nyssa* is named for a nymph because it grows in the water, is the correct one, being taken from Linnaeus' own explanatory remarks. — *Department of Biology, Harvard University.*


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A NEW PEPEROMIA FROM JAMAICA. — Botanical exploration in the John Crow Mountains of eastern Jamaica has brought to light new species of plants in nearly every family of plants occurring in the area, suggesting a long history of at least ecological isolation from the rest of the island. Among the undescribed species collected in recent years is the following diminutive *Peperomia,* which has been found several times on the sheltered sides of overhanging limestone cliffs.

**Peperomia lewisii** Proctor, sp. nov.

Herba parva et fragilis; caulibus breve pilosis, plerumque sine ramis, recurvato-pendentibus, 3–8 cm. longis, non plus quam 1 mm. diametro. Foliae oppositae vel paucae alternatae 1.5–2 (–2.5) cm. longae, includenti petiolum gracile 3–4 mm. longum, lamina obovato-elliptica, apice rotundata, base cuneata, 0.5–1 cm. lata; supra glabrosa praeter prope marginem, griseo-virida vivens, tenebrosior sicca; infra hispidulosa, pallide-virida vel punicea. Spicae 1–3, terminales vel solae in axillis superioribus, graciles, glabrosae, 1–3 cm. longae; pedunculi hispidulosi, circa 8 mm. longi; drupae circa 0.5 mm. diametro, fuscae sicca.

Small, fragile herb; stems short-pilose, mostly unbranched, recurved-pendent, 3–8 cm. long, not more than 1 mm. in diameter. Leaves opposite or a few alternate, 1.5–2 (–2.5) cm. long (including the slender, 3–4 mm. long petiole), the blade ovate-elliptic, apex rounded, base cuneate, 0.5–1 cm. broad; upper surface glabrous except near the margin, gray-green when fresh, darker when dry; lower surface hispidulous, pale green or pinkish. Spikes 1–3, terminal, or solitary in the upper axils, slender, glabrous, 1–3 cm. long; peduncles hispidulous, about 8 mm. long; fruits about 0.5 mm. in diameter, dark brown when dry.

TYPE: Parish of Portland, east slope of the John Crow Mountains 1.5–2.5 miles southwest of Ecclesdown, on shaded limestone cliff, elevation 1500–2500 ft., *Proctor 10473*, collected August 11, 1955 (Holotype at the Institute of Jamaica). Additional material: *Proctor 9996* and *Webster & Wilson 5148*, from the same general area.

Named for Mr. C. Bernard Lewis, Director of the Institute of Jamaica and Curator of its Museum.

This species somewhat resembles *P. barbata* of the Jamaican "Cockpit Country" and adjacent areas, but differs in its much slenderer, mostly unbranched, recurved-pendent stems, its obovate-elliptic (instead of roundish-elliptic) leaves of more delicate texture, by its glabrate upper leaf-surfaces, and by its slenderer, shorter spikes and smaller fruits.

*P.* lewisii also differs from *P. spathophylla* Dahlst. of eastern Cuba (with which it was for a time confused) in its short-recurved (instead of long-creeping) stems which are never stoloniferous, its mostly opposite (instead of alternate) leaves which are glabrate above and never retuse or retuse-cordate, in its hispidulous (instead of glabrous) peduncles, and in having slenderer spikes. The fruits of the two species cannot at present be compared because those of *P. spathophylla* are known only in an immature state.—GEORGE R. PROCTOR, INSTITUTE OF JAMAICA, KINGSTON, W. I.

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VIOLA ERIOCARPA VS. V. PENSYLVANICA. — The two common widespread, yellow-flowered, leafy-stemmed violets in eastern North America, *Viola pubescens* and *V. eriocarpa* are readily distinguishable by several morphological characters. Their taxonomy and ecology seem to be adequately understood, but on one point of nomenclature a correction seems to be necessary, as in recent years a few sporadic attempts have been made to substitute for the well-known binomial *Viola eriocarpa* that has stood since 1822, another that has been supposed to antedate it, namely *V. pensylvanica* Michaux (1803).

As already noted, the two species of violets are clearly defined.

Plants of *Viola pubescens*, described by Aiton in 1789, are decidedly pubescent, with strongly veined thickish leaves with ovate stipules, the basal leaves usually absent at flowering time, and seeds 2.6-3 mm. long. The other species of this pair, described by Schweinitz in 1822 from North Carolina as *V. eriocarpa*, is nearly glabrous, with thinner, less conspicuously veiny leaves, and somewhat narrower stipules, the basal leaves usually present at flowering time, and smaller seeds about 2-2.6 mm. long.

In 1941 an attempt was made (Rhodora 43: 616-617) to displace the name *V. eriocarpa* in favor of *V. pensylvanica* Michx. An argument was presented that a photograph of the original material of Michaux's *V. pensylvanica* shows a mixture of *V. pubescens* and of *V. eriocarpa*, the former represented by very immature plants scarcely in bloom, the latter by a plant with well-grown foliage and an old flower. The author concludes that the latter stands as the type of the Michaux name. When we turn, however, to the original description we find the statement "V [iola] tota villoso-pubescens": the conclusion seems inescapable that the plant described is *V. pubescens* Ait. According to Recommendation 8C (Int. Code, 1956), whenever type material of a taxon is heterogeneous, the lectotype should be so selected as to preserve current usage unless another element agrees better with the original description and (or) figure, and in Appendix IV, paragraph 4, "The original description of the taxon concerned should be the basic guide."

That part of the original material of *Viola pensylvanica* that agrees with the original description in Michaux's Flora Boreali-Americana 2:149 (1803) is designated as the lectotype, and *V. pensylvanica* is clearly a synonym of *V. pubescens*. — GEORGE NEVILLE JONES, UNIVERSITY OF ILLINOIS.

THE TYPE OF SETARIA FABERII. — The majority of plant taxonomists regard *Setaria faberii* Herrmann as a distinct species. A noteworthy exception is H. A. Gleason. In December, 1953 he wrote to me "I frankly can not see *S. faberii* as a good species. To me it is just another race of *S. viridis*, to be recognized possibly as a variety, or a form, or what you please, but to me it is not a species." The absence of the taxon from his New Illustrated

Flora was no oversight but the result of courageous deliberate exclusion. David E. Fairbrothers (Brittonia 11: 44-48. 1959) has brought the full force of his attention to the subject of morphological variation of *S. faberii* and *S. viridis*. After measurements and observation of numerous plants both from wild populations and cultivation he defined comparative sizes in the spikelets, panicles and bristles for the two species, which he set in a key, and furthermore concluded that: "The one stable qualitative feature was the strigose condition of the upper surface of the blades of *S. faberii* in contrast to the glabrous or glabrate condition present in *S. viridis*." Although Dr. Fairbrothers did not definitely state whether he accepts *S. faberii* in the specific category, his treatment would seem to suggest so. The investigator did not study the species on a world-wide basis; he apparently consulted few herbaria, and did not examine the type of *S. faberii*. Because of the latter omission there arises a peculiar situation regarding "the one stable" feature, leaf-pilosity, a dilemma which will be discussed below. The principal purpose of the present note is to indicate the problem of pilosity of the leaf-blades of *S. faberii* especially in the light of the type of the species.

For several years I have given some cursory attention to *S. faberii*. The species grew in vast quantities, almost like a cultivated crop, on the grounds in the rear of the Museum Building of The New York Botanical Garden. A specimen (Monachino #582) was sent to Jason R. Swallen in October, 1953, who confirmed the identification and asserted that he considered *S. faberii* "a good species." This collection has hairy leaf blades. The pilosity on the upperside of the leaf blades of *S. faberii* is easily observable; it can be clearly seen, and even felt by merely running the fingers lightly over the surface of the blade. The very ease with which this character is employed (I suspect) has sometimes prejudiced my identification in doubtful cases. It is thus that I refrain from naming another of my collection from The New York Botanical Garden grounds (Monachino #583, Sept. 1956), notwithstanding that measurements would key it out to *S. faberii* and that it was growing in a population of *S. faberii* and simulating that species. The spikelets of my #583 are over 2.5 mm. long, the length of the panicle is up to 10 cm. and its width up to 8 mm.; the sterile lemma of the spikelet manifestly surpasses the second glume. The maxima given for *S. viridis* by Fairbrothers are 2.2 mm., 9.5 cm. and 0.7 cm., respectively; sterile lemma length ratio to 2nd glume 0.95 to 1.06. The leaf blades of #583 are glabrous and so it lacks Fairbrothers' one stable qualitative feature conveniently characterizing *S.faberii.*

My specimen #583 is not the only one in the herbarium of The New York Botanical Garden with glabrous blades and with measurements surpassing those given for *S. viridis.* A Chinese collection distributed as *S. viridis* is another example: *Steward Chiao & Cheo 220,* Kweichow Province, Liang Feng Yah, Tsunyi Hsien, 6 Aug. 1931. Fernald in the 8th edition Grays' Manual describes the spikelets of *S. viridis* up to 2.5 mm. long.

As to the constancy of leaf-strigosity of *S. faberii,* Fernald said "usually", and I have examined plants having lower leaves manifestly pilose while the upper ones were glabrous. But the most disconcerting problem concerning pilosity is posed by the very type of *S. faberii.*

In the original description of *S. faberii,* Herrmann (Beitr. Biol. Pfl. 10; 51. 1910) described the leaves glabrous above: "laminis utrimque glabris, supra scabris." The type was collected in China, Szech-uen, Faber No. 582–1182, and at Vienna. A specimen of Faber 1182, possibly an isotype, is found amongst specimens of *S. viridis* in the herbarium of The New York Botanical Garden, has glabrous blades. Through the kindness of Karl H. Rechinger, Naturhistorisches Museum, Wien, I obtained a portion of a leaf from the type and this too is glabrous! Apparently the type lacks the very feature named constant for the species!

It is thus seen that the problem centering on *S. viridis - S. faberii* is a complex one indeed, at least regarding pubescence. How is one to harmonize Fairbrothers' conclusion concerning leaf-pilosity with the type of *S. faberii?* Dr. Fairbrothers, who has read this paper in manuscript, provides part of the answer himself. He wrote to me (letter of 27 April 1959): "Since my *Setaria* paper appeared in Brittonia specimens have been sent to me by taxonomists from three different states in which the five quantitative characteristics fit *faberii,* but the leaves were glabrous. Each person indicated they found only one or two plants of the glabrous type in a population of hairy ones." — JOSEPH MONACHINO, NEW YORK BOTANICAL GARDEN.

## AN INTERPRETATION OF TWO FORMS OF OSMUNDA CINNAMOMEA

TAYLOR A. STEEVES

Within the range of Gray's Manual, six aberrant forms of the cinnamon fern, *Osmunda cinnamomea* L., have been described, in addition to the typical form and the well defined var. *glandulosa* Waters. Other varieties are also known from tropical and sub-tropical America and from eastern Asia. The writer and several of his colleagues have been interested in this species for over ten years as a remarkably fine subject for morphogenetic studies. During this period many observations have been made on plants growing under natural conditions in the vicinity of Boston, Massachusetts, and certain tagged plants have been examined in successive growing seasons. These studies have made it possible to offer at least partial explanations for two of the described forms, forma *frondosa* (T. & G.) Britt., and forma *latipinnula* Blake.

*O. cinnamomea,* f. *frondosa* was first described as a variety by Torrey and Gray (Torrey, 1840), and later reduced to a form by Britton (1890). In contrast to the typical condition in which fertile fronds are completely distinct from foliage fronds and are without laminar development, this form is characterized by reproductive fronds which bear some laminar tissue. In fact, sterile pinnae may predominate, with only a few sporangia-bearing leaflets present. The fertile and sterile pinnae are variously intermixed; and sometimes sporangia may even be born on the edges or backs of leafy pinnae. In the writer's own observations, the sterile pinnae have been basally located and have given way, with various intermediates, to fertile pinnae in the upper portion of the frond in the manner reported in the original description of the phenomenon (Torry, 1840). Other arrangements, however, can occur (Kittredge, 1941). There have been well-documented suggestions that this form represents a response to unusual environmental conditions such as burning (McLouth, 1897), a late spring frost (Owen, 1901), or the close proximity of a recently tarred roadway (House, 1933); but still the form with its Latin name has persisted.

It is evident from regular observations of tagged plants in the field, that there is considerable variation from year to year in the number of fertile fronds produced by any given plant. For example, one group of 19 plants, which was treated as a unit, produced a total of four fertile fronds in 1949, and in 1950 produced 25. Although fertile fronds are not evident above ground until early spring, it is known (Steeves and Wetmore, 1953) that the nature of the leaves is fully determined within the apical bud during the preceding season. Dissections in late summer show that the fertile fronds for the next year are fully formed, but coiled, and that the sporangia are present. It would seem reasonable to suppose that environmental conditions during the period of frond determination might influence the extent of fertility in any plant. No real evidence is available on this matter, but two observations may be reported. It has been noted that a hot dry summer is usually followed by a high degree of fertility in the following spring, whereas a cooler, moister summer leads to reduced fertility. Further, a comparison made in one area between plants in heavy woods and plants in a powerline right-of-way revealed a consistently higher level of fertility in the open right-of-way. Such observations suggest that temperature, soil moisture, or possibly total light energy received might be important factors in regulating the extent of fertility. Recent studies (Sussex and Steeves, 1958) on excised leaves of several species of ferns, including *O. cinnamomea,* growing in sterile nutrient culture, have shown that an increased supply of carbohydrate favors the initiation of sporangia; but it is difficult to correlate such observations with environmental conditions in the field.

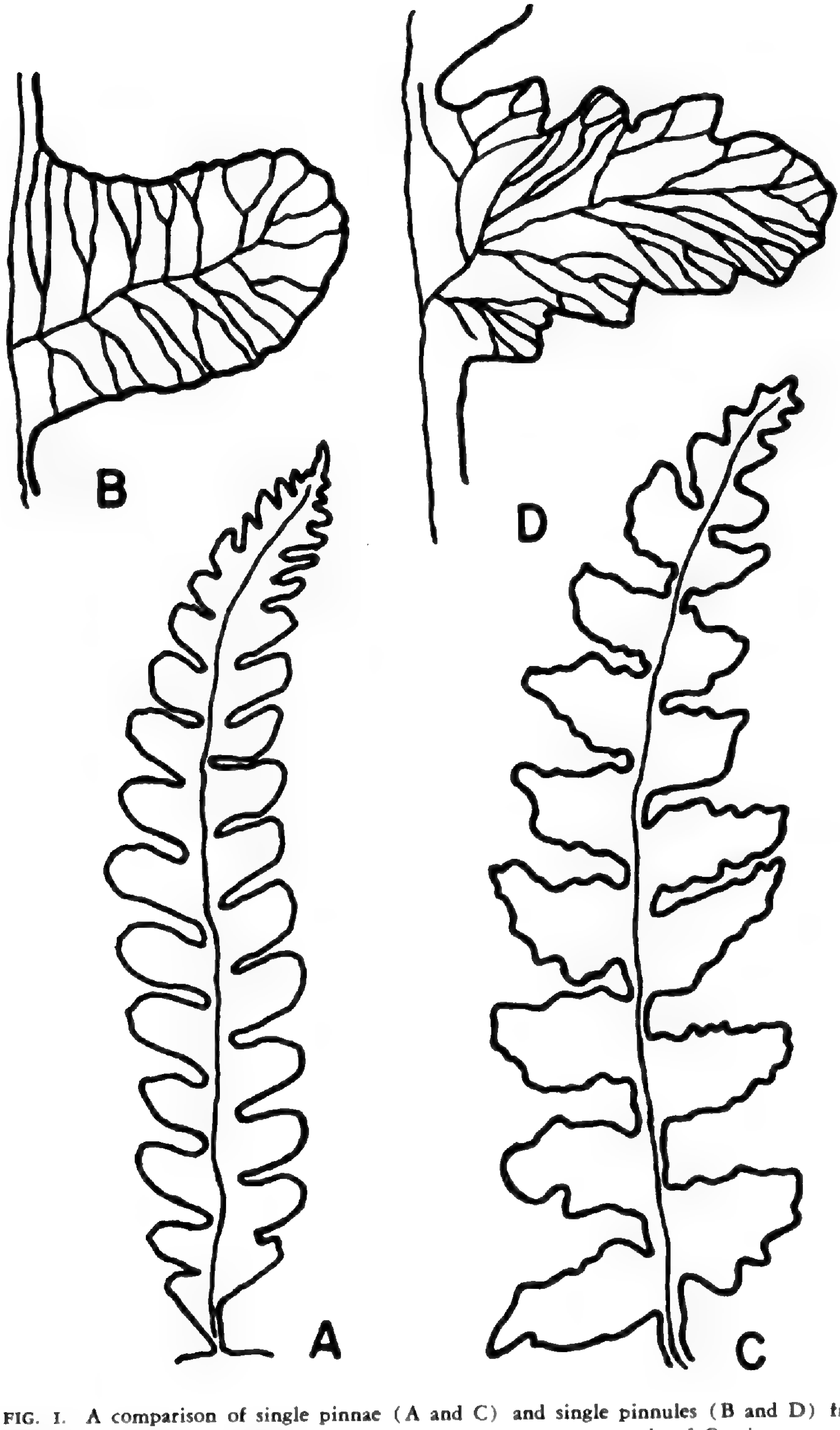


FIG. 1. A comparison of single pinnae (A and C) and single pinnules (B and D) from a typical example of *O. cinnamomea* (A and B) and from an example of *O. cinnamomea* f. *latipinnula* (C and D). A and C natural size. B and D X 4.

In the spring of 1949, the plants of the group mentioned above were all normal, that is, no mixed fertile and sterile fronds were observed. In 1950 three such fronds were found among the 25 fertile fronds produced, two on one plant, which also bore two normal fertile leaves, and one on another plant which also bore a normal fertile frond. A search of the neighboring woods revealed that the "frondosa" condition was common throughout the area. The following year was characterized by moderate fertility in the tagged group of plants and no mixed fronds were observed. As mentioned earlier, in the cases studied by the writer, the sterile portion of the leaf was always basal, with the fertile pinnae more apical in location. Since the initiation of the pinnae along the rachis proceeds from base to apex (Steeves and Briggs, 1958), it is suggested that the leaves were originally determined as sterile fronds and then changed over to the fertile condition after pinna initiation had begun. In individual mixed pinnae, however, it is the basal portion which is fertile and the tip sterile; and the same is true of mixed pinnules. An explanation of this phenomenon cannot as yet be given since the development of pinnae is not known in sufficient detail.

In contrast to the form just discussed, *O. cinnamomea* f. *latipinnula* Blake is both striking in appearance and rare in occurrence. It was originally described by Blake in 1913 on the basis of its broad, deltoid pinnules which are characterized by a crenulate margin which may even become faintly lobed. The pinnules are reduced in number and are correspondingly broad (more than a centimeter in some cases). The venation is unusually coarse and the lateral veinlets are more pronounced than in normal fronds (fig. 1, cf A and B with C and D). In many ways the fronds are suggestive of juvenile leaves of the species except, of course, for size. Originally described from Vermont, f. *latipinnula* has subsequently been collected in Massachusetts (Report on the Flora of Massachusets II, 1933), Pennsylvania (Gruber, 1940) and New York.

In the early summer of 1951, three plants of f. *latipinnula* were found by the writer, growing through a pile of brush on a powerline right-of-way in Hingham, Massachusetts. The identity of the material was established by Prof. W. H. Wagner, Jr., who also ascertained that there was no polyploidy involved in this unusual vegetative form. The fronds were late in emerging from the apical bud and were very slender and weak. Two of the abnormal plants were carefully marked, and a third was taken to the laboratory in the fall and stored over winter in a cold room. In the following spring, this plant was forced in a greenhouse. This plant, as well as the two left in the field, were of essentially normal form, although the fronds showed some slight deviation from the typical condition. In any event they were not of the *latipinnula* type. Clearly then f. *latipinnula* is a temporary condition representing a modification of normal leaf development.

It seemed at least possible that the heavy covering of brush had in some way induced these abnormal characteristics. Accordingly, in the fall of the year, several tagged normal plants were covered by similar piles of brush. These plants were examined in the following spring and found to be essentially normal. The fronds grew through the covering with difficulty, and were somewhat distorted; but they did not show the *latipinnula* characteristics. In late summer of 1951 a large-scale experiment was performed, to the writer's benefit but not at his instigation, which shed much more light upon the nature of this aberrant form. The powerline right-of-way was cleared again and new poles were set. These operations involved the bringing of considerable heavy equipment into the area. The following spring, a number of new examples of f. *latipinnula* were discovered in the cleared area. They were of the same form as the previous examples, but the fronds were not weak. Furthermore, there was no covering of brush over them.

There was now sufficient material available to make it possible to dissect some of the plants in an attempt to ascertain the cause of the abnormality. In all cases there was definite evidence of injury to the plant, and many leaf bases showed the results of breaking or crushing. Two plants, located side-by-side, were especially enlightening in this connection. Both were in the path of a truck tire track, and both were of the *latipinnula* type. Examination of the plants which had been found during the previous season also gave clear evidence of injury, presumbly in an earlier clearing operation. It thus seemed reasonably established that the f. *latipinnula* is a response to rather drastic injury. It was, moreover, possible to establish the role which the injury had played.

Previous studies (Steeves and Wetmore, 1953, Steeves and Briggs, 1958) have shown that *O. cinnamomea* is characterized by a slow rate of leaf development. Leaves are produced at the shoot apex and develop within the apical bud for nearly four years before finally expanding above ground. As a consequence, the apical bud contains a large reservoir or pool of immature leaves, sufficient throughout most of the year for four subsequent growing seasons. During the growing season preceding final expansion of an annual set of fronds, the leaves of this set acquire the form of cataphylls (bud scales), fertile fronds and sterile fronds; and, starting from the outside of the bud, this is the sequence of leaf types within each set. Both fertile and sterile fronds form a rachis with pinnae, coiled into the characteristic fern crozier. The cataphylls, on the other hand, develop a flaring margin on the leaf base, but the portion which in the other leaves develops into the above-ground portion, is arrested in its growth and does not complete its development. During the winter, the cataphylls enclose and protect the apical bud. In the spring the fertile and sterile fronds push up inside these and expand above ground. Then a new set of cataphylls, fertile fronds and sterile fronds begins to take form from immature leaves inside these. Also, at the very center of the bud, a new set of primordia is added to the reservoir by the apical meristem. In other words, each year one set of leaves is used up at the outside of the bud and a new set is added at the center, so that the number of sets in the pool remains relatively constant. The cataphylls early lose any power to develop a complete rachis with pinnae because the leaf apex stops growing and usually undergoes necrosis. This loss progresses from the outside of the set inwards, but ends abruptly with the first frond, the apex of which is actively developing. Early in the growing season, the removal of the current year's set of fronds has the effect of forcing some of the cataphylls to expand above ground. If this operation is performed somewhat later, the outer cataphylls will not respond, but some of the inner ones which have not lost the power of apical growth may do so. After early July, there is ordinarily no response at all; but sometimes a drastic treatment, such as complete mowing of a large area, will cause some of the innermost cataphylls, or even some of the next season's fronds, to complete their development and expand. Under these conditions, the fronds which emerge may be abnormal, and many show a broadening of the pinnae suggestive of the f. *latipinnula*. They are not, however, typical examples of this form.

In the case of the plants which showed *latipinnula* characteristics in 1952, the situation was somewhat more complex; but an examination of the cataphylls and persistent leaf bases outside the fronds of the current year has made an interpretation possible. In the latter part of July of 1951, the area was cleared and all fronds were mowed down. In many plants, probably including those under consideration, some of the inner cataphylls began to develop as fronds. The fronds for the next growing season continued to develop their croziers or a few may have started to form cataphylls. Then, later in the summer, an injury occurred which destroyed not only the released cataphylls, but also the fronds for the next growing season and possibly some leaves inside them. Subsequent developments are not very clear; but it appears that a new set of cataphylls was formed inside the crushed fronds, and that inside these a new set of fronds developed for the next season. In fact, the cataphylls and new fronds were, to a certain extent, intermixed, a condition never found in normal plants. When these new fronds expanded during the following spring they were of the *latipinnula* form.

In essence, the injury, occurring when it did, pushed the entire leaf utilization sequence considerably further into the special bud than is normal. The *latipinnula* fronds developed, therefore, much more rapidly than under normal circumstances. It is suggested that the drastic change of form of these fronds was the result of this accelerated development. The tendency toward the *latipinnula* condition in fronds forced by mowing in late summer provides support for this interpretation. Changes in leaf form resulting from acceleration of development have been noted previously and have been described in detail in certain woody dicotyledons by Späth (1912). In any event, the f. *latipinnula*, like the f. *frondosa*, has no genetic or taxonomic significance, but should rather be regarded as one of the variable morphogenetic expressions of the leaf of *O. cinnamomea*.

It is a pleasure to acknowledge the valuable assistance of Mr. C. P. Steeves and Mr. G. S. Lord in making field observations and in reconstructing the history of the area in which they were made, and to Prof. W. H. Wagner, Jr. for his helpful advice and suggestions. Miss Barbara Coffin very kindly drew the illustrations in Fig. I. — DEPARTMENT OF BIOLOGY, UNIVERSITY OF SASKATCHEWAN, SASKATOON, SASK.

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# Rhodora

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## A REVISION OF EUCNIDE

U. T. Waterfall

The genus *Eucnide*, in the Loasaceae, was established by Zuccarini (1844) with the description of a single species, *E. bartonioides.* Asa Gray (1857) transferred the earlier *Microsperma lobata* Hooker (1840) to *Eucnide*, since there already existed a *Microsperma* described by Lagasca in 1816, a genus near *Flaveria* in the Compositae. He stated that *Microsperma rudis* Schauer, 1847, probably should be included in the same specific concept. Following this, ten other species were described, the three latest being: *E. hypomalaca* Standley (1940), *E. xylinea* C. H. Muller (1942), and *E. guatemalensis* Standley (1944).

*Eucnide* is obviously and amply distinct from *Sympetaleia*, which has sympetalous corollas and is the only other member of the Eucnideae as delimited by Gilg (1894). It somewhat resembles *Mentzelia*, in the Mentzelieae, but the numerous small seeds, covering a large placenta, or in many rows on it, are in distinct contrast to the larger seeds in one or two rows on the placentas of Mentzelia.

The genus is here considered to consist of 10 taxa, circumscribed in 8 species, and ranging geographically from southwestern Texas and the southwestern United States through Mexico into Guatemala.

There appear to be two natural, but somewhat intergrading series in the genus. One series has flowers solitary in the leaf axils. It includes *E. bartonioides, E. xylinea* and *E. urens.* The second group has terminal inflorescences more or less developed. Plants with few-flowered inflorescences may have the lower flowers subtended by leaf-like bracts; collections from young plants beginning to flower might be confused with the first group.

*E. bartonioides,* ranging from Texas to Chihuahua and Tamaulipas, is readily distinguished by its long fruiting peduncles; in flower it tends to resemble other species, especially since the size of the flowers is quite variable. The dwarf, endemic *E. xylinea* of western Coahuila, and the more wide-spread *E. urens* of the southwestern United States and adjacent Baja California are amply distinct.

The tendency toward terminal inflorescences reaches its greatest development in *E. cordata* of Baja California, which has many-flowered inflorescences often lifted above the leaves on a short peduncle. *E. grandiflora* of Oaxaca, and its similar var. *guatemalensis,* are easily recognized by their large flowers with petals 5.5 to 8 cm. long, while *E. cordata* (sen. lat.) of central to northeastern Mexico is characterized by small petals usually 6-10 mm. long. *E. sinuata* (incl. *E. Nelsonii*), Michoacan to Vera Cruz and Guatemala, is characterized by its long fruiting peduncles (5-11 cm. long). *E. Pringlei* from Guerrero, and its var. *hypomalaca* of southern Sonora and adjacent Chihuahua have corollas 3-4 cm. long.

The author is indebted to the curators of the Gray Herbarium, the National Herbarium of the Smithsonian Institution, the Chicago Museum of Natural History and the University of California for the loan of their material of *Eucnide.* The symbols for these herbaria, used in citation of specimens, are the standardized ones of Lanjouw and Stafleu (1956). Thanks are also due the librarians of Oklahoma State University for their generous assistance in securing photostats of publications unavailable locally.

*Eucnide* Zucc., Del. Sem. Hort. Monac. 1844; Abhandl. Akad. Wissensch. Munich. Math.-Naturwissen. Abtielung. 1-11. 1845 *Microspermum* Hook. Ic. Plant. 3. 1840, non Lagasca, Gen. et Sp. Pl. 25. 1816.

Plants herbaceous or suffrutescent, covered with glochidiate hairs which may have extra verticils below their apices, these often mixed with simple hairs, hairs frequently in two layers of different lengths, or of uneven lengths, often stinging, usually stiff, sometimes villous-canescent, sometimes pustulate-based; leaves usually alternate, sometimes crowded or opposite, usually petioled, sometimes sessile, blades mostly subrotund to ovate, more or less lobed and toothed; stems erect and branched, or matted, or pendulous on cliff faces; flowers single on axillary peduncles or in inflorescences with bracts leaf-like, or much reduced; sepals 5, linear-lanceolate to ovate-lanceolate, persistent; petals 5, white to yellow, lanceolate or lanceolate-spatulate to nearly ovate, 0.4-8 cm. long; stamens several to numerous, usually exserted; filaments 0.5-11 cm. long, slightly joined to each other basally, and to the bases of the petals; anthers rounded-quadrate, 0.4-2.1 mm. long and about as wide; ovary inferior, 5-carpellate, unilocular, with ovules in several rows on each placenta; fruits subhemispheric to subturbinate, opening by 5 apical tooth-like valves; style usually exserted slightly beyond the petals and stamens, but included in one species; stigmas somewhat 5-lamellate to 5-angled or 5-sulcate, oblong to clavate and often twisted to narrowly obconic; seeds numerous, elongate, minute, 0.5-1.25 mm. long and 0.13-0.38 mm. wide, longitudinally lineolate.

KEY

a. Flowers large; petals 5.5–8 cm. long.
  b. Leaves mostly wider than long, or nearly orbicular; petals acutish. 8a. *E. grandiflora* var. *grandiflora.*
  b. Leaves longer than wide; petals obtusish ........ 8b. *E. grandiflora* var. *guatemalensis.*
a. Flowers smaller; petals less than 4.5 cm. long.
  c. Flowers single in leaf-axils, or if crowded then subtended by bracteal leaves similar to the stem leaves, but smaller
    d. Flowers and leaves large; petals 1–4 cm. long; fruits (5) 10–17 mm. long and (5) 6–10 mm. wide; leaf blades mostly 2.5–8 cm. long and 2–8 cm. wide.
      e. Peduncles (especially of older flowers and of fruits) 8–30 cm. long; stamens exserted: leaves all petioled ........ 1. *E. bartonioides.*
      e. Peduncles short, 5–10 (15) mm. long; stamens included, often one-third to one-half as long as petals; upper leaves often sessile ........ 3. *E. urens.*
    d. Flowers and leaves small: petals 2–2.5 cm. long; fruits 3–5 mm. long and 6–8 mm. wide at their apices; leaf blades mostly 5–15 mm. long and 4–10 mm. wide, densely villous-canescent ........ 2. *E. xylinea.*
  c. Inflorescences present when plants well developed
    f. Pedicels long, fruiting ones (3) 5–11 cm. long; corollas 2–2.5 cm. long ........ 5. *E. sinuata.*
    f. Pedicels short, most of them 1–3 cm. long
      g. Flowers large; petals 1.5–4 cm. long
        h. Petals usually 3–4 cm. long
          i. Vestiture of fruits of long, pointed hairs, 1.2–2.1 mm. long, under

which is often a dense layer of minute, often glochidiate hairs, ca. 0.2 mm. long ........................................................ 6a. *E. Pringlei* var. *Pringlei.*

i. Longer hairs on fruits mostly 0.4–1.0 mm. long, mostly glochidiate, but sometimes with a few simple hairs, a sparse layer of minute, capillary, sometimes glochidiate hairs, ca. 0.2 mm. long, present .......................... 6b. *E. Pringlei* var. *hypomalaca.*

h. Petals 1.5–2 (2.5) cm. long .......................... 7. *E. cordata.*

g. Flowers small; petals (4) 6–10 (12) mm. long .............. 4. *E. lobata.*

1. **Eucnide bartonioides** Zuccarini, Del. Sem. Hort. Monac. 28, 1844; Abhandl. Akad. Wissenschaften, Munich 4: 1-7, Tab. 1. 1845.

Plant herbaceous, covered with long, bristly, probably stinging hairs, and with shorter glochidiate ones; often trailing, or hanging on cliff sides; leaves alternate, but the nodes often crowded, blades mostly suborbicular to subovate, cordate to subcordate, irregularly and shallowly lobed, and coarsely and unevenly toothed, mostly 3-8 (12) cm. wide and long, about equalling, or slightly shorter than the petioles; flowers single, axillary; peduncles becoming 8-30 cm. long in fruit; upper branches of well-developed fruiting plants sometimes have the subtending leaves reduced in size showing a tendency toward the development of an inflorescence having flowers with leaf-like bracts; sepals linear-lanceolate to nearly lanceolate-ovate, on small flowers often 3-5 mm. long and 1-1.5 mm. wide and on large flowers often 10-20 mm. long and 2-5 mm. wide, persistent on fruits; petals obovate to obovate-oblanceolate, narrowed toward their bases, usually 1-4 cm. long, yellow, drying lighter; stamens several to numerous, slightly exserted, usually 1-5 cm. long; fruits hemispheric to obovate-turbinate, 5-12 mm. long and 4-8 mm. wide; seeds 0.6-1 mm. long and 0.2-0.33 mm. wide.

The plants, and particularly the flowers, vary greatly in size. Most collections have petals 2-4 cm. long, and fruits 8-12 mm. long and 6-8 mm. wide. However the petals may be only 3-10 mm. long, and other flower parts may be correspondingly small. On Johnston and Muller 1204 the note appears "variable in size according to habitat". Another sheet, "F. L. 419, collected in 1850" states "flowers of very different sizes". Flower size seems not to be correlated with geographic distribution. Small-flowered specimens occur from the northern limit of the species' range in Comal County, Texas, to Chihuahua in the southwest and Tamaulipas in the southeast.

This species has been attributed to Guatemala (Standley and Steyermark 1940: 179) as "has been collected there but once". The single specimen seen from Guatemala which was labelled

E. bartonioides, Kellerman 8062 (F), is not that species, but is E. sinuata.

The author has not seen the type, but the drawing accompanying the description (Zuccarini, 1845) shows the unmistakable long fruiting peduncles of this species.

**Representative collections:** TEXAS: BREWSTER CO.: *Sperry 519,* banks of Tornillo Creek near Hot Springs (US); COMAL CO.: *Lindheimer 814,* Comanche Spring, New Braunfels, June 1850 (F, GH, US); EDWARDS CO.: *Palmer 11010,* shaded limestone ledges, Upper Cedar Creek near Barksdale, Oct. 12, 1916 (US); PRESIDIO CO.: *Hinckley 1868,* rocky ledge, north fork of Palo Blanco Creek, Sierra Tierra Vieja, July 1, 1941 (GH); REEVES CO.: *Mueller 8827,* Pecos, June 14, 1931 (F); UVALDE CO.: *Cory 29149,* chalk bluff of Nueces River, May 19, 1938 (GH); VAL VERDE CO.: *McKelvey 1903,* near mouth of the Pecos, Apr. 20, 1931; CHIHUAHUA: *Johnston 8035,* shelter of limestone ledge, 11½ miles south of Ojinaga, Aug. 10-12, 1941 (GH); *Pringle 520,* face of cliffs, Santa Eulalia Mts., Sept. 1885 (GH, UC, US); COAHUILA: *Marsh 1037,* Musquiz-La Mariposa, Dec. 5, 1936 (F, GH); *Palmer 355,* Monclova, Aug. 1880 (GH, US); *Stewart 1019,* rocky arroyo, 6 km. north of C. Sierra Mojada, Aug. 4, 1941 (GH); NUEVO LEON: *Frye and Frye 2438,* flat on limestone walls, upright in soil, 39 miles north of Monterrey, Apr. 23, 1939 (GH, UC, US); *Gentry 6729,* limestone cliffs, Cuesta de Mamiluque, Aug. 14, 1942 (GH, UC, US); *Palmer 354,* mouth of caves, 27 miles southeast of Monterrey, March 1880 (GH, US); TAMAULIPAS: *Bartlett 10587,* limestone ledges, La Tamaulipeca, near San Miguel, July 25, 1930 (F, US); *Palmer 36,* vicinity of Victoria, Feb. 1 to Apr. 9, 1907 (F, GH, UC, US).

2. **Eucnide xylinea** C. H. Muller, Am. Midl. Nat. **27:** 487. 1942.

Plants growing in mats as much as 2 meters wide on cliff faces; principal branches appearing to be perennial; erect, herbaceous branches mostly 4–10 cm. high; plant densely villous-canescent, long hairs not glochidiate, shorter ones sometimes so; leaf blades ovate, mostly 5–15 mm. long and 4–10 mm. wide, upper ones smaller, on petioles one-third as long as the blades to equalling them; sepals linear-lanceolate, 8–15 mm. long; petals 20–25 mm. long; stamens 20–25 mm. long; style ca. 35 mm. long; fruits subhemispheric, 3–5 mm. long and 3–8 mm. wide on peduncles 12–25 mm. long; seeds light yellow, oblong, 0.63–0.84 mm. long and 0.2–0.33 mm. wide.

The type is *C. H. Muller 3311,* Canon de San Salvador, above Esmerelda, in Sierra Mojada, Municipio de Sierra Mojada, Coahuila, Sept. 14, 1939 (US); isotypes (UC, US).

**Collections seen:** COAHUILA: *Johnston 9003,* high banks of arroyo, plastered against cliff, covering areas of 4–5 square meters, Canon de la Charretera, Sierra de la Madera, 5200 ft. altitude, Sept. 13, 1941 (GH);

*Stewart 1075*, mats 2 meters broad on cliffs below crest, Canon de Hidalgo, Sierra Mojada, near Esmeralda, Aug. 4, 1941 (GH).

3. **Eucnide urens** (Parry ex A. Gray) Parry, Am. Nat. **9:** 144. 1875; *Mentzelia urens* Parry ex A. Gray, Proc. Am. Acad. Arts and Sciences, n. s., **10:** 71–72. 1874; *Eucnide Parryi* House (*Mentzelia urens* Parry ex Gray, non Vell. Fl. Flum. **5:** 5. 97. 1825), Bull. N. Y. State Mus. **234:** 67. 1922.

Suffrutescent with spreading herbaceous branches; leaf blades mostly ovate, sometimes oblong to obovate, coarsely and irregularly toothed, not lobed, 2–7 cm. long and 2–6 cm. wide on petioles equally long, uppermost leaves sometimes sessile and slightly amplexicaul; plants bristly with stinging hairs, plus glochidiate hairs which often have verticils of short retrorse barbs on their axes; sepals linear-lanceolate, 15–20 mm. long; petals light yellow, pale cream or greenish yellow, 30–45 mm. long, apiculate; stamens included, 10–18 mm. long; style included; stigma 5-ridged, 6–8 mm. long, ca. one-third the length of the style; fruits 10–20 mm. long and 8–12 mm. wide at their apices; seeds nearly oblong, very light yellow, 0.5–0.6 mm. long and ca. 0.25 mm. wide.

In describing "Mentzelia (Eucnide) urens Parry in herb." Gray cited three collections: Bigelow in 1854 (no. 79), rocky ravines of the Colorado near the confluence of Williams River; Dr. Parry in 1867, (winter vestiges only) from the same locality; and Dr. Parry (in blossom) near St. George, southern Utah. Since the first and second specimens cited are very poor, the third one, C. C. Parry 79, southern Utah, 1874, is selected as Lectotype. It is in the Gray Herbarium, mounted in the middle of a sheet, with the other two collections mounted on either side. Isotypes: F, US.

E. urens grows in southwestern Utah, northeastern Arizona, southwestern Nevada, adjacent California and northern Baja California.

**Selected collections:** ARIZONA: GRAND CANYON: *Cummings* June 22, 1942, growing in Red Wall limestone near Mooney Falls, Havasu Canyon (US); MOHAVE CO.: *Kearney and Peebles 11241*, petals very pale cream color, Boulder Lake, Apr. 18, 1935 (US); CALIFORNIA: INYO CO.: *Train 658*, dry rocky canyons against cliff banks, Emigrant Canyon, Panamint Range, Apr. 19, 1937 (GH, US); SAN BERNARDINO CO.: *Hitchcock 6091*, shrub 2 ft. tall, in desert wash, 4 miles below Cave Spring, Apr. 17, 1940; DEATH VALLEY NATL. MONUMENT: *Epling, Robison and Haines*, Apr. 20, 1935, Death Valley Grotto Canyon (US); NEVADA: CLARK CO.: *Clokey 8023*, limestone ledges, south of Indian Springs, July 10, 1938 (F, GH, US); *Heller 10450*, petrified forest, canyon west of Logan.

June 8, 1912 (F, GH, US); LINCOLN CO.: *Kennedy and Gooding 75,* Muddy Valley, May 1, 1906 (US); UTAH: *Parry 79,* "southern Utah", 1874 (F, GH, US); BAJA CALIFORNIA: *Brandegee,* May 15, 1889, Santa Maria (US); *Harvey 604,* Pt. San Fermin Mts., Apr. 22, 1933 (US); *Harvey 647,* Pt. San Fermin Wash, Apr. 22, 1933 (US).

4. **Eucnide lobata** (Hook.) A. Gray, Pl. Lindh., Boston Journ. Nat. Hist. **6**(2): 191-192. 1857; *Microsperma lobata* Hook., Ic. Plant. **3**: t. 234. 1840; *Mentzelia lobata* (Hook.) Walp., Rep. **2**: 224. 1843; *Microsperma rudis* S. Schauer, Linnaea **20**: 721-722. 1847; *Eucnide floribunda* Wats., Proc. Amer. Acad., **17**: 358. 1882; *Eucnide Watsoni* Urban & Gilg. K. Deutsche Akad. Naturf. Halle **76**: 105. 1900.

Plants herbaceous or suffrutescent (herbaceous branches usually collected), with simple bristly hairs and shorter glochidiate ones; leaf blades ovate to rotund-ovate, irregularly toothed and usually shallowly lobed, rarely sinuate-toothed to nearly entire, mostly 3–10 cm. long, and nearly as wide, sometimes cordate at their bases, on petioles, 1.5–6 cm. long; sepals ovate to ovate-lanceolate, somewhat attenuate, 4–5 mm. long; petals yellowish, 6–12 mm. long; stamens several to many, about equalling the petals; style and stigma 8–10 mm. long; stigma oblong to oblong-clavate, 1.5–2 mm. long; fruits ovate-hemispheric to ovate-oblong, 7–12 mm. long; seeds greenish-yellow, oblong to oblong-ovate, tapering at ends, 0.5–1.05 mm. long and 0.21–0.376 mm. wide.

Although Urban (1900) cites a specimen from Comal County, Texas, (Matthews 471) this is probably a misidentification of *E. bartonioides.* Young, small-flowered specimens of the latter species, without the characteristic, long fruiting-peduncle, might easily be mistaken for *E. lobata.*

A small fragment labelled "Berlandier ex Hook." is mounted in the upper left quarter of a sheet in the Gray Herbarium. It is possible that this is a part of the type collection. In any event, the illustration accompanying the description of Microsperma lobata is easily recognized by the small flowers and the short fruiting pedicels as being conspecific with the taxon as here considered. Furthermore, other characteristic collections have been seen from the type locality "Santa Catarina, near Monterrey, Nouv. Leon, Mexico. Berlandier".

**Representative collections:** COAHUILA: *Hinton 16675,* hanging plant, flowers yellow, small isolated colonies, limestone cliff near Saltillo, July 14, 1946 (GH, US); *Johnston 7158,* a sprawling sparsely branched brittle shrub, petals and stamens yellow, shelter of cliff at canyon mouth, 4 miles west of Cuatro Cienegas, Aug. 24-26, 1938 (GH); *Johnston 9324,* corolla yellow, plants 3–4 ft. broad, flattened, shrubby caudex, crevices on canyon wall, deep narrow canyon, ca. 2 km. southeast of Puertocito, western end of Sierra de la Madre, Sept. 21, 1941 (GH); *Palmer 832* (GH, *type of E. floribunda*), San Lorenzo de Laguna and vicinity, 22–27 leagues southwest of Parras, May 1-10, 1880 (F, US); *Waterfall 13228,* along arroyo in gravelly slopes in desert, 18 mi. ne. of Saltillo, Aug. 6, 1957 (OKLA, SMU); GUANAJUATO: *Kenoyer 2271,* Yichu mine, Aug. 20, 1947 (GH); HIDALGO: *Moore 1389,* in crevices of rock overhang, slopes and summit of Cerro de las Canteras, near Puerto de San Pedro, km. 104 on highway from Pachuca to Actopan, Oct. 9, 1946 (GH, UC, US); *Moore 2133,* flowers yellow, open, stems sticky, branched, forming mats against rocky underhang, near Jihuico, Meztitlan (GH, UC); NUEVO LEON: *Chase 7761,* bench in canyon, Galeana, Aug. 3, 1939 (F, GH); *Nelson 6107,* Santa Catarina, Apr. 13, 1902 (GH, US); *Pennell 16797,* Rio Santa Catarina, Sierra Madre Orientale, Monterrey, June 17, 1934 (US); *Pringle 9801,* dry banks and ledges, Monterrey, Sept. 4, 1902; *Waterfall 13228,* conglomerate bank, 24 miles west of Monterrey, Aug. 6, 1957 (F, GH, OKL, OKLA, SMU); PUEBLA: *Purpus 3379,* vicinity of San Luis Tultitlanapa near Oaxaca, July 12, 1905 (UC); *Rose, Painter and Rose 9925,* collected near Tehuacan, Aug. 30 to Sept. 8, 1905 (GH, US); QUERETARO: *McVaugh 10371,* desert arroyos, 45–50 miles northeast of Queretaro, Apr. 24, 1949 (US); *Waterfall 14117,* on cliff sides, 10 miles south of Zimapan, Aug. 20, 1957; TAMAULIPAS: *Stanford, Retherford and Northcraft 959,* small creek, 9 km. east of Palmillas, Aug. 15, 1941 (GH, UC).

5. **Eucnide sinuata** Wats. Proc. Am. Acad. Arts and Sciences **17:** 358. 1882; *E. Nelsoni* Rose, Contrib. U. S. Nat. Herb. **12:** 286-287. 1909.

Stems herbaceous, often sprawling or hanging on cliffs; densely vestite with long spreading simple hairs, and shorter glochidiate ones on stems, leaves, pedicels, ovaries and sepals, often quite bristly on pedicels, ovaries and sepals; leaf blades usually ovate, sometimes cordate, mostly 3–9 cm. long and 2.5–8 cm. wide, on petioles 3–9 cm. long; fruiting pedicels usually (3) 5–11 cm. long; sepals linear to linear-oblong, 10–15 mm. long; petals 20–25 mm. long, often remaining erect and overlapping laterally into a tube-like structure; stamens many, slightly exserted; style 20–25 mm. long, slightly enlarged apically into a stigma ca. 1–1.5 mm. long; fruits obovate to turbinate, 10–13 mm. long and 6–8 mm. wide; seeds oblong, greenish-yellow, ca. 0.6–0.8 mm. long and 0.2–0.3 mm. wide.

Plants beginning to flower may not have the elongate fruiting pedicels found in more mature specimens. The only probability of confusion would be with *E. Pringlei* var. *Pringlei* which has petals 3.5-4 cm. long.

The type collection is *Botteri 266,* Orizaba, Vera Cruz. Watson stated that the type was in the Gray Herbarium, but I have not seen it in the material borrowed for study. A sheet of type material (US) was available for study.

**Collections seen:** HIDALGO: *Moore 2026,* forming masses on underhang of road cut, barranca walls above Metzquititlan on road to Zacultipan, Nov. 11, 1946 (GH, UC); *Moore 2122,* limestone talus between high and low water levels, Laguna de Metztitlan between San Cristobal and main body of lake, Nov. 23, 1946 (GH, UC); MEXICO: *Hinton 5895,* hanging down, cliffs by the river, Pungarancho, District of Temascaltepec, Apr. 10, 1934 (F, GH, US); *Hinton 7562,* on sand by the river, Villa Neda, District of Temascaltepec, Mar. 27, 1935 (GH, US); MICHOACAN: *Hinton 11803,* cliffs, Huetamo, Mar. 10, 1938 (F, GH, US); *Hinton 13332,* hanging in clumps, dry clay cliffs in mixed forest, Ruzantla-Paso Tierra Caliente, District of Zitacuaro, Oct. 5, 1938 (F, GH, UC, US); *Hinton 13403,* hanging, cliff by river, Zitacuaro-Pucuaro, Oct. 25, 1938 (GH, UC, US); *Nelson 6926,* isotype of *E. Nelsoni* (US); SAN LUIS POTOSI: *Purpus 5242,* Minas de San Rafael, June 1911 (UC); VERA CRUZ: *Purpus,* July 1906, steep rocks, Barranca de Tenampa, Zacuapan (UC, US); *Purpus 16434,* on steep rocks, barranca near Rancho Remudadero, Apr. 1935 (A, F, US); GUATEMALA: *Kellerman 8062,* Guastatoyo, Dept, of Jalapa, Jan. 20, 1908 (F).

6. **Eucnide Pringlei** Rose, Contr. U. S. Natl. Herb. **12:** 287. 1909.

6a. **E. Pringlei** var. **Pringlei**

Stems herbaceous, covered with varying amounts of long, rather soft, sometimes twisted hairs; shorter glochidiate hairs, or hairs with verticils of short recurved hooks, absent to abundant, but minute ones, ca. 0.2 mm. long often present; leaf blades suborbicular to ovate, mostly 5–12 cm. long and 5–10 cm. wide, shallowly lobed and irregularly toothed, often cordate, on petioles usually 3–7 cm. long; sepals linear-lanceolate, 15–20 mm. long; petals yellowish, remaining wraped around each other in a tubular structure (3) 3.5–4 cm. long; stamens many, 4–5 cm. long; style 4.5–6 long; stigma 1.5–2 mm. long; fruits subhemispheric, 8–10 mm. long and 8–10 mm. wide, with long pointed hairs, 1.2–2.1 mm. long, under which is usually a dense layer of minute, often glochidiate hairs, ca. 0.2 mm. long; seeds light yellow, pointed at both ends, 0.6–1.0 mm. long and 0.2–0.3 mm. wide.

The type is *C. G. Pringle 10077,* limestone cliffs, Iguala Canon, 2500 ft., Guerrero, Mexico, Sept. 22, 1905 (US); isotypes: (F, US).

Known only from the type collection.

6b. **E. Pringlei** var. **hypomalaca** (Standl.) Waterfall, comb. et stat. nov., based on *E. hypomalaca* Standl., Field Mus. Publ. Bot. **22:** 41. 1940.

Suffrutescent; plant with both long soft hairs and long glochidiate ones, minute glochidiate hairs ca. 0.2 mm. long, may also be present; leaf blades nearly ovate, 5–10 cm. long and 4–9 cm. wide, shallowly lobed and irregularly toothed, on petioles 3–5 cm. long; sepals linear-lanceolate, 15–30 mm. long; petals cream-white, 2.5–4 cm. long, usually not fully opening; stamens 3–5 cm. long; styles 3–7 cm. long, upper 1.5–2 mm. expanded into a 5-ridged or 5-lamellate stigma; ovary with long hairs mostly glochidiate and up to 1 mm. long, and with shorter capillary, often glochidiate hairs ca. 0.2 mm. long, often present; fruits subhemispheric to obovoid to subtruncate apically, 8–10 mm. long and 6–8 mm. wide; seeds bright yellow or greenish-yellow, oblongish, pointed at ends, 0.5–0.8 mm. long and 0.13–0.2 mm. wide.

The type is *H. S. Gentry 1315*, Arroyo Mescales, Rio Mayo, Sonora, Feb. 18, 1935 (F).

**Collections seen:** CHIHUAHUA: *Hartman 1016*, Batopilas, Apr. 1892 (GH, US); *Hewitt 272*, abundant locally, 1 m. in diameter, cliffs and walls of ruined buildings, Batopilas, Apr. 5, 1948 (GH); SONORA: *Gentry 3021*, perennial spreading bush, flowers cream white, on arroyo bank rocks, Arroyo de Mescales, Rio Mayo, Mar. 3, 1937 (GH).

7. **Eucnide cordata** (Kell.) Kell. ex Curran, Bull. Calif. Acad. **1:** 137. 1885; *Mentzelia cordata* Kellogg, Proc. Calif. Acad. **2:** 33. 1863; and as an illustration, Hesperian p. 33. 1863.

Suffrutescent; plant with long hairs which may be simple, glochidiate, or with verticils of short recurved spines along main axis; leaf blades suborbicular to broadly ovate, shallowly lobed and irregularly toothed, principal ones 4–9 cm. long and 4–10 cm. wide, on petioles 2–6 cm. long; inflorescences branched, several-flowered; sepals linear-lanceolate to lanceolate-ovate, 9-13 mm. long; petals yellowish white, or greenish white, not expanding, 1.5–2 (2.5) cm. long; style 2.5–4 cm. long with upper 1–2 mm. slightly expanding into a stigma; fruits bristly, subhemispheric to subcampanulate, 7–10 mm. long and 7–10 mm. wide; seeds light yellow or greenish yellow, linear-oblong to oblong, 0.59–1.0 mm. long and 0.125–0.138 mm. wide.

Immediately preceding the description of *Mentzelia cordata* the statement appears "Dr. Kellogg read a description of a new species of *Mentzelia*, from Cerros Island, presented by Dr. J. A. Veatch". From this it is inferred that a specimen collected by J. A. Veatch, wherever it may be deposited, is the type, and that the type locality may be Cedros Island.

In the following citations the islands off the coast of Baja California are listed separately for convenience in giving the location of the collections.

**Selected collections:** BAJA CALIFORNIA (mainland): *Gentry 4226,* low succulent bush, flowers white, rocky arroyo margins and moist rock recesses, Las Cuevitas, below Comundu, Feb. 17, 1939 (GH); *Johnston 3070,* 3 ft. high with a few coarse loose ascending stems, La Paz, Apr. 12, 1921 (US); *Orcutt 1347,* near San Quentin, Apr. 22, 1886 (F, GH, US); *Rose 16656,* Mulege, Apr. 4, 1911 (US); *Shreve 7065,* 12 miles south of Santa Rosalia, Mar. 9, 1935 (F, GH); ANGEL DE LA GUARDIA ISLAND: *Johnston 3410,* shrubby with ascending stems, bank of wash near ocean, Palm Canyon, May 3, 1921 (A, GH, US); CARMEN ISLAND: *Palmer 867,* Nov. 1-7, 1890 (GH, US); CEDROS ISLAND: *Anthony 72,* July-Oct., 1896 (F, GH, US); *Greene,* May 3, 1885 (F, GH); *Mason 1982,* June 3, 1925 (US); *Palmer 753,* 4 ft. high, Mar. 18-20, 1889 (F, GH, US); *Rose 16101,* Mar. 10, 1911 (US); ESPIRITU SANTO ISLAND: *Bryant,* Apr. 1892 (GH); *Collins, Kearney and Kempton 144,* Apr. 1, 1931 (US); *Jones 27104,* Sept. 30, 1930 (US); *Nelson and Goldman 7505,* herb 6–10 inches, in rock crevices, Feb. 7, 1906 (US); *Rose 16861,* Apr. 18, 1911 (US); PICHILMQUE ISLAND: *Rose 16538,* Mar. 20, 1911 (GH, US); SAN LUIS ISLAND: *Johnston 3311,* infrequent on sides of draws, Apr. 28, 1921 (A, F, GH, US); SONORA: *Drouet and Richards 3837,* on sand as bases of large rocks on shore of island at entrance to harbor, Guaymas, Dec. 2, 1939 (F); *Drouet and Richards 3882,* on gravelly beach at base of bluff north of Cabo Arco, Guaymas, Dec. 6, 1939 (F); *Palmer 325a,* Islands in harbor, Guaymas, Oct. 1887 (GH); *Palmer 341,* Guaymas and Los Angeles Bay (US).

8. **Eucnide grandiflora** (Groenland) Rose, Contr. U. S. Natl. Herb. 3: 317. 1895; *Microsperma grandiflora* Groenland, Revue Horticole 349, t. 84, 1861.

8a. **E. grandiflora** var. **grandiflora**

Stems herbaceous; plant with long simple hairs, shorter glochidiate ones, and an underlayer of still shorter and finer hairs of both kinds; leaf blades broadly ovate to suborbicular, usually slightly wider than long, shallowly lobed and irregularly toothed, principal ones 8–12 cm. long and 9–13 cm. wide, often with a more or less quadrate basal sinus, on petioles 6–15 cm. long; inflorescences few-flowered, bracts herbaceous, lobed and toothed, but much smaller than the leaves; pedicels 3–5 cm. long, becoming recurved in fruit; sepals linear-lanceolate or linear-falcate, 2.5–5 cm. long; petals white to white with a greenish tinge, acutish, 5.5–8 cm. long; stamens many, 8–11 cm. long; style 10–12 cm. long; stigma abruptly expanded, 2–3 mm. long and 2–2.5 mm. wide; ovary broadly obconic, bristly; fruits campanulate, 12–18 mm. long and 16–18 mm. wide; seeds light yellow, linear, 0.97–1.25 mm. long and 0.13–0.2 mm. wide.

No type is known for *Microsperma grandiflora* Groenland, published as an illustration with a narrative in a garden magazine.

Rose, in making the transfer to *Eucnide* and in supplying a more complete and formal description, cited two collections, *E. W. Nelson 1589* and *C. G. Pringle 4645*. Both collections are quite representative of the species, and since I have seen 4 sheets of the latter collection and only 2 sheets of the former, I am choosing as lectotype *C. G. Pringle 4645*, dry cliffs, Tomellin Canyon, 3000 ft., May 17, 1894, Oaxaca, Mexico (US); Isotypes: (F, GH).

**Collections seen:** OAXACA: *Conzatti 1757*, Estacion Almoloyas, 1907 (US); *Gonzales 44*, Cuicatlan, Dec. 4, 1895 (GH); *Nelson 1589*, six miles above Dominguillo, Oct. 3, 1894 (GH, US); *Relso 4234*, Canon de Tomallia, Sept. 9, 1919 (US); *Rose and Rose 11343*, Tomellin Canon, Sept. 7, 1906 (US).

8b. **Eucnide grandiflora** var. **guatemalensis** (Standl. & Steyerm.) Waterfall, comb. et stat. nov., based on *E. guatemalensis* Standl. & Steyerm., Field Mus. Publ. Bot 23: 178–179. 1944.

Similar to var. *grandiflora*, differing principally in being more or less viscid, in having leaf blades slightly longer than wide, and in its obtusish petals. Although Standley and Steyermark (1944:179) stated that "the size of its flowers . . . approaches *E. grandiflora* . . . that has still larger flowers, with petals fully 7 cm. long", it will be seen that its petal length falls well within the size, 5.5–8 cm. here ascribed to var. *grandiflora*.

The Type is *J. A. Steyermark 50818*, leaves viscid-fetid, filaments and petals white-pale greenish, pale green at very base, on vertical bluffs, northwest of Cuilco, two-thirds way up Cerro Chiquihui above Carrizal, alt. 1350–2300 meters, Dept. Huehuetenango, Guatemala, Aug. 17, 1942 (F); Isotype: (US). This variety is known only from the type collection. DEPARTMENT OF BOTANY AND PLANT PATHOLOGY AND THE RESEARCH FOUNDATION OKLAHOMA STATE UNIVERSITY, STILLWATER.

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# THELESPERMA NUECENSE, A NEW SPECIES FROM SOUTH TEXAS AND ITS BEARING ON THE STATUS OF T. FILIFOLIUM

B. L. TURNER

**Thelesperma nuecense** n. sp.[1] Planta annua, 45–100 cm. alt., glabra ubique; unicus caulis a quaque rosula oriens; folia rosulae relative pauca, ternatisecta, 5–15 cm. long., petiolis 4–7 cm. longis, breviter ciliatis 1–8 mm. ad basim; folia inferiora mediaque pinnate 1 vel 2 (3)-secta, divisione terminali 1–7 cm. long.; folia in parte caulis superiore semel-composita, 1–5 divisionibus longis linearibusque; capitula 2–30 in omnibus caulibus primariis, matura in pedunculis elongatis 10–40 cm. long.; involucrum exterius ex 8–12 phyllariis herbaceis subulatis 2–4 mm. long. omnino levibus constans; involucrum interius 10–14 mm. lat., 5–10 mm. alt. normaliter ex 8 phyllariis, ca. 1/3 ad 2/5 longitudinis subtus coalescentes; ores radii octo, steriles; ligula 1.5–2.5 cm. long., 1–1.5 cm. lat., inconspicue trifida, aurea, maculam clarissimam rubro-brunneam ad basim habens; flores disci multi, corollis rubiginosis, regularibus aut quasi regularibus, glabris, 6 mm. longis; lobi florum disci quinque, aequi, 2 mm. long., 1½–2 plo longiores quam iugulum, venis perspicuis rubro-brunneis secundum margines praediti; rami styli in appendiculas subulatas hispidas, ca. 0.3 mm. long. supra lati facti; palea oblonga, ad apicem rotundata, marginem latum scariosum 6–7 mm. long., 1.5–2 mm. lat., atque par nervorum mediorum perspicuorum habens; ovarium glabrum; achaenium maturum subbrunneum, manifeste verrucosum ad fere leve; pappus e 2 dentibus crassis 0.5 mm. long., ut videtur pubescentibus, excrescentias hispidas retrorse barbatis habentibus, constat.

Annual; leaves once or twice ternatisect, the segments filiform or nearly so; heads radiate; outer phyllaries subulate 2–4 mm. long, about one-half as long as the inner; achenes narrow, without wings; pappus of 2 stout retrorsely barbed teeth; disk corolla regular, the lobes about twice the length of the throat.

Plant 45–100 cm. high, glabrous throughout; stems single from each

[1]Grateful acknowledgment is due Dr. Hannah T. Croasdale of Dartmouth College who prepared the Latin description.

rosette (sometimes more following injury of primary growth); rosette leaves relatively few, ternatisect, 5–15 cm. long, the petioles 4–7 cm. long, short ciliate for 1–8 mm. at the base; lower and middle stem leaves pinnately 1 or 2 (3)-sect, the terminal division 1–7 cm. long (measured on leaves at second node above rosette); upper stem leaves once compound with 1–5 long, linear divisions; heads 2–30 to each main stem, at maturity on elongate peduncles 10–40 cm. long; outer involucre of 8–12 subulate, herbaceous phyllaries 2–4 mm. long, completely smooth; inner involucre 10–14 mm. across, 5–10 mm. high, phyllaries normally 8, fused below for about 1/3 to 2/5 their length; ray flowers eight, sterile; ligule 1.5–2.5 cm. long, 1–1.5 cm. wide, slightly 3-cleft, golden yellow with a well-defined reddish-brown spot at base; disk flowers numerous, their corollas rusty-brown, regular or nearly so, glabrate, 6 mm. long (with lobes unreflexed); lobes of disk flowers 5, equal, 2 mm. long, 1½ to 2 times as long as throat, with very distinct, reddish-brown veins along the margins; style branches broadened above into subulate hispid appendages about 0.3 mm. long; palea oblong, rounded at apex, broadly scarious margined, 6–7 mm. long, 1.5–2 mm. wide with a pair of distinct medial nerves; ovary (except those of the sterile ray flowers) glabrous; achene brownish at maturity, conspicuously warty to nearly smooth; pappus of 2 stout teeth, 0.5 mm. long, seemingly pubescent with retrorsely barbed, hispid outgrowths.

Chromosome number determined as $n=10$.

HOLOTYPE: TEXAS. Kenedy Co.; 22 miles south of Armstrong. Deep sandy soil along roadside. *B. L. Turner 4476*. (Deposited University of Texas Herbarium; isotypes to be distributed.) The species is named after Nueces County, a region where several very localized endemics occur.

*Some additional specimens examined:* TEXAS, Nueces Co.: 10 mi. east of Corpus Christi. *Turner 3966;* Corpus Bay, Flour Bluff, *B. C. Tharp 5625*. Aranas Co.: 1 mi. north of Rockport, *Turner 3968*. Kleberg Co.: *M. C. Johnston 54440*. Kenedy Co.: *B. C. Tharp 49092*.

Counting the above, there are 27 different collections of the species in the University of Texas Herbarium.

Shinners (1950a), in his treatment of the Texas species of *Thelesperma*, placed the plants from southern-most Texas in *T. filifolium* (Hook.) Gray. He did this with considerable hesitation, stating that "Hooker's plate (which accompanied the type description of *T. filifolium*) shows the upper part of a plant only, and it is almost impossible to tell definitely whether the present species (*T. filifolium*) or *T. intermedium* var. *rubrodiscum* is shown," and further that "it must be admitted that this identification (of *T. filifolium*) is largely a guess."

Actually the plate accompanying the description of *T. filifolium* cannot represent the same species as the southern Texas material here described as *T. nuecense,* and which Shinners included in his concept of *T. filifolium,* since the colored plate, which was apparently drawn from living material, shows the rays to be completely yellow. *T. nuecense* has a definite reddish-brown blotch at the base of its rays. In addition, it is likely that Drummond did not collect in the area where this latter taxon grows (see below).

*T. filifolium,* as is apparent from the type description and accompanying plate, is correctly applied to the common *Thelesperma* of central Texas where it occurs in clay or gravelly roadside soils. It also occurs along roadsides of the Texas gulf coast on shell ridges or rarely on mixed sandy-shell fills. (Shinners apparently confused such collections from Matagorda County with the present *T. nuecense.*) Drummond collected the seeds that produced the material from which the original plate was drawn and it is extremely unlikely that he collected in the region where *T. nuecense* occurs (Geiser, 1948); although, as indicated by Shinners, it is obvious that Drummond did collect within the range of the common clay-land species of *Thelesperma* which Shinners treated as *T. intermedium.*

Shinners (1950b), in a later paper described variety *flavodiscum*[2] of *T. intermedium.* As indicated by the epithet, the disc flowers of this taxon are yellow, so that even though it might have been collected by Drummond, Hooker's plate (which shows a reddish-brown disc) and description clearly eliminate it as a contender for the name *T. filifolium.*

Alexander (1955) has published the most recent account of *Thelesperma.* Unfortunately he was unaware of Shinners' study and made no reference to either his views or published names. Alexander apparently included material of *T. nuecense* and *T. flavodiscum* in *T. filifolium.*

I have studied populations of *Thelesperma* in the field since 1953. The biological situation, as concerns the several taxa mentioned above, is fairly clear-cut, at least insofar as central and

[2]*Thelesperma flavodiscum* (Shinners) Turner, *comb. nov.* – *T. intermedium* var. *flavodiscum* Shinners, Field and Lab. 18: 98. 1950.

south Texas is concerned, the region from which the type collection of *T. filifolium* was obtained. Briefly, the status of the three taxa is as follows: *T. filifolium* is a rather small annual (1-2 feet tall) with completely yellow rays and reddish-brown disc, occurring on clay or calcareous soils of central Texas (but often on shell-fill or ridges along the gulf coast). Its chromosome number, as established from counts on several populations in central Texas, is $n = 9$ (Turner, unpubl.)[3], *T. flavodiscum* is a robust annual 2-4 feet tall) with completely yellow rays and yellow disc, occurring in sandy soils of pine and oak woodlands of central and east Texas. Its chromosome number has been determined as $n = 10$ (Turner, unpubl.); *T. nuecense* is an annual of medium height (2-3 feet tall), with yellow rays which, so far as is known, always bear a reddish-brown blotch at the base near the throat; in addition, the disc is reddish-brown and the heads are borne on exceptionally long peduncles. The species occurs in deep, normally rather bare, sandy soils in the coastal grasslands of southern Texas. It has a chromosome number of $n = 10$.

These three taxa are separated by morphological, geographical and/or edaphic discontinuities. Populations of *Thelesperma nuecense* and *T. filifolium* often occur near each other in the gulf coastal region (e.g. Aransas and Nueces Counties), but the species are readily distinguished and intergrades have never been found, either in the field or in the herbarium. — BOTANY DEPARTMENT, UNIVERSITY OF TEXAS, AUSTIN.

[3]Torres (1958) has reported a count of $n = 8$ for this species (cited as *T. intermedium*), but his counts were obtained from populations in New Mexico. Shinners (1950a) recognized material from this area as a taxon distinct from the typical element of the species, though Alexander (1955) makes no such distinction.

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Sedum sexangulare *in* New Hampshire. — On June 28, 1942, I collected a species of *Sedum* growing on a grassy roadside abutting the Sawyer Estate near the Oyster River in Durham. This species which I proceeded to misidentify as *S. acre* L. on re-examination, proves to be *S. sexangulare* L., a European species and one not previously reported wild in eastern America. A reasonably good description of it is to be found in Bailey's Standard Cyclopedia of Horticulture. It occurs for about 75 feet along the roadside on a warm and dry grassy bank. An area about 15 feet long and 4 or 5 feet wide at present is dominated by it. The plant shows a high degree of persistence as indicated by its presence in the year 1958 in tall grass, in essentially the same situation where it grew in 1942.

Some authors seem to have considered it to be closely related to *S. acre* L. But the herbarium specimens that I have seen, as well as living plants, possess slenderly linear cylindric leaves quite different from those of that species. Since there seem to be no other herbarium specimens or reports of *S. sexangulare* in the wild, it is apparent that we have here a local escape that may or may not become a permanent part of the flora.

My concern with *S. sexangulare* led me to investigate the contemporary status of another *Sedum, S. anopetalum* DC., which was collected by E. B. Chamberlain on August 24, 1912 in South Bristol, Maine and, as *S. anophyllum* DC., reported in Rhodora from there in November 1912. On September 14, 1958, I had no difficulty again in finding this species along a roadside and in the crevices of a ledge at South Bristol, essentially as Mr. Chamberlain described it nearly 50 years ago. — A. R. Hodgdon, department of botany, university of new hampshire, durham.

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Two Grasses New to Essex County, Massachusetts. — A thorough perusal of dumps often uncovers the presence of unusual adventives and a number were found during the 1958 season. On the city dump in Lawrence a grass which formed a dense prostrate mat of foliage caught my eye and I collected specimens thinking that it might be Zoysia. While sterile, it seems to match perfectly with material of *Cynodon dactylon* (L.) Pers. The extent of the mat would indicate that the species has persisted there for several years. This is the first record from Essex County and there are a relatively few collections from New England. City dump, Lawrence, Essex County, Massachusetts, *Stuart K. Harris 18753* (21 September 1958).

The use of the City dump on Brimball Avenue in Beverly was abandoned some time ago and the dump has since been leveled and covered with gravel. On a visit there last fall I noticed a small clump of a tall grass which I suspected of being an unfamiliar Andropogon. However study showed that it was *Miscanthus sacchariflorus* (Maxim.) Hack., a native of Asia. It differs from the more common *M. sinensis,* which occasionally escapes from cultivation, in being awnless. There is no material of *M. sacchariflorus* from the United States in the Gray Herbarium and the only printed record of its having been found growing outside of cultivation in the United States which I have been able to find is one in the revised edition of Hitchcock's Manual from Iowa. Site of old dump, Brimball Avenue, Beverly, Essex County, Massachusetts, *Stuart K. Harris 18888* (5 October 1958). Specimens of both species have been deposited in the herbarium of the New England Botanical Club. — STUART K. HARRIS, DEPT. OF BIOLOGY, BOSTON UNIVERSITY, BOSTON.

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CABOMBA CAROLINIANA IN ROCKINGHAM COUNTY, NEW HAMPSHIRE. — In 1956 I was informed by Mr. Terrence P. Frost, Biologist of the New Hampshire Water Pollution Commission that there was a serious infestation of *Cabomba caroliniana* in Island Pond. In view of the fact that, until the recent report by Stuart Harris in the April, 1958, RHODORA, there had been no official record of Cabomba from north of Boston, I thought that there had been a misidentification. However, specimens brought to me in 1957 proved to be of this species.

My colleague at the University of New Hampshire, Dr. Philip Sawyer, professor of Zoology has visited the area and reports that the infestation is most severe in the eastern part of the pond in the township of Hampstead. Here the plant forms a dense mass of vegetation in all the shallow parts and is even present to the bottom in some places where the water is from 10–15 feet deep. In his words the situation seems to be "frightening because of the plants explosive quality of growth". Dr. Sawyer reports that the weed has now spread into the township of Atkinson, but that there is some doubt about its being yet in Derry. Motor boats cut plants into pieces and serve as excellent agents of distribution; before long the entire pond except the deepest parts, will be invaded.

The rapid spread of Cabomba in Island Pond had caused such concern to cottage owners along the shore that a bill specifically aimed at its control was introduced at the meetings of the 1957 State Legislature. Before public support becomes organized against Cabomba it would seem desirable to record it now as part of the New Hampshire flora if only as a very undesirable alien. — A. R. Hodgdon, department of botany, university of new hampshire, durham.

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The Status of Hypericum prolificum. — Attention must be called once again to the unnecessary changing of the name of the widespread North American plant long known as *Hypericum prolificum L.* In 1948 Fernald and Schubert (Rhodora 50:167 168) decided, after study of the Linnaean specimens, to replace this epithet with the relatively unused *H. spathulatum* (Spach) Steud. After study of what they called a "vast amount of herbarium-material" they stated that they could find nothing which "can be identified unquestionably" with the type in the Linnaean Herbarium.

There are five sheets of the plant in question in the Linnaean Herbarium (photographs of these specimens are in the Gray Herbarium). Sheet number 943.20 was arbitrarily selected as the type by Svenson (Rhodora 42:9-10, 1940). He regarded this specimen as representing "*H. prolificum* in the accepted sense" but considered it as being somewhat aberrant in having "unusually revolute" leaves. This condition, he stated, "can be approached in any large series of specimens of *H. prolificum*." Fernald and Schubert concurred in Svenson's choice of sheet number 943.20 as the type of *H. prolificum L.* They did not agree, however, that this specimen is merely an atypical plant of the widespread North American species. The revolute leaves were considered by them to be an "extreme variation" which "seems to us to indicate a differentiation more basic." Not being able to equate sheet number 943.20 with any of the material available to them, they revived Spach's epithet. Some four years later Svenson (RHODORA 54:205-207, 1952) re-emphasized his previous contention that the Linnaean specimen "represents merely an aberrant condition, perhaps ecological, of the generally accepted *H. prolificum*."

During the preparation of a monographic study of *Hypericum* section *Myriandra* (which includes the woody species of the genus in eastern North America) I have observed the species in question in the field at numerous stations and have examined more than one thousand sheets of herbarium material. From these observations I believe that all five specimens (sheets number 943.20 through 943.24) in the Linnaean Herbarium represent the plant long known as *H. prolificum* L. The flowers and inflorescence of specimen number 943.20 are very similar to those of the plant called H. prolificum L. Stamen length (ca. 7.5 mm.) and petal length (ca. 8.5 mm.) fall well within the limits of this species — a fact also noted by Fernald and Schubert. The "extreme variation in leaf characters" (i.e. revolute leaves) of this specimen appears to be due to wilting of the leaves either as the result of long drought or insufficient pressure during the drying procedure following collection. These inrolled leaves have been seen on specimens from throughout the entire range of the species in question. Many specimens (e.g. *Svenson 13000*, Russell Co., Va.) came from plants which grew on the thin soils of limestone rocks. Such habitats are often very dry during portions of the summer. The leaves of *H. prolificum* respond to these drought conditions by inrolling their margins. Numerous other specimens (e.g. *Davidson 2604*, Appanoose Co., Iowa) appear to have wilted some before pressing, since both inrolled and flattened leaves are present.

In conclusion, since the flowers of specimen number 943.20 are very similar to those of the species long known as *H. prolificum* L. and the inrolled leaf condition appears to be merely a response to water loss, the Linnaean name must be reinstated. *Hypericum spathulatum* (Spach) Steud. is a later synonym. — WILLIAM P. ADAMS, DEPT. OF BIOL. SCI., FLORIDA STATE UNIVERSITY, TALLAHASSEE.

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# Rhodora

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## THE GENUS SYNTHLIPSIS (CRUCIFERAE)


REED C. ROLLINS


Accepted genera of the Cruciferae are often very closely related to one another and it is never quite safe to take for granted the unequivocal reference of a given species to a particular genus. This situation frequently makes the problem of generic limits a particularly difficult one and it is often the case that a given species may be recognized without difficulty, while the reasonable placement of it in a genus is a matter of considerable uncertainty. The problem-species, in this respect, are the ones somewhat at the fringe of the genus and which have characteristics that deviate from those possessed by the more centrally located species. While these species are problems to the classificationist, they are at the same time crucially important to the evolutionist who searches for evidences of the pathways by which genera may be interconnected and thus display possible evolutionary lines linking one genus with another.

In studying the genus *Lesquerella*, I have sought to discover the connections of this genus with others in the family and one of the most obvious is that shown by *L. lasiocarpa* with *Synthlipsis* (cf. Rollins, 1955). In the earlier literature, this relationship is pointed up by the fact that Gray (1859) originally described *L. lasiocarpa* var. *Berlandieri* as

*Synthlipsis Berlandieri.* Furthermore, the inadequacy of material, coupled with the wide range of variation present in *L. lasiocarpa* as a whole, misled Watson (1882) into describing *Synthlipsis heterochroma* and *S. Berlandieri* var. *hispida.* The variants thus recognized by Watson are now accommodated in the four varieties of *L. lasiocarpa* (Rollins, l.c.), but it is more than probable that the last word on the taxonomy of the group has not been written. Additional material, particularly from eastern Mexico, should ultimately provide a more adequate basis for an understanding of this particular species in its entirety. In any event, the tie between the genera *Lesquerella* and *Synthlipsis* is clearly revealed through the characteristics of what is now called *Lesquerella lasiocarpa.*

In considering *Synthlipsis* alone, one of the major questions has been whether, with its single species, it did in fact, represent a genus sufficiently different from other genera of the family to merit continued recognition. Earlier (Rollins, 1939), we presented evidence for retaining *Synthlipsis* as against merging *Nerisyrenia* with it. In reviewing this evidence, I am less firmly convinced that the bases for keeping *Synthlipsis* and *Nerisyrenia* apart are unequivocal because some of the differences previously enumerated do not stand up in light of the data obtained from more recent collections of *Synthlipsis.* We are still in need of a broader spectrum of information than is at present available or even possible until further material is obtained. However, it does not seem probable that the merging of *Nerisyrenia* with *Synthlipsis* will be fully supported even with more material for study.

Up to the present, it has not been possible to consider the genus *Synthlipsis* in any context different from that of a single known species, *S. Greggii.* However, in the last few years considerable additional material of the genus has been collected, bringing to light two previously undescribed species. The siliques of all three species are strongly compressed at right angles to the replum, they are carinate-margined, possess a deep V- or U-shaped notch at the apex and are densely pubescent with multiple-branched trichomes. These and other characteristics provide the members of the genus with a certain unity not shared by any other known species of the Cruciferae.

One of the new species described below, *Synthlipsis elata*, shows some resemblance in general habit to *Mancoa pubens*. This led to a consideration of the position of *M. pubens* in *Mancoa* and opened the question as to its possible inclusion as a member of *Synthlipsis*. However, *M. pubens*, although a somewhat anomalous species in *Mancoa*, seems better left in that genus for the present.

The following synopsis brings up to date the information we have concerning the genus *Synthlipsis*.

KEY TO THE SPECIES

Infructescences elongated, 1-4 dm. long; caudex not thick and heavily clothed with old leaf-bases; sinus at base of style open; styles pubescent or glabrous.

Siliques 2.5-3.5 mm. wide, narrowly oblong; ovules 15-25 in each locule; petals obovate, 4-5 mm. long ................................ 1. *S. elata.*

Siliques 6-8 mm. wide, broadly elliptical; ovules 7-11 in each locule; petals broadly obovate, 9-12 mm. long. ........................ 2. *S. Greggii.*

Infructescences compact, 2-5 cm. long; roots thick, caudex clothed with old leaf-bases; sinus at base of style narrow, nearly closed; styles glabrous throughout ................................................ 3. *S. densiflora.*

## 1. **Synthlipsis elata** Rollins, sp. nov. Fig. 1A-1F.

Annual; stems erect, divaricately branched from base upward, densely pubescent with dendritically branched trichomes, 4-6 dm. long; branches ascending; lower leaves narrowed at base, scarcely petiolate, 5-10 cm. long; 1-2 cm. wide; upper leaves sessile, 2-4 cm. long, 5-8 mm. wide; all leaves irregularly dentate to nearly pinnate, densely pubescent with stellate and dendritic trichomes, strongly 1-nerved on the lower surface, narrowly oblong, acute; inflorescence racemose, elongating in fruit, 1-3 dm. long; sepals nonsaccate, oblong, densely pubescent, ca. 2.5 mm. long, ca. 1.2 mm. wide; petals white, obovate, differentiated into blade and claw, entire, not dilated below, 4-5 mm. long, 2-2.5 mm. wide; filaments not dilated at base, 4-5 mm. long; anthers ca 1.5 mm. long; pedicels divaricately ascending, straight, densely pubescent, very slightly expanded at summit, 6-10 mm. long; siliques narrowly oblong, strongly compressed at right angles to septum, carinate-margined, notched at apex, densely pubescent, 8-12 mm. long,

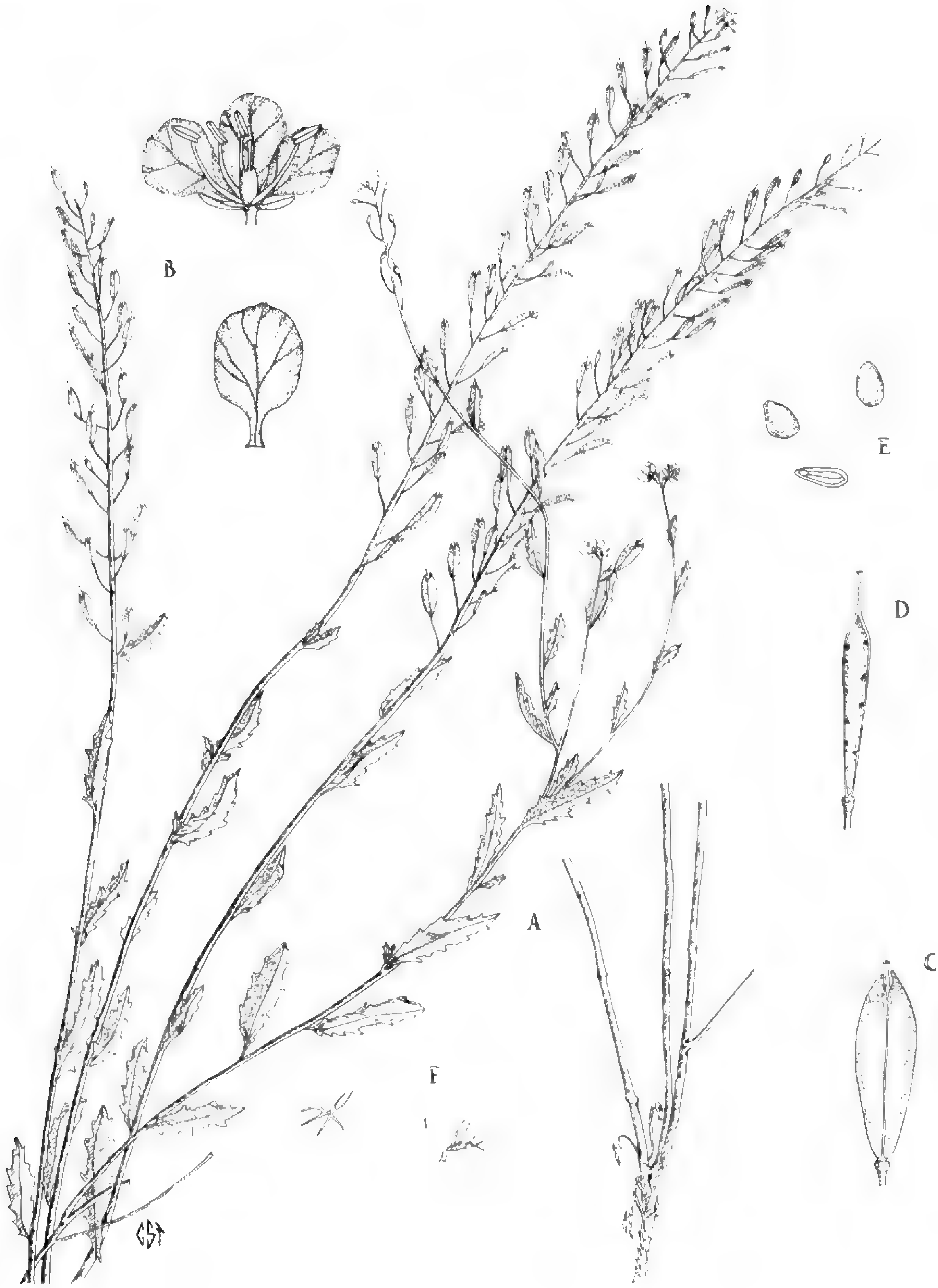


FIG. 1. *Synthlipsis elata* Rollins. A — habit sketch of upper portion of plant, × ½; B — flower with some parts removed and single petal, × 3; C — mature silique, × 3; D — replum, × 3; E — seeds, × 5; one seed in cross-section to show cotyledon position in one of the most compressed types, × 10; F — trichomes, × 25.

2.5-3.5 mm. wide, apical notch V-shaped, shoulders acute; styles slender, pubescent at base, 2-2.5 mm. long; stigma capitate, discoid to slightly bifid; ovules 15-25 in each loculus; seeds plump, often angular, wingless, mucilaginous when wetted, 1.1-1.3 mm. long, ca. 0.75 mm. broad; cotyledons incumbent to accumbent.

Herba annua; caulibus erectis ramosis pubescentibus 4-6 dm. longis; foliis anguste oblongis acutis dentatis vel sinuatis ad basi cuneatis 1-nervatis dense pubescentibus; inflorescentiis racemosis elongatis; infructescentiis 1-3 dm. longis; sepalis nonsaccatis oblongis pubescentibus ca. 2.5 mm. longis, ca. 1-2 mm. latis; petalis albis obovatis 4-5 mm. longis, 2-2.5 mm. latis; pedicellis divaricatis rectis pubescentibus 6-10 mm. longis; siliquis anguste oblongis compressis carinatis pubescentibus 8-12 mm. longis, 2.5-3.5 mm. latis; loculis 15-25-ovulatis; seminibus emarginatis brunneis 1.1-1.3 mm. longis, ca. 0.75 mm. latis; cotyledonibus incumbentibus vel accumbentibus.

Type in the Gray Herbarium, collected on rocky slope, 9 miles northeast of Durango, Route 31, Durango, Mexico, 25 July, 1958, *D. S. Correll and I. M. Johnston 20149.* Isotype at the Lundell Herbarium (TRF).

*Synthlipsis elata* has considerably narrower siliques and very much smaller flowers than either *S. Greggii* or *S. densiflora.* The pedicels are rather rigidly divaricate and only slightly ascending, giving a somewhat rigid appearance to the infructescence. Another striking feature is the very slender style which broadens very slightly at the base where a few branched trichomes are present. The plants of *S. elata* are virgately branched, the major branches beginning just above the soil line and branching repeatedly upward and outward. The tap root is well developed, but appears not to be that of a perennial plant.

The numerous small seeds are crowded in the loculi of the siliques and the shape of each seed is somewhat determined by pressure from adjacent seeds. This crowding also affects the position of the cotyledons with respect to the radicle. They are basically incumbent but often are crowded into an oblique to nearly accumbent position.

*S. elata* differs from *S. Greggii* and *S. densiflora* in having numerous seeds and incumbent cotyledons. In these features, it is more like *Nerisyrenia* than the other species of *Synthlipsis.*

**2. Synthlipsis Greggii** Gray, Mem. Am. Acad. 4:116. 1849.

Annual or biennial, possibly perennial; stems numerous from a slender or thickened caudex, densely covered with whitish dendritically branched trichomes, simple below, branched above, weak, often decumbent or sprawling in nearby bushes, 2-7 dm. long; leaves petiolate, densely pubescent with multiple-branched trichomes, mid-vein conspicuous; basal and cauline leaves basically similar; basal leaves with a slender petiole, broadly oblong or obovate to nearly spatulate, acute to somewhat rounded at apex, deeply dentate to nearly entire, 2-14 cm. long, 1-4 cm. wide; cauline leaves short-petiolate to cuneate at base and nearly sessile, oblong to broadly obovate, deeply lobed to shallowly dentate, acute to somewhat rounded at apex, 1-6 cm. long, 5-30 mm. wide; inflorescence much elongated, 1-4 dm. long; sepals narrowly oblong, nonsaccate, densely pubescent, 5-8 mm. long, 1.5-2 mm. wide; petals white to violet, broadly obovate, 9-12 mm. long, 6-9 mm. wide; filaments slender, not dilated at base; anthers oblong, 3-3.5 mm. long; fruiting pedicels widely spreading to slightly recurved, often somewhat sigmoid, 5-15 mm. long, slightly flattened in same plane as fruit, densely pubescent; siliques strongly flattened at right angles to replum, carinate-margined, elliptical to broadly oblong, densely pubescent, 8-15 mm. long, 5-8 mm. wide, apical notch shallowly to deeply U-shaped, more rarely V-shaped; styles slender, glabrous, 2-5 mm. long; ovules 7-11 in each locule; seeds plump, wingless, slightly longer than broad, 1.5-2 mm. long; cotyledons accumbent.

KEY TO VARIETIES

Siliques more or less uniformly pubescent with multiple-branched short-stalked trichomes ........................................ 2a. var. *Greggii.*
Siliques hispid with long-stalked trichomes and pubescent with an understory of multiple-branched short-stalked trichomes ........................................................................................ 2b. var. *hispidula.*

**2a. S. Greggii** var. **Greggii.** Fig. 2A-2F.

Variety *Greggii* is distributed from southwestern Texas south and west into Mexico, reaching the southern extremity of its known range in Hidalgo and its westward limit in the state of Durango. The area of occurrence in Hidalgo in

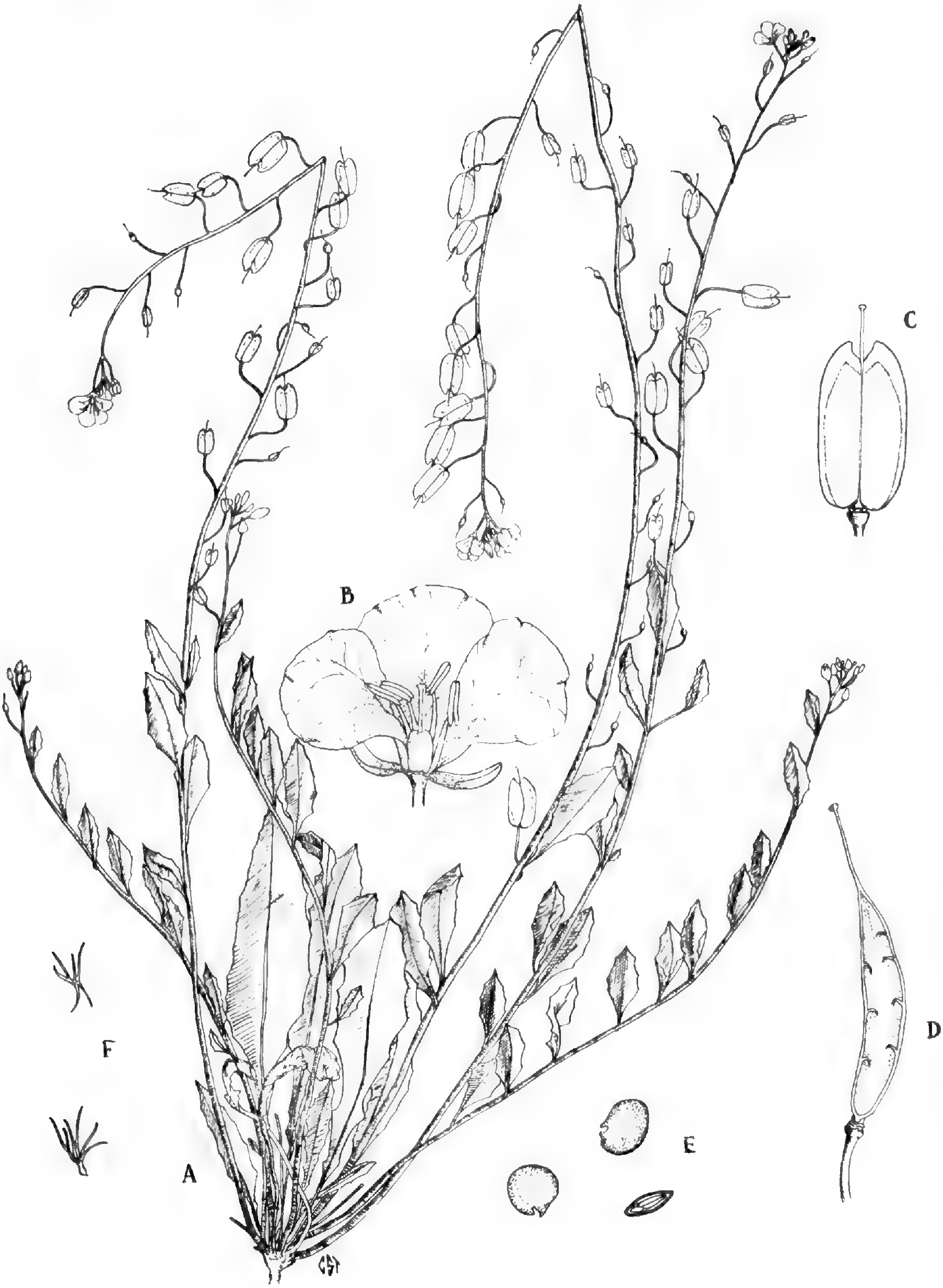


FIG. 2. *Synthlipsis Greggii* Gray. A — habit sketch, × ½; B — flower with some parts removed, × 2; C — mature silique, × 2; D — replum, × 3; E — seeds, × 2.5. one seed in cross-section to show cotyledon position; F — trichomes, × 25.

the district of Ixmiquilpan appears to be isolated from the main distributional area of the species. This disjunction parallels that of other plant species, such as *Parthenium argentatum*, and apparently is not uncommon. Var *Greggii* is unusually variable in many morphological features and this variability may be associated with wide seasonal fluctuations in moisture and temperature. It flowers and fruits over a very long time-span, depending upon seasonal conditions, and the continued growth of any given plant appears to be under moisture control rather than seasonal domination. This is shown by the dates of collection of the 38 specimens in the Gray Herbarium. According to these, flowering or fruiting specimens were collected in every month of the year except December, and the absence of the latter month from the roster is probably pure chance. The number of collections taken in each month are as follows: Jan., 1; Feb., 3; Mar., 2; Apr., 4; May, 3; June, 3; July, 5; Aug., 4; Sept., 3; Oct., 4; Nov., 6. Taking the full geographic range of the species into account, there is no regular dormant season as far as growth is concerned and no period when flowering may not occur under appropriate conditions.

As a result of its tendency to grow whenever the moisture regime is favorable, *S. Greggii* may grow continuously for many months, producing greatly elongated flowering stems. On the other hand, a short moist period followed by a long dry one produces a short growth period which is followed by the slowing down and cessation of growth and a relatively dwarfed plant results. These extremes in the overall growth pattern are paralleled by leaf-size and other deviations which must be taken into account in any assessment of the variation of the species as a whole.

Growing in open ground, *S. Greggii* has a central tuft of basal leaves with decumbent sprawling stems that arise in their axils. Because the stems are weak and lie along the ground, the cauline leaves are oriented to the upper side of the stem, even though they are borne alternately. In heavily grazed areas, the plants of *S. Greggii* survive through the protection of spiney bushes and cactus clumps where the stems are enmeshed among the branches or spines of the protecting clump.

Some populations of *S. Greggii* have pure white flowers. These usually become pale pink upon drying. But the commonest flower color is a light to dark shade of violet. Upon drying, the petals of many of these flowers become very deep violet in color.

In addition to the collections cited in my earlier paper (1939), the following have been studied: — **Texas**: Maravillas Creek, 44 miles southeast of Marathon, Brewster Co., *Cory 31618* (GH); between Persimmon Gap and Dog Flat, Brewster Co., *Warnock C293* (GH); La Joya, Hidalgo Co., *Mrs. E. J. Walker 27* (GH). **Mexico — Chihuahua:** Cañon del Rayo, Sierra del Diablo, *Stewart 854* (GH). **Tamaulipas**: San Fernando, *Berlandier 811* (GH). **Nuevo Leon**: 5 miles west of Santa Catarina toward Saltillo, *Rollins & Tryon 5893* (GH); south of La Paz, 80 miles south of Saltillo, *Rollins & Tryon 58171* (GH); near Pablillo, *Shreve & Tinkham 9746* (GH); 29 miles northeast of Saltillo on road to Monterrey, *Rollins & Tryon 58311* (GH). **Coahuila**: about 4 miles east of Carneros Pass, *Correll & Johnston 21328* (GH, TRF); south of Castaños, *Wynd & Mueller 201* (GH); Cañon de Jara, east of Socorro, *Schroeder 15* (GH); western base of Pecacho del Fuste, *Johnston 8427* (GH); 9 km. south of Parras, *Stanford, Retherford & Northcraft 152* (GH); 13 km. east of Jimulco, *Stanford, Retherford & Northcraft 112* (GH); Sierra del Pino, *Johnston & Muller 392; 756* (GH); 2 km. west of Las Margaritas, *Stewart 2844* (GH); Valle de Acatita, *Stewart 2997* (GH). **Durango**: Trancas Canyon, about 7 miles southeast of Chocolate, *Correll & Johnston 20015* (GH, TRF); 74 miles northeast of Durango, *Rollins & Tryon 58280* (GH); between Guadalupe Victoria and Cuencame, 87 miles northeast of Durango, *Rollins & Tryon 58283* (GH). **San Luis Potosi**: 50 miles northeast of San Luis Potosi, *Rollins & Tyron 58200* (GH). **Hidalgo:** between Ixmiquilpan and river cut on road to Cardonal, *Moore & Wood 3728* (GH).

2b. **S. Greggi** var. **hispidula** Rollins, Madroño 5:133. 1939.

We have seen this variety growing on limey gravel 16 km. southeast of San Luis Potosi where we were led by Dr. Jerzy Rezdowski in November, 1958. The plants have the hispid siliques and broad replum of the type specimen, but I cannot find any other characters to distinguish them from var. *Greggii*. In the same area we found *Lesquerella Schaffneri*, whose type Schaffner also obtained in the area around San Luis Potosi, probably in the San Miguelito Mountains, which was one of his favorite collecting grounds. Our collection is *Rollins & Tryon 58208* (GH).

### 3. **Synthlipsis densiflora** Rollins, sp. nov. Fig. 3A-3E.

Perennial, caespitose; root caudex thick and often clothed with old leaf-bases; stems erect to somewhat decumbent, usually branched above, densely pubescent with irregular dendritic trichomes, arising from the crown amid a cluster of erect petiolate leaves, 1-2 dm. long; basal leaves petiolate, irregularly dentate to somewhat lobed, 5-10 cm. long, 2-4 cm. wide, pubescent throughout with dendritic trichomes, blade obovate to broadly elliptical, obtuse at apex; cauline leaves cuneate to obovate, usually petiolate, sparsely dentate, obtuse at apex, densely pubescent, 1.5-4 cm. long, 8-20 mm. wide, often subtending branches; inflorescence dense, terminating the main axes and the branches; sepals densely pubescent, narrowly oblong, ca. 5 mm. long, ca. 1 mm. wide, outer pair slightly saccate, inner pair nonsaccate; petals obovate with a slender claw, white, 7-9 mm. long, ca. 4 mm. wide; stamens shorter than petals; anthers ca. 2 mm. long; fruiting pedicels straight, at right angles to rachis to slightly ascending, densely pubescent, 5-10 mm. long, somewhat expanded at summit; siliques oblong to elliptical in outline, notched at apex, densely pubescent, strongly flattened at right angles to the septum, 8-15 mm. long, 5-8 mm. wide, trichomes of the valves of markedly different sizes; valves glabrous on interior; sinus at apex of silique V-shaped, 1-2 mm. deep; replum glabrous, acute at apex; styles slender, glabrous, 1-2 mm. long; seeds plump, somewhat pear-shaped, wingless, ca. 1.2 mm. long; position of cotyledons not determinable from the available material.

Herba perennis caespitosa; caudicibus crassis; caulibus erectis vel decumbentibus ramosis pubescentibus 1-2 dm. longis; foliis radicalibus petiolatis dentatis vel sinuatis obovatis vel ellipticis obtusis dense pubescentibus 5-10 cm. longis, 2-4 cm. latis; foliis caulinis cuneatis vel obovatis 1.5-4 cm. longis, 8-20 mm. latis; inflorescentiis densis; sepalis anguste oblongis pubescentibus ca. 5 mm. longis, ca. 1 mm. latis; petalis obovatis vel late spathulatis albis 7-9 mm. longis, ca. 4 mm. latis; pedicellis rectis divaricatis pubescentibus 5-10 mm. longis; siliquis late oblongis vel ellipticis compressis dense pubescentibus 8-15 mm. longis, 5-8 mm. latis; stylis tenuibus glabris 1-2 mm. longis; loculis 6-8-ovulatis; seminibus pyriformibus exalatis.

Type in the Gray Herbarium collected from crevices of limestone on


FIG. 3. *Synthlipsis densiflora* Rollins. A — habit sketch, × ½; B — mature silique, × 2; C — replum, × 2; D — seeds, × 5, one seed in cross-section to show cotyledon position; E — trichomes, × 25.

exposed high west-facing cliffs just below the ridge-crest, southwestern end of the Sierra de la Fragua, a high limestone ridge with a forest of *Pinus pinceana*, 1-2 km. north of Puerto Colorado, western Coahuila, Mexico, Sept. 2, 1941, *I. M. Johnston 8740.*

*Synthlipsis densiflora* is at present known only from the type series which in itself shows considerable variation. For one thing, there is an unusual amount of abortive fruit on several of the specimens, but even taking this into account, the variation in the siliques, both as to length and width, is remarkably great. The plants as a whole vary greatly in size and one suspects that the cliff-crevices where they were found were not uniformly favorable for growth. The dense cluster of basal leaves and thick caudex invested with old leaf-bases, as found in *S. densiflora*, often characterize plants of cliff-crevices in arid areas and it is interesting to have a species of *Synthlipsis* adapting itself to this particular habitat. *S. densiflora* is most closely related to *S. Greggii* and differs from it mainly in the shape of the silique, the fact that it is a heavy rooted perennial, and in the short, dense inflorescence. Also, the flowers are smaller and the styles are shorter in *S. densiflora* than in *S. Greggii.* — GRAY HERBARIUM OF HARVARD UNIVERSITY.

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# DISTRIBUTIONAL AND CYTOLOGICAL NOTES ON SALSOLA COLLINA[1]

RICHARD W. POHL AND JAMES P. GILLESPIE[2]

The Eurasian *Salsola collina* Pall. has been previously reported by Schapaugh (1958) from Minnesota, Colorado, and Iowa. At the time of this report, the only collection of this species from Minnesota was a specimen collected by Moore in South St. Paul in 1937. Field observations of this species during 1959 indicate that it is now well established and apparently vigorously spreading in Sherburne County, about sixty miles northwest of the original record. In late June numerous young seedlings and dead plants of the previous year were found near Monticello and along sandy roadsides in the vicinity of Sand Dunes Game Preserve. In July, the species was found in great abundance along the railroad and newly graded embankment of Hys. 10 and 52 northwest of Becker, some ten to twelve miles from the earlier find. Citations of specimens collected at these localities are given below and specimens ultimately will be distributed to various herbaria.

Sandy roadside along highway 1.5 mi. n. e. of Monticello, Sherburne Co., Minnesota. Abundant at this locality and for several miles along sandy country roads near Sandhills Game Preserve. *Richard W. Pohl 7771*, June 19, 1959 (ISC).

Abundant on road shoulders and railroad right-of-way, along Hys. 10 and 52, 4.5 mi. n. w. of Becker, Sherburne Co., Minnesota. Plants monopodial, later producing lateral branches. Dark green, up to 2 ft. tall, *Richard W. Pohl 8017*, July 20, 1959 (ISC).

In general appearance, *S. collina* resembles the common Russian thistle, *S. kali* var. *tenuifolia*. However, the young plants possess a strong erect monopodial stem and later become bushy by the growth of basal branches. This growth

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1 The facilities of the Iowa State University Herbarium, supported by the Industrial Science Research Foundation, were used in the preparation of this paper.

2 National Science Foundation teacher research participant, I. S. U. 1959. Expenses of publication were borne by the National Science Foundation.

habit is in striking contrast to that of the common Russian thistle, which has a more diffuse branching pattern. With a little practice it is easy to separate the two at a distance from a moving car.

The original Iowa collection of *S. collina*, made in 1957, was a scrap of a dead and dry plant. The species was apparently very rare in Ames at that time. This year the original colony has spread considerably and contains hundreds of plants, which are thriving on the dry slag and cinders of the railroad embankment. Apparently *S. collina* is well adapted to midwestern conditions and may become as aggressive a weed as *S. kali* var. *tenuifolia*.

Gametic chromosome numbers in the genus *Salsola* are

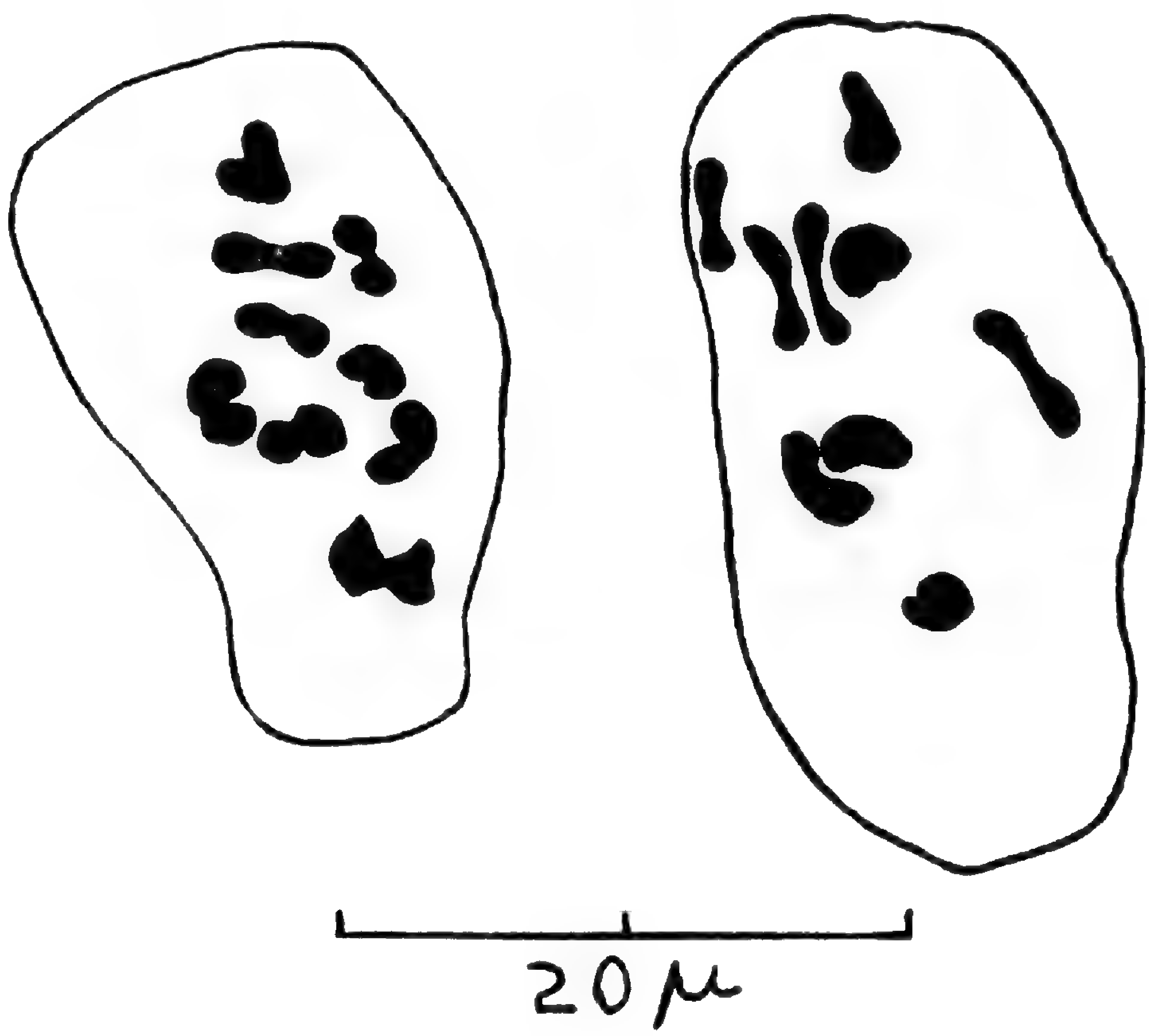


FIG. 1. *Salsola collina* Pall. Diakinesis in pollen mother cells, showing 9 pairs of chromosomes.

N = 9 (Reese, 1957) and N = 18 (Wulff, 1936, 1937). *S. kali* is a tetraploid with 18 pairs.

The gametic chromosome number of *S. collina* was determined from pollen mother cells as N = 9 (Fig. 1). The determination was made from plants grown in the greenhouse from wild seedlings collected at the Ames locality. It was found that the anther walls contained large numbers of druses which prevent proper flattening of aceto-carmine squash preparations. Efforts to dissolve the druses with versene or hydrochloric acid failed. In order to get sufficient flattening of squashes, it was necessary to remove all fragments of the minute anthers.

A voucher specimen for the above chromosome count is preserved in the Iowa State University Herbarium. The pertinent data are: cultivated in I. S. U. greenhouse, Ames, Story County, Iowa. Grown from wild seedlings taken at 6th St. overpass of C. & N. W. R. R., Ames. Chromosome number N = 9 from P. M. C.'s. July 26, 1959. *James P. Gillespie 1293A* (ISC).

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SOME ADDITIONS TO THE VASCULAR FLORA OF NEW HAMPSHIRE. — The presence of the following species in New Hampshire as indigeuous or naturalized and well established components of the flora will necessitate some revision of the statements of their ranges in Gray's Manual.

**Aristida tuberculosa** Nutt. This distinctive grass was found on September 17, 1958 by the authors in the township of Seabrook. It occurred along with *Andropogon scoparius* as scattered but very conspicuous individuals on the sandy area that lies between the highway at Seabrook Beach and the marshes of Blackwater River. Only a few collections have been made of this species north of Connecticut though apparently it is common on Plum Island. Also it has been collected at Winter Pond, Winchester and in Winthrop. These seem to be the only stations for it in Massachusetts. Apart from its occurrence on coastal sands *Aristida tuberculosa* turns up again near Lake Michigan and in Minnesota and Iowa. Its absence from Cape Cod, where conditions would seem to be ideal for it raises an interesting question in plant distribution.

**Crotalaria sagittalis** L. A number of plants of the Rattlebox were seen by the authors on September 11, 1958 in the township of Nashua not far from the Merrimack River in sandy soil. The discovery of this species in New Hampshire for the first time comes as no great surprise for it has been collected in the adjacent township of Tyngsboro as well as in numerous other Massachusetts localities in Middlesex and Essex Counties. In view of its occurrence in extreme southeastern Vermont it might also be expected in nearby parts of southwestern New Hampshire.

**Arabidopsis Thaliana** (L.) Heynh. The Mouse-ear Cress occurs here and there in the vicinity of the highway that winds its way toward Newmarket not far from the shores of Great Bay. It grows both in open grassy situations and among ledge-outcrops in varying degrees of shade beneath deciduous trees. The species has at least held its own during the years since 1938 when the junior author first found it.

The question of what constitutes naturalization should be considered in respect to this Durham record. A collection of *A. Thaliana* made by A. S. Pease from a henyard in Exeter in 1913 is present in the herbarium of the New England Botanical Club. Fernald may have felt that one such collection was insufficient to demonstrate even an adventive status. In any event Gray's 8th edition gives the range only to Massachusetts. Here in Durham we have a very different situation: the species is found in considerable quantity in a variety of ecological niches and it has reproduced itself satisfactorily for at least 20 years.

**Hackelia americana** (Gray) Fern. This was discovered by the authors, on a trip under the leadership of Professor A. S. Pease, in Dartmouth College Grant. Previously Professor Pease had found the only New Hampshire station of *Draba lanceolata* Royle on the cliffs of the Diamond Peaks in the Grant. *Hackelia* was found on a talus slope below the cliffs. Both *Draba* and *Hackelia* are essentially northern and calcareous in their affinities. There is one station of *Draba* in Maine, in southeastern Piscataquis county, and two stations in northern Vermont. *Hackelia* is rare in New England, occurring very locally south to central Maine and central Vermont. It is frequent in the calcareous areas of Gaspe. It seems probable that the Diamond Peaks have more available calcium than most New Hampshire rocks.

**Uvularia perfoliata** L. Sumners Falls in Plainfield long has been known as a station for certain calcophiles, such as *Astragalus alpinus* L. and A. *Jesupi* (Egglest. & Sheld.) Britt. A half a mile back from the Connecticut River in Plainfield, the senior author located a stand of mixed hardwoods containing *Uvularia perfoliata* L., *Dentaria laciniata* Muhl., *Orchis spectabilis* L. and some other plants that are rare in New Hampshire. *Uvularia perfoliata* is well distributed in Massachusetts and infrequent in southern Vermont. Its occurrence in Plainfield, which is almost the northern limit, as well as the first state record, may perhaps be accounted for by the fact that the rich calcareous woods provide an unusually favorable site.

**Dentaria laciniata** Muhl. In addition to the station mentioned above, it also occurs on the talus slope of a cliff in Rumney.

Specimens of all the plants mentioned above have been placed in the New England Botanical Club. — FREDERIC L. STEELE AND A. R. HODGDON, ST. MARY'S-IN-THE MOUNTAINS, LITTLETON, N. H. AND UNIVERSITY OF NEW HAMPSHIRE, DURHAM, N. H.

A NEW MANUAL FOR CALIFORNIA[1]. — The best known work and until now the standard manual covering the entire flora of California has been that of Jepson[2] finally published in 1925. There have been several reissues, since the original, of Jepson's important work and these have served their users well in the decades from 1925 to the present. But even at the time of its appearance, certain limitations in Jepson's Manual were made evident by the fuller and more inclusive treatments of various groups of plants in the parts of several volumes of his own "A Flora of California" then being published. Abrams' Illustrated Flora of the Pacific States, of which we have seen three volumes [the fourth and last volume is nearly ready for release under the authorship of Mrs. R. S. Ferris] has also pointed up the need for improved treatments of various plant groups over the presentation in Jepson's Manual. Officially, the newly published "A California Flora" does not replace Jepson's Manual. However, practically, it does just that and it is as a replacement of the well known Jepson's Manual that we shall consider it in the present review.

Traditionally, a flora or manual attempts to be a guide to the plants growing in a given area. It provides finding-guides in the form of keys to the families, genera, species

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1 A California Flora by Philip A. Munz in collaboration with David D. Keck. 1-1681. University of California Press, Berkeley and Los Angeles. 1959. $11.50.

2 A Manual of the Flowering Plants of California by W. L. Jepson. 1-1238. 1925.

and infraspecific taxa, along with descriptions, habitat notes and information on geographical distributions. A California Flora provides all of these items and in addition gives an indication of the plant community to which the particular taxon belongs and its chromosome number, if that is known. In any early section of the book, five biotic provinces, eleven vegetation types and twenty-nine plant communities are described for California. These subdivisions form the basis for the placing of the taxa into plant communities, as one finds in the write-up of each species, subspecies or variety.

In a volume such as the one under review, the quantity of material included is of such a vast scope that no casual appraisal of it is possible. The proof of the book's value will come only with the demonstrated effectiveness of its service to the user over a period of time. Not all parts of the book will prove to be equally sound, as the author himself predicts, because of the differences in the available information about the various groups of plants treated, if for no other reason. But several different persons did provide the treatments for different genera and parts of families which is bound to produce some unevenness in the book overall. However, this does not detract much, if any, from the book and I predict that a very high percentage of the family treatments will stand up well over the years ahead.

Dr. Munz and his collaborators, to a surprising degree, have availed themselves of modern treatments wherever they could be found. In general, they have accepted the new treatments, yet there has been maintained an overall conservative tone in the book, showing a decided sifting and distilling of conflicting evidence where controversial matters are concerned.

Perhaps the most radical departure in the organization of the book under review, as compared to similar ones, is the abandonment of the Engler and Prantl sequence for the families of the Angiosperms. The new arrangement will be acknowledged to reflect more nearly the presently accepted phylogenetic sequences than the outdated traditional arrangement but it is certain that those familiar with the old arrangement, both in herbaria and in other manuals, will be frequently fumbling in the wrong part of this book for a particular family. The break with tradition in this respect is justified if the presentation of a truer conception of plant relationships is achieved, even though we may regret the loss of the familiar, more convenient arrangement.

As compared with Jepson's Manual, which delineates a total of 4019 species, A California Flora purports to cover, "6,000-odd kinds of plants growing spontaneously in California", according to notes provided on the jacket cover. Since the figures are not comparable, one including only the species and the other inclusive of all "kinds", presumably species and infraspecific taxa, they cannot be compared directly. However, it is clear that a considerable number of presumed taxa not included in Jepson are treated in the Munz book. This is to be expected because of the continued botanical exploration and increased study of the plants of California since 1925. Furthermore, there have been a good many introductions into the California flora during the same period. Some notion as to the increased number of species recognized in the new flora may be obtained by comparing a few of the representative genera with mostly indigenous species, as shown in the following table.

NUMBERS OF SPECIES

| GENUS | JEPSON | MUNZ | GENUS | JEPSON | MUNZ |
|---|---|---|---|---|---|
| Carex | 126 | 144 | Potentilla | 44 | 26 |
| Poa | 29 | 36 | Lupinus | 65 | 82 |
| Calochortus | 24 | 37 | Lomatium | 23 | 35 |
| Allium | 27 | 38 | Phacelia | 55 | 87 |
| Eriogonum | 66 | 76 | Penstemon | 37 | 58 |
| Arabis | 20 | 35 | Erigeron | 32 | 46 |
| Ribes | 26 | 31 | Senecio | 33 | 38 |

It should not be inferred that because in all but one of the genera listed above there is an increased number of species recognized, a lack of restraint in the recognition of described species characterizes the new manual. Rather, insofar as I can judge, it appears that the increased number of species recognized merely reflects a more accurate coverage of the plants of the area than heretofore. Thus viewed, one sees that the new book was definitely needed and those interested in California plants should find it to be a considerable improvement over Jepson's Manual. In turning from the old to the new, students will not mind leaving behind the confusing English line that was used for short dimension measurements throughout the older work, but they will miss the many pertinent illustrations. Munz' Manual has a rather minimal number of illustrations. Those present are of good quality, but there are too few to be of any real importance to the book as a whole. The book is well manufactured and well printed. The inevitable slips are to be found, such as the page references being upside down for groups 3 through 5 on page 68, but these seem to be at a minimum.

A California Flora is a notable addition to the growing list of state floras in the United States and because of the high endemism in that flora, there is more justification for the use of the state boundaries to delimit the area of coverage than in most state floras. This book is among the best of its kind and every serious botanist interested in the plants of the California area will want a copy near at hand. — REED C. ROLLINS, GRAY HERBARIUM OF HARVARD UNIVERSITY.

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# CONTRIBUTIONS TO THE FLORA OF NOVA SCOTIA VII. DISTRIBUTION OF SOME AQUATIC AND PALUDIAL SPECIES

E. C. SMITH

Rather extensive floristic surveys have been undertaken in Nova Scotia during the past ten years as part of a series of ecological studies sponsored by the Nova Scotia Research Foundation under the direction of the author. Some of the discoveries made during this work have already been published (Erskine, D. S. 1951; Smith and Schofield 1952; Schofield and Smith 1953; Smith and J. S. Erskine 1954; Schofield 1955; Webster 1956; Smith and Schofield 1959).

Nova Scotia has probably had a longer and more intensive botanical exploration than any other province in Canada. Yet as the detailed exploration of the area proceeds, many of the supposed rarer plants have proven to be much more widespread in distribution than was previously thought. This has been particularly true in the case of the arctic-montane species, and of the coastal plain species in the eastward extension of their range. Another group which has proven to be quite widespread are certain of the smaller aquatic and paludial species which are characteristic of the marginal waters of ponds, lakes and streams, and of the swamps associated with these.

The arctic-montane species, and to some extent the coastal plain species in the southeastern counties, are frequently very local in occurrence in habitats which are not widespread in the province. Some of the group of aquatic and paludial species listed in this paper are also apt to be local in distribution, as for instance *Lemna trisulca* L., *Ranunculus Gmelini* DC., var. *Hookeri* (D. Don) Benson, *Megalodonta Beckii* (Torr.) Greene, and *Alisma triviale* Pursh which are found in the less acid areas. However, others such as *Najas flexilis* (Willd.) Rostk. & Schmidt, *Subularia aquatica* L., *Elatine minima* (Nutt.) Fisch. & Mey., *Calla palustris* L., *Utricularia minor* L., *Littorella americana* Fern., and *Ceratophyllum demersum* L., are now found to be widespread. The previously poorly known distribution of these species is probably due to the inconspicuous nature of these plants, and to the obscure habitats in which they grow.

The annotated list below of these rarely collected plants includes most of the stations discovered since the publication of the Flora of Nova Scotia by Roland in 1947. The maps show these new stations as well as those included in the above publication.

Grateful acknowledgement is made to the Nova Scotia Research Foundation for financial support and to those persons who aided the author in various ways, particularly to the members of the various summer field parties who assisted in the collection of plants, and to Mr. J. S. Erskine and others for permission to publish various records. The collection numbers, unless otherwise designated, are those of the author and associated collectors.

**Typha angustifolia** L. This narrow-leafed cat-tail is local in occurrence. Roland (1947) cites it as being local around some of the small lakes south of Amherst, near the head of the tide. It has also been reported from near Cheticamp in Inverness County. Unsubstantiated reports exist for Beaverbank, Halifax County and near Windsor, Hants County. The following are recent collections which show a wider distribution near the coast, chiefly in more basic areas. Pictou County: roadside swale, Mount Thom, *3989*. Cumberland County: marsh north of Amherst, *Smith, Smith and Collins*, Sept. 5, 1948. Hants County: abundant along small brook, one mile south of Falmouth, *12511;* rare and local in swamp near Mount Denson, *3993;* roadside ditch, Walton, *J. S. Erskine 51.113.* Kings County: gravel pit by Black River Lake, *J. S. Erskine 53.165.* Digby County: brackish swale beside Route 1 at Meteghan, *J. S. Erskine 54.922;* common in marsh behind beach, Beaver River, *J. S. Erskine 53.234.* Queens County: swale near Caledonia, *11523.* Lunenburg County: growing in large colony in swale near shore, Blandford, *8865;* very extensive colony in brackish swamp near Lower Blandford, *W. B. Schofield 2875.*

**Najas flexilis** (Willd.) Rostk. & Schmidt. The distribution of this species has been poorly known in the province and the species has been little collected. Fernald (1921) records it as not seen in Yarmouth, Shelburne, and Queens Counties. In recent years it has been found over a wider area (Smith and Schofield, 1952; Schofield, 1955). The present known distribution is shown in the map, Fig. 1. It is particularly common in Cape Breton and the northcentral counties of the mainland, and rarer in the southeastern and southwestern counties. While it is now known from Yarmouth and Queens counties, it is rare. It has not yet been collected in Shelburne County. Victoria County: abundant in marginal water of Lakes O'Law, *7024;* abundant in pond back of beach, Briton Cove, *13891 and 7957;* abundant in water of pond north of Briton Cove, *8091.* Inverness County: in four feet of water of lake, Friar's Head, *13837;* in water of pond at Grand Etang, *10294;* occasional in water of Lake Ainslie near Scottsville, *6995;* marginal water of Horton Lake, *13801;* rare in wrack of pond, West Mabou Harbour, *13332.* Cape Breton County: abundant in marginal water of Canoe Lake, *13069;* abundant in marginal water of Blackett's Lake, *12996;* in wrack and rooted in shallows of lake three miles south of Albert Bridge, *12946;* marginal water of lake west of New Boston, *12952;* in wrack, marginal shallows of McIsaac Lake, *12873.* Antigonish County: in pond near James River, *7043;* rare in wrack of Gaspereau Lake, *13240;* abundant and rooted in muck of Gillis Lake, *13135A.* Pictou County: common in shallows of lake south of Churchville, *12811.* Colchester County: abundant in marginal water of Earltown Lake, *11747;* frequent in Stewiacke River, Middle Stewiacke, *12702;* shallows of Nine Mile River at Elmsdale, *12671;* large colonies on mud bottom of Gay River, Gay River Village, *12673;* marginal water of Shortt's (Otterton) Lake, *12556.* Cumberland County: in ice pond, Tidnish Road near Amherst, *J. S. Erskine 55.730.* Hants County: muddy shallows of Comagun River, *J. S. and D. S. Erskine 55.486;* abundant in water of Lily Lake, *9117;* abundant in pond north of Summerville, *9075;* lake three miles south of Maitland, *9236.* Kings County: pond near station, Avonport, *J. S. Erskine 53.375.* Annapolis County: wrack of Millbury Lake, *13273.* Digby County: rare in wrack of lake, Midway Lake, *11859;* margin of small lake, east of Mistake Lake, *11975.* Queens County: marginal shallows of Charlotte Lake, *12444*. Lunenburg County: shallow water at edge Hen Lake, New Canada, *17243;* rare in Blystner Lake, *12768*. Halifax County: locally abundant in marginal shallows of Barrett Lake, *12608;* in wrack of Briny Lake at Seabright, *12663;* abundant in river at Brandy Spring, *9300;* river water at Middle Musquodoboit, *9268*. Guysborough County: marginal water of Salmon River Lake, *13167;* occasional in wrack of lake at Lakedale, *13155;* rare in water of Pringle Lake near Goshen, *13190;* rare, water of Glenelg Lake, *9417*.

**Scheuchzeria palustris** L., var. **americana** Fern. Nichols (1918) lists this species as characteristically associated with the sphagnum mat of undrained swamps on the Cape Breton Plateau. Fernald (1922) notes its occurrence in quagmires of Shelburne County. It has also been reported from similar habitats in Kings, Queens, and Colchester Counties. Recent collections are as follows: Victoria County: bog ten miles west of Neil's Harbour, *3821;* rare in water of bog pools, at an elevation of 1400 feet on Ingonish Barrens, *4644*. Richmond County: very rare in quaking bog, Louisdale, *5064*. Digby County: a few plants on floating mat, Boar Back Lake, *J. S. Erskine 53.248*. Queens County: floating mat of small lake near Ponhook Lake, *J. S. Erskine 51.1513;* bog west of Caledonia, *12434*. Lunenburg County: bog one mile west of East River, *D. S. Erskine 846;* boggy margin of Shoal Cove Lake Brook, *W. B. Schofield 2778;* floating mat, Fox Point Lake, *J. S. Erskine 54.1600;* swale, Mill Cove Lake, *J. S. Erskine 52.1334*. Halifax County: abundant in bog, Head of Chezzetcook, *9319;* abundant, boggy lake edge, West Quoddy, *9561*. Guysborough County: frequent on floating mat of lake west of Marie Joseph, *9508*.

**Alisma triviale** Pursh. Rather common from Annapolis County to Pictou and Cumberland Counties (Roland, 1947), this plant of muddy ditches, pond and stream edges is now shown to extend into Cape Breton. Inverness County: common at edge of gypsum sink hole, Hillsborough, *4823*. Antigonish County: stream in marsh, Monastery, *656;* abundant at pond edge, Bayfield, *6932*. Pictou County: river gravel at River John, *11694;* abundant in swale west of Pictou, *11737;* edge of East River near Sunny Brae, *J. S. Erskine 55.1227*. Hants County: shallow pond above fish hatcheries, Martock, *D. S. Erskine 50;* pond edge, Newport, *J. S. Erskine 51.361;* shallow pond, Three Mile Plains, *J. S. and D. S. Erskine 12*. Annapolis County: in water of stream, Middleton, *J. S. and D. S. Erskine 202;* wet margin of Croskill Lake, *W. B. Schofield and D. H. Webster 4274*, swale below Route 1, Bloody Creek, *J. S. Erskine 54.1467*.

**Sagittaria graminea** Michx. Well known from the southwestern counties, Roland (1947), this plant has been reported by Schofield (1955) from four locations in Cumberland County. It is also now known to be relatively common in the central and eastern counties, and in Cape Breton. Richmond County: muddy lake shore, Loch Lomand, *760;* rare on rocky shores of Grand Lake, Isle Madame, *5083;* edge of Ferguson Lake, *J. S. Erskine 51.1087.* Cape Breton County: common in muck at edge of Blacketts Lake, *15049;* rare, edge of Pottles Lake, North Sydney, *13033.* Antigonish County: submerged in marginal water of lake, St. Joseph, *13706.* Pictou County: lakeside, Eden Lake, *1231;* common on lake beach south of Churchville, *12817.* Hants County: sandy margin of Lewis Lake, *12486;* lake edge in water, Mockingigh Lake, *8950.* Annapolis County: rare on muddy margin of Sandy Lake, *W. B. Schofield 2920.* Queens County: shallows of ox-bow pond below Mill Village, *J. S. Erskine 55.375;* marshy, gravelly shore, Medway River above Charleston, *Dore and Gorham 44.954;* marginal mud of Charlotte Lake, *12450.* Lunenburg County: submerged in marginal water of LaHave River, *12732;* shallows, edge of Wentzels Lake, *6884;* Maplewood, *Ord, Watts and Bridgeford* July 8, 1949; one plant in shallows, Fancy Lake, *J. S. Erskine 53.350;* beach of Big Mushamush Lake, *J. S. Erskine 52.1117.* Halifax County: lake edge west of Lake Charlotte, *J. S. Erskine 51.416;* muddy, gravelly margin of lake, Banook Lake, Dartmouth, *Dore, Judd and Gorham 45.1103.* Guysborough County: occasional, gravel beach of Two Mile Lake, *9391;* occasional in shallows of lake, Half Island Cove, *6781,* sterile plants in one foot of water in Pringle Lake, *13194.*

**Sagittaria cuneata** Sheldon. Erskine (1951) shows the extension of this species into Inverness County, Cape Breton, where it appears to be the common species. The following collections substantiate this statement and show its range to be confined mainly to the northeastern counties of the province. Victoria County: in one foot of water, Washabuck Bridge, *13943;* abundant in boggy runnels of lake, St. Colomba, *9763;* common in shallows of alkaline pond, South Haven, *8173;* muddy border of pond South Gut, St. Ann, *894.* Inverness County: in water of lake, Friar's Head, *13834;* edge of lagoon, River Denys, *9689;* abundant in mucky edge of brook, East Lake Ainslie *6993;* abundant in water of pond, Mabou Harbour, *4898.* Antigonish County; pond near beach, Cape Jack, *16787;* abundant in one foot of water, pond edge, St. Joseph, *13220.* Pictou County: beach of River, East St. Mary's, *J. S. Erskine 55.1155.* Colchester County: in marsh near brook, Lower Truro, *Macfadden 246.* Hants County: Herbert Brook, Brooklyn, *J. S. Erskine 52.782;* Lebreau Creek, crossing Chester Road near Windsor, *Bell, Erskine and Gorham,* Aug. 3, 1948. Kings County: Habitant River above Canning, *J. S. and D. S. Erskine,* Aug. 31, 1949.

**Rhynchospora capitellata** (Michx.) Vahl. Previously known to occur frequently on lake shores, savannahs, and peaty openings in the southwestern counties, and scattered eastward to Annapolis and Halifax Counties (Roland, 1947) and again in Cumberland County (Schofield, 1955), this species has now been collected in all the counties of the mainland portion of the province except Kings and Colchester. It is most luxurious and abundant in the western counties, more scattered in the east. Pictou County: locally abundant at edge of West Branch Lake, *12851*. Hants County: margin of Noel Lake, *12462;* stony beach, Cameron Lake, *52.596;* rocky pasture, West Brooklyn, *J. S. Erskine 1430* Annapolis County: roadside near Young Lake, *13277;* outlet of Millbury Lake, North Mountain, *J. S. Erskine 54.1513;* abundant in damp field, Upper Clarence, *W. B. Schofield 2938*. Shelburne County: abundant in ditch, Nine Mile Road between Sable River and Jordan Falls, *17117*, woods road near Round Bay, *W. B. Schofield 5510;* river bank, Ohio, *12136;* woods road, Woods Harbour, *12213*. Queens County: abundant on beach at Ten Mile Lake, Graywood, *17301;* mat at edge of pond, Ponhook Lake, *J. S. Erskine 51.1517;* beach of Sand Lake, Shelburne River, *12287*, common on lake beach, Hibernia, *13317*. Lunenburg County: common on lake beach, Ashland Lake, *17021;* shores of Church Lake, *17180;* margin of LaHave River, New Germany, *12379*. Halifax County: beach of Lake Charlotte, *J. S. Erskine 55.1089*. Guysborough County: gravel bank of river, two miles north of Sherbrooke, *J. S. Erskine 55.1055;* locally abundant, beach of Glenelg Lake, *9409*, on cobbly flood beach of St. Mary's River near Caledonia, *J. S. Erskine 51.786*.

**Rhynchospora fusca** (L.) Ait. f. Previously thought to be rare or absent from the central and eastern counties, the following collections represent additional stations for this area, and for Annapolis and Queens Counties where few have been reported. Victoria County: abundant on salt meadow, one mile south of Black Brook Mouth, *6564;* swale of lake at an elevation of 1300 feet, ten miles north of Oregon, *J. S. Erskine 56.270;* occasional in sphagnum bog north of Briton Cove, *8086;* at pond edge, Indian Brook, *5633;* bog at an elevation of 1100 feet, Cape Smoky, *922*. Inverness County: shore of Horton Lake, *13186;* bog at an elevation of 1300 feet, head of MacGregor Brook, *1127*. Richmond County: bog at edge of Cranberry Lake, *13108;* very abundant on bog near Point Michaud, *10103;* rare in bog at West L'Ardois, *5142*. Cape Breton County: colonies in brackish swamp near pond, Eastern Harbour, Scatari Island, *8567;* quaking lake edge at Frenchvale, *15071;* beach of lake near New Boston, *12958;* abundant on floating mat at edge of Black Brook Lake, Morrison Road, *12968;* occasional in floating mat, edge of lake near McAdam Lake, *5486*. Pictou County: locally abundant at edge of West Branch Lake, *12852*. Cumberland County: beach of Mellady Lake near Parrsboro, *J. S. Erskine 55.657*. Hants County: grassy lake edge, Noel Lake, *9136 and J. S. and D. S. Erskine 55.494;* marshy edge of Cameron Lake, *J. S. Erskine 52.607*. Annapolis County: abundant in bog near Lequille River, *11868;* damp margin of Sandy Lake, *13287;* in mat at lake edge, MacKenzie Lake, *W. B. Schofield and D. H. Webster 4314*. Queens County:

beach of Ponhook Lake, *J. F. Donly and J. S. Erskine 55.446.* Halifax County: beach of Lake Charlotte, *J. S. Erskine 55.1083;* abundant in floating mat of lake near Upper Musquodoboit on Sheet Harbour Road, *9252;* abundant on shore of Briny Lake, Seabright, *12656.* Guysborough County: boggy barren, Marie Joseph, *J. S. Erskine 51.474.*

**Calla palustris** L. The Water Arum or Wild Calla occurs locally in the province. Roland (1947) notes that it is rare in the western counties and rare or absent in Cape Breton. Smith and Schofield (1952) noted a somewhat wider distribution; particularly in Cape Breton Island, reporting it from Cape Breton, Victoria, and Inverness Counties. This plant of cold bogs and swampy pond, lake and stream edges is usually localized in small areas and can easily escape detection. The largest station seen was that near Sand River, Cumberland County in a burnt over bog (Smith, Collins, Bruce, Sampson, and Bent 3147) where the plant had spread over an area of several square rods. The present known distribution (Fig. 2) shows it to be most common in the northern part of the province and rare or absent from the south and southwestern counties. The following are new collections, mainly from the eastern region. Victoria County: rare in alder thicket at pond edge, West Tarbot, *14920.* Inverness County: abundant in boggy pond edge near Orangedale, *7524;* alder thickets at river edge, River Denys, *7582;* bog at pond edge, Eden, *7547;* margin of streamlet, Mason Point, Lake Ainslie, *13779;* abundant at pond edge, West Bay Station, *8790.* Cape Breton County: edge of lake north of Gabarus, *13077;* abundant and forming a mat in alder thicket, Blackett's Lake, *15041;* Caribou Marsh near Mira, *G. E. Warren* July 25, 1948. Antigonish County: boggy swamp, Keppoch, near James River, *2902;* swampy woodland near James River, *10630.* Annapolis County: abundant in wet quaking bog, West Dalhousie, *5550.* Shelburne County: locally abundant in swale near diversion dam, Jordan Lake, *18948.* Queens County: wet grassy bog edge, Caledonia, *Nancy Bleakney* June 10, 1953; common at lake edge, Kempt, *17521.* Lunenburg County: quaking bog near Mahone Bay, *W. B. Schofield and D. H. Webster 4600;* locally abundant at bog, South Maplewood, *17372.* Guysborough County: bog, Marie Joseph, *588.*

**Lemna trisulca** L. This small submerged duckweed has been known to occur in springs, brooks, and pools of the Annapolis Valley and Cumberland County (Roland, 1947) and has been reported by Erskine (1951) from Inverness and Victoria Counties. These following additional stations show a somewhat wider distribution and greater abundance than was previously known. Victoria County: common in shallows of lake, north of New Campbellton, *D. H. Webster 561;* very abundant in alkaline pond near Baddeck Forks, *8185.* Inverness County: occasional in pond near mouth of River Denys, *7559;* abundant in pond water, two miles east of Melford, *8791;* very abundant in pond, Mabou Harbour, *4880*. Antigonish County: in water of river near St. Joseph, *10594;* in lake at St. Joseph *13225*, abundant in pond east of James River, *7675*.

**Ceratophyllum demersum** L. Reported by Roland (1947) as rare, and known from one location; Canard River, Kings County above the tide level. Schofield (1955) notes its occurrence at three locations in Cumberland County. The map, (Fig. 3) gives the known distribution, based mainly upon the following collections: Cape Breton County: abundant at *Chamaedaphne* edge of small lake near Albert Bridge, Mira, *10167*. Antigonish County: in water near pond edge, St. Joseph, *13223; and 13709*. Pictou County: common in wrack of Black River Lake, East River St. Mary's, *13348*. Colchester County: mucky bottom of ox-bow pond, Stewiacke River at Landor, *12691*. Cumberland County: in water of Halfway River, Newville, *J. S. Erskine 55.626*. Kings County: abundant in pond near railway, Coldbrook, *W. B. Schofield 4452;* marginal water of Simpson Lake, *12803;* growing in marsh above Kentville, *Roland, Lewis and Dore*, June 22, 1942; dense growth in quiet pond near Cornwallis River, Kentville, *D. H. Webster 145;* in back water of Gaspereau River near Gaspereau, *D. and R. Erskine 967*. Queens County: in wrack of lake at Hibernia, *13307*. Lunenburg County: fragments in wrack, Oakland Lake, *12770*. Guysborough County: abundant in water of lily pond near Two Mile Lake, *9396;* water of Glenelg Lakes, *9448*.

**Nuphar microphyllum** (Pers.) Fern. This pond lily has been known from relatively few locations in the province. The following collections add to our knowledge of its distribution. Inverness County: abundant in water at mouth of Hay's River, West Lake Ainslie, *6958*. Antigonish County: in pond of meadow of South River near St. Andrews, *3976*. Pictou County: in millpond near Pictou, *Howe and Lang 610*. Colchester County: in water of south branch, Stewiacke River, *J. S. Erskine 55.624*. Hants County: in water of Mantletree Lake, *S. Bleakney*, June 26, 1950; in water of Lily Lake, Burlington, *Gorham and Roland*, July 16, 1946. Kings County: ox-bow pond of Cornwallis River at Berwick, *J. S. and D. S. Erskine 338;* in river at Aylesford, *J. S. Erskine 52.075*. Digby County: brook by road to New France, *J. S. Erskine 55.237*. Queens County: outlet of Frozen Ocean Lake, *S. Bleakney*, July 8, 1950; inlet to Telfer Lake, *Livingstone and Cameron*, July 1, 1949. Halifax County: in Shubenacadie River between Shubenacadie and Middle Musquodoboit, *J. S. Erskine 51.744*. Guysborough County: pond in meadow, Glenelg, *521*.

**Ranunculus Gmelini** DC., var. **Hookeri** (D. Don) Benson. While the overall range of this plant has been known to extend from Kings County east to Cape Breton, few actual stations have been recorded. The plant seems to be abundant where found, in slow flowing streams and ditches, shallow pools, and ponds in the more alkaline areas of

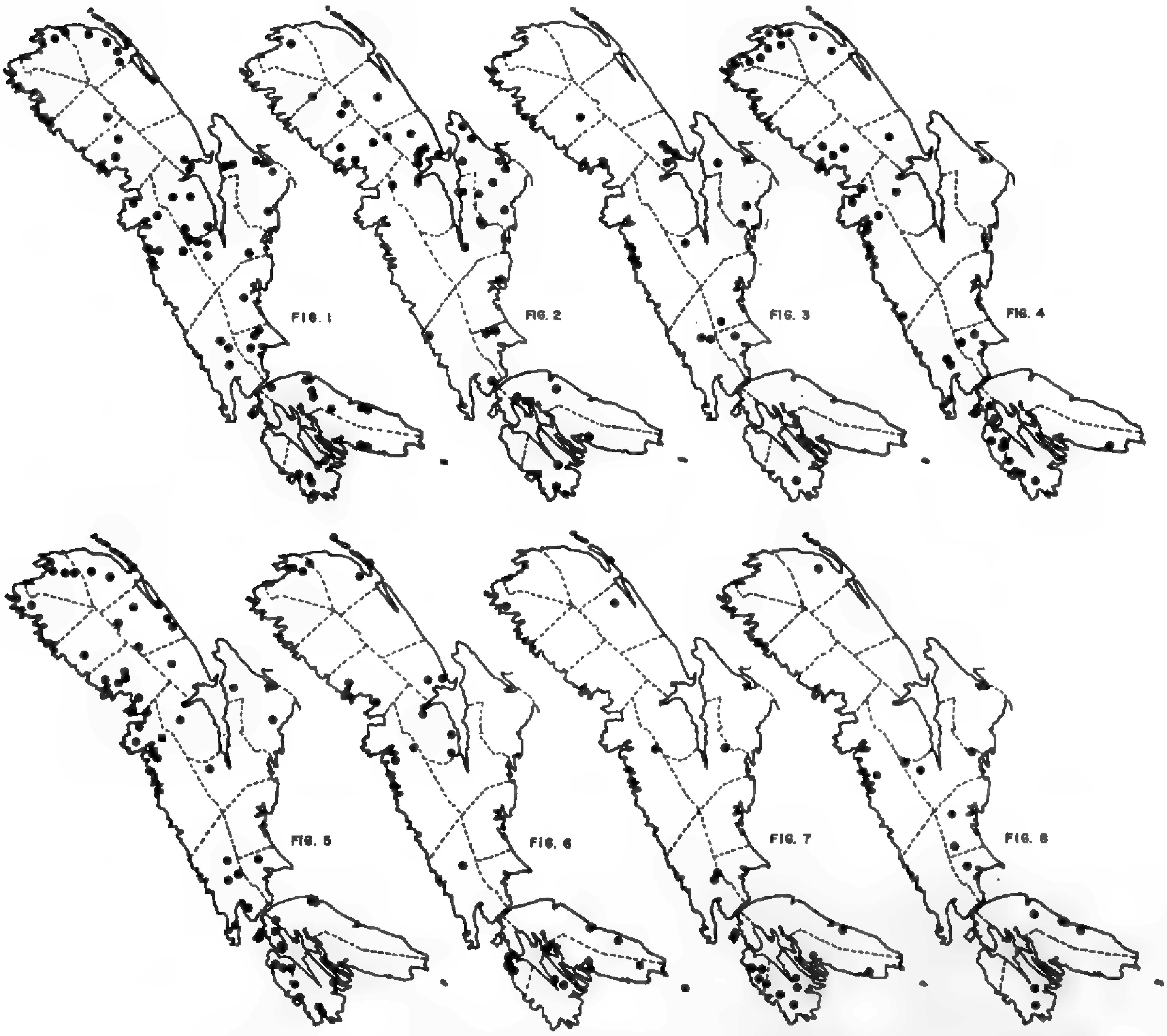


FIG. 1-8. Distribution maps for certain species in Nova Scotia. FIG. 1, *Najas flexilis*. Fig. 2, *Calla palustris*. Fig. 3, *Ceratophyllum demersum*. Fig. 4, *Subularia aquatica*. Fig. 5, *Elatine minima*. Fig. 6, *Utricularia minor*. Fig. 7, *Littorella americana*. Fig. 8, *Megalodonta Beckii*.

the province. The following are collections within the known range. Victoria County: growing in water of pond, Plaster Mines, *15022;* abundant in margin of alkaline pond near Baddeck Forks, *8184;* in water of pond, Hazeldale, near Little Narrows, *13955;* in water of slow stream at Baddeck Bridge, *1039;* pond by Route 5 Whycocomagh — Baddeck Road, *J. S. Erskine 53.434.* Inverness County: in water of pool in woods, West Lake Ainslie, *6979;* abundant in pools, Kenloch, *4917.* Colchester County: in water of brook near Cloverdale, *12687.* Cumberland County: marsh by Blair Lake, Amherst, *J. S. Erskine 55.732;* in water of pond at Truemanville, *W. B. Schofield 4196;* pond edge, Point Amherst, *J. S. Erskine 52.923.* Hants County: very abundant in pond near Brooklyn, *15615;* gypsum pond east of railway crossing south of Pemberton Station, *J. S. Erskine 52.154*. Halifax County: pond below gypsum cliffs, Upper Musquodoboit, *J. S. Erskine 53.138*.

**Subularia aquatica** L. This small plant usually occurs immersed and scattered on the gravelly bottoms of lakes and at the margins of slow streams. Occasionally it has been found in great abundance, forming mats on the muddy bottoms of lakes. Such stations are those south of Albert Bridge, Cape Breton County, edge of Black River Lake, Richmond County, and the edge of Salmon River Lake, Guysborough County. It appears to be most common in the extreme southeast and southwest portions of the province (Fig. 4) with scattered stations elsewhere. No stations have as yet been reported from Cumberland, Colchester, and Pictou Counties in the northcentral region, or from Queens, Shelburne, and Annapolis Counties in the south and west. The following represent unreported stations. Richmond County: marginal water, east side of Loch Lomand, *10151;* abundant in shallows of Ferguson Lake, *10074;* west side Loch Lomand in sandy shallows, *5055;* very rare on gravelly beach, Grand Lake, Isle Madame, *5069;* rare in marginal waters of Cranberry Lake, *13109;* very common in extensive mats, marginal water of Black River Lake, *13094*. Cape Breton County: common in water, margin of Gabarus Lake, *5106;* abundant in muck at edge of lake south of Albert Bridge, *12937;* abundant in marginal water of Giant Lake, *13056;* occasional in water of lake eight miles north of Gabarus, *13084*. Antigonish County: occasional in marginal water of Gaspereau Lake, *13242*. Hants County: in six inches of water at edge of Cameron Lake, *9927*. Kings County: occasional, submerged in shallows of Lake George, *W. B. Schofield and D. H. Webster 2989;* shallows of Summit Lake, *D. S. Erskine 53.1003*. Lunenburg County: shallows of Big Mushamush Lake, Lower Northfield, *17192;* submerged in marginal shallows of Blystner Lake, *12766*. Halifax County: submerged in marginal water of Briny Lake, Seabright, *12661;* marginal shallows of Barrett Lake, *12606;* occasional in lake water, West Quoddy, *9542;* Sawlors Lake, *Hubbards, Bell, Gorham and Mason*, Aug. 10, 1949. Guysborough County: marginal water of Hurley Lake, *13175;* abundant in muck at edge of Salmon River Lake, *13162;* rare in marginal shallows of pond south of Half Island Cove, *6778*.

**Elatine minima** (Nutt.) Fisch. & Mey. Fernald (1921, 1922) reported this plant from the sandy and muddy tidal flats of the Tusket River, Yarmouth County, and in shallow water at the sandy margin of Harper's Lake, Shelburne County, and also from stations in Annapolis, Lunenburg and Hants Counties. Roland (1947) records it as common in Digby, Yarmouth and Shelburne Counties, and scattered east to Lunenburg and Hants Counties. Smith and Schofield (1952) point out its occurrence in Cape Breton, and Schofield (1955) in

Cumberland County. It is now shown to be of widespread occurence, found whenever a suitable habitat is present. The only area in which it has not been found is the northern plateau in Cape Breton. The locations shown on the map (Fig. 5) are based upon published records and the following collections. Inverness County: occasional, edge of MacIntyre Lake, *13090*. Richmond County: shallows of Ferguson Lake, *10077;* water of Barren Lake, *10161;* edge of Cranberry Lake, *13111;* occasional, marginal water of Potties Lake, Isle Madame, *13046;* in muck at edge of Black River Lake, *13095*. Cape Breton County: abundant in muck, edge of lake, three miles south of Albert Bridge, *12939;* occasional, shallows of lake, three miles west of New Boston, *12950;* rare in marginal shallows of Scotch Lake, *13028;* occasional in marginal shallows of Giant Lake, *13057*. Antigonish County: rare in water at lake edge, west of Havre Boucher, *6928;* abundant in dense clumps, Gaspereau Lake, *13241*. Colchester County: marginal shallows of Shortt's (Otterton) Lake, *12566*. Hants County: abundant in one foot of water, edge of Cameron Lake, *9928*. Kings County: sandy shallows of Aylesford Lake, *J. S. Erskine 55.462;* submerged in marginal shallows of Lake George, *W. B. Schofield 2988*. Annapolis County: shallow lake edge, Lake Pleasant, *6835;* sandy bottom of Milbury Lake, *13271;* marginal shallows of Liverpool Head Lake, *11881;* on mud of shallows of Croskill Lake, *W. B. Schofield and D. H. Webster 4275;* edge of lake one mile north of county line, Annapolis — Liverpool Road, *11886 and 11894;* very abundant on wet mud and in shallows of Sandy Lake, *W. B. Schofield and D. H. Webster 2145*. Digby County: common in marginal shallows, Little Meteghan Lake, *7103;* submerged among rocks of lake shore Midway Lake, *11856;* abundant on wet sandy shore, Wentworth Lake, *7080*. Yarmouth County: shallows of backwater below power dam, Tusket Lakes, *J. S. Erskine 51.1435;* abundant, wet shore of lake at Carleton, *7060;* abundant on wet mud and in shallows of Parr Lake, *7069;* submerged in marginal shallows, Lake Milo, *W. B. Schofield 2825*. Queens County: marginal shallows of Charlotte Lake, *12431*. Lunenburg County: occasional in shallows of Wentzels Lake, *6885;* very abundant with *Isoetes* in marginal water of pond, back of beach, Blanford Beach, *8872;* abundant in marginal water of Lather Lake, *8921;* common in marginal water of lake behind sand beach, Bayswater, *W. B. Schofield 5533;* submerged in marginal shallows of Blystner Lake, *12765;* marginal water of Oakland Lake, *12779*. Halifax County: in mucky shore of Briny Lake, Seabright, *12660;* marginal water of Barrett Lake, *12605;* rare at lake edge near Preston, *9381;* abundant in wet mud among gravel of now exposed lake margin, Banook Lake, Dartmouth, *Dore, Judd, and Gorham 45.1100;* Sawlors Lake, *Hubbards, Bell, Gorham and Mason,* Aug. 10, 1949; Hatchet Lake, Prospect Road near Halifax, *Dore 45.1149*. Guysborough County: marginal water of Hurley Lake, *13174;* marginal water of Pringle

Lake near Goshen, *13193;* marginal water of Salmon River Lake, *13163;* marginal water of lake at Lakedale, *12152;* abundant in shallows at lake edge south of Half Island Cove, *6777;* abundant on lake bottom in one foot of water, Lake Mannassette, *6807;* rare in marginal water of Glenelg Lakes, *9444*.

**Hippuris vulgaris** L. While Roland (1947) shows stations for this species in the central, and in the extreme east and western counties only, his statement that it is probably widely scattered seems to be substantiated by the following collections. Victoria County: in muddy stream edge, Cheticamp River near Cheticamp Lake, *3341;* in water of pond behind beach, Black Brook, *3427;* edge of pond by road south of Neil's Harbour, *J. S. Erskine 52.477*. Inverness County: rare in brackish pond, Judique, *5012*. Richmond County: boggy pond, Point Michaud, *794;* rare in wet swamp, Arichat, Isle Madame, *5096*. Cape Breton County: very abundant in ponds behind beach, Eastern Harbour, Scatari Island, *8396;* pond edge, Louisbourg, *2835;* abundant in pool behind beach, Main-a-Dieu, *5202;* in pond behind beach, Northwest Cove, Scatari Island, *5350*. Cumberland County: submerged in water of Diligent River, *Wharton 5557;* shallows of pond, Amherst Point, *J. S. Erskine 52.909*. Hants County: in backwater of Cogmagun River, *J. S. and D. S. Erskine 55.512*. Digby County: edge of pond, Little Pond, Brier Island, *Roland and Smith 250*, and behind barrier beach, north of lighthouse, *Roland and Smith 122*. Yarmouth County: in pond water near sea, LaRanche, *Bruce and MacFarlane*, June 25, 1951; border of stream, near Upper Chegoggin, *D. S. Erskine 953;* shallow water of brackish pond Cape Forchu, *J. S. Erskine 50.081*. Halifax County: in brook at Port Dufferin, *J. S. Erskine 55.1091*. Guysborough County: pool behind beach east of Larry River, *J. S. Erskine 51.655*.

The submerged forma **fluviatilis** (Hoffm.) Crosson & Germain is represented by the following collections. Antigonish County: abundant in Loch Katrine, *7628*. Cumberland County: in water of Parrsboro River at Cross Roads, *W. B. Schofield 3546*. Yarmouth County: floating in stream near Upper Chegoggin, *D. S. Erskine 953*.

**Lysimachia thyrsiflora** L. Roland (1947) gives the distribution of this plant as common in marshes about Truro and scattered east to Pictou and northwards in Cumberland County. As the following collections indicate, it extends to the east into Cape Breton. Victoria County: swamp, Bay St. Lawrence, *11037 and 6471;* swamp near pond, Cape Dauphin, *11004;* occasional in swampy border of alkaline pond near Baddeck Forks, *8178;* marsh at edge of brook, head of Baddeck Bay, *8237*. Inverness County: abundant in sedge mat, pond edge, Eden, near Orangedale, *7545;* abundant in mucky swamp at river edge, River Denys, *7583;* second bridge, Margaree, *M. V. Roscoe*, July 21, 1939; swamp, Cheticamp, *3635*. Cape Breton County: edge of alkaline pond, South Side Bouladerie, *8262*. Antigonish County: shaded swamp near James River, *10612*.

**Limosella subulata** Ives. The presence of this species has been reported by Macoun (1899), St. John (1921), and Erskine (1954) on Sable Island where it grows on brackish beaches and sand flats near Wallace Lake. Roland (1947) records the species as being scattered along the coast of Yarmouth and Shelburne Counties, and about the Northumberland Strait to Cape Breton. Recent collections show its presence on both the south coast of the mainland and on Cape Breton Island. Inverness County: muddy shore behind beach at Margaree Harbour, *Roland and Adams 2242*. Richmond County: abundant on low area by pond, Point Michaud, *5136*. Cape Breton County: gravel shore of Lake Mira near Albert Bridge, *10174;* muddy edge of pond behind barrier beach, Main-a-Dieu, *2850*. Cumberland County: mud at margin of River Philip at Oxford, *W. B. Schofield 5409*. Queens County: marsh by estuary, Port Medway, *Donly and Erskine 55.391*. Halifax County: tidal edge of Eastern Passage, *L. S. Brown*, Sept. 27, 1948, and *J. S. Erskine*, July 13, 1949.

**Utricularia minor** L. The distribution of *Utricularia minor* is noted by Roland (1947) as being scattered, probably throughout the province, but the known distribution as shown by him indicates collections from the western half of the province only. Recent collections show that Roland's supposition was correct. The distribution map (Fig. 6) is based upon Roland (1947) and the following collections: Victoria County: pond edge, West Tarbot, *14938;* common in pond, Middle Aspy River, *5607;* bog pool near mouth of Indian Brook, *8110;* occasional, water of lake, St. Colomba, *9756*. Inverness County: on mud in bog pool, French Mountain, *3610;* edge of meadow pond, Margaree, *10306*. Richmond County: occasional in shallow pools, Graceville, *5159;* bog pool and on muck, west of Grand River, *10102;* bog hole, L'Ardoise, J. S. *Erskine 51.1080*. Cape Breton County: boggy margin of lake at Frenchvale, *15097;* abundant in water of lake, one mile north of McAdam Lake, *5493*. Hants County: in water of Noel Lake, *9176;* in water of pond near St. Croix, *9936;* lake three miles south of Maitland, *9237*. Kings County: in quaking muck amongst *Typha*, roadside pond near Kentville, *D. H. Webster 144*. Digby County: in water of slow flowing stream, south of Plympton Station, *14581;* very abundant in bog pond near Southwest Light, Brier Island, *Smith and Roland 89*. Yarmouth County: Deerfield Lake, *Perry and Allen*, July 21, 1912. Lunenburg County: marginal muck at edge of Henneberry Lake, *W. B. Schofield 5526;* wet quaking margin of pools near Hebbville, *W. B. Schofield 2840*. Halifax County: on muck of lake near Preston, *9363*. Guysborough County: in two feet of water, Glenelg Lakes, *9449*.

**Littorella americana** Fern. The first collection of this plant in Nova Scotia was made by Mrs. Britton on the shores of Shubenacadie Grand

Lake, Halifax County in 1879 (A. Gray, 1880). For many years this remained the only known station, and from it collections were repeatedly made (Brown in 1937, Roland 1937, Dore 1945, Smith et al 1952). More recently Smith and Schofield (1952) have reported the species from three stations in Cape Breton Island, and Schofield (1955) from one in Colchester County. Some twenty stations are now established. The greatest concentration is in southern Cape Breton Island with scattered stations on the mainland. The general habitat is the gravelly or sandy bottom of lakes in sheltered locations. Usually the plants are covered with from three to eighteen inches of water, but occasionally extend deeper into the lakes. In only two cases were plants found above water level at the time of collection. About one half of the collections were sterile, and flowering and fruiting specimens were found in both an exposed and immersed condition. Flowering times vary from year to year and probably also with depth of water. Flowering material has been collected from July 19 to September 10, and fruiting material as early as August 20. The plant is often abundant locally, forming mats with the basal rosettes of *Lobelia Dortmanna, Eriocaulon septangulare,* and sometimes *Isoetes* spp. It now seems probable that any pond or lake in the province with sheltered, gravelly bottomed lagoons will harbor *Littorella.* No doubt the inconspicuous nature of the plant and its habitat explain why its wider distribution has remained unknown. The following are unreported stations. Victoria County: very abundant in marginal water of Salem Lake, Bouladerie Island, *8259;* occasional in shallows of Warren Lake, *16917;* common in marginal shallows of Lewis Lake, *16726.* Inverness County: locally abundant in shallow of pond near Grant Etang, *10274.* Richmond County: common in lake northwest of Framboise, *13055;* very abundant in shallows of Potties Lake, Isle Madame, *13041.* Cape Breton County: sandy shallows of Gillis Lake, *15059;* abundant in marginal water of Blacketts Lake, *12994;* abundant in marginal water of Giant Lake, *13064;* rare in shallows of Canoe Lake, *13073;* shallows of lake west of New Boston, *12949.* Annapolis County: marginal shallows of Liverpool Head Lake *11879.* Digby County: locally abundant in shallows of Midway Lake, Centerville, *11849.* Shelburne County: marginal shallows of Greenwood Lake, Port Saxon, *12186.* Guysborough County: marginal shallows of Grant Lake, *13158;* occasional in marginal water of lake at Lakedale, *13157.*

**Megaladonta Beckii** (Torr.) Greene. Fernald (1922) first reported this water plant from the province where he found it growing in a deadwater of Rocky Brook, north of Hassett, Digby County. Since then Roland (1938) reported the plant as abundant in the water of the Southwest Margaree River at the outlet from Lake Ainslie, Inverness County, and Schofield (1955) in wrack of Mattatall Lake, Colchester County. To these have now been added some ten additional stations (Fig. 8) which show the distribution of this species, as presently known, to be concentrated in the northeastern portion of the province, in the less acid areas. It is particularly abundant in Inverness County in the slow flowing streams about Lake Ainslie, and in ponds to the north in this county. Here the collection at Friar's Head represents the northeastern extension of its range. In only two cases has it been found in flower. Inverness County: occasional in water of Hays River, West Lake Ainslie, *6959;* abundant in water of pond near Friar's Head, *10270;* in water of river lagoon, Margaree, *10303.* Cape Breton County: rare, lagoon of Black Brook Lake, *12965;* abundant in water of Blacketts Lake, *12988.* Antigonish County: in water of Cameron Lake, Pinevale, *13147.* Pictou County: in water of Grant Lake, *J. S. Erskine 55.1221;* common, Black River Lake, West River St. Mary's, *13346;* rare in wrack, Grant Lake, northeast of Elgin, *12831.* Colchester County: small quiet area of Gay River, Gay River Village, *12672;* ox-bow of Stewiacke River, Landor, *12692.* Halifax County: abundant in water of Musquodoboit River at Brandy Spring, *9301.*

Material substantiating the majority of these records has been deposited in the Acadia University Herbarium. — PERRY BIOLOGICAL LABORATORIES, ACADIA UNIVERSITY, WOLFVILLE, NOVA SCOTIA.

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NOTES ON CYPERACEAE FROM ILLINOIS. — These notes pertain primarily to the genera Scirpus and Lipocarpha, the latter not previously reported from Illinois.

Nearly a century ago, in August 1860, Elihu Hall, botanist and surveyor of Menard County, Illinois, collected *Scirpus hallii* A. Gray. The type locality was given as "Along ponds, Mason Co., Illinois . . . . *E. Hall.*" (Gray, *Manual of Botany* 1863). The type might conceivably have come from Menard County although Dr. Reed C. Rollins has kindly examined the type and finds that on the specimen it says "wet banks of pond, Mason Co., Illinois." The following locality data are taken from *Vascular Plants of Illinois*, page 116 (1955) : Menard Co.: without definite locality, "low sandy places, rare, Aug. 1860, not seen since," *E. Hall;* sandy pond, Athens, *E. Hall* in 1861.

This slender bulrush was recently collected by Mr. R. T. Rexroat of Virginia, Illinois. The following collection data are given: MASON CO., Sept. 22, 1957, W. of Saidora, wet sand, *R. T. Rexroat 4367* and *4367A*. CASS CO., Aug. 13, 1957, E. of Beardstown, water hole in sand and mud, *R. T. Rexroat 4142* and Aug. 23, 1957, E. of Chandlerville, edge of water hole in sand, *R. T. Rexroat 4251*. The writer also collected specimens of *S. hallii* in September 1958, Cass Co., *G. S. Winterringer 15026* and *15027*. Mason, Menard and Cass Counties, of west central Illinois, are adjoining with similar sand and water habitats.

Two other plants may be mentioned in connection with the locality of *Scirpus hallii*: *Chamaesyce geyeri* (Engelm.) Small was first collected by C. A. Geyer in 1842, and *Trautvetteria carolinensis* (Walt.) Vail., near Beardstown, Cass Co., by C. A. Geyer in the same year. The latter plant has not been found in Illinois since the original collection.

In the 1957 collection of Mr. Rexroat there appeared a small annual sedge tentatively identified as *Lipocarpha maculata* (Michx.) Torr. and later verified by Dr. Theodor Just of Chicago Natural History Museum. This sedge had not been reported for Illinois. Collection data: *Lipocarpha maculata* (Michx.) Torr., Cass Co., E. of Beardstown, Sept. 3, 1957, bank of sandy pond, *R. T. Rexroat 4258* and *4258A*. Specimens are in herbaria of Illinois State Museum and Chicago Natural History Museum.

The range of *L. maculata,* according to the Eighth Edition of *Gray's Manual of Botany,* is from Florida to Alabama and north to Virginia; adventive near Philadelphia. That this species should be regarded as a waif or adventive in the Illinois locality would be merely interesting, but such is not likely the whole story. It brings to mind several semi-aquatic plants which have been collected in the same locality and from similar habitats, i.e.: *Scleria reticularis* Michx., (reported as found first for the state in 1956; RHODORA **60**: 41-43, 1958), *Heteranthera limosa* (Sw.) Willd., *Echinodorus parvulus* Engelm., and *Scirpus hallii* A. Gray. Most of these species are distributed through the Mississippi Valley and it is likely that *L. maculata* will be found in other suitable habitats to further extend its known range.

With this in mind it may be worthwhile to examine some comments as to the origin of the sandy ponds in which these species have been collected. According to Dr. George E. Ekblaw of the Illinois State Geological Survey Division,

"All of the pond localities are one or another of three terrace surfaces (Manito, Bath and Havana terraces) developed in the Illinois River Valley by melt-water from glaciers in the Lake Michigan basin during Cary and early Mankato substages of the Wisconsin glacial stage. All of the terraces were developed partly by erosion and redeposition of outwash materials. The age or time of development of the terraces cannot be determined very precisely. The Manito and Havana terraces are ascribed to the early part of the Cary substage, which according to current carbon-14 dating was approximately 15,000-16,000 (±1000 years) ago. Although the entrenchment that resulted in the Bath terrace started in later Cary time, it is believed that it was accomplished in early Mankato time, or according to current carbon-14 dating approximately 13,000-14,000 years ago.

The ponds in which Mr. Rexroat collected his specimens could be as old as but no older than the respective terrace surfaces on which they occur. On the other hand, they could have been created at any subsequent time. Sand dunes are abundant in the area. Their formation doubtless started as soon as the terraces were exposed and has probably continued to some degree ever since, and some of the ponds could be in depressions between the dunes and therefore could be of any age younger than that of the terrace on which they occur."

Heavy rainfall was recorded in Illinois during the early summer months of 1958, and flood conditions existed in some areas not usually under water.

The water level of the ponds previously mentioned rose considerably which may alter the growth conditions for some species listed above. However, other recurrent drought and wet years have been reported in old weather records. At this time (late August 1958) Mr. Rexroat noted the appearance of *L. maculata* in the same area in which he collected the 1957 specimens.

Is there some unknown environmental requirement for these pond plants, or have some been overlooked in botanical collecting during the past century and a half? It seems likely that they have been residents of the area for a very long time. — GLEN S. WINTERRINGER, ILLINOIS STATE MUSEUM, SPRINGFIELD, ILLINOIS.

TYPIFICATION OF THE GENUS FORESTIERA (OLEACEAE). — In a note with this title, published in the December RHODORA (**60**: 327 — 328, 1958), Kenneth A. Wilson states that the type species properly is *F. cassinoides* (Willd.) Poir., not *F. porulosa* (Michx.) Poir. (now to be called *F. segregata* (Jacq.) Krug & Urban), as was designated by Marshall C. Johnston in his recent synopsis (S.W. Nat. 2: 141, 1957). The question does not involve nomenclature, since both plants not only belong to the same genus, but are even regarded by Johnston as identical. The choice of a type is hardly anything but a bit of pedantic quibbling. But it is perhaps worth pointing out, simply as an illustration of the pitfalls that surround our modern efforts to graft a type method onto the work of botanists who had no conception of such, reasons for rejecting Wilson's choice. Poiret established the genus *Forestiera* in Encyclop. Méth. — Bot., Suppl. 2: 664, 1811 (not 1: 132, 1810, where the genus *Adelia* as then accepted by Poiret is treated in detail, and the reader is briefly referred to *Forestiera* for the account of *Adelia* of Michaux). Following the detailed "Caractère générique," Poiret states explicitly, "Ce genre a été établi par Michaux, sous le nom d'*adelia,* auquel M. Willdenow a substitué celui de *borya.* Ces deux noms, déjà employés, m'ont forcé d'en adopte un autre." Michaux had in reality taken the genus over from Browne, whom he cites as author; we might list the former's version as *Adelia* Browne emend. Michaux. Poiret was not acting under any compulsion from modern rules of nomenclature, but even under them he technically would be at liberty to do precisely as he did. He stated unequivocally that his *Forestiera* was a renaming of *Adelia* as treated by Michaux, not by Browne. Hence the type species of *Forestiera* Poiret must be selected from those included by Michaux; it cannot be a fourth species which Michaux did not list. In choosing one of Michaux' three species, it would seem best to take that one which most nearly accords with *Adelia* Browne, *sensu originali.* This is *A. porulosa.* We have then arrived at the same conclusion as

Johnston, though by slightly different details of reasoning. In any case, Wilson's designation of *Forestiera cassinoides* as the type species must be rejected. — LLOYD H. SHINNERS, SOUTHERN METHODIST UNIVERSITY, DALLAS, TEXAS.

ADDITIONAL NOTE ON VEGETATIVE REPRODUCTION IN CAREX TRIBULOIDES AND C. PROJECTA. — Late last June (1959) in Concord, Massachusetts, I collected specimens from an abundant colony of *Carex tribuloides* with many over-wintering prostrate culms bearing at the nodes roots and vigorous leafy shoots. They were growing near the bank of the Concord River in an undisturbed open portion of the Great Meadows. Later in the day, more than a mile upstream on the shady bank of the Assabet River, I collected two plants of *C. projecta* likewise with rooting vegetative shoots on culms of the previous year.

I had not previously encountered this phenomenon in *Carex*, but I do find a short note on the subject in RHODORA 47:39 (1945) by C. A. Weatherby. Although he discovered an incidental allusion by Theodor Holm in 1896 to the occasional development on *C. tribuloides* of transient axillary buds, he could find no other references to the matter. Weatherby appears to have been the first and only person to have called attention to occasional vegetative reproduction in these two closely related species of Carex. He, himself, had collected a specimen of *C. projecta* exhibiting this condition and had found ten others in the Gray Herbarium in addition to three of *C. tribuloides* (there are now six). He expressed surprise that a phenomenon so far from being rare should not have been alluded to in print, suggesting that the plethora of poorly collected specimens may be partly responsible. This may well be so. In my own case I did not notice any peculiarity about my specimens until I had dug them. If I had merely snatched a few culms, as so many collectors of a past generation had been contented to do, I would never have seen the tangle of viable over-wintering culms matted on the ground under the lush meadow vegetation.

To supplement Weatherby's count of pertinent material in the Gray Herbarium I have examined all of the specimens of the two species in question in the herbarium of the New England Botanical Club. Many were hopelessly inadequate in that they were a meagre array of fruiting culms broken off above or at the base of the plant; none of these did nor could be expected to show the phenomenon even if it had been present on the growing plant. Here is the numerical summary:

| | *C. tribuloides* | *C. projecta* |
|---|---|---|
| Total number of specimens examined | 100 | 231 |
| Less inadequate specimens | 82 | 113 |
| | 18 | 118 |
| Specimens with reproductive over-wintering culms | 2 | 10 |

These data, although relatively scant, do reinforce Weatherby's remark that the phenomenon is by no means rare. It may not be irrelevant to remark that the much higher ratio of inadequate specimens of the more southern and (in New England) the less common *C. tribuloides* may be due to its generally ranker growth in successful competition with the lush growth of bottom land vegetation. It frequently occurs in very tough-rooted clumps, and probably is much harder to dig than *C. projecta.* Hence, the much lower frequency of vegetative reproduction in the former species than in the latter, as judged from the foregoing summary, may be more apparent than real.

Obviously, the ability of the sterile culms of these two sedges to survive over a winter depends not only on genetic factors but also on a favorable combination of ecological and weather conditions. Possibly, if the mature culms of the season are beaten down onto wet ground before serious alternate freezing and thawing conditions set in, they may be sufficiently protected during dormancy by dead vegetation, snow cover, or even by latewinter freshets. One would expect winter-hardiness to increase with a decrease in latitude. Hence, it may not be far-fetched to suggest that the frequency of reproductive over-wintering culms may prove to be higher in *C. tribuloides* than in *C. projecta.* — RICHARD J. EATON, LINCOLN, MASSACHUSETTS.

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# Rhodora

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# Rhodora

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## REMARKS ON THE VIRGINIA LOCATION OF SHORTIA GALACIFOLIA[1]

P. A. Davies

In the February, 1956, number of Rhodora, Dorothy L. Crandall published a location of *Shortia galacifolia* for Amherst County, Virginia.[2] This station is of interest because of its distance beyond the present known natural range of Shortia and because it is not associated with a formal garden.

On April 14, 1957, the writer in the company of Dorothy L. Crandall, Franklin Flint, and Mr. and Mrs. Samuel K. Roller, all of Amherst county, had the opportunity to visit and study the Virginia station. The colonies were as Crandall had described them. Plants were in flower so specimens were secured. Again on August 6, 1958, with Charles F. Moore, Brevard, North Carolina, this station was revisited, observations and measurements were again made and soil samples taken.

Crandall in her paper did not state whether she thought this station was natural or had been planted. The writer from his knowledge of the various types of *Shortia,* distribution of this plant in the Carolina mountains and elsewhere, culture requirements, and data obtained from the study of the Virginia station, believes it was planted. He places his judgment upon the following conclusions:

1. Virginia location is not the only flourishing station of *Shortia galacifolia* outside the known range. Its uniqueness lies in that no history is available as to when it was

[1] Contribution No. 29 (New Series) from the Department of Biology, University of Louisville.

[2] Crandall, Dorothy L., Rhodora 58: 38-40, 1956.

planted, by whom planted, or the source of the initial plants. Of the many scattered plantings, two are particularly outstanding, for not only are they at a greater distance beyond the natural range than the one described by Crandall but also in size and vigor are equal to or exceed it. On a west facing hemlock and oak covered hillside, as part of the Swarthmore College Campus, are two healthy patches. Charles F. Jenkins in 1942 gave the initial plants which came from a tributary of the Keowee River in Oconee County, South Carolina. The upper and larger patch, approximately five by eight feet, is more vigorous and is spreading by stolons in all directions. Measurements of stolon growth for the past two years indicate an average annual growth of from two to four inches. Separate young plants in various stages of development on the lower side of the patch show a more rapid spread in that direction through seed germination.

The other is in the garden of Mrs. Gilbert B. Mustins, Lansdowne, Pennsylvania. A steep, rocky west-facing hillside above Darby Creek was terraced with walks approximately three feet wide. Mature oak and beech trees top the slope while Rhododendrons, Kalmias and Azaleas form the cover toward Darby Creek. Between the walks are many healthy and spreading patches of *Shortia* varying in size from a few plants to more than three feet in diameter. Seeding has occurred freely and seedlings in various stages of development are distributed on the top and bottom faces between the walks. R. B. Chillas, Jr. has conservatively estimated that more than 1,000 plants are present in this garden.[3]

At Highlands, North Carolina and its environs, a shorter distance from the natural range than the Virginia station, are several successful plantings. T. G. Harbison made the first planting at his home in Highlands from plants he gathered along the Horsepasture River, Oconee County, South Carolina, in 1890. This has grown to be the largest known planted patch and is many times larger than the one Crandall discovered.

[3] Chillas, R. B. Jr., Letter to P. A. Davies, October 15, 1958.

2. The small valley in which the Virginia station is located is not isolated, as it is known to the inhabitants of the area. It is close to Lynchburg and near well-traveled roads. Three pathways afford a ready entrance into the valley: one from the road above, another from the valley below and the third from the north. By converging they form the path which follows the small stream (Roller Creek) through the floor of the valley. Two springs at the head of the valley, one flowing mineral water, form Roller Creek. Evidence indicates that the valley has been used in the past and to some extent today, as an outing area or as a source from which mineral water can be obtained. Whoever made the planting knew the accessibility of the valley and favorable cultural conditions that were present.

3. No other location without a planting record is known to exist outside the natural range. During the past ten years, the writer has checked each patch that has come to his attention in which any doubt existed about its origin, and in every case, except Crandall's Virginia station, the source of the plants could be determined.

4. The small patches along Roller Creek are all that have been found for the area. Crandall and parties explored without success the region about Roller Creek and inquired about old gardens from which *Shortia* could have escaped. They also searched for several miles along the larger creek below Roller Valley without discovering additional plants. The writer checked the immediate hillsides above Roller Creek without finding a single source from which seeds, seedling or mature plants could have been carried or washed down to establish the plots.

5. The environment at the Crandall station is favorable for the growth of *Shortia*. However, it is no more favorable than other places in the immediate vicinity or closer to the natural range where none is present. It is more favorable than either the Swarthmore College or Mustins locations which support vigorous and expanding plots. The steep valley slopes above the patches in Roller Valley allow sufficient seepage to supply ample moisture to the limited root system and at the same time afford good drainage so necessary for survival. Leaf mold so important for the protection

of the extending rhizomes and for organic enrichment of the soil is present in adequate amount. Soil organic layer is thin but ample with a subsurface composed of loose decaying Lynchburg gneiss. Soil samples taken in the large patch and within a ten-foot radius give pH readings ranging from 4.8 to 5.1. This pH is comparable to that found along the lower part of the Toxaway River (Oconee and Pickens Counties, South Carolina) where *Shortia* is plentiful. Steepness of the valley with its small stream and the larger one close by in the valley below, maintain a moist air drift sufficient to equalize the cyclical summer and winter temperatures. Shade so indispensable for a healthy growth is present in ideal amount. Due to its deciduous nature the canopy allows enough light to reach the plants during late fall, winter and early spring while protecting them against over-exposure during the summer.

6. All patches along Roller Creek are small but healthy and expanding, indicating a short duration in this location. Had they been there for a long period one would be able to observe signs of retarded growth, which is not the case. Measurements of rhizome growth for the past two years show an annual extension of from two to four inches. This is comparable to that found in the Swarthmore College station and within the natural range in the Carolinas. Samuel K. Roller informed the writer that *Shortia* has been known in this location for about 50 years. Taking into account the possibility of unfavorable years, this period is more than sufficient for the expansion of the patch from a single planting.

The largest patch, approximately four by six feet, is the most favorably situated and is probably the original planting from which the others have originated. The next plot in size, approximately two by three feet, is situated on a small knoll close to the edge of the stream about 300 feet below the main patch. The structure of the stream bed at this place indicated that a dam was formed there creating a small pond which raised the water level to the top of the knoll. A seed or seedling carried down from the original patch and lodged on top of the knoll could have established the clump. The other clumps are small and distributed along the stream, mostly above the original patch.

7. Davies has shown that variations exist between *Shortia* on the sources of the Keowee River (Oconee and Pickens Counties, South Carolina and Transylvania County, North Carolina) and those to the north and east on the tributaries of the Catawba River (McDowell County, North Carolina).[4] In the former the plants are crowded in the colonies and the pistils are long in relation to the length of the mature ovaries while in the latter the plants are more openly distributed and the pistil-ovary index is shorter.

Plants in the Virginia station are crowded in the colonies and have a long pistil-ovary index which resembles closely the ones present on the tributaries of the Keowee River. It is reasonable to expect that if the Virginia station was a natural stand, the plants would resemble the closer ones on the sources of the Catawba River.

After Frank E. Boynton discovered in 1889 that *Shortia* could be obtained easily and in abundance on the sources of the Keowee River, particularly along the Whitewater River in Jocassee Valley, Oconee County, South Carolina, all the early stock for planting came from this area. After 1916 when the Toxaway Hotel was constructed it was also collected on the frequent tours that the management promoted to Bearwallow Creek in Transylvania County, North Carolina. Only in the past few years, because the distribution before this time was unknown, have collectors taken plants from the Catawba River area.

As the plants in the Crandall station, Amherst County, Virginia have been known for about 50 years, whoever made the planting must have collected the stock from the sources of the Keowee River or obtained it from a collector who gathered it from this area. — DEPARTMENT OF BIOLOGY, UNIVERSITY OF LOUISVILLE.

[4] Davies, P. A., Rhodora 54: 121-124, 1952.

# A NATURALLY OCCURRING $F_1$ HYBRID OF MONARDA MEDIA AND M. FISTULOSA

WILBUR H. DUNCAN

On 25 June 1959 I was traveling along the highway south of Blairsville, Union County, Georgia and noticed a large colony of the relatively common *Monarda fistulosa* var. *mollis* (L.) Benth. growing along the cleared right-of-way and in the adjacent open woods. I was unable to stop but did notice, in striking contrast to all other plants of *Monarda* in the area, one circular cluster of stems which I thought was *M. media* Willd. Earlier in the day and within the previous few years I had seen this species as an ornamental at various mountain homes and occasionally escaped, or possibly native. It should be recorded that *M. media* has not been previously reported as spontaneously reproducing in the wild from Georgia.

I was able to return later in the day to the large colony of *M. fistulosa* var. *mollis* with its beautiful display of light violet corollas. There were several thousand stems scattered in such a manner that it would be possible to walk among most without trampling them. It was obvious that there were a number of instances in which a single plant was represented by a cluster of stems still connected by living rhizomes. There were a few large distinctly circular clusters in which many groups of stems were not connected to the whole by living rhizomes. It seems, therefore, that there was some development of clones from original isolated plants. It does not appear likely that the entire population was one large clone because of the occurrence of isolated circular clusters of stems, particularly at the population margins.

The deep purple corollas of the single cluster of stems previously thought to represent *M. media* seemed in even greater contrast than earlier in the day. It was soon evident that this small cluster of plants was in some ways unlike *M. media* which it at first seemed to be. The time available was very short and so I was able to make only a few notes and take specimens of both kinds of plants. I then traveled about one-fourth mile to the nearest colony of *M. media* in the open yard of a mountain residence, examined the plants, and made a collection.

Back at the herbarium of the University of Georgia I was able to study at length the collections and notes. I came to the conclusion that the small cluster of stems was a clone perhaps only recently developed from a naturally occurring $F_1$ hybrid. Some stems were joined in groups by living rhizomes but separation had occurred in the 30″ diameter cluster. All stems seemed to have arisen from a single plant which presumably grew from the $F_1$ seed. It is thought that at least one flower of *M. fistulosa* var. *mollis* must have been pollinated by some insect carrying pollen from *M. media* plants. The resultant $F_1$ embryo developed into a plant which is described as follows:

1. Petal color identical to that of *M. media*, deep purple (7.5p-3/9 of the Nickerson Color Fan, published by the Munsell Color Co., 1957). In the common native var. *mollis* the corollas are light violet (2.5p-6/7).
2. Calyx lobes 1 mm. long as in *M. media*. In the other they are 2 mm.
3. Leaf texture is similar to var. *mollis* which is described by Fernald (1950) as being firm in contrast to the membranaceous leaves of *M. media.*
4. The throat of the calyx tube is densely hirsute with erect white hairs as described for var. *media* by Gleason (1952). That of *M. media* is less bearded and the hairs are not white. These differences are readily evident to the naked eye.
5. Height of plants is intermediate.
6. Average leaf shape is intermediate (Fig. 1) but the sides do not gradually curve to acuminate tips as in *M. media.*
7. The vestiture at the tip of the upper lip of the corolla is intermediate between the densely villose var. *mollis* and the less prominently villous *M. media.*

**Monarda** × **medioides** Duncan, hybr. nov., hybrida naturalis nova inter *M. fistulosam* var. *mollem* (L.) Benth. et *M. mediam* Willd. Similis primae in textura foliorum (firmus) et pilis in gutture calycis. Similis alteri in colore petali et longitudine loborum calycis. Media in altitudine plantae forma foliorum et pilis apicem versus labiae superioris corollae.

The type (*Duncan 21628*) is deposited in the University of Georgia Herbarium, the colony of *M. fistulosa* var. *mollis* being represented by the collection, *Duncan 21629*, and *M. media* by *Duncan 21630*.

*Monarda* × *medioides* in some respects is similar to *M. fistulosa* var. *rubra* Gray but lacks the plant height and the

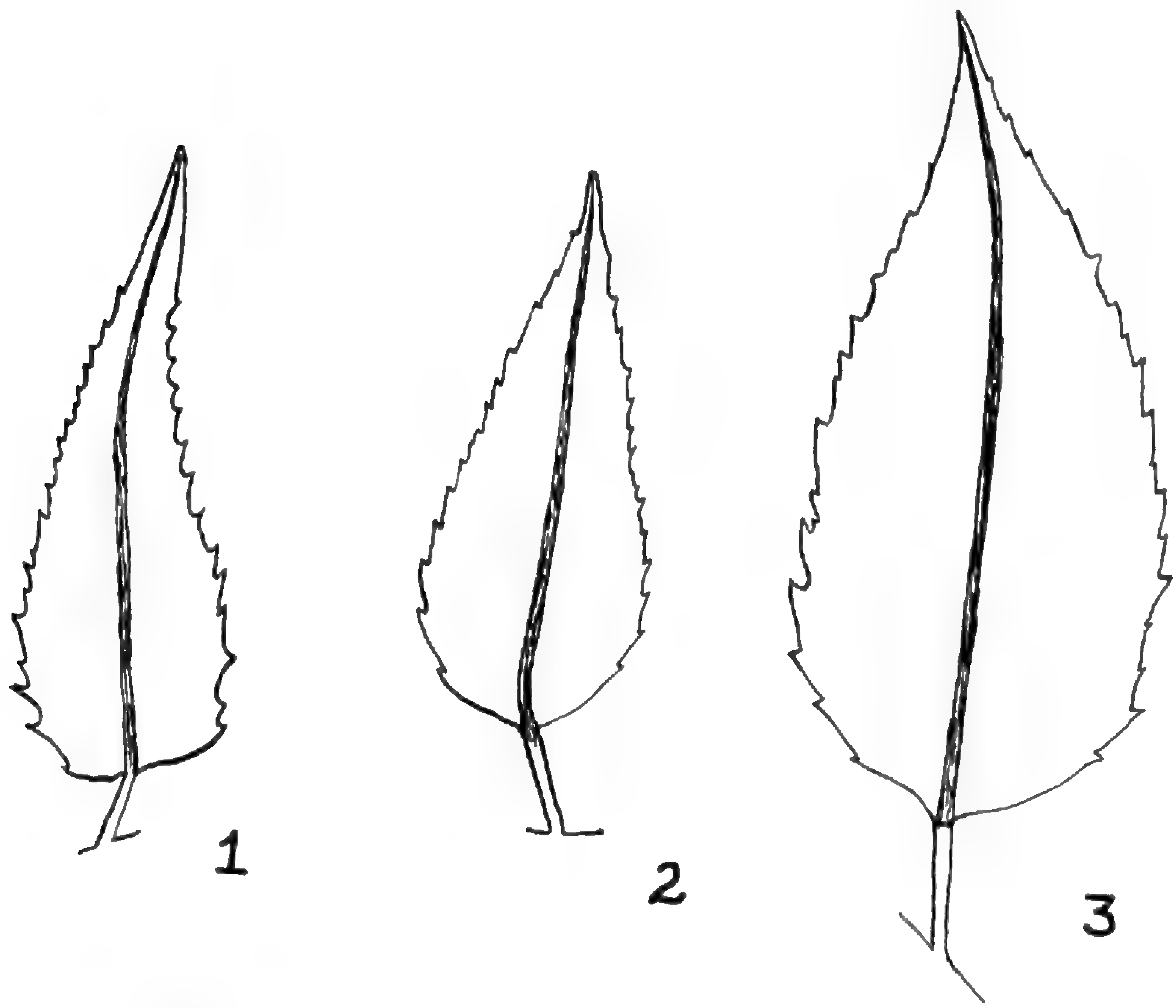


FIG. 1 Outline of average leaves of: 1. *M. fistulosa* var. *mollis*. 2. $F_1$ hybrid. 3. *M. media*.

pubescence attributed to the leaves and upper part of the plant (Fosberg and Artz, 1953). Furthermore, the lower lip of the corolla is pubescent.

Apparently hybridization in *Monarda* is to be expected. McClintock and Epling (1942) state that except for two species, it would appear that the whole subgenus (to which the taxa involved here belong) is a polyploid complex. They point out the occurrence of intergradation between various species. However, no close relationship nor intergradation between *M. media* and *M. fistulosa* is indicated by them.

The microscopic examination made of pollen of the parents and hybrid by Dr. Edward T. Browne is gratefully acknowledged. In *M. media* 20% of 69 grains appeared aberrant, in the other parent 28% of 219 grains, and in the hybrid 25% of 223 grains. These pollen data do not suggest a distant relationship for the two parents. However, the nature of the relationship needs to be solved. It is hoped that someone may have the opportunity, which I do not have, to attempt artificial crosses and to make backcrosses to the two parents, thus providing data concerning the compatibility of the parental types. — DEPARTMENT OF BOTANY, UNIVERSITY OF GEORGIA.

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## NEW COMBINATIONS IN THELYPTERIS

GEORGE R. PROCTOR

In preparing an account of the ferns for a forthcoming volume on the flora of the Lesser Antilles[1], the writer is recognizing a total of 35 species in the genus *Thelypteris* for this geographic area. A number of these have not previously been formally transferred to this genus (or, in one case, was published in an illegitimate combination) : the following new combinations are therefore necessary:

THELYPTERIS ABRUPTA (Desv.) comb. nov., based on *Polypodium abruptum* Desv., Mém. Soc. Linn. Paris 6:293. 1827. (Type from the West Indies without exact locality). (Not *Dryopteris abrupta*

1 This research supported by Grant No. G-4441 from the National Science Foundation, Division of Biological and Medical Sciences, for work on the flora of the Lesser Antilles in cooperation with Dr. Richard A. Howard of the Arnold Arboretum, Harvard University.

(Kunze) Ktze., 1891). Syn. *Dryopteris pyramidata* (Fée) Maxon, Contr. U. S. Nat. Herb. **10**(7):489. 1908.

THELYPTERIS CLYPEOLUTATA (Desv.) comb. nov., based on *Nephrodium clypeolutatum* Desv., Mém. Soc. Linn. Paris **6**:258. 1827. (Type stated to be from Jamaica, probably in error; the type specimen is labelled "in Antillis". So far as now known, this species is endemic to the Lesser Antilles).

THELYPTERIS CONSANGUINEA (Fée) comb. nov., based on *Aspidium consanguineum* Fée, Mém. Foug. **11**:76, *pl.* 20, *fig.* 3. 1866. (Type from Guadeloupe, *L'Herminier in 1861*).

THELYPTERIS DELICATULA (Fée) comb. nov., based on *Phegopteris delicatula* Fée, Mém. Foug. **11**:51, *pl.* 20, *fig.* 1. 1866. (Type from Guadeloupe, *L'Herminier in 1864*).

THELYPTERIS GERMANIANA (Fée) comb. nov., based on *Phegopteris germaniana* Fée, Mém. Foug. **11**: 55, *pl. 13, fig. 2.* 1866. (Type from Guadeloupe, *L'Herminier in 1861*).

THELYPTERIS GLANDULOSA (Desv.) comb. nov., based on *Polypodium glandulosum* Desv., Berlin Mag. **5**:317. 1811. (Type from the West Indies without exact locality).

THELYPTERIS HYDROPHILA (Fée) comb. nov., based on *Phegopteris hydrophila* Fée Mém. Foug. **11**: 56, *pl. 13, fig. 3.* 1866. (Type from Guadeloupe, *L'Herminier in 1861*).

THELYPTERIS INVISA (Desv.) comb. nov., based on *Nephrodium invisum* Desv. Mèm. Soc. Linn. Paris **6**:257. 1827; *Polypodium invisum* Sw., Prodr. Veg. Ind. Occ. 133. 1788. (Type from Jamaica, *Swartz*) (Not Forst., 1786). Syn. *Dryopteris sloanei* Ktze., Rev. Gen. Pl. **2**:813. 1891, based on *Nephrodium sloanei* Baker ex Hooker & Baker, Syn. Fil. ed. 2, 263. 1874 (Not Presl, 1825). *Dryopteris oligophylla* Maxon, Contr. U. S. Nat. Herb. **10**(7):489. 1908. Under the present International Rules (Art. 72), Maxon's name is illegitimate because not the earliest one available for this species. *Thelypteris oligophylla* Proctor, Bull. Inst. Jamaica, Sci. Ser. 5:62. 1953.

THELYPTERIS LIMBATA (Sw.) comb. nov., based on *Aspidium limbatum* Sw., Jour. Bot. Schrad. **1800**[2]:35. 1801. (Type from Guadeloupe, *Fahlberg*).

THELYPTERIS REPTANS (Gmel.) Morton, var. TENERA (Fée) comb. nov., based on *Goniopteris tenera* Fée, Mém. Foug. **11**:60, *pl. 15, fig. 3.* 1866. (Type from Guadeloupe, *L'Herminier in 1861*).

THELYPTERIS RUSTICA (Fée) comb. nov., based on *Phegopteris rustica* Fée, Mém. Foug. **11**:55, *pl. 13, fig. 1.* 1866. (Type from Ravine la Rose de Mateliane, Guadeloupe, *L'Herminier in 1861*). Syn. *Dryopteris dominicensis* C.Chr., Smiths. Misc. Coll. **52**:384. 1909.

— INSTITUTE OF JAMAICA, KINGSTON, JAMAICA, W. I.

ILLINOIS FLORA: NOTES ON ERIOCHLOA AND JUSSIAEA. — During my field work in the autumn of 1958, I found a grass which is new to the Illinois flora and I obtained additional information on the distribution of *Jussiaea leptocarpa* Nutt. in Illinois.

*Eriochloa gracilis* (Fourn.) Hitchc. is an annual of open ground and frequently a weed in fields, which ranges, according to Hitchcock[1], from Oklahoma, western Texas and southern California, southward through the highlands of Mexico. Illinois must now be added to the known range.

On October 22, 1958, Dr. M. W. Sanderson, an insect taxonomist on the staff of the Illinois Natural History Survey, and I were collecting insects and plants in the bottomland or floodplain of the Mississippi River in southern Illinois. In the bottomland of northwestern Union County we visited a field of turnips and, while Dr. Sanderson swept for noxious insects, I collected some of the plants growing as weeds in this field and also in the adjacent field of mustard grown for greens. One of the grasses of this collection was *Eriochloa gracilis* (Fourn.) Hitchc.[2] Numerous individuals of this species were growing in several sizable patches. It may be that the seeds of *E. gracilis* had been accidentally introduced with the seeds of some farm crop. On November 12, I visited the field again and found that the plants of *E. gracilis* had produced numerous seeds.

Herbarium specimens, which are in the herbarium of the Illinois Natural History Survey (ILLS) and in the United States National Museum (US), have the following label data:

In a bottomland field 4 miles northwest of Ware, Union County, Illinois, October 22, 1958, *R. A. Evers 59736;* November 12, 1958, *R. A. Evers 59753.*

This occurrence of *Eriochloa gracilis* raises the number of species of this genus in Illinois to three. Two of these, *E. gracilis* and *E. contracta,* are North American; the third, *E.*

1 Manual of the Grasses of the United States. Ed. 2.

2 I wish to thank Dr. Jason R. Swallen, United States National Museum, for examining the specimens and verifying my identifications.

*villosa*, is Asiatic. All three have been reported in Illinois in the last decade.

In a previous article[3] I reported the occurrence of *Jussiaea leptocarpa* Nutt. in two localities on the banks of the Mississippi River in Alexander County, Illinois, one in the Dogtooth Bend south of Miller City, the other at Fayville. The statement "We did not, however, observe this species on the riverbank at Thebes, about 5 miles upstream from Fayville" may have led some readers to the conclusions that Fayville was the northernmost limit of this species in Illinois. The fact is that Dr. M. W. Sanderson and I had not yet examined the riverbanks between Fayville and Thebes nor any of those north of Thebes.

In October and November, 1958, I spent 5 days along the shores of the Ohio and Mississippi rivers; Dr. Sanderson accompanied me on 3 of the 5 days. During this time I examined 15 stretches of riverbank from Bay City in Pope County, down the Ohio to its junction with the Mississippi just below Cairo and 13 northward along the Mississippi to Grand Tower in Jackson County. I observed *Jussiaea leptocarpa* in 14 of the 28 sites, 6 along the Ohio River and 8 along the Mississippi. In many of the 28 sites I found another willow primrose, *J. decurrens* (Walt.) DC., growing either alone or with *J. leptocarpa*.

Following are records of *Jussiaea leptocarpa* representing some of the specimens that have been added to the two previously cited in the herbarium of the Illinois Natural History Survey (ILLS):

ALEXANDER CO.: muddy shore of the Mississippi River southwest of Cache, October 14, 1958, *R. A. Evers 59436;* muddy shore of the Mississippi River southwest of McClure [opposite Cape Girardeau, Mo.], October 21, 1958, *R. A. Evers 59699.* JACKSON CO.: muddy shore of the Mississippi River at Grand Tower, October 22, 1958, *R. A. Evers 59748.* MASSAC CO.: muddy shore of the Ohio River at Brookport, October 15, 1958, *R. A. Evers 59504.* PULASKI CO.: muddy shore of the Ohio River at Baccus Landing, east of Grand Chain, October 21, 1958, *R. A. Evers 59651.* UNION CO.: muddy shore of the Mississippi River 4 miles northwest of Ware, November 12, 1958, *R. A. Evers, 59770.*

In the autumn of 1959, Dr. Sanderson and I plan to examine more of the muddy shores of the Ohio and Mississippi

[3] Rhodora **60**: 142-144. 1958.

rivers, especially north of Grand Tower on the Mississippi. *Jussiaea leptocarpa* is apparently more widespread in southern Illinois than botanists believed. To find this plant, it is necessary that the botanist be in the right place — on muddy shores — at the right time — September to November. ROBERT A. EVERS, ILLINOIS NATURAL HISTORY SURVEY, URBANA.

THE STATUS AND DISTRIBUTION OF ELEPHANTOPUS ELATUS. — Although *Elephantopus elatus* was described by Bertoloni in 1851, it was not considered distinct from *E. tomentosus* L. by other botanists until the beginning of the present century. The early doubt concerning the validity of this species was probably due, in part at least, to the influence of a paper published by Gray (1852) in which many of Bertoloni's binomials were shown to be mere synonyms of species described much earlier by Nuttall, Torrey, and others. Baker (1902), in a revision of the Elephantopeae, recognized the distinctiveness of *E. elatus* and reassigned it to specific status, distinguishing it from *E. tomentosus* by the denser and more coarsely pubescent glomerules and the shorter heads and pappus. Gleason (1919), too, confirmed the validity of *E. elatus*, pointing out that the trichomes on the mid-vein are forwardly appressed in this species while in *E. tomentosus* they are retrorse or spreading. In spite of these observations and the quite satisfactory key to the species of this genus provided by Gleason (1922) [but not later adopted by Small (1933)] *E. elatus* is still, in practice, seldom distinguished from *E. tomentosus*.

Concerning the distribution of these species Fernald (1950), Gleason (1952), and Small (1933) all merely report that *E. tomentosus* occurs in Florida, as Gleason (1922) and Small also report for *E. elatus*. Apparently there is no reference to the relative abundance of these species in this area or to the exact southern limits of their ranges. It is obvious, however, from certain publications (Baker, 1949; Ledin, 1951; et al.) and usage that *E. tomentosus* is accepted as the common species throughout Florida. Of the specimens examined in this study the only ones from Florida which can clearly be assigned to *E. tomentosus* are all from the panhandle of that state (Bay, Franklin, Gadsden, Leon, Wakulla, Walton, and Washington Counties). Furthermore, the common, weedy species throughout Florida is *E. elatus* — and not *E. tomentosus*. As is indicated by the accompanying map, *E. elatus* occurs on the Coastal Plain northward from Florida into South Carolina and westward into Louisiana. It was reported by Baker (1902) from Arkansas, but its occurrence there could not be verified.

The distribution of *Elephantopus elatus* Bertol.

A few collections including some from areas (Alachua, Citrus, and Sumter Counties) south of the range of *E.*

*tomentosus* were encountered which have some definite characteristics of *E. tomentosus* but they cannot be properly referred to any one of the known species. These are presumably introgressants or other hybrid forms of this species and *E. elatus* and/or *E. nudatus.*

Specimens examined were kindly made available by the curators of the following institutions: UARK, FLAS, GA, GH, LA, and MO; including a specimen in the Gray Herbarium of a type collection of *E. elatus* Bertol. made by Gates from Alabama and an isotype of *E. elatus* Bertol. var. *intermedius* Gleason (a segregate not later maintained by Gleason, 1922) from Coopolis, Mississippi (Tracy 4741, MO). — C. W. JAMES, DEPARTMENT OF BOTANY, UNIVERSITY OF GEORGIA.

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THE SECOND VOLUME OF SPECIES PLANTARUM[1]. — Every taxonomic botanist knows the value and convenience of having Species Plantarum within easy reach but the present issue of that famous work has much in addition to the original work. In my review[2] of Volume I, I tried to emphasize the richness of Mr. Stearn's introductory material. Now it is equally appropriate to focus attention upon the Appendix of the newly issued Volume II. The first sixty-eight pages of the one hundred and forty-eight page Appendix are devoted to "an index and bibliography interpreting and amending the abbreviated references to authorities by Linnaeus in the first edition of *Species Plantarum*" prepared by J. L. Heller. The intricacies and inconsistencies of the literature citations in Species Plantarum are a severe hurdle for the average user of this work. One is fairly frequently led astray by some quirk of citation not easily determined and only after much struggling does he manage to return to the correct path of search. Heller's meticulously prepared notations should go far to help the unwary find his quest when looking for a Linnaean reference.

Mr. Stearn's contributions to the Appendix include a section of notes on illustrations and a section of four supplementary Linnaean publications including Methodus (1736), Demonstrationes Plantarum (1753), Genera Plantarum (1754) and Ordines Naturales (1764). In addition, he has provided a most useful index to the classes, genera and species of both Volumes I and II whereby, through a series of different symbols, the reader is given considerable information and led to many references on the typification of the genera.

All botanists are indebted to Mr. Stearn and the Ray Society for making Species Plantarum again available, but the added material at the beginning of Volume I and at the end of Volume II are alone worth what we are asked to pay for the entire work. — REED C. ROLLINS, GRAY HERBARIUM OF HARVARD UNIVERSITY.

1 Species Plantarum by Carl Linnaeus. A Facsimile of the first edition, 1753. Volume II, with an appendix by J. L. Heller and W. T. Stearn. Publication No. 142 of the Ray Society, London, 1959. Sold by Bernard Quaritich Ltd., 11 Grafton St., London, W. 1. £3.

2 Species Plantarum — More than a Facsimile Edition. Rhodora **60**: 59-60. 1958.

*Volume 61, number 731, including pages 275-296, was issued November 24, 1959.*

## ERRATA

Page 53, line 15, for **Bartonica**, read **Bartonia.**
Page 55, line 9, for **Batonia**, read **Bartonia.**
Cover, No. 724, for *A. R. H. Hodgdon*, read *A. R. Hodgdon.*
Page 88, for line 6, substitute the following: *Sporidesmium* and 15 species of *Stigmella* that I have exam-
Page 88, line 10, for *stigia* read *stygia*, and for *kastenii* read *karstenii.*
Page 117, line 3, for *melanopa*, read *melanopus.*
Pages 153 and 155, running head, *for* Pokentilla, *read* Potentilla.
Cover, No. 726, for **Paucedanum**, read **Peucedanum.**
Page 181, running head, *for* Paucedanum, *read* Peucedanum.
Page 210, line 9, *for* Pleistocene, *read* Pleiocene.
Cover, No. 729, *for* 248 *read* 247, *for* 249, *read* 248, *for* 250, *read* 249.

# INDEX TO VOLUME 61

**New scientific names and combinations are printed in bold face type**