THE NORTH AMERICAN SPECIES OF NYMPHAEA.

By GERRIT S. MILLER, Jr., and PAUL C. STANDLEY.

INTRODUCTION.

NOTE BY J. N. ROSE.

There are some groups of plants whose taxonomy can be fairly well understood almost solely from ordinary herbarium material. There are others in which it is impossible to understand the true relationships from such material alone, and some even in which herbarium specimens are almost useless. Among the last are the Cactaceae, many of the tropical Euphorbias, the Crassulaceae, and in general all the succulent plants. To be properly understood such plants should be seen growing, or should be studied from material preserved in alcohol or formalin, since in dry specimens most of the important characters are distorted beyond all possibility of recognition. Among plants of this kind the Nymphaeaceae must be included. Most of our knowledge of the genus Nymphaea, judging from the literature of the North American species at least, has been derived from the study of dried herbarium material. As a result, different authors have arrived at very different conclusions. Important peculiarities of habit and structure not discernible in such specimens have been overlooked, and our knowledge of the genus has not kept pace with the advances made in some other groups.

About ten years ago Mr. Gerrit S. Miller, jr., became interested in the genus Nymphaea from field observations of the plants occurring in central New York and in the vicinity of Washington, currently regarded as belonging to one species. Study of fresh and formalin-preserved material showed that there were important and easily recognizable differences between the northern form and that found farther south, differences in habit, color, and structure, scarcely to be detected in dried specimens. He published a brief paper in 1902[1] stating these differences and recognizing the northern plant as a distinct species. About the same time he began to bring together fresh material from all parts of North America to facilitate complete knowledge of the genus as represented there. This attempt was remarkably successful. The plants wherever they occur are well known as "yellow pond lilies," hence, not only professional botanists,

[1] Proc. Biol. Soc. Washington 15: 11–13.

but those with little or no botanical knowledge, were able to secure the specimens desired. Numerous persons connected with the various branches of scientific work in Washington as well as botanists and others throughout the country assisted, so that finally a very large suite of specimens was brought together. This material consists at present of about two hundred and twenty jars of specimens preserved in formalin, besides an exhaustive series of dried specimens, the whole being deposited in the National Herbarium. Canada, Alaska, and practically every State in the Union are represented, except the Territories of New Mexico and Arizona, where the genus is not known to occur. This material was forwarded to Washington, sometimes in formalin, but more often fresh and merely wrapped in oiled paper. As soon as specimens were received careful notes were made on the color of the various parts. Tracings of some of the leaves were drawn, seeds were selected from the ripe fruits and dried, and in general a careful study was made of any peculiarities exhibited by the fresh plants. All but one of the species finally recognized were thus studied in the fresh condition. By the year 1904 enough material had been brought together to permit the determination of all but two of the nineteen forms of Nymphaea now known to occur in America. At this time pressure of other duties, necessitating several prolonged absences from Washington, made it impossible for Mr. Miller to continue the task of completing and publishing a revision of the genus, though he had written out the key to the species essentially in the form in which it now stands. At Mr. Miller's request, Mr. J. H. Painter prepared to take up the work of elaborating the paper and procuring such additional material as was needed, but in December, 1908, this was interrupted by Painter's tragic death. During the past year it has been resumed and brought to completion by Mr. Paul C. Standley, under whose authorship jointly with Mr. Miller's the paper is now printed.

AUTHORS' INTRODUCTION.

MATERIAL STUDIED.

As stated by Doctor Rose, dry herbarium material is of little value for the study of this genus. When the species are once known, however, most of them can be recognized in the dried state. Consequently, we have examined all the herbarium material available, with the result that we are able to map the areas of distribution of the better known species with some detail. In addition to showing the distribution of the various species upon outline maps, we have listed, with name of collector and date and locality of collection, all the specimens examined. These include all the material in the herbaria

of the University of Pennsylvania, the Philadelphia Academy of Natural Science, the New York Botanical Garden and Columbia College, the Gray Herbarium, and the Missouri Botanical Garden (this containing the types of the Engelmann Herbarium), together with certain material from the University of California, that in the private herbarium of Dr. E. L. Greene, and, finally, all that in the National Herbarium. To those who have charge of these collections we are deeply indebted, either for the loan of the specimens or for facilities for their study. In addition, we are under obligations to the dozens of people all over the country who have responded to requests for living material. Their names, which are so numerous as to prohibit their full enumeration here, will be found in the lists of specimens examined. Without their assistance the work could not have been completed.

HISTORY OF NAMES.

NAMES APPLIED TO GENERA.

Blephara J. E. Smith, Mem. & Corr. **1**: 577. 1832.

Before publishing the name Nuphar, Smith sent a diagnosis of the genus under the name Blephara to the Bishop of Carlisle in a letter dated November 17, 1808. This letter is printed in the "Memoir and Correspondence," thus giving the name Blephara a definite status. The type is given as *Nymphaea lutea*.

Nuphar J. E. Smith in Sibth. Fl. Graec. Prodr. **1**: 361. 1808 or 1809 (title page dated 1806, but part containing this name not printed before December, 1808).

Type, by monotypy, *Nymphaea lutea* L. A synonym of Nymphaea L., as restricted by Salisbury in 1806, and of Nymphozanthus L. C. Richard, May, 1808.

Nymphaea L. Sp. Pl. 510. 1753.

Type, *N. lutea* L. The genus originally contained the species *lutea* (misprinted *lusea*), *alba*, *lotos*, and *nelumbo*, representing the modern genera Nymphaea (*lutea*), Castalia Salisb., 1806 (*alba* and *lotos*), and Nelumbo Adans., 1763 (*nelumbo*). No type was designated, nor was any clue furnished to the author's intention.

Under the American code of Botanical Nomenclature the types of the genera of Linnæus' Species Plantarum are to be determined through the citations given in his Genera Plantarum (1754). On page 227 of this work are cited under Nymphaea Tournefort's plates 137 and 138. These represent the white-flowered *Castalia alba* and the yellow-flowered *Nymphaea lutea*. Since Linnæus gives no specific indication that either was the type of his genus, the first of the Linnæan species common to the two works is to be regarded as the type. This is *Nymphaea lutea* L.

In 1806 Salisbury,[1] the first reviser of the genus Nymphaea restricted the name to a group containing *lutea* only of the original Linnæan species, thus fixing the type, according to the practice of zoologists. Two years later J. E. Smith,[2] deliberately setting aside Salisbury's perfectly valid action, and overlooking the Nymphozanthus of Richard, May, 1808, re-restricted Nymphaea to the group represented by *alba* and *lotos*, and applied a new name, Nuphar, to *lutea* and its allies. Although not justified by any rules of nomenclature, Smith's treatment of the subject received the general sanction of botanists for nearly eighty years. In 1887 and 1888, however, Greene [3] and Britten [4] called attention to the errors and restored the correct names.

Nymphona Bubani, Flora Pyrenaea **3**: 259. 1901.

A substitute for Nuphar proposed on account of philological prejudices, the ancients having applied the word "nuphar" to the plant's root. It is a synonym of Nymphaea.

Nymphozanthus[5] L. C. Richard, Démonstr. Bot. 68. 1808.

A name based on the yellow-flowered species of the Linnæan genus Nymphaea. As it was published in May, 1808, it antedates the Nuphar of Smith by at least seven months (see Britten, Journ. Bot. **26**: 7. January, 1888).

Ropalon Raf. New Fl. N. Amer. **2**: 17. 1836.

A synonym of Nymphaea based on *Nymphaea sagittata* Pers.

NAMES APPLIED TO SPECIES.

In addition to the names *lutea* and *pumila* originally applied to European members of the genus and erroneously used for American species, thirty names, including the ten published here for the first time, have been based on American plants. They are as follows:

Advena. *Nymphaea advena* Ait. Hort. Kew. **2**: 226. 1789.

This is the first name based on an American member of the genus. It was applied to a plant brought to the Kew Gardens in 1772 by William Young. As Young collected in South Carolina and in the neighborhood of Philadelphia, Pennsylvania,[6] there can be no question as to the applicability of the name to the common erect species characteristic of the Upper Austral zone. It has been more commonly misapplied, however, to the floating-leaved Boreal plant.

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[1] Ann. Bot. **2**: 71.

[2] See Memoir and Correspondence of Sir J. E. Smith. **1**: 575, 577–581. 1832.

[3] Bull. Torrey Club **14**: 177–179. September, 1887; 257–258. December, 1887; ibid., **15**: 84–85. March, 1888.

[4] Journ. Bot. Brit. & For. **26**: 6–11. January, 1888.

[5] Spelled Nymphozanthus on p. 63 and in the index, Nymphosanthus on p. 68 where the genus is defined. The second form may be regarded as an obvious misprint.

[6] See Britten, Journ. Bot. Brit. & For. **32**: 332. November, 1894.

Americana. *Nuphar americana* Provancher, Fl. Canad. 1: 28. 1862.

Although intended merely as a substitute for *advena* this name is available for the Boreal species now better known as *variegata*. The diagnosis clearly refers to the northern plant, and the type locality, Lake St. Jean–Georgie, Quebec, is far beyond the range of *Nymphaea advena*.

Arifolia. *Nymphaea arifolia* Salisb. Ann. Bot. 2: 71. 1806.

Another substitute for *advena*.

Bombycina. See page 102.

Chartacea. See page 94.

Erythraea. See page 91.

Fletcheri. *Nymphaea fletcheri* Lawson, Proc. & Trans. Royal Soc. Canada 6: 119. 1888.

A name applied to *Nymphaea rubrodisca*. The author did not, however, regard the plant as a distinct species, but as a hybrid between *N. kalmiana* and *N. americana* (*"advena"*).

Fluviatilis. *Nymphaea fluviatilis* Harper, Bull. Torrey Club 33: 234. April, 1906.

The only name based on a certain well-marked species, confined, so far as now known, to the State of Georgia. Type locality, near Groveland, Bryan County, Georgia.

Fraterna. See page 82.

Hastata. *Nymphaea hastata* Steud. Nom. Bot. ed. 2. 200. 1841.

The entry is as follows: "[*Nymphaea*] *hastata* Michx. *Nuphar sagittaefolia.*"

Hybrida. *Nuphar advena* var. *hybrida* Peck, Ann. Rep. N. Y. Mus. Nat. Hist. 34: 53. 1881.

This is the earliest name for the peculiar Boreal plant better known as *rubrodiscum* and *minor*. In accordance with the American Code of Botanical Nomenclature it is at present set aside in favor of its synonym *rubrodiscum*. Type locality, Forked Lake, Hamilton County, New York.

Kalmiana. *Nymphaea lutea β kalmiana* Michx. Fl. Bor. Amer. 1: 311. 1803.

The first name applied to the smallest of the three eastern Canadian species, but for the present displaced by the later *microphylla*. No locality further than "Canada" mentioned.

Longifolia. *Nymphaea longifolia* Michx. Fl. Bor. Amer. 1: 312. 1803.

A synonym of *N. sagittifolia* Walt. 1788, as suspected by Michaux himself. "Hab. in amnibus Carolinae sept. et merid."

Ludoviciana. See page 92.

Macrophylla. *Nymphaea macrophylla* Small, Bull. Torrey Club 25: 465. September, 1898.

The local race of *advena* occurring in northern and central Florida. Type locality, Eustis, Lake County.

Microphylla. *Nymphaea microphylla* Pers. Syn. Pl. 2: 63. 1807.

Although published later than *kalmiana* Michx. 1803, this name, under the American Code, stands for the plant to which it was applied.

Minor. *Nuphar advena* var.? *minor* Morong, Bot. Gaz. **11**: 167. July, 1886.

A name originally applied to depauperate specimens of *Nymphaea americana* from Smith's Pond near Litchfield, Herkimer County, New York, but afterward transferred by Watson and Coulter to *N. rubrodisca* (Gray's Manual, ed. 6. 56. 1889).

Orbiculata. *Nymphaea orbiculata* Small, Bull. Torrey Club **33**: 128. April 30, 1896.

The only name for a strikingly characterized, large-leaved species known from southern Georgia only. Type locality, a small lake near Thomasville, Thomas County.

Ovata. See page 97.

Ozarkana. See page 91.

Pictum. *Nuphar polysepalum pictum* Engelm. Trans. Acad. St. Louis **2**: 285. 1868.

A synonym of *polysepalum*.

Polysepalum. *Nuphar polysepalum* Engelm. Trans. Acad. St. Louis **2**: 282. 1868.

The first name based on the large-fruited western member of the genus. After mentioning specimens from various localities Engelmann says: "* * * And finally, Dr. Parry gathered ample material and full notes, which have been largely used in the following description, in Osborn's Lake in the same region [near Longs Peak, Colorado] at an altitude of 8,800 feet, where it grows with *Menyanthes trifolium* * * *." As the description is almost wholly based on the Parry material, Osborn's Lake must be accepted as the type locality of *polysepalum*. On page 285, however, the plant from the same lake receives a second name: "The flowers of Dr. Parry's plant are more highly colored than that of Dr. Hayden's [from a small lake between Henry's Fork and Snake Fork of the Columbia River] and may preserve the name of var. *pictum*, which the discoverer has applied to the species." The name *pictum* is thus an exact synonym of *polysepalum*.

Puberula. See page 99.

Rubrodiscum. *Nuphar rubrodiscum* Morong, Bot. Gaz. **11**: 167. 1886.

The first specific name given to the plant originally described as a subspecies under the name *hybrida*. The author apparently regarded the plant, which he found on the Vermont shore of Lake Champlain, as a species in process of formation from a hybrid. "Intermediate between *N. advena* [=*americana*] and the following [*microphylla*], and produced from a hybrid between them. Still a hybrid in many localities."

Sagittaefolia. *Nuphar sagittaefolia* Pursh, Fl. Amer. Sept. **2**: 370. 1814.

Substitute for *sagittifolia* Walt. 1788.

Sagittata. *Nymphaea sagittata* Pers. Syn. Pl. **2**: 63. 1807.

This is merely another name for *Nymphaea sagittifolia*.

Sagittifolia. *Nymphaea sagittifolia* Walt. Fl. Carol. 155. 1788.

The first name based on the plant to which it is currently applied. No type locality is mentioned, but the preface to the Flora is subscribed: "Carolinae Meridionalis, ad Ripis Fluvii Santee."

Tomentosum. *Nuphar advena β tomentosum* Torr. & Gr. Fl. N. Amer. **1**: 58. 1838.

This name was based on a specimen of *Nymphaea advena* collected by Thomas Nuttall in the vicinity of Philadelphia, Pennsylvania, and labeled by him *Nuphar tomentosum*. It is still extant in the herbarium of the Academy of Natural Sciences of Philadelphia. The supposed pubescence of the petioles and lower surface of the leaves is merely a dense growth of algæ.

Ulvacea. See page 97.

Variegata. *Nuphar advena* var. *variegatum* Engelm. in A. Gray, Man. ed. 5. 57. 1867.

Under this name, based apparently on specimens from Michigan, *Nymphaea americana* was first, though imperfectly, distinguished from *N. advena*. Later it was used in binomial form for the same plant by G. S. Miller.[1]

SYSTEMATIC TREATMENT.

NYMPHAEA L.

1753. **Nymphaea** L. Sp. Pl. 510. Type, *Nymphaea lutea* L. (Salisbury, Ann. Bot. **2**: 71. 1806.)

1808. **Nymphozanthus** L. C. Richard, Démonstr. Bot. 63–68. Type, *Nymphaea lutea* L. (Misprinted *Nymphosanthus*; the correct spelling on p. 63 and in index.) May, 1808.

1808 or 1809. **Nuphar** J. E. Smith in Sibth. Fl. Graec. Prodr. **1**: 361. December, 1808, or early in 1809. Type, *Nymphaea lutea* L.

1832. **Blephara** J. E. Smith, Mem. & Corr. **1**: 576. (Substitute for Nuphar suggested but not adopted.)

1836. **Ropalon** Raf. New Fl. N. Amer. **2**: 17. Type, *Nymphaea sagittata* Pers.

1887. **Nymphaea** Greene, Bull. Torrey Club **14**: 177–179. September, 1887; 257–258. December, 1887.

1901. **Nymphona** Bubani, Fl. Pyr. **3**: 259. (Substitute for Nuphar.) Type species, *Nymphaea lutea* L.

DISTRIBUTION: Fresh-water ponds and sluggish streams (rarely in damp ground away from water) of the Holarctic Region from northern Europe and Asia to the Mediterranean and Japan and from Alaska and northern Canada to Cuba and northeastern Mexico.

DESCRIPTION: Perennial aquatics with stout, creeping rootstocks; leaf blades entire, with a deep sinus at the base, narrowly lanceolate to orbicular, floating or emersed, on slender or stout, cylindric or flattened petioles; submersed leaves often present, these thin and delicate; sepals 5 to 12, orbicular to oblong or spatulate, concave, greenish, tinged with yellow or red; petals numerous, linear to oblong, thick, stamen-like or scale-like, inserted with the very numerous stamens on the receptacle under the ovary; stigma disk-like, with few to many rays; fruit ovoid to columnar, usually ripening above the water; seeds mostly ovoid, yellow or brown, smooth and shining, numerous.

The Old World forms of Nymphaea are so imperfectly known that it is impossible to make any satisfactory estimate of the number of species in the genus. The Old World species are recognized by Engler and Prantl as about five. Half a dozen

[1] Proc. Biol. Soc. Washington **15**: 13. February 18, 1902.

forms have until recently been supposed to represent the specific differentiation of the American members of the group. Their number is now increased to nineteen.

KEY TO THE AMERICAN SPECIES.

Width of leaf blade less than half the length; sinus less than one-fourth the length of the blade.
Sinus usually closed; length of blade 2.5 times the breadth or less; fruit about 2 cm. long; seeds 3 mm. long; stigma rays elliptical; leaves acutish..... 11. *N. ulvacea.*
Sinus usually open; length of blade over 3 times the breadth; fruit about 3 cm. long; seeds 4 mm. long; stigma rays linear; leaves obtuse..... 10. *N. sagittifolia.*
Width of leaf more than one-half its length; sinus one-half to one-fourth the length of the blade.
Calyx of more than 6, usually 9, parts..... 17. *N. polysepala.*
Calyx of usually 6 parts.
Petioles conspicuously flattened; leaves floating.
Anthers shorter than the filaments.
Stigma rays less than 10; flowers less than 20 mm. in diameter; sepals narrow..... 1. *N. microphylla.*
Stigma rays more than 10; flowers about 30 mm. in diameter; sepals broad..... 2. *N. rubrodisca.*
Anthers at least equaling the filaments.
Capsules about 40 mm. high and 30 mm. in diameter; flowers about 45 mm. in diameter; leaves broadly rounded..... 3. *N. americana.*
Capsules about 25 mm. high and 18 mm. in diameter; flowers 22 to 26 mm. in diameter; leaves acutish..... 4. *N. fraterna.*
Petioles subterete; leaves erect or floating.
Lower surface of leaves glabrous.
Leaves of an orbicular type..... 8. *N. fluviatilis.*
Leaves conspicuously longer than broad.
Submersed leaves present; leaves and sepals very thin..... 9. *N. chartacea.*
Submersed leaves wanting; leaves and sepals thick.
Sinus closed; stigma rays usually more or less confluent at the base, broad; disk usually oval..... 7. *N. ludoviciana.*
Sinus usually open; stigma rays not confluent at the base, narrower; disk orbicular.

Fruit not tinged with red when mature.
Leaves 15 to 35 cm. long; rounded at the apex.... 5. *N. advena.*
Leaves 25 to 50 cm. long, acutish... 5a. *N. advena macrophylla.*
Fruit conspicuously tinged with red at maturity.
Leaves large, 25 to 40 cm. long, acutish; seeds very numerous..... 5b. *N. advena erythraea.*
Leaves smaller, 12 to 20 cm. long, broadly rounded at the apex; seeds few (15 to 30)..... 6. *N. ozarkana.*
Lower surface of the leaves more or less pubescent.
Leaf blades of an oval type; pubescence dense..... 12. *N. ovata.*
Leaf blades orbicular in outline, or nearly so.
Lower surface of leaves with little pubescence; petioles nearly glabrous; leaves 16 to 21 cm. wide..... 13. *N. puberula.*
Lower surface of leaves and petioles covered with a dense, silvery, silky pubescence.
Fruit small, 18 to 24 mm. in diameter; stigma rays about 12 (9 to 14); leaves 16 to 24 cm. wide..... 14. *N. microcarpa.*
Fruit larger, 45 to 50 mm. in diameter; stigma rays much more numerous; leaves 30 to 50 cm. wide.
Sinus closed; stamens in 9 or 10 rows; diameter of flowers about 50 mm.; seeds about 4 mm. long and 3 mm. thick..... 15. *N. orbiculata.*
Sinus open; stamens in 6 or 7 rows; diameter of flowers about 70 mm.; seeds about 6 mm. long and 4.6 mm. thick..... 16. *N. bombycina.*

1. **Nymphaea microphylla** Pers.[1]

Nymphaea lutea L. Sp. Pl. 810. 1753, in part.

Nymphaea lutea β kalmiana Michx. Fl. Bor. Amer. **1**: 311. 1803.

Nymphaea microphylla Pers. Syn. Pl. 63. 1807; Robins. & Fern. in Gray, Man. ed. 7. 391. 1908.

Nymphaea kalmiana Sims, Curtis's Bot. Mag. *pl. 1243.* 1809; Britton, Man. ed. 2. 407. 1905.

Nuphar kalmiana Ait. Hort. Kew. ed. 2. **3**: 295. 1811.

Nuphar lutea kalmiana Torr. Fl. N. Y. **1**: 40. 1843.

TYPE LOCALITY: Eastern Canada.

DISTRIBUTION.—Eastern Canada, south through New York to eastern Pennsylvania and northern New Jersey.

DESCRIPTION.

Floating leaves oval to broadly oblong or suborbicular, thin, broadly rounded at the apex, 35 to 100 mm. long and 35 to 75 mm. wide, the sinus 15 to 35 mm. deep, two-thirds as long as the midrib or more; sinus narrowly triangular, or closed, the lobes just meeting, these triangular, acutish; veins rather inconspicuous, glabrous above, generally somewhat pubescent beneath, especially when young; submersed leaves orbicular, very thin, somewhat crispate, of about the same size as the floating ones, their sinuses usually more open; peduncles and petioles terete, very slender; flowers depressed-obovoid, about 18 mm. in diameter and 12 mm. high when normally open, the perianth when spread measuring about 30 mm.; sepals 5, obovate or elliptical, about 10 mm. long and 6 to 8 mm. wide, scarcely overlapping when expanded, obtuse at the apex, not contracted into a claw at the base; petals 7 to 10, broadly spatulate, 6 mm. long and 3 mm. wide; stamens in 3 rows, about 15 to the row; filaments linear, cuneate, 5 mm. long, 1 mm. wide; anthers one-half as long as the filament; sepals gamboge yellow throughout, except those parts exposed in the bud, these apple green; petals orange, narrowly edged with gamboge yellow; anthers maize yellow, filaments gamboge; ovary pale apple green slightly variegated with yellow and much tinged with burnt carmine, especially on the ridges and at the base, the disk burnt carmine; fruit very small, ovoid, strongly constricted above into a neck 3 mm. long, the whole about 14 mm. high and 11 mm. in diameter, smooth except near the top, there faintly ribbed; stigmatic disk orbicular or oval, crenate, plane, 4 or 5 mm. in diameter; stigma rays 6 to 10, extending almost to the edge of the disk, somewhat confluent in the center, with no trace of a median groove; color of fruit oil green, the disk bright red, often edged with yellow, the body of the fruit usually with more or less of red; seeds oblong, 3 mm. long and 2 mm. in diameter, yellowish brown, shining. (PLATES 35, A; 36, A. FIGURES 2, 3, 4, c.)

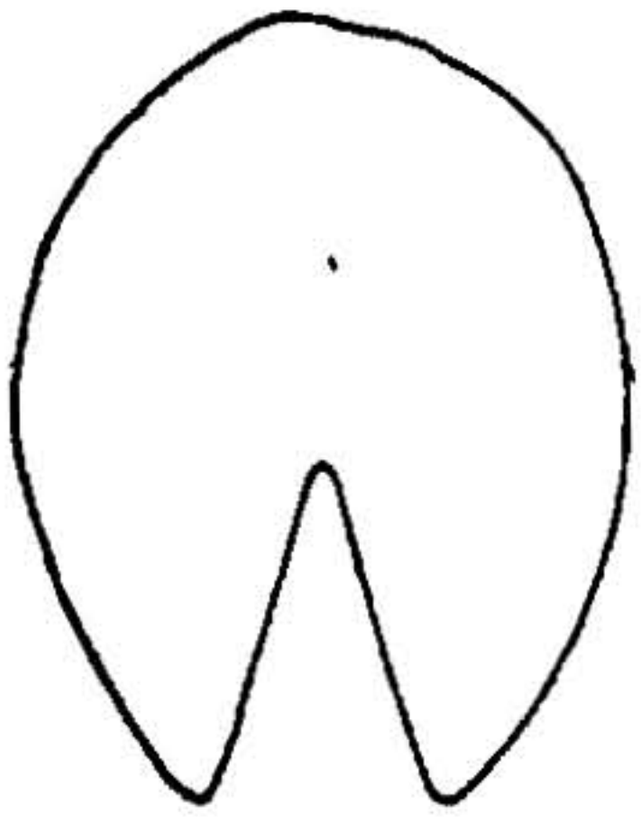
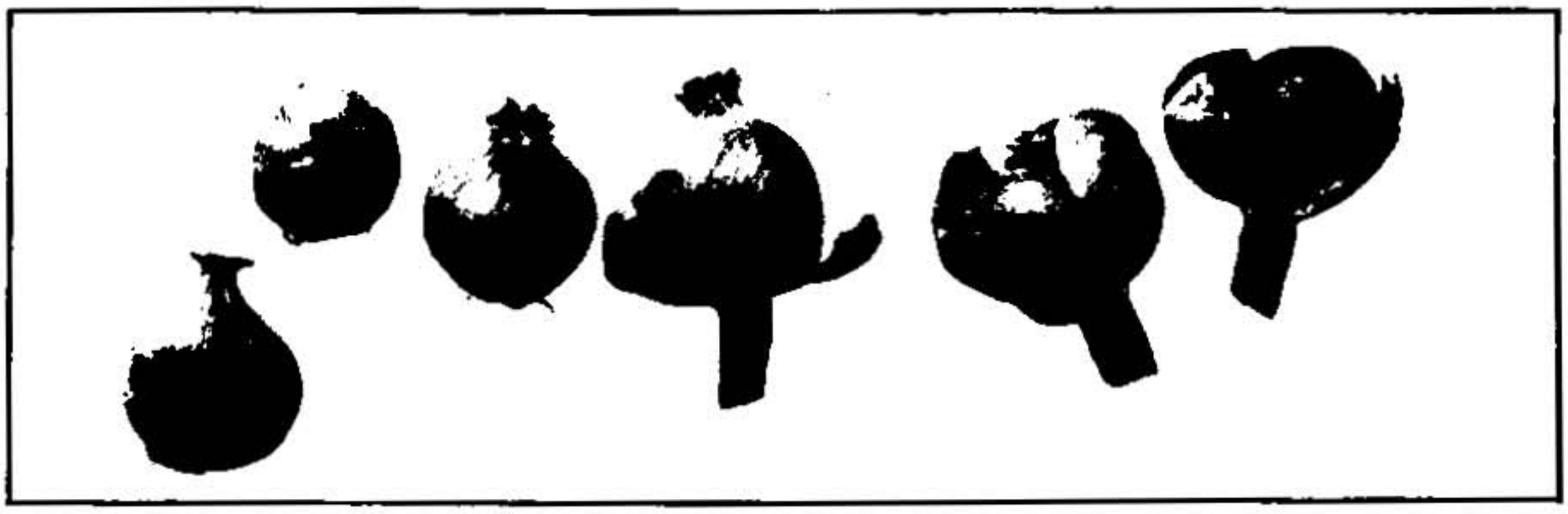


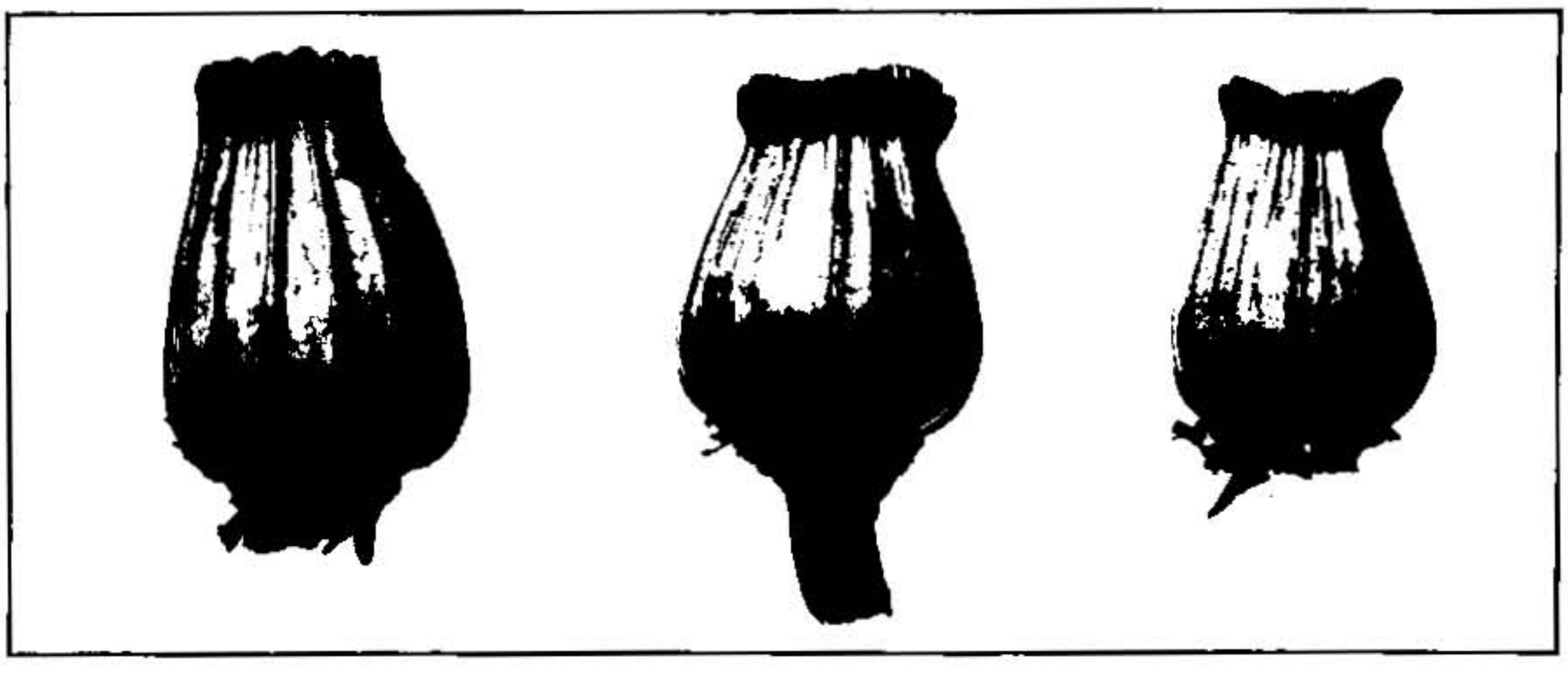
FIG. 2.—Leaf outline of *Nymphaea microphylla*. Scale ½.

FIG. 3.—Stigmatic pattern of *Nymphaea microphylla*. Natural size.

[1] The use of the synonym *microphylla* in place of the original name *kalmiana* is in conformity with article 49 of the Vienna Code, which provides that "when a tribe becomes a family * * * a subdivision of a species becomes a species, or the reverse * * * the earliest name (or combination of names) received by the group in its new position must be regarded as valid, if it is in conformity with the rules, unless there exist any of the obstacles indicated in the articles of section 7." Although "this

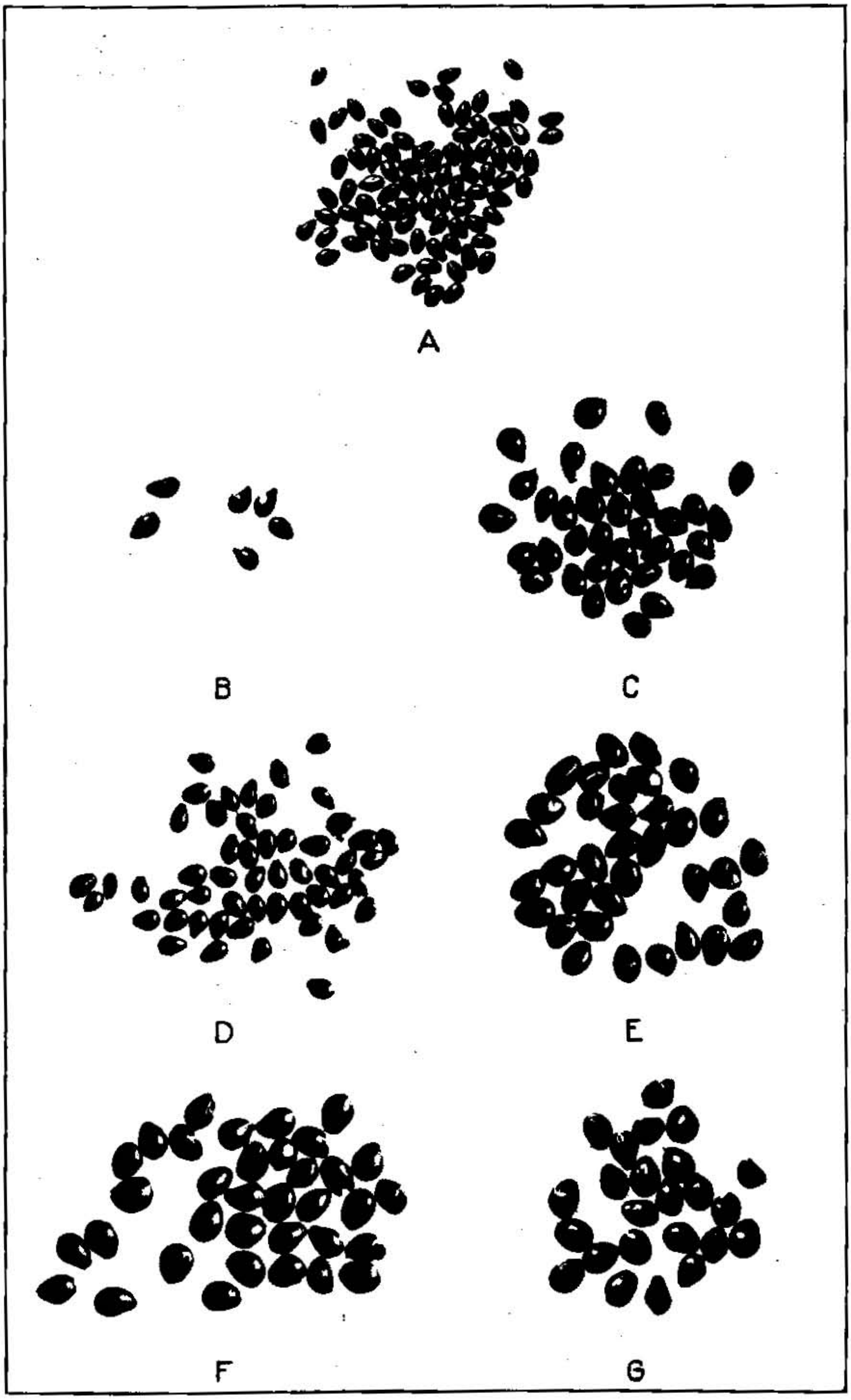


A. FRUIT OF NYMPHAEA MICROPHYLLA PERS.



B. FRUIT OF NYMPHAEA FRATERNA MILLER & STANDLEY.

C. FRUIT OF NYMPHAEA ADVENA AIT.



SEEDS OF SEVERAL SPECIES OF NYMPHAEA.

EXPLANATION OF PLATE 35.—A. Fruit of *Nymphaea microphylla*. B. Fruit of *Nymphaea fraterna*, type collection. C. Fruit of *Nymphaea advena*. All natural size.

EXPLANATION OF PLATE 36.—Seeds of (A) *Nymphaea microphylla*, (B) *N. rubrodisca*, (C) *N. americana*, (D) *N. fraterna*, (E) *N. advena*. (F) *N. advena macrophylla*, (G) *N. ozarkana*. All natural size.

Specimens examined:

In formalin—

MAINE: Birch Brook near north end of Cross Lake, Eagle Lake Chain, Aroostook County, 1903, *W. C. Kendall.*

NEW HAMPSHIRE: Cambridge River near Lake Umbagog, 1905, *Kendall.*

NEW YORK: Piseco, 1901, *W. L. Ralph;* Gray, 1901, *J. Perkins;* Lake Champlain, 1901, *Eggleston.*

Dried [1]—

CANADA: Fredericton, New Brunswick, 1892, *Fowler* (Gray); Amqui Station, Metapedia River, 1882, *Macoun* 97; Otter Slide Lake, Ontario, 1900, *Macoun* 21699; St. Johns County, New Brunswick, 1869, *Fowler;* near Quebec, *Mrs. Percival* (C.); St. Johns River, New Brunswick, 1885, *G. U. Hay* (C.); Saguenay River, 1890, *T. F. Allen* (C.); Moose River Basin, Northern Ontario, 1903, *J. M. Bell;* Punk Island, Lake Winnipeg, 1884, *Macoun.*

MAINE: Moosehead Lake, 1875, *Charles E. Smith;* Cabossucontu Lake, Monmouth, 1899, *W. C. Kendall;* shallow pond, St. Francis, Aroostook County, 1893, *Fernald* 10; Sunkhaze Stream, Milford, 1892, *Fernald* (N. E.); West Baldwin, Cumberland County, 1894, *Furbish* (N. E.); Piscataquis River, Dover, 1894, *Fernald* (N. E.); Orono, 1878, *Scribner* (Greene); Penobscot River, Somerset County, 1882, *Charles E. Smith* (Phila.); near the east branch of the Penobscot, 1847, *A. Young, jr.* (C.); without locality, 1847, *Thurber* (Gray); Green, 1878, *Scribner* (Mo.); Winthrop, 1862, *Sturtevant* (Mo.).

VERMONT: Shelburn, 1879, *Pringle;* Winooski River, Colchester, 1876, *Pringle;* Joes Pond, Danville, 1894, *Grant & Eggleston* (C.); Lake Memphremagog, 1860 (N. Y.); Little Otter Creek, Ferrisburg, 1880, *E. & C. E. Faxon* (Gray); Shoreham, 1878, *Brainerd* (Mo.); Burlington, 1841, *John Carey* (Mo.).

NEW HAMPSHIRE: Ponds, no locality, *Oakes Herbarium.*

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action is in the highest degree arbitrary, as contravening a cardinal principle" (more specifically article 15 of the Vienna Code itself: namely, that the only valid designation of a group of plants is the earliest name applied to it within certain clearly defined limitations) article 49 is one of the portions of the Vienna Code accepted by the Nomenclature Commission of the Botanical Club of the American Association for the Advancement of Science, and thus incorporated in the American Code of 1907 now used as the standard by writers in the Contributions from the United States National Herbarium. Apart from its contravention of the "cardinal principle" which lies at the base of all stability in nomenclature, article 49 is further objectionable on account of the encouragement which it offers to slovenly and incomplete study of the literature, and to the multiplication of useless new names; while finally, though here the situation is brightened by a note of comedy, it rests on the tacit assumption that between tribe and family, or subgenus and genus, or subspecies and species, there is an actual, knowable difference of kind.—G. S. M.

[1] The letters in parentheses refer to the herbaria where the species are to be found. "Gray" denotes the Gray Herbarium; "N. Y.," that of the New York Botanical Garden; "C," the herbarium of Columbia College, deposited at the New York Botanical Garden; "Mo.," the Missouri Botanical Garden; "N. E.," the herbarium of the New England Botanical Club, deposited with the Gray Herbarium; "Greene," the private herbarium of Dr. E. L. Greene; "Phila.," the herbarium of the Academy of Natural Sciences of Philadelphia. All specimens not marked thus are in the National Herbarium.

Specimens examined—Continued.

Dried—Continued.

MASSACHUSETTS: Holyoke, 1883, *G. R. Lumsden;* Concord River, Concord, 1886, *H. S. Richardson* (N. E.); Northampton, 1871, *Jesup*.

CONNECTICUT: Milford Pond, in river meadow, 1895, *Eames;* Derby, *Oakes* (Phila.); North Haven, 1899, *C. H. Bissell* 335 (N. Y.); Reynolds Bridge, 1898, *E. B. Harger* (N. E.)

NEW YORK: Troy, *Dr. W. E. A. Aikin* (Phila.); near Niagara, *Doctor Eddy* (C.); Raquette Lake, 1896 (C.); Penn Yan, *Sartwell* (Gray); Albany Lake, 1879, *Ward;* Gray, Herkimer County, 1901, *House;* McDonough, 1884, *A. L. Coville*.

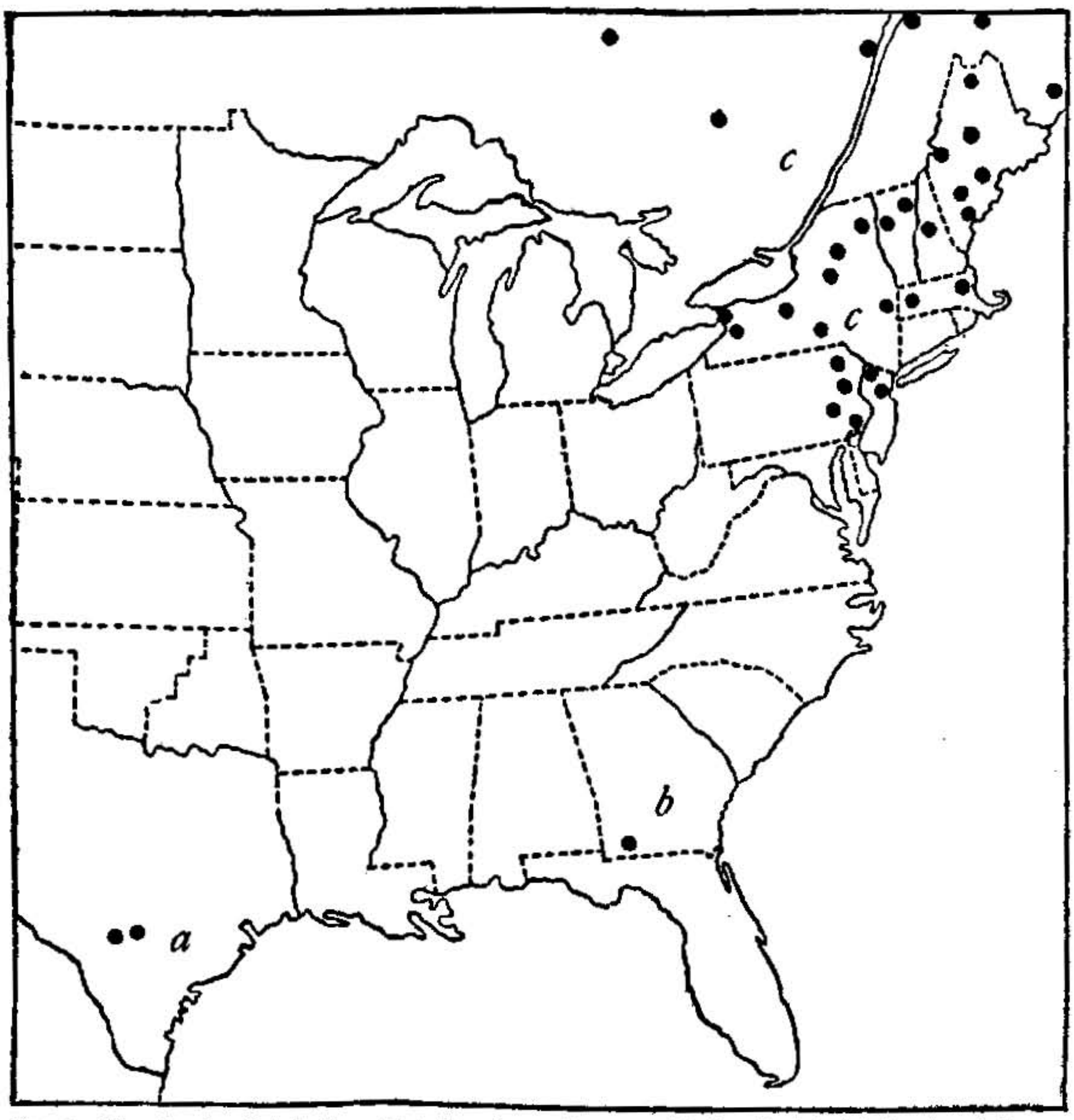

FIG. 4.—Map showing distribution of (*a*) *Nymphaea microcarpa;* (*b*) *N. orbiculata;* (*c*) *N. microphylla*.

PENNSYLVANIA: Colliers Ferry, Lancaster County, 1863, *Porter* (Gray); Tobyhanna Creek, Pocono Mountains, 1858, *Traill Green* (Gray); Naomi Pines, Monroe County, 1893, *Dr. & Mrs. Britton;* Monroe County, *Traill Green;* Silver Lake, Pike County, 1899, *Stewardson Brown* (Phila.); Bristol, 1865, *C. F. Parker* (Phila.); Philadelphia, *Nuttall* (Phila.); head of Naomi Pines Lake, 1904, *Harshberger* (Mo.).

NEW JERSEY: Closter, 1860, *Austin* (C.); Pompton Lake, Pompton, 1892, *Morong* (C.).

This, the smallest of our Nymphaeas, is the American representative of the Palearctic *N. pumila*. Indeed it has often been considered identical with that species. The

leaves of the two are much alike, so too the flowers, in size at least. The anthers of our plant are oblong, while in *N. pumila* they are cubical. In the European species the stigmatic disk is only partially tinged with orange-red, while in our plant the whole disk is a dark carmine.

Michaux, in the original description of the plant, says: "Quamvis differentiam specificam verbis notare non possim; diverse tamen videtur." Evidently he had only dried specimens, otherwise it would have been very easy to separate it from *Nymphaea lutea*, of which he considered it a subspecies.

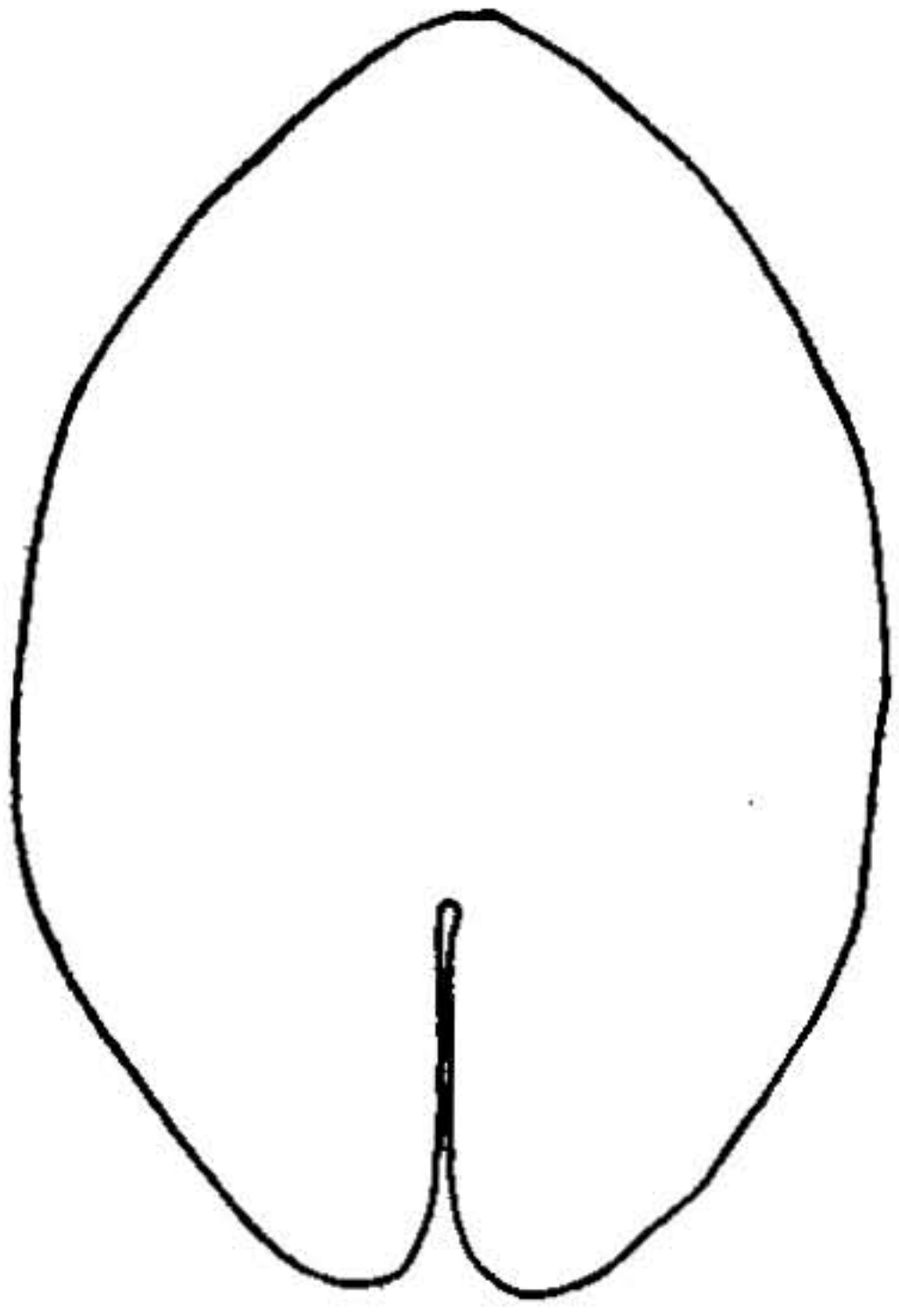

FIG. 5.—Leaf outline of *Nymphaea rubrodisca*. Scale ½.

2. Nymphaea rubrodisca (Morong) Greene.[1]

Nuphar advena hybrida Peck, Ann. Rep. N. Y. Mus. Nat. Hist. **34:** 53. 1881.

Nuphar rubrodiscum Morong, Bot. Gaz. **11:** 167. 1886.

Nymphaea rubrodisca Greene, Bull. Torrey Club **15:** 84. 1888; Robins. & Fern. in A. Gray, Man. ed. 7. 391. 1908.

Nymphaea fletcheri Lawson, Proc. & Trans. Roy. Soc. Canada **64:** 119. 1888.

Nuphar advena minus Wats. & Coult. in A. Gray, Man. ed. 6. 56. 1889, not Morong.

Nymphaea hybrida Peck, Bull. N. Y. State Mus. **6:** 75. 1899; Britton, Man. ed. 2. 407. 1905.

TYPE LOCALITY: Lake Champlain, Vermont.

DISTRIBUTION: Quebec and Ontario, through New York and the New England States to eastern Pennsylvania and northern New Jersey, also in eastern Minnesota and western Wisconsin.

DESCRIPTION.

Floating leaves 75 to 200 mm. long, 55 to 145 mm. wide, oval or ovate, rounded at the apex; sinus about half as long as the midrib or slightly longer, closed or very narrow; blades rather thin, glabrous, their lobes oblong-triangular or rounded-triangular, obtuse; submersed leaves well developed, very thin, crispate, broadly oblong or ovate, broadly rounded and retuse at the apex, of about the same size as the floating ones, their sinuses broader and more open; rootstocks comparatively slender, somewhat flattened, about 25 mm. in their longest diameter, the leaf scars elliptical or oval, 8 to 10 mm. long; flowers 25 to 35 mm. in diameter, 20 mm. high, depressed-globose; sepals usually 5, glabrous, rather thin, all similar, oblong or oval or almost orbicular, obtuse or truncate, only slightly narrowed at the base; petals spatulate, truncate, 8 or 9 mm. long; stamens in 4 or 5 rows, their anthers about one-half as long as the filaments, sometimes longer, but always shorter than the filaments; sepals canary yellow, with or without red on their inner surfaces, the red when present less vivid than in *americana;* petals clear yellow or slightly tinged with green; stamens yellow, the anthers light buff; ovary greenish yellow, lighter than the sepals and stamens, faintly marked

FIG. 6.—Stigmatic pattern of *Nymphaea rubrodisca*. Natural size.

[1] The use of the synonym *rubrodisca* in place of the original name *hybrida* is in accordance with article 49 of the Vienna Code. See footnote under *Nymphaea microphylla*, p. 72.—G. S. M.

with carmine beneath the disk, the disk carmine; fruit ovoid, slightly constricted above, about 22 mm. high and 10 mm. in diameter, rather strongly and coarsely ribbed; disk when mature about 11 mm. in diameter, orbicular, its edge undulate; stigma rays 8 to 13, usually 10 to 12, linear, 3 mm. long, extending almost to the edge of the disk, distinct, with no trace of a median line, the center deeply depressed, smooth; fruit when mature dark purplish brown; seeds ovoid, 2.5 to 3 mm. long, 1.5 to 2 mm. in diameter, light brown, shining. (PLATE 36, B, facing p. 73. FIGURES 5, 6, 7, *b*.)

Specimens examined:

In formalin—

CANADA: Ottawa, 1901, *Fletcher*.

NEW HAMPSHIRE: Cambridge River near Lake Umbagog, 1905, *W. C. Kendall*.

NEW YORK: Smiths Pond; Gray, 1901, *J. Perkins;* Blind Bay near Fishers Landing, Jefferson County, 1902, *Maxon;* Thousand Island Park, 1902, *Maxon;* Lake Champlain, 1901, *Eggleston*.

WISCONSIN: West Superior, 1902, *Charles Bullard*.

Dry—

CANADA: Danville, Quebec, 1894, *Berg* (C.); near Pictou, Nova Scotia, 1901, *Howe & Lang* 610 (N. Y.); Red Pine Lake, 1900, *Macoun* 23261 and 23262 (N. Y.); Whites Lake, 1900, *Macoun* 21698 (N. Y.); Brigham Creek, Ottawa River, 1882, *Fletcher;* Ottawa, 1902, *Fletcher;* St. Francis River, Quebec, *Eggleston* 3010.

MAINE: Androscoggin River, Auburn, 1896, *Merrill* 4430 (N. E.); Birch Brook, north end of Cross Lake, Eagle Lake Chain, Aroostook County, 1903, *W. C. Kendall;* Hartford, 1886, *Parlin* (Gray); Milford, 1892, *Fernald* (Gray); Valley of the St. Francis River, Aroostook County, 1902, *Eggleston & Fernald* (N. E.); Mattawamkeag Lake, Aroostook County, 1897, *Fernald* (N. E.); Bradley, 1890, *Fernald* (N. E.).

NEW HAMPSHIRE: Gilmore Pond, Jaffrey, 1897, *Robinson* 263 (Gray).

VERMONT: Joes Pond, Danville, 1894 (C.); Lake Champlain, Ferrisburg, 1879, *Brainerd* (C.); Burlington, 1878, *Pringle* (N. Y.); Manchester, 1898, *M. A. Day* (Gray); Williamstown, 1881, *E. & C. E. Faxon* (Gray); Lake Champlain, 1873, *H. G. Jesup* (Gray); sluggish tributaries of Lake Champlain, 1879, *Pringle*.

MASSACHUSETTS: Woburn, 1909, *Wm. Boott* (Gray); Ashburnham, 1896, *Sydney Harris* (N. E.).

NEW YORK: Wilmurt Lakes, Herkimer County, 1901, *House;* vicinity of Fishers Landing, Jefferson County, 1902, *Robinson & Maxon* 75; Carpenters Pond, Onondaga County, 1903, *House;* Troy, 1876, *J. H. Wibbe* (Greene); Raquette Lake, 1896 (C.); Troy, 1829, *Doctor Aikin;* Bronx River, Williams Bridge, 1890, *Bicknell* (C.); ponds in the Adirondacks, 1884, *Morong* (N. Y.); Westchester County, Williams Bridge, *Dr. T. P. Allen* (N. Y.); Smiths Pond, Herkimer County, 1855 (Gray); Gorham, *Doctor Torrey*.

NEW JERSEY: Barrack Creek, Burlington, *Solomon Conrad* (Phila.); Pompton Lake, Pompton, 1892, *Morong* (C.); Green Pond, Morris County, 1894, *Wm. Van Sickle*.

PENNSYLVANIA: Pocono Plateau, Monroe County, 1893, *Dr. & Mrs. Britton*.

WISCONSIN: West Superior, 1902, *Charles Bullard*.

MINNESOTA: Daniels Lake, 1891, *F. F. Wolf;* Vermilion, 1891, *Sandberg* 500.

This species is so readily distinguishable from the other American members of the genus, and particularly from those which occupy the same general region, that no special comparisons are required. By many authors the plant has been regarded as a hybrid between *Nymphaea americana* and *N. microphylla*. Its characters are for the most part intermediate between those of the two better-known plants. It shows a less degree

of fertility than other members of the genus, so much so that ripe fruit with well-developed seeds is not easily obtained. In geographic range it appears to be a boreal form, occurring therefore in the same region as *N. microphylla*, and in that part of the range of *N. americana* which extends north of the Transition Zone and overlaps that of the smaller plant. All of these facts might readily be construed as indicating a hybrid origin. On the other hand the characters of *Nymphaea rubrodisca* are quite as constant as in other American species, and no specimens are yet known which show any tendency to reversion toward either of the supposed parents. The plant is by no means invariably found locally associated with both *N. americana* and *N. microphylla*, as

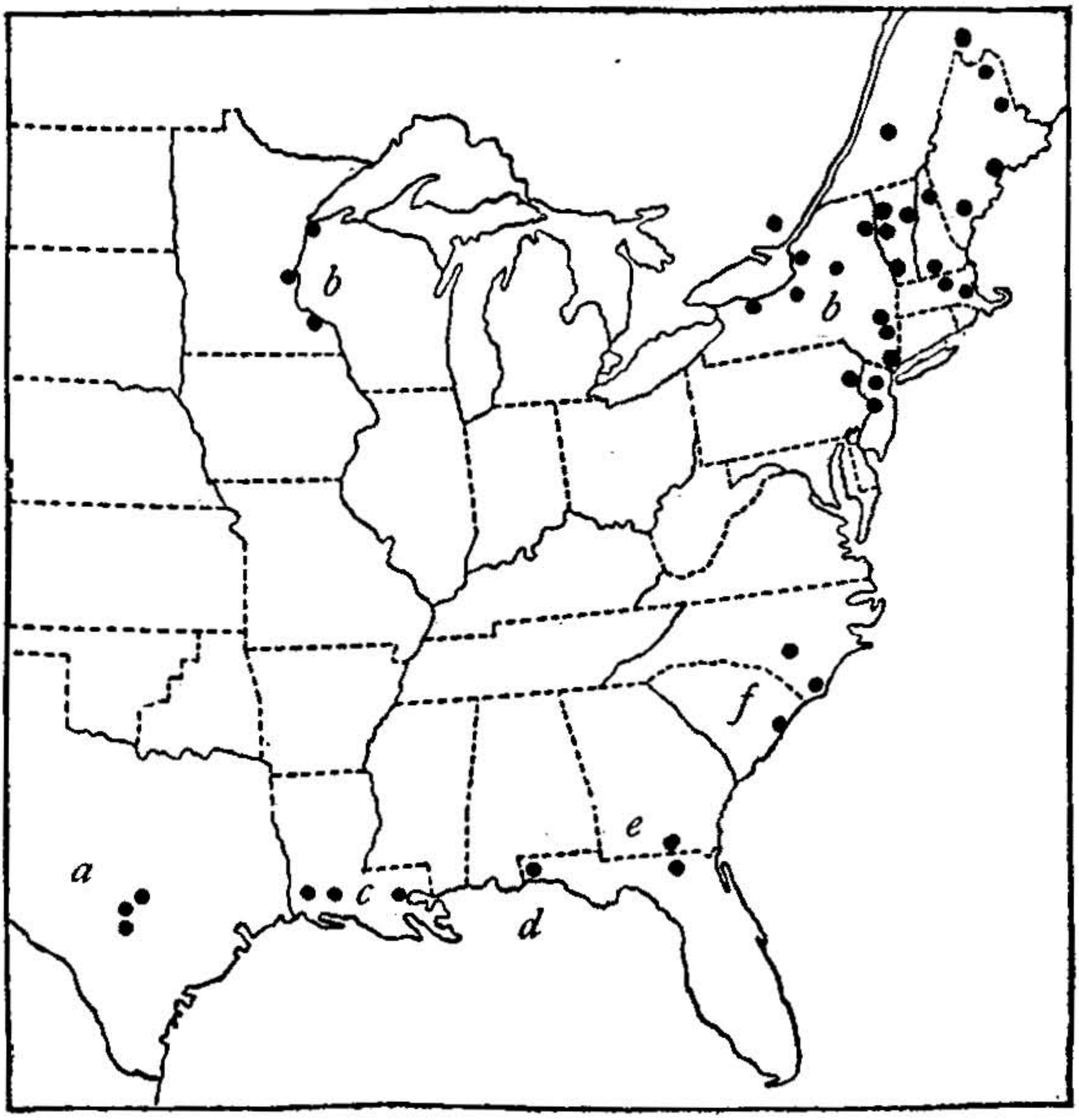

FIG. 7.—Map showing distribution of (*a*) *Nymphaea ovata;* (*b*) *N. rubrodisca;* (*c*) *N. ludoviciana;* (*d*) *N. ulvacea;* (*e*) *N. bombycina;* (*f*) *N. sagittifolia.*

either or both of these may be absent from the particular stream or pond in which it grows;[1] while in general distribution it extends decidedly beyond the western limit of the range of *N. microphylla* as now known. Finally, it is not unusual among plants for certain members of a genus to produce fruit less abundantly than others, particularly in groups where asexual reproduction and dispersal can readily occur. The hypothesis of hybrid origin seems, therefore, to present the greater number of difficulties, and until more facts can be brought to its support we prefer not to accept it.

[1] It was found thus alone by Peck at the type locality of *hybrida*.

3. **Nymphaea americana** (Provancher) Miller & Standley.

Nuphar americana Provancher, Fl. Canad. 29. 1862, excluding synonyms.
Nuphar variegatum Engelm.; Peck, Ann. Rep. Univ. N. Y. **19:** 73. 1866.
Nuphar advena variegatum Engelm. in A. Gray, Man. ed. 5. 57. 1867.
Nuphar advena minor Morong, Bot. Gaz. **11:** 167. 1886.
Nymphaea variegata G. S. Miller, Proc. Biol. Soc. Washington **15:** 13. 1902.
"*Nymphaea advena* Soland." Small, Fl. Southeast. U. S. 456. 1903, in part; Britton, Man. ed. 2. 407. 1905, in part.
Nymphaea advena variegata Fernald, Rhodora **10:** 49. 1908.

TYPE LOCALITY: Lake St. Jean-Georgie, Quebec.

DISTRIBUTION: Eastern Canada westward to British Columbia, south to Montana, Nebraska, northern Indiana, and Ohio, eastern Pennsylvania, and New Jersey.

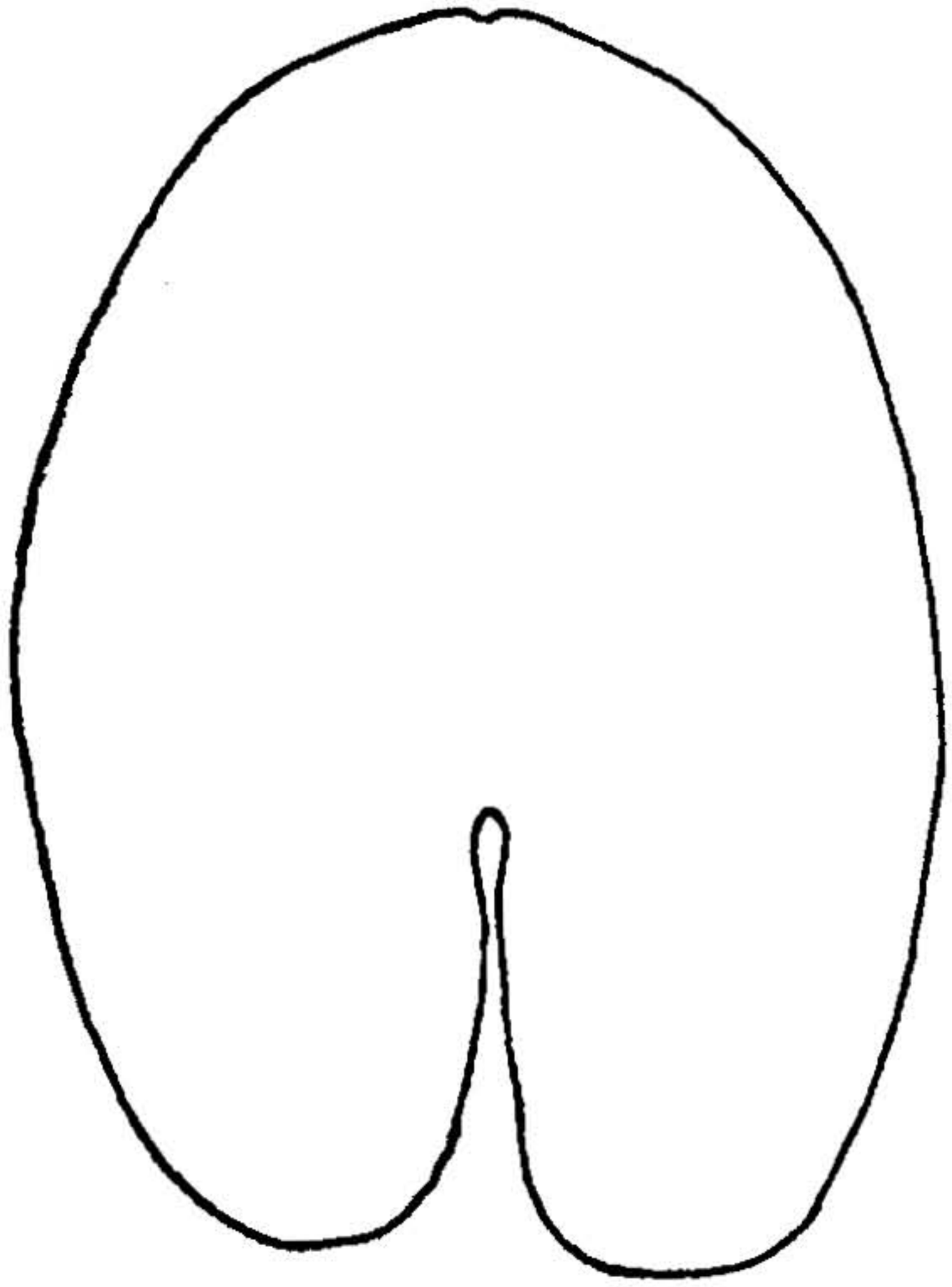

FIG. 8.—Leaf outline of *Nymphaea americana*. Scale, ½.

DESCRIPTION.

Floating leaves usually 17 to 28 cm. long and 11 to 22 cm. wide, oblong or oval, the blades averaging narrower and smaller than in *advena*, slightly but noticeably narrowed towards the apex, the sinus 50 to 75 mm. deep, closed or very narrow, the lobes semiorbicular or oblong; submersed leaves sometimes but not always present, similar in form to the floating ones but broader, very thin and membranous; petioles slender, conspicuously flattened, with a conspicuous median ridge forming a prolongation of the midrib; peduncles terete, slender, glabrous; flowers about 45 mm. in diameter, 30 mm. high, the perianth when spread measuring about 100 mm., in other particulars similar to those of *advena;* petals about 16, the largest 8 mm. wide at the apex and sometimes almost spatulate; stamens usually in 6 rows, about 26 to the row; filaments often 4 mm. wide; color of flowers variable but usually quite distinct from that of *N. advena;* outside of outer sepals oil green, the inner ones lemon yellow outside; lower half of inner surface of all sepals usually, although not invariably, red, this color sometimes covering the whole inner side of the smaller sepals, the exact shade varying in different specimens from a mere indefinite tinge in the yellow to a bright pure maroon; petals clear yellow or sometimes bright parrot green, usually tipped with green, and

FIG. 9.—Stigmatic pattern of *Nymphaea americana*. Natural size.

PLATE 37.

NYMPHAEA AMERICANA (PROVANCHER) MILLER & STANDLEY, IN FLATHEAD LAKE, MONTANA.

PLATE 38.

FRUIT OF NYMPHAEA AMERICANA (PROVANCHER) MILLER & STANDLEY, FROM SPRINGFIELD, MASSACHUSETTS.

occasionally tinged or tipped with red; stamens clear, bright lemon yellow throughout; fruit smaller than that of *advena*, 40 mm. high and 30 mm. in diameter, ovoid, conspicuously constricted above, the ribs less prominent and the crater more shallow than in that species, the crater usually about 5 mm. deep; margin of the disk definitely although not deeply crenate; stigma rays 7 to 25, usually 12, 13, or 14, extending to within 1 mm. or less of the edge of the disk; capsule oil green, usually tinged with red, and often becoming a bright red with age; in the brightest colored fruits the stigmatic region usually remaining greenish yellow in striking contrast; seeds similar to those of *N. advena* but smaller, about 5 mm. long, the greater diameter 3.6 mm., the lesser diameter 3.2 mm., less compressed and with a less prominent raphe. (PLATES 36, C, facing p. 73; 37, 38. FIGURES 8, 9, 10,*c*.)

EXPLANATION OF PLATES 37, 38.—Pl. 37, *Nymphaea americana*, in Flathead Lake, Montana. Photographed by Prof. M. J. Elrod. Pl. 38, fruit of *Nymphaea americana*, collected at Springfield, Massachusetts, by Mr. Frederick Knab. Natural size.

Specimens examined:

Formalin—

CANADA: Port aux Basques, Newfoundland, 1901, *F. W. True;* 150-mile House, Cariboo, British Columbia, 1901, *A. C. Brooks;* near Toronto, 1901, *J. H. Fleming;* Lake Joseph, Muskoka, Ontario, 1902, *Fleming;* Ottawa, 1902, *Fletcher;* Pointe á Pic, 1902, *D. G. Elliott;* St. Clair River near Walpole, Ontario.

MAINE: Maneskootuck, Rangeley, 1901, *F. S. Dickson;* Green Lake, 1901, *E. E. Race;* Cape Niddick, 1901, *Charles Bullard;* Little Sebago Lake; Birch Brook, Eagle Lake Chain, Aroostook County, 1903, *W. C. Kendall.*

NEW HAMPSHIRE: Intervale, 1901, *G. M. Allen;* Mud Pond, tributary to first Connecticut Lake, Coos County, 1904.

VERMONT: Lake Champlain, 1901, *Eggleston.*

MASSACHUSETTS: Springfield, 1901, *Frederick Knab;* Wareham, 1901, *O. Bangs;* Stockbridge, 1903, *J. A. Loring.*

CONNECTICUT: Pembroke Lake near Bridgeport, 1902, *G. A. Meeker.*

RHODE ISLAND: Lymansville, 1901, *Angell & Cash;* without locality, 1900, *Mearns.*

NEW JERSEY: New Bedford, Monmouth County, 1902, *M. W. Lyon;* Clementon, 1902, *S. N. Rhoads;* Spring Lake, 6 miles south of Ocean Grove, 1902, *Lyon.*

PENNSYLVANIA: Three and one-half miles east of Lopez, Sullivan County, 1901, *Witmer Stone;* pond near Lehigh River at Lehigh Gap, Lehigh County, 1901, *J. A. G. Rehn;* Shady Nook.

NEW YORK: Chautauqua Lake, 1901, *M. Schlegel;* Peterboro, 1901, *B. D. Miller;* Piseco, 1901, *W. L. Ralph;* Lake Titus, 1901, *E. W. Nelson;* South Mountain Lake, Catskill Mountains, 1903, *Shull;* Fish Creek, Oneida Lake, 1901, *Maxon;* Thousand Islands, 1902, *Maxon;* Machias, 1901, *F. E. Ferris;* Sodus Bay, 1901, *G. B. Turner;* Smiths Pond, *B. D. Gilbert.*

OHIO: Sandusky, 1902, *W. A. Kellerman;* Sandusky, 1903, *M. T. Cook;* Squaw Bay, Put in Bay Harbor, 1901, *U. S. Fish Commission.*

MICHIGAN: Belle Isle Park, Detroit, 1907, *Farwell;* St. Clair Flats, 1901, *U. S. Fish Commission.*

WISCONSIN: Lake Superior, 1901, *H. V. Ogden;* Green Bay, 1903, *J. H. Schuette;* Upper Nemahin Lake, Waukesha County, 1901, *H. V. Ogden;* Milwaukee, 1902, *Ogden;* West Superior, 1902, *Charles Bullard.*

INDIANA: Wolf Lake, 1903, *Shull.*

IOWA: Manchester, 1901, *R. S. Johnson.*

MINNESOTA: Lake Itasca, 1902, *T. S. Robertson;* St. Louis River near Duluth, 1901, *L. E. Balbridge.*

MONTANA: Big Fork, 1902, *M. J. Elrod;* Big Fork, 1901, *W. C. Barr.*

Specimens examined—Continued.

Dry—

CANADA: On an island of the Simpson Group 40 miles northeast of Fort Resolution, Mackenzie Territory, 1903, *Preble* 242; St. Francis River, Quebec, 1902, *Eggleston* 3011; Canso, Nova Scotia, 1901, *Fowler;* Golden Lake, Renfrew County, Ontario, 1899, *Umbach;* Gananoque, Ontario, 1887, *Fowler;* Cache Lake, Algonquin Park, Ontario, 1900, *Macoun* 21697; Port aux Basques, Newfoundland, 1901, *A. W. Prentiss;* North Sidney, British Columbia, 1883, *Macoun* 8 (Gray); pond near Whitbourne, Newfoundland, 1894, *Robinson & Schrenk* (Gray); Seven Islands, 1907, *C. B. Robinson* 889 (N. Y.); Channel,

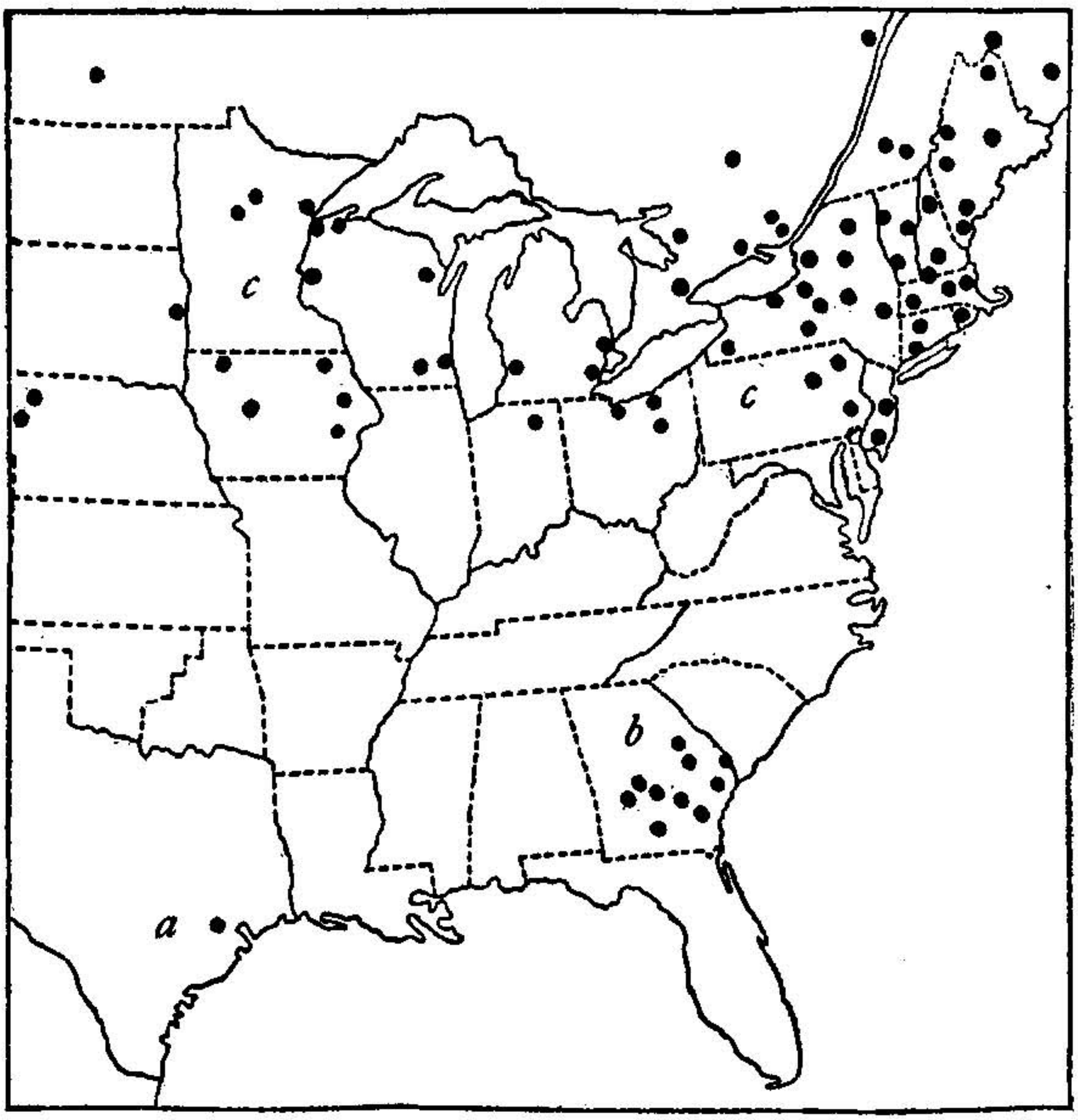

FIG 10.—Map showing distribution of (*a*) *Nymphaea puberula;* (*b*) *N. fluviatilis;* (*c*) *N. americana.*

Newfoundland, 1901, *Howe & Lang* 870, 944 (N. Y.); near Digby, Nova Scotia, 1901, *Howe & Lang* 313 (N. Y.); St. Jean l'Evangeliste, Nouvelle, Quebec, 1904, *Collins & Fernald* (Gray); Belleville, Ontario, 1883, *Macoun* 95; Cross Lake, Renfrew County, Ontario, 1899, *Umbach;* Killarney, Manitoba, 1896, *Macoun,* (Greene); Kaministigma River, 1889, *Dr. & Mrs. Britton* (C.); Fredericton, New Brunswick, 1880, *Fowler.*

Specimens examined—Continued.

Dry—Continued.

MAINE: Valley of Saint Francis River, 1902, *Eggleston & Fernald* (Gray); Pettiquaggamas Lake, Aroostook County, 1893, *Fernald* 9; Orono, Penobscot County, 1897, *Fernald* (N. E.); Industry, Franklin County, 1894, *Fernald* (N. E.); Manchester, 1874, *Scribner* (N. E.); West Auburn, 1896, *Merrill* 4429 (N. E.); Westbrook, 1899, *Ricker* 605; Clear Pond, Pleasant Ridge Township, Somerset County, 1906, *Chamberlain;* Winthrop, 1862, *Sturtevant.*

NEW HAMPSHIRE: Frost Pond, Jaffrey, 1898, *B. L. Robinson* 495 (Gray); Whitefield, Coos County, 1896, *Deane* (N. E.).

VERMONT: Johnson, 1893, *Grout* (C.); Willoughby, 1892, *Rusby* (C.); La Plot River, Shelburn, 1879, *Pringle;* Barnumville, Manchester, 1898, *M. A. Day* (Gray).

MASSACHUSETTS: Vicinity of Cambridge, 1891, *Underwood* 2694 (C.); without locality, 1865, *Gray;* South Framingham, 1888, *Sturtevant;* Dartmouth, 1889, *Sturtevant;* Ashland, 1879, *Morong;* Waverly, 1895 (Gray); Melrose, 1880, *R. Frohock* (N. E.); Malden, 1872, *H. L. Wordy* (N. E.); Beaver Brook Reservation, west of Kame, 1896, *Deane* (N. E.); Eastham, 1907, *F. S. Collins* (N. E.); Stockbridge, Berkshire County, 1902, *R. Hoffmann* (N. E.); Stony Brook, 1895, *W. H. Manning* (N. E.); Great Barrington, 1894, *Pollard.*

CONNECTICUT: West Goshen, 1891, *Underwood* 3208, 3210, 3210a (C.); Southington, 1899, *L. Andrews* (N. E.); Tranquility Farm, Middlebury, 1896, *W. M. Shepardson* (N. E.); New Haven, 1884, *Safford* 164.

NEW JERSEY: Swartzwood Lake, 1906, *C. S. Williamson* (Phila.); New Bedford, Monmouth County, 1902, *M. W. Lyon;* Egg Harbor City, 1882, *J. H. Redfield* 243; Inskip, 1894, *Brinton & Keller;* Mays Landing, *Isaac Burk.*

PENNSYLVANIA: Pocono Plateau, 1904, *Harshberger* (Phila.); Shady Nook, Sullivan County, 1901, *Stewardson Brown* (Phila.).

NEW YORK: Steeres Pond, Preston, 1886, *F. V. Coville;* South Mountain Lake, Catskills, 1903, *Shull;* Smiths Pond, Litchfield, Herkimer County, 1903, *House;* Peterboro, Madison County, 1904, *G. S. Miller;* Brisben Station, Chenango County, 1887, *F. V. Coville;* Geneganslet Lake, McDonough, 1886, *F. V. Coville;* South Bay, Wellesley Island, Jefferson County, 1902, *Robinson & Maxon* 74; Troy, *Schweinitz Herbarium;* Gorham, *Torrey;* Raquette Lake, 1896 (C.); Lake Ontario, 1892, *Britton* (C.); Great Otter Lake, Lewis County, 1884, *O. R. Willis* (C.); Sylvan Beach, Oneida County, 1900, *House;* Little York, Cortland, 1905, *G. T. Hastings;* South Bay, eastern end of Oneida Lake, 1910, *Maxon* 4616.

OHIO: Sandusky Bay, 1902, *J. H. Schuette;* Sandusky, 1902, *Kellerman;* Black River, Lorain County, 1892, *J. W. Beach;* Sandusky, 1903, *Mel T. Cook;* Fox Lake, Wayne County, 1899, *Selby & Duvel.*

WISCONSIN: Mirror Lake, 1903, *Eggert;* Waupaca, 1907, *E. F. Garerche;* St. Croix Falls, Polk County, 1899, *Baker* (Gray); near Milwaukee, 1902, *H. V. Ogden;* De Pere, 1888, *T. S. Kellogg.*

MICHIGAN: Iron River, 1902, *Rydberg* (N. Y.); west end of Swan Lake, Allegan County, 1902, *Wight* 5; Bloody Run, Detroit, 1865, *Bigelow* (Mo.); Parkhouse Marsh, Detroit, 1866, *Bigelow* (Mo.); Connors Creek, Detroit, 1866, *Bigelow* (Mo.); Belle Isle, Detroit, 1865, *Bigelow* (Mo.).

MINNESOTA: Silver Lake, 1887, *Cratty;* Lake Itasca, 1902, *T. S. Roberts;* Lake Kilpatrick, Cass County, 1893, *Ballard;* Minnetonka, 1891, *Sandberg* 631.

NEBRASKA: Weigand, 1893, *Fred Clements* 2686; Lake Region of Grant County, 30 miles south of Whitman in Swan Lake, 1893, *Rydberg* 1650; Cherry County, 1892, *Smith & Pound* 168 (Mo.).

Specimens examined—Continued.

Dry—Continued.

IOWA: Iowa City, *Hitchcock* (Mo.); Hamilton County, 1891, *P. H. Rolfs* (Mo.); Armstrong, Emmet County, 1887, *Cratty* (Mo.); Iowa and Minnesota Line, 1897, *Pammel* 520 (Mo.); Winnesheik County, 1895, *Fitzpatrick* (Mo.).

SOUTH DAKOTA: White, 1893, *Thornber;* Six Mile Creek, west of White, 1902, *A. G. Johnson;* White, 1893, *T. A. Williams;* Aurora Creek southeast of Brookings, 1904.

MONTANA: Rost Lake, 1901, *MacDougal* 652; Columbia Falls, 1892, *R. S. Williams* 869.

For comparison of this plant with *Nymphaea advena* see page 88.

4. **Nymphaea fraterna** Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, no. 441399, collected in Toms River, New Jersey, August 6, 1903, by M. W. Lyon.

DISTRIBUTION: East-central New Jersey.

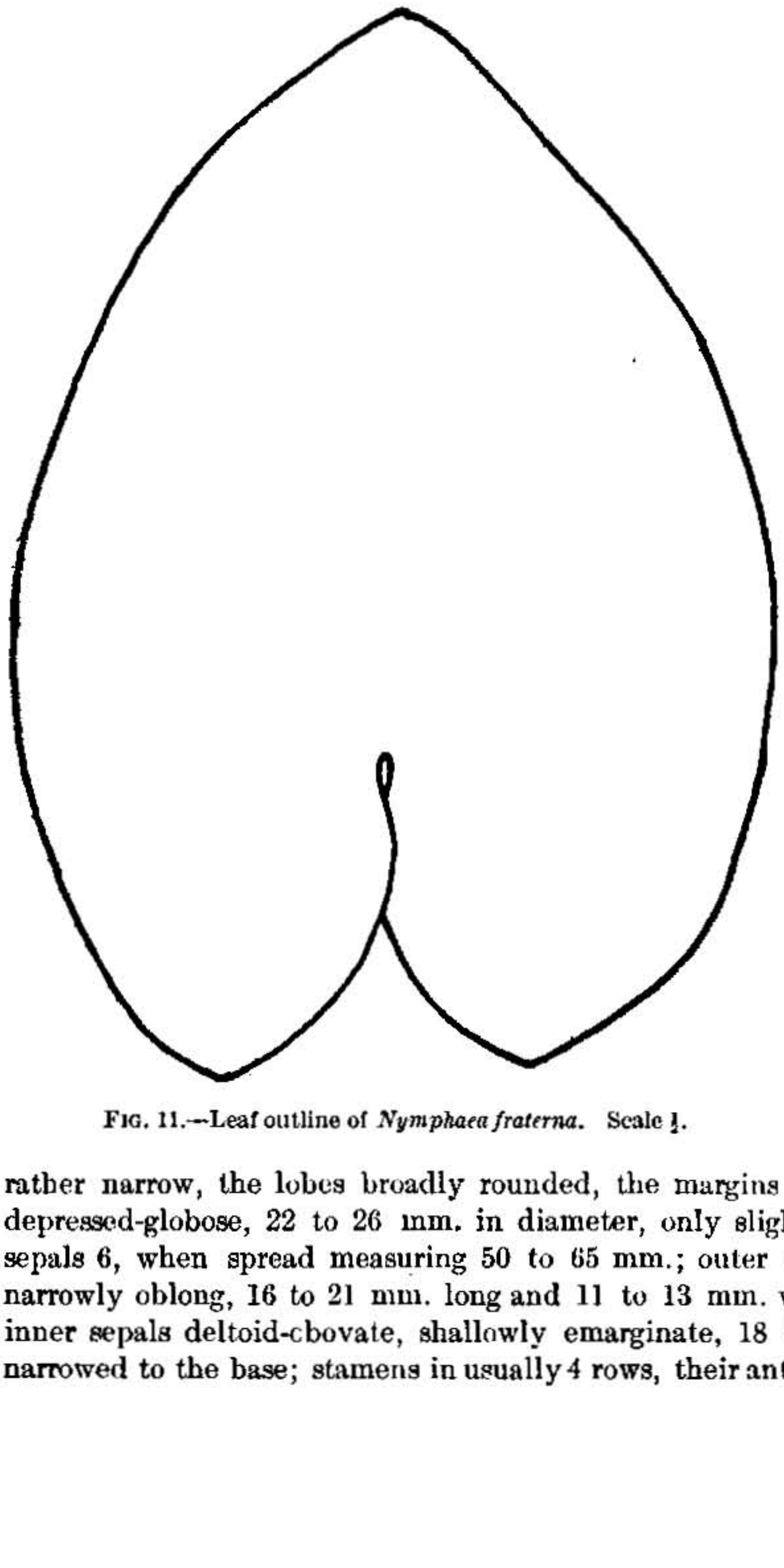

FIG. 11.—Leaf outline of *Nymphaea fraterna*. Scale ¼.

DESCRIPTION.

Petioles flattened, with a median ridge along the inner side, glabrous; floating leaf blades oblong-ovate or ovate, 10 to 22 cm. long and 8 to 15 cm. wide, broadest at or below the middle, conspicuously narrowed and acutish towards the apex, rather thin, glabrous; sinuses open and very narrow, or closed and the lobes partly overlapping, 20 to 65 mm. deep, the lobes rounded; submersed leaves very thin and delicate, numerous, broader than the floating ones, broadly ovate or almost orbicular in outline, 85 to 155 mm. long and 70 to 135 mm. wide, broadly rounded or slightly narrowed at the apex, the sinus 25 to 50 mm. deep, usually open, rather narrow, the lobes broadly rounded, the margins somewhat plicate; flowers depressed-globose, 22 to 26 mm. in diameter, only slightly depressed at the base; sepals 6, when spread measuring 50 to 65 mm.; outer ones thin, glabrous, rather narrowly oblong, 16 to 21 mm. long and 11 to 13 mm. wide, rounded at the apex; inner sepals deltoid-obovate, shallowly emarginate, 18 to 23 mm. long, gradually narrowed to the base; stamens in usually 4 rows, their anthers slightly longer than the

filaments; petals narrowly oblong, truncate, 6 or 7 mm. long; fruit ovoid, gradually narrowed above to a short neck, 21 to 30 mm. high and 17 to 20 mm. in diameter, inconspicuously ribbed above, almost smooth near the base; rim of the disk 3 mm. high, divergent or erect; disk 12 to 14 mm. in diameter, orbicular, entire or slightly crenate, the crater usually shallow, 2 to 4 mm. deep; rays 11 to 16, usually 14, linear, 3 or 3.5 mm. long, narrow, extending to within 1 or 2 mm. of the edge of the disk, distinct, the center 3 or 4 mm. in diameter, smooth; seeds 3.5 to 4 mm. long, ovoid, pointed, with an acutish and rather conspicuous raphe. (PLATES 35, B, facing p. 72; 36, D, facing p. 73. FIGURES 11, 12, 13, *b*.)

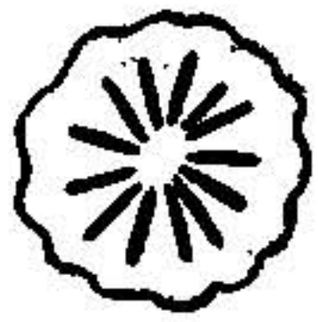

FIG. 12.—Stigmatic pattern of *Nymphaea fraterna*. Natural size.

Described from material preserved in formalin collected by W. M. Lyon, jr., in Toms River, New Jersey, August, 1902, July 27, 1903, August 6, 1903, and August 15, 1902. Dried specimens collected August 6, 1903, are mounted on sheets 441395 to 441399, inclusive, in the National Herbarium.

FIG. 13.—Map showing distribution of (*a*) *Nymphaea ozarkana;* (*b*) *N. fraterna;* (*c*) *N. chartacea.*

Additional material seen:

In formalin—

NEW JERSEY: Pemberton, June 24, 1900; Speedwell, Burlington County, June 20, 1901, *Witmer Stone.*

Additional material seen—Continued.

Dry—

NEW JERSEY: Toms River, July 26, 1903, *Lyon;* same locality, August 11, 1902, *Lyon;* New Bedford, Monmouth County, August 14, 1902, *Lyon;* Forked River, May 29 to June 2, 1896, collected on an excursion of the Torrey Botanical Club.

This species comes from a region long known to botanists as one producing many interesting plants. Although closely related to *Nymphaea americana* it seems amply distinct in its much smaller flowers, smaller, greenish fruit, pointed leaves, smaller seeds, and numerous and conspicuous submersed leaves. While submersed leaves are occasionally found in *N. americana* they are never so numerous or conspicuous as in the New Jersey plant.

5. Nymphaea advena Ait.

Nymphaea advena Ait. Hort. Kew. **2:** 226. 1789; G. S. Miller, Proc. Biol. Soc. Washington **15:** 12. 1902; Small, Fl. Southeast. U. S. 456. 1903, in part; Britton, Man. ed. 2. 390. 1908, in part; Robins. & Fern. in A. Gray, Man. ed. 7. 390. 1908.

Nymphaea arifolia Salisb. Ann. Bot. **2:** 71. 1806.

Nuphar advena Ait. Hort. Kew. ed. 2. **3:** 295. 1811.

Nuphar advena tomentosum Torr. & Gr. Fl. N. Amer. 1: 58. 1838.

TYPE LOCALITY: Vicinity of Philadelphia, Pennsylvania.

DISTRIBUTION: Eastern Wisconsin and Southern Michigan and New York to eastern Nebraska and Kansas, southern Missouri, Kentucky, and North Carolina. Northern limit coinciding with that of Upper Austral zone.

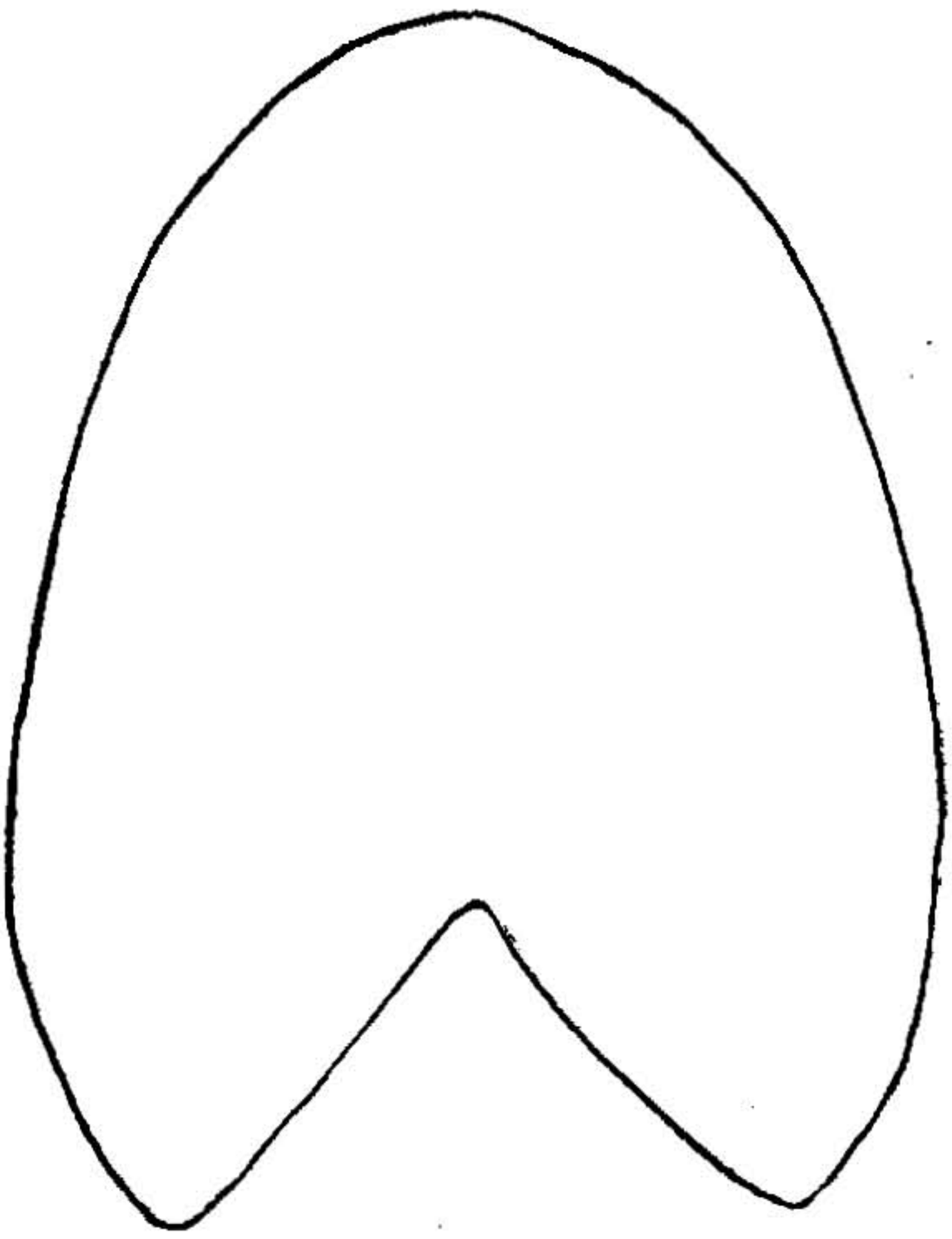

FIG. 14.—Leaf outline of *Nymphaea advena*. Scale ¼.

DESCRIPTION.

Leaves erect, usually borne above the surface of the water, occasionally floating in deep water; blades ovate to rounded oblong or oval, rather thick and firm, oil green, glabrous, 16 to 33 cm. long and 14 to 25 cm. broad, usually very broadly rounded at the apex; sinus 4.5 to 10 cm. deep, open, the lobes usually diverging at an angle of about 80°; lobes mostly triangular, often acutish; peduncles stout, glabrous; petioles stout, subterete, glabrous; flowers depressed-globose, 30 to 40 mm. in diameter, about 23 mm. high when normally spread, the perianth when spread measuring about 80 mm.; sepals usually 6, the 3 outer broadly ovate, about 35 mm. long and 25 mm. wide, obtuse, the three inner suborbicular, about 35 mm. long and 45 mm. wide,

PLATE 39.

NYMPHAEA ADVENA AIT., IN MONTEERS POND, KNOX COUNTY, INDIANA.

A. EARLIER VERNAL STAGE OF NYMPHAEA ADVENA AIT., FOUR MILE RUN, VIRGINIA.

B. LATER VERNAL STAGE OF NYMPHAEA ADVENA AIT., FOUR MILE RUN, VIRGINIA.

their bases abruptly narrowed to a short claw about 6 mm. wide, truncate or retuse at the apex; petals about 20, cuneate-oblong, 8 mm. long and 3 to 5 mm. wide, truncate or retuse at the apex; stamens usually in 7 rows, varying from 5 to 8, about 35 to the row; filaments cuneate-linear, 10 mm. long, 2 mm. broad at the tip; anthers a little more than half as long as the stamen; outer sepals rich oil green outside, lighter within and occasionally but rarely tinged with red; inner sepals clear yellow throughout except at the tips, there tinged with green, the inner side occasionally tinged with purplish red;[1] petals yellow like the inner sepals, usually tinged with red; filaments dull red except the exposed tip, this yellow; anthers and pollen yellow; stamens occasionally clear yellow throughout, all becoming dull red throughout in age; fruit subglobose, about 40 mm. high and 50 mm. in diameter (the height usually less than the diameter, but this character not constant), with conspicuous longitudinal ribs extending its entire length; stigmatic disk orbicular, entire, faintly undulate, strongly concave; stigma rays distinct, varying in number from 9 to 23, but usually 15, 16, 17, or 18, 7 to 8 mm. in length and about .75 mm. wide, extending to within about 2 mm. of the edge of the disk, without a median furrow; capsule oil green, the stigmatic region abruptly lighter and more yellowish; seeds elliptical or obovate, slightly flattened laterally, with a prominent raphe, 6 mm. long, greater diameter 5 mm., lesser diameter 4 mm. (PLATES 35, C, facing p. 72; 36, E, facing p. 73; 39, 40. FIGURES 14, 15, 16, *b*.)

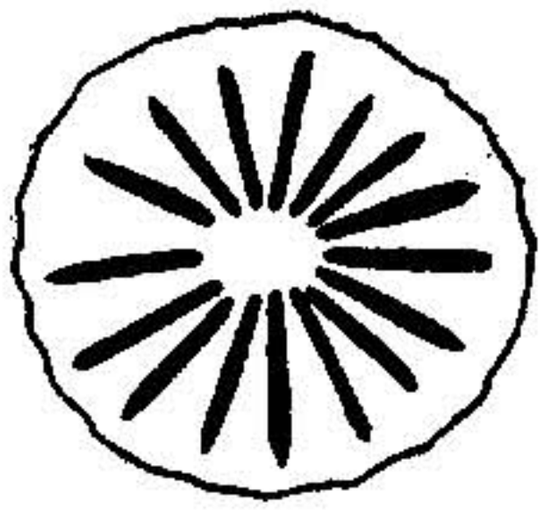

FIG. 15.—Stigmatic pattern of *Nymphaea advena*. Natural size.

EXPLANATION OF PLATES 39, 40.—Pl. 39, *Nymphaea advena*, at Monteers Pond, Indiana, photographed by Mr. Robert Ridgway. Pl. 40, vernal stage of *Nymphaea advena*, at Four Mile Run, Alexandria County, Virginia; photographed by Mr. Gerrit S. Miller, jr., (A) April 20, (B) May 4, 1902.

Specimens examined:

In formalin—

NEW YORK: Lake Grove, Long Island, 1901, *A. H. Howell;* Sing Sing, 1901, *E. Acker;* near Croton, 1901, *Van Cortlandt*.

NEW JERSEY: Whale Pond Creek, Monmouth County, 1902, *M. W. Lyon;* Milburn, Essex County, 1902, *Lyon;* arm of Newton Creek, Collingswood, Camden County, 1902, *S. N. Rhoads;* Centerton, 1900, *G. S. Miller;* Haddonfield, 1907, *Rhoads*.

PENNSYLVANIA: Erie, 1906, *S. E. Bacon;* same locality, 1902, *Bacon;* Philadelphia, 1901, *Witmer Stone;* Meadville, 1902, *H. C. Kirkpatrick*.

MARYLAND: Pocomoke City, 1902, *W. P. Hay;* Havre de Grace, 1902, *Shull*.

VIRGINIA: Holmes Run, Fairfax County, 1901, *G. S. Miller;* Luray, 1901, *Lewis Willis;* Clifton, 1901, *Miller;* Four Mile Run, Fairfax County, 1901, *Miller*.

WEST VIRGINIA: Marlinton, 1902, *W. B. Kellerman*.

NORTH CAROLINA: Raleigh, 1901, *Brimley Brothers;* Hendersonville, 1901, *Clayton*.

TEXAS: Fort Clark, 1901; Del Rio, 1901, *Franks*.

OHIO: Buckeye Lake, Licking County, 1902, *W. A. Kellerman;* Cadiz Junction, Harrison County, 1902, *W. A. Kellerman;* Sandusky, 1903, *M. T. Cook*.

INDIANA: Merrillville, 1903, *Shull;* Winona Lake, 1902, *C. A. King*.

ILLINOIS: Mount Carmel, 1901, *Schneck*.

MICHIGAN: Northville, 1901, *U. S. Fish Commission;* Washtenaw County, *J. B. Steere*.

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[1] Among 137 flowers collected at Four Mile Run, Virginia, May 18, 1902, there were 16 with purplish-blotched sepals, 121 with red on stamens, and none with red on the disk.

Specimens examined—Continued.

Dry—

NEW YORK: Ponds near New York, *M. Ruger* (Greene); Dougan Hills, Staten Island, 1890, *Britton* (C.); Valley Stream, Long Island, 1903, *L. T. Hanks* (N. Y.); Van Cortlandt Swamp, 1893, *Pollard;* Catskills, 1903, *Shull;* without locality, 1841, *H. R. Browne.*

PENNSYLVANIA: Schuylkill River below South Street Bridge, Philadelphia, 1888, *McElwee* 301 (Phila.); Neshonning, Bucks County, 1891, *McElwee* (Phila.); McCalls Ferry, York County, 1904, *Rose & Painter* 8167; Meadville, 1902, *H. C. Kirkpatrick;* Mahoning, Carbon County, 1906, *Krautter;* Conewago Creek, eastern Pennsylvania, 1898, *C. W. Eisenhower* (Mo.); in fluvio Lecha Pennsylvaniae, 1832, *C. J. Moser* (Mo.); York, 1895, *Glatfelter* (Mo.).

NEW JERSEY: Newton Creek near Collingwood, Camden County, 1902, *S. N. Rhoads;* Milburn, Essex County, 1902, *Lyon;* Springfield, Essex County, near Rahway River, 1902, *Lyon;* Spring Lake near Ocean Grove, 1902, *Lyon;* Lake Hopatcoug, 1890, *Nash* 1004; Belleville, Essex County, 1902, *Lyon;* Delawanna Station below Passaic, 1902, *Lyon;* Clementon, 1902, *Rhoads;* Newark, 1878, *C. H. Harding;* Cedar Swamp, *S. Conrad* (Phila.).

OHIO: Cincinnati, *R. Buchenau* (Phila.); Chapelle Creek, Florence, 1903, *Moseley;* Salem, Columbiana County, 1903, *H. S. Fawcett;* Cadiz Junction, Harrison County, 1902, *W. A. Kellerman* 3882; near Canton, *Nicholas Riehl* (Mo.); Sandusky Bay, 1902, *J. H. Schuette;* near Salem, 1906, *Fawcett.*

MICHIGAN: Detroit, 1855, *Bigelow* (Mo.); Coldwater, 1877, *Milligan;* Bloody Run, Detroit, 1866, *Bigelow* (Mo.); Connors Creek, Detroit, 1866, *Bigelow* (Mo.).

INDIANA: Sanford Lake, Orange Township, Noble County, 1905, *Deam* 301; Lost Lake, Marshall County, 1903, *Paul Bartsch;* Merrillville, 1903, *Shull;* Winona Lake, 1902, *C. A. King;* Lake Maxinkuckee, 1900, *Scovell & Clark* 1261.

ILLINOIS: Bluffs Lake, 1876, *Eggert;* north end of Clover Lake, 1888, *J. W. Davie* (N. Y.); DuPage River near Naperville, 1897, *Umbach;* near Woodlawn, Washington County, 1898, *Eggert* (Mo.); Iuka, 1904, *Jensen* (Mo.); lakes in the American Bottom opposite St. Louis, 1838, *Engelmann* 771 (Mo.).

MISSOURI: Near Poplar Bluff, 1893, *Eggert* (Mo.); St. Francois River, Dunklin County, 1897, *Trelease* 13 (Mo.); Carterville, 1906, *E. J. Palmer* 888; Barton County, *Broadhead Herbarium* (Mo.).

WISCONSIN: Delavan, 1907, *Ned Hollister;* Green Bay, 1903, *J. H. Schuette.*

NEBRASKA: Wiegand, 1893, *Fred Clements 2686.*

KANSAS: Chautauqua County, 1896, *Hitchcock* 607.

KENTUCKY: Bear Creek, Edmonson County, 1901, *Miss Price.*

DISTRICT OF COLUMBIA: Eastern Branch, 1873, *Ward* 30; without locality, 1869, *H. Brummell;* without locality, 1885, *McCarthy;* Jackson City, 1897, *Steele;* Washington, 1878, *Chickering* (Mo.).

MARYLAND: Patuxent, Anne Arundel County, 1905, *House;* Ardwick, Prince George County, 1903, *Lyon;* 9 miles southeast of Pocomoke City, 1902, *W. P. Hay.*

VIRGINIA: Ashland, *De Chalmot;* Alexandria, 1874, *George Vasey;* Ocean View, Norfolk County, 1898, *Kearney* 1464; Dismal Swamp, 1898, *Kearney* 1611; Great Falls, 1902, *A. H. Howell;* Passage Creek, Warren County, 1897, *G. S. Miller;* Washington Canal near Duke, Dismal Swamp, 1893, *Boettcher.*

NORTH CAROLINA: Swamps near Hendersonville, 1897, *Biltmore Herbarium* 4231a.

TEXAS: Devils River, *Mexican Boundary Survey;* Fort Clark, Kinney County, 1893, *Mearns* 1365.

MEXICO: Tamesin River, Alta Mira, Tamaulipas, 1898, *Goldman* 95.

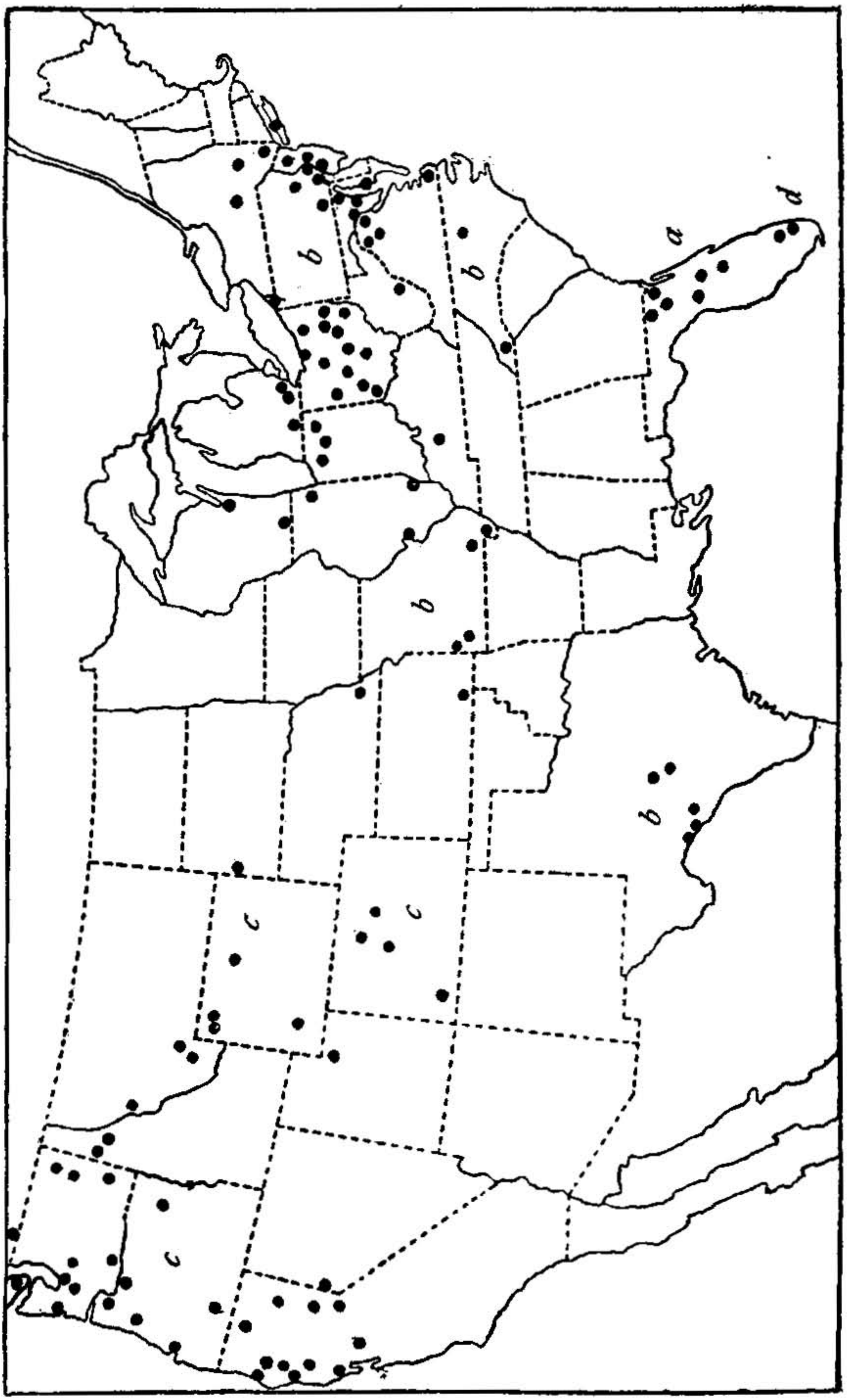

FIG. 16.—Map showing distribution of (a) *Nymphaea advena macrophylla*; (b) *N. advena*; (c) *N. polysepala*; (d) *N. advena erythraea*.

The differences between *Nymphaea advena* and *N. americana* (under the specific name of *variegata*) have been discussed by Miller in the Proceedings of the Biological Society of Washington, but it is worth while to repeat them here. The most striking difference existing between the two is found in the shape of the petioles. In *N. advena* these are subterete; in *americana* they are conspicuously flattened and there is a median ridge, a continuation of the midrib, running along the dorsal surface. This difference in petiole structure has an important effect upon the leaf habit of the two species. When the leaves of *advena* first appear in the spring the petioles are comparatively weak and the blades are often found floating upon the water; sometimes, however, when the plants are growing in mud or in very shallow water, especially when subjected to the action of tides, the blades are erect from the first. Almost invariably in the typical form, as the leaves become older the blades are held stiffly erect. In *americana* the weakness of the petioles, due to their flattening, makes it impossible for the blades to be held erect, hence they are always floating, or, if the water in which they are growing is lowered, they lie flat upon the mud. As a consequence of this difference in habit, *americana*, driven away from very shallow water probably by injury following its drying up, is usually found in comparatively deep water; while *advena*, able to live in ground which is even moderately moist, clings to the shores, or even retreats to the moist meadows bordering streams and ponds.

Habit is not the only respect in which the two plants differ. The outline of the leaf blades is so striking that it is almost always possible to separate the two plants certainly from herbarium material. In *advena* the lobes of the leaves are always pointed while in *americana* they are broadly rounded. The flowers, too, show apparently constant differences. Those of the latter species are usually somewhat larger. In addition to this the flowers of *americana* have the inner surface of the sepals blotched with red near the base, while in *advena* the corresponding region is normally shaded with green, and only in rare instances tinged with red.

The fruit of *americana* is smaller, less strongly ribbed, and is usually tinged with red, while that of *advena* is uniformly green throughout. In the former the most common number of stigma rays is 12 while in the other species it is 16.

The ranges of the two plants, as well, are rather clearly marked. *Nymphaea americana* is confined to the northern part of the United States and eastern Canada, extending as far south as Pennsylvania. *Nymphaea advena* is confined to the southern United States, extending northward into New Jersey and southern New York. In the central States we know less of the ranges but all the data accessible indicate that the ranges there are what we would expect from conditions in the east. Thus it will be seen that *americana* is usually restricted to the Boreal and Transition zones while *advena* occurs in the Upper Austral.

The range of *advena* in the extreme Southern States seems rather peculiar. Perhaps it would appear less so if we had fuller material from all parts of the range. The species is most common from eastern Pennsylvania south through Maryland and Virginia to northern Florida. We have seen no true *advena* from any of the Gulf States west of Florida. The plant has been reported from most of these States, but such material as we have seen is referable to species here described for the first time. In fact we are not certain that the plant appears again until we reach the Rio Grande region of western Texas. Here this same species is found in at least two localities. Fresh material which we have secured offers no means of separating this extreme western plant from the form so common in Pennsylvania and Virginia. Farther south, in Mexico, a plant is found which is apparently the same, though the dried material that we have seen shows that the leaves of the Mexican plant are more acute than those of the typical form.

Still farther west the plant has been reported again, this time in California. We have seen only dried material from that State, hence can not be sure as to its identity. It is probable that it is merely an abnormal form of *Nymphaea polysepala*.

In the National Herbarium there is an interesting specimen collected at Lake Ellis, North Carolina, July 3, 1908, *W. H. Brown* 72. The leaf blades are 11 to 17 cm. long and only 6.5 to 10 cm. wide; in outline they are lance-ovate and very acute at the apex; the sinus is very narrow or closed; flowers 35 mm. in diameter. Unfortunately the material is too scanty to show whether the form is anything more than an individual variation.

Torrey and Gray's subspecies *tomentosum* was based upon a specimen collected by Thomas Nuttall in the vicinity of Philadelphia and labeled by him *Nuphar tomentosum*. We have examined this specimen in the herbarium of the Philadelphia Academy of Science. The "pubescence" consists merely of algæ or some similar low organisms which cover the lower surfaces of the leaves and the petioles. At present a part of the surface has become completely glabrous, owing to the falling away of the artificial covering. This same phenomenon we have observed in other herbarium specimens. In the National Herbarium is a specimen of some cultivated Castalia, which at first glance appears to have coarsely dentate leaves. On closer inspection it is seen that the teeth are masses of algæ which have adhered to the edge of the blade.

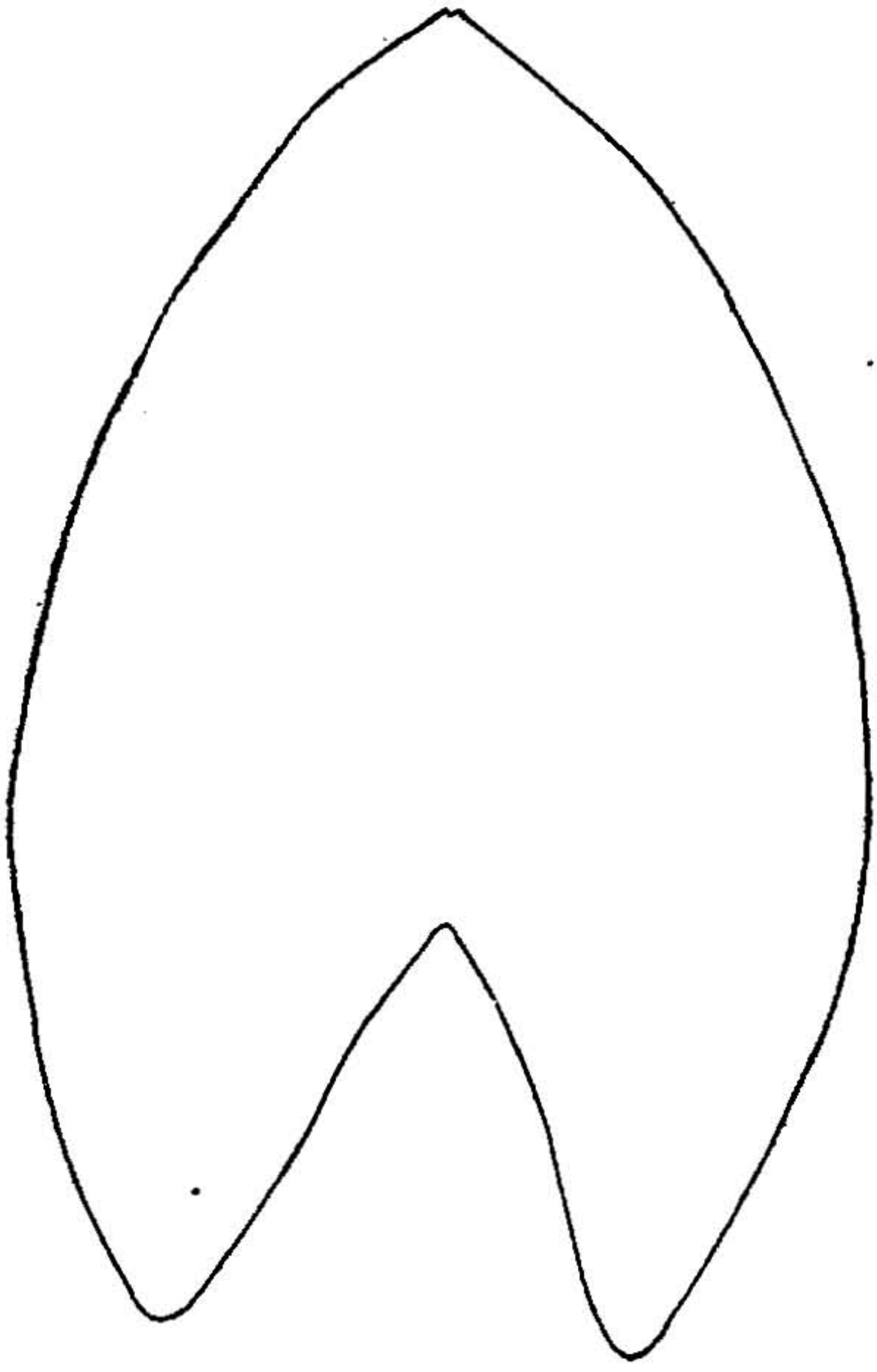

FIG. 17.—Leaf outline of *Nymphaea advena macrophylla*. Scale ½.

5a. Nymphaea advena macrophylla (Small) Miller & Standley.

Nymphaea macrophylla Small, Bull. Torrey Club **25**: 465. 1898.

TYPE LOCALITY: The type, in the herbarium of Columbia College, was collected in August, 1894, in the vicinity of Eustis, Lake County, Florida, by Geo. V. Nash (no. 1751).

DISTRIBUTION: Northeastern Florida.

DESCRIPTION.

Habit of leaves as in *N. advena;* blades 28 to 40 cm. long and 20 to 27 cm. wide, glabrous, ovate, acute or at least acutish, with a V-shaped sinus 8 to 13 cm. deep, the lobes triangular, acutish; no submersed leaves known; flowers depressed-globose, 32

to 38 mm. in diameter, about 22 mm. high; sepals 6, glabrous; the outer ones obovate, rounded, somewhat narrowed at the base, about 32 mm. long and 20 mm. wide; inner sepals thinner, deltoid-obovate, retuse; petals broadly cuneate, 10 mm. long, truncate or retuse; stamens in 6 rows, their anthers almost twice as long as the filaments; color of sepals as in *N. advena;* disk when young of the same color as the sepals; stamens lemon yellow; petals a slightly lighter yellow throughout; fruit narrowly ovoid, 35 mm. high and 25 mm. in diameter in the largest specimens, only slightly constricted above, coarsely ribbed above but almost smooth at the base; stigmatic disk orbicular, 20 mm. in diameter, depressed about 4 mm. in the center, its edge entire or slightly undulate; stigma rays linear, distinct, unequal, with slight traces of a median groove, 6 mm. long, extending to within 2 mm. of the edge of the disk, 10 to 15 in number, usually 12 or 14; body of fruit apple green, the disk chrome yellow. (PLATE 36, F, facing p. 73. FIGURES 16, *a*, 17.)

Specimens examined:

In formalin—

FLORIDA: Santa Fe River, southern edge of Columbia County, 1902, *T. Wayland Vaughan;* Dade City, *H. S. Fawcett;* Whitfield, 1903, *W. E. C. Todd;* Jacksonville, 1901, *Curtiss;* Kissimmee River, 1901, *Mearns.*

Dry—

FLORIDA: Vicinity of Eustis, type; in the Everglades near the unfinished railroad grade between Cocoanut Grove and Cutter, 1903, *Small & Carter* 665 (N. Y.); vicinity of Eustis, 1894, *Hitchcock;* Kissimmee River, 1874, *E. Palmer* 7; Alligator Lake near Lake City, 1907, *H. S. Fawcett;* Jacksonville, 1901, *Curtiss* 6844; Jacksonville, 1894, *Curtiss* 4684; Southport Canal, Kissimmee Valley, *Mearns;* North Santee, 1837, *G. Maurigault* (N. Y.).

CUBA: Without locality, 1860–64, *Wright* 1858 (Gray); Provincia de Pinar del Rio, 1904, *Earle & Wilson* 1656 (N. Y.); San Cristobal, 1905, *M. T. Cook* 130; Herradura, 1905, *M. T. Cook* 132; without locality, 1906, *M. T. Cook* 1, 6 (N. Y.).

Dr. J. K. Small in the original description of this plant compares it with so-called *Nymphaea advena*, pointing out numerous differences. The plant with which it was compared was not *advena* but the northern *Nymphaea americana.* In the herbarium of the New York Botanical Garden at that time there were practically no specimens of *N. advena*, nearly all of those so labeled being *americana.* Evidently the Florida plant is amply distinct from the latter. The description of *Nymphaea advena* in Doctor Small's Flora of the Southeastern United States applies to *N. americana* and the key separates *americana* (under the name *advena*) from *advena* (under the name *macrophylla*). It can readily be seen by examination of the key that the characters used for separating the two species will not hold for separating true *advena* from the Florida plant.

The material at our command, and it seems to be ample, does not warrant us in maintaining *macrophylla* as a separate species. The only difference that we can see lies in the larger size of the Florida plant and the longer, more acute, thicker leaves whose lobes are rather narrower.[1]

It is not certain whether the Cuban specimens belong here. The leaf outline seems to be the same. Fresh material collected in 1910 in the vicinity of Havana by Brother León shows that the outer edge of the stigmatic disk is tinged with a dull purplish red. This color does not extend to the interior of the crater and is very different from the bright geranium red of the following subspecies.

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[1] Under the provisions of the American Code we would be justified in substituting a new name for the somewhat inappropriate *macrophylla.*—G. S. M.

5b. Nymphaea advena erythraea Miller & Standley, subsp. nov.

Type in the U. S. National Herbarium, in formalin, collected at Miami, Florida, by Mr. E. A. Brewer, April 17, 1902.

DISTRIBUTION: Southern Florida.

This appears to differ in no way from typical *macrophylla* except in having the disk of the fruit of a bright geranium red. Our material consists of plants preserved in formalin, collected by E. A. Brewer near Miami, April 17, 1902. Probably the same, although it is impossible to tell from material which has faded in drying, are specimens collected by J. H. Simpson in the Miami River, March 7, 1892 (no. 555). It is possible that some of the specimens listed under *macrophylla* belong here, but we are unable to tell from dried material. (FIGURE 16, *d*.)

6. Nymphaea ozarkana Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, no. 615581, collected by Mr. Otto M. Smith in southern Missouri along White River, in August, 1910. The material was received fresh. Additional material is mounted on sheet no. 615582.

DISTRIBUTION: Ozark region of southern Missouri, probably also in northern Arkansas.

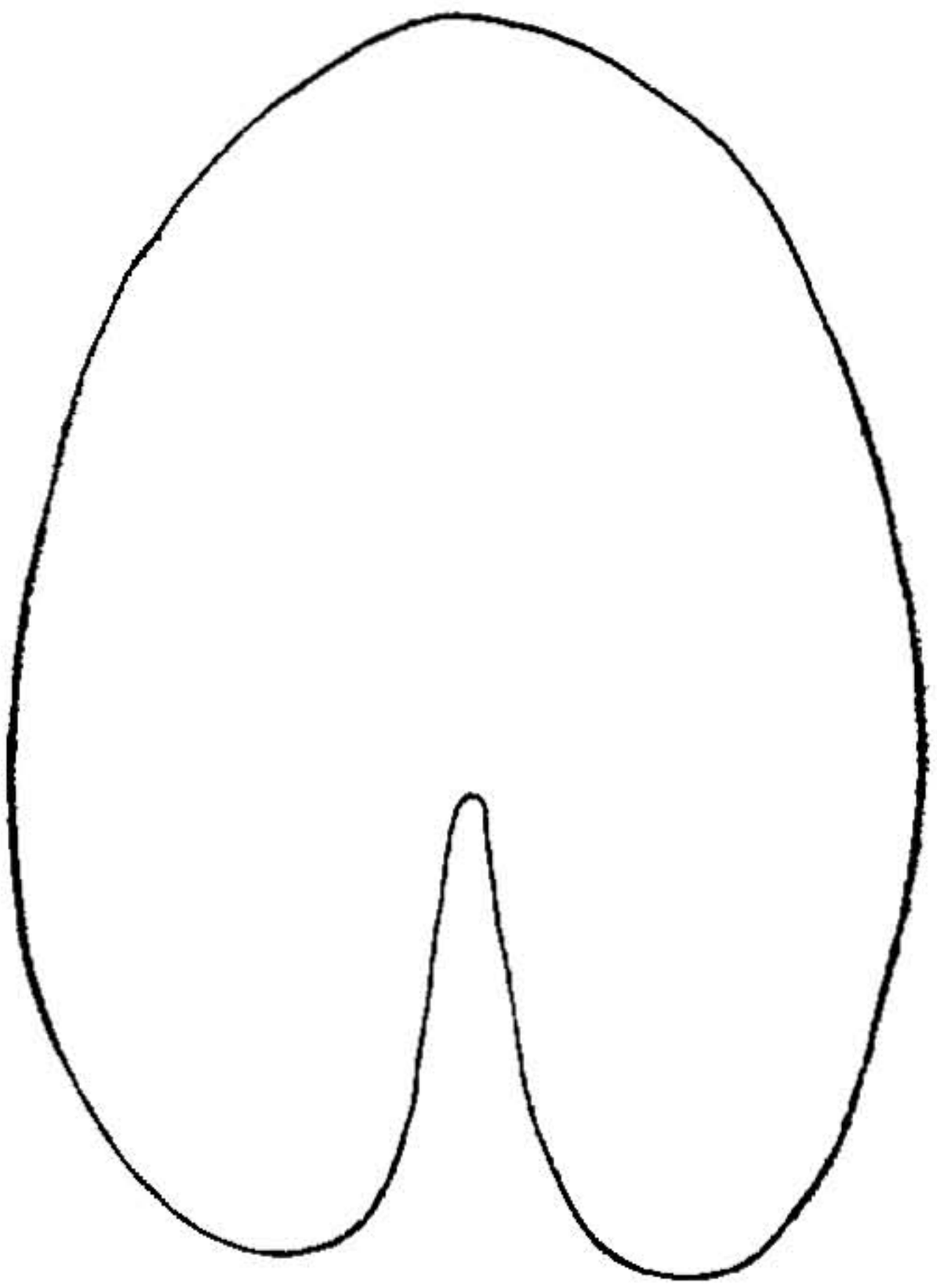


FIG. 18.—Leaf outline of *Nymphaea ozarkana*. Scale ½.

DESCRIPTION.

Rootstock slender; leaf blades apparently floating in most cases but sometimes erect; petioles terete, glabrous, 3 to 11 mm. in diameter; leaves orbicular to oblong, bright yellowish green, glabrous and smooth, 12 to 20 cm. long and 7 to 19 cm. wide, or even larger, those of average size measuring about 14 by 12 cm., broadly rounded at the apex, the sinus about one-third the length of the blade, open, triangular, the lobes deltoid-orbicular or semiorbicular, rounded; peduncles stout, glabrous; flowers depressed-globose, 30 mm. in diameter or less; sepals thin, glabrous, pale green, often yellowish toward the tips, the inner thinner and sulphur yellow, all red within or at least tinged with red; stamens in about 5 rows, the anthers longer than the filaments; stigma rays 10 to 12, broadly linear, distinct, extending to within 1.5 mm. of the edge of the disk; fruit subspherical, abruptly constricted above, 15 to 25 mm. high and 14 to 20 mm. in diameter, smooth; disk 8 to 12 mm. in diameter, slightly depressed, the edges vertical; seeds few, 15 to 30, large, 5 mm. long and 3.5 mm. in the greatest diameter, ovoid, scarcely pointed, with a rather obtuse and conspicuous raphe, pale brown, shining; body of fruit bright yellowish green, the stigmatic disk strongly tinged with orange red. (PLATE 36, G, facing p. 73. FIGURES 13, *a*, 18.)

Additional specimens examined:

MISSOURI: Swan, Taney County, 1897, *Trelease* 14; Little Black River near Pleasant Grove, 1897, *Mackenzie* 370; Swan Creek near Swan, 1899, *Bush* 749; Shannon County, September 16, 1888, *Bush;* Ironton, Iron County, September, 1897, *Colton Russell;* Current River, Carter County, 1897, *Trelease* 12; Mineral Point, Washington County, May 29, 1892, *Eggert;* Greene County, June 2, 1888, *Blankinship.*

All of the specimens listed above, with the exception of the type, are in the herbarium of the Missouri Botanical Garden. We have seen no material elsewhere, chiefly for the reason that so few plants from southern Missouri are to be found in eastern herbaria.

The plant appears to be not uncommon in the Ozark region. All our specimens are Missourian, but the range of the species must extend south into Arkansas. We have seen the plant growing abundantly in the James River south of Springfield, and in the same stream farther south in Christian County. Mr. B. F. Bush has also written us concerning its occurrence in the region.

Most of the specimens cited were labeled in the herbarium as *N. hybrida*, evidently because of the characteristic color of the fruit. There seems to be no very close relationship between the two species, that of the Ozarks being more closely connected with *N. advena* and *N. americana*. From the former it differs in the coloring of the flowers and fruit and in the shorter leaves more rounded and obtuse at the apex; from the second of these species it differs in the terete petioles and the open sinuses of the leaves. With both it disagrees decidedly in the small number of seeds, this being one of the most striking characteristics of our plant.

7. **Nymphaea ludoviciana** Miller & Standley, sp. nov.

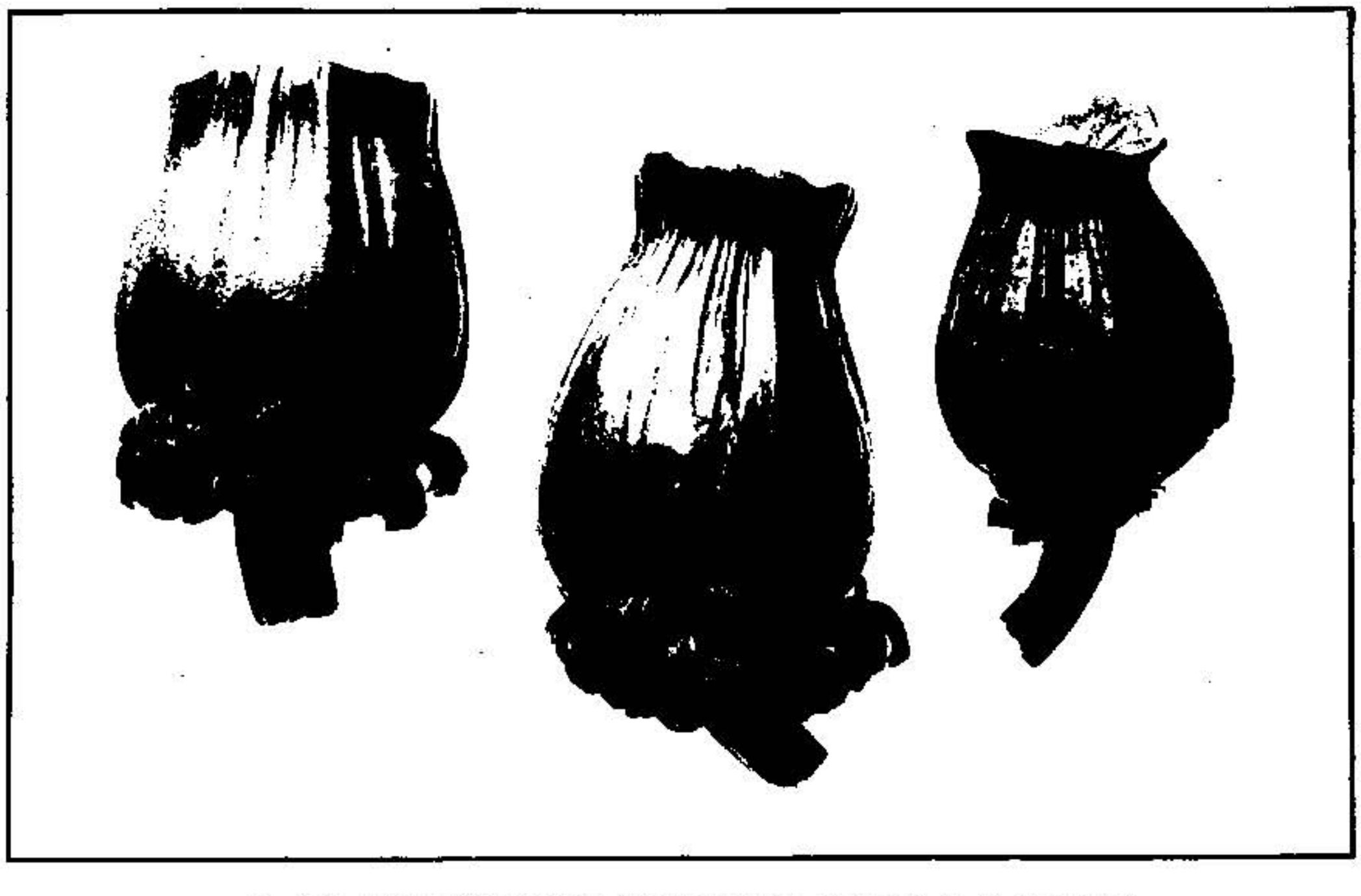
Type in the U. S. National Herbarium, no. 441413; also material preserved in formalin, collected by R. S. Cocks, early in April, 1903, "in stagnant ponds, dug out in making the railroad track, two miles from a place known as North Shore on Lake Ponchartrain, about 27 miles from New Orleans," Louisiana. In the National Herbarium other dried material of this collection is mounted on sheets 441410 to 441414 inclusive.

DISTRIBUTION: Southern Louisiana, near the coast.

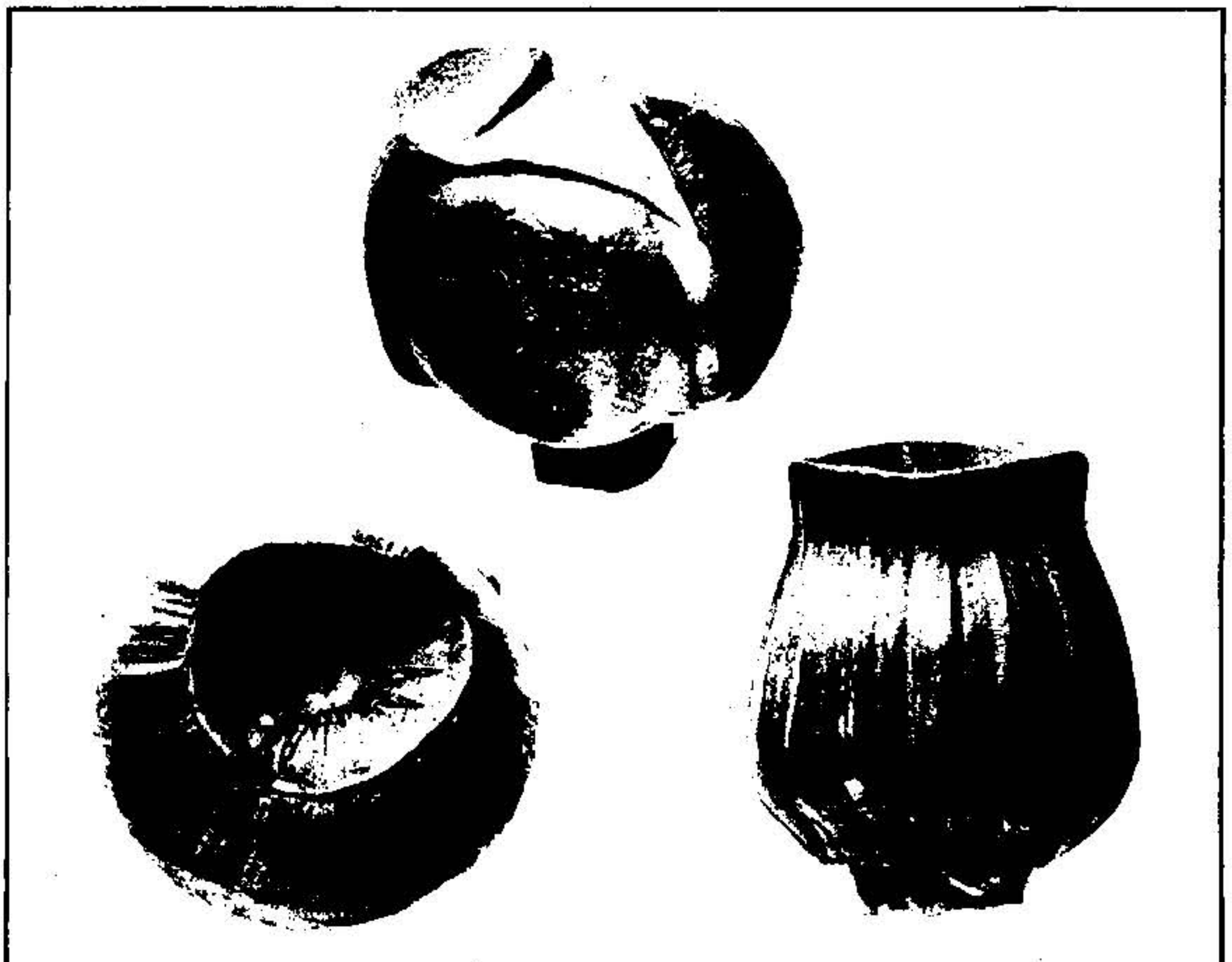
DESCRIPTION.

Leaf blades floating, oblong-ovate, somewhat narrowed towards the apex, rather thin, 29 to 38 cm. long and 20 to 27 cm. wide, widest about the middle; sinuses closed, 9 to 12 cm. deep; lobes rounded, slightly overlapping; blades glabrous throughout like the petioles, the lateral veins 23 to 25 on each side, about parallel for three-fifths their length, then branching dichotomously; petioles and peduncles subterete; flowers depressed-globose, 30 to 35 mm. in diameter, the sepals when spread measuring about 65 mm.; outer sepals oblong or obovate, 25 to 32 mm. long, rounded, somewhat narrowed to the base; inner sepals orbicular to obovate, narrowed at the base into a short claw, slightly longer than the outer ones and thinner; stamens in about 5 rows, the anthers 2 to 3 times as long as the filaments; no mature fruit with the type material but the immature capsules ovoid, 20 mm. high and 25 mm. in diameter, rather conspicuously ribbed; stigmatic disk strongly depressed, oval or almost orbicular, 16 mm. in diameter; stigma rays 13 to 19, usually 17, extending to within 1.5 mm. of the edge of the disk, about 1.3 mm. wide, usually confluent at the base; edge of the disk shallowly crenate; color of sepals rather dark chrome yellow at the apex, becoming green below; petals deep chrome yellow growing paler towards the base; anthers maize yellow, the filaments pale cream; disk deep chrome with its rays light purplish brown. (PLATE 41, B. FIGURES 7, *c*, 19, 20.)

EXPLANATION OF PLATE 41.—A. Fruit of *Nymphaea microcarpa*. B. Fruit and unopened flower of *Nymphaea ludoviciana*. Both natural size.



A. FRUIT OF NYMPHAEA MICROCARPA MILLER & STANDLEY.



B. FRUIT AND UNOPENED FLOWER OF NYMPHAEA LUDOVICIANA MILLER & STANDLEY.

Mr. Andrew Allison, on June 28, 1904, collected in Lake Charles, Louisiana, mature fruit that undoubtedly belongs to this species; its description is as follows:

Subglobose, abruptly constricted above, 35 to 40 mm. high and of the same diameter, smooth at the base, rather conspicuously ribbed above; edge of the disk 5 or 6 mm. high, diverging; disk usually oval, its center mostly umbonate, depressed 6 or 7 mm.; stigma rays linear, or widened at the base, usually slightly confluent at the base, with a distinct median groove; seeds about 4 mm. long and 3 mm. in diameter, the raphe only acutish and not conspicuous.

Additional specimens examined:

Dry—

In bayou, Vermilion, Lafayette County, May 27, 1883, *Langlois* (Greene); near Lake Charles, July 10, 1893, *Langlois* (Greene); vicinity of Lake Charles, 1904, *Andrew Allison* 219 and 323.

The collector writes further: "The plants can nearly always be found in the ponds or very slow-flowing streams of the pine barrens. The leaves are always floating on the surface with stems sometimes a foot or two long. The plant can be found blooming from March to December."

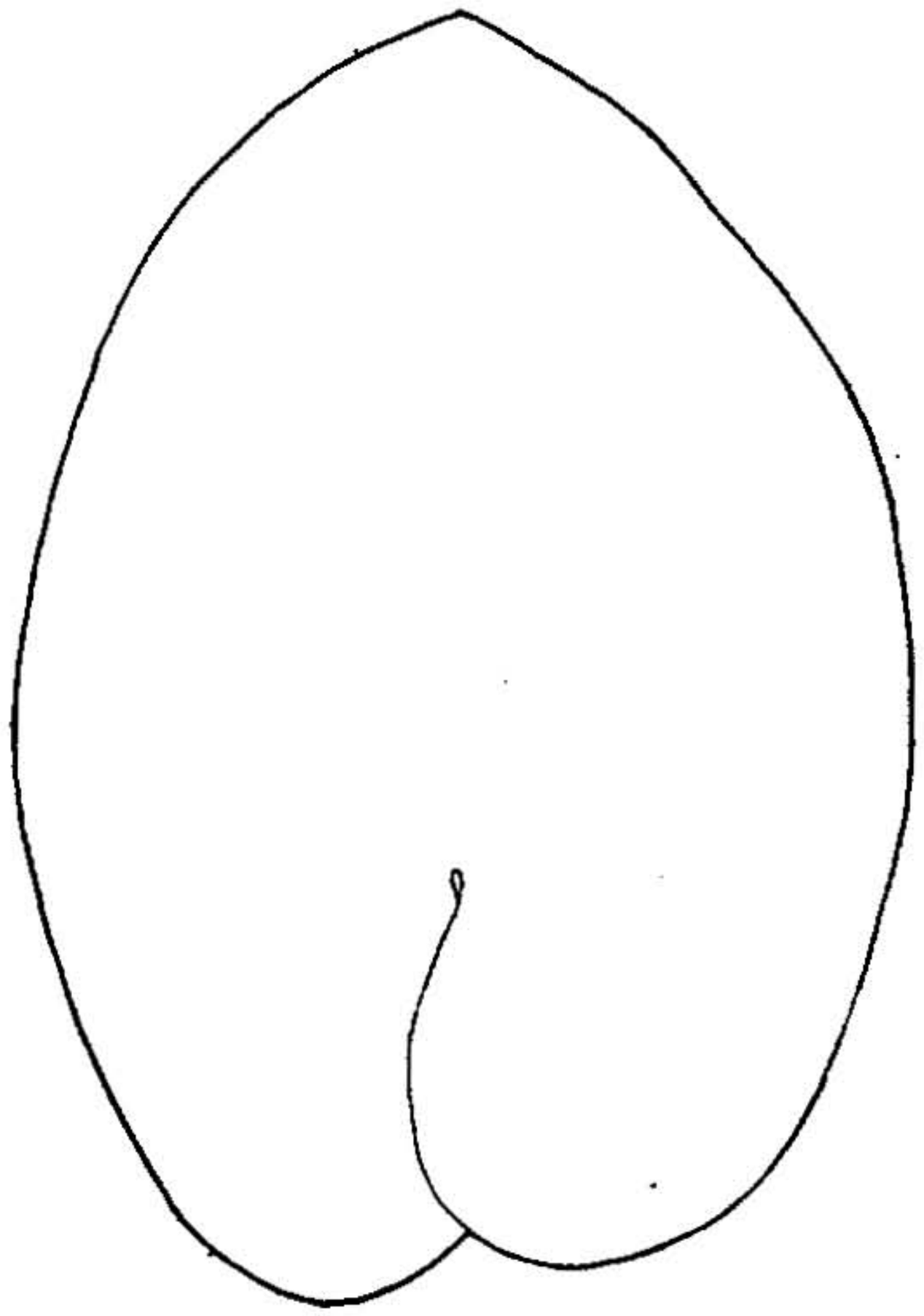


FIG. 19.—Leaf outline of *Nymphaea ludoviciana*. Scale ¼.

Not all the material from the vicinity of New Orleans belongs to this species, as noted elsewhere.

In the National Herbarium there are two sheets of a Nymphaea collected at the south end of Long Pond, Lowndes County, Georgia, September 4, 1902, *Harper* 1611. These specimens represent a plant resembling *N. ludoviciana*, and possibly identical with it. The leaves are floating, the sinuses closed, and their outlines similar to those of this species. Unfortunately Mr. Harper was unable to secure fresh material.

FIG. 20.—Stigmatic pattern of *Nymphaea ludoviciana*. Natural size.

8. **Nymphaea fluviatilis** Harper.

Nymphaea fluviatilis Harper, Bull. Torrey Club **33**: 234. 1906.

TYPE LOCALITY: "In sloughs of the Canoochee River near Groveland, in the northwestern corner of Bryan County," Georgia.

DISTRIBUTION: Coastal plain of Georgia, perhaps also in northern Florida.

DESCRIPTION.

Floating leaves thin, glabrous, 18 to 25 cm. long and 16 to 22 cm. wide, almost orbicular in outline or broadly rounded-oblong, rounded and slightly emarginate at the apex; sinuses 5 to 8 cm. deep, narrow; lobes rounded; submersed leaves very thin and delicate, crisped, similar in outline to the floating ones, 9 to 19 cm. long and 10 to 12 cm. wide; rootstock comparatively small and slender, about 3 cm. in diameter in the specimens examined, the leaf scars oval, about 10 mm. long and 7 mm. wide; flowers depressed-globose, about 25 mm. in diameter and 50 mm. when spread; sepals glabrous, very thin, the outer oblong, 16 to 18 mm. long and 15 or 16 mm. wide, obtuse, very slightly narrowed at the base; inner sepals obovate, slightly longer than the outer, rounded at the apex, narrowed at the base into a claw about 8 or 10 mm. wide and 6 or 7 mm. long; stamens in usually 4 rows; no mature fruit seen, but the immature ovoid, the stigma rays about 12, broadly linear, with a distinct median line, extending almost to the edge of the disk; center of the crater smooth. (FIGURES 10, *b*, 21, 22.)

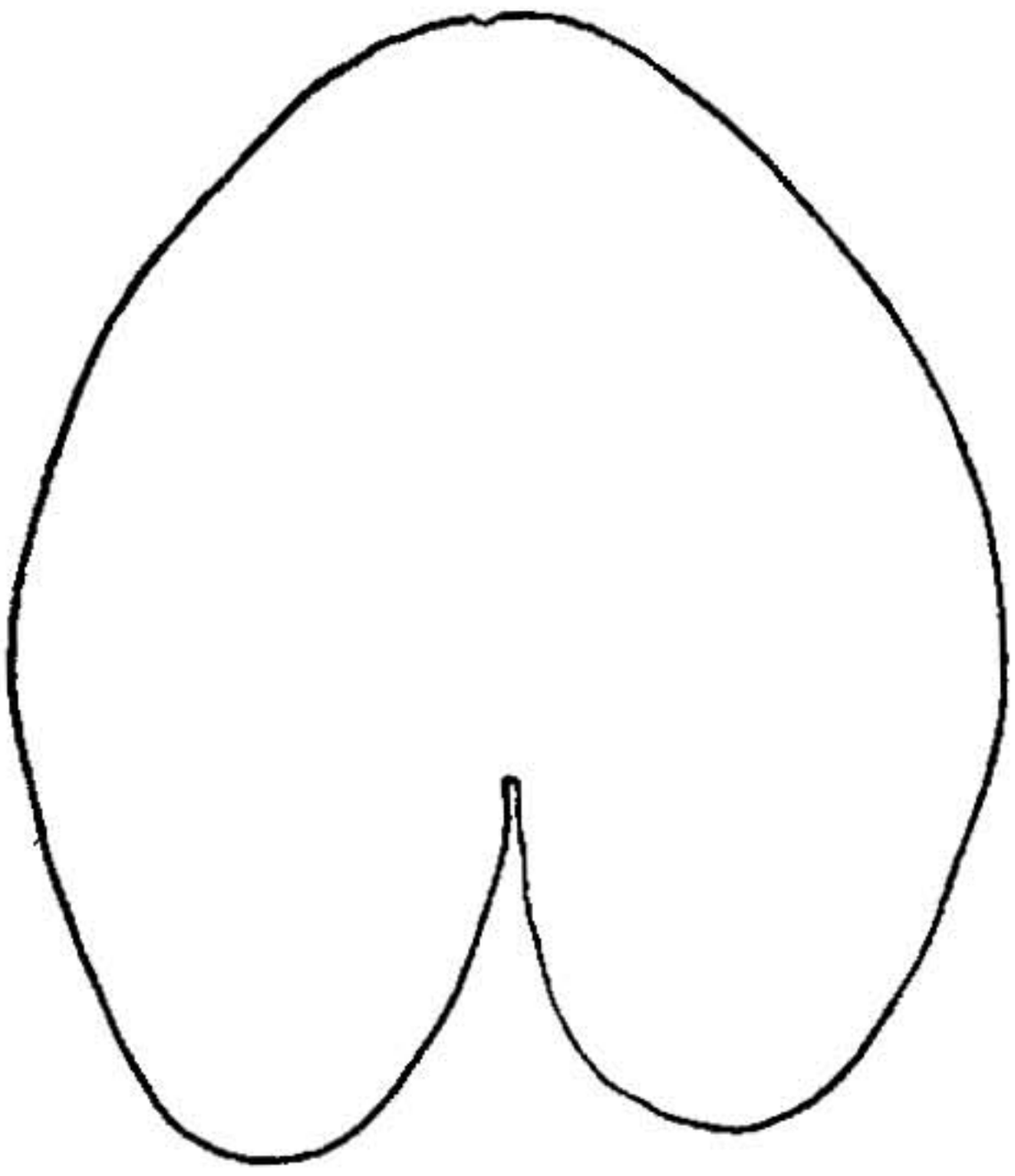


FIG. 21.—Leaf outline of *Nymphaea fluviatilis*. Scale ¼.

Specimens examined:

In formalin—

GEORGIA: Rather scanty material from the Canoochee River near Groveland, June 22, 1903, *Harper*.

Dry—

GEORGIA: In Canoochee River near Groveland, June 22, 1903, *Harper* 1849 (type collection); Savannah, a sheet in the Herbarium of the Missouri Botanical Garden, labeled in Nuttall's handwriting.

With regard to this plant Mr. Harper writes as follows: "*Nymphaea fluviatilis* seems to be quite common in creeks, small rivers, and the swamps of large rivers, but apparently never in ponds, in the coastal plain. I have seen it in the Savannah River swamp in the southeastern corner of Effingham County, in Rocky Comfort Creek near Louisville, in Buckhead Creek near Millen, in the Ogeechee River near Chalker, Millen, Rocky Ford, Dover, and Meldrim, in the Canoochee at the type locality, in the Ohoopee near Ohoopee and Reidsville, in the swamps of the Altamaha near Doctortown and Barrington, in the Oconee swamps near Mount Vernon, in the little Ocmulgee near Lumber City, in Echeconnee Creek near its mouth (on the line between Bibb and Houston Counties), in the Ocmulgee River swamps near Abbeville, in the Withlacoochee near Nashville, and in the Flint River swamps in Crawford County near Everett."

FIG. 22.—Stigmatic pattern of *Nymphaea fluviatilis*. Natural size.

9. Nymphaea chartacea Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, no. 592491, collected at Mobile, Alabama, June 14, 1885, by Dr. Charles Mohr.

DISTRIBUTION: Mississippi, Alabama, and western Florida, near the Gulf coast.

DESCRIPTION.

Petioles and peduncles slender, glabrous; floating leaves glabrous, thin, ovate, 14 to 23 cm. long and 8 to 14 cm. wide, conspicuously narrowed at the apex, broadest at or just above the base; sinuses 3.5 to 6 cm. long, very narrow or closed, the lobes somewhat unequally rounded; submersed leaves similar in outline, 15 to 23 cm. long, rounded at the apex, crisped, very thin and delicate; flowers 30 to 35 mm. in diameter; sepals 6, 12 to 20 mm. long, oblong, obtuse; fruit not seen. (FIGURES 13, *c*, 23.)

In Mohr's Plant Life of Alabama this is listed as *Nymphaea sagittifolia*. The distribution of this species in Alabama is given as the "Central Pine belt to Coast plain. Still-flowing water. Most frequent in the coast region. Tuscaloosa County (E. A. Smith). Montgomery, Mobile, and Baldwin Counties. Flowers lemon yellow. June, July; not rare." Just how many of the plants thus listed belong to our new species it is impossible to tell. Probably most of them belong here. At any rate, none of the plants thus referred to are *N. sagittifolia*. We are reluctant to describe a Nymphaea from dried material, but in this case there can be no doubt about the distinctness of the plant. The leaves, while resembling those of *N. ulvacea* and *N. sagittifolia* in texture, are very different in outline. From our studies in this genus we may confidently expect that when fresh material of this plant is secured it will present other marks of distinction.

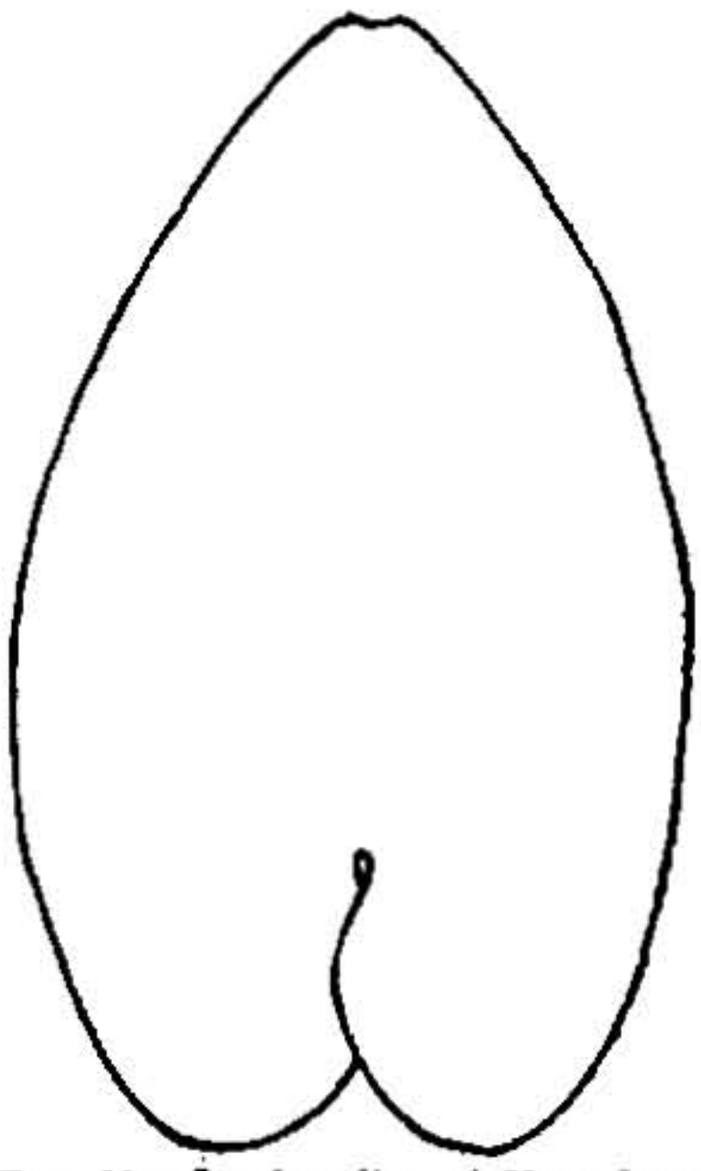


FIG. 23.—Leaf outline of *Nymphaea chartacea*. Scale ¼.

We have seen the following additional dried material that seems to belong here. The leaves of the Florida specimens are somewhat more obtuse than those from farther west, but they are equally thin; the flowers have the very thin sepals so characteristic of this and *Nymphaea fluviatilis*.

Additional specimens examined:

MISSISSIPPI: Biloxi, March 26, 1898, *Tracy* 5012; Ocean Springs, April 5, 1889, *Tracy;* ponds and bayous near the coast, May, 1859, *Hilgard;* Wells Ferry, April 22, 1895, *Skehan*.

FLORIDA: Without locality, *Chapman Herbarium;* Apalachicola, December 6, 1898, *Trelease*.

10. Nymphaea sagittifolia Walt.

Nymphaea sagittifolia Walt. Fl. Carol. 155. 1798.
Nymphaea longifolia Michx. Fl. Bor. Amer. **1**: 312. 1803.
Nymphaea sagittata Pers. Syn. Pl. **2**: 63. 1807.
Nuphar sagittaefolium Pursh, Fl. Amer. Sept. **2**: 370. 1814.
Nuphar longifolium Smith; Rees's Cycl. no. 5. 1819.
Ropalon sagittatum Raf. New Fl. N. Amer. **2**: 17. 1837.
Nymphaea hastata Steud. Nom. Bot. ed. 2. **2**: 199. 1841.
Nymphaea sagittaefolia Britt. & Brown. Illustr. Fl. **2**: 43. 1897; Small, Fl. Southeast. U. S. 456. 1903, in part; Britton, Man. ed. 2. 407, 1905, in part; Robins. & Fern. in A. Gray, Man. ed. 7. 391. 1908, in part.

TYPE LOCALITY: South Carolina.

DISTRIBUTION: Eastern North and South Carolina.

DESCRIPTION.

Floating leaves rather thick and leathery, narrowly oblong or usually narrowly oblong-lanceolate, 14 to 28 cm. long and 5 to 10 cm. wide, not conspicuously narrowed at the apex, rounded; sinus 30 to 35 mm. deep, open, V-shaped; submersed leaves well developed, similar in outline to the floating ones but larger, sometimes 36 cm. long and only 7 cm. wide, very thin and delicate, crispate, glabrous like the floating ones; petioles slender, glabrous, cylindrical, 8 or 9 mm. in diameter; rootstocks 20 to 25 mm. in diameter, densely leafy; leaf scars narrowly oval to semioval, 6 to 8 mm. long; flowers depressed-globose, 26 to 29 mm. in diameter and 19 to 22 mm. high; sepals 6, glabrous, the outer ones 21 to 26 mm. long and 17 to 20 mm. wide, oblong, slightly narrowed towards the base, thin; the inner sepals of about the same length, orbicular, thin; stamens in 5 or 6 rows, the anthers scarcely if at all longer than the filaments; color of sepals canary yellow, tipped with green; petals and stamens yellow but paler than the sepals; fruit ovoid, 31 to 34 mm. high and 23 to 28 mm. in diameter, considerably constricted above, smooth or almost so below, conspicuously ribbed above; edges of the disk raised 4 or 5 mm., vertical or slightly spreading, orbicular in outline, almost or quite entire, 15 to 17 mm. in diameter, its center depressed about 3 mm., smooth, 3 to 6 mm. in diameter; stigma rays 10 to 14, linear, 4 mm. long, extending to within 2.5 mm. of the edge of the disk, distinct, with no trace of a median groove; color of fruit shining apple green, a little darker towards the top, occasionally darkening to oil green throughout; seeds ovoid, pointed but not sharply so, 4 to 5 mm. long and 3 mm. in diameter, the raphe rather obtuse and not conspicuous. (PLATES 42, A, facing p. 96. 44, A, facing p. 99. FIGURES 7, *f*, 24, 25.)

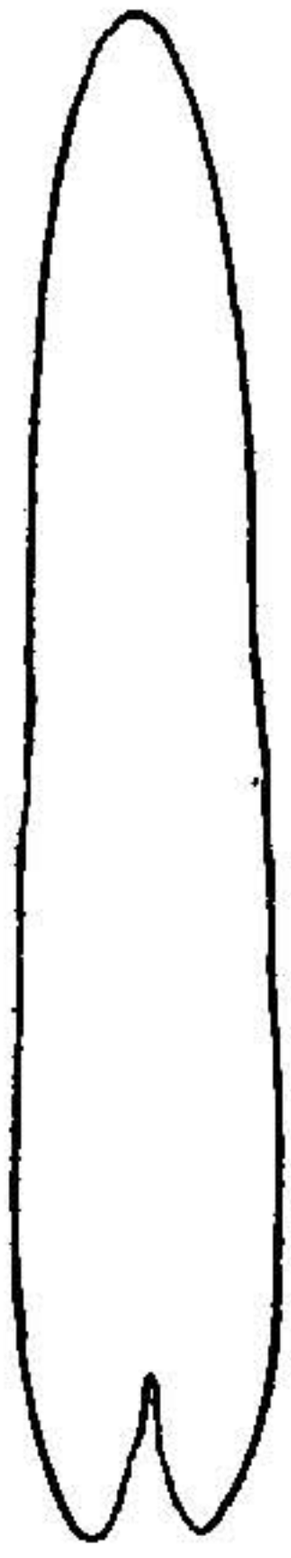


FIG. 24.—Leaf outline of *Nymphaca sagittifolia*. Scale ½.

EXPLANATION OF PLATE 42.—Seeds of *Nymphaca* spp. (A) *Nymphaca sagittifolia*, (B) *N. ulvacea*, (C) *N. ovata*, (D) *N. puberula*, (E) *N. orbiculata*, (F) *N. bombycina*, (G) *N. polysepala*. All natural size.

Specimens examined:

In formalin—

NORTH CAROLINA: Fayetteville, 1902, *Boynton*.

Dried—

NORTH CAROLINA: Fayetteville, 1902, *Boynton*; Wilmington, 1880, *Dr. Thos. F. Wood*; without locality, 1884, *McCarthy*; without locality, 1885, *McCarthy* 9; Northeast River, 1879, *Hyams* (N. Y.); Cape Fear River, Wilmington, 1855, *Hexamer & Maier* (N. Y.); Fayetteville, 1904, *Biltmore Herbarium* 9657d; Wilmington, *C. S. Williamson* (N. Y.); near Fayetteville in Little River, *Major Le Conte* (Mo.); in the fresh water of Cape Fear River and its bayous under the influence of the tides, 1867, *Canby* (Mo.); Wilmington, *Curtiss* (Mo.).

SOUTH CAROLINA: Georgetown, 1857, *L. R. Gibbes* (N. Y.).

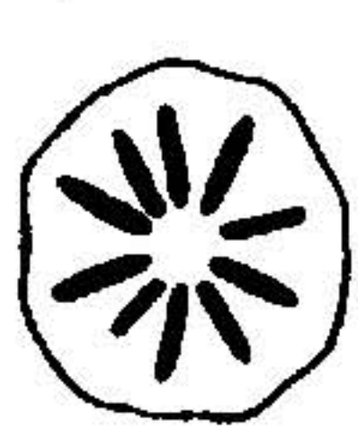
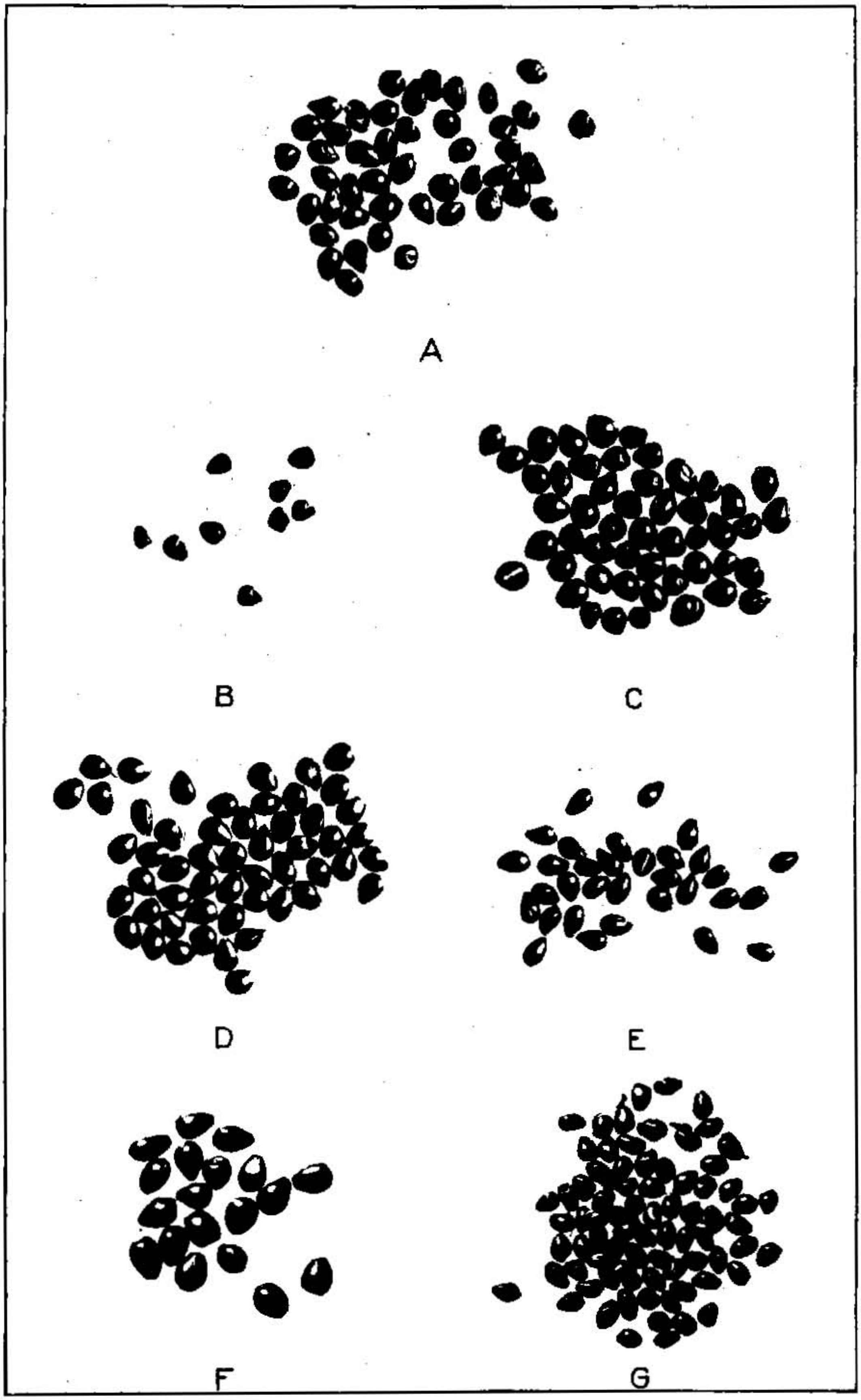
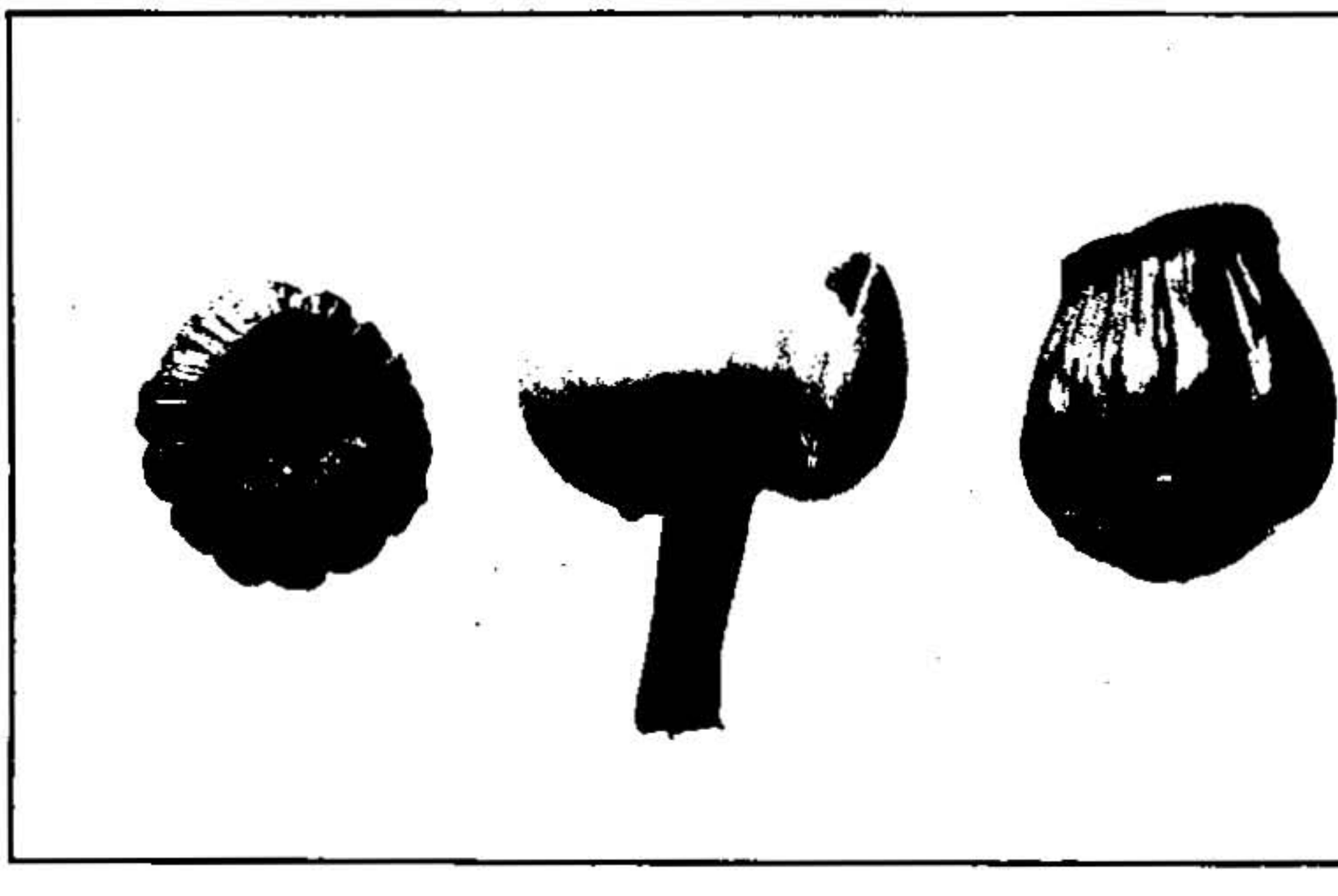


FIG. 25.—Stigmatic pattern of *Nymphaca sagittifolia*. Natural size.

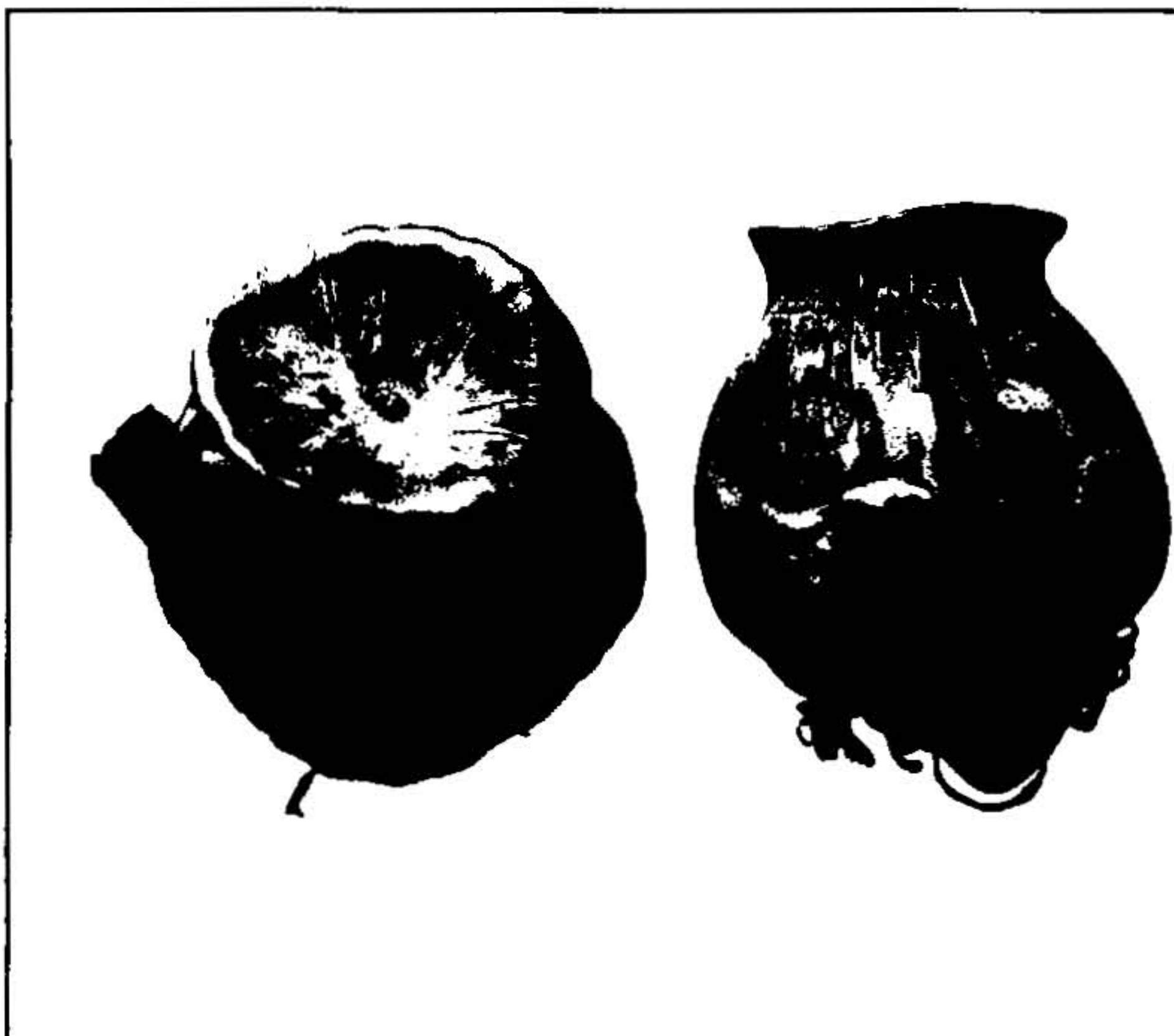
In Mohr's Plant Life of Alabama this species is reported as occurring within that State. The specimens thus referred belong, for the greater part at least, to *Nymphaca chartacea*. In Gray's Manual it is reported as occurring in southern Indiana and Illinois; but the ponds in which the plant grew are now drained, and we have been unable to procure fresh material from the region. It is exceedingly improbable that the species is found outside the States of North and South Carolina.



SEEDS OF SEVERAL SPECIES OF NYMPHAEA



A. FRUIT AND UNOPENED FLOWER OF NYMPHAEA ULVACEA MILLER & STANDLEY.



B. FRUITS OF NYMPHAEA OVATA MILLER & STANDLEY.

We have seen no specimens from other States nor have we any information that clearly indicates the plant's occurrence elsewhere.

11. **Nymphaea ulvacea** Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, no. 357366, collected in the Blackwater River near Milton, Florida, May 14, 1898, by A. H. Curtiss (no. 6409).

DISTRIBUTION: Extreme western Florida.

DESCRIPTION.

Petioles slender, terete, smooth, glabrous, 7 mm. in diameter, 45 to 70 cm. long; rootstocks stout, 2 to 5 cm. in diameter, oval in cross-section, the leaf scars 11 to 13 mm. long and 8 or 9 mm. wide; floating leaves lanceolate or lance-ovate, 115 to 165 mm. long and 54 to 66 mm. wide, very much narrowed at the blunt apex, glabrous; sinus closed, 20 to 28 mm. deep, the lobes overlapping conspicuously; submersed leaves 23 to 28 cm. long and 7 to 10 cm. wide, very thin and delicate, the margins notably plicate; flowers 20 to 23 mm. in diameter, 15 to 18 mm. high, depressed-globose; sepals 6, when spread measuring 45 to 65 mm.; outer sepals 24 to 28 mm. long and 14 to 18 mm. wide, broadly oblong, rounded, slightly narrowed at the base; inner sepals rounded-obovate, thinner, narrowed at the base into a claw 6 mm. long and 7 mm. wide; stamens in 4 or 5 rows, the anthers slightly longer than the filaments; fruit subglobose, abruptly contracted above, prominently ribbed almost to the base, 15 to 21 mm. high and 16 to 24 mm. in diameter; rim of the disk 1.5 or 2 mm. high; disk orbicular, 11 to 18 mm. in diameter, its edges vertical, the center depressed about 3 mm. and smooth; stigma rays 11 to 16, usually 12 to 14, elliptical, 5 mm. long and 1.5 mm. wide, acutish at both ends, distinct, with a very faint median groove or smooth; seeds 3.5 to 4 mm. long, 2.5 mm. in diameter, pointed, with an acute and conspicuous raphe. (PLATES 42, B, facing p. 96; 43, A. FIGURES 7, *d*, 26, 27.)

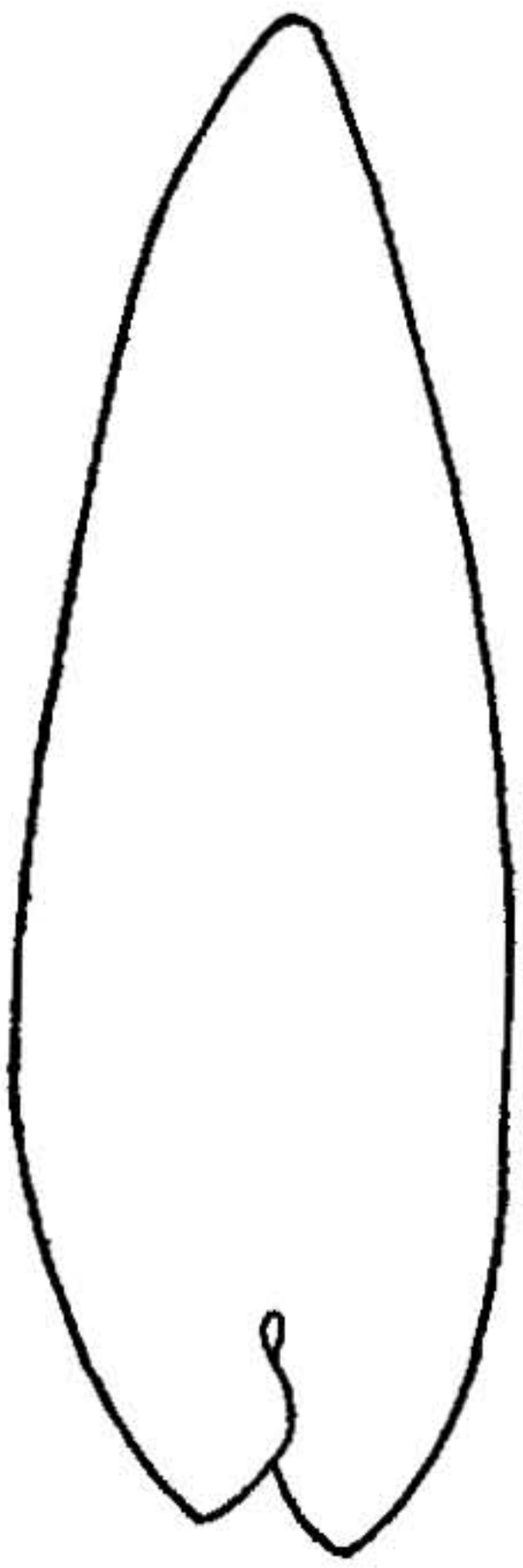


FIG. 26.—Leaf outline of *Nymphaea ulvacea*. Scale ½.

EXPLANATION OF PLATE 43.—A. Fruit and unopened flower of *Nymphaea ulvacea*. B. Fruit and flower of *Nymphaea ovata*. Both natural size.

Additional specimens examined:

In formalin—

FLORIDA: Milligan, September 24, 1901, *Curtiss*.

Dried—

FLORIDA: Milligan, May 14, 1898, *Curtiss* 6409; Blackwater River, Santa Rosa County, *Curtiss* 104.

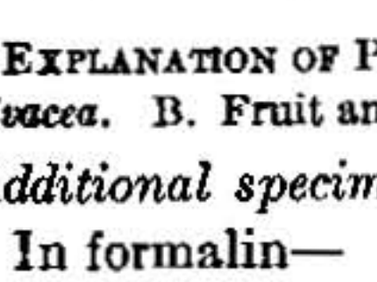


FIG. 27.—Stigmatic pattern of *Nymphaea ulvacea*. Natural size.

Although related to *Nymphaea sagittifolia* the Florida plant may be distinguished by its much wider, more pointed leaves, its smaller fruit, and its elliptical stigma rays. The submersed leaves when dried strongly suggest specimens of certain algæ, especially the genus Ulva, hence the specific name.

12. **Nymphaea ovata** Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, collected at San Marcos, Texas, August 6, 1901, by Mr. J. L. Leary. Preserved in formalin. The description was based principally upon the fresh material of this collection.

DISTRIBUTION: Central-eastern Texas.

DESCRIPTION.

Petioles stout, terete, 13 to 15 mm. in diameter, smooth, more or less silky-pubescent; leaf blades ovate, 22 to 35 cm. long and 16 to 28 cm. wide, broadest just above the base, thick, smooth and shining dark green above, densely silky-pubescent beneath, the principal lateral veins about 24 on each side, distinct and parallel for two-thirds the distance to the margin; sinuses open but very narrow, 7 to 9 cm. long; flowers depressed-globose, 30 to 40 mm. in diameter, 18 to 23 cm. high; sepals 6, when spread measuring 65 to 82 mm.; the outer ones 24 to 30 mm. long, 20 to 25 mm. wide, oblong to suborbicular, often asymmetrical, silky-pubescent on the outer surface, strongly convex, green except sometimes at the tips, there yellowish; inner sepals 28 to 32 mm. long and about as broad, broadly deltoid-obovate, truncate or emarginate, glabrous or sparingly pubescent near the middle of the base, narrowed at the base to a short, broad claw, bright chrome yellow throughout or greenish toward the base; stamens in 5 or 6 rows, the anthers twice as long as the filaments; fruit globose-ovoid, slightly constricted above, 30 to 35 mm. high, 30 to 40 mm. in diameter, rather inconspicuously ribbed below, prominently so above, green becoming yellowish above; rim of disk vertical, 5 to 7 mm. high; disk depressed 5 to 8 mm., 22 to 24 mm. in diameter, almost orbicular, smooth in the center, chrome yellow; rays buff, 13 to 20, usually 15 to 17, 5 to 8 mm. long, extending to within 2 to 4 mm. of the edge of the disk, linear-lanceolate, 1.3 mm. wide at the base, narrower and acutish at the apex, usually confluent at the base, with a strong median groove; seeds 3.5 to 4 mm. long, 3 mm. in diameter, ovoid, pointed, with a prominent acute raphe. (PLATES 42, C, facing p. 96; 43, B, facing p. 97. FIGURES 7, *a*, 28, 29.)

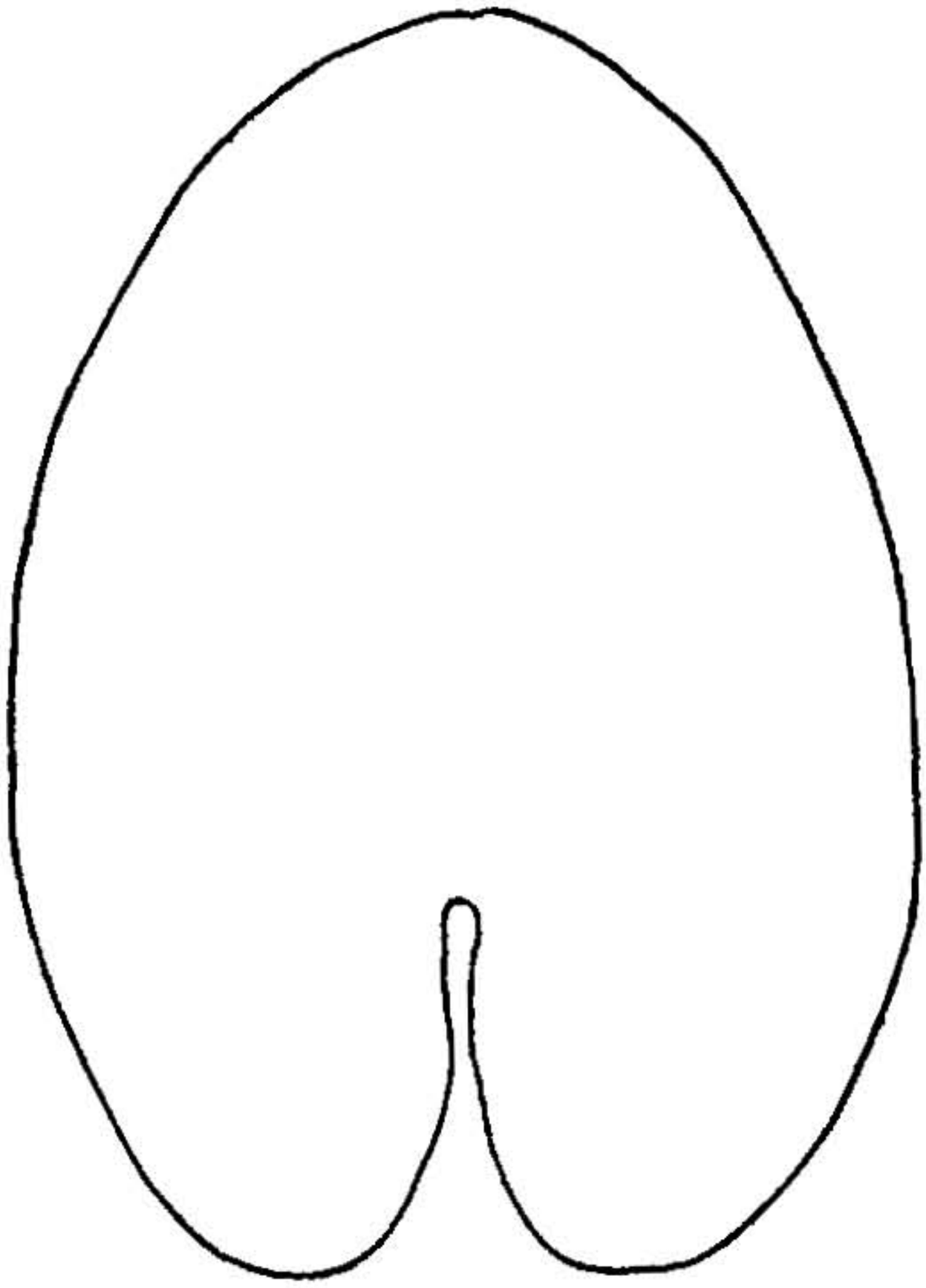


FIG. 28.—Leaf outline of *Nymphaea ovata*. Scale ½.

Additional specimens examined:

Dry—

TEXAS: New Braunfels, June 17, 1906, *Otto Locke;* same locality, June 15, 1910, *Otto Locke;* San Marcos, November 6, 1897, *Trelease.*

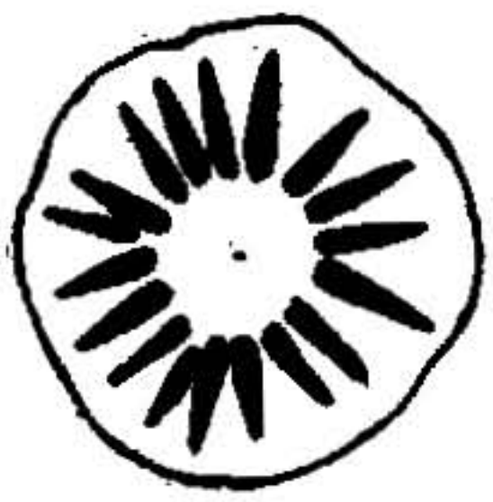
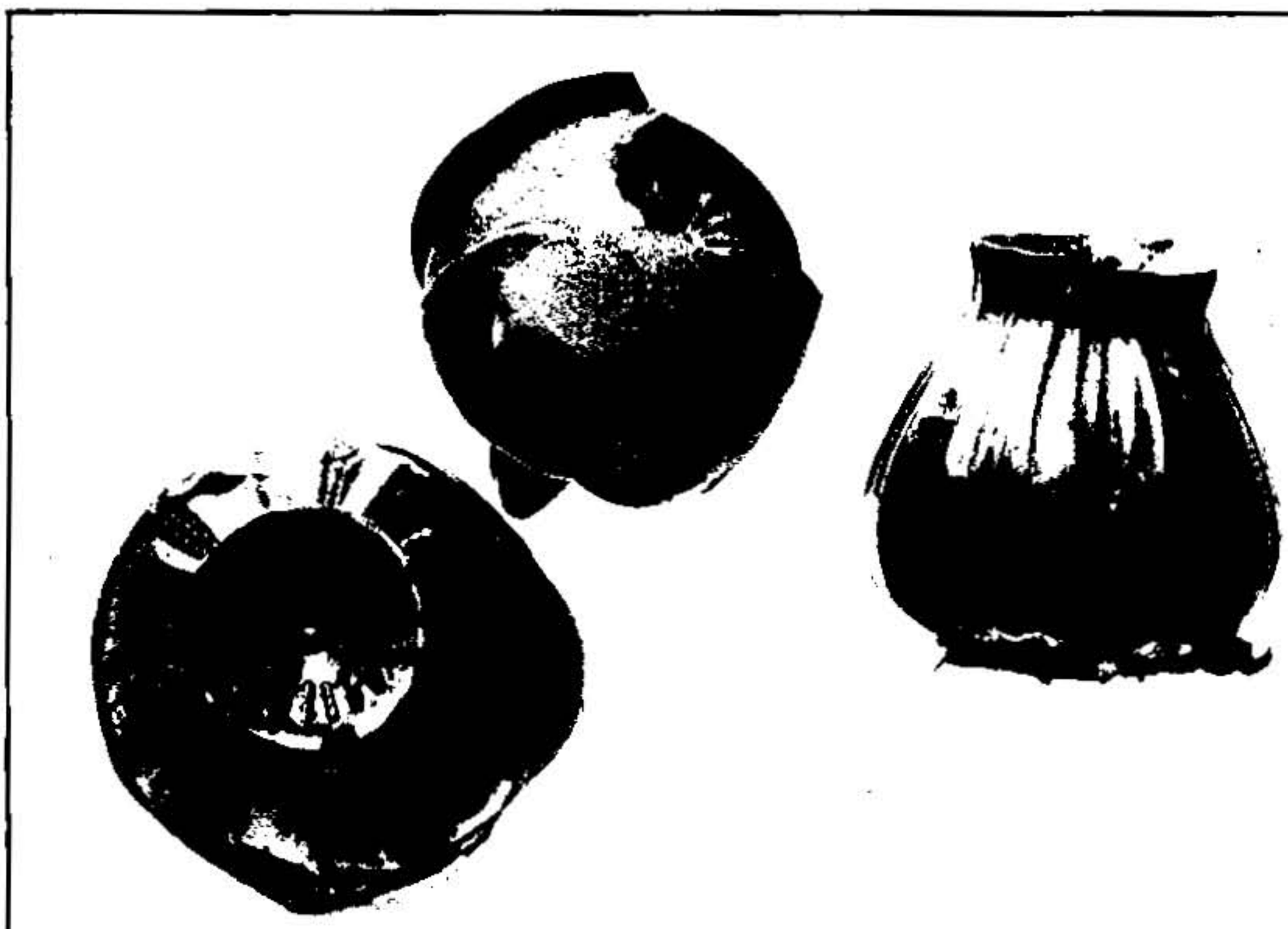


FIG. 29.—Stigmatic pattern of *Nymphaea ovata*. Natural size.

This can not be confounded with any other species. Although its leaves are pubescent beneath they are very different in outline from those of the other species whose leaves are pubescent.

Material collected by Mr. Andrew Allison at Slidell, Louisiana, in July, 1904, resembles this very closely; unfortunately it consists of leaves only. One sheet in the

A. FLOWER AND FRUIT OF NYMPHAEA SAGITTIFOLIA WALT.



B. FRUIT OF NYMPHAEA PUBERULA MILLER & STANDLEY.

Mohr Herbarium belongs here so far as one can tell from dried material; it was collected by Doctor Mohr at Mobile, Alabama. The one leaf is 19 cm. long and densely pubescent beneath. A specimen in the herbarium of the Missouri Botanical Garden, collected at San Antonio, Texas, by Gustav Jermy, may also represent this plant.

13. **Nymphaea puberula** Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, collected in Brays Bayou, about 4 miles south of Houston, Texas, September 6, 1901, by H. P. Attwater. Preserved in formalin. Described from the fresh material of this collection.

DISTRIBUTION: Near Houston, Texas.

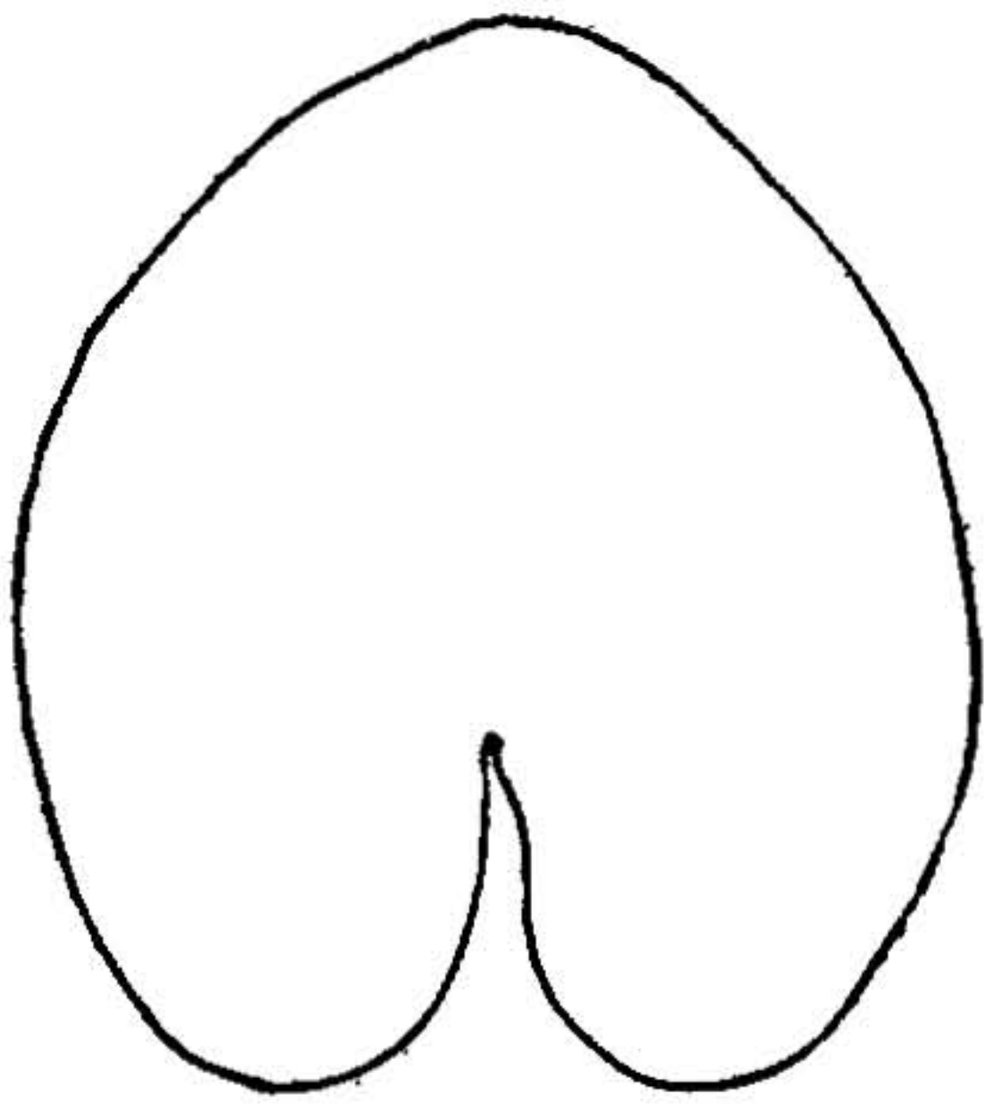


FIG. 30.—Leaf outline of *Nymphaea puberula*. Scale ¼.

DESCRIPTION.

Leaves floating, rather thin, orbicular-ovate, rounded at the apex, widest about the middle, 17 to 25 cm. long and 16 to 21 cm. wide, the sinus about 6 cm. deep, open but very narrow; blades smooth above, rather sparsely puberulent beneath; petioles and peduncles terete, almost glabrous; lateral nerves of the blades 14 to 16, parallel and unbranched for one-half or two-thirds their length; flowers depressed-globose, 26 to 33 mm. in diameter, the perianth when spread measuring about 60 mm.; outer sepals oblong, subtruncate at the apex, slightly narrowed towards the base, 20 to 26 mm. wide; inner sepals broader, broadly deltoid-obovate to almost orbicular, retuse, narrowed abruptly at the base into a claw 5 mm. long and 6 mm. wide; stamens in 5 or 6 rows, linear-cuneate, the anthers one and one-half times as long as the filaments; sepals in color canary yellow, the disk of the ovary slightly and the stamens decidedly paler, no trace of red anywhere present in the flowers; fruit broadly ovoid, only slightly constricted above, 31 to 38 mm. high, 32 to 40 mm. in diameter, the edges of the disk raised as a rim 3 to 5 mm. high; stigmatic crater conspicuously depressed; stigmatic rays 9 to 20, usually 13 to 15, 4 to 5 mm. long, linear, with no trace of a median groove, extending to within 1.5 or 2 mm. of the edge of the orbicular disk; center of disk umbonate; fruit faintly ribbed above, almost smooth below; seeds 4 to 5 mm. long and 2.5 or 3 mm. in diameter, conspicuously pointed, with a sharply acute raphe; color of fruit pepper green, the disk yellowish. (PLATES 42, D, facing p. 96; 44, B. FIGURES 10, *a*, 30, 31.)

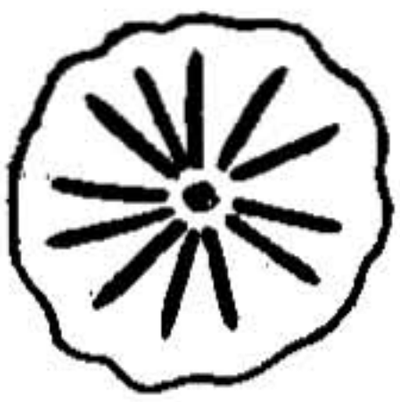


FIG. 31.—Stigmatic pattern of *Nymphaea puberula*. Natural size.

EXPLANATION OF PLATE 44.—A. Flower and fruit of *Nymphaea sagittifolia*. B. Fruit of *Nymphaea puberula*. Both natural size.

Here belongs a sheet in the herbarium of the Missouri Botanical Garden, collected in running water near Houston by Lindheimer.

The plant suggests *Nymphaea fluviatilis* but the pubescent leaves distinguish it at once. Its pubescence throws it into the group with *N. orbiculata*, *N. bombycina*, and *N. ovata*, but the leaves are very different in outline and their pubescence is much more sparse.

Concerning the locality where the specimens were gathered Mr. Attwater, the collector, says: "All of the specimens are from Brays Bayou, about 4 miles south of Houston. This bayou is like many others in the Gulf Region; in dry weather the water stands in pools or holes. Its sides are lined with trees, bushes, and tangled weeds, so that the water is kept shaded all day long. The particular spot where these lilies were taken would get only a few gleams of sunshine during the day, but I presume the plants grow in more open water where they are not shaded all day long. They were growing in water about knee-deep."

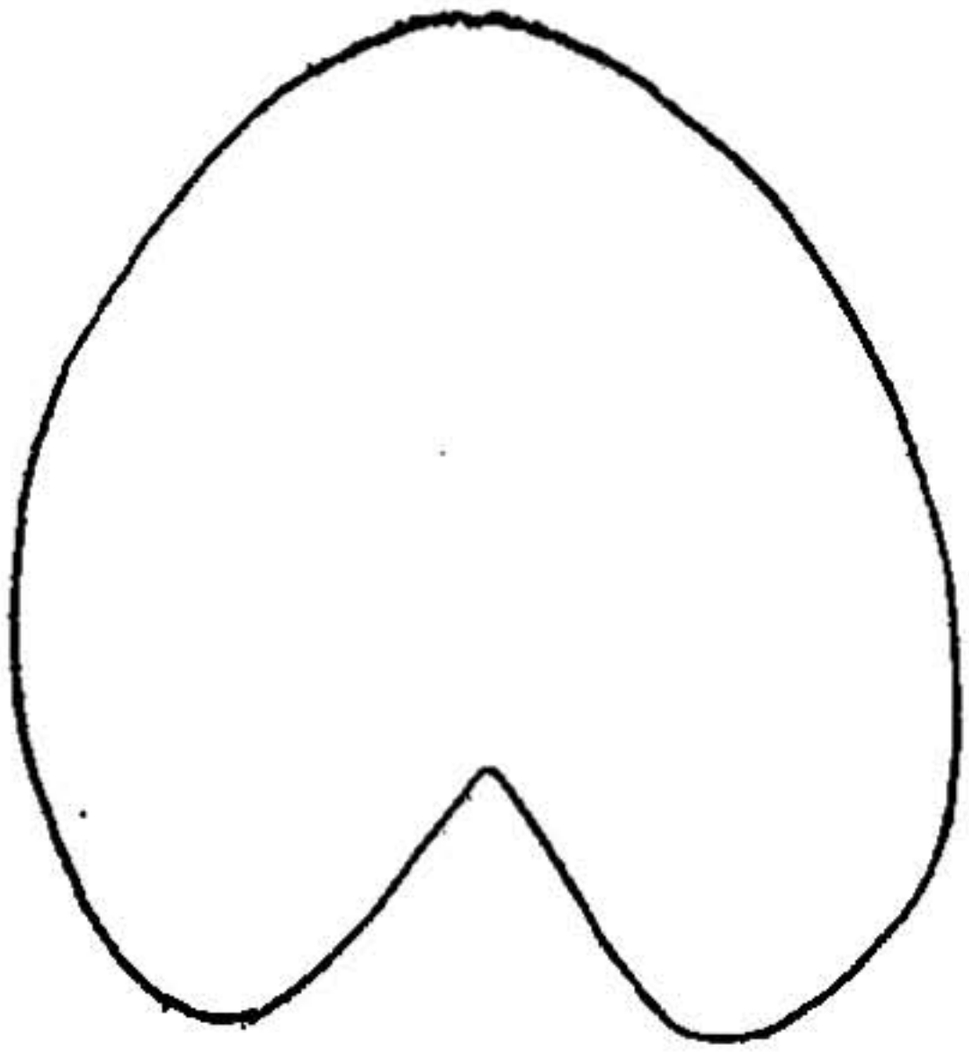


FIG. 32.—Leaf outline of *Nymphaea microcarpa*. Scale ¼.

14. Nymphaea microcarpa Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, collected in the San Antonio River near San Antonio, Texas, March 26, 1910, by Mr. Bernard Mackensen. Preserved in formalin. Described from the fresh material of the type collection.

DISTRIBUTION.—Vicinity of San Antonio, Texas.

DESCRIPTION.

Leaves broadly rounded-ovate to orbicular in outline, widest near the base, 12 to 25 cm. long and 16 to 24 cm. wide, rounded at the apex, emarginate, dull green and glabrous above, rather densely silky-pubescent beneath; sinus broadly V-shaped; lobes rounded; petioles terete, silky-pubescent throughout; sepals thin, the outer orbicular to oblong, the inner obovate, rounded, truncate, or slightly emarginate at the apex, the outer oil green, yellowish at the apex, the inner sulphur yellow, the flowers with no tinge of red; stamens in 5 or 6 rows, the anthers slightly longer than the filaments; fruit subglobose to almost cylindrical, 20 to 26 mm. high and 18 to 24 mm. in diameter, slightly constricted above, deeply ribbed, almost lobed, from base to top; rim of the disk somewhat spreading or erect, 1.5 to 2.5 mm. high; disk orbicular, 13 to 20 mm. in diameter, entire, slightly depressed (1 to 4 mm.), the center umbonate, 3 or 4 mm. in diameter; rays 9 to 15, mostly 12, linear or slightly widened at the base, distinct, with an evident median groove, extending to within 1.5 or 2 mm. of the edge of the disk; body of the fruit clear green, the edge of the disk faintly tinged with red; seeds 3.5 mm. long and 2.5 mm. in diameter, shining dark brown, ovoid, acutish. (PLATE 41, A, facing p. 92. FIGURES 4, *a*, 32, 33.)

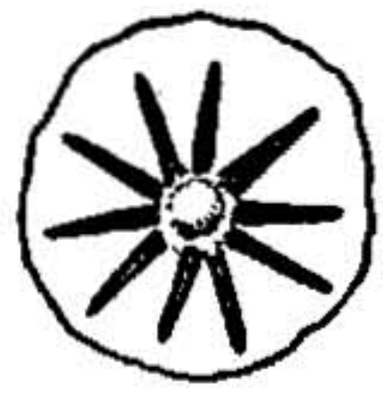


FIG. 33.—Stigmatic pattern of *Nymphaea microcarpa*. Natural size.

We first became acquainted with this plant through rather incomplete material collected by Mr. H. P. Attwater, October 18, 1902, in the Medina River, about 15 miles southwest of San Antonio, Texas. This consisted of leaves and fruit without flowers. Later we were fortunate enough to secure specimens from Mr. Bernard Mackensen, of San Antonio. This last sending enables us to complete our diagnosis and to be more certain of the distinctness of the species. The same collector has forwarded less complete material than the type collected in the Cibolo River at Sutherland Springs, 30 miles east of San Antonio, March 27, 1910. He states that the leaves are usually floating, rarely erect.

Nymphaea microcarpa is most closely related, perhaps, to *N. ovata* of San Marcos, Texas, a locality not far distant. The outline of the leaves, however, is very different,

A. FLOWER AND FRUIT OF NYMPHAEA ORBICULATA SMALL.

B. FLOWER AND FRUIT OF NYMPHAEA BOMBYCINA MILLER & STANDLEY.

and the plants lack the peculiar yellowish cast exhibited by the San Marcos specimens. The fruit, too, is much smaller, and the number of stigmatic rays decidedly less.

15. Nymphaea orbiculata Small.

Nymphaea orbiculata Small, Bull. Torrey Club **23:** 128. 1896.

TYPE LOCALITY: "In a small lake near Thomasville, Thomas County, southern Georgia." Type collected by J. K. Small.

DISTRIBUTION: Known only from Thomas County, Georgia.

DESCRIPTION.

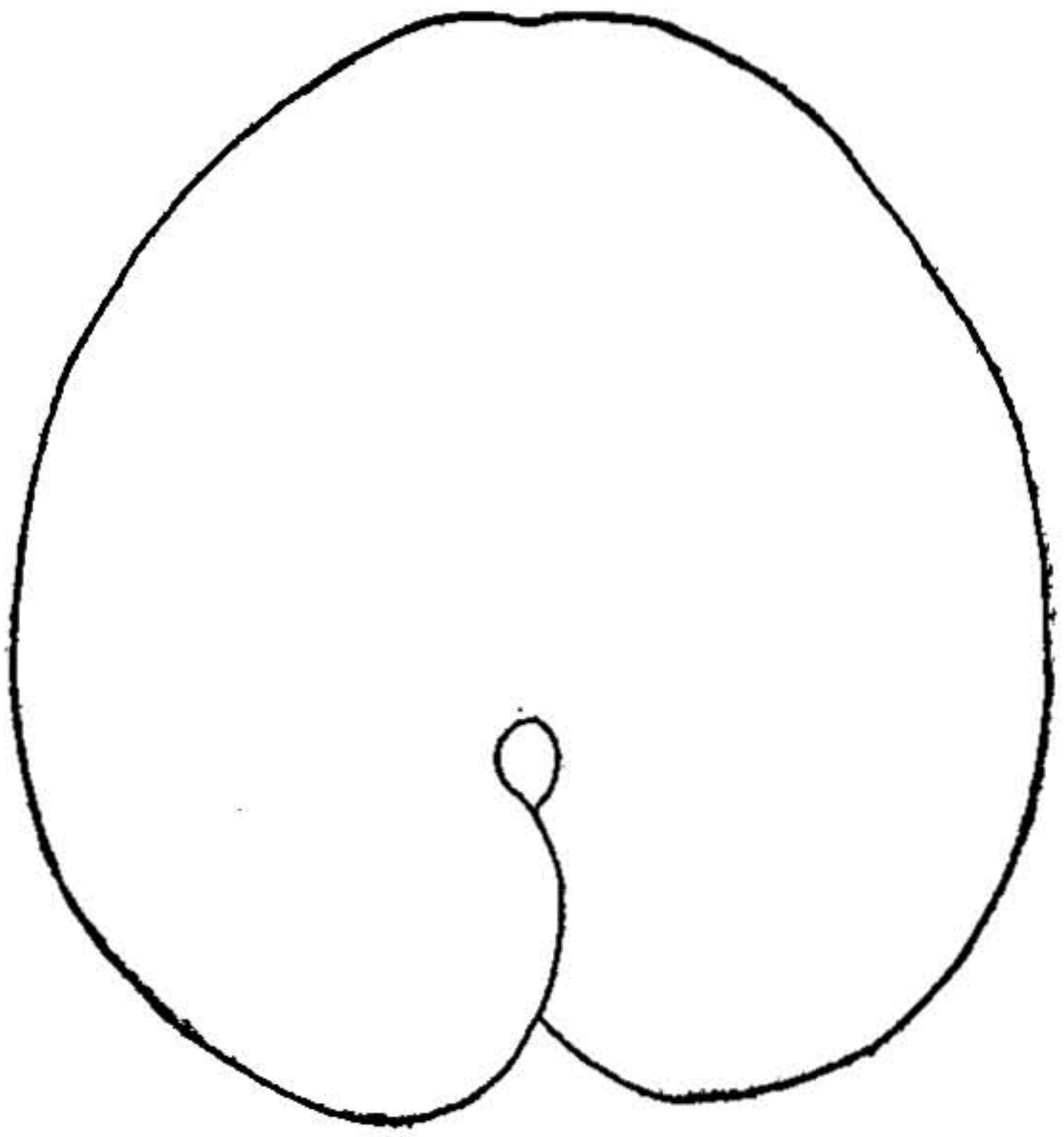


FIG. 34.—Leaf outline of *Nymphaea orbiculata*. Scale ¼.

Leaves floating, orbicular in outline but broadest near the base, thick and leathery, glabrous above but silky-pubescent beneath, 30 to 50 cm. in diameter, emarginate, the closed sinus 6.5 to 14 cm. deep, the broadly rounded lobes overlapping; veins parallel almost to the margin; petioles and peduncles cylindrical, stout, pubescent throughout; flowers depressed-globose, about 55 mm. in diameter and 30 mm. high, the perianth when spread measuring about 100 mm.; sepals normally 6, the 3 outer elliptical-oblong, about 45 mm. long and 30 mm. wide, glabrous throughout, the three inner suborbicular, about 40 mm. in diameter, their bases abruptly narrowed to a claw 10 mm. wide, truncate or retuse at the apex; petals 22 to 24, varying from linear to oblong or oblong-obovate, 9.5 mm. long and 2.5 to 6 mm. wide, retuse, truncate, or rounded at the apex, with a glandular spot 2 mm. in diameter usually present on the outer side near the tip; stamens usually in 8 rows, about 30 to the row; anthers slightly but distinctly longer than the filaments; color of flowers not accurately known, but specimens after a few weeks' immersion in formalin showing a pattern in no way peculiar and proving the entire absence of red; fruit subglobose, about 45 mm. in diameter, distinctly marked with fine ribs above, smooth about the base; stigmatic crater about 28 mm. wide and 5 mm. deep, its outer wall usually vertical; center of disk smooth; stigma rays distinct, varying in number from 12 to 22, but usually 15, 16, or 17, when fully developed 4 to 6 mm. in length and about 0.5 mm. wide, extending to within 1.5 mm. of the edge of the disk; surface of rays with barely indicated median line; seeds ovoid, about 4.5 mm. long and 3 mm. in diameter, with a distinct raphe. (PLATE 42, E, facing p. 96; 45, A. FIGURES 4, *b*, 34, 35.)

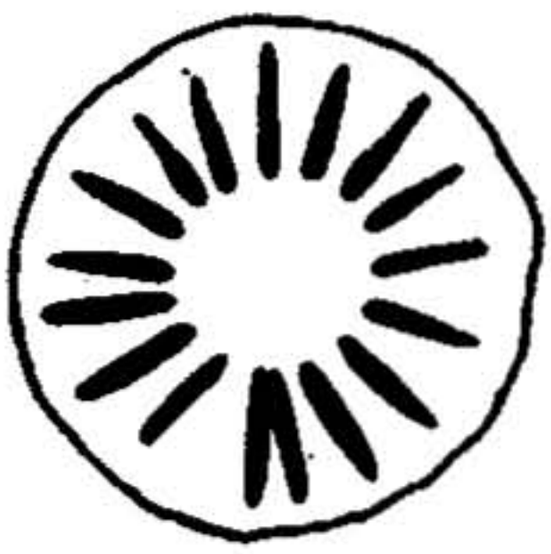


FIG. 35.—Stigmatic pattern of *Nymphaea orbiculata*. Natural size.

EXPLANATION OF PLATE 45.—A. Flower and fruit of *Nymphaea orbiculata*. B. Flower and fruit of *Nymphaea bombycina*. Both natural size.

Specimens examined:

In formalin—

GEORGIA: Heards Pond, 1901, *Harper.*

Dry—

GEORGIA: Along the Ochlockonee River, near Thomasville, 1895, *Small*, type (N. Y.); Heards Pond, Thomas County, 1901, *Harper* 1178.

16. Nymphaea bombycina Miller & Standley, sp. nov.

Type in the U. S. National Herbarium, no. 394797, collected at Wellborn, Florida, October 11, 1901, by A. H. Curtiss (no. 6900). Besides the type sheet another in the National Herbarium, no. 394798, is of this collection.

DISTRIBUTION: Northern Florida and southern Georgia.

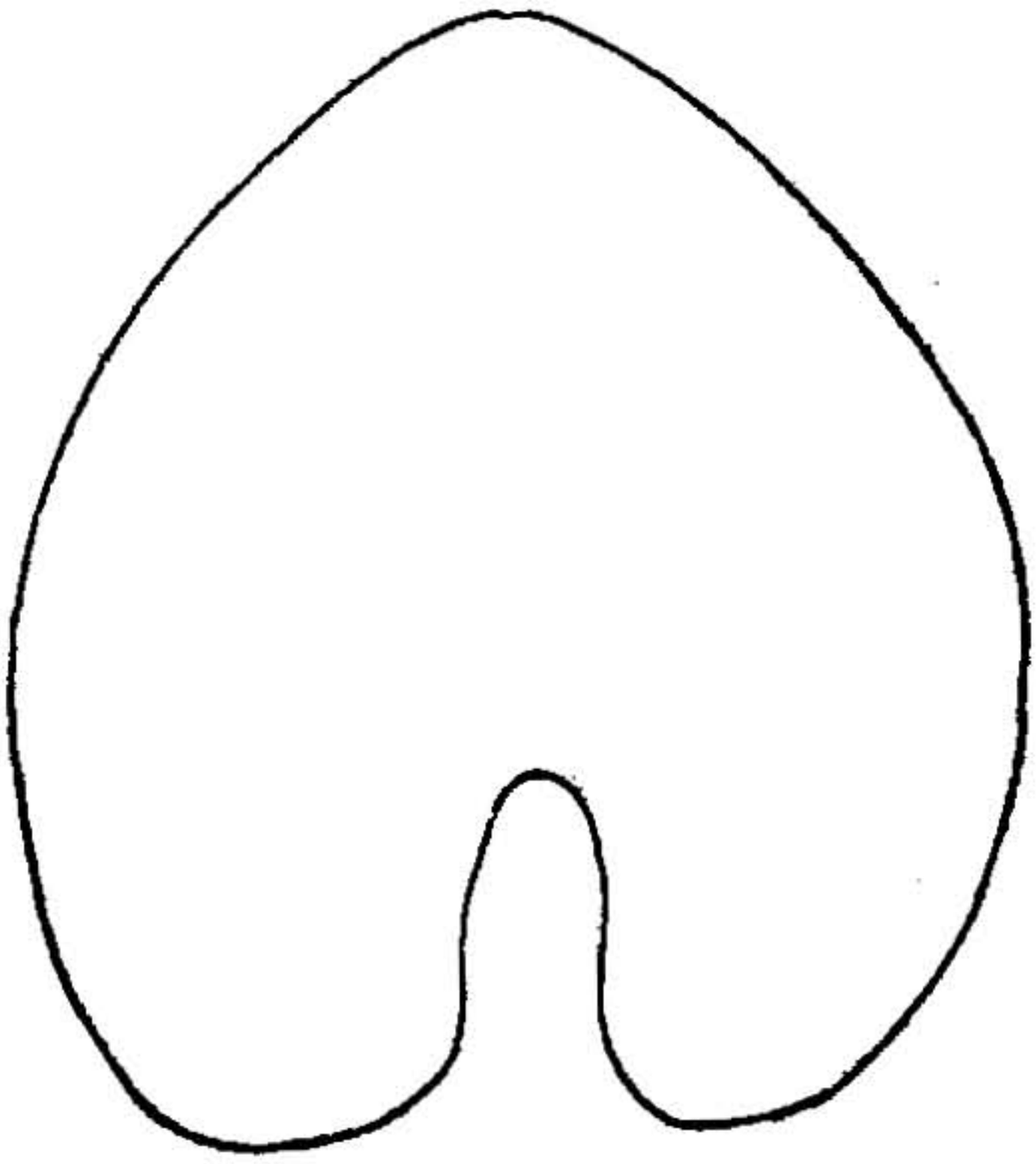


FIG. 36.—Leaf outline of *Nymphaea bombycina*. Scale ¼.

DESCRIPTION.

Rootstocks stout, very large and fleshy, rough, 7 or 8 cm. in diameter; leaf blades floating, glabrous on the upper surface, densely silky-pubescent beneath, thick and leathery, very broadly ovate to almost orbicular in outline, 20 to 30 cm. long and 20 to 25 cm. wide, broadest near the base, rounded at the apex, and emarginate; sinus open, V-shaped or U-shaped, two-fifths as long as the blade, the lobes broadly rounded; veins conspicuous, parallel almost to the margin, the midrib stout and very prominent; petioles stout, terete, about 10 mm. in diameter, silky-pubescent; peduncles stout, densely pubescent, 10 to 15 mm. in diameter; flowers large, depressed-globose, much flattened, 60 to 80 mm. in diameter, 35 to 45 mm. high, when spread measuring 12 to 14 cm.; sepals very thick and fleshy, the outer oblong, obtuse, the inner obovate, broadly rounded; outer sepals oil green, yellowish at the tips, the inner almost entirely sulphur yellow, no red present anywhere in the flower; stamens in 6 or 7 rows, the anthers about twice as long as the filaments; fruit ovoid or almost cylindrical, 50 to 60 mm. in diameter, smooth below, faintly and finely ribbed above, slightly constricted just below the spreading edges of the stigmatic disk, this 30 to 35 mm. in diameter, orbicular, the margin undulate; rays 15 to 18, usually 16, linear, distinct and distant, extending to within 2 mm. of the edge of the disk, with no trace of a median groove; central area about 12 mm. in diameter, smooth, depressed about 5 mm.; seeds ovoid, light chestnut brown, 6 mm. long and 4.5 mm. in diameter. the raphe acutish; color of fruit much as in *N. orbiculata*, the body oil

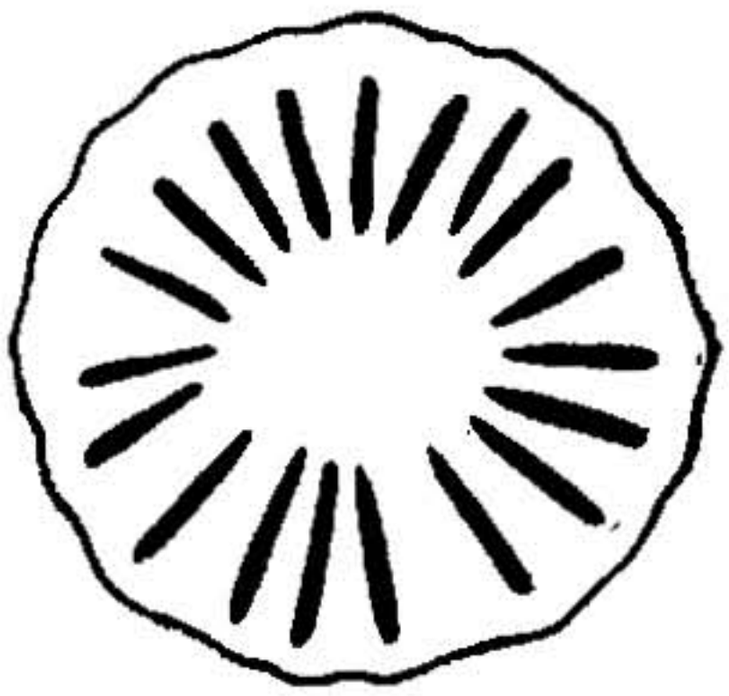


FIG. 37.—Stigmatic pattern of *Nymphaea bombycina*. Natural size.

NYMPHAEA POLYSEPALA (ENGELM.) GREENE, AT CRATER BUTTE, COLORADO.

green or lighter, the disk yellowish. (PLATES 42, F, facing p. 96; 45, B, facing p. 101. FIGURES 7, *e*, 36, 37.)

Additional specimens examined:

Dry—

GEORGIA: In shallow water (30 to 60 cm. deep) of Ocean Pond, Lowndes County, September 4, 1902, *R. M. Harper* 1610.

With *Nymphaea orbiculata*, the only closely related species, this forms a group sharply differentiated from all other North American Nymphaeas. The plants are marked by their large, almost orbicular, silky-pubescent, thick and almost leathery leaves, and large flowers and fruit. This species may be separated from its near relative by the open sinus of the leaves, larger flowers and fruit, and larger seeds. In addition the stamens are in decidedly fewer rows.

17. Nymphaea polysepala (Engelm.) Greene.

Nuphar polysepalum Engelm. Trans. Acad. St. Louis. **2**: 283. 1865.

Nuphar polysepalum pictum Engelm. loc. cit. 285. 1865.

Nymphaea polysepala Greene, Bull. Torrey Club **15**: 84. 1888.

TYPE LOCALITY: "In Osborn's Lake, in the same region, at an altitude of 8,800 feet." "The same region" is "Gibson's Lake, near Long's Peak," Colorado. The type was collected by Dr. C. C. Parry.

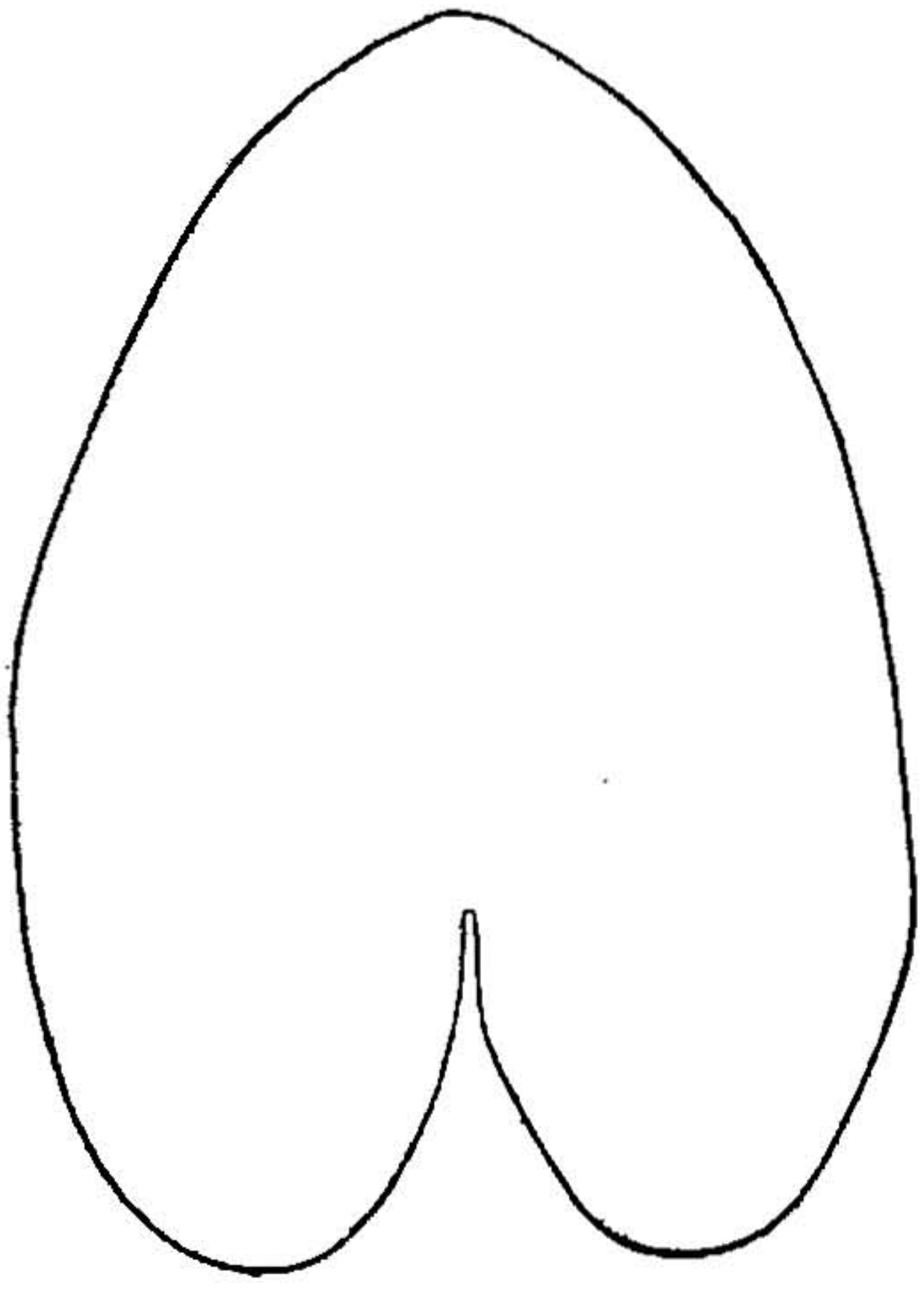


FIG. 38.—Leaf outline of *Nymphaea polysepala*, typical form. Scale ¼.

DISTRIBUTION: Alaska south through northern California and in western Nevada, and southeastward through northern Idaho and western Montana to western South Dakota and Colorado.

FIG. 39.—Stigmatic pattern of *Nymphaea polysepala*. Natural size.

DESCRIPTION.

Leaves usually floating, rarely held above the water, the lobes, however, often elevated, oblong or ovate, rather thick, dull green, glabrous, 21 to 40 cm. long and 16 to 26 cm. wide, sometimes slightly narrowed at the apex but usually rather broadly rounded, widest just above the base; sinus usually open and broadly V-shaped, sometimes closed, 7 to 10 cm. deep, the lobes rounded or acutish; petioles and peduncles glabrous, terete, 8 to 16 mm. in diameter; submersed leaves lacking; flowers 55 to 70 mm. in diameter and 40 mm. high, depressed-globose, the perianth when spread measuring 110 to 140 mm.; sepals usually 9, sometimes 7 to 12, the outer ones small, rounded-oblong, 30 to 50 mm. long, the inner orbicular, 40 to 55 mm. long and 35 to

50 mm. wide, truncate or retuse at the apex, gradually narrowed to the base or abruptly narrowed into a short claw; petals very thick, oblong, equaling the stamens; these in 5 to 7 rows, their anthers slightly exceeding the filaments; capsules globose-ovoid to almost cylindrical, 45 to 90 mm. high and 35 to 60 mm. in diameter, abruptly constricted above, rather conspicuously ribbed throughout; stigma rays 14 to 30, usually 20 to 25; crater suborbicular, 30 to 35 mm. in diameter, usually about 20 mm. deep, its margin almost entire, sometimes slightly undulate; rays linear, with no trace of a median groove, distinct, 14 to 18 mm. long, extending to within 1 mm. of the edge of the disk; center of the crater smooth; outer sepals oil green, yellowish at the tips; inner sepals chrome yellow, the tips usually shaded with green; petals greenish yellow, their inner surfaces tinged with purplish brown except at the base and tip; filaments light greenish yellow, the anthers dark prune purple; pollen straw yellow; fruit varying in color from light apple green to citron yellow; seeds 3.5 to 4 mm. long, oblong, dull brown, shining. (PLATES 42, G, facing p. 96; 46, 47. FIGURES 16, *c*, 38–40.)

EXPLANATION OF PLATES 46, 47.—Pl. 46, *Nymphaea polysepala* at Crater Butte, Colorado; photographed by Mr. E. R. Warren. Pl. 47, fruit of *Nymphaea polysepala* (typical). Natural size.

Specimens examined:

In formalin—

ALASKA: Iliamna, 1902, *W. H. Osgood;* Kodiak, 1901, *W. J. Fisher.*
WASHINGTON: Tacoma, 1902, *Flett;* same locality, 1901, *Flett.*
IDAHO: Henrys Lake, Lake P. O., 1901, *J. Sherwood.*
WYOMING: Beaver Lake, Yellowstone National Park, 1902, *Mearns.*
SOUTH DAKOTA: Spearfish, 1901, *D. C. Booth.*
COLORADO: Near Boulder, 1902, *R. T. Young*; near Leadville, 1901, *Tulian.*
CALIFORNIA: Near Albion, Mendocino County, 1901, *James McMurphy;* Stockton, 1902, *L. Belding.*

Dry—

ALASKA: Yakutat Bay, 1899, *Trelease & Saunders* 3758, 3758a, 3759, 3760 (Mo.); Yakutat, 1904, *Piper* 4362; Seldovia, 1904, *Piper* 4346; vicinity of Yakutat Bay, Khantaak Island, 1892, *Funston* 43; Copper River Region, 1902, *Wm. L. Poto* 114; Kodiak, 1900, *Walpole* 1173; Sitka, 1900, *Walpole* 1132; Camp Retreat, 1886, *H. G. U. Stoney;* Yakutat Mission, 1899, *Trelease* 3759; near Orca, Prince William Sound, 1899, *Coville & Kearney* 1317; Kodiak, 1899, *Coville & Kearney* 2323; Kodiak, 1897, *Evans* 394; Short Bay, 1895, *Gorman* 107; Kodiak, 1874, *U. S. Coast Survey* (Gray); in small mountain ponds near Yes Bay, 1895, *T. Howell* (Greene).

BRITISH COLUMBIA: Vancouver Island, 1893, *Macoun* (Greene); Chilliwick Valley, 1901, *Macoun* 33763; Revelstoke, 1890, *Macoun;* Victoria, Vancouver Island, *J. R. Anderson;* swamp by Goldstream, Selkirks, 1903, *C. H. Shaw* 986 (Phila.); San Juan Lake and River, Vancouver Island, 1902, *Rosendahl* 893 (N. Y.); Fort Rupert, Vancouver Island, 1904, *Geo. Hunt* (N. Y.); Lower Frazer River, 1859, *Lyall* (Gray); near Victoria, 1885, *Fletcher* (Gray).

WASHINGTON: Falcon Valley, 1882, *Suksdorf;* Union Flat, Whitman County, 1892, *Hull* 421 (N. Y.); Chehalis County 1897, *Lamb* 1260 (N. Y.); Seattle, 1892, *Mosier;* Big Meadows, 8 miles west of Ione, 1902, *Kreager* 426; Spokane River, *Wilkes Exploring Expedition* 546; Lake Union, King County, 1898, *Savage, Cameron & Lencoker* (Mo.).

OREGON: Sauvies Island, 1886, *T. Howell* (C.); Forest Grove, Washington County, 1894, *F. E. Lloyd* (N. Y.); without locality, 1871, *Hall* (Gray); Blue Mountains, 1888, *Cusick* 1525; Buck Lake, Klamath County, 1897, *Coville & Applegate* 48; in a slough near Todds, Forest Grove, 1902, *T. E.*

FRUIT OF NYMPHAEA POLYSEPALA (ENGELM.) GREENE.

Specimens examined—Continued.

Dry—Continued.

Wilcox 1; Klamath Agency, 1902, *Walpole* 2221; ponds, Salem, 1871, *Hall;* Mount Hood, 1898, *Applegate* 2844; vicinity of Portland, 1905, *Wm. Palmer* 1474; ponds near Portland, 1900, *Henderson* 44 (Mo.); near Coos Bay, 1880, *George Engelmann* (Mo.).

MONTANA: Spanish Basin, Gallatin County, 1898, *Blankinship;* Big Fork, 1901, *MacDougal* 566 (N. Y.); Forks of the Madison, 1897, *Rydberg & Bessey* 4058; Spanish Basin, 1897, *Rydberg & Bessey* 4059 (N. Y.); Spanish Creek, Gallatin County, 1901, *J. Vogel* (Gray); Lost Horse Pass, Bitter Root Forest Reserve, 1897, *Leiberg* 2982; Madison Valley, *Robert Adams;* no locality, *E. V. Wilcox* 326.

WYOMING: Norris Geyser Basin, Yellowstone National Park, 1899, *Blankinship* (Mo.); Shell Creek, Big Horn Mountains, 1899, *Tweedy* 2284 (N.Y.); shallow water near Leighs Lake, 1901, *Merrill & Wilcox* 1116; Beaver Lake, Yellowstone National Park, 1902, *Mearns* 2626; in a small lake, Norris Geyser Basin, 1899, *A. & E. Nelson* 6152; Yellowstone National Park, 1902, *Mearns* 2526, 2624; head of Green River, 1894, *A. Nelson* 898; pond one mile east of the Falls of the Firehole River, Yellowstone National Park, 1887, *Ward.*

IDAHO: Valley of Lake Tesemini, Kootenai County, 1892, *Sandberg, MacDougal & Heller* 701; Lake Coeur d'Alene, 1892, *Aiton* 71 (N. Y.); Farmington Landing, Lake Coeur d'Alene, 1892, *Sandberg, MacDougal & Heller* 621; in the South Fork of the Coeur d'Alene River, near Old Mission, 1895, *Leiberg* 1412; Clarks Fork, 1889, *Greene* (Greene); North Fork of Columbia River near Lake Pend Oreille, *Leiberg.*

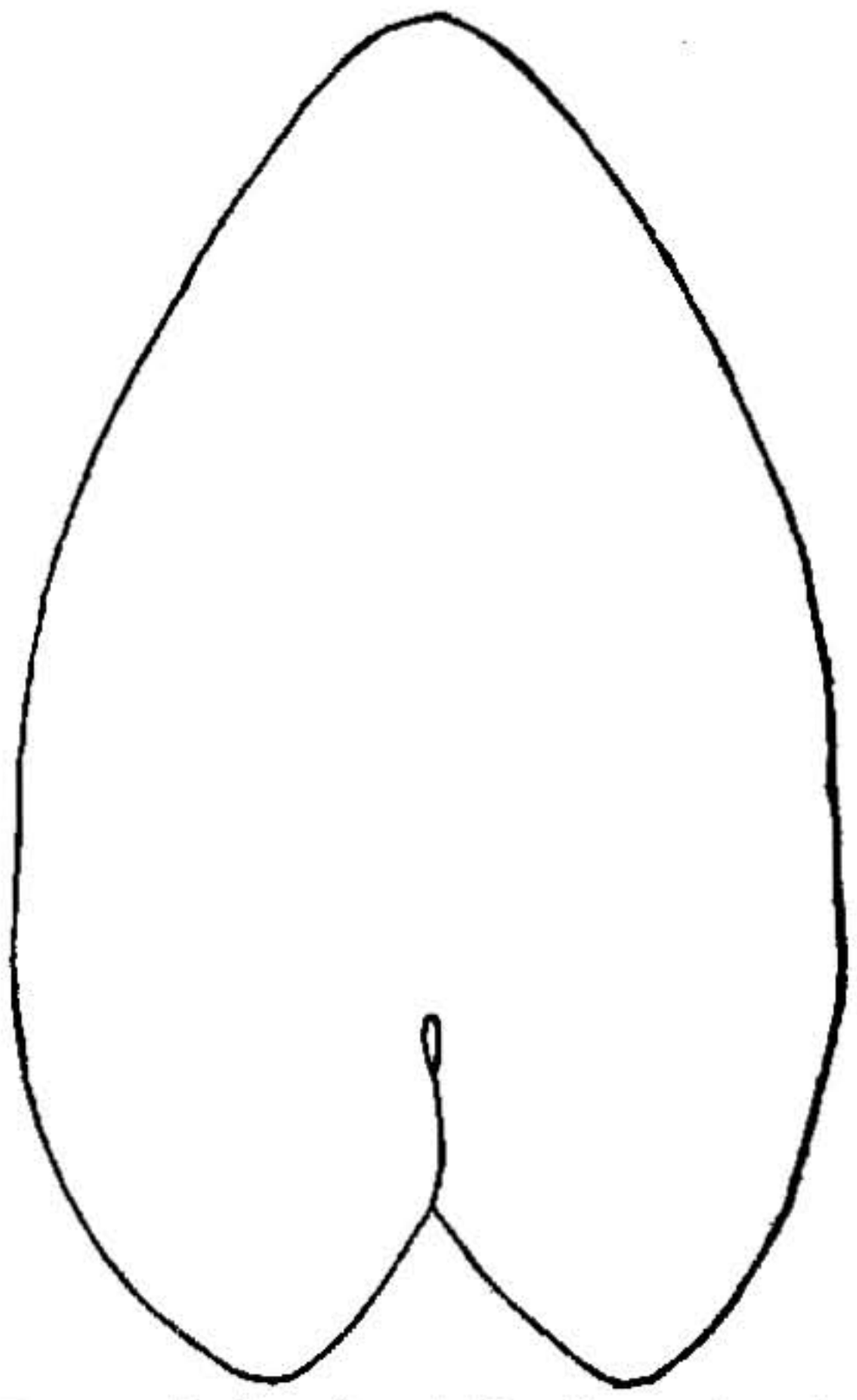


FIG. 40.—Leaf outline of *Nymphaea polysepala,* southern form. Scale ¼.

UTAH: Uintas, northern Utah, 1869, *Watson.*

COLORADO: Small lake in Animas Valley, 1875, *T. S. Brandegee* 1166 (Phila.); Osborne Lake, 1864, *Parry* (Gray, Mo.).

NEVADA: Marlette Lake, Washoe County, 1902, *Baker* 1479.

CALIFORNIA: Stockton, 1902, *L. Belding;* 10 to 15 miles west from Amedee, alt. 1,200 meters, 1897, *Jones;* Susie Lake Trail, Lake Tahoe Region, 1909, *McGregor* 179; without locality, *Bridges* 13a (C.); Lagunitas, Marin County, 1877, *Edwards* (N. Y.); Pudding Creek, Mendocino County, 1894, *Eastwood* (Gray); Plumas County, *Mrs. Ames* (Gray); Blue Lakes, Lake County, 1893, *Blankinship* (Gray); Stockton, 1890, *Greene* (Greene); Stockton, 1890, *J. A. Sanford* (Greene); Siskiyou County, 1876, *Greene* (Greene); Eureka, Humboldt County, 1890, *Greene* (Greene); Big Lagoon, Big River, 1903, *McMurphy* 194; without locality, 1875, *G. R. Vasey;* near Lassen Buttes, Plumas County, 1897, *Brown* 656; without locality, *Hartweg* 1637 (Gray); sloughs

Specimens examined—Continued.

Dry—Continued.

near Stockton, 1896, *Jepson* (Gray); Mad River near Vances, Humboldt Bay, 1901, *Chandler* 1236; Olema Lake, Marin County, 1862, *State Survey* 1481; Truckee, 1893, *Miss Michener*; Long Valley, 1866, *Bolander* (Mo.).

The species seems to be fairly constant in all its essential characters. As in other species, the leaves are somewhat variable but within definite limits. Figure 38 represents the typical leaf form exhibited by the greater number of specimens. Figure 39 shows a leaf outline characteristic of the southern representatives of the species. There seem to be no concomitant characters which, combined with the difference in leaf form, might separate the northern and southern plants.

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The following list includes most of the titles dealing with the genus Nymphaea in North America. No attempt has been made to include mere isolated data regarding local distribution. The articles listed are only those that have been referred to in the preparation of the present paper.

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Contains the original description of *Nymphaea advena.*

Aiton, WILLIAM T. Hortus Kewensis ed. 2. **3:** 295. 1811.
Makes the new combinations *Nuphar advena* and *N. kalmianum.*

Bailey, L. H. Cyclopedia of American Horticulture **3:** 1096–97. 1901.
Enumerates 7 species from North America.

Brewer, W. H., **Watson,** Sereno, and Gray, Asa. Botany [of California] **1:** 17. 1876.
Description of *Nymphaea polysepala* with notes upon distribution.

Britten, JAMES. The nomenclature of Nymphaea. Journ. Bot. Brit. & For. **26:** 6–11. 1888.
A discussion of the application of generic names.

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