



# Flora of North America

Lentibulariaceae  
Garrett E. Crow  
27 October 2014

## Notice About Flora of North America Provisional Publications

Preparation of each volume of the Flora of North America is a multi-year process involving dozens of authors and editors. To facilitate access to taxonomic treatments that meet specific editorial criteria but that otherwise might not appear in printed volumes for months or possibly years, the Flora of North America Association (FNAA) electronically publishes treatments. These “Provisional Publications” have been peer-reviewed and are treatments that minimally meet the following editorial standards:

Any 03 level manuscript that has been

- 1) accepted and approved by the taxon editor as an official FNA submission;
- 2) initially tech-edited (i.e., has been formatted and edited by the volume technical editor);
- 3) through regional review, with regional review comments and any additional tech-editing comments addressed by the author and corrections made to the manuscript; and
- 4) reviewed once by the bibliographic editor;
- 5) approved by the author(s) and taxon editor for posting as a Provisional Publication.

Major corrections, additions, and other modifications are allowed to 03 version manuscripts, and significant changes are published as new versions become available. Provisional Publications at the 04 level (second bibliographic pass completed, reviews by nomenclature and reviewing editors completed, genus description checked for parallelism against other genera in the family) and 05 level (all major checks completed, treatment ready for indexing and application of styles) are closer to publication form.

Readers are encouraged to submit comments and corrections for Provisional Publications to the author(s) and taxon editor, especially comments concerning the geographic distributions of taxa. Contact information can be found at <http://floranorthamerica.org/review> under the appropriate volume. The header portion of each Provisional Publication contains the taxon name and manuscript version, book volume number, taxon editor surname, manuscript page number, and date when then the posted version was published provisionally.

All provisional publications are copyrighted by the Flora North America Association and are to be cited as follows:

Author, Date, Title (e.g. Genus name, Flora of North America, Provisional Publication), Publishing institution, Date of publication, URL, Date actually viewed.

Example: Whittmore, A. T. and E. McClintock. 2008. Pittosporaceae. Flora of North America, Provisional Publication. Flora of North America Association. September 14, 2007. [fna.huh.harvard.edu/files/Pittosporaceae.pdf](http://fna.huh.harvard.edu/files/Pittosporaceae.pdf). Accessed [date actually viewed].

Questions about FNA Provisional Publications may be directed to Ms. Heidi Schmidt, Managing Editor, Flora of North America Association, at [heidi.schmidt@mobot.org](mailto:heidi.schmidt@mobot.org).

## LENTIBULARIACEAE Richard

### \* Bladderwort Family

Garrett E. Crow

**Herbs**, annual or perennial, carnivorous, free-floating, submersed aquatics (*Utricularia*), or semi-aquatics (*Utricularia*), often anchored by rhizoids or stolons, or epiphytes (tropical *Utricularia*), usually with tubers, or terrestrial in damp to wet sites (*Pinguicula*). **Roots** present (*Pinguicula*) or absent (*Utricularia*). **Stems** short, bearing rosettes of leaves, or submersed and elongate. **Stipules** absent. **Leaves** alternate or whorled or in rosettes, blades narrowly linear to broad or obovate, margins entire and involute, or leaves highly dissected capillary segments (submersed aquatic *Utricularia* species). **Carnivorous traps**: bladders or sticky glands. **Inflorescences** solitary flowers on scapes (*Pinguicula*) or 1+-flowered racemes; bracts (and bracteoles) sometimes present, basifixed or peltate. **Flowers** zygomorphic, bisexual; calyx 2, 4, or 5-lobed; corolla sympetalous, often with conspicuous palate at throat, 2-lipped, 5-lobed, lower lip spurred; stamens 2, epipetalous, anthers dehiscent longitudinally; staminodes 0 or 2; ovary superior, usually globose, sometimes pyriform, carpels 2, locule 1, style 0 or 1, stigma 2-lobed; placentation free-central, ovules 1+. **Fruits** usually capsules, brown, dehiscence usually circumscissile, by 2--4 valves, or irregular, rarely indehiscent. **Seeds** brown, reticulate.

Genera 3, species ca. 320 (2 genera, 27 species in the flora): nearly worldwide.

*Utricularia* has about 215 species worldwide; *Pinguicula* has about 85 species; *Genlisea* has about 20 species, 11 in Central and South America and the others in Africa (with 1 also in Madagascar). Tubers (in some species of Lentibulariaceae) are critical for surviving periods of desiccation. Some species are popular to grow as novelties and have been the focal point of specialty plant societies worldwide. Some species are adapted to nutrient-poor acidic habitats, especially *Genlisea* and *Utricularia*; *Pinguicula* species are more frequently found in calcareous sites.

SELECTED REFERENCES Crow, G. E. 2007. Lentibulariaceae. In: B. E. Hammel et al., eds. 2007. Manual de Plantas de Costa Rica. Vol. VI: "Dicotiledóneas" (Haloragaceae--Piperaceae). Missouri Bot. Gard. Press, St. Louis & Inst. Nac. de Biodiversidad, Santo Domingo de Heredia, Costa Rica. Pp. 189--197. Crow, G. E. and C. B. Hellquist. 1985. Aquatic vascular plants of New England: Part 8. Lentibulariaceae. New Hampshire Agric. Exp. Sta. Bull. 528: 1--19. Jobson, R. W. et al. 2003. Molecular phylogenetics of Lentibulariaceae inferred from plastid *rps16* intron and *trnL-F* sequences: Implications for character evolution and biogeography. Syst. Bot. 28: 157--171.

1. Plants terrestrial, leaves in rosettes, blades not dissected, margins involute, adaxial surface glandular hairy; flowers solitary, bracts none, calyx 5-lobed not 2-lipped..... 1. *Pinguicula*, p. xxx
1. Plants aquatic or semi-terrestrial, leaves not in rosettes, blades dissected or laminar, adaxial surfaces glabrous; flowers usually few+-flowered racemes (sometimes 1 open at a time), sometimes solitary, subtended by a single bract, sometimes also a pair of bracteoles; calyx 2-lipped..... 2. *Utricularia*, p. xxx

1. PINGUICULA Linnaeus, Sp. Pl. 1: 17. 1753; Gen. Pl. ed. 5, 11. 1754 \* Butterwort  
[Latin *pinguis*, fat, alluding to greasy feel due to secretions of glandular hairs on adaxial

leaf surface]

### *Isoloba* Rafinesque

**Herbs**, perennial (annual), terrestrial. **Stems** vertical. **Leaves** in rosettes, margins entire, strongly involute (often increasingly in-rolled toward apex, resulting in narrow to broad deltate outline), adaxial surface greasy, covered with subsessile glandular hairs. **Flowers** solitary, borne on scapes, bracts absent; calyx 2-lipped; corolla 2-lipped, often incised or notched (except in northern taxa); palate absent (northern taxa) or conspicuously formed at summit of tube, exerted beyond throat at base of lower lip, densely covered with clavate hairs; filaments stout, inserted adjacent to each other within throat on upper wall of corolla tube, curving outward and upward, anthers nearly touching; ovary glandular pubescent; stigma whitish or violet. **Fruits** 2- or 4-valved capsules. **Seeds** oblong to obpyramidal to cylindrical.

Species ca. 85 (8 in the flora): North America, Mexico, Central America, South America (to Tierra del Fuego), Europe, Asia.

Species of *Pinguicula* growing in cold climate regions produce buds (hibernacula) late in the growing season; these buds produce new rosettes the following season, resulting in clusters of rosettes. Some species of *Pinguicula* utilize gemmipary, producing plantlets at leaf tips; plantlets are well-rooted by the time parent leaf disintegrates. The “greasy” leaf surface results from a covering of subsessile glandular hairs (that capture insects) and obscure sessile glands (that secrete digestive enzymes).

SELECTED REFERENCES Casper, S. J. 1962. On *Pinguicula macroceras* Link in North America. *Rhodora* 64: 212--221. Casper, S. J. 1966. Monographie der Gattung *Pinguicula*. *Biblioth. Bot.* 127/128: 1--209. Cieslak, T. et al. 2005. Phylogenetic analysis of *Pinguicula* (Lentibulariaceae): Chloroplast DNA sequences and morphology support several geographically distinct radiations. *Amer. J. Bot.* 92: 1723--1736. Degtjareva, G. V. et al. 2004. Seed morphology in the genus *Pinguicula* (Lentibulariaceae) and its relation to taxonomy and phylogeny. *Bot. Jahrb. Syst.* 125: 431--452. Degtjareva, G. V. et al. 2006. Morphology and nrITS phylogeny of the genus *Pinguicula* L. (Lentibulariaceae), with special attention to embryo evolution. *Pl. Biol. (Stuttgart)* 8: 778--790. Godfrey, R. K. and H. L. Stripling. 1961. A synopsis of *Pinguicula* (Lentibulariaceae) in the southeastern United States. *Amer. Midl. Naturalist* 66: 395--409. Rondeau, J. H. and J. F. Steiger. 1997. *Pinguicula macroceras* subsp. *nortensis*, a new subspecies of *Pinguicula* (Lentibulariaceae) from the California-Oregon border. *Intl. Pinguicula Study Group Newslett.* 8: 3--8. Wood, C. E. Jr. and R. K. Godfrey. 1957. *Pinguicula* (Lentibulariaceae) in the southeastern United States. *Rhodora* 59: 217--230.

1. Corollas bilabiate, upper lip 2-lobed, lower lip 3-lobed; raised palate lacking; Canada and northern United States.
  2. Rosettes 0.8--2(--3) cm across; corolla purple-veined from tube into spur, lips not lobed; scapes usually white-villous proximally, densely glandular-pubescent distally; corollas 6--10 mm (including spur); spur conical, (1.5--2.5--5(--6) mm .....7. *Pinguicula villosa*
  2. Rosettes 2.3--9 cm across; corolla not purple-veined (except within corolla tube on white blotch), lips lobed; scapes never villous, with short glandular hairs entire length or sparsely glandular above, glabrous below or sometimes glabrous; corollas (10--14--36 mm (including spur); spur slender, (1--3--9(--11) mm .....8. *Pinguicula vulgaris*
1. Corollas not bilabiate, individual lobes notched or incised 1+ more times (shallowly to deeply, sometimes giving appearance of several petals); raised palate evident; southeastern United States.
  3. Corollas bright to pale yellow (with reddish purplish veins in tube and spur); corolla lobes with 1(--3) notches .....3. *Pinguicula lutea*
  3. Corollas white to light blue, blue, light lavender, or violet (veins prominent or not); corolla lobes with 1 notch.
  4. Rosettes (0.8--1--3.5(--6) cm across; corolla (4--8--18(--22) mm diam.; palate 1.5--2.5 mm, included within corolla tube or barely exerted .....6. *Pinguicula pumila*

- 4. Rosettes mostly 4+ cm across; corolla mostly 18+ mm diam.; palate 3--10 mm, conspicuously exerted from tube.
- 5. Corolla lobes narrowly lanceolate, deeply notched or incised (1/3--1/2 length; spur 2--3(--4) mm; leaves reddish or reddish green (remaining green in shade) .....4. *Pinguicula planifolia*
- 5. Corolla lobes broader, notched to 1/4 length; spur (3--4)4--8 mm; leaves green.
  - 6. Scape villous proximally <1--4 cm>, glandular to sparsely glandular distally; corolla lobes strongly veined; palate white to cream (to greenish yellow); spur (4--5--7(--8) mm, violet to greenish yellow .....1. *Pinguicula caerulea*
  - 6. Scapes not villous proximally, glandular to sparsely glandular or glabrous distally; corolla lobes not strongly veined; palate yellow; spur 2.5--5 mm, yellow or yellow-olive.
    - 7. Corolla tube violet, with darker violet veins; corolla lacking ring of white at base of lobes; hairs on inside lateral walls of corolla tube white; corolla lobes longer than broad .....2. *Pinguicula ionantha*
    - 7. Corolla tube yellow, with brown or reddish brown veins; corolla with a ring of white at base of lobes, yellow within throat (best seen in fresh specimens); hairs on inside lateral walls of corolla tube yellow; corolla lobes nearly as broad as long or often broader.....5. *Pinguicula primuliflora*

1. *Pinguicula caerulea* Walter, Fl. Carol., 63. 1788 \* Blueflower butterwort E

*Isoloba elatior* (Michaux) Rafinesque; *Pinguicula elatior* Michaux

**Perennials**, hibernacula not produced. **Rosettes** (2.5--4--9 cm across. **Leaves** persisting year-round, yellowish green, ovate to obovate, longer leaves 1.2--3.4 cm (some with long non-glandular hairs along sunken midrib near base, crisscrossing midvein). **Scapes** to 32 cm, densely pubescent (villous, multicellular hairs) proximally (to 1--4(--5) cm from base), sparsely to densely glandular pubescent distally. **Flowers:** calyx densely glandular, lobes 4--5 mm; corolla usually blue to light blue or deep violet to pale violet, sometimes white, 20--38 mm diam., lobes notched 1/3--1/2 length, strongly veined, veins blue; corolla tube blue or violet to greenish yellow or white and strongly veined, veins blue to violet, broad [(4--6--13 mm diam. (pressed)]; palate exerted, white to cream (to light greenish yellow), broad, blunt, (3--5)5--8 mm; lacking short-stalked clavate hairs along corolla ridge behind palate; non-glandular hairs on lateral walls within corolla tube white; spur violet to greenish yellow, usually thick, blunt at apex (sometimes slender, acute at apex), (4--5--7(--8) mm, glabrous or sparsely glandular; filaments white, anthers pale yellow. **Capsules** globose, 4--5 mm (6--10 mm dehisced). **2n** = 32.

Flowering mid Jan--early Jun. Moist sandy soils, sandy peat, and wet areas, flatwoods, pine savannas, adjacent ditches and roadsides, coastal plains; 0--200 m; Fla., Ga., N.C., S.C.

2. *Pinguicula ionantha* R. K. Godfrey, Amer. Midl. Naturalist 66: 405, fig. 6. 1961 \* Violetflower butterwort C E

**Perennials**, terrestrial or leaves submersed; hibernacula not produced. **Rosettes** 6--15 cm across. **Leaves** persisting year-round, bright green, narrowly elliptic to lanceolate to oblanceolate to obovate, longer leaves 3--4.5(--6.5) cm. **Scapes** 9--19 cm, glandular pubescence sparse to glabrous proximally, more densely glandular distally, not villous at base, non-glandular hairs lacking. **Flowers:** calyx glandular, lobes 4--5(--6) mm; corolla pale lavender to white with throat darker lavender within, 9--20(--23) mm diam., lobes usually longer than broad, shallowly notched, lacking a white ring at base of lobes; corolla tube lavender to deep lavender, with darker purple veins, base of tube tapering abruptly to spur; palate strongly exerted, 3--4(--6) mm, upper portion covered with yellow clavate hairs (tips redden with age), lower portion lavender or white, glabrous; darker golden short-stalked clavate hairs along inner corolla tube ridge behind palate; non-glandular hairs on lateral walls within corolla tube white; spur yellowish green to tan-olive to yellow-olive to brown-olive to tannish brown, linear-cylindric, 2.5--5(--6) mm, glandular (especially toward apex); filaments pale violet to white, anthers pale yellow. **Capsules** globose, with depression, 4--5 mm (5--7.5 mm dehisced). **2n** = 22.

Flowering Feb--Apr. Boggy, mucky soils or wet sands of depressions in pine flatwoods, bogs, ditches, and drainage canals, usually with *Pinguicula planifolia*, coastal plains; of conservation concern; 0--50 m; Fla.

*Pinguicula ionantha* is known only from the Florida panhandle.

3. *Pinguicula lutea* Walter, Fl. Carol., 63. 1788 \* Yellow butterwort E

*Isoloba lutea* (Walter) Rafinesque; *Pinguicula campanulata* Lamarck; *P. edentula* Hooker; *P. lutea* var. *edentula* (Hooker) A. de Candolle; *P. lutea* var. *minor* A. de Candolle

**Perennials**, hibernacula not produced. **Rosettes** 4--9(--15) cm across. **Leaves** persisting year-round, yellowish green, broadly ovate to ovate to narrowly elliptic to lanceolate to somewhat deltoid, longer leaves 1.8--4 cm, margins ciliate at base. **Scapes** 15--25(--34) cm, densely glandular pubescent (sometimes becoming less glandular proximally). **Flowers:** calyx densely glandular pubescent, lobes 4--8 mm; corolla bright yellow to pale yellow, (1--1.5--3(--4.5) mm diam.; lobes longer than broad, 1(--3) notches to 1/3 length, glabrous; corolla tube yellow to yellowish green, with prominent reddish to purplish veins (especially prominent within corolla tube), glandular pubescent; palate strongly exerted, stout, blunt, 6--10 mm, densely covered with long yellow clavate hairs; yellow-orange short-stalked clavate hairs on corolla tube ridge below palate; hairs on lateral walls within corolla tube yellow; spur same color as corolla tube, slender, tapering to acute apex, (3--4--8(--10) mm, sparsely to densely glandular; filaments white, anthers pale yellow. **Capsules** globose, 4--6 mm (7--9 mm dehisced).  $2n = 32$ .

Flowering Feb--Apr. Wet to moist sandy, peaty or mucky soils of bogs, depressions of pine flatwoods and pine savannas, adjacent ditches and roadsides, coastal plains; 0--200 m; Ala., Fla., Ga., La., Miss., N.C., S.C.

Plants of *Pinguicula lutea* with white corollas occur occasionally in the Longleaf Pine-Saw Palmetto flatwoods in the Apalachicola region of the Florida panhandle.

4. *Pinguicula planifolia* Chapman, Fl. South. U.S. ed. 3, 303. 1897 \* Chapman's butterwort C E

**Perennials**, hibernacula not produced, vegetative reproduction sometimes by gemmipary. **Rosettes** 5--18 cm across. **Leaves** persisting year-round, reddish or reddish green (remaining dull green in shade, often suffused with red-purple especially along margins), rather flat, elongate, oblong to narrowly elliptic to oblanceolate to narrowly lanceolate to ovate, longer leaves 3--10 cm, margins slightly in-rolled except at apex. **Scapes** to 34 cm, sparsely glandular pubescent, weakly glandular or glabrous on proximal 2/3. **Flowers:** calyx sparsely glandular pubescent or glabrous, lobes 3.2--5.4 mm; corolla lavender to violet to very pale lavender to nearly white, and somewhat darker lavender within throat, 15--36 mm diam., lobes narrowly lanceolate, deeply notched or incised 1/3--1/2 length, glabrous; corolla tube with veins reddish purple; palate exerted, oblong, 3--6 mm, covered with yellow clavate hairs (less dense than other southern species); darker golden short-stalked clavate hairs along inner corolla tube ridge behind palate; long non-glandular hairs within tube on lateral walls within corolla tube white; spur olive-green to olive-lavender, sometimes yellowish green, short and thick, acute at apex, (1.5--2.5--3 mm, sparsely glandular; filaments pale to deep violet, anthers yellow. **Capsules** globose 4--5 mm (5--7.7 mm dehisced).  $2n = 32$ .

Flowering Mar--Apr. Very wet sites, often marly substrates (leaves frequently submersed at flowering), bogs, boggy flatwoods, seeps, margins of peaty ponds, ditches, coastal plains; of conservation concern; 0--100 m; Ala., Fla., Miss.

*Pinguicula planifolia*, while often locally abundant, is geographically very restricted (Florida panhandle and the Gulf coastal plain of Alabama and Mississippi), and is vulnerable to habitat destruction; it needs conservation.

5. *Pinguicula primuliflora* C. E. Wood & R. K. Godfrey, Rhodora 59: 219, figs. 1--7, 11--14, 30. 1957 \*  
Southern butterwort C E

**Perennials**, hibernacula not produced, vegetative reproduction frequently resulting from gemmipary, with plantlets developing on leaves touching wettest mossy substrate. **Rosettes** 4--12.5 cm across. **Leaves** persisting year-round, bright green, broadly lanceolate to ovate to narrowly elliptic to narrowly oblanceolate, longer leaves 2.3--7 cm. **Scapes** 8--17 cm, weakly glandular pubescent, usually glabrous proximally, more glandular at summit. **Flowers:** calyx glandular, lobes 2.5--4 mm; corolla white or light blue to light lavender with a ring of white in center at base of corolla lobes just above yellow throat, (1.5--2.5--30 mm diam. (often not opening fully in morning), lobes nearly as broad as long or often broader, shallowly notched; corolla tube lemon yellow, with prominent reddish brown or brown veins (more prominent within, sometimes obscure externally), base of corolla tube abruptly truncated/auriculate at junction with spur (hidden by lower calyx lobes); palate exerted from corolla tube, cylindrical, (1.5--3--5 mm, covered with bright yellow hairs; darker golden short-stalked clavate hairs along inner corolla tube ridge behind palate; hairs on lateral walls yellow (best seen in fresh

specimens); spur yellow, usually thick and blunt at apex, sometimes slender, 2--5 mm; filaments white, anthers pale yellow. **Capsules** globose, with small depression, 4--6 mm.  $2n = 32$ .

Flowering late Feb--May. Shade of springy woods with *Sphagnum* or *Pallavicinia*, flowing water, peaty sands, peaty islands, tussocks in *Nyssa* swamps, bogs, depressions in pine flatwoods and savannas, springs along streams, coastal plains; of conservation concern; 0--100 m; Ala., Fla., Ga., Miss.

Small specimens of *Pinguicula primulifolia* can be confused with larger plants of *P. pumila*; they can be recognized by scapes more glandular distally, and sparsely glandular to glabrous proximally, corollas with a ring of white at the base of the lobes (just above the corolla throat), and the bases of corolla tubes abruptly truncated at junction with the spur; scapes in *P. pumila* are strongly glandular to the base, corollas lack a white ring, and corolla tubes taper into the spur. The habitat is also unique for *P. primulifolia*, with its affinity for sphagnum springs and streamlets in shady woods, differing from all the other species of the Southeast.

*Pinguicula primulifolia* is endemic to the southwest corner of Georgia (possibly extirpated) and the Florida panhandle west along the Gulf coastal plain, in highly vulnerable habitat and is recognized throughout its greatly restricted range as needing conservation.

#### 6. *Pinguicula pumila* Michaux, Fl. Bor.-Amer. 1: 11. 1803 \* Small butterwort

*Isoloba pumila* (Michaux) Rafinesque; *Pinguicula australis* Nuttall; *P. floridensis* Chapman; *P. pumila* var. *buswellii* Moldenke

**Perennials**, hibernacula not produced, vegetative reproduction sometimes occurs by gemmipary. **Rosettes** 1--3.5(--6) cm across. **Leaves** persisting year-round, light green to dark green, ovate to oblong, longer leaves (0.5--1)--1.9 cm, long non-glandular ciliate hairs at base and along midvein. **Scapes** 3--10 cm, glandular pubescent to base. **Flowers**: calyx densely glandular, lobes 2.5--3.5 mm; corolla dark blue to pale blue to lavender to pink to white, yellow within corolla throat, (4--10)--18(--22) mm diam., lobes obovate, shallowly to barely notched; corolla tube pale yellow or violet especially on upper portion, sometimes whitish on lower portion (except darker-colored flowers), veins darker reddish brown or purple and conspicuous into spur, glandular; palate included within corolla tube or barely exerted, conical, 1.5--2(--2.5) mm, covered with short yellow clavate hairs; darker golden short-stalked clavate hairs along inner corolla tube ridge behind palate; non-glandular hairs on lateral walls within corolla tube yellow; spur yellow, cylindrical, thick, usually tapering abruptly to apex (occasionally slender, tapering to acute apex), 2--4(--5) mm, nearly as long as corolla tube, glandular, curved or deflected away from scape; filaments white, anthers white to pale yellow. **Capsules** nearly globose, 2.5--4 mm.  $2n = 22$ .

Flowering Jan--Jun. Moist to wet calcareous sites, rocky or sandy soils, pond margins, edges of depressions of peaty pine savannas and flatwoods, margins of sandy, grassy hummocks, ditches and drainage canals, coastal plains; 0--150 m; Ala., Fla., Ga., La., Miss., N.C., Okla., S.C., Tex.; West Indies (Bahamas).

Corolla color in plants of *Pinguicula pumila* may vary widely within a single population; albino plants occasionally are seen. More robust plants of *P. pumila* sometimes occur under favorable moisture conditions, and individuals with blue corolla lobes and yellow corolla tubes can be confused with *P. primuliflora*. *Pinguicula pumila* can be recognized by scapes strongly glandular to the base and corollas lacking white rings at the bases lobes, and corolla tubes tapering into spurs. In *P. primuliflora*, the scapes are more glandular distally and sparsely glandular proximally; corollas have rings of white at the bases of the lobes and corolla tubes are abruptly truncate at the junction with the spur.

#### 7. *Pinguicula villosa* Linnaeus, Sp. Pl. 1: 17. 1753 \* Hairy butterwort

**Perennials** over-wintering by small hibernacula. **Rosettes** 0.8--2(--3) cm across. **Leaves** ciliate along petiole, blade ovate to obovate, longer leaves 0.4--1 cm. **Scapes** 2.5--5.5 cm, usually white-villous on proximal 1/3--1/2, densely glandular pubescent with shorter hairs distally, sometimes glabrescent in fruit. **Flowers**: calyx glandular, lobes 1--1.5 mm; corolla light lavender to purple, 6--10 x 4--7 mm, unlobed, conspicuous purple veins extending from corolla lips and tube into spur (remaining purple when flower color fades in drying); palate none; spur conical, blunt at tip, (1.5--2.5)--5(--6) mm; filaments and anthers white. **Capsules** globose to pyriform, 2--4 mm.  $2n = 16$ .

Flowering Jun--Jul. Sphagnum bogs, muskegs, hummocks along streams and pools, arctic/timberline, turfey alpine tundra; 0--1400 m; Alta., B.C., Nfld. and Labr. (Nfld.), N.W.T., Nunavut, Ont., Que., Sask., Yukon; Alaska; Eurasia.

*Pinguicula villosa* populations with white corollas occasionally occur.

8. *Pinguicula vulgaris* Linnaeus, Sp. Pl. 1: 17. 1753 \* Common butterwort, bog-violet F

**Perennials**, over-wintering by hibernacula. **Rosettes** 2.3--9 cm across. **Leaves** green to yellowish green or reddish green. **Scapes** glabrous or glandular pubescent. **Flowers:** calyx sparsely to glandular pubescent, lobes (1--1.5--3(--4.5) mm; corolla violet to blue-violet to pale blue, (10--14--36 mm diam., white base into throat of corolla tube; swollen palate absent; long, white, multicellular hairs at base of lower corolla lip and within corolla throat on lateral and lower walls; spur straight, slender to stout, tapering to acute or blunt tip, (1--3--10(--11) mm; filaments and anthers white. **Capsules** globose to slightly pyriform, 4--5(--6) mm, valves ovate after dehiscence.

Subspecies 2 (2 in the flora): North America, Europe, Asia.

1. Flowers (10--14--22(--29) mm (including spur); spur 3--6(--7) mm; lobes of lower corolla lip oblong, not overlapping .....8a. *Pinguicula vulgaris* subsp. *vulgaris*
1. Flowers (14--17--36 mm (including spur); spur (4--5--9(--11) mm; lobes of lower corolla lip obovate-oblong, usually overlapping ..... 8b. *Pinguicula vulgaris* subsp. *macroceras*

8a. *Pinguicula vulgaris* Linnaeus subsp. *vulgaris* F

*Pinguicula acutifolia* Michaux; *P. vulgaris* var. *americana* A. Gray; *P. vulgaris* var. *pallida* Lange

**Rosettes** 2.3--4.5(--6) cm across. **Leaves** green to yellowish green, broadly lanceolate to oblanceolate, longer leaves (1--1.5--3.5(--4) cm. **Scapes** 4--9 cm, usually glandular-pubescent throughout or weakly glandular on distal 1/3--1/2, sometimes glabrous, glabrescent in fruit. **Flowers** (10--14--22(--29) mm; calyx glandular to sparsely glandular pubescent or glabrous, lobes (1--1.5--3 mm, acute or blunt at apex, lower pair united 2/3 length; corolla 6--10(--15) mm diam., lobes of lower lip oblong, not overlapping; spur slender, tapering to acute tip (occasionally short and stubby), (1--3--6(--7) mm. **2n** = 64.

Flowering Jun--Jul. Wet rocks and rock ledges, gravelly shores, seeps and wet gravelly open sites, bogs and wet meadows, acidic or calcareous areas; 0--2300 m; Greenland; St. Pierre and Miquelon; Alta., B.C., N.B., Nfld. and Labr. (Nfld.), N.W.T., N.S., Nunavut, Ont., Que., Sask., Yukon; Alaska, Maine, Mich., Minn., Mont., N.H., N.Y., Vt., Wis.; Europe; Asia.

Plants of subsp. *vulgaris* often form clusters by producing plantlets from short stolons arising from stems below rosettes. In western North America, subsp. *vulgaris* tends to be distributed less commonly in coastal areas. Larger-flowered plants appearing more like subsp. *macroceras* occasionally occur in areas such as Greenland, Newfoundland and southern Labrador, along James Bay, the Northwest Territories, and Yukon. The two subspecies appear to overlap in the Canadian Rockies and western Montana where subsp. *macroceras* tends to have lower corolla lobes that may be somewhat obovate, but that often do not overlap. Some intermediate specimens occur in eastern Oregon and eastern Washington. Frequently specimens occur that are difficult to clearly place in one taxon or the other.

8b. *Pinguicula vulgaris* Linnaeus subsp. *macroceras* (Link) Calder & Roy L. Taylor, Canad. J. Bot. 43: 1399. 1965 \* Pacific Northwest butterwort F

*Pinguicula macroceras* Link, Jahrb. Gewächsk. 1(3): 54. 1820; [P. macroceras subsp. nortensis J. Steiger & J. H. Rondeau](#); *P. microceras* Chamisso; *P. vulgaris* var. *macroceras* (Pallas ex Link) Herder

**Rosettes** 3--9 cm across. **Leaves** reddish green (dried), broadly to narrowly lanceolate, oblanceolate or sometimes narrowly oblong, with conspicuously darkened midvein, longer leaves 2--6 cm. **Scapes** 5.5--10 cm, glabrous or sparsely glandular pubescent, more glandular distally (junction with calyx). **Flowers** (14--17--36 mm; calyx glandular-pubescent at base, lobes 2--3(--4.5) mm, blunt to acute at apex, lower pair of lobes united usually 1/2; corolla 12--20 mm diam.; lobes of lower lip obovate-oblong, usually overlapping; spur somewhat stout, somewhat blunt at apex (sometimes slender and acute), (5--6--9(--11) mm. **2n** = 64.

Flowering Apr--Aug. Wet rocks and cliffs, seeps, boggy sites, sphagnum moss; 0--2500 m; Alta., B.C., Yukon; Alaska, Calif., Mont., Oreg., Wash.; e Asia (Japan, Russian Far East).

Morphological distinction of the large-flowered subsp. *macroceras* from subsp. *vulgaris* is not consistent. Subspecies *macroceras* tends to occur at mid elevations in the mountains and coastal distributions, ranging from northern California to the Aleutian Islands, extending to the Russian Far East and northern Japan. Populations from the Canadian Rockies (Banff/Jasper), Montana and eastern Oregon/Washington have the large flowers of subsp. *macroceras* and were treated by S. J. Casper (1962) as inland populations. In general,

plants with larger flowers have a central corolla lobe that does not overlap the two lateral lobes, the spurs are sometimes shorter than typical, and the leaves tend to be greenish (rather than reddish).

Some populations, primarily from the Aleutian Islands, Alaska, having large flowers, but short stubby spurs (3--4 mm) have been called *Pinguicula microceras* Chamisso. Within the same populations both long-spurred and short-spurred plants occur. Some individual specimens have flowers with both short and longer spurs on the same plant. S. J. Casper (1962) showed that these plants fall within the range of variability of subsp. *macroceras* and although he used the name *P. macroceras* var. *microceras*, the nomenclatural transfer was not formally made, nor was it taxonomically recognized in his later monograph (Casper 1966).

Populations restricted to rocky serpentine seeps and stream drainages in northern California and southwestern Oregon have been described as subsp. *nortensis*, distinguished by calyx lobes blunt-tipped, the central lobe of the lower corolla lip oblongate, with lateral lobes obovate and not overlapping, and the spur 6--11 mm. It is recognized that plants growing on serpentine may exhibit some morphological variation differing from other populations; this appears to be within the overall range of variability for subsp. *macroceras* across its geographic distribution and is not recognized taxonomically herein.

Albino plants from Attu Island, in the Aleutians, have been described as *Pinguicula macroceras* forma *alba* Casper.

## 2. UTRICULARIA Linnaeus, Sp. Pl. 1: 18. 1753; Gen. Pl. ed. 5, 11. 1754 \*

Bladderwort [Latin *utriculus*, little sac, bag, or bladder, alluding to carnivorous traps]

**Herbs**, perennials submersed aquatic, semi-aquatic and amphibious, and epiphytic. **Stems** stolons, most giving rise to leaves (leaflike branches); in some species, specialized stolons bearing bladders, suspended in water or anchored in substrate. **Leaves** (modified leaflike branches) alternate, opposite or whorled, blades usually dissected and bearing bladders or blades linear and bladders borne separately from leaves; bladders ovoid to globose. **Flowers** few- to many-flowered racemes (sometimes 1 open at a time), sometimes solitary, subtended by a single bract, sometimes also a pair of bracteoles; calyx 2-lipped; corolla 2-lipped, lower lip entire to lobed, usually with conspicuous, raised, swollen palate (umbo) at base, spurred; filaments curved, pollen white; ovary glabrous. **Fruits** 2-valved capsules. **Seeds** subglobose to cylindrical (sometimes angular).  $x = 7, 9, 10, 11$ .

Species ca. 215 (19 in the flora): nearly worldwide; tropical to cold temperate.

Aquatic species of *Utricularia* in cold temperate regions perennate by turions ("hibernacula"); these are usually distinctive by species. Semi-terrestrial and tropical epiphytic species usually develop tubers by which they survive dry conditions. Plants in this genus lack roots; the aquatic species are often free-floating or anchor by rhizoids or stolons. Bladders (carnivorous suction-traps in *Utricularia*) bear external "trigger" appendages associated with trap mouths and internal trap glands, comprised of 2-fid trichomes (few, adjacent to trap opening) and 4-fid trichomes (abundant, associated with setting trap, secreting enzymes and absorbing nutrients). In aquatic species, flower scapes are thickened at water surface by development of aerenchyma.

SELECTED REFERENCES Müller, K. and T. Borsch. 2005. Phylogenetics of *Utricularia* (Lentibulariaceae) and molecular evolution of the *trnK* intron in a lineage with high substitutional rates. *Pl. Syst. Evol.* 250: 39--67. Reifenrath, K. et al. 2006. Trap architecture in carnivorous *Utricularia* (Lentibulariaceae). *Flora* 201: 597--605. Roszbach, G. B. 1939. Aquatic utricularias. *Rhodora* 41: 113--128. Rutishauser, R. and B. Isler. 2001. Developmental genetics and morphological evolution of flowering plants, especially bladderworts (*Utricularia*): Fuzzy Arberian morphology complements classical morphology. *Ann. Bot.* 88: 1173--1202. Schlosser, E. 2003. *Utricularia stygia* in California, USA, and *U. ochroleuca* at its southern range. *Carniv. Pl. Newslett.* 32: 113--121. Taylor, P. 1989. The genus *Utricularia*: A Taxonomic Monograph. London. Kew Bull., Addit. Ser. 14. Taylor, P. 1991. *Utricularia* in North America north of Mexico. *Carniv. Pl. Newslett.* 20: 8--20.



1. Plants semi-aquatic, in wetlands or anchored on wet shores (appearing semi-terrestrial), typically only flowers and scapes visible (leaves when present, very slender, terete, linear to thin, obovate to oblanceolate).
2. Corollas purple or violet to pink to nearly white.
  3. Inflorescences usually (2--6--10)-flowered, flowers rarely solitary; each flower subtended by a bract and 2 bracteoles; scapes with alternate, scales; corollas violet or mauve to pink to nearly white, with yellow spot on palate, lower lip distinctly 3-lobed; spur 2--3 times longer than lower lip; leaf blades narrowly to broadly obovate or nearly round, not septate ..... 1. *Utricularia amethystina*
  3. Inflorescences 1-flowered; each flower subtended by a single pair of opposite, fused bracts at base of pedicel; scapes lacking scales; corollas light purple to rose-pink (rarely completely white), usually with a cream spot at base of lower lip; lower lip obscurely 3-lobed; spur 1/2 as long as corolla lip; leaf blades linear-subulate to filiform, distinctly septate (sometimes septa only 1--2, toward apex)..... 15. *Utricularia resupinata*
2. Corollas yellow.
  4. Bracts and calyx lobes red, fimbriate .....16. *Utricularia simulans*
  4. Bracts and calyx lobes green, not fimbriate.
    5. Corollas pale yellow to greenish yellow, with conspicuous veins, red streaks at base of lower lip, continuing into spur; spur usually with shallow notch at apex, sometimes obscurely 3-fid; stolons radiating from base of inflorescence, whitish, bearing rhizoids ..... 17. *Utricularia striata* (in part)
    5. Corollas bright yellow, without conspicuous veins; spur not notched at apex; base of inflorescence not bearing radiating stolons.
      6. Upper corolla lip 3-lobed, slightly larger than lower lip.....6. *Utricularia gibba* (in part)
      6. Upper corolla lip entire to 2-lobed, smaller than lower lip.
        7. Scape bracts peltate; flowers each subtended by a bract, bracteoles absent; spur length 1 time lower than corolla lip, usually reddish; palate bilobed .....18. *Utricularia subulata*
        7. Scape bracts basifixed; flowers each subtended by a bract and 2 bracteoles; spur longer than lower lip, never reddish; palate a conical hump (not bilobed).
          8. Inflorescences congested, 3--5- flowered, usually clustered distally; corollas 15--25(--30) mm, spur 7--12(--14) mm; scapes green to yellowish green, stout, 0.5--1.5 mm diam. near base..... 2. *Utricularia cornuta*
          8. Inflorescences elongate, several--many-flowered, usually distributed along scape; corollas 9--15 mm, spur 4--6(--7) mm; scapes greenish purple to purple, slender, wiry, 0.1--1 mm diam. near base..... 9. *Utricularia juncea*
  1. Plants aquatic, submersed, unattached (rootless) or creeping over substrate (sometimes stranded on mud, appearing anchored); leaves divided into filiform segments.
    9. Leaves whorled; bladders borne only at tips of leaf segments; corollas usually purple or pink, rarely white, lateral lobes of lower lip saccate..... 13. *Utricularia purpurea*
    9. Leaves not whorled; bladders scattered; corollas yellow or white, lateral lobes of lower lip not saccate.
      10. Scapes subtended by inflated, floating branches.
        11. Racemes (3--9--14(--18))-flowered, pedicels 1--3.5 cm; corollas bright yellow, spur distinctly notched at apex; pedicels strongly recurved in fruit; inflated branches 3--8 cm; individual float branches: margins tapering to scape; main stem 2--3 mm diam. (at 5 cm proximal to floats), leaves on submersed stolons divided into unequal primary segments, much-branched, bushy, ultimate segments filiform; bladders of 2 sizes, 1.5--2(--3) mm and 0.7--1 mm ..... 7. *Utricularia inflata*
        11. Racemes (1--3 or 4(or 5))-flowered, pedicels 0.2--1.8 cm; corollas dull yellow, spur rounded at apex (rarely with slight notch); pedicels

- ascending in fruit; inflated branches 1--4 cm; individual float branches: margins parallel most of length; main stem to 0.7 mm diam. (at 5 cm proximal to floats), leaves on submersed stolons divided into 2 equal primary segments, less densely branched, ultimate segments threadlike, not bushy; bladders of consistent size, 1.5--2 mm ..... 14. *Utricularia radiata*
10. Scapes not subtended by inflated, floating branches.
12. Stolons dimorphic, whitish, bearing bladders (often buried in substrate), green stolons bearing dissected leaves with no or 1--few bladders (fewer bladders than on non-green stolons).
13. Green leafy branches cylindric in outline, leaf segments fine, terete, narrower beyond each dichotomy, ultimate divisions threadlike, midveins not visible; bracts and scales basifixed, clasping pedicel; corolla lips nearly equal length.
14. Plants in deep water, anchored in substrate; green leafy branches cylindric, to 40 cm, 2--5 cm across; scape flexuous; corolla bright yellow, not streaked; spur (4--4.5--6 mm, slightly longer than lower lip, apex blunt ..... 3. *Utricularia floridana*
14. Plants in shallow water (some appearing terrestrial when stranded if water recedes), green leafy branches +/- flat, to 10 cm, 1--1.5(--2) cm across; scape erect, slender-wiry, 1 mm diam.; corolla pale to greenish yellow, with red streaks on palate; spur (5--6--9 mm, length 3/4 as long as to slightly longer than lower lip, apex usually notched sometimes obscurely 3-fid ..... 17. *Utricularia striata* (in part)
13. Green leafy branches flat, leaf segments flat, +/- same width throughout, with midvein visible in ultimate divisions; bracts and scales conspicuously auriculate at base; corolla lower lip length 2 times upper lip.
15. Corollas bright yellow, spur slightly shorter than lower lip, spur slender-cylindric, narrowed, constricted at base, +/- appressed to lower lip; bladders (1.5--2.5--5.5 mm; leaves: ultimate segments toothed, teeth(5--9--12(--20)), setulose, apex +/-obtuse; turions oblong, 7--11(--15) mm long, setulose with white bristles on margins of scalelike leaves ..... 8. *Utricularia intermedia*
15. Corollas light or pale yellow, spur to 1/2 as long as lower lip, short-conical to pyramidal, broad at base, oriented at acute to right angle to lower lip; bladders on both white subterranean stolons and on green leaves, 0.3--2.2(--3.8) mm; ultimate green leaf segments lacking teeth or with 1--7(--9) lateral setulose teeth, always acute at apex; winter buds (turions), when present, globose-ovoid, (1.5--2--3(--3.5)), weakly setulose (appearing naked, green).
16. Bracts and scales purplish; lateral margins of lower lip strongly curved downward; palate obscure, elongate, with slightly raised lateral margins; lateral margins of ultimate leaf segments ..... 10. *Utricularia minor* (in part)
16. Bracts and scales green; lateral margins of lower lip nearly flat to slightly curved upward or slightly deflexed; palate conspicuous, rounded; ultimate leaf segments toothed ..... 11. *Utricularia ochroleuca*
- [12. Shifted to left margin.—Ed.]
12. Stolons not dimorphic, green, leaves bearing bladders.
17. Corollas white-translucent, (1--2--2.3(--3.5) mm; leaves absent (vegetative portion extremely diminutive, delicate, leaves absent, green stolons coiled at tips, plants often entangled with other submersed vegetation, thus species easily overlooked) ..... 12. *Utricularia olivacea*
17. Corollas yellow, (4--5+ mm; leaves present.

18. Corollas pale yellow, with purplish tinge or striped near base; lower corolla lip strongly recurved; spur 1.5--3.2 mm, saccate or broadly conical; bracts auriculate, purplish ..... 10. *Utricularia minor* (in part)
18. Corollas bright yellow; lower corolla lip spreading; spur 3+ mm, broadly to narrowly conic to cylindrical; bracts not auriculate, green.
  19. Stolons flat, 1--4 mm wide; vegetative branches usually dimorphic or trimorphic with ultimate segments capillary (readily collapsing when withdrawn from water); spur apex notched; capsule indehiscent ..... 4. *Utricularia foliosa*
  19. Stolons terete, 0.5--1.5 mm diam.; vegetative branches +/- monomorphic, leaves with ultimate segments not capillary; spur apex not notched; capsule dehiscent.
  20. Vegetative stems less than 30 cm; leaves divided 1--4 times, ultimate segments hairlike; flowers usually (1 or)2 or 3(--6); upper corolla lip 3-lobed, larger than lower lip; plants usually entangled among floating vegetation, or submersed, creeping over substrate (or, if stranded, then vegetative portion usually buried in wet mud/sand)6. *Utricularia gibba* (in part)
  20. Vegetative stems 30--100 cm; leaves divided 6+ times, ultimate segments not hairlike; flowers 2--15; upper corolla lip entire or slightly notched, smaller than lower; submersed and free-floating, not typically tangled among other vegetation.
  21. Racemes 2--5-flowered; corolla: <lower lip distinctly 3-lobed>, not red-streaked <upper and lower lip oriented upward, giving saddlelike appearance (similar in *U. gibba*)>; apetalous cleistogamous flowers 1 or 2, 1.5--2.5 mm diam., at base of scape; vegetative branches 1--3.5 cm across; leaf segments: margins entire or sparsely setulose ..... 5. *Utricularia geminiscapa*
  21. Racemes (3--)6--15-flowered; corolla streaked with red; cleistogamous flowers none; vegetative branches 3--12 cm across; leaf segments: margins setulose (with or without teeth)..... 19. *Utricularia vulgaris*

**1. *Utricularia amethystina*** Salzm. ex A. Saint-Hilaire & Girard, Compt. Rend. Hebd. Séances Acad. Sci. 7: 870. 1838 \* Florida purple bladderwort

*Calpidisca amethystina* (Salzm. ex A. Saint-Hilaire & Girard) Barnhart; *C. modesta* (A. de Candolle) Barnhart; *C. standleyae* Barnhart; *Utricularia modesta* A. de Candolle

**Plants** annual or perennial; semi-terrestrial. **Stolons** few, filiform, branched, 0.2 mm wide. **Leaves** 2--6, in basal rosette, petioles to 2.5 cm, lamina narrowly to broadly obovate or somewhat orbiculate, membranous, with numerous anastomosing veins, 2.5--6 mm wide. **Bladders** borne on stolons, usually buried within substrate, 1--1.2 mm. **Scapes** 1.5--9 cm; scales basifixed, few along scape, 1 mm; flowers subtended by 1 bract and 2 bracteoles, bract basifixed, ovate or ovate-deltate, 1 mm; bracteoles 2, united to bract 1/2 length or more, bract appearing 3-fid. **Racemes** (1 or)2--6(--10)-flowered, erect, filiform. **Pedicels** ascending, usually 5--15 mm. **Flowers** pale yellow [violet to lavender to pink or nearly white], 1.5--3.2[--20 x 3--10] mm (very variable in size); calyx 2-lobed, lobes unequal (the lower shorter), somewhat densely glandular pubescent; corolla with upper lip entire, oblong to oblong-elliptic, deflected, rounded at apex; lower lip shallowly to clearly 3-lobed, shorter than upper lip, often with a yellow spot at base with white border; palate prominent, bilobed, papillate (sometimes with stipitate glands); spur long, slender, narrowly cylindrical, tapering to acute apex, usually 1.5--3 times as long as lower lip. **Capsules** globose, 1.5--2.5 mm, wall thick, hard, dehiscence bivalvate dorsiventrally.

Flowering Jan. Wet pine flatwoods, coastal plains; 0--20 m; Fla.; Mexico; Central America; South America.

P. Taylor (1989) noted that *Utricularia amethystina* is a difficult and incredibly polymorphic species. The North American specimens, originally described as *Calpidisca standleyae* Barnhart, are documented from only two counties in Florida and are extremely small for the species. This widespread neotropical species has not been seen in Florida since it was collected January 14, 1946, and has likely become extirpated.

**2. *Utricularia cornuta*** Michaux, Fl. Bor.-Amer. 1: 12. 1803 \* Horned bladderwort

*Stomopsis cornuta* (Michaux) Rafinesque

**Plants** perennial; semi-aquatic/semi-terrestrial. **Stolons** numerous, filiform, developing a delicate branch-system within substrate; rhizoids numerous. **Leaves** arising from stolons (often not seen), narrowly linear, terete, gradually tapering to a long point when submerged, when stranded becoming more straplike, flattened toward tip, or often withering away. **Bladders** on stolons, rhizoids, and leaves within substrate, inconspicuous, 0.3--0.8 mm. **Scapes** green to yellowish green, somewhat stout (not wiry), 12--38 cm, 0.5--1.5 mm thick near base; scales basifixed, narrow, acute, 1.2--2.5 mm; flowers subtended by 1 bract and 2 bracteoles, bract basifixed, yellowish, broadly ovate with acute tip, slender, 1.6--2.8 mm; bracteoles paired, very slender, linear 1.9--3 mm, slightly longer than the bract. **Racemes** (1--3--5(--9))-flowered, congested at apex of scape, erect, appearing spicate, emergent. **Pedicels** 1--2 mm, flowers subsessile, pedicels shorter than or equal to bracts and bracteoles. **Flowers** yellow, 15--25(--30) x (4--9--12(--17)) mm; calyx yellow, 3--5(--7) mm, upper lobe distinctly longer than other, slightly recurved at summit; lower lobe slightly notched; corolla with upper lip entire, obovate to broadly oblong from a narrow base, sides curved backward, smaller than lower lip; lower lip entire, lateral lip margins strongly deflexed; palate comprising most of lower lip, broadly humped or hood-shaped; spur very slender, conic, long-tapering to acute apex, conspicuously curved, 7--12(--14) mm, longer than lower lip, lacking clear distinction between corolla tube and spur. **Capsules** ovoid-pyriform, 3.5--4.5 mm, wall thick, hard, dehiscence by single longitudinal slit on ventral side.  $2n = 18$ .

Flowering Apr--Aug, Nov. Shallow water, bogs, sandy-peaty margins of ponds, wet pine savannas, flatwoods, cypress pond borders, sandy alluvium, peaty ditches; 0--400 m; Alta., Man., N.B., Nfld. and Labr. (Nfld.), N.S., Ont., P.E.I., Que., Sask.; Ala., Ark., Conn., Del., Fla., Ga., Ill., Ind., Ky., La., Maine, Md., Mass., Mich., Minn., Miss., N.H., N.J., N.Y., N.C., Ohio, Pa., R.I., S.C., Tenn., Tex., Vt., Va., W.Va., Wis.; West Indies (Bahamas, Cuba).

3. *Utricularia floridana* Nash, Bull. Torrey Bot. Club 23: 105. 1896 \* Florida yellow bladderwort E

**Plants** perennial; aquatic, in deep water, anchored in loose, silty substrate. **Stolons** slender, terete, of dimorphic vegetative branches, one type bearing abundant bladders, occurring as slender whitish branches, subterranean within silty substrate, or as submersed suspended branches, other stolon type bearing leaves, these green leafy branches cylindrical (*Myriophyllum*-like), to 40 cm, 2--6 cm diam. **Leaves** dimorphic, alternate, bearing no (or very few) bladders, photosynthetic type with highly divided, filiform segments, to 30 mm, and achlorophyllous, subterranean leaves divided into filiform segments with apical setae, to 20 mm. **Bladders** 1--2(--3) mm, primarily borne on subterranean stolons. **Scapes** long, flexuous (often emergent from as deep as 1 m), becoming thicker, 2--3 mm; scales none or few, basifixed, similar or smaller than bracts; bracts basifixed, clasping pedicel length of bract, truncate with denticulate (often tridentate) apex or broadly tapering to a tooth at tip, glandular, (1.5--2--3) mm; bracteoles absent. **Racemes** 5--20-flowered, emergent. **Pedicels** ascending, spreading, or slightly curved (not distinctly recurved), 7--20 mm. **Flowers** bright yellow, 8--20 x 9--15 mm; calyx ovate, 2.5--4 mm, blunt at apex; corolla with upper lip nearly round, wavy, shallowly 3-lobed; lower lip a little smaller than upper, nearly round, wavy, shallowly 3-lobed; palate conspicuously swollen bilobed-wrinkled, red-streaked, densely pubescent; spur narrowly cylindrical, somewhat S-shaped, with slight constriction at bend, +/- appressed to lower lip, (4--4.5--6) mm, tip deflected, blunt at apex, slightly shorter to slightly exceeding lower lip. **Capsules** globose, 4.5--8 mm, wall thick, fleshy, dehiscence bivalvate.

Flowering Mar--Oct. Submersed in quiet waters of lakes and ponds to 1 m deep (especially karst-formed, with little other vegetation), coastal plains; 0--100 m; Ala., Fla., Ga., S.C.

4. *Utricularia foliosa* Linnaeus, Sp. Pl. 1: 18. 1753 \* Leafy bladderwort

*Utricularia mixta* Barnhart; *U. oligosperma* A. St. Hilaire

**Plants** perennial; robust aquatic. **Stolons** (principal) elongate, clearly flat, to several meters, 1--4 mm wide; nodes often branching into usually dimorphic or trimorphic branch systems of varying lengths (some bearing numerous bladders and others bearing few or none). **Leaves** alternate, primary rachis 20--30(--45) cm, secondary divisions numerous, with ultimate segments exceedingly delicate, fine, capillary, readily collapsing when withdrawn from water, very mucilaginous. **Bladders** borne on leaves, 0.7--2 mm. **Scapes** 7--45 cm; scales few, basifixed, 3--3.5 mm; bracts basifixed, broadly ovate, rounded to slightly acute at apex, clasping pedicel, 1.8--4 mm; bracteoles absent. **Racemes** (3--7--15(--20))-flowered, flowers somewhat congested at apex, emergent. **Pedicels** spreading to ascending at anthesis, 7--21 mm, elongating and recurved in fruit. **Flowers** yellow, 8--16 x 10--20 mm; calyx 3--6 mm, glandular; corolla with upper lip entire, wavy, not lobed, orbicular or nearly transversely elliptic, rounded at apex, veins often red on inner surface; lower lip broadly spreading, broadly bilobed or slightly 3-lobed; palate, swollen, sparsely papillate, often streaked with red; spur

narrowly conic, straight, 4--7 mm, notched at apex, sometimes much shorter than or equal to lower lip. **Capsules** globose, (4.5--5--8(--10) mm, walls thick, fleshy, indehiscent.  $2n = 42$ .

Flowering Jan--Dec. Ponds, pools, swamps, marshes, canals, drainage ditches, coastal plains; Fla., Ga., La., Miss., Tex.; Mexico; Central America; South America; Africa; Indian Ocean Islands (Madagascar).

5. *Utricularia geminiscapa* Benjamin, *Linnaea* 20: 305. 1847 \* Hidden-fruit bladderwort E

*Utricularia clandestina* Nuttall ex A. Gray

**Plants** perennial; aquatic, (overwintering by globose-ovoid turions, 2--5 mm diam.). **Stolons** terete, to 60 cm; little branched. **Leaves** very numerous, divided at base into 2 unequal primary segments, 10--20 mm, secondary segments dichotomously divided with numerous slightly flattened segments, segments entire or with few inconspicuous lateral bristles (setae) and often bristle-tipped at apex. **Bladders** borne on leaves, (0.5--1--2 mm, sometimes dimorphic. **Scapes** 5--25 cm; scales absent; bracts basifixed, linear, acute at apex, 2--3 mm; bracteoles absent. **Racemes** 2--5(--8)-flowered (chasmogamous), emergent, with 1 or 2 apetalous cleistogamous flowers at very base of scape, oriented opposite peduncle of chasmogamous flowers, or with only cleistogamous flowers (obscure, occasional along stolon). **Pedicels** strongly ascending, slender, 3--10(--20) mm. **Flowers** yellow, 7--10 x 3.5--5.5 mm; calyx 1.5--2.5 mm, lower lobe notched; corolla with upper lip ascending, broadly ovate, rounded to truncate at apex; lower lip 3-lobed, broadly elliptic; palate densely pubescent; spur cylindrical, 2--3 mm, obtuse at apex, slightly curved, nearly as long as lower lip; cleistogamous flowers obscure, 1.5--2.5 mm diam., corolla absent, with pedicels arising directly from stolons, 0.5--2.5 mm. **Capsules** globose, 1.5--3 mm, wall thin, membranous, dehiscence circumscissile; capsules from cleistogamous flowers, 1.8--2 mm.

Flowering Jul--Sep. Quiet waters of lakes, ponds, bogs, swamps, sluggish streams; 0--400 m; N.B., Nfld. and Labr. (Nfld.), N.S., Ont., P.E.I., Que.; Conn., Del., Ind., Maine, Md., Mass., Mich., N.H., N.J., N.Y., N.C., Ohio, Pa., R.I., Vt., Va., W.Va., Wis.

6. *Utricularia gibba* Linnaeus, *Sp. Pl.* 1: 18. 1753 \* Humped bladderwort

*Utricularia biflora* Lamarck; *U. exoleta* R. Brown; *U. fibrosa* Walter; *U. fornicata* Leconte; *U. gibba* subsp. *exoleta* (R. Brown) P. Taylor; *U. longirostris* Leconte; *U. obtusa* Swartz; *U. pumila* Walter; *Vesiculina gibba* (Linnaeus) Rafinesque

**Plants** annual or perennial; aquatic, (flowering only when plant becomes stranded with drop in water level, or if plant becomes entangled among floating vegetation at water surface; overwintering by small globose-ovoid turions, 1 mm diam., consisting of few loosely integrated leaves forming coiled leaf tips). **Stolons** delicate, usually to 30 cm, 0.2--1 mm wide; much branched, often coiled at growing tips, often creeping over substrate or vegetative portion buried in wet mud/sand when stranded after drop in water level. **Leaves** alternate, 5--15 mm, very delicate, filiform, divided dichotomously, usually 2--4(--8) times, ultimate segments short, hairlike. **Bladders** borne on leaves, dimorphic, larger traps 1--1.6 mm, smaller traps 0.3--0.8 mm. **Scapes** solitary or in pairs, slender, short, 3--13 mm; scales 1 or 2 or absent, 0.8--1.3 mm; bracts basifixed, truncated at apex, clasping pedicel length of bract, 0.5--1.5 mm; bracteoles absent. **Racemes** (1 or)2 or 3(--6)-flowered, emergent, (sometimes plants remaining submersed with reduced cleistogamous flowers). **Pedicels** (3--5--10) mm. **Flowers** yellow, (4--5--17 x 4--13 mm; calyx 2--4 mm; corolla with upper lip broadly ovate to nearly round, 3-lobed, larger than lower lip; lower lip 3-lobed (or entire), spreading, both upper and lower lips oriented upward, giving saddlelike appearance; palate prominent, 2-humped, veins red-streaked, densely pubescent; spur broadly conic, straight, (2--3--4(--5) mm, blunt at apex, shorter than to equal length as lower lip, or (southeastern coastal plain United States) cylindrical, straight or slightly curved, tapering to apex, 6--7(--8) mm, apex somewhat acute or slightly blunt, slightly shorter to slightly longer than lower lip (may be strongly curved and well-developed in bud). **Capsules** globose, 2--4(--5) mm, wall membranous, dehiscence bivalvate.  $2n = 28$ .

Flowering Feb--Oct (mid Jul--Sep in north). Shallow water of lakes, ponds, pools, swamps, marshes, bogs, ditches, sluggish streams; 0--400 m; B.C., N.B., N.S., Ont., Que.; Ala., Ark., Calif., Conn., Del., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., La., Maine, Md., Mass., Mich., Minn., Miss., Mo., N.H., N.J., N.Y., N.C., Ohio, Okla., Oreg., Pa., R.I., S.C., Tenn., Tex., Vt., Va., Wash., W.Va., Wis.; Mexico; West Indies; Central America; South America; s Europe; Asia (including s Japan); Africa; Indian Ocean Islands (Madagascar); Pacific Islands (Hawaii, New Caledonia, New Zealand, Palau); Australia; pantropical and warm-temperate regions, extending to cool-temperate regions of North America.

P. Taylor (1989) regarded *Utricularia gibba*, the most widely distributed species of the genus, as best treated as a single extremely variable species, with a pantropical/eastern North American distribution. Within eastern United States and Canada there appear to be two fairly distinct infraspecific entities, which can be distinguished only when in flower. "True" *U. gibba*, described from Virginia and widely distributed in the cool-temperate

northeastern North America and extending into the southeast primarily in the Piedmont, tends to have smaller flowers, 5--9(--12) x 4--6 mm, with spurs (2--3--4(--5) mm, shorter than to same length as the lip, more broadly conic, straight, and blunt at the apex. Plants of this complex along the Atlantic and Gulf coastal plain, traditionally recognized as *U. biflora*, have somewhat to considerably larger flowers, 11--17 x 6--13 mm, with spurs 6--7(--8) mm, slightly shorter to slightly longer than the lower lip (strongly curved in bud) and more slender, cylindrical, straight or slightly curved, tapering to a somewhat acute or slightly blunt. Additionally, a number of specimens from the Coastal Plain have been misidentified as belonging to *U. gibba* (*U. biflora*), but represent the terrestrial phase of *U. striata* (see comments under that taxon).

The taxonomy of *Utricularia gibba*, in the broad sense, is further confused by also having a pantropical phase. Interestingly, some populations occurring in western North America (California, western Oregon, western Washington, and southwestern British Columbia), having smaller flowers (4--8 mm) with spurs narrowly conical, clearly exceeding the lower corolla lobe, are very similar to plants collected in Costa Rica and Bolivia, thus appearing to have strongest affinity with the pantropical phase of *U. gibba*, and may be introduced in western North America. P. Taylor (1961, 1964), studying *Utricularia* in Africa, treated the neotropical plants as subsp. *gibba* (including *U. biflora* and *U. obtusa*), and incorporated *U. exoleta* R. Brown of the Old World Tropics (Asia and Australia) as *U. gibba* subsp. *exoleta* (R. Brown) P. Taylor, with both subspecies occurring widely in Africa. Later (1989) he abandoned recognition of any infraspecific taxa for this highly variable, widespread species. It would be reasonable to recognize three infraspecific taxa, preferably at the subspecific rank: a north-temperate "true" *U. gibba* occurring throughout northeastern North America, a southeastern United States coastal plain "*U. biflora*" entity (which may include plants of the Caribbean described from Jamaica as *U. obtusa*, a name formerly used widely for *U. gibba* plants of the Neotropics), and a highly variable pantropical taxon ("*U. exoleta*" type); however, Taylor's concept of the species is retained here.

**7. *Utricularia inflata*** Walter, Fl. Carol., 64. 1788 \* Floating bladderwort, large swollen bladderwort E

*Plectoma inflata* (Walter) Rafinesque; *Utricularia ceratophylla* Michaux

**Plants** annual or perennial; aquatic. **Stolons** robust, to 1 m, 2--3 mm diam., (vegetative portion submersed, often breaking off from fertile portion below whorl of floats when collected). **Leaves** alternate, along submersed vegetative stolons immediately divided into unequal primary segments, much-branched, bushy, with threadlike ultimate segments. **Bladders** abundant, borne on leaves, dimorphic, 0.7--1 mm and 1.5--2(--3) mm. **Scapes** 10--18 cm (above floats); scales none; bracts basifixed, narrowly ovate, acute at apex, 3.5--5 mm; bracteoles absent. **Racemes** (4--9--14(--18))-flowered, emergent, subtended by a whorl of 5--8(--10) large, inflated branches (floats) 3--8 cm; individual float branches cylindrical with margins gradually tapering to scape; main stem below floats stout, 2--3 mm wide (at 5 cm below). **Pedicels** long, ascending 1--3.5 cm, strongly recurved in fruit. **Flowers** bright yellow, 12--18 x 15--20 mm; calyx 3--5(--6) mm; corolla with upper lip entire, rounded at tip; lower lip deeply 3-lobed; palate saccate, 2-humped, wrinkled, marked with red streaks or dots; spur yellow to greenish yellow, with reddish to brownish lines, conical, curved upward, 6--9 mm, distinctly notched at tip, 1/2 length of lower corolla lip. **Capsules** globose, (3--4--5(--6) mm, wall thick, fleshy, dehiscence circumscissile. **2n** = 18, 36.

Flowering Jan--Jun (Aug--early Sep Pacific Northwest). Ponds, lakes, swamps, sloughs, ditches, canals, chiefly coastal plains; 0--200 m; Ala., Ark., Del., Fla., Ga., Ky., La., Md., Mass., Miss., N.J., N.Y., N.C., Okla., Pa., S.C., Tenn., Tex., Va., Wash.

When sterile specimens are encountered, the vegetative submersed branches of *Utricularia inflata* can be confused for *U. foliosa*, but the latter has a distinctive flat stem that is readily discerned in the field.

An introduction in the vicinity of Olympia, Washington, was encountered as early as 1980 (*Ceska & Ceska* 4913, WTU) and is now known from four counties in western Washington.

**8. *Utricularia intermedia*** Hayne, J. Bot. (Schrader) 1800(1): 18, plate 5. 1800 \* Flatleaf bladderwort

*Lentibularia intermedia* (Hayne) Nieuwland & Lunell; *Utricularia intermedia* var. *robbinsii* Alph. Wood; *U. robbinsii* (Alph. Wood) Alph. Wood

**Plants** perennial; aquatic or anchored, (spread flat over surface of substrate, sometimes stranded on substrate as water recedes; turions oblong, 7--11(--15) mm, setulose with white bristles on margins of scalelike leaves). **Stolons** to 30 cm, dimorphic: whitish bladder-bearing stolons usually unbranched, sometimes appearing anchored in loose substrate; green stolons flat, bearing no bladders. **Leaves** alternate, flat, 10--20 mm, slightly longer than wide, segments same width throughout, ultimate segments flat with a central vein, divisions

toothed, teeth (5--9--12(--20), setulose, apex +/- obtuse, sometimes setulose (bristles sometimes in fascicles of 2--4). **Bladders** (1.5--2.5--5.5 mm. **Scapes** (5--9--20 cm; scales 2 or 3, basifixed, 2.2--3 mm, base auriculate, margins translucent; bracts basifixed, 2.5--3.2 mm, base auriculate, apex acute, margins translucent; bracteoles absent. **Racemes** (2 or)3--5-flowered, emergent. **Pedicels** 4--17 mm. **Flowers:** calyx 2.5--4 mm, with lower lobe obtuse, truncate or shallowly notched; corolla bright yellow, 8--18 x 8--15(--18) mm, upper lip ascending, broadly ovate, apex rounded, veins on inner surface red; lower lip broadly elliptic, entire, apex rounded, length 2 times upper; palate rounded, glabrous, sometimes marked with red veins on summit and tube; spur slender-cylindric, straight, +/- constricted at junction with tube, 4--7 mm, apex acute, +/- appressed to lower lip, sometimes marked with red veins. **Capsules** globose, 2.5--3 mm, wall firm textured, dehiscence circumscissile.

Flowering late May--Sep. Shallow pools and ponds, bog mats, peaty soils, wet sands; 0--3400 m; Greenland; St. Pierre and Miquelon; Alta., B.C., Man., N.B., Nfld. and Labr., N.W.T., N.S., Nunavut, Ont., Que., Sask., Yukon; Alaska, Ark., Calif., Colo., Conn., Idaho, Ill., Ind., Iowa, Maine, Md., Mass., Minn., Mont., Nev., N.H., N.J., N.Y., N.Dak., Ohio, Oreg., Pa., R.I., Utah, Vt., Wash., Wis., Wyo.; Eurasia.

**9. *Utricularia juncea*** Vahl, Enum. Pl. 1: 202. 1804 \* Southern bladderwort

*Stomoisia juncea* (Vahl) Barnhart; *S. virgatula* (Barnhart) Barnhart; *Utricularia virgatula* Barnhart

**Plants** perennial; semi-aquatic/semi-terrestrial. **Stolons** numerous, filiform, developing a delicate branch system within substrate; rhizoids numerous. **Leaves** arising from stolons (often not seen), narrowly linear, terete, gradually tapering to a long point when submerged, when stranded becoming more straplike, flattened toward tip, or withering away. **Bladders** on stolons, rhizoids, and leaves, subterranean, inconspicuous, 0.3--0.6 mm. **Scapes** slender, wiry, greenish purple to purple, 11--32 cm, 0.4--1 mm thick near base; scales several to numerous along scape, basifixed, 1.5--2.6 mm; bracts basifixed, narrow, purple, (0.7--1.5--2.3 mm; bracteoles paired, linear, 1.5--2 mm, as long as bracts. **Racemes** several-many-flowered, usually widely spaced along scape, erect, appearing spicate, emergent. **Pedicels** 0.5--1.5 mm, flowers nearly sessile, to pedicel as long as or longer than bracts. **Flowers** yellow, 9--15 x 9--12 mm; calyx (2.5--3--4(--4.8) mm, one lobe distinctly longer than other; corolla with upper lip entire, broadly obovate to orbicular from a narrow base, sides curved backward, smaller than lower lip; lower lip entire; palate comprising most of lip, broadly humped or hood-shaped, pubescent; spur slender, conic, long-tapering to acute apex, straight or slightly curved, 4--6(--7) mm, longer than lower lip, lacking distinction between corolla tube and spur. **Capsules** globose to pyriform, 2.5--3(--3.5) mm diam., wall thick, hard, dehiscence by single longitudinal slit on ventral side.  $2n = 18$ .

Flowering May--Oct. Shallow water, bogs, sandy-peaty margins of ponds, wet pine savannas and flatwoods, sandy alluvium, seepages, peaty ditches, coastal plains; 0--200 m; Ala., Del., Fla., Ga., La., Md., Miss., N.J., N.Y., N.C., Okla., S.C., Tex., Va.; e Mexico; West Indies; Central America; n South America; Africa (Ivory Coast).

**10. *Utricularia minor*** Linnaeus, Sp. Pl. 1: 18. 1753 \* Lesser bladderwort

*Lentibularia minor* (Linnaeus) Rafinesque

**Plants** perennial; aquatic, (overwintering by turions, globose, 3--4 mm). **Stolons** to 30 cm, somewhat dimorphic, usually anchored in substrate by subterranean bladder-bearing whitish stolons; slender green leafy bladder-bearing stolons usually creeping flat on surface of substrate, or suspended in water. **Leaves** alternate, flat, 2--8 mm, along leafy branches to 40 cm, dichotomously-palmately divided (2--3--4(--6) times, each segment flat, with a central vein, margins entire (or, if sparsely denticulate, then only microscopically setulose), sometimes segments very slender to filiform, acute at apex, with or without minute bristle-tip. **Bladders** few on ultimate lateral leaf segments, more numerous on separate whitish stolons in substrate, 0.8--1.5(--2.5) mm. **Scapes** 5--24 cm; scales few, basifixed, purplish, conspicuously auriculate at base, 1--1.5 mm; bracts basifixed, purplish, conspicuously auriculate at base (1--1.5--2 mm; bracteoles absent. **Racemes** 2--6(--10)-flowered, erect, emergent. **Pedicels** ascending, 4--8 mm, recurved in fruit. **Flowers** pale yellow, 3.5--8 x 2--3 mm; calyx 1.3--2 mm; corolla with upper lip broader than long, apex with a shallow notch, less than 1/2 length of lower lip; lower lip with lateral margins strongly curved downward, with purplish tinge or stripes (veins) toward base of lower lip; palate obscure, elongate, with slightly raised lateral margins; spur small, saccate or broadly conical, veins often purplish, 1.5--3.2 mm. **Capsules** globose, 2--3 mm, wall firm, dehiscence circumscissile.  $2n = 36--40, 40, 44$  [Europe].

Flowering May--Sep. Acidic shallow waters of lake margins, bog pools, marshes, wet meadows, circumboreal; 30--3400 m; Greenland; St. Pierre and Miquelon; Alta., B.C., Man., N.B., Nfld. and Labr., N.W.T., N.S., Nunavut, Ont., P.E.I., Que., Sask., Yukon; Alaska, Ariz., Calif., Colo., Conn., Del., Idaho, Ill.,

Ind., Iowa, Maine, Mass., Minn., MO., Mont., Nebr., Nev., N.H., N.J., N.C., N.Dak., Ohio, Oreg., Pa., R.I., S.Dak., Utah, Vt., Wash., Wyo.; Eurasia.

Populations of *Utricularia minor* are often encountered only in the vegetative state.

**11. *Utricularia ochroleuca*** R. W. Hartman, Bot. Not. 1857(2): 30. 1857 \* Northern bladderwort C F

*Utricularia occidentalis* A. Gray; *U. stygia* G. Thor

**Plants** perennial; aquatic, (suspended or anchored with leafy branches creeping flat over surface of substrate; overwintering by globose-ovoid bladders, weakly setulose, (1.5--2--3(--3.5) mm, appearing naked). **Stolons** to 20 cm, dimorphic with whitish bladder-bearing stolons usually within substrate, stolons bearing green leaves with some bladders. **Leaves** alternate, flat, 2--7 mm, as wide as long, leaf segments flat, but very slender, remaining same width in each dichotomy, ultimate segments flat with a central vein, divisions with (0--3--6(--9) setulose teeth (bristles as long or longer than teeth, very obscure, even with magnification), always acute at apex, bristle-tipped. **Bladders** 1 or sometimes 2 borne on lateral segments of green leaves and on white stolons, or only on white stolons, 1--2.2(--3.8) mm. **Scapes** 5--17 mm; scales basifixed, 1.3--1.9 mm, auriculate at base, acute at apex; bracts basifixed, 1.5--3 mm, auriculate at base, acute at apex, clasping pedicel; bracteoles absent. **Racemes** (2 or)3--5(--10)-flowered, emergent. **Pedicels** 5--8 mm. **Flowers** yellow to pale yellow, 8--11 x 7--13 mm; calyx 1.6--2.6 mm, lower lobe distinctly notched; corolla with upper lip ascending, broadly ovate, rounded at apex, 1/2 length of lower lip; lower lip entire, broadly elliptic, apex rounded, as long as wide; palate prominent, rounded, glabrous, often streaked with red veins; spur often streaked with red veins, short-conical to short pyramidal, typically straight, at right angle to lower lip, 1/2 length of lower lip, 2.2--3.5(--5.5) mm, somewhat acute at apex. **Capsules** unknown (ovary broadly ellipsoid).  $2n = 40, 44, 46, 48$  [Europe].

Flowering Jun--Sep. Bogs, boggy meadows, marshes, often shallow water, tending to remain vegetative if in deeper water of streams and lakes; 0--2400 m; Greenland; Alta., B.C., Man., N.W.T., N.S., Ont., Que.; Alaska, Calif., Colo., Mont., Oreg., Wash., Wyo.; Eurasia; circumboreal.

Flowers of *Utricularia ochroleuca* vary in regard to streaking (presence of reddish streaks/veins, conspicuous to sometimes faint) or absence of streaks on the palate and spur. The spur is especially distinctive with its short-conical/pyramidal shape and right-angle orientation (in contrast to *U. intermedia* with its spur appressed to and only slightly shorter than the lower lip, and constricted near base of spur). Vegetatively the bladders are often borne on the flat green leaf segments as well as on separate white, non-photosynthesizing, stolons (whereas in *U. intermedia*, the bladder traps are borne only on the colorless shoots or very rarely with a few occurring on leaves). Turions of *U. ochroleuca* appear naked, whereas the densely packed turion leaves of *U. intermedia* are conspicuously setulose, appearing whitish on herbarium specimens.

*Utricularia ochroleuca*, regarded as of hybrid origin with purported *U. intermedia* and *U. minor* parentage, appears to be a vegetative apomict, persisting and dispersing via turions (P. Taylor 1989). When in flower, the taxon is more readily recognizable, but it is not uncommon for populations to occur in the sterile/vegetative state, complicating identification.

G. Thor (1988) employed morphology of the 4-fid trichomes lining the inner surface of bladder traps as taxonomic characters. B. J. Plachno and L. Adamec (2007) found that measurement of the angle between the two shorter arms to be statistically most diagnostic. I have found them reliable to distinguish *U. ochroleuca* (with mean angle 128.9°; range 111--146°) from *U. intermedia* (with mean angle 28.6°; range 16--42° or arms closed) and from *U. minor* (arms usually reflexed), but not from depauperate, sterile specimens of *U. vulgaris* subsp. *macrorhiza* (with mean angle 133.9°; range 114--154°). A few populations from North America that appear to fit Thor's concept of *U. stygia* have 4-fids that are intermediate between *U. intermedia* and *U. ochroleuca* (the most problematic populations occurring in northern California), but considering the variability observed, it appears more practical to treat the *U. ochroleuca* complex in the broader sense.

**12. *Utricularia olivacea*** C. Wright in A. H. R. Grisebach, Cat. Pl. Cub., 161. 1866 \* Piedmont

bladderwort, pygmy bladderwort

*Biovularia olivacea* (C. Wright) Kamienski

**Plants** annual; <minute, delicate>; aquatic, (becoming entangled with other aquatic plants or stranded as water recedes, and then more likely to flower). **Stolons** a few cm, chlorophyllous, filiform, coiled at growing tips, branched and often forming suspended mats. **Leaves** (leaflike branchlets) absent. **Bladders** numerous, borne directly along stolons, 0.4--0.7 mm. **Scapes**, extremely short (appearing absent), 0.1--0.2 mm; scales absent; bracts basifixed, clasping, 0.5--0.7 mm, truncated or erose at apex; bracteoles absent. **Inflorescences** solitary flowers, or racemes 2--5-flowered, emergent. **Pedicels** 0.5--5 mm. **Flowers** white-translucent, minute, as wide



as long, 2--2.5 mm; calyx 0.5--0.7 mm; corolla upper lip short, 1--1.3 mm, broader than long, with tiny basal auricles, truncated to rounded or slightly emarginate at apex; lower lip 1.3--2.3 mm, 2--3 times as long as the upper lip, emarginate or weakly 2--3 lobed; palate slightly raised, indistinct; spur very short, base of lower lip more saccate than forming a distinct spur. **Capsules** fusiform, 1--1.1 mm, wall thin, indehiscent.

Flowering Aug--Oct. Ponds, lakes, sloughs, shallow ditches, coastal plains; 0--200 m; Ala., Fla., Ga., N.J., N.C., S.C., Va.; West Indies (Cuba); Central America (Nicaragua); South America.

*Utricularia olivacea* is undoubtedly overlooked, partly because of the diminutive nature of the vegetative plant body and tiny flowers, and partly because flowering tends to occur when the plants are stranded on the wet substrate when water recedes or when the plants become greatly entangled with other aquatic species, allowing the plants to grow at the surface (much as is the case with *U. gibba*).

**13. *Utricularia purpurea*** Walter, Fl. Carol., 64. 1788 \* Eastern purple bladderwort

*Vesiculina purpurea* (Walter) Rafinesque

**Plants** perennial; aquatic, <overwintering by poorly developed turions, (thickened, strongly incurled leaf tips), 1--2 mm diam.>. **Stolons** elongate, delicate, to 60 cm or more. **Leaves** whorled, stalked, with repeatedly divided whorls of thinner segments, ultimate segments filiform. **Bladders** borne only at tips of leaf segments, 1.5--2.5(--2.8) mm, translucent. **Scapes** stout, ascending, borne along stolons near surface at irregular intervals (plants often remaining vegetative), 2.5--10(--21) cm; scales none; bracts peltate, attached near base with shorter lower lobes extending beyond point of attachment, clasping, 2--3.5 mm; bracteoles absent. **Racemes** 2 or 3(--5)-flowered (usually 1 open at a time), emergent. **Pedicels** 5--20 mm. **Flowers** usually light purple to deep purple or pink, rarely white, as wide as long, 5--15(--18) x 6--14 mm; calyx 2--2.5(--3) mm; corolla with upper lip convex, nearly orbicular, rounded or with shallow notch at apex; lower lip of corolla 3-lobed, yellow blotch at base of lip, lateral lobes conspicuously saccate, central lobe nearly square and strongly deflexed along margins, truncate and slightly notched at apex; palate not prominently raised (confluent with saccate lateral lobes), marked with yellow blotch with white border, papillate; spur conical to short-cylindric, distinctly shorter than lower lip, enclosed by enrolled lateral margins of central lobe, (2--)4--6 mm, blunt at apex. **Capsules** globose, 3--4 mm, walls thin, membranous, dehiscing by single ventral slit; fruits rare.

Flowering Feb--Oct. Acidic waters of ponds, lakes, swamps, quiet waters of slow streams, sloughs, ditches; 0--400 m; N.B., Nfld. and Labr. (Nfld.), N.S., Ont., Que.; Ala., Conn., Del., Fla., Ga., Ill., Ind., La., Maine, Md., Mass., Mich., Minn., Miss., N.H., N.J., N.Y., N.C., Pa., R.I., S.C., Tex., Vt., Va., Wis.; Mexico; West Indies; Central America (Belize, Nicaragua).

**14. *Utricularia radiata*** Small, Fl. S.E. U.S., 1090. 1903 \* Little floating or small swollen bladderwort E

*Utricularia inflata* Walter var. *minor* Chapman, Fl. South. U.S., 282. 1860

**Plants** annual or perennial, vegetative portion submersed, <delicate, (often breaking off from fertile portion below whorl of floats when collected); overwintering by small globose turions, to 1 mm diam.>. **Stolons** filiform, to 0.5 m, 0.3--1 mm diam. **Leaves** alternate, along submersed vegetative stolons immediately divided into 2 equal primary segments, these less densely branched, with filiform ultimate segments, but not appearing bushy. **Bladders** abundant, borne on leaves, all of similar size, 1.5--2 mm. **Scapes** 3.5--11 cm (above floats); scales none; bracts basifixed, oblong, margins clasping pedicel, +/- 3-lobed at apex; bracteoles absent. **Racemes** (1--)3 or 4(or 5)-flowered, emergent, subtended by a whorl of (4 or)5--7(--10) inflated branches (floats), 1--4 cm; individual float branches cylindrical with margins parallel entire length until just before scape; main stem below floats very slender, 0.3--0.7(--1) mm diam. (at 5 cm below). **Pedicels** short, 0.2--1.8 cm ascending, fruiting pedicels usually ascending, rarely recurved. **Flowers** 8--20 x 5--10 mm; calyx 2.5--3.5 mm; corolla dull yellow, upper corolla lip entire, rounded at tip; lower lip deeply 3-lobed; palate saccate, distinctly 2-humped, marked with red streaks and spots; spur yellow with red lines (veins), conical to cylindrical, 4.6--6 mm, shorter than lower corolla lip, rounded at tip (rarely with slight notch). **Capsules** globose, 3--5 mm, wall thick, fleshy, dehiscence circumscissile.  $2n = 28$ .

Flowering Feb--Oct. Ponds, lakes, swamps, quiet waters of slow-moving rivers, drainage ditches, chiefly coastal plains and Mississippi embayment, few inland localities; 0--200 m; N.B., N.S.; Ala., Ark., Conn., Del., Fla., Ga., Ind., La., Maine, Md., Mass., Mich., Miss., N.H., N.J., N.Y., N.C., Okla., Pa., R.I., S.C., Tenn., Tex., Vt., Va.

**15. *Utricularia resupinata*** B. D. Greene ex Bigelow, Fl. Boston ed. 3, 10. 1840 \* Lavender bladderwort

E F

*Lecticula resupinata* (B. D. Greene ex Bigelow) Barnhart

**Plants** perennial, semi-aquatic/semi-terrestrial, (vegetative parts anchored in substrate, often mat-forming). **Stolons** to 20 cm (or more), filiform, branched. **Leaves** arising from horizontal stolons, long, linear-subulate to filiform, distinctly septate, 4--11 cm. **Bladders** numerous, borne on leaves and stolons, dimorphic, tiny bladders on threadlike stolons 0.2--0.5 mm, larger traps (0.6--0.8--1(--1.5) mm. **Scapes** 4--20 cm (including erect pedicel); scales absent; bracts basifixed, borne as a single pair, opposite, fused at base, 1.2--2.5 mm; bracteoles absent. **Inflorescences** solitary flowers, erect. **Flowers** usually light purple to rose-pink, rarely completely white, 5--13(--17) x 5--11 mm; calyx 2--3 mm, rounded at apex; corolla: upper lip very narrowly oblong-obovate, ascending; lower lip obscurely 3-lobed (usually ascending, flower tipped backward, giving flower upside-down appearance), very sparsely stipitate-glandular; palate prominent, wrinkled, marked with yellow spot; spur purple-lavender, cylindrical or narrowly conic, with a pronounced saccate swelling at base, 3.5--6 mm, 1/2 as long as corolla lip, conspicuously curving upward or away from scape, blunt to truncate or slightly notched at apex. **Capsules** globose, 2.5--3(--4) mm, wall firm, dehiscence by single longitudinal slit on ventral side.  $2n = 36$ .

Flowering Mar--Dec (Aug--Sep in north). Sand and mud in shallow water of pools, ponds, lakes, river shores, ponds in open pine savannas and flatwoods; 0--400 m; N.B., N.S., Ont., Que.; Ala., Conn., Del., Fla., Ga., Ind., Maine, Md., Mass., Mich., Minn., N.H., N.J., N.Y., N.C., Pa., R.I., S.C., Tenn., Vt., Wis.

16. *Utricularia simulans* Pilger, Notizbl. Königl. Bot. Gart. Berlin 6: 189. 1914 (as *simulaus*) \* Fringed bladderwort

**Plants** perennial, semi-aquatic/semi-terrestrial. **Stolons** very short (few cm), delicate, branching within substrate. **Leaves** in rosettes, emergent, lamina linear, gradually tapering to base, obtuse to acute at apex. **Bladders** numerous, borne on stolons within substrate, some on leaves, 0.2--0.3 mm. **Scapes** 5--15 cm; scales numerous, basifixed, 1.1--1.5(--2.2) mm, slightly auriculate at base, margins strongly fimbriate; bracts basifixed, 1--1.5 mm, slightly auriculate, margins strongly fimbriate; bracteoles larger than bracts, 2--4 mm, similar to and about same size as calyx (can be confused with calyx), not auriculate, borne at summit of short pedicel. **Racemes** 2--10-flowered, often congested at summit, spicate, emergent. **Pedicels** to 1 mm. **Flowers** 3--7 x 5--8 mm; calyx 2.2--4.5 mm, conspicuous, strongly fimbriate, lower lobe slightly notched at apex, calyx, bracts and bracteoles reddish, especially fimbriae; corolla yellow, upper lip broadly ovate, apex rounded; lower lip entire, apex rounded; palate papillose; spur conic, distinctly flattened horizontally, 2--4.2 mm, as long as lower corolla lip, apex acute to obtuse. **Capsules** globose to pyriform, 1--2.3 mm diam., wall thin, firm, dehiscence a single longitudinal slit on ventral side.

Flowering Aug--Nov. Acidic, sandy substrates, wet pine flatwoods and savannas; 0--20 m; Fla.; West Indies (Cuba); Central America (Belize); South America; Africa.

The name *Utricularia fimbriata* of various authors, but not of Kunth, has been applied to *U. simulans*.

17. *Utricularia striata* Leconte ex Torrey, Cat. Pl. New York, 89. 1819 \* Striped bladderwort E

*Trilobulina striata* (Leconte) Rafinesque

**Plants** perennial, vegetative portions submersed in shallow water, becoming stranded when water recedes, then appearing semi-aquatic/semi-terrestrial and anchored in wet substrate. **Stolons** dimorphic, subterranean branches numerous, delicate, often with short rhizoids (especially along upper portion), bearing numerous subterranean leaves; submersed stolons elongate, to 10 cm, bearing leaves; terrestrial phase with stolons radiating from base of inflorescence, whitish, bearing short rhizoids (frequently severed when collected). **Leaves** alternate, dimorphic, subterranean leaves short, asymmetrically divided to 4 times; leaves on elongate submersed stolons forming cylindrical green branches 1--1.5(--2) cm diam., leaf segments fine, terete, becoming narrower, ultimate segments filiform. **Bladders** numerous on subterranean leaves, absent or sparse on green, non-subterranean leaves, 0.7--2 mm. **Scapes** erect, emergent, slender-wiry, (9--12--32) cm, 1 mm diam.; scales 1 or 2, basifixed, 1.2--2.5 mm; bracts basifixed, clasping pedicel, broadly obovate, 1.1--2.5 mm, obtuse at apex; bracteoles absent. **Racemes** 1--4-flowered. **Pedicels** 1--3 cm, ascending. **Flowers** pale yellow to greenish yellow, (10--15--22) x 10--17 mm; calyx 2.7--3.5 mm, broadly ovate; corolla veins very conspicuous in dried specimens, upper lip shallowly 3-lobed, upper and lower lips nearly equal; lower lip entire or weakly 3-lobed, red streaks at base; palate prominent, bilobed, usually with red streaks, densely pubescent; spur yellow with red streaks extending into spur from lower lip, narrowly cylindrical or conic, nearly straight, (5--6--9) mm, 3/4 to as long as to slightly longer than lower lip, notched at apex (or slightly 3-fid, appearing entire when pressed laterally). **Capsules** globose, 3--4.7 mm, wall thin, fleshy, dehiscence bivalvate.  $2n = 28$ .

Flowering Mar--Oct. Ponds, pools, swamps, wet peats, sandy shores, coastal plains; 0--200 m; Ala., Ark., Calif., Conn., Del., Fla., Ga., La., Md., Mass., Miss., N.J., N.Y., N.C., Pa., R.I., S.C., Tex., Va.

According to P. Taylor (1989), the name *Utricularia fibrosa* has been applied widely to *U. striata*, but his careful interpretation of Walter's descriptions led him to conclude that *U. fibrosa* is conspecific with *U. biflora*, a name placed in synonymy under *U. gibba*.

Flowering occurs usually during March through July. Plants becoming stranded following a drop in the water table can be readily confused with the terrestrial form of the Atlantic and Gulf coastal plain phase of *Utricularia gibba* ("*U. biflora*"), but if vegetative portions of the plant are present, the two are easily distinguished. The terrestrial phase of *U. striata* can be recognized by the presence of several whitish subterranean stolons at the base of the inflorescence (radiating downward on specimens) bearing tiny rhizoids near the summit of the stolons. Additionally, the flowers are larger, typically having red streaks (veins) on the palate and at the base of the lower lip, extending into the spur, with the spur notched.

Documented from a single site in Butte County, California, (*Abart 497*, CAS, OSC), the species appears to be a chance introduction there, perhaps a weed associated with rice cultivation in that area.

**18. *Utricularia subulata*** Linnaeus, Sp. Pl. 1: 18. 1753 \* Zigzag bladderwort

*Enetophyton cleistogamum* (A. Gray) Niewland; *Setiscapella cleistogama* (A. Gray) Barnhart; *S. subulata* (Linnaeus) Barnhart; *Utricularia cleistogama* (A. Gray) Britton; *U. subulata* var. *cleistogama* A. Gray; *Vesiculina setacea* (Michaux) Rafinesque

**Plants** annual, <very small>; semi-aquatic, (vegetative parts anchored in wet substrate). **Stolons** several cm, numerous, filiform, branched. **Leaves** arising from stolons (leaves usually not visible when flowering), lamina narrowly linear, 30--40 x 0.2--0.6 mm, gradually tapering to base. **Bladders** on stolons and leaves (usually remaining within substrate when plants collected, seldom on herbarium specimens), 0.2--0.5 mm. **Scapes** filiform-wiry, 4--18 cm; scales peltate, sometimes ciliate, 0.6--1.1 mm; bracts peltate, appressed and clasping, 0.6--1(--1.5) mm; bracteoles absent. **Racemes** (1 or)2--4(--8)-flowered, erect with zigzag appearance, sometimes slightly branched, emergent. **Pedicels** 0.2--1 cm, ascending. **Flowers** yellow, as wide as long, 4--9 x 3--9 mm; calyx 1--2(--2.5) mm; corolla with upper lip entire, ovate and rounded to acuminate at apex, smaller than lower lip; lower lip 3-lobed; palate prominent, bilobed (2-humped); spur often reddish, conic, appressed, (2.5--)3--5(--7) mm, slightly shorter than to slightly longer than lower lip, apex acute to rounded to sometimes slightly denticulate; sometimes some or all of flowers cleistogamous. **Capsules** globose, 1.5--3.5 mm, wall thin, firm, dehiscence by ventral ovate pore. **2n** = 30.

Flowering Mar--Oct. Open areas of wet pine savannas and flatwoods, bogs, clearings of swampy woods, peaty sands or marly wet soils, wet ditches; 0--200 m; N.S.; Ala., Ark., Calif., Del., D.C., Fla., Ga., Ind., La., Md., Mass., Mich., Miss., Mo., Nebr., N.J., N.Y., N.C., Okla., Pa., R.I., S.C., Tenn., Tex., Va.; Mexico; West Indies; Central America; South America; Asia; Africa; Indian Ocean Island (Madagascar); Australia.

*Utricularia pusilla* Vahl is similar to *U. subulata* but differs by having scapes bearing sterile bracts and a spur two times as long as the lower lip. *Utricularia pusilla* occurs in southern Mexico (north to Vera Cruz) and the West Indies, and therefore might be expected to occur in southern Florida.

**19. *Utricularia vulgaris*** Linnaeus, Sp. Pl. 1: 18. 1753 F

Subspecies 2 (1 in the flora): North America, nw Mexico, n Asia.

**19a. *Utricularia vulgaris*** Linnaeus subsp. **macrorhiza** (Leconte ex Torrey) R. T. Clausen, Cornell Univ.

Agric. Exp. Sta. Mem. 291: 9. 1949 \* Common bladderwort, greater bladderwort F

*Utricularia macrorhiza* Leconte ex Torrey, Cat. Pl. New York 11. 1819; *Lentibularia vulgaris* (Linnaeus) Moench var. *americana* (A. Gray) Nieuwland & Lunell; *U. vulgaris* var. *americana* A. Gray

**Plants** perennial; coarse aquatics, (overwintering by large ovoid, strongly setulose turions, 1--2 cm diam.). **Stolons** terete, branched, to 1 m or more, 0.5--1.5 mm diam. **Leaves** alternate, very numerous, divided at base into 2 unequal primary segments, 15--90 mm, secondary divisions pinnatifid, with numerous slightly flattened filiform segments, laterally setulose, with or without teeth, apex bristle-tipped. **Bladders** borne on leaves, dimorphic, lateral traps 1--5 mm, basal bladders minute. **Scapes** 10--40 cm; scales (1--)3(or 4), similar to bracts; bracts basifixed, 3--7 mm, slightly cordate to weakly to distinctly auriculate at base; bracteoles absent. **Racemes** 3--15-flowered, emergent. **Pedicels** ascending at anthesis, recurved in fruit, 8--15 mm. **Flowers** bright yellow, 11--18 x 8--12 mm; calyx 3--5 mm, lower lobe shallowly notched; corolla with upper lip ascending,

broadly ovate, truncate or slightly notched at apex, slightly shorter than lower lip; lower lip ellipsoid, as long as wide, lateral margins strongly deflexed; palate prominently swollen, marked with red or reddish brown veins at apex, covered with short hairs; spur with red veins, broadly conical at base, curved upwards, tapering to apex, 4--9 mm, as long as lower lip, apex narrowly cylindrical, obtuse or acute. **Capsules** globose, 5--6 mm, wall firm, dehiscence circumscissile.  $2n = 40, 44$ .

Flowering late May--early Sep. Quiet waters of lakes, ponds, bogs, swamps, sluggish streams; 0--1700 m; St. Pierre and Miquelon; Alta., B.C., Man., N.B., Nfld. and Labr., N.W.T., N.S., Nunavut, Ont., Que., Sask., Yukon; Ala., Alaska, Ariz., Ark., Calif., Colo., Conn., Del., D.C., Idaho, Ill., Ind., Iowa, Kans., Ky., La., Maine, Md., Mass., Mich., Minn., Mo., Mont., Nebr., Nev., N.H., N.J., N.Mex., N.Y., N.C., N.Dak., Ohio, Okla., Oreg., Pa., R.I., S.Dak., Tenn., Tex., Utah, Vt., Va., Wash., W.Va., Wis., Wyo.; Mexico (Baja California); n Asia.

Treated here as subsp. *macrorhiza*, this taxon has been widely treated as distinct at the species level from the European *Utricularia vulgaris*, but the differences, largely associated with the spur, are very minor. P. Taylor (1989) noted that in the European taxon the spur is 2.5--6(--8) mm, shorter than the lower lip, with a broad conical base and tapering to a narrowly cylindrical or narrowly conical, blunt to somewhat acute apex, and typically straight (sometimes somewhat concave or convex), and internal glands are present only on the dorsal surface of the spur. In contrast, subsp. *macrorhiza* has a spur as long as the lower lip, 4--7(--9) mm, basally more narrowly conical, with the cylindrical distal portion clearly curved upward, and with an acute apex; internal glands are present on both dorsal and ventral surfaces. In both taxa the internal glands are usually not visible on herbarium specimens, and spurs must be dissected in fresh material to be seen. When fruiting, both subspecies have recurved pedicels, while the sepals are somewhat to strongly divergent. The European subsp. *vulgaris* is vegetatively less robust, but Taylor acknowledged that the two cannot be distinguished vegetatively. While subsp. *macrorhiza* has been known to extend into northeast Asia, Taylor noted that it was not clear to what extent either subsp. *macrorhiza* or subsp. *vulgaris* occurred in western Siberia. During field work in the region west of Novosibirsk and in the Altai Mountains, it was found that the Siberian material was indistinguishable from our American taxon, and recent reexamination of that Siberian material confirmed that those specimens belong to subsp. *macrorhiza*. Hence, subsp. *macrorhiza* appears to be geographically more widely distributed than subsp. *vulgaris*. It is noteworthy that no infraspecific taxa were recognized by Taylor for any species in his worldwide monograph, a reasonable, practical approach when addressing 214 species of *Utricularia*.