Figure 1: The tiny white flecks of *U. olivacea* flowers. Article on page 69.

Figure 1: Close-up of *U. olivacea* with flowers; U.S. penny (1.9 cm diameter) included for scale. Article on page 73.

Stalking the Pygmy Bladderwort, *Utricularia olivacea* (Lentibulariaceae)

Loran C. Anderson • Department of Biological Science • Florida State University • Tallahassee, FL 32306-4370 • USA • anderson@bio.fsu.edu

Keywords: observations: Florida, *Utricularia olivacea*.

The pygmy bladderwort, *Utricularia olivacea* Wright ex Grisebach, ranges along the coastal plain of the United States from New Jersey to Florida; it was recently recorded in Mississippi (Sorrie & Leonard, 1999). It also occurs in the West Indies (was originally discovered in Cuba) and Central and South America. Although widespread, this rare plant is seldom seen. Godfrey & Wooten (1981) stated: "its rarity is perhaps attributable more to the difficulty of perceiving the plant in the field than to its actual distribution." It is easily overlooked because its delicate stems look like algal filaments and the flowers, when present, are only 2-2.5 mm long. Small (1933) called it "one of the smallest (perhaps the smallest by weight) of all flowering plants." He placed species of *Utricularia* in eight separate genera and recognized this species as *Biovularia olivacea* (Wright) Kamienski. Small provided a meager drawing of the plant; a somewhat better illustration is found in Radford *et al.* (1968), but the best technical illustrations are in Allen (1959), Beal and Quay (1968), and Taylor (1989).

The diminutive plants usually occur floating submersed in shallow water, but they can occur in surface waters of ponds 6 meters deep. They are more likely to flower (and thus more likely to be recognized) when they become stranded on land as waters recede. I have knowingly seen this species twice in Franklin County, Florida. I first saw it in 1984 on the muddy bottom of a drying water-lily pond near Graham Creek. The flowers appeared like fine confetti scattered over the green, matted stems. My second sighting was in Big Branch Slough of Whiskey George Creek in a region locally known (somewhat affectionately) as Tate's Hell Swamp. The water levels in the shallow ditches that parallel the dirt roads in Big Branch Slough had dropped because of low rainfall during the summer of 1999, exposing gently sloped bare ground (a clayey sand) on which extensive mats of the pygmy bladderwort were found. After taking some voucher specimens for the Florida State University Herbarium (which involved pressing a clump of soil with the associated mat of plants), I took a fresh sample back to the university to be photographed. Ken Womble, our departmental photographer-illustrator, photographed the plants (Figure 1, page 72, bottom) in a studio with macro gear and flash lighting.

With the aid of a hand lens in the field, the flowers appeared a pale, ghostly white (more or less translucent), but with further magnification through photography, the faint yellow veins are apparent, and the anthers (often purple in my sample) suggested two "beady eyes" peering out from the corolla tube. Surprisingly, the petal surfaces were roughened rather than smooth. The rather detailed species diagnosis given by Taylor (1989) can now be augmented. He stated the racemes were 2-5 flowered; many in my sample had but a single flower. Taylor (1989) also described the upper (adaxial) lip of the corolla as transversely oblong with the apex truncate or emarginate, whereas in my material they are truncate apically but with tiny auricles basally. The smaller racemes, auriculate upper corolla lobes, and purple anthers add new dimensions to the species description of the seldom-seen Pygmy Bladderwort.

References:

Allen, R.McV. 1959, A study of *Utricularia olivacea*, Bartonia 29:1 (published 16 Dec. 1959, although dated 1957-58).

Beal, E.O., and Quay, T.L. 1968, A review of *Utricularia olivacea* Wright ex Grisebach (Lentibulariaceae), J. Elisha Mitchell Sci. Soc, 84:462-466.

Godfrey, R.K., and Wooten, J.W. 1981, Aquatic and wetland plants of southeastern United States, Dicotyledons, University of Georgia Press, Athens.

Radford, A.E., Ahles, H.E., and Bell, C.R. 1968, Manual of the vascular flora of the Carolinas, University of North Carolina Press, Chapel Hill.

Small, J.K. 1933, Manual of the southeastern flora, University of North Carolina Press, Chapel Hill.

Sorrie, B.A., and Leonard, S.W. 1999, Noteworthy records of Mississippi vascular plants, Sida 18:889-908.

Taylor, P. 1989, The Genus *Utricularia*—a taxonomic monograph, Kew Bull. Additional Series XIV, Her Majesty's Stationery Office, London.

Literature Reviews

Barthlott, W., Fischer, E., Frahm, J.P. & Seine, R. 2000, First Experimental Evidence for Zoophagy in the Hepatic *Colura*, Plant Biol., 2: 93-97.

For the first time, the entrapment of protists (primitive, unicellular organisms that can neither be classified as plants nor as animals) in the so-called water sacs (highly differentiated hollow lobules characteristic of several foliose liverworts) of a recently described species of *Colura* (Lejeuneaceae, Hepaticae, i.e. liverworts) has been observed directly. *C. zoophaga* from the Aberdare Mountains in Kenya, growing on twigs of *Cliffortia nitida* (Rosaceae) is able to capture and retain the ciliate *Blepharisma americana*. The protists might be killed by complete desiccation, a process that frequently occurs in the natural habitat of the investigated liverwort without killing the liverwort. Decomposition of the prey is likely to occur by the action of bacteria, and digestion products may easily be taken up through the uncuticularized epidermis of the liverwort. The carnivorous syndrome of *C. zoophaga* is incomplete, the most obvious "deficiency" being an apparent lack of specific attraction of protozoa in comparison to other bryophytes (i.e. mosses, hornworts, and liverworts). Even mosses that are hitherto unsuspected of carnivorous tendencies seem to attract the protozoa at the same rate as *Colura*. A distinction between plant carnivory (a syndrome observed only in vascular plants that have cuticles and specific mechanisms of nutrient uptake and redistribution) and zoophagy (Greek for "eating animals", describing perhaps a quite widespread phenomenon among plants, distinguished from carnivory by the lack of a series of features like specific attraction and digestion) seems a useful approach to the strange behaviour of hepatics presented in this paper. The term "zoophagous" is rather problematic, however, because it insinuates that metazoa (i.e. true multicellular animals) are eaten, while in the investigated case only protists were captured. It will be difficult to assess the specificity and importance of animal nutrition to hepatics (or to bryophytes in general), because plants that do not use roots for the uptake of nutrients (cf. the bromeliads that likewise have been suspected of carnivory) are generally adapted to the opportunistic utilization of any organic matter eventually "trapped" by their vegetative organs. (JS)