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# Scientific Note: *Utricularia macrorhiza* LeConte (common bladderwort; Lentibulariaceae) Recorded in the Mississippi Delta.

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## ABSTRACT

Plant communities of aquatic ecosystems have outsized effects on the system structure and function. In Mississippi, aquatic plant communities are often poorly described, particularly in small lakes. In June 2024, the plant community of Mosquito Run at Matthews Brake National Wildlife Refuge was described in Leflore County, Mississippi, using a littoral zone point survey. Mosquito Run is a cypress-tupelo gum backswamp whose hydrology is dominated by fluvial processes within the Mississippi Alluvial Plain. This survey described a species rich aquatic plant community with substantial infestation of invasive species. The dominant submersed macrophyte, however, was *Utricularia macrorhiza*, a native aquatic plant which was previously presumed absent in Mississippi. This observation acts as the first record of this species in Leflore County, Mississippi and the greater Mississippi Delta. These findings assert the importance of continue floristic surveys, particularly of aquatic ecosystems, in Mississippi and the greater southeastern United States.

**Key words:** Aquatic, carnivorous plant, macrophyte, submersed, wetland

## INTRODUCTION

*Utricularia* L. is a well-studied, cosmopolitan genus of carnivorous plants with roughly 250 species that can inhabit aquatic, wetland, and/or terrestrial ecosystems (Taylor 1989; Miranda et al. 2021). *Utricularia macrorhiza* LeConte [syn: *Utricularia vulgaris* L. subsp. *macrorhiza* (LeConte) Clausen] is a large, aquatic species which is widely distributed throughout North America and northeastern Asia (Taylor 1989). In North America, *U. macrorhiza* is common throughout the Great Lakes region, and the Atlantic Northeast, and it can also be found throughout much of the Intermontane West and West Coast (Gleason and Cronquist 1991; National Resource Conservation Service 2024a). Generally, the likelihood of observing *U. macrorhiza* in North America decreases with latitude, with the species becoming rarer in southern and Gulf Coast states (Weakley et al. 2024). *Utricularia macrorhiza* is generally considered to be present in all states and provinces in the United States and Canada, with the exception of Hawaii and Mississippi (National Resource Conservation Service 2024a; Plants of the World Online 2024; Weakley et al. 2024).

Within Mississippi, aquatic *Utricularia* spp. (sect. *Utricularia* L.) are relatively common and often inhabit lentic waters with robust plant communities (Turnage and Shoemaker 2018; Turnage et al. 2020; Schmid and Turnage 2023). Most commonly in Mississippi aquatic systems is *Utricularia gibba* L., with *Utricularia purpurea* Walter [sect. *Vesiculina* (Raf.) P.Taylor], *Utricularia radiata* Small, *Utricularia striata* LeConte, and *Utricularia inflata* Walter being uncommon to rare (Weakley and Southeastern Flora Team 2024). A major ecoregion that occurs in Mississippi is the Mississippi Alluvial Valley (Wiken et al. 2011). The section of this ecoregion within the state of Mississippi is colloquially known (and henceforth referred to) as the Mississippi Delta. Historically,

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the Mississippi Delta was an expansive bottomland hardwood forest, most of which was converted to row-crop agriculture after the American civil war (Mitsch and Gosselink 2000; Ervin 2023). This ecoregion is dominated by fluvial hydrology and geomorphology from the Mississippi River and its tributaries (Mitsch and Gosselink 2000). Aside from rivers, the primary hydrologic features in the Mississippi Delta are oxbow lakes and backswamps (colloquially known as brakes) often dominated by *Nyssa aquatica* L. and/or *Taxodium distichum* (L.) Rich. (Mitsch and Gosselink 2000; Wiken et al. 2011). The aquatic plant community within these freshwater systems are critically important, as they drive the structure and function of these ecosystems (Wetzel 2001; Ervin 2023). During June of 2024, the littoral zone of a backswamp known as Matthews Brake in the Mississippi Delta was surveyed to determine the species composition of the aquatic plant community therein.

Findings presented here are the result of data from aquatic plant community surveys in Mississippi, USA. The objective of these surveys is to inventory the flora of aquatic ecosystems in Mississippi and track the spread of aquatic invasive plants while focusing on small lakes and rivers.

## MATERIALS AND METHODS

### Site description

This survey took place at Mosquito Run (33.3679, −90.2596) in Matthews Brake National Wildlife Refuge in Leflore County, Mississippi which is managed by the United States Fish and Wildlife Service (USFWS). Mosquito Run is primarily managed for migratory waterfowl habitat, with management activities principally consisting of the management of invasive, aquatic plants. Matthews Brake is positioned in the Mississippi Delta and is primarily influenced by fluvial geomorphology. The land in and around Matthews Brake is dominated by the Alligator, Tensas, and Dowling soil map units, which are characterized as hydric soils formed in backswamps and floodplains and primarily consisting of silty and/or clayey alluvium (National Resource Conservation Service 2024b). These series are Alfisols, Entisols, or Vertisols with aquic moisture regimes due to a near-surface water table (Schaetzl and Thompson 2015; National Resource Conservation Service 2018a, 2018b, 2021). Mosquito Run is a cypress-tupelo gum backswamp which is dominated by free-floating and emergent invasive plants, namely: *Alternanthera philoxeroides* (Mart.) Griseb., *Cyperus blepharoleptos* Steud., and *Pontederia crassipes* Mart. This system consists of roughly 400 ha of heavily vegetated water and its littoral zone is composed of numerous emergent, floating-leaf, submersed, and free-floating macrophytes.

### Littoral survey

A littoral survey of Mosquito Lake was conducted by boat on 19 Jun 2024 using a point-sampling method where sample points were placed around the margin of Mosquito Lake in the littoral zone, approximately 200 m apart (n=28). At each sample point, all aquatic macrophytes within 10 m of the boat were identified *in situ* and recorded as present. When necessary, a plant rake was deployed to sample submersed macrophytes. Periodically, voucher specimens were pressed, dried, labeled, and deposited at the Mississippi State University Herbarium (MISSA). Two voucher specimens of *Utricularia macrorhiza* from Mosquito Lake were deposited at MISSA (*Schmid and Magandy 338*, MISSA039776; *Schmid and Magandy 341*, MISSA039777). In addition to the littoral surveys, water quality data was recorded near the middle of Mosquito Lake at midday. Water quality metrics consisted of Secchi depth (cm), water temperature (°C), dissolved oxygen (ppm), pH, conductivity ($\mu S \times cm^{-1}$), salinity (ppt), total dissolved solids (ppm), and nitrates (ppm). Secchi depth was measured with a Secchi disk and all other water quality metrics were measured with a YSI ProQuatro multimeter.

## RESULTS AND DISCUSSION

The dominant submersed macrophyte in Mosquito Run was *Utricularia macrorhiza,* which was growing at high density and flowering at the time of survey (Table 1, Figure 1). This record contradicts reports by major aggregators (*i.e., PLANTS Database* and *Plants of the World Online*) that

**Table 1. Species name, growth form (emergent, floating-leaf, free-floating, or submersed), status (introduced or native), and frequency of occurrence of macrophytes in the plant community of Mosquito Run. Taxonomy follows Weakley et al. (2024).**

| Species | Growth form | Status | Frequency |
|---|---|---|---|
| *Lemna minor* L. | free-floating | native | 1.000 |
| *Utricularia macrorhiza* LeConte | submersed | native | 1.000 |
| *Alternanthera philoxeroides* (Mart.) Griseb. | emergent | introduced | 0.964 |
| *Cyperus blepharoleptos* Steud. | emergent | introduced | 0.964 |
| *Limnobium spongia* (Bosc) Steud. | free-floating | native | 0.964 |
| *Utricularia gibba* L. | submersed | native | 0.893 |
| *Pontederia crassipes* Mart. | free-floating | introduced | 0.857 |
| *Azolla caroliniana* Willd. | free-floating | native | 0.607 |
| *Ceratophyllum demersum* L. | submersed | native | 0.607 |
| *Hydrocotyle ranunculoides* L.f. | emergent | native | 0.607 |
| *Nelumbo lutea* Willd. | floating-leaf | native | 0.536 |
| *Nyssa aquatica* L. | emergent | native | 0.393 |
| *Taxodium distichum* (L.) Rich. | emergent | native | 0.321 |
| *Cabomba caroliniana* A.Gray | submersed | native | 0.250 |
| *Ludwigia* sp. L. | emergent | native | 0.250 |
| *Spirodela polyrhiza* (L.) Schleid. | free-floating | native | 0.143 |
| *Nymphaea odorata* Aiton | floating-leaf | native | 0.107 |
| *Persicaria* sp. (L.) Mill. | emergent | native | 0.071 |
| *Cephalanthus occidentalis* L. | emergent | native | 0.071 |
| *Salix nigra* Marshall | emergent | native | 0.071 |
| *Sesbania herbacea* (Mill.) McVaugh | emergent | native | 0.071 |
| *Triadenum walteri* (J.F.Gmel.) Gleason | emergent | native | 0.071 |
| *Hydrocotyle umbellata* L. | emergent | native | 0.036 |
| *Ricciocarpos natans* (L.) Corda. | free-floating | native | 0.036 |
| *Sagittaria latifolia* Willd. | emergent | native | 0.036 |
| *Zizaniopsis miliacea* (Michx.) Döll & Asch | emergent | native | 0.036 |

show no record of *U. macrorhiza* within the state of Mississippi (National Resource Conservation Service 2024a; Plants of the World Online 2024). By contrast, *Flora of the Southeastern United States* reports *U. macrorhiza* as having historically occurred in Mississippi (Weakley et al. 2024). This historical designation of *U. macrorhiza* in Mississippi is likely due to the last available "record" of this species being collected in 1987 and no known extant populations since then (*Ebinger 23545*, EIU007455; reported as *U. vulgaris* under a previous taxonomic treatment) however, this specimen is an apparent misidentification, as the leaves are smaller (<1 cm) than would be expected from *U. macrorhiza* (Taylor 1989). Aside from this collection, *U. macrorhiza* was documented from Mississippi only through collections in the 1930s (*e.g.*, W.P.a. *966*. USF65900). There are no available records of this species in the Mississippi Delta, and this is the first record of *U. macrorhiza* in Leflore County. It is not apparent whether this population of *U. macrorhiza* at Matthews Brake is a remnant population, or the result of an introduction. Key managing personnel at the USFWS were previously unaware of this population at Matthews Brake (Dorris and Rosamond pers. comm.). *Utricularia foliosa* L. is another large-leaved aquatic species that inhabits the southeastern states, particularly in coastal systems (Taylor 1989). Taylor (1989) reported *U. foliosa* and *U. macrorhiza* as sometimes being confused in the Southeast, but he describes the appearance of these species as not particularly similar. Le Conte (1824) remarked, however, that *U. foliosa* and *U. macrorhiza* would likely, eventually be combined due to their apparent similarities, but this has yet to be substantiated. Principally, these species differ in their leaf branching patterns. *Utricularia macrorhiza* has a very distinct branching pattern where the leaf branches, into sections of unequal size (shown in Figure 1b; Taylor 1989). Comparatively, *U. foliosa* branches pinnately and relatively equally (Taylor 1989).

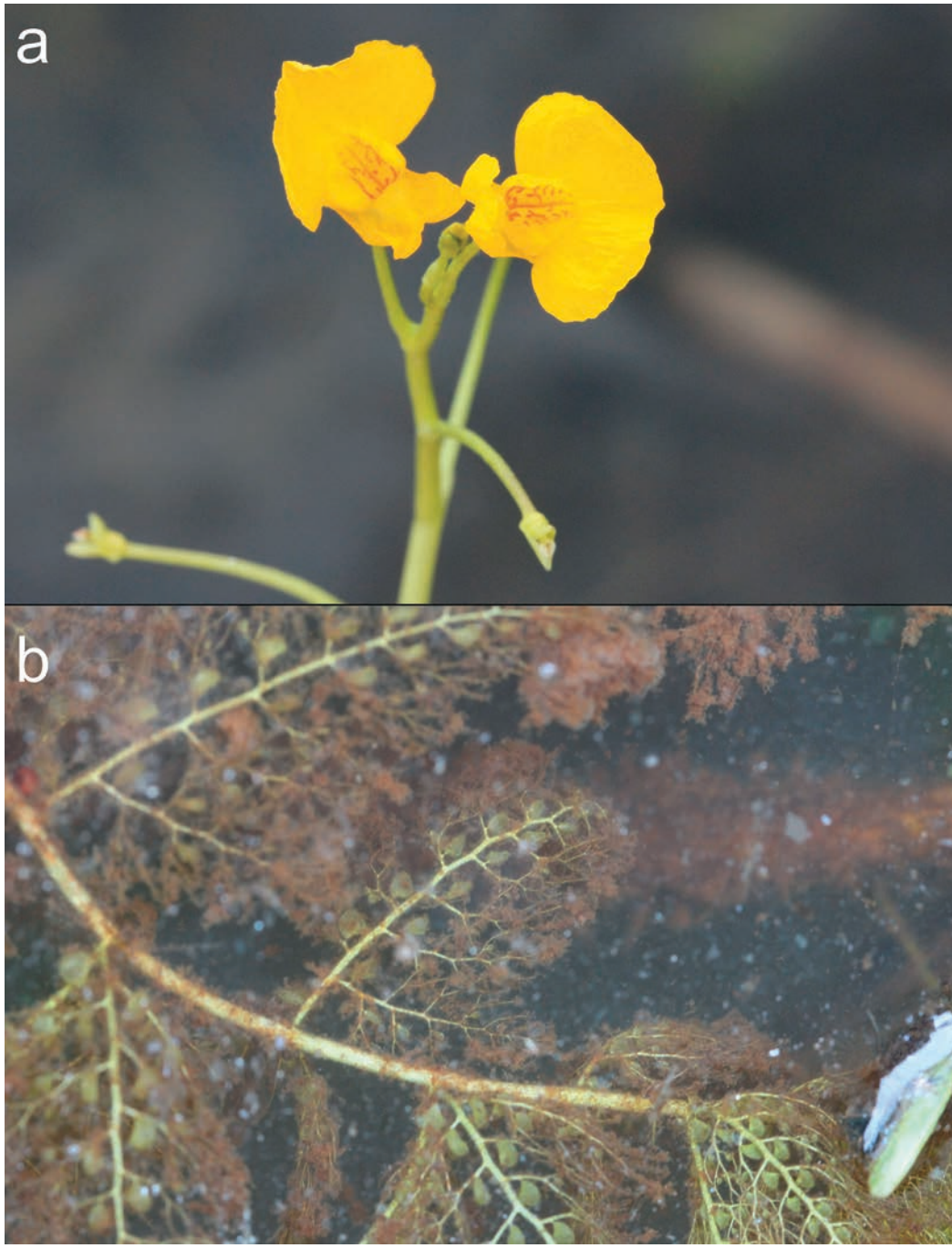


**Figure 1.** *Utricularia macrorhiza* at Mosquito Run, Leflore County, Mississippi: **a.** emergent inflorescence and **b.** submersed leaves. Photos by S.A. Schmid.

**Table 2. Water quality metrics of Mosquito Run.**

| Metric | Unit | Value |
|---|---|---|
| Secchi depth | cm | 40.0 |
| water temperature | °C | 28.3 |
| dissolved oxygen | ppm | 5.0 |
| pH | | 6.34 |
| specific conductance | $\mu S \times cm^{-1}$ | 0.0622 |
| salinity | ppt | 0.04 |
| total dissolved solids | ppm | 40.4 |
| nitrates | ppm | 109.43 |

These species also differ in stolon cross-section and seed shape; *U. foliosa* has stolons flattened in cross-section and lenticular, circular seeds whereas *U. macrorhiza* has stolons terete in cross-section and prismatic seeds (Taylor 1989).

Compared to other lakes in the Delta, the species richness at Mosquito Run was well above average (Turnage and Shoemaker 2018, Turnage et al. 2019, 2020). Additionally, the mean richness at sample points from this survey was 11 species, which is substantially greater than most lakes within the Mississippi Delta (Turnage and Shoemaker 2018, Turnage et al. 2019, 2020, Schmid and Turnage unpubl. data). Aside from *Utricularia macrorhiza, Alternanthera philoxeroides* was a dominant species in the plant community, with *Cyperus blepharoleptos* and *Pontederia crassipes* as subdominant (Table 1). *Lemna minor* was present at every sample point in the survey (Table 1), however the density of this species was usually low and thus would not be considered a dominant species. In addition to *U. macrorhiza, U. gibba* had high frequency in Mosquito Run, but it was usually observed at low densities (Table 1). Most water quality metrics of Mosquito Run were similar to other lakes in the Mississippi Delta (Schmid and Turnage unpubl. data, Table 2), however, the water in Mosquito Run was more turbid and acidic than other Delta waterbodies (Table 2). *Utricularia* spp. often show preference for acidic, wetland ecosystems like bogs in which carnivorous plants often inhabit as a response to low nutrient availability (Adamec 1997). The slightly acidic water at Mosquito Run may, in part, explain the dominance of *U. macrorhiza* in the plant community, however, there appear to be no studies that show a pH preference of *U. macrorhiza*. As this is the first record of *U. macrorhiza* in Mississippi in nearly a century, we recommend the Mississippi Natural Heritage Program review this population at Matthews Brake and determine if a state rank is warranted.

This record of *U. macrorhiza* in the Mississippi Delta exemplifies the importance of continued floristic surveys of natural areas, especially as the climate and landscape changes and develops. Aquatic systems (and particularly, small lakes) are often underrepresented in this regard. While Mississippi broadly has been well collected historically, the counties in the Mississippi Delta consistently rank as some of the most under-collected across American herbaria (SERNEC 2024). Future floristic efforts within Mississippi should focus on the Mississippi Delta, particularly in poorly collected counties. Additionally, aquatic plants are often under-represented in herbarium collections, suggesting that many collectors have a bias for terrestrial ecosystems (Panchen et al. 2019). Aquatic plants also exhibit a greater rate of extinction than their terrestrial counterparts which emphasizes the importance of describing aquatic plant biodiversity (Nualart et al. 2017). These findings when contextualized in the primary literature accentuate the value of current and continued survey of aquatic plant communities, particularly in Mississippi.

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