

MINUARTIA DRUMMONDII (CARYOPHYLLACEAE) AND GRATIOLA FLAVA
(PLANTAGINACEAE) REDISCOVERED IN LOUISIANA AND GRATIOLA FLAVA
HISTORICALLY IN ARKANSAS

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ABSTRACT

Collected in Louisiana in the mid-nineteenth century and not found since, *Minuartia drummondii* and *Gratiola flava* have recently been discovered in saline prairies in Caddo and De Soto parishes. Two herbarium sheets of *M. drummondii* collected in the mid-nineteenth century in Louisiana were located as well as an herbarium specimen of *M. drummondii*, misidentified as *M. muriculata* (*M. muscorum*), collected in a saline prairie in Red River Parish in 1990. Herbarium sheets from the mid-nineteenth century containing *G. flava* specimens from Texas, Louisiana, and possibly Arkansas were also located.

RESUMEN

Minuartia drummondii y *Gratiola flava* colectadas en Louisiana a mediados del siglo diez y nueve, y que no habían vuelto a encontrarse desde entonces, se han descubierto recientemente en paraderas salinas en las parroquias de Caddo y De Soto. Fueron localizados dos pliegos de herbario de *M. drummondii* colectados a mediados del siglo diez y nueve en Louisiana, así como un pliego de *M. drummondii*, mal identificada como *M. muriculata* (*M. muscorum*), colectada en una paradera salina en la parroquia de Red River en 1990. Se localizaron también pliegos de herbario de la mitad de la mitad del siglo diez y nueve que contienen especímenes de *G. flava* de Texas, Louisiana, y posiblemente Arkansas.

Minuartia drummondii (Shinners) McNeill [*Arenaria drummondii* Shinners] was first reported in Louisiana by Riddell (1852) under the name *Stellaria nuttallii* Torr. & A. Gray. Schutz (1979) reported it under the same name for Rapides Parish on the basis of a specimen collected in the mid-nineteenth century by Josiah Hale (s.n. NO). Hale's specimen is presumably the source of Riddell's (1852) inclusion since he and Hale collaborated. MacRoberts (1984) included the taxon as *M. drummondii* in his checklist of the Louisiana flora on the basis of the Schutz report. MacRoberts (1989) later reported it for Louisiana citing the Hale (s.n. NO) specimen. Thomas and Allen (1996) excluded *M. drummondii* from the Louisiana flora apparently because they were unable to locate an herbarium specimen. It is currently reported from Texas, Oklahoma, and Arkansas by Kartesz and Meacham (1999), Turner et al. (2003), NatureServe (2006), and USDA (2006) and in Texas, Oklahoma, Arkansas, and Louisiana by the *Flora of North America* (2006).

We located two Josiah Hale (s.n. NO) specimens of *M. drummondii* collected in Louisiana in the mid-nineteenth century. One label reads: "Stellaria Nuttallii, Prairies on Red River, J. Hale, M.D." and the other, "Stellaria Nuttallii, Moist Prairies, Caddo Par. La., April, Collected by Dr Josiah Hale." Neither of these specimens has a specific date.

Gratiola flava Leavenw. ex Pennell, a West Gulf Coastal Plain endemic (MacRoberts et al. 2002), is currently reported from Texas and Louisiana (Kartesz & Meacham 1999; Turner et al. 2003; NatureServe 2006;

USDA 2006). In Louisiana, *G. flava* is currently considered to be an historical species (Louisiana Natural Heritage Program 2006) because it has not been observed or collected since Josiah Hale's collections in the mid-nineteenth century (Vincent 1982; Pennell 1935; Thomas & Allen 1998).

Specimens of *G. flava* collected by Hale exist at GH, NO, and NY. The specimen at GH is part of a composite sheet containing additional specimens of *G. flava* and a single individual of *Gratiola neglecta* Torr. The *G. flava* specimens are separated on the sheet into six different groups, each of which is associated with its own typed label, packet, or handwritten inscription. The Hale specimen is located in the lower left corner of the sheet above a label bearing the following information: "Torr. & Gray; Flora, N. Amer. Louisiana. Hale." Three of the other specimens on the sheet were collected from Texas. Two of these are Charles Wright (*s.n.*) collections, one from "Texas" and the other from "Texas. On the Colorado [River] below Lagrange [Fayette County]." The third Texas specimen is a collection by Elihu Hall (414) from Hempstead, Waller County. One packet containing three individuals, located in the lower right corner, bears the note "Texas & Arkansas, Leavenworth (Hb. Torr.)." Just above this packet in the right-central portion of the sheet are two individuals and to the lower right of these specimens there is an annotation "Arkansas, Leavenworth."

Whether "Arkansas" here refers to modern Oklahoma or Arkansas is unknown. Between 1819 and 1835 the Arkansas Territory incorporated both and Melines Conkling Leavenworth was collecting in the upper West Gulf Coastal Plain when Oklahoma and Arkansas were divided in 1835. To possibly further confuse matters, in territorial times there was a town of Leavenworth on the Arkansas River in Oklahoma. But from the sheet as a whole, it appears unlikely that the reference is to the town of Leavenworth.

At NO, there is a Hale specimen that is a collection consisting of a single individual of *G. flava* and two stems of *Gratiola brevifolia* Raf. The specimen has no original label data but has been annotated by Francis W. Pennell (in 1921), Karl A. Vincent (in 1980–81), and Dwayne Estes (in 2005). It is unclear from the available data whether this specimen was actually collected in Louisiana.

At NY, there are two Hale specimens. One has a form label that bears the information "*Gratiola flava*. Josiah Hale, M.D. Alexandria, Louisiana." This specimen was deposited at NY in 1983 and was formerly part of the Sartwell Collection at Hamilton College in Clinton, New York. It was annotated by Karl Vincent in 1988 but has not been annotated by anyone else. The second specimen at NY is of a single individual of *G. flava* collected by Hale from "Moist Prairies. April" and was given the collection number "12"; it was identified only as "*Gratiola*." Someone later wrote the specific epithet "*pusilla* Torr." on the specimen following the genus name. This specimen was also annotated by F.W. Pennell in 1920 (as *G. tenella* Pennell ined.) and again in 1930 (as *G. flava* Leavenworth). Vincent verified the specimen in 1980–81 and provided the following annotation: "The specimen of *Gratiola flava* is not a type specimen. This Hale collection is merely cited by Pennell as from Louisiana in his 1935 monograph (pg 83)."

Examination of all available Hale material of *G. flava* revealed that these specimens lack specific locality data. Therefore, it is quite interesting that Thomas and Allen (1998) and the USDA Plants Database (2006) map the species from Rapides Parish, Louisiana. Thomas and Allen (1998, p. 159) cite the Hale specimen at NO as the basis for the Rapides Parish record in spite of the lack of explicit label data on the specimen. Therefore, the attribution of *G. flava* to Rapides Parish is likely based on the fact that Hale primarily collected in the vicinity of Alexandria where he lived for a period of time (Ewan 2005; Anne Bradburn, Tulane University, pers. comm.). It is also possible that the species was attributed to Rapides Parish based on one of the specimens at NY that has a form label with "Alexandria, Louisiana" printed on it. Whether or not the specimen actually came from the Alexandria area cannot be known, and it is possible that this is merely the address of Hale and not the origin of the specimen. However, it is not unreasonable to believe that *G. flava* could have been collected from Rapides Parish for three reasons. First, the species is known from within a few kilometers of the Louisiana state line in northern Newton County, Texas, only about 55 km west of Rapides Parish. Second, the geologic formation with which populations of *G. flava* are associated in Newton County, the Catahoula Formation, extends eastward into northern Rapides Parish. Last, since the Hale specimen at NO was mixed with *G. brevifolia*, a species that within Louisiana is found only in Allen,

Beauregard, Calcasieu, Cameron, Jefferson Davis, Rapides, and Vernon parishes (Thomas & Allen 1998; Knapp & Estes 2006) mostly in pineland seeps, it seems quite plausible that *G. flava* could have been collected by Hale from central or southwestern Louisiana, possibly in Rapides Parish.

Alternatively, it is also possible that Hale collected the specimens of *Gratiola flava* from northwestern Louisiana in prairies along the Red River. It is interesting to note that one of the specimens at NY bears the label data “Moist Prairies. April” and that similar data are found on one of the specimens of *Minuartia drummondii* collected by Hale from Caddo Parish in northwestern Louisiana (this paper).

The presence of specimens of *Gratiola flava* labeled as having been collected from “Arkansas” (Leavenworth s.n. GH) prompted us to investigate the literature in search of additional notes concerning the distribution of this species. Small (1903) reported *G. flava* (as *Gratiola pusilla* Torr.) from “prairies” in Arkansas and Texas without citing any vouchers, although he most likely attributed the species to Arkansas based on a specimen at NY bearing the label data “Arkansas. Dr. Leavenworth.” Later, Pennell (1921) gave the distribution of *G. flava* as “sandy prairies in and near the pinelands of southern Arkansas, western Louisiana, and eastern Texas.” Pennell based his citation of the species from Arkansas on the same Leavenworth specimen at NY following Small, and his attribution of the species to Louisiana was based on one of the Hale specimens at NY (Pennell 1921, p. 473). Later, Pennell (1935, p. 83) maintained *G. flava* as a component of the Louisiana flora based again on the Hale specimens (at both GH and NY); however, he did not attribute the species to Arkansas. In the list of synonyms for *G. flava*, Pennell (1935, p. 83) dismisses the occurrence of the species in Arkansas, noting “As no specimen was found marked as from ‘Arkansas,’ the plant must have originally been attributed to that territory because of Leavenworth’s residence there or his form-labels so printed.” Smith (1988:424) also excluded *G. flava* from Arkansas and provided the following note: “reported (as *G. pusilla*) for Arkansas by Small (1913) [Smith probably meant 1903], but apparently not in the state.”

Extant populations of Minuartia drummondii and Gratiola flava in saline prairies in Louisiana—In March and April 2006, we found thousands of flowering *M. drummondii* and *G. flava* scattered across the 9.7 ha (23.4 acres) Barron Road Saline Prairie in southern Caddo Parish. On 13 April 2006, we found thousands of *M. drummondii* and a small number of *G. flava* on the 10.9 ha (26.8 acres) Dickson Saline Prairie in northern De Soto Parish. Subsequently, these two species have been found at two more saline prairies in De Soto Parish. The discovery of *M. drummondii* in these prairies was initially thought to be the first discovery in Louisiana since Hale’s collections. However, subsequently while visiting NLU we found a specimen of *M. drummondii* (Thomas 115,384) misidentified as *M. muriculata* (Maguire) McNeill (*M. muscorum* (Fassett) Rabeler), collected in 1990 from a saline prairie in Red River Parish.

Saline prairies have been described by McInnis et al. (1993), Keith et al. (2004), Lester et al. (2005), and Arkansas Natural Heritage Commission (2006) in Louisiana, Texas, and Arkansas. Those in Caddo and De Soto parishes resemble other saline prairies, being open grassy expanses with treed mima mounds scattered over them. They are a mosaic of dense to sparse herbaceous vegetation with interspersed bare soils or “slicks.” The soils, which are typically cryptogamic, are poorly drained with slow permeability and high sodium content. The soil series for the saline prairies in Caddo, De Soto, and Red River parishes is Bonn silt loam (Edwards et al. 1980, 1991). Brimstone and Lafe soils are also known to support saline prairies in Louisiana. In addition to *M. drummondii* and *G. flava*, species found in Louisiana saline prairies include *Anagallis minima* (L.) Krause, *Aristida longespica* Poir., *Aristida oligantha* Michx., *Astragalus distortus* Torr. & Gray, *Cooperia drummondii* Herbert, *Coreopsis tinctoria* Nutt., *Crassula aquatica* (L.) Schoenl., *Croton michauxii* G.L. Webster, *Evolvulus sericeus* Sw., *Fimbristylis puberula* (Michx.) Vahl, *Geocarpon minimum* Mackenzie, *Habranthus tubispathus* (L’Her.) Traub, *Houstonia micrantha* (Shinners) Terrell, *Houstonia pusilla* Schoepf, *Houstonia rosea* (Raf.) Terrell, *Isolepis carinata* Hook. & Arn. ex Torr., *Iva angustifolia* Nutt. ex DC., *Krigia occidentalis* Nutt., *Lepuropetalon spathulatum* Ell., *Lotus unifoliolatus* (Hook.) Benth., *Marshallia caespitosa* Nutt. ex DC., *Mimosa strigillosa* Torr. & Gray, *Minuartia muscorum* (Fassett) Rabeler, *Mirabilis albida* (Walt.) Heimerl, *Neptunia lutea* (Leavenworth) Benth., *Nothoscordum bivalve* (L.) Britt., *Opuntia humifusa* (Raf.) Raf., *Phacelia glabra* Nutt., *Phalaris caroliniana* Walt., *Plantago pusilla* Nutt., *Rumex hastatulus* Baldw., *Sabatia campestris* Nutt., *Schedonnardus*

paniculatus (Nutt.) Trel., *Schoenolirion wrightii* Sherman, *Sporobolus pyramidatus* (Lam.) Hitchc., *Sporobolus vaginiflorus* (Torr. & Gray) Wood., *Talinum parviflorum* Nutt., *Tradescantia hirsutiflora* Bush, *Tradescantia occidentalis* (Britt.) Smyth, and *Valerianella radiata* (L.) Dufr.

Since we collected *M. drummondii* and *G. flava* in saline prairies, it is possible that Hale also did so. If that is the case and if the label information for his *M. drummondii* is correct, it would follow that at least some of the prairies on the Red River floodplain that existed in Caddo Parish in the mid-nineteenth century were saline prairies (MacRoberts et al. 1997; MacRoberts & MacRoberts 2005), and perhaps it was from these that Hale collected *G. flava*. However, it is also possible that *G. flava* was collected by Hale farther to the south in western or west-central Louisiana quite possibly from Rapides Parish. Given the close proximity of the newly discovered Louisiana populations to Arkansas, it is quite possible that Leavenworth collected *G. flava* from southwestern Arkansas in saline prairies or similar habitats.

Voucher for *Gratiola flava*. **LOUISIANA. Caddo Parish:** B.R. & M.H. MacRoberts 7296 (LSUS), B.R. & M.H. MacRoberts 7310 (TENN). **De Soto Parish:** B.R. & M.H. MacRoberts 7584 (LSUS), Reid 5724 (LSU).

Vouchers for *Minuartia drummondii*. **LOUISIANA. Caddo Parish:** B.R. & M.H. MacRoberts 7314 (LSUS). **De Soto Parish:** B.R. & M.H. MacRoberts 7586 (LSUS), Reid 5721 (LSU). **Red River Parish:** Thomas 115384 (NLU).

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REFERENCES

- ARKANSAS NATURAL HERITAGE COMMISSION. 2006. Warren Prairie Natural Area. www.naturalheritage.com
- EDWARDS, J.P., P.G. MARTIN, J.W. MAGOUN, W.W. KILPATRICK, and C. HENRY. 1980. Soil survey of Caddo Parish, Louisiana. U.S.D.A. Soil Service, Washington, D.C.
- EDWARDS, J.P., M. COOLEY, and C.L. GODFREY. 1991. Soil survey of De Soto Parish, Louisiana. U.S.D.A. Soil Service, Washington, D.C.
- EWAN, J.A. 2005. Notes on Louisiana botany and botanists, 1718–1975. *Sida* 21:2275–2296.
- FLORA OF NORTH AMERICA. 2006. www.eFlora.org.
- KARTESZ, J.T. and C.M. MEACHAM. 1999. Synthesis of North American flora. Version 1.0. North Carolina Botanical Garden, Chapel Hill.
- KEITH, E.L., J.R. SINGHURST, and S. COOK. 2004. *Geocarpon minimum* (Caryophyllaceae), new to Texas. *Sida* 21:1165–1169.
- KNAPP, W.M. and D. ESTES. 2006. *Gratiola brevifolia* (Plantaginaceae) new to the flora of Delaware, the Delmarva Peninsula, and the mid-Atlantic. *Sida* 22: 825–829.
- LESTER, G.D., S.G. SORENSEN, P.L. FAULKNER, C.S. REID, and I.E. MAXIT. 2005. Louisiana comprehensive wildlife conservation strategy. Louisiana Department of Wildlife and Fisheries. Baton Rouge.
- LOUISIANA NATURAL HERITAGE PROGRAM. 2006. Rare plant species of Louisiana. Louisiana Department of Wildlife and Fisheries. Baton Rouge.
- MACROBERTS, D.T. 1984. The vascular plants of Louisiana: an annotated checklist and bibliography of the vascular plants reported to grow without cultivation in Louisiana. *Bull. Mus. Life Sci., Louisiana State University-Shreveport* 6:1–165.
- MACROBERTS, D.T. 1989. A documented checklist and atlas of the vascular flora of Louisiana. *Bull. Mus. Life Sci. Louisiana State Univ.* 8:257–536.
- MACROBERTS, D.T., B.R. MACROBERTS, and M.H. MACROBERTS. 1997. A floristic and ecological interpretation of the Freeman and Custis Red River expedition of 1806. *Bull. Mus. Life Sci. Louisiana State Univ.* 12:1–26.

- MACROBERTS, H.H., B.R. MACROBERTS, B.A. SORRIE, and R.E. EVANS. 2002. Endemism in the West Gulf Coastal Plain: importance of xeric habitats. *Sida* 20:767–780.
- MACROBERTS, M.H. and B.R. MACROBERTS. 2005. Reference conditions of the Red River floodplain and upland, Caddo Parish, Louisiana. *Sida* 21:1793–1806.
- MCINNIS, N.C., L.M. SMITH, and A.B. PITTMAN. 1993. *Geocarpon minimum* (Caryophyllaceae), new to Louisiana. *Phytologia* 75:159–162.
- NATURESERVE 2006. NatureServe Explorer. An online encyclopedia of life [web application]. Version 4.7. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>.
- PENNELL, F.W. 1921. Scrophulariaceae of the west gulf states. *Proc. Acad. Nat. Sci. Philadelphia* 73:459–536.
- PENNELL, F.W. 1935. The Scrophulariaceae of eastern temperate North America. The Academy of Natural Sciences of Philadelphia, Philadelphia, PA.
- RIDDELL, J.L. 1852. *Catalogus florae Ludovicianae*. *New Orleans Med. Surg. J.* 8:734–754.
- SCHUTZ, S.E. 1979. A preliminary survey of the vascular flora of Rapides Parish, Louisiana. M.S. Thesis, Northeast Louisiana University, Monroe.
- SMALL, J.K. 1903. *Flora of the southeastern United States*. Published by the author, New York.
- SMITH, E.B. 1988. Atlas and annotated list of the vascular plants of Arkansas. Privately Printed, Fayetteville. (Available online at: <http://www.csd1.tamu.edu/FLORA/arkansas/arkindex.htm>)
- THOMAS, R.D. and C.M. ALLEN. 1996–1998. Atlas of the vascular flora of Louisiana. Vols. 2 and 3. Louisiana Department of Wildlife and Fisheries, Baton Rouge.
- TURNER, B.L., H. NICHOLS, G. DENNY, and O. DORON. 2003. Atlas of the vascular plants of Texas. *Sida, Bot. Misc.* 24:1–888.
- USDA NRCS. 2006. The PLANTS Database (<http://plants.usda.gov>, 5 July 2006). National Plant Data Center, Baton Rouge, LA 70874–4490.
- VINCENT, K.A. 1982. Scrophulariaceae of Louisiana. M.S. Thesis, University of Southwestern Louisiana, Lafayette.