



# Flora of North America

Glossostigma (Phrymaceae)  
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2. **GLOSSOSTIGMA** Wight & Arnott, Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 355. 1836, name conserved \* Mud mat [Greek *glossa*, tongue, and *stigma*, spot, alluding to ligulate stigma] **I**

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**Herbs**, annual or perennial, aquatic, mat-forming; stolons horizontal. **Stems** absent. **Leaves** arising along stolon, opposite, succulent; petiole absent [present]; blade margins entire. **Inflorescences** of axillary, solitary flowers; bracts absent. **Pedicels** absent or present; bracteoles absent. **Flowers** [monomorphic] dimorphic (in perianth characteristics); sepals 3[–4], calyx radially or bilaterally symmetric (adaxial lobe longer), campanulate or urceolate, lobes oblong; petals 0 or [3–]5, corolla (rudimentary or well-developed), white [suffused with blue, pink, or purple], bilaterally symmetric, short-funnelform, abaxial lobes 3, adaxial lobes 2, (reduced); stamens 2 [4], adnate to corolla, equal [didynamous], filaments glabrous, staminode 0; ovary 2-locular, placentation axile; stigma broad, flaplike, or reduced. **Capsules** symmetric, loculicidal. **Seeds** 12–73 [100], brown, flattened bilaterally, not winged.  $x = 5$ .

Species 7 or 8 (1 in the flora): introduced; Asia, Africa, Pacific Islands (New Zealand), Australia.

Chromosome counts from New Zealand (E. J. Beuzenberg and J. B. Hair 1983; P. J. de Lange et al. 2004) uniformly indicate a base number of  $x = 5$  for *Glossostigma*. An anomalous count ( $2n = 32$ ) has been reported for *G. diandrum* from Bangladesh (see M. O. Rahman 2006).

SELECTED REFERENCE Les, D. H., R. S. Capers, and N. P. Tippery. 2006. Introduction of *Glossostigma* (Phrymaceae) to North America: A taxonomic and ecological overview. Amer. J. Bot. 93: 927–939.

1. **Glossostigma cleistanthum** W. R. Barker, J. Adelaide Bot. Gard. 15: 72. 1992 \* Cleistogamous mud mat  
**F I**

**Roots** (3–)5(–6) per node. **Stolons** creeping along substrate surface, internodes 1–18 mm. **Leaves**: blade erect, green or yellow-green, narrowly spatulate, gradually tapering to base, 4–11 mm when emerged, (7–)9–25(–57) mm when submersed, base with a pair of longitudinal lacunae, glossy. **Pedicels** 4–15 mm (chasmogamous flowers), 0–2 mm (cleistogamous flowers). **Flowers** dimorphic, chasmogamous and/or cleistogamous when emerged, cleistogamous when submersed; calyx green, red, or brown, campanulate, 1 mm (chasmogamous flowers), urceolate, 1.5–3 mm (cleistogamous flowers), shorter than tube, lobes spreading, obtuse; corolla 5-lobed (chasmogamous flowers), tube 0.6 mm, abaxial lobe 0.5–0.7 mm, adaxial lobes 0.2 mm, lateral lobes 0.3–0.5 mm, lobes distinct, obtuse, roundish, spreading or corolla rudimentary (cleistogamous flowers); stamens exerted 0.1–0.2 mm, stigma 1 mm, exerted 0.4 mm, inrolled over anthers distally, tactile, straightening when touched, adaxial surface papillate, receptive (chasmogamous flowers), or reduced, elliptic, non-tactile (cleistogamous flowers). **Capsules** oblong (chasmogamous flowers) or spherical (cleistogamous flowers), 1.4–1.8 mm. **Seeds** oblong, 0.4–0.5 mm.  $2n = 50$  (New Zealand).

Flowering spring–fall; fruiting summer–winter. Emerged or submersed in fresh, oligotrophic waters to 2.6 m, margins of coastal plain lakes, ponds, and watercourses, on sand or sandy substrates mixed with clay, gravel, or silt; 10–200 m; introduced; Conn., Del., Md., Mass., N.J., Pa., R.I.; Pacific Islands (New Zealand); Australia.

Introduced North American plants initially were misidentified as *Glossostigma diandrum* (Linnaeus) Kuntze due to the presence of chasmogamous flowers, which had not yet been reported in *G. cleistanthum*. Subsequent field and genetic studies confirmed that all known cleistogamous and chasmogamous North American material belonged to *G. cleistanthum* (D. H. Les et al. 2006).

When submersed, *Glossostigma cleistanthum* is perennial (perhaps also annual) and can remain green throughout winter, even under ice. Submersed plants produce only cleistogamous flowers but longer leaves and stolon internodes. Emerged plants have shorter leaves and stolons and are annual in the flora area. They produce cleistogamous and/or chasmogamous flowers; however, the latter are infrequently observed in North America.

In chasmogamous flowers, the apex of the flaplike stigma curls inward to cover the anthers but quickly straightens, displacing the receptive surface against the adaxial corolla when contacted; it then slowly recurls to cover the anthers. Despite this presumed adaptation for outcrossing, autogamy occurs frequently by means of the cleistogamous flowers. Seed set and germination typically are high. Seed production is prodigious, reaching densities of 23,000 seeds m<sup>2</sup>.

*Glossostigma* is regulated as a noxious aquatic weed even in the states of Oklahoma and Washington, which are quite remote from any of the known populations. Though small, these plants are seriously invasive because they can become dense (to 25,000 plants m<sup>2</sup>) in fairly pristine sites, displacing imperiled native species. Sterile or cleistogamous plants easily avoid detection because they often resemble masses of seedlings. Dispersal occurs by transport of the minute seeds (in mud or feathers of waterfowl), or locally by dislodged fruit-bearing plants, which float by means of their buoyant lacunal leaves. Chasmogamous flowers exhibit splash-cup seed dispersal. The Delaware and Maryland attributions are based on photographs sent to us by Wayne Longbottom (W. M. Knapp et al. 2011). The presence of this species in New York is probable but has not yet been documented.

The use of *Glossostigma* as an aquarium plant (C. Kasselman 2003) likely is associated with its introduction to North America. The first documented North American specimens were collected from a tidal freshwater river wetland in New London County, Connecticut, in 1992.