

Pest plant risk assessment

Glush weed

Hygrophila costata

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Taxonomy and related species

Hygrophila costata Nees is in the family Acanthaceae—a pantropical family of about 250 genera and 2600 species with four main centres of distribution: Indo-Malaya, Africa, Brazil and Central America (Bremekamp 1965; Hsieh & Huang 1974). Two genera, *Justicia* and *Hygrophila*, contain aquatic species. The *Hygrophila* genus contains 80–90 species found throughout the warmer regions of the world. Most species are marsh plants (Cook et al. 1974). The name *Hygrophila* is derived from the Greek *hygros* meaning ‘moist’ and *philos* meaning ‘friend’. Several congeners are cultivated as decorative aquarium plants, including *H. corymbosa* (Blume) Lindau, *H. lacustris* (Schlecht) Nees, *H. polysperma* (Roxb.) T Anderson, *H. salicifolia* (Vahl) Nees and *H. difformis* (Cook et al. 1974).

The taxonomy of species within the *Hygrophila* genus is not clear and *H. costata* has at least 15 synonyms, including *H. brasiliensis* (Spreng.) Lindau, *H. guianensis* Nees, *H. conferta* Nees var. *rubricaulis* Nees, *H. lacustris* (Schtdl. and Cham.) Nees, *H. conferta* Nees, *H. hispida* Nees, *H. longifolia* Nees, *H. portoricensis* Nees, *H. pubescens* Nees, *H. rivularis* (Schtdl.) Nees, *H. verticillata* (Spreng.) Cabrera and G Dawson and *Ruellia brasiliensis* Spreng., *Ruellia lacustris* Schtdl. and Cham., *R. rivularis* Schtdl. and *R. verticillata* Spreng. (*Atlas of Florida vascular plants* 2002). Some references mention a variety of *H. costata*, var. *angustifolia* Nees.

Other details from the United States Department of Agriculture Germplasm Resources Information Network (GRIN) database (GRIN 2002) are as follows:

Nomen number:	415479
Place of publication:	Pl. hort. bonn. icon. 2:7, t.3.1824
Name verified on:	23 November 1999 by Systematic Botany Laboratory. No accessions for species.

Common names for *H. costata* include ‘glush weed’ (Australia), ‘gulf swampweed’ (Florida) and ‘hygrophila’ (aquarium trade).

A native species, *H. salicifolia* (Vahl) Nees (syn. *Ruellia salicifolia* Vahl), grows in swampy areas in south-eastern Queensland (Stanley & Ross 1986).

Description

Hygrophila costata is a perennial, amphibious marsh plant generally 0.5–1 m tall, but up to 2.5 m tall when scrambling up through taller vegetation. While it is generally an erect plant when grown in isolation, specimens that are growing close together often have stems that grow along the ground, with roots produced at the point where nodes touch the ground. *H. costata* can grow either fully submerged or above water level on nearby moist ground.

Leaves opposite, simple, 3–18 cm long, 1–5 cm wide, oblong to elliptic-lanceolate, narrowed at base to a very short petiole. Stems softly hispid with long pluricellular hairs, rarely branched. Flowers bisexual, zygomorphic, white (or light rose), 9–11 mm wide and produced in cymes in the leaf axils. Four stamens (occasionally two fertile and two sterile); anther sac at same level. The ovary is superior, two-locular and the fruit is a two-valved capsule, 14–17 mm long. Each capsule has 12–18 seeds. Seeds are pale brown, round, flattened, smooth, 0.3–1 mm long (Long 1970; Adams 1972).

Phenology

Flowering and fruit production occurs from December to March (Adams 1972).

Reproduction and dispersal

H. costata is readily propagated from cuttings or from severed leaves (Sterba 1967; Kelsey-Wood 1976). Leaves can be left floating on the water surface where they will soon form roots (Sterba 1967). Aquarium guides such as Sterba (1967) and Johnson and Heins (1985) note that *H. costata* can be propagated from a 15 cm section of stem, which produces roots. Presumably, wild specimens growing in marshy areas can produce new plants downstream if floodwaters break off sections of stems or leaves.

The small seeds are sticky when wet but there is no information available on dispersal or longevity.

Distribution in Australia

Hygrophila costata has been planted at an unknown number of wetland locations by one or more people to supply the aquarium and pet trade with aquatic plant material. It is suspected that these people harvest the wild plant material as required.

Five naturalised populations have been recorded in Australia, four in Queensland and one in New South Wales.

Queensland Herbarium records are as follows:

- Lake McDonald, 15 km south-east of Cooroy (first collected in 1993). Several thousands of specimens noted at site by 1999.
- Caboolture River, approximately 0.5 km south of Caboolture (collected 7 January 1995). In 1995, this infestation was recorded to be about 50 m long and quite dense (T Bean, Queensland Herbarium, unpubl.).
- Four Mile Creek, Strathpine (Brisbane) (collected 26 November 1996).
- Beenleigh, Hugh Muntz Park (collected May 1997).

Additional infestations in Queensland have been found at:

- Cedar Creek, Mt Tamborine—scattered clumps.
- Albert River (at junction of Cedar Creek)—one small clump.
- Coomera River—a very small infestation.
- Beaudesert.

The New South Wales (Tamworth Agricultural Research Centre) Herbarium record is as follows:

- Casino Wetlands, Queensland Road, north of Casino (collected March 1999). Recorded to exist as 20 patches of varying size (0.5–20 m²).

Origin

H. costata occurs naturally in North America (Mexico) and Central/South America (Argentina–Corrientes, Entre Rios, Misiones, Salta, Tucuman; Belize; Bolivia; Brazil; Columbia; Costa Rica; Cuba; Ecuador; French Guiana; Guatemala; Guyana; Hispaniola; Honduras; Jamaica; Nicaragua; Panama; Paraguay; Puerto Rico; Suriname and Venezuela (Standley & Steyermark 1946–1976; Steyermark et al. 1955; Burger 1971; Adams 1972; Cabrera 1977; Liogier 1984; Jorgensen & Leon-Yanez 1999; GRIN 2002).

It is thought that *H. costata* was imported and cultivated in Australia for use as an aquarium plant. The plant is mentioned in several books and websites that feature ‘desirable’ aquarium plants. For example, the Tropica Aquarium Plants website describes *H. guianensis* as ‘most suitable for planting in groups in large aquariums. If not pruned it easily grows above the water surface, which makes it suitable for open aquariums.’ (Tropica Aquarium Plants, n.d.). Sterba (1967) comments that *H. costata* is ‘a completely undemanding plant’.

The earliest record of this species in Australia was in 1993 at Lake McDonald near Cooroy, Queensland (Barker 1996).

Preferred habitat and climate

In tropical America, *H. costata* is ‘rare and local’ (Adams 1972). *H. costata* and its synonym, *H. guianensis*, are recorded to grow along muddy river banks, on silt, gravel banks and rocks in rivers (Adams 1972).

In Queensland and New South Wales, *H. costata* has naturalised along the banks of creeks and in shallow, freshwater wetlands. At a few locations it has formed pure stands. At these sites, the native vegetation has been heavily disturbed and eutrophic conditions prevail. It is not known to what degree eutrophication is a requirement for survival and proliferation of this plant in Australia.

Status as a weed in other states

H. costata has naturalised in New South Wales but is not declared in any other state or territory.

History as a weed overseas

H. brasiliensis, a synonym for *H. costata*, is a noxious weed in North Carolina, United States (USDA, n.d.).

Pest potential in Queensland

Hygrophila costata has several attributes that suggest invasive potential in Queensland (see attachment). Perhaps most importantly, it has already formed pure stands at several sites in south-east Queensland and it has a history as a weed in the United States. Congeners are recorded as weeds in rice field and irrigation ditches (Cook et al. 1974).

Climatically, the plant is well suited to coastal, sub-tropical Queensland, but can be found further inland wherever suitable shallow wetlands occur. Habitats at risk of invasion include virtually any shallow, freshwater wetlands, particularly muddy and eutrophic wetlands, as well as the banks of creeks and rivers where the native riparian vegetation has been removed or degraded.

Of concern is the plant's potential to form pure stands that exclude other vegetation. While the plant is believed to serve as an alternate host for two native species of butterflies (the brown soldier and the blue argus), invasion has the potential to reduce total wildlife biodiversity at any particular site.

Since *Hygrophila costata* produces large numbers of water-dispersed seeds, its spread could be rapid and difficult to contain.

Hygrophila costata was listed as a potential environmental weed and a candidate for preventative control by Csurhes and Edwards (1998).

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