

Mini data sheet on *Hydrilla verticillata* (Hydrocharitaceae)

Added in 2009 - Deleted in 2012

Reasons for deletion:

Hydrilla verticillata was added to the EPPO Alert List in 2009 and transferred to the List of Invasive Alien Plants in 2012.

Why

Hydrilla verticillata is a submerged freshwater aquatic plant originating from Australasia which is used as an aquarium plant. Within the EPPO region, its distribution is still limited. Because this plant has shown invasive behaviour in all continents and is of limited distribution in the EPPO region, it can be considered an emerging invader in Europe.

Geographical distribution

EPPO region: Ireland, Latvia, Lithuania, Poland, Russia.

Africa: Kenya, Mauritius, Tanzania, Seychelles, Uganda.

North America: Mexico, USA (invasive) (Alabama, Arizona, California, Connecticut, District of Columbia, Delaware, Florida, Georgia, Iowa, Louisiana, Maryland, Maine, Mississippi, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington).

South America: Colombia, Panama.

Asia: Bangladesh, Brunei Darussalam, Cambodia, China, India, Indonesia, Iran, Japan, Korea Dem. People's Republic, Korean Republic, Lebanon, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam.

Oceania: Australia (Queensland, New South Wales, Northern Territory, Victoria, Western Australia), Fiji, French Polynesia, Guam, New Caledonia, New Zealand (invasive), Papua New Guinea.

Note: *H. verticillata* is considered to be native to Asia and northern Australia. Import is prohibited in Western Australia and Tasmania.

It is casual in the following EPPO countries. The plant was found in 1914 in one locality in Great Britain, and another in Ireland. It has been suggested that both populations arose from turions (overwintering dense vegetative buds) carried on the feathers or feet of wildfowl. In the UK, the species was not found subsequently and is believed to have become extinct. It still survives in Ireland, but its populations declined.

In Austria, it is recorded as casual from a hot spring in Carinthia where several alien plants and animals from warmer regions persist. In Germany, *H. verticillata* was found around 100 years ago, but there are no recently known occurrences. Nevertheless, it can be easily confused with *Elodea canadensis* (Hydrocharitaceae), and might be overlooked. In Latvia, the species was first found in 1961.

Morphology

H. verticillata is a submerged aquatic perennial with heavily branched stems toward the water surface. The plant is usually rooted to the substrate but sometimes grows as floating mats at the surface. Stems can grow up to 9 m long. Leaves are 6 to 20 mm long, 2 to 4 mm wide. Leaves are strap-shaped and have saw-tooth edges and grow in whorls of 4 to 8 around the stem. Leaf colour can vary from green, translucent, yellowish, to brown. The plant is both dioecious and monoecious, it produces small white flowers on long slender stems (female flowers), and small, green, free-floating, inverted bell-shaped flowers (male flowers).

Biology and ecology

H. verticillata grows very fast and can double its biomass every two weeks in summer conditions. It is found in freshwater but can tolerate salinities of up to 7%. It can grow in relatively low light and CO₂ conditions, as well as in low or high nutrient conditions. The plant is winter-hardy, it prefers temperatures between 20 and 27°C, and its maximum temperature is 30°C. Seeds play a very small role in its spread, and indeed most populations do not produce any seed at all. The dioecious plant (having female and male flowers on different plants) is native to southern India and the monoecious plant (having both female and male flowers on the same plant) is probably native to Korea. The dioecious and the monoecious plants are found on every continent except Antarctica. *H. verticillata*

reproduces mainly by regrowth of stem fragments, which breaks easily, and small pieces of stem no more than 2.5 cm can produce entire new plants. The plant also produces turions of 0.6 cm (overwintering dense vegetative buds) at the axils of leaves and potato-like tubers attached to the roots in the mud. The turions break off the stems in the autumn and can drift for long distances before sinking to start a new plant. Tubers may remain viable for 4 to 7 years in the sediments and one tuber can lead to the production of 5000 new tubers per square metre. Tubers and turions can survive ice cover, drying, ingestion and regurgitation by waterfowl. Fragments, tubers and turions are spread by water currents. The plant may initially be discarded into the wild through aquarium dumping. Fragments of the plant can then be spread by boats, trailers and fishing equipments. Fragments of *H. verticillata* have also been found contaminating shipments of water lilies.

Habitats

H. verticillata has been found in springs, lakes, marshes, ditches, rivers and tidal zones. According to the Corine Land Cover nomenclature, these habitats correspond to: inland wetlands (marshes, peat bogs) and continental waters (water courses, water bodies).

Impacts

H. verticillata forms dense mats on the water surface that totally exclude sunlight from other plants, reducing plant and animal diversity. In North America, native plants such as *Potamogeton* spp. (Potamogetonaceae), *Vallisneria americana* (Hydrocharitaceae) and *Ceratophyllum demersum* (Ceratophyllaceae) are shaded out, outcompeted and eliminated. Populations of fishes can be affected by the plant as they cannot hunt effectively within the thick mats. Although some birds feed on the plant, bird populations generally decline in a heavily infested site. The dense mats also affect recreational activities as boat motors can become tangled with them, and swimming areas can be choked. *H. verticillata* often slows or clogs rivers, irrigation ditches, and flood control canals, creating stagnant water that is prime mosquito breeding habitat. Dense stands can even cause flooding, damage dams and power plants, alter water quality by decreasing oxygen levels and by increasing pH and water temperature.

Control

In ponds and small lakes, water draw-downs have been effective. Harvesting and the use of motorized boats is not recommended as it can fragment the plant and ease its spread.

Aquatic herbicides (e.g. fluridone and endothall in the USA) have been effective at temporarily controlling the weed, but do not kill the tubers, turions and seeds. Biological control agents include Chinese grass carp (*Ctenopharyngodon idella*), tuber-feeding weevils - such as *Bagous affinis* attacking tubers when the plant is not submerged beneath the water - and leaf-eating flies - such as *Hydrellia pakistanae*, whose larvae feed on the plant. Chinese grass carp are effective but should be used with care since they are not selective and might destroy native plants. An integrated approach including biological control with Chinese grass carp, mechanical and manual methods has been found to achieve maximum success.

Sources

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