

The invasion mediated by aquarium hobbyists in the case of water lettuce, *Pistia stratiotes*

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Pistia stratiotes is a floating aquatic plant of the genus *Pistia* (in fact the only species of the genus), Family Araceae. This family belongs to Order Arales and comprises herbaceous plants with tubers or rhizomes. *P. stratiotes* is often called water cabbage, Nile cabbage, water lettuce, or shellflower (Tyagi & Agarwal 2017).

The native distribution of the species across the globe is not very precise, but it is supposed to be pantropical. The species was discovered somewhere along the Nile river, near Lake Victoria, Africa (Xu & Chang 2017). It is now widespread, either naturally or due to human introduction, in nearly all tropical and subtropical fresh waterways and classified an invasive species (Khabbach et al 2019) as well as a mosquito breeding habitat (Thangamathi et al 2018).

It is a perennial monocotyledon with thick and soft leaves, which form a floating rosette on the surface of the water. Its submerged roots hung beneath the floating leaves (Figure 1). The leaves can be up to 14 cm long and have no stem. They have a light green color, wavy margins, parallel veins and are covered in short hairs. The flowers are unisexual, and are hidden in the middle of the plant amid the leaves (Galal et al 2019). The flowers turn into small green berries after successful fertilization. The species also multiplies by asexual reproduction, more precisely by stolons (Galal et al 2019).



Figure 1. *Pistia stratiotes*, morphology. Source: Public domain, <https://commons.wikimedia.org/w/index.php?curid=6267287>.

The shellflower is not winter-hardy, while its temperature tolerance interval is not very wide. The species minimum growth temperature is 15°C, its optimum growth temperature interval is 22-30°C, and its maximum growth temperature is 35°C (Kasselmann 1995).

The shellflower is one of the world's most productive freshwater aquatic plants and demonstrated to be an invasive species (Rangaswamy 2009). Under conditions of sufficient nutrients, the plant shows an exacerbated growth. Often it blocks the drainage of canals and covers lakes or accumulation reservoirs from shore to shore (Kasulo 2000) (Figure 2).



Figure 2. *Pistia stratiotes*, invasion on the water surface. Photo by Pradeep717, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=70509580>.

The shellflower is often used as floating plant in tropical aquaria, paludaria or in some types of terraria. In aquaria, the plant confers hidden for fry and small fish (Figure 3). It is also useful due to the fact it outcompetes algae for nutrients in the water, thereby preventing exacerbated algal blooms.

More and more studies show that the species is spreading in more and more regions of the world due to the deliberate or accidental release in rivers, lakes, ponds or pools (Beentje et al 2017; Peres et al 2018). The release of the plants in the wild occurs in parallel with the release in the wild of the fish from the aquaria. The people responsible for these facts are aquarium hobbyists (Mag et al 2009). Fortunately, the invasive trait of the species is not felt in all temperate areas due to the cold in the winter months.



Figure 3. *Pistia stratiotes*, cultivated in aquarium (original picture).

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