

Family Pontederaceae - Overview, Botany and Ecological Consequences: A Case study in Haroti Region of Rajasthan

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Abstract: This study provides a comprehensive overview of the Pontederiaceae family, focusing on its occurrence, adaptation, and impact within the wetlands of the Haroti region of Rajasthan, India. The Pontederiaceae is a small family of aquatic plants prevalent in various wetland environments. The family Pontederiaceae is known as Pickerel - weed family. Through a detailed literature survey and field observations conducted between 2020 and 2022, this research examines the morphological and hydrophytic characteristics of these plants, their reproductive strategies, and their ecological impacts. The findings highlight the significant challenge posed by these aquatic weeds in terms of waterway obstruction and biodiversity loss, underscoring the need for effective management and conservation strategies to protect wetland ecosystems. This paper contributes to the understanding of aquatic angiosperms in Haroti region and emphasizes the importance of preserving these vital ecosystems amidst the challenges of invasive species.

Keywords: Aquatic weeds; Hydrophyte; Monocotyledonous; Pontederiaceae; Runners

1. Introduction

Pontederiaceae is a small family of aquatic plants. It is placed in series Coronarieae by Bentham and Hooker's. In some classifications it is placed in Commelinales. *Pontederia* genera is a group of aquatic and semi - aquatic monocotyledonous flowering plants. *Pontederia crassipes* Mart. is most common aquatic weed. It was introduced to Bengal, India, by British, because of its ornamental flowers and shapes of leaves. They impressed the beauty of the flowers of *Pontederia crassipes* Mart. but which has now spread to most of the small to large water bodies. It was referred to as the blue devil and Bengal terror in our country. *Pontederia crassipes* Mart. is native to South America, but incorporated throughout the world as invasive species.

The vegetative characters of family Pontederiaceae are - Plants floating aquatic weeds, unbranched offsets stolons or rhizomes, leaves ½ alternate, with spongy inflated petiole. The floral characters of family are - bisexual flowers, hypogynous and zygomorphic, perianth petaloid, connate, stamens 6, in two whorls 3+3, carpels 3 and syncarpous. The fruits of the genera are capsule or achene (one seeded) and with 1 - seeded utricle. Two species *Pontederia crassipes* Mart. and *Pontederia vaginalis* Burm. f. of Pontederiaceae have been commonly observed in the region. These are free - floating perennial hydrophyte, and perfect example of fastest - growing aquatic plants.

The south - east region of Rajasthan is rich in flora and fauna, and shows more diverse plant species. Many rivers, canals, ponds and other water bodies makes important reasons for abundance of aquatic angiosperms of the area. The area is situated between 23°45' to 25°53' N latitude and 75°9' to 77°26' E longitude in the south - eastern corner of Rajasthan. The Haroti region includes Kota, Bundi, Jhalawar and Baran districts respectively. The present paper highlights the general account of family Pontederiaceae with observation, adaptation and impact on wetlands of area.

2. Material and Methods

Literature survey of related ecological and taxonomical work was done by various workers (Vyas, 1967; Champion and Seth, 1968; Sharma and Tiagi, 1979; Majumdar, 1981; De Groot, Wilson and Boumans, 2002; Sharma, 2002; Jain and Vairale, 2007; Pandey and Dilwakar, 2008; Sujana and Sivaperuman, 2008; Hegde and Bhat, 2012; Meena, 2012; Chowdhury and Das, 2013; Barooah and Ahmed, 2014; Govaerts, Jiménez - Mejías, Koopman, Simpson, Goetghebeur, Wilson, Egorova and Bruhl, 2016; Jadhav, 2016; Koyama, Bunwong, Pornpongrueng and Hind, 2016; Sharma, 2018, 2022 and 2023 and Sathisha and Sachin Gowda, 2023). General observation and overview of Pontederiaceae of south - east Rajasthan was provided in this article. The investigation creates the awareness about the wealth of wetland ecosystem and their conservation. The present work is based on literature study, field tours and observations of wetlands of area during 2020 to 2022.

3. Results and Discussion

The common aquatic plants of area are *Lemna perpusilla* Torrey., *Spirodella polyrhiza* (L.) Schleid., *Wolffia arrhiza* (L.) Horkel. ex Wimm., *Hydrilla verticillata* (L. f.) Royle., *Vallisneria spiralis* L., *Najas marina* L., *Potamogeton crispus* L., *Typha domingensis* Pers., *Nymphaea nauchali* Burm. f., *Nelumbo nucifera* Gaertn., *Trapa natans* L., *Ceratophyllum demersum* L., *Utricularia aurea* Lour., *Limnophila heterophylla* (Roxb.) Benth., *Limnophila indica* (L.) Druce. and *Pontederia crassipes* Mart.

The Pontederiaceae is widely distributed family of aquatic habitat. *Pontederia crassipes* Mart. and *Pontederia vaginalis* Burm. f. are most common hydrophyte of water bodies. Common name, morphology, occurrence, hydrophytic characters, propagation modes, flowering and fruiting period of plant species of family Pontederiaceae has been described

in this observation. Harmful impact on natural wetland ecosystem has also been enumerated.

1. *Pontederia crassipes* Mart.

Common name: Jal kumbhi

Native Regions: South America

A stolon, spongy, floating aquatic herb, adventitious roots arise densely at the nodes. Leaves large, radical, ovate, spatulate or paddle shaped, petioles spongy and swollen, like globular green bladder. Flowers in spikes, sessile, attractive, violet - blue, fruits capsule ovoid.

Most common fresh water habitats noxious floating aquatic weeds, forming pure formations at many places like lakes, ponds, rivers etc.

Fls. and Frs: August to November.

Pontederia crassipes Mart. reproduce vegetatively very fast, so it spread rapidly. Its removal is a very difficult task. *Pontederia crassipes* Mart. introduced as an ornamental aquatic plant, has become a serious weed clogging waterways and even impedes navigation and fishing in many areas.

Hydrophytic characters of plant:

Pontederia crassipes Mart. is most common aquatic free - floating herb. It is founding in clumps on water surface. It covers complete water surface. The plant body remains in contact with water and air. It has no contact with soil. From the short, thickened, prostrate stem develops many fibrous roots towards the lower side. Fibrous root pockets occur in bunches. Root works as maintaining the balance, not in absorption. Stems of *Pontederia crassipes* Mart. is thick, small, stoloniferous and spongy nature. Many leaves develop in bunches on stem at a common point. Leaves of plant is radical, relatively large, shining and with dark green coloured. Lamina are thick, succulent and ovate - tetragonal which are covered by cuticle. Its bulbous petiole is usually spongy and swollen. The inflated petiole is filled with air and helps in floatation. Vegetatively propagates by offset stems.

2. *Pontederia vaginalis* Burm. f.

Common name: Launkia

Native Regions: South Asia, South - east Asia and East Asia
An erect, fleshy, ascending or sometimes creeping, usually perennial herb, aquatic or semi aquatic weed, leaves ovate, base cordate. Flowers on long peduncles, in racemes, deeply lobed, pale - blue, capsules ellipsoidal, oblong, ribbed seeds many, ovoid, pale and ribbed.

Common in paddy fields, marshy places and swampy ponds.

Fls. and Frs: August to November.

It is robust aquatic herbs.

Both species of *Pontederia* are aquatic weeds, but well known for its attractive flowers. *Pontederia crassipes* Mart. known as Water Hyacinth, occurs mainly in stagnant, slow - moving water bodies. *Pontederia vaginalis* Burm. f. is heart - shaped false pickerelweed, occurs mainly in shallow - muddy water and invade rice paddies. These species reproduce sexually as well as asexually. It reproduces vegetatively (by runners or stolons) eventually form daughter plants.

Pontederia crassipes Mart. reproduces and grows quickly, and cover the large areas of water bodies. It competes local aquatic plants such as *Hydrilla verticillata* (L. f.) Royle., *Najas marina* L., *Potamogeton crispus* L., *Typha domingensis* Pers., *Nymphaea nauchali* Burm. f. and *Nelumbo nucifera* Gaertn. *Pontederia crassipes* Mart. affected the human activities like bathing, boating and fishing. It critically modifies the environment of natural wetland ecosystem due to depletion of dissolved oxygen and causes of death of aquatic flora and fauna. Both species of *Pontederia* has become threat to the native species of plants and responsible for loss of biodiversity of water bodies.

4. Conclusion

In conclusion, the comprehensive study on Pontederiaceae, specifically *Pontederia crassipes* Mart. and *Pontederia vaginalis* Burm. f., within the south - eastern region of Rajasthan has provided valuable insights into their distribution, morphology, propagation, and ecological impacts. These species, introduced for their ornamental value, have become pervasive aquatic weeds, posing significant challenges to waterway navigation, fishing activities, and native biodiversity. Their rapid vegetative propagation and resilience highlight the urgent need for effective management and control strategies to mitigate their adverse effects on wetland ecosystems. This research not only contributes to the understanding of Pontederiaceae ecological dynamics but also underscores the importance of sustainable practices in managing invasive species to preserve aquatic biodiversity and maintain healthy ecosystems.

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