CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Limnophila indica (L.) Druce, Indian marshweed

Family: Plantaginaceae

Current Pest Rating: A

Proposed Pest Rating: B

Synonyms: *Hottonia indica* L.

Comment Period: 12/10/2020 through 01/24/2021

Initiating Event:
Limnophila indica is designated as a noxious weed as defined by the California Food and Agricultural Code Section 5004 and is listed in Title 3, California Code of Regulations, Section 4500. A pest rating proposal is required to evaluate the current rating and status of the species in California.

History & Status:

Background:
Limnophila indica is a perennial, rooted, freshwater, amphibious plant. It grows in both terrestrial and submersed aquatic conditions and displays morphologically different characteristics depending on environmental conditions (Philcox, 1970). Submerged stems may be up to one meter long, are highly branched, glabrous, and have whorls of six to 12 finely dissected or deeply divided leaves (FOC, 1994). The feathery submerged leaf blades are broadly ovate in outline and 1 to 3.5 cm in length (Barringer, 2019). *Limnophila indica* can form dense underwater stands, described by Philbrick (1970) as luxuriant.

Aerial stems can reach 15 centimeters long and can be simple or branched. Aerial leaves are whorled or opposite, finely dissected or undivided and linear to lanceolate in shape, and have rounded-toothed margins (Philcox, 1970; FOC, 1994). Aerial stems can be glabrous but typically bear sessile glands or glandular hairs.

Small flowers are borne in terminal racemes or solitary in leaf axils (Barringer, 2019). The corolla tube is whitish to yellowish and approximately 6-12 mm long, with lobes 1 to 2 mm long, pink to purple (Barringer, 2019; Philcox, 1970). The flowers are prominently stalked, with the pedicels approximately 3 to 8 mm long in flower and 5 to 12 mm long in fruit, subtended by a pair of bracteoles 1 to 4 mm in length (Barringer, 2019). The fruit is a brown, compressed, elliptical capsule, 3 to 5 mm in length, with numerous small conic brown seeds (Barringer, 2019; Philcox, 1970).

Limnophila indica differs from the related species *L. sessiliflora* in having the flowers prominently stalked and regularly subtended by a pair of bracts (versus sessile or very short-stalked and usually without bracteoles), in having the calyx glandular-pubescent (versus hirsute with non-glandular hairs), and in lacking small cleistogamous flowers on the submerged stems. The fertile hybrid between these two species, *L. x ludoviciana* Thieret, was described from wetland habitats in southern Louisiana, and is characterized by stalked flowers without bracteoles, and hirsute sepals (Philcox, 1970). Plants collected in ricefield habitats in Yuba and Butte Counties in California have been identified as belonging to the hybrid (Consortium of California Herbaria, 2020; DiTomaso and Healy, 2003) or are tentatively grouped with *L. sessiliflora* in the recent Flora of North America treatment by Barringer (2019).

Worldwide Distribution: *Limnophila indica* is native to southeast Asia, tropical Africa, the Indian subcontinent, and Australia. Its range includes Kenya, Tanzania, Malawi, Mozambique, Zambia, Zimbabwe, Mali, Senegal, Togo, Cameroon, southern Japan, China, India, Nepal, Pakistan, Sri Lanka, Taiwan, Cambodia, Laos, Thailand, Vietnam, the Philippines, Indonesia, Malaysia, Papua New Guinea, and northern Australia (USDA/GRIN, 2020; FOC, 1994; Philcox, 1970).

Limnophila indica has been collected in the United States in Florida in 1983 and 2007, and has been reported from Louisiana in 1972 (USGS/NAS, 2020) and Georgia in 1970 (Wunderlin et al., 2020), although Barringer (2019) only includes Florida in its naturalized range in the Flora of North America region and notes that this species is uncommon where it occurs in North America and may not persist.

Official Control: *Limnophila indica* is designated as a noxious weed by California Code of Regulations (CCR) Section 4500. The Department is mandated by CFAC, Division 1, Chapter 3, Section 403 to prevent the introduction and spread of noxious weeds. The species has been designated as a restricted noxious weed seed under California Seed Law (California Food and Agriculture Code (CFAC), Division 18, Chapter 2, Section 52258).

California Distribution: The CalFlora Database (2020) contains a 1977 record of *Limnophila indica* collected from a submersed rice paddy near Marysville in Yuba County, but this record and all subsequent recorded collections from ricefields and adjacent drainage ditches in Yuba and Butte Counties are identified in the vouchered collections in the Consortium of California Herbaria database (2020) as *L. x ludoviciana* Thieret, the fertile hybrid of *L. indica* and *L. sessiliflora* (Philbrick, 1970).

California Interceptions: *Limnophila indica* has been intercepted one time in 2009 at a retail pet and aquarium store in San Diego (CDFA/PDR Database, 2020).

Consequences of Introduction

1) **Climate/Host Interaction:** Score is **Medium (2)**
Limnophila indica can grow on riverbanks, in rice cultivation areas, ponds, marshes, and flood plains (Philcox, 1970). It has been documented to occur in a wide range of habitat types from slow moving or stagnant ponds to mountain streams. It tolerates temperatures ranging from 15° to 28°C. Where endemic it occurs below 1,800 meters above sea level (FOC, 1994).

   - Low (1) Not likely to establish in California; or likely to establish in very limited areas

- Medium (2) may be able to establish in a larger but limited part of California
- High (3) likely to establish a widespread distribution in California

2) **Known Pest Host Range:** Score is **High (3)**
Limnophila indica can occur wherever general ecological conditions exist that are conducive to its survival.

- Low (1) has a very limited host range
- Medium (2) has a moderate host range
- High (3) has a wide host range

3) **Pest Dispersal Potential: Score is High (3)**
Limnophila indica is frequently grown as an aquarium plant (UF/IFAS, 2020). Plants sold as *Limnophila indica* in the aquarium trade are often *Limnophila sessiliflora* (Barringer, 2019). Plants of *Limnophila* in North America are likely to have escaped from aquarium use or other aquatic cultivation in the United States (Les, 2012).

Laboratory studies of root fragments (one centimeter long) of *Limnophila indica* were found to be capable of regenerating whole plants (Rao and Mohan Ram, 1981).

Evaluate the natural and artificial dispersal potential of the pest.
- Low (1) does not have high reproductive or dispersal potential
- Medium (2) has either high reproductive or dispersal potential
- High (3) has both high reproduction and dispersal potential

4) **Economic Impact:** Score is **Low (1)**
Limnophila species are documented problematic weeds of paddy rice fields in southeastern Asia, including in India, China, Japan, and the Philippines, including a fertile hybrid between *Limnophila indica* and *Limnophila sessiflora*, (UF/IFAS, 2020; Spenser and Bowes, 1985). California rice had an estimated value of approximately $759 billion in 2018. Rice is grown on over 500,000 acres in California in the counties of Butte, Colusa, Glenn, Sacramento, Sutter, Yolo, Yuba, San Joaquin, and Placer and is one of the leading California agricultural exports to Japan (CDFA, 2020; USDA/NASS, 2018).

Limnophila x ludoviciana has also been reported to clog irrigation and flood-control canals, as well as pumping and power stations (EPPO, 2013).

A. The pest could lower crop yield.
B. The pest could lower crop value (includes increasing crop production costs).
C. The pest could trigger the loss of markets (includes quarantines).
D. The pest could negatively change normal cultural practices.
E. The pest can vector, or is vectored, by another pestiferous organism.
F. The organism is injurious or poisonous to agriculturally important animals.
G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact:

- Low (1) causes 0 or 1 of these impacts
- Medium (2) causes 2 of these impact**s**
- High (3) causes 3 or more of these impacts

5) Environmental Impact: Score is **Medium (2)**

A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
B. The pest could directly affect threatened or endangered species.
C. The pest could impact threatened or endangered species by disrupting critical habitats.
D. The pest could trigger additional official or private treatment programs.
E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

Environmental Impact:
- Low (1) causes none of the above to occur
- Medium (2) causes one of the above to occur
- High (3) causes two or more of the above to occur

Consequences of introduction to California for *Limnophila indica*: **Medium (11)**

Low = 5-8 points
Medium = 9-12 points
High = 13-15 points

1) Post Entry Distribution and Survey Information: Score is **Not established (0)**

-Not established (0) Pest never detected in California or known only from incursions.
-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).
-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.
-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7) Final Score: Medium 11

Conclusion and Rating Justification: *Limnophila indica* is offered for sale in the aquarium trade and potentially invasive in wetland habitats in California, but in North America has only naturalized to a limited degree under milder climatic conditions in Florida. A B-rating is recommended.

Uncertainty: Plants of *Limnophila* in ricefield areas of Butte and Yuba Counties have been referred to *L. x ludoviciana*, a fertile hybrid between *Limnophila indica* and *Limnophila sessiflora* (Philcox, 1970) rather than *L. indica*. DiTomaso and Healy (2003) report *Limnophila x ludoviciana* as an uncommon

submerged aquatic in ricefield irrigation ditches in Butte County. Further studies are needed to more fully characterize these naturalized California populations of *Limnophila*.

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***Comment Period: 12/10/2020 through 01/24/2021**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at permits[@]cdfa.ca.gov.

Comment Format:

- Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

  Example Comment:

Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to "Climate/Host Interaction" here.]

- Posted comments will not be able to be viewed immediately.

- Comments may not be posted if they:

  Contain inappropriate language which is not germane to the pest rating proposal;

  Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

  Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

  Violates agency regulations prohibiting workplace violence, including threats.

- Comments may be edited prior to posting to ensure they are entirely germane.
- Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Proposed Pest Rating: [B]
