CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Limnophila sessiliflora Blume, ambulia, Asian marshweed

Family: Plantaginaceae

Current Pest Rating: A

Proposed Pest Rating: A

Synonyms: *Ambulia sessiliflora* (Vahl) Baillon; *Hottonia sessiliflora* Vahl

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

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

History & Status:

Background: *Limnophila sessiliflora* is a perennial, rooted, freshwater, amphibious plant with morphologically different submerged and emergent leaves. Submerged portions of the stems are branched, up to 3.7 meters long, sparsely pubescent to glabrous, and green to reddish. Submerged leaves are dark green, with the leaf blade 0.5 to 4 cm long, ovate to broadly ovate in outline and deeply dissected and feathery in appearance (Barringer, 2019; FOC, 1994).

Emergent portion of stems are relatively much shorter than the submerged portion, measuring up to 20 centimeters long. The emergent stems are simple or sparsely branched, and greenish to pink (Yang and Yen, 1997). Emergent leaves are whorled, elliptic-lanceolate, 1 to 3 (occasionally to 8) cm long, and glandular-punctate (Barringer, 2019; FOC, 1994).

The flowers of *Limnophila sessiliflora* are solitary in the leaf axils and stalkless or with short pedicels up to 1.5 mm in length. Flowers on the emergent stems have a tubular corolla approximately 6-12 mm in length, with four to five apical lobes representing the five fused petals. The corolla lobes are blue to purple or pinkish and the corolla tube is white and may have distinct purple lines on the underside (Philcox, 1970). Calyx lobes are lanceolate, 2 to 4 mm long, and sparsely to densely hirsute. Bracteoles are usually absent at the base of the flowers, and if present are 1.5 mm or less in length (Barringer, 2019; Yang and Yen, 1997). The submerged stems also bear small cleistogamous flowers, which are budlike in appearance (Barringer, 2019).

The fruit is a subglobose capsule approximately 2 to 3 mm in length that can contain up to 200 to 300 elliptic to obovoid brown seeds (Barringer, 2019; Spencer and Bowes, 1985). Capsules are pale green-brown when submerged and dark brown when emerged (Yang and Yen, 1997).

Limnophila sessiliflora differs from the related species *L. indica* in having the flowers sessile or with very short pedicels up to 2 mm in length, generally lacking bracteoles at the base, and having the calyx hirsute rather than glandular-pubescent (Barringer, 2019; Philcox, 1970). Budlike cleistogamous flowers are also found on the submerged stems in *L. sessiliflora* but not in *L. indica*. 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 tentatively grouped with *L. sessiliflora* in the Recent Flora of North America treatment (Barringer, 2019).

Worldwide Distribution: *Limnophila sessiliflora* is native to tropical to warm temperate areas of eastern and southern Asia, including portions of Bhutan, China, India, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan, and Vietnam (USDA/GRIN, 2020; FOC, 1994; Philcox, 1970).

In North America *Limnophila sessiliflora* has become naturalized in Florida, Georgia, and Texas (USGS/NAS, 2020). Occurrences of *Limnophila sessiliflora* have been recorded in South America in Brazil; in Africa in Cameroon; in Europe in Hungary and Slovakia; and in Papua New Guinea (GBIF, 2020; EPPO, 2013).

Official Control: *Limnophila sessiliflora* is listed as a Federal Noxious Weed (USDA/APHIS/PPQ, 2012). *Limnophila sessiliflora* is listed as a noxious weed or prohibited aquatic plant in Alabama, California, Florida, Massachusetts, North Carolina, South Carolina, Vermont, and Wisconsin (USDA/NRCS/PLANTS database, 2020).

Limnophila sessiliflora is designated as a noxious weed by CCR Section 4500. The Department is mandated by California FAC, Division 1, Chapter 3, Section 403 to prevent the introduction and spread of noxious weeds.

Limnophila sessiliflora is designated a prohibited noxious weed seed by the Federal Seed Act (Title 7, Code of Federal Regulations, Section 201.16(b). There is no tolerance for *Limnophila sessiliflora* in interstate shipments of agricultural seed. *Limnophila sessiliflora* is listed as a restricted noxious weed seed in California Seed Law (3 CCR section 3854).

Limnophila sessiliflora is on the European Plant Protection Organization's (EPPO) Observation List of invasive alien plants (EPPO, 2013).

California Distribution: *Limnophila sessiliflora* has not been reported to occur in California (CalFlora Database, 2020; Consortium of California Herbaria). Plants with characters intermediate between *L. sessiliflora* and *L. indica* (L.) Druce have been described as *L. x ludoviciana* Thieret, which has been collected at several localities in rice fields and adjoining drainage ditches in Butte and Yuba counties (Consortium of California Herbaria, 2020).

California Interceptions: *Limnophila sessiliflora* has been intercepted one time in 2014 in a shipment destined to a retail pet and aquarium store in Placer County (CDFA/PDR Database, 2020).

Consequences of Introduction

1) **Climate/Host Interaction:** Score is **High (3)**
*Limnophila sessiliflor*a can grow in a variety of habitats, including swamps, ponds, ditches, lakes, rice fields, wet places along streams, and damp soils at elevations below 1,900 meters above sea level (EPPO, 2013; FOC, 1994). It can grow in waters up to three meters deep (EPPO, 2013).

Limnophila sessiliflora can withstand water temperatures of 15°C and has an optimal water temperature between 20-26°C and pH level between 5-7 (IFAS, 2001). Spencer and Bowes (1985) found vegetative growth of *Limnophila sessiliflora* to be seasonal in Florida and measured increasing standing crop values from late spring through fall and decreasing standing crop values in the winter through early spring. *Limnophila sessiliflora* is reported to flower from April to November in Japan, and from July to November in Florida and Texas (EPPO, 2013).

-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 sessiliflora 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 sessiliflora plants can break free from the substrate and form free-floating mats on the water surface. Spencer and Bowes (1985) found that *Limnophila sessiliflora* stem fragments were capable of vegetative reproduction in a laboratory setting, but only about 25% of the time and only when stem fragments contained six or more nodes. Fragments with fewer than six nodes did not grow at all.

Limnophila sessiliflora reproduces sexually through the production of up to 150-300 seeds per seed capsule (Spencer and Bowes, 1985; EPPO, 2013). Seeds can be dispersed on free-floating mats of vegetation. In controlled aquatic conditions with adequate light and oxygen levels, *Limnophila sessiliflora* seeds were found to have a germination rate of 96% (Spencer and Bowes, 1985).

Limnophila sessiliflora is frequently grown and sold as an aquarium plant. Plants of *Limnophila* naturalized in the United States are likely to have escaped from cultivation (UF/IFAS, 2020).

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, including a fertile hybrid between *Limnophila indica* and *Limnophila sessiliflora*, are documented problematic weeds of paddy rice fields in southeastern Asia, including in India, China, Japan, and the Philippines, (UF/IFAS, 2020; Spencer 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).

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 **High (3)**

Limnophila sessiliflora has the ability to photosynthesize effectively under low light regimes (Spenser and Bowes, 1985) and can start growing earlier in the year before other plants. *Limnophila sessiliflora* grows quickly and can form dense mats of vegetation in the water and on the water surface (Spencer and Bowes, 1985) resulting in its ability to shade out, and thus out-compete, totally submersed species (UF/IFAS, 2001).

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 sessiliflora*: **High (13)**

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: High 13 (13-0=13)

Conclusion and Rating Justification:

Due to the high score of this evaluation and the presence of the species in the commercial aquarium plant trade, it is recommended that *Limnophila sessiliflora* continue to receive an A-rating.

Uncertainty

Plants with characters intermediate between *L. sessiliflora* and *L. indica* (L.) Druce have been described as *L. x ludoviciana* Thieret, which has been collected at several localities in ricefield habitats in Butte and Yuba Counties (Consortium of California Herbaria, 2020; DiTomaso and Healy, 2003). Barringer (2019) has suggested that some of the plants identified as the hybrid may represent *L. sessiliflora* with pedicellate flowers and has included California in the naturalized range of the species on this basis. Further studies are needed to more fully characterize the naturalized California populations of *Limnophila*.

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Author Contact: Courtney.Albrecht@cdfa.ca.gov

Responsible Party: Robert Price, Primary State Botanist; California Department of Food & Agriculture; Seed Laboratory and Herbarium; 3294 Meadowview Road, Sacramento, CA 95832; (916) 738-6700; permits@cdfa.ca.gov.

***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: [A]