

Spiketop Applesnail (*Pomacea bridgesi*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, May 2012

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http://eol.org/data_objects/13234705. (May 2018).

1 Native Range and Status in the United States

Native Range

From Pastorino and Darrigan (2011):

“This species is found in Paraguay, Brazil, and Bolivia (Simone 2006). It is most likely that this species occurs in the Paraguay and Amazon Rivers (G. Darrigan pers. comm. 2010)”

From NatureServe (2017):

“The type locality for this species is the Rio Grande, Bolivia, but it is widely distributed in the Peruvian and Brazilian Amazon area [...]”

Status in the United States

Benson (2018) reports *Pomacea bridgesi* as established in the U.S. territory of Puerto Rico and introduced but not established on the islands of Hawaii, Kauai, and Oahu in Hawaii.

From Howells et al. (2006):

“D.N. Shelton (Alabama Malacological Research Center, Mobile, personal communication, February 2005) reported that this species had been introduced into a park pond in Mobile [Alabama] in approximately 2003 and had maintained a minimal population there since that time.”

“This popular aquarium species was first reported in Florida in the 1960s, but may have been present since the 1950s. It has been confirmed in Alachua (1981), Brevard (1971), Broward (1992), Dade (1973), Monroe, Palm Beach (1967), and Pinellas counties (Thompson 1984, Strange 1998). This species appears to be well established in Florida waters.”

“*P. bridgesii* was found in the Brazos River, Waco, McClennan County [Texas] in January 2004 when two recently dead specimens were found during a low-water period and associated cold weather.”

“Established populations of *P. bridgesii* and *P. haustum* are believed to be restricted to Florida [...]”

From Cowie et al. (2009):

“Regulatory changes have banned live *Pomacea* spp., with the exception of *P. bridgesii* ([often a misidentification of] *P. diffusa*), from any United States trade.”

This species appears to be in trade in the United States, although misidentification is common (see Remarks):

From Aquatic Arts (2018):

“BLUE MYSTERY SNAILS (POMACEA BRIDGESII) - TANK-RAISED! \$ 3.95”

Means of Introductions in the United States

From Benson (2018):

“*Pomacea bridgesi* is very common in the aquarium trade and was most likely introduced through this pathway.”

From Howells et al. (2006):

“In the continental United States (US) and Canada, [...] nearly all introductions are related to releases and escapes from aquarium and pet trade sources (Britton 1991; Howells 2001a, b). Species involved have included exotic *P. bridgesii*, *P. “haustrum,”* one or more members of the *P. canaliculata* complex, and *M. cornuarietis*, as well as relocations of native *P. paludosa* to sites outside its native range in peninsular Florida. Although there appear to have been earlier releases, significant introductions in US waters began in the 1950s and 1960s.”

Remarks

From Joshi et al. (2017):

“Taxonomic confusion among apple snails [...] extends into the aquarium trade in the USA. *Pomacea maculata* differs substantially from *Pomacea diffusa*, the scientific name of the so-called ‘spike-topped’ apple snail found in the aquarium trade (Rawlings et al., 2007). Howells et al. (2006) treated it as *P. bridgesii*, of which *P. diffusa* was then considered a subspecies (Cowie & Thiengo, 2003), but Rawlings et al. (2007) recognised *P. diffusa* as a valid species, with ‘spike-topped’ apple snail as its common name. *Pomacea diffusa* is still often misidentified as *P. bridgesii* (often mis-spelled ‘*bridgesi*’) in the aquarium trade, or it is frequently incorrectly labelled as a generic ‘mystery’ snail (Rawlings et al., 2007; Hayes et al., 2008). We provide this update as some proportion of *P. maculata* introductions probably occur from aquarium releases by consumers mistakenly sold the wrong species (Karatayev et al., 2009).”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Lophozoa
Phylum Mollusca
Class Gastropoda
Subclass Prosobranchia
Order Architaenioglossa
Family Ampullariidae
Genus *Pomacea*
Species *Pomacea bridgesi* (Reeve, 1856) – spiketop applesnail”

“Taxonomic Status:

Current Standing: valid”

Size, Weight, and Age Range

From Pastorino and Darrigan (2011):

“*Pomacea bridgesii bridgesii* is a large species, over 65 mm high (Perera and Walls 1996).”

From Aditya and Raut (2001):

“[...] (the newly hatched snails range from 2.3 to 2.7 mm in shell length), [...]”

Environment

From Pastorino and Darrigan (2011):

“This genus is a common neotropical genus, found in low oxygen environments, usually lakes and rivers, [...]”

From Benson (2018):

“Applesnails are tropical to subtropical organisms and cannot survive below 50°F in the winter (Florida DOACS 2002).”

Climate/Range

From Benson (2018):

“Tropical and subtropical South America”

Distribution Outside the United States

Native

From Pastorino and Darrigan (2011):

“This species is found in Paraguay, Brazil, and Bolivia (Simone 2006). It is most likely that this species occurs in the Paraguay and Amazon Rivers (G. Darrigan pers. comm. 2010)”

From NatureServe (2017):

“The type locality for this species is the Rio Grande, Bolivia, but it is widely distributed in the Peruvian and Brazilian Amazon area [...]”

Introduced

From Joshi et al. (2017):

“Roll et al. (2009) reported *Pomacea bridgesii* (almost certainly misidentified *P. diffusa*), [...] associated with human dominated habitats in Israel, but the identifications need verification.”

Aditya and Raut (2001) report that *P. bridgesi* is established in India and other countries in southeast Asia, although they do not specify the countries by name.

Means of Introduction Outside the United States

From Howells et al. (2006):

“Throughout Southeast Asia, the Indo-Pacific, and Oceania, most populations of *Pomacea* species arose from misguided attempts to use cultured snails to create a local Asian escargot industry (Su Sin 2003).”

Short Description

From Benson (2018):

“Large snails reaching several inches in diameter, shells are yellow to brown and may have banding.”

Biology

From Benson (2018):

“Aditya and Raut (2001) found a wide range of food acceptability that included weeds, garden vegetation, oligochaetes, snail eggs, decomposing decapods and molluscan flesh, birds and mammals (cut pieces of meat). They further stated that animal food was preferred to plant food.”

Human Uses

From Howells et al. (2006):

“Unlike most other introduction sites around the world, the presence of exotic ampullariids in US waters largely reflects use of several *Pomacea* species and *M. cornuarietis* in the ornamental aquarium trade rather than for human consumption or biocontrol purposes. In the early to mid-1900s, balanced aquarium philosophy included the use of freshwater gastropods in aquarium culture. So, aquarists sought snails for this purpose.”

“*P. paludosa* and species in the *P. canaliculata* complex aggressively consumed aquarium plants and often failed to eat algae. Thus, these snails soon fell out of favor. Ultimately, *P. bridgesii*, which does not feed on macrophytes but does eat algae, became the primary snail in the American aquarium industry.”

This species appears to be in trade in the United States, although misidentification is common (see Remarks):

From Aquatic Arts (2018):

“BLUE MYSTERY SNAILS (POMACEA BRIDGESII) - TANK-RAISED! \$ 3.95”

Diseases

No information available, but see Threat to Humans below regarding this genus. No OIE-reportable diseases have been documented for this species.

Threat to Humans

From Howells et al. (2006):

“Although *P. canaliculata* and other Ampullariidae can carry *Angiostrongylus cantonensis* (rat lungworm) (Halwart 1994), none of the *P. canaliculata* complex populations in the US have been reported as carriers thus far. However, two points need to be recognized. First, rats in New Orleans, Louisiana are known to host this parasite (Kliks and Palumbo 1992) and at least one case of human infection has occurred there (Campbell and Little 1988). Actively utilized highway and rail transport exists between areas with infected rats in Louisiana and *P. canaliculata* complex populations in Texas (and other states). Thus relocation of parasite-carrying rats is a real possibility. Second, although most biologists working with *Pomacea* in the US believe that local snail populations do not host the parasite, very few individual specimens or populations have actually been examined for the infection. Ampullariidae can also host a varied array of other parasites as well, but again, few US populations have ever been examined regarding associated parasites. Therefore, there is a necessity for a parasitological study of introduced *Pomacea* in the US [...]”

3 Impacts of Introductions

From Howells et al. (2006):

“[...] there is a possibility that *P. bridgesii* and other exotic *Pomacea* may be displacing *P. paludosa* in Florida waters (Warren 1997). In Alabama, the *P. bridgesii* population apparently has a restricted distribution in a city park pond, contains a limited number of individuals, and has been present only for a short time, with no significant impact reported.”

From Hayes et al. (2008):

“Using phylogenetic approaches, we identified four introduced apple snail species in Asia. At least two of these, *P. canaliculata* and *P. insularum*, had previously not been distinguished, and another, *P. diffusa*, had been misidentified. Recovery of four closely related species indicates that others in the family (e.g. *P. dolioides*, *P. bridgesii*) may share characteristics allowing them to become invasive if introduced. Adding additional players to the already complicated invasion scenario will only hamper their management. Regulations aimed at controlling the spread of apple snails must therefore target the entire genus *Pomacea* and perhaps the entire family if they are to be effective.”

4 Global Distribution



Figure 1. Known global distribution of *Pomacea bridgesi*. Map from GBIF Secretariat (2017). Occurrences in western Florida, Mexico, Ecuador, northern Brazil, Peru, Taiwan, Australia, and Papua New Guinea could not be confirmed to represent established populations and were excluded from the climate matching analysis. No georeferenced occurrences were available for *P. bridgesi* established in India.

5 Distribution Within the United States



Figure 2. Known distribution of *Pomacea bridgesi* in Hawaii. Map from Benson (2018). No occurrences represent established populations.



Figure 3. Known distribution of *Pomacea bridgesi* in Florida and the U.S. territory of Puerto Rico. Map from Benson (2018). Occurrences in Puerto Rico represent established populations; Florida occurrence is of an unknown status according to Benson (2018), although Howells et al. (2006) report that *P. bridgesi* is established in the county where the occurrence is located. No georeferenced occurrences were available for the established population in Alabama or the occurrences reported from Texas.

6 Climate Matching

Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.046, which is a medium climate match. The range for a medium climate score is between 0.005 and 0.103. The climate match was highest in the southern United States, including high matches in Florida, much of Georgia, eastern South Carolina and North Carolina, and parts of the Texas coastline. Florida, Georgia, North Carolina, and South Carolina had high climate scores. Areas of medium climate match mostly surrounded the areas of high match in the Southeast; medium climate matches were also present along the central coast of California, in the vicinity of Seattle, Washington, and in scattered locations in the Southwest. Alabama, Louisiana, and Texas had medium climate scores, and all other states had a low climate score. In general, the areas of lowest climate match were in the northern and western United States.

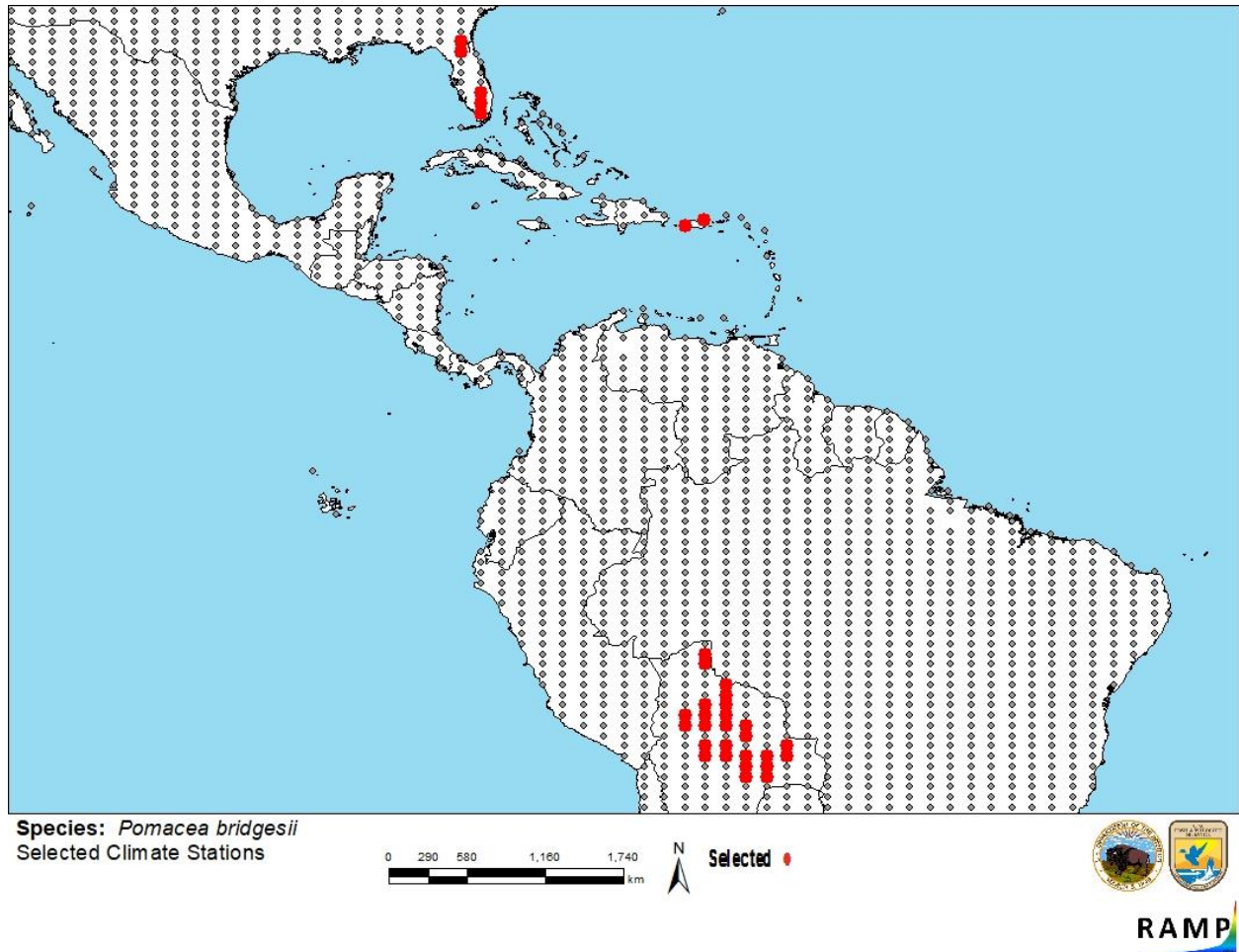


Figure 4. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Bolivia, United States (Florida and Puerto Rico)) and non-source locations (gray) for *Pomacea bridgesii* climate matching. Source locations from GBIF Secretariat (2017).

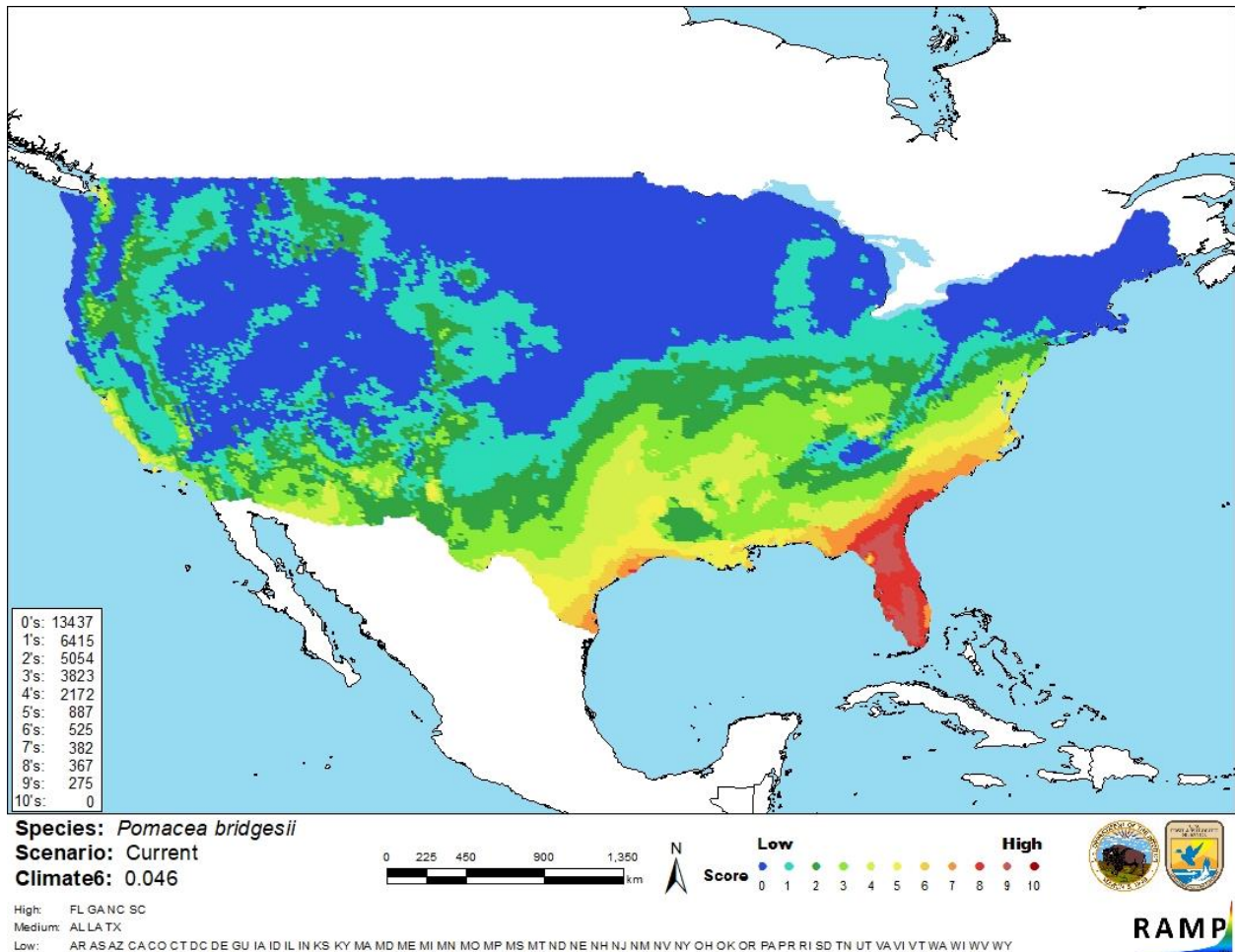


Figure 5. Map of RAMP (Sanders et al. 2018) climate matches for *Pomacea bridgesii* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). 0=Lowest match, 10=Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 \leq X < 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

Information is available on the biology and distribution of *Pomacea bridgesii*, but no definitive negative impacts of this species’ introduction have been documented. Available information on impacts (or lack thereof in Alabama) is limited, contradictory and not well documented. Further information is needed to adequately assess the risk this species poses to the contiguous United States. In addition, there is some confusion in the taxonomy of apple snails, and frequent misidentification, especially in the aquarium trade. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Spiketop Applesnail (*Pomacea bridgesi*) is a freshwater snail native to South America. This species has been introduced to the United States through the aquarium trade, and members of this genus have been introduced to Asia as a food source. Other members of this genus can carry *Angiostrongylus cantonensis* (rat lungworm); although *A. cantonensis* has not been found in *Pomacea* in the United States, it has been found rats, and in at least one case, in humans. *P. bridgesi* has a medium climate match with the contiguous United States, with the highest matches in the coastal areas of the Southeast. Although it is established in isolated locations in the United States, information on impacts is contradictory. There are indications that it is helping to displace a native species in Florida, but this is not well-documented. In Alabama, no negative impacts have been documented in a pond where it was introduced. Because of the limited, contradictory information on history of invasiveness and taxonomic confusion surrounding the genus, the certainty of this assessment is low. The overall risk assessment category is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): Medium**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

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10 References Quoted But Not Accessed

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

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