Titan Applesnail (*Pomacea haustrum*)

Ecological Risk Screening Summary

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Photo: L. R. Berti, USGS.

1 Native Range and Status in the United States

Native Range

From Rawlings et al. (2007):

"[…] native to Brazil, Peru, and Bolivia […]"

Status in the United States

From Rawlings et al. (2007):

"The only established populations of *P. haustrum* known by us in the U.S. are in Palm Beach County, Florida. As of June, 2006, adults and egg masses were present in the Loxahatchee National Wildlife Refuge and in canals and lakes of some surrounding communities (Collins and Rawlings, pers. obs.). *Pomacea haustrum* was reported as established in Palm Beach County after 1989 [Winner 1991], although a specimen of *P. haustrum* was collected there as early as 1983 [Howells et al. 2006]. We believe, however, that specimens collected in the 1970s and 1980s attributed to *P. canaliculata* […] are *P. haustrum*. Therefore, *P. haustrum* was probably introduced and successfully established by the late 1970s, but has failed to expand its range appreciably since then."

From Fasulo (2011):

"Effective 5 April 2006, USDA-APHIS requires permits for importation or interstate shipment of all marine and freshwater snails. Permits are not being issued for members of the genus *Pomacea*, with the exception of the spike-topped applesnail, *Pomacea diffusa* (FFWCC 2006). To ship any of these species without a permit is a violation of U.S. federal law."

Means of Introduction into the United States

From Benson (2016):

"Probable aquarium introduction."

Remarks

From Ghesquiere (2007):

"Not surprisingly [*sic*] *Pomacea haustrum* is very similar to other members of the *canaliculata* complex. It can be hard to distinguish from *Pomacea maculata* (Perry, 1810), *Pomacea lineata* (Spix, 1827), *Pomacea sordida* (Swainson, 1822), *Pomacea insularum* (D'Orbigny, 1839) (habitat: Parana, La Plata to Bolivia) and *Pomacea canaliculata* (Lamarck, 1819)."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2016):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Lophozoa
Phylum Mollusca
Class Gastropoda
Subclass Prosobranchia

Order Architaenioglossa
Family Ampullariidae
Genus Pomacea
Species *Pomacea haustrum* (Reeve, 1858)"

"Taxonomic Status: valid"

Size, Weight, and Age Range

From Ghesquiere (2007):

"Relatively large shell (9-12 cm heigth [*sic*]) […]"

From White-McLean (2011):

"Time to Maturity: approximately 1 year; Longevity: undocumented"

Environment

From Benson (2016):

"Freshwater rivers."

From Cowie (2002):

"[…] the invasive species, notably *Pomacea canaliculata* and *P. insularum* but also *P. diffusa, P. haustrum, P. scalaris, Pila conica,* and *Marisa cornuarietis,* generally occur in their native ranges in slower moving or stagnant shallow water in lowland swamps, marshes, ditches, ponds and lakes, usually with muddy bottoms."

"Few studies have assessed the chemical characteristics of the water in habitats favored by ampullariids. […] Because they can breathe air, ampullariids are also tolerant of low levels of oxygen in the water."

From White-McLean (2011):

"[…] these species are known to tolerate low levels of salinity."

Climate/Range

From Fasulo (2011):

"[…] tropical/subtropical […] not known to withstand water temperatures below 10°C (FFWCC 2006)."

Distribution Outside the United States

Native

From Rawlings et al. (2007):

"[…] native to Brazil, Peru, and Bolivia […]"

Introduced

No introductions of this species have been reported outside of the United States.

Means of Introduction Outside the United States

No introductions of this species have been reported outside of the United States.

Short Description

From Ghesquiere (2007):

"Shell: Relatively large shell (9-12 cm height [*sic*]) with a dark green to brown base colour. The shell is also heavily banded with dark-brown bands. Near the shell opening (aperture) the shell becomes lighter in colour. The suture is deeply indended [*sic*], much like in *Pomacea canaliculata* and *Pomacea maculata*. Compared with *Pomacea canaliculata, haustrum* has a less round and relatively higher shell."

"Operculum: The operculum is moderately thick and corneous. The structure is concentric with the nucleus near the centre of the shell. The operculum can be retracted in the aperture (shell opening)."

"Body: The body has a grey-brownish colour with dark pigment spots. The head is ligth [*sic*] in colour (nearly white), while the tentacles and the siphon are well pigmented. The siphon is very long when fully extended. At rest, the siphon is still a tube, but is bended below the shell."

Biology

From White-McLean (2011):

"These snails are omnivorous and will consume vegetation, and all life stages of other snail species. Apple snails are known to be amphibious; however they will spend considerable periods in terrestrial habitats. This behavior facilitates disperal in both terrestrial and aquatic habitats."

"Clutch size: 236; Egg Color: bright green and polygon-shaped; Incubation Period: 9-30 days; […]"

From Ghesquiere (2007):

"Behaviour: Most active during the night."

Human Uses

From Ghesquiere (2007):

"The apple snails are popular aquarium-pets because of their attractive appearance and size."

From Cowie (2002):

"Ampullariids have been introduced in attempts to control the snail vectors of schistosomes. […] Many ampullariids feed voraciously on aquatic plants, this being one reason for their success in controlling other snail species: they reduce the available food. They have therefore been used or suggested for aquatic weed control in both natural wetlands and irrigated rice […]"

Diseases

No information available.

Threat to Humans

No information available.

3 Impacts of Introductions

From Rawlings et al. (2007):

"*Pomacea haustrum* is currently of relatively minor concern in the U.S., given its failure to spread beyond Palm Beach County after 30 years or more in Florida. It should be noted, however, that many species have maintained limited distributions, sometimes for decades, before becoming invasive [Cox 2004]."

4 Global Distribution

Figure 1. Known global established locations of *Pomacea haustrum*. Map from GBIF (2016).

5 Distribution Within the United States

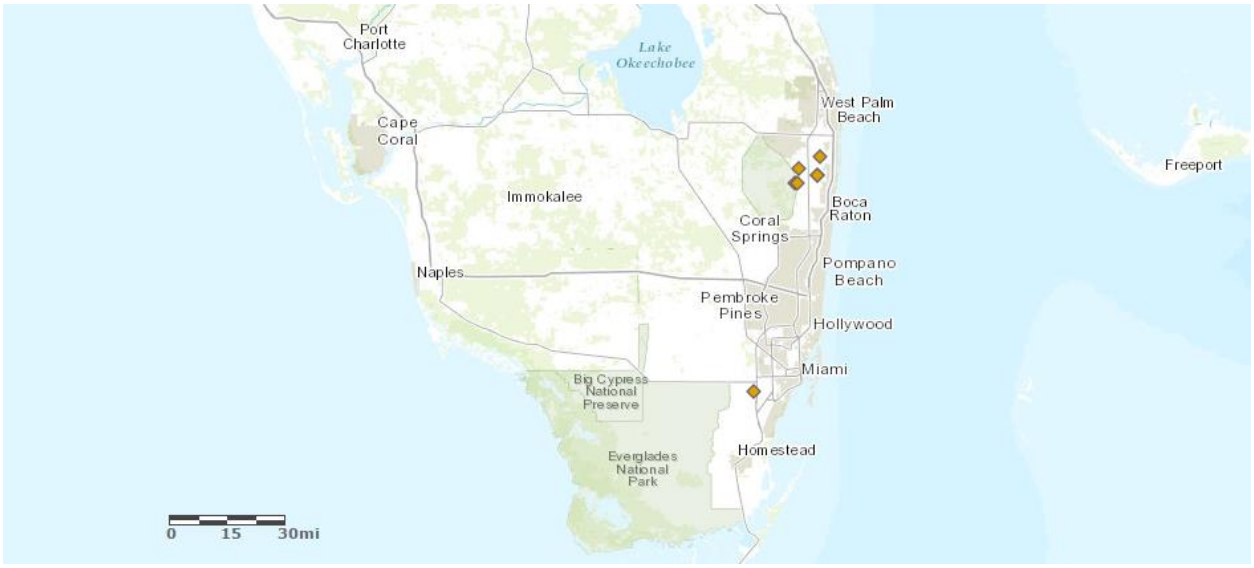

Figure 2. Known established locations of *Pomacea haustrum* in the contiguous United States. Map from Benson (2016). Location in Miami-Dade county was not included in climate matching because the species has not been reported as established outside of Palm Beach County (see Status in the United States, above).

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high in peninsular Florida; medium in Georgia, coastal South Carolina, and coastal Texas; and low elsewhere. Climate 6 proportion indicated that the contiguous U.S. was a medium climate match. The range for a medium climate match is 0.005-0.103; the Climate 6 proportion for *Pomacea haustrum* was 0.017.

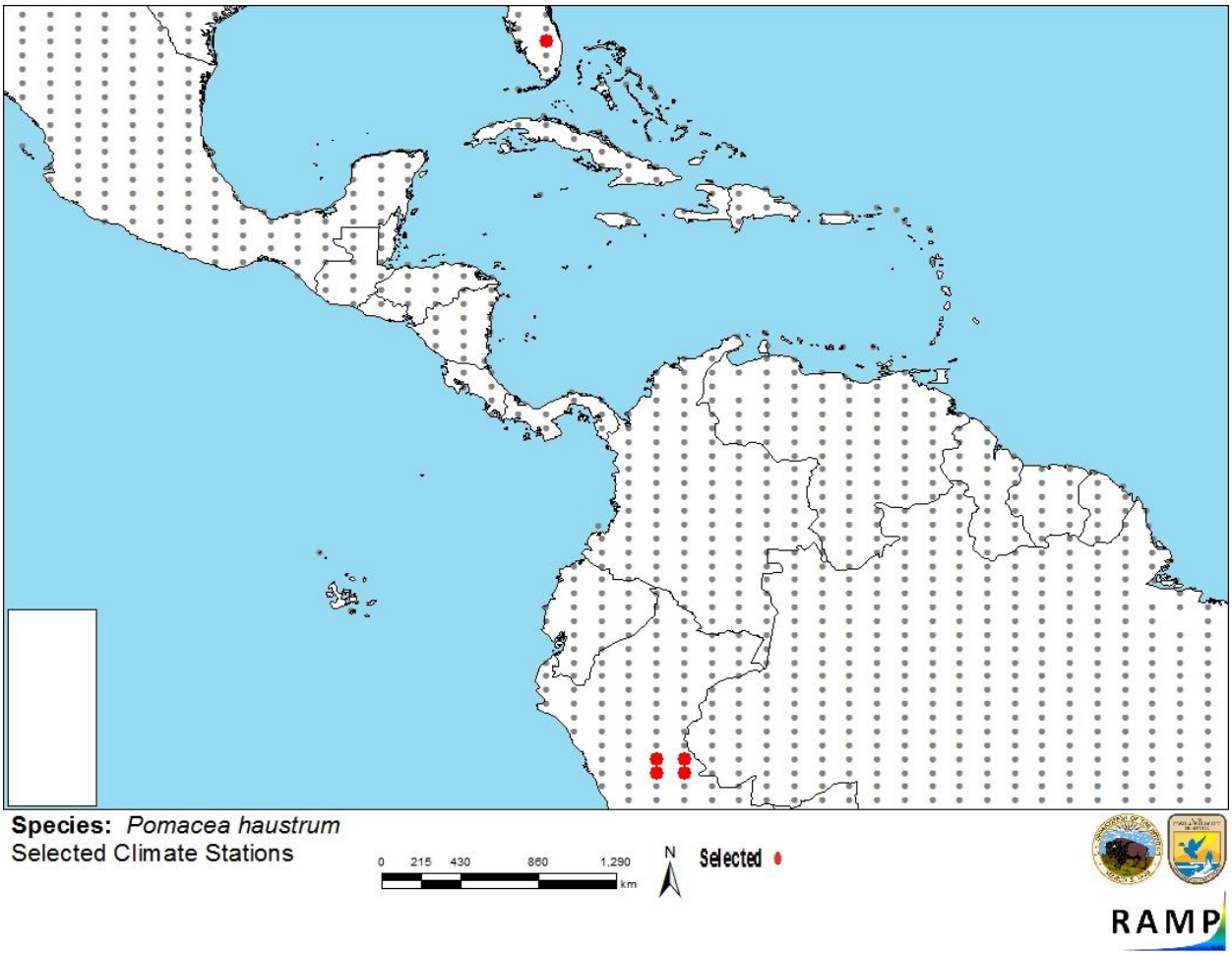

Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Pomacea haustrum* climate matching. Source locations from GBIF (2016) and Benson (2016).

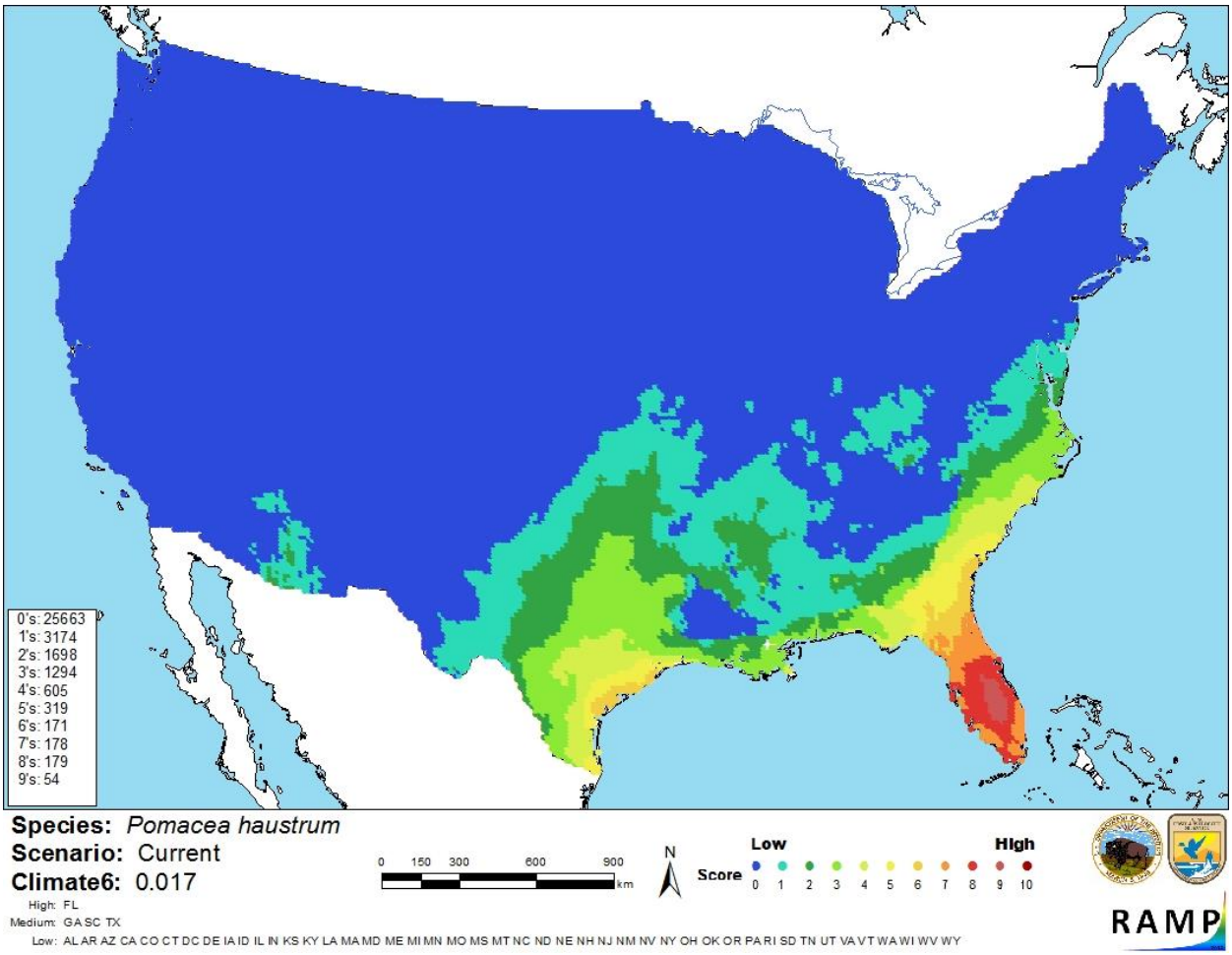

Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Pomacea haustrum* in the contiguous United States based on source locations reported by GBIF (2016) and Benson (2016). 0= Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

Compared to other *Pomacea* species, there is little information available on *P. haustrum.* This species has been reported in Florida for over 30 years, but its distribution has not expanded in that time. There are no documented adverse ecological impacts of this species in the scientific literature. Further information is needed to evaluate if this species will have any negative impacts if introduced elsewhere. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Pomacea haustrum has been established in Palm Beach County, Florida since the 1970s or 1980s. It was probably introduced as a result of the aquarium trade. Despite persisting in Florida for over 30 years, it has not spread to other areas of the United States. Further research is needed to determine what, if any, impacts *P. haustrum* is having on native species in Florida. *P. haustrum* has a medium climate match with the contiguous United States. 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.

Benson, A. J. 2016. *Pomacea haustrum*. USGS Nonindigenous Aquatic Species Database, Gainesville, Florida. Available: https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=2600. (November 2016).

Cowie, R. H. 2002. Apple snails (Ampullaridae) as agricultural pests: their biology, impacts and management. Pages 145-192 *in* G. M. Barker, editor. Molluscs as crop pests. CABI Publishing, Wallingford, U.K.

Fasulo, T. R. 2011. Applesnails of Florida. University of Florida, Gainesville. Publication number EENY-323. Available: http://entnemdept.ufl.edu/creatures/misc/gastro/apple_snails.htm. (January 2017).

GBIF (Global Biodiversity Information Facility). 2016. GBIF backbone taxonomy: *Pomacea haustrum* (Lamarck, 1858). Global Biodiversity Information Facility, Copenhagen. Available: http://www.gbif.org/species/2292579. (November 2016).

Ghesquiere, S. 2007. Apple snails (Ampullariidae). Available: http://applesnail.net/. (November 2016, January 2017).

ITIS (Integrated Taxonomic Information System). 2016. *Pomacea haustrum* (Reeve, 1858). Integrated Taxonomic Information System, Reston, Virginia. Available: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=568122#null. (November 2016).

Rawlings, T. A., K. A. Hayes, R. H. Cowie, and T. M. Collins. 2007. The identity, distribution, and impacts of non-native apple snails in the continental United States. BMC Evolutionary Biology 7(1):97.

Sanders, S., C. Castiglione, and M. Hoff. 2014. Risk Assessment Mapping Program: RAMP. U.S. Fish and Wildlife Service.

White-McLean, J. A. 2011. *Pomacea* spp. Terrestrial Mollusc Tool. USDA/APHIS/PPQ Center for Plant Health Science and Technology and the University of Florida. Available: http://idtools.org/id/mollusc/factsheet.php?name=Pomacea%20spp. (November 2016).

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.

Cox, G. W. 2004. Alien species and evolution. Island Press, Washington, D.C.

FFWCC (Florida Fish and Wildlife Conservation Commission). 2006. Non-native applesnails in Florida. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida. Available: http://myfwc.com/media/673720/FWC_applesnails_FLMS_handout.pdf. (June 2013).

Howells, R. G., L. F. Burlakova, A. Y. Karatayev, R. K. Marfurt, and R. L. Burks. 2006. Native and introduced Ampullariidae in North America: history, status, and ecology. Pages 73-112 *in* R. C. Joshi, and L. S. Sebastian. Global advances in the ecology and management of golden apple snails. Philippine Rice Research Institute, Muñoz, Nueva Ecija, Philippines.