

Marbled Aplexa (*Stenophysa marmorata*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2023

Revised, March 2023

Web Version, 5/29/2024

Organism Type: Mollusk

Overall Risk Assessment Category: Uncertain



Photo: Josephbanjo. Public Domain. Available:
https://en.wikipedia.org/wiki/Stenophysa_marmorata (February 2023).

1 Native Range and Status in the United States

Native Range

From USGS (2023):

“Native Range: Brazil, Guatemala, Uruguay [sic], Venezuela, and the West Indies (Te 1978).”

Núñez (2010) reports *Stenophysa marmorata* is native to Argentina.

From Taylor (2003):

“It is found throughout the Greater Antilles except for Cuba, through the Lesser Antilles to Trinidad at least, in the western Caribbean on Providence Island, and in eastern Costa Rica [...].”

From NatureServe (2023):

“This species occurs in the West Indies, from Jamaica to Trinidad; probably on Isla Providencia of the western Caribbean; eastern Costa Rica; probably Panama (Taylor, 2003); also St. Vincent in the Lesser Antilles (Taylor, 2004). It has been reported from Venezuela and repeatedly from eastern Brazil, but confirmation is required (Taylor, 2003).”

Status in the United States

From Howells (2001):

“Both pond or tadpole snail species [*Stenophysa marmorata* and *Stenophysa maugeriae*] were listed by Te (1978) as introduced into Texas and this record was subsequently repeated by Howells [1992] and others. However, Te did not give location, date, or other collection specifics and their current status remains unclear.”

No records of *Stenophysa marmorata* in trade in the United States were found.

Regulations

No species-specific regulations on possession or trade were found within the United States for *Stenophysa marmorata*.

Means of Introductions within the United States

From Howells (2001):

“The method of introduction [of *Stenophysa marmorata* to Texas] is [...] uncertain, but aquarium trade origin is a reasonable possibility.”

Remarks

From Sartini et al. (2024):

“Many authors reported the occurrence of this species in South America (Rumi et al. 2004, 2008, Paraense 2005), though its status as an invasive or native species in this continent is not clear (Appleton 2003, Taylor 2003).”

“This apparent widespread distribution of *S. marmorata*, including several isolated hydrographic basins indicates the possibility of species misidentifications due to the similarities in shell shape, which is the main criteria available for the discrimination of South American physids. [...] Alternatively, this apparently wide distribution may also indicate the presence of a complex of cryptic species under the name *S. marmorata*.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2023):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Lophozoa
Phylum Mollusca
Class Gastropoda
Order Basommatophora
Family Physidae
Genus *Stenophysa*
Species *Stenophysa marmorata*

According to MolluscaBase editors (2023), *Stenophysa marmorata* is the current valid name for this species.

The following synonyms of *Stenophysa marmorata* from MolluscaBase editors (2023) were used to search for information for this report: *Physa marmorata*, *Aplexa marmorata*, *Aplexa sowerbyana*, *Physa sowerbyana*, *Physa marmorata*, *Physa acuminata*.

Size, Weight, and Age Range

From Núñez (2010):

“Specimens of *S. marmorata* were born with a mean length of 0.97 mm (SD±0.1) and only survived 60 weeks reaching a mean length of 7.56 mm in the last week. The maximum observed length in this species was 9.7 mm, while calculated L_{∞} [maximum estimated length] was 8.72 mm.”

From Bony et al. (2008):

“The largest specimens were 10–12 mm in height and 5–7 mm in width.”

“The largest specimens of *Physa marmorata* collected in the Ivory Coast (10–12 mm) are smaller than full-grown specimens described from Saint Vincent (14 mm; Paraense 1986), South Africa (15 mm; Appleton 1996), and from Guadeloupe (19 mm; J.P.P., unpubl. data), [...]”

Environment

From Palomares and Pauly (2023):

“Demersal; freshwater.”

From Bony et al. (2008):

“*P. marmorata* is negatively associated with [...] high pH, conductivity and temperature values.”

From Núñez (2010):

“Both *Physa acuta* and *Stenophysa marmorata* are able to inhabit semi-permanent habitats although neither can survive in the absence of water (Núñez 2009).”

Climate

From Palomares and Pauly (2023):

“Subtropical”

Distribution Outside the United States

Native

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From Taylor (2003):

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From NatureServe (2023):

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Introduced

From Bony et al. (2015):

“*Physa marmorata* [...] was introduced into Africa before 1900 and has previously been reported from Bénin, Togo, Ghana, Nigeria and South Africa. Here we show that it is also common in temporary ponds, fish ponds, dams and streams in the La Mé and Agnèby basins, southern Ivory Coast.”

From Palacio-Villamagual et al. (2021):

“We present the first record of the freshwater gastropod *Stenophysa marmorata* in Loja,

Ecuador. Specimens were collected in the rivers of the urban zone in Loja city, between 2019 and 2020, through techniques such as manual collection and use D-net for aquatic invertebrate sampling.”

From Dana (2000):

“[...] [*Aplexa*] *marmorata* has, during the past 15 years, been found in a variety of waterbody types. These are all in the extreme eastern part of South Africa and range from artificial ponds to natural pans and backwaters in rivers. It seems to be spreading and is likely to become the country's third invasive freshwater pulmonate snail ([Appleton and Brackenbury], 1997).”

“Specimens conforming to the species [*Aplexa marmorata*] from South and Central America have been collected during the past 15 years from several sites in KwaZulu-Natal and Northern Province [South Africa].”

From Mahmoud et al. (2013):

“[...] collected locally from lakes in botanic garden in Erlangen [Germany]”

No evidence was found to indicate establishment in the wild in Germany.

Means of Introduction Outside the United States

From Bony et al. (2015):

“The introduction of this snail is most likely due to human activities, probably via the trade of aquatic plants (Madsen & Frandsen 1989).”

From Dana (2000):

“The first two of these [South African] localities are particularly remote and no explanation can be given as to how the snails reached them.”

“[...] *Aplexa marmorata* has spread over quite a large part of South Africa, particularly KwaZulu-Natal. How it has achieved this spread is not known but it may well be more widely distributed than the records cited in this thesis suggest.”

Short Description

From Paraense (1986):

“The shell is thin, horn-colored, surface very glossy, diaphanous. Spire acute, elevated; protoconch distinct, rounded-conical, reddish-brown; five not shouldered, broadly convex whorls with subobsolete spiral lines and thin growth lines. Aperture elongated, 1.4-2.0 times as long as the remaining shell length, narrow obovate-lunate; upper half acute-angled, lower half oval, narrowly rounded at the base, outer lip sharp, inner lip completely closing the umbilical region; a very distinct callus on the parietal wall; columellar lip with a low ridge gradually merging into the callus.”

Biology

From Taylor (2003):

“*S. marmorata* is very sensitive to direct sunlight, lack of oxygen, desiccation, and lack of food after even two days.”

From Núñez (2011):

“According to Rankin and Harrison (1979), *Stenophysa marmorata* is an r-selected, pioneering species capable of rapid exploitation of favorable conditions [...].”

From Wethington and Lydeard (2007):

“The family Physidae (Pulmonata: Basommatophora) is a group of freshwater hermaphroditic snails [...].”

From Bony et al. (2008):

“*Physa marmorata* from the Lesser Antilles occupies a great variety of habitats, such as natural or artificial ponds, lakes, marshes, drains, canals and small rivers, but prefers standing water. It is also often associated with a high aquatic plant cover (Pointier & Augustin 1999; Pointier & David 2004). In Puerto Rico, *P. marmorata* was mainly reported from limestone sink ponds and was less commonly encountered in small, low-gradient streams (Harry & Hubendick 1964). In the Ivory Coast, this species [...] has colonized several types of habitats, including ponds, dams, canals and rivers. However, as observed in Antillean islands, *P. marmorata* was always found in the most protected areas of a river (i.e. oxbow lakes or areas upstream of dams) confirming its preference for standing waters.”

Human Uses

No information was found on human uses of *Stenophysa marmorata*.

Diseases

No information was found associating *Stenophysa marmorata* with any diseases listed by the World Organisation of Animal Health (2023).

Poelen et al. (2014) list *Stenophysa marmorata* as a host of trematode parasites from the families Echinostomatidae and Diplostomoidea, and the genus *Trichobilharzia*.

Threat to Humans

From CDC (2019):

“Cercarial dermatitis (“swimmer’s itch”, “clam-digger’s itch”, “duck itch”) is caused by the cercariae of certain species of schistosomes whose normal hosts are birds and mammals other than humans.”

“Several genera/species are known to cause cercarial dermatitis; the most commonly implicated genus globally is the waterfowl schistosome *Trichobilharzia* spp. [...] These schistosomes all use different snail intermediate hosts, commonly those from the families Nassariidae, Lymnaeidae, and Physidae.”

3 Impacts of Introductions

From Bony et al. (2008):

“This species has never been involved in the transmission of parasites of medical or veterinary importance (Malek 1980) and its impact on local biodiversity has never been established. However, as pointed out by Appleton (2003) it is naïve to think that they have not had any impact, especially when population densities are as high as we observed at several sites, such as in the Agboville river or in the Attinguié pond [Ivory Coast].”

4 History of Invasiveness

The History of Invasiveness for *Stenophysa marmorata* is classified as Data Deficient. There are records of nonnative introductions and establishment of *S. marmorata*. There is little information available on the means of introduction of this species. Although there is no evidence to date of specific impacts from these introductions, the literature also did not show evidence of lack of impact. *S. marmorata* has been reported from Texas, but its current status there is unknown.

5 Global Distribution



Figure 1. Reported global distribution of *Stenophysa marmorata*. Map from GBIF Secretariat (2022). Observations are reported from the United States, the Caribbean, Central America, South America, and southeastern Africa. The occurrence reported in Texas is a centroid point and was excluded from the source points for the climate matching analysis. Occurrences reported in Colombia, Guyana, and French Guiana were also excluded from the source points for the climate matching analysis because these countries have not been reported elsewhere as part of the range of *S. marmorata*.

Additional points in Africa from Bony et al. (2008), Koudenouko et al. (2020), and Oloyede et al. (2017) were included in selecting source points for the climate matching analysis.

No georeferenced occurrences were found for *S. marmorata* in Ecuador.

6 Distribution Within the United States

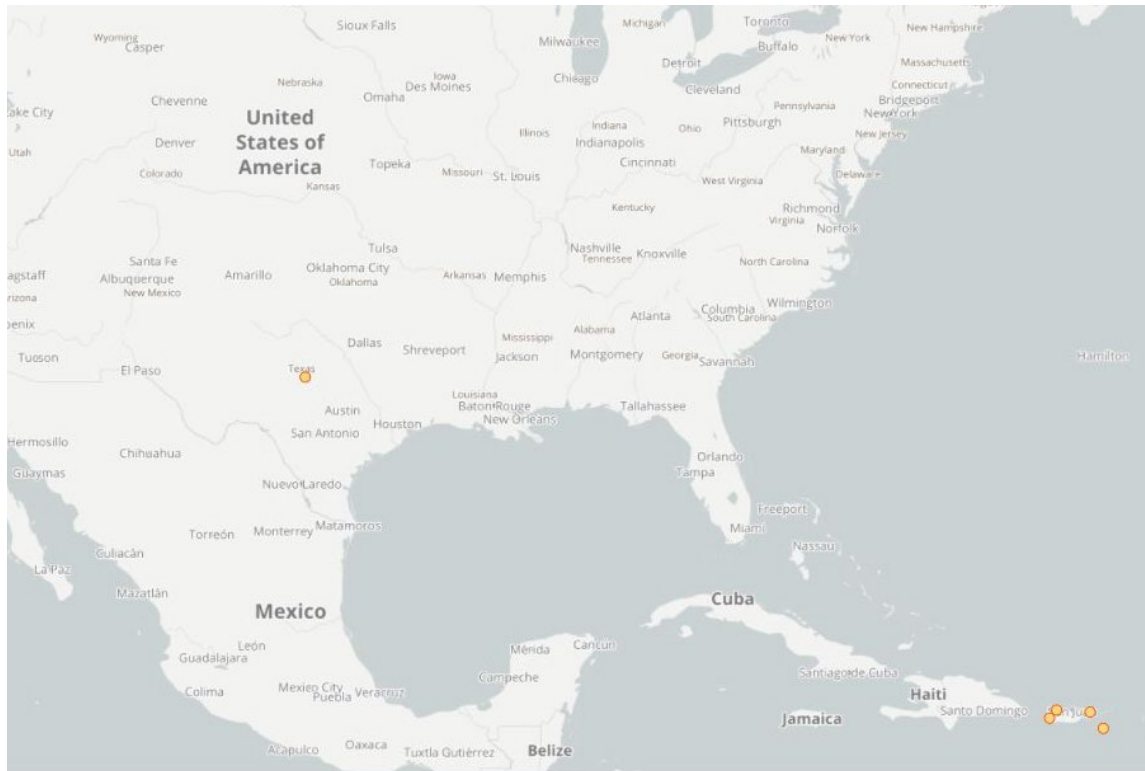


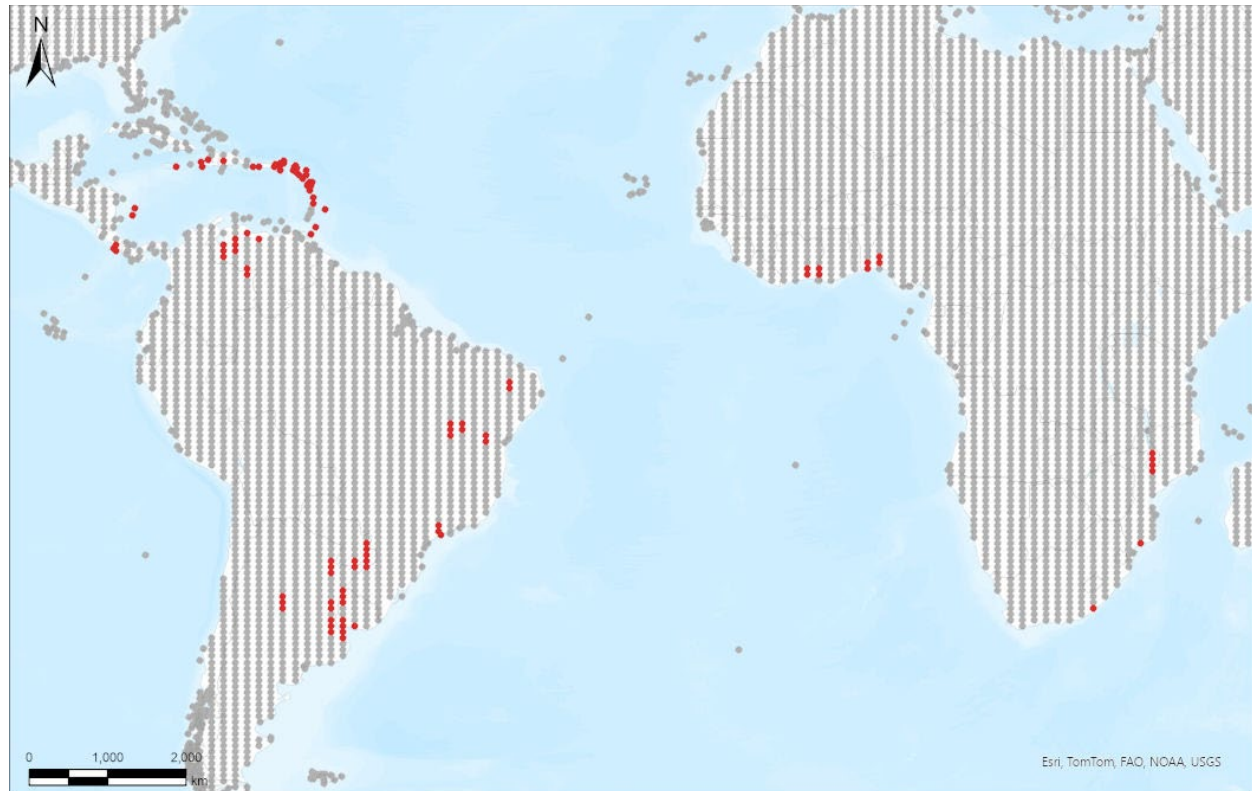
Figure 2. Reported distribution of *Stenophrys marmorata* in the United States. Map from GBIF-US (2023). Observations are reported from Texas, Puerto Rico, and the U.S. Virgin Islands. Reported occurrence in Texas is a centroid point and does not represent the actual location of occurrence; therefore, it was excluded from the source points for the climate match analysis.

7 Climate Matching

Summary of Climate Matching Analysis

The areas of the contiguous United States with the highest climate match for *Stenophrys marmorata* were located along the Atlantic Coast and the Gulf Coast, from the Mid-Atlantic region around to Texas. There were areas of medium climate match in the southern Midwest, Southern Plains, interior Southeast and Mid-Atlantic regions, and small areas of the Southwest. The lowest climate matches were found along western mountain chains, including the Cascades, the Sierra Nevada, and the northern Rockies. Other areas of low climate match included California, the Great Basin, the Colorado Plateau, the far northern Plains, and northern New England. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.332, indicating that Yes, there is establishment concern for this species. The Climate 6 score is calculated as: (count of target points with scores ≥ 6)/(count of all target points). Establishment concern is warranted for Climate 6 scores greater than or equal to 0.002 based on an analysis of the establishment success of 356 nonnative aquatic species introduced to the United States (USFWS 2024).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Stenophysa marmorata* (see Appendix). These projected climate matches are provided as additional context for the reader; future climate scenarios are not factored into the Overall Risk Assessment Category.



Species: *Stenophysa marmorata*

Selected Climate Stations ●



RAMP

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Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in Central America, South America, Caribbeans, and Africa selected as source locations (red; Argentina, Brazil, Uruguay, Venezuela, Costa Rica, Jamaica, Haiti, Puerto Rico, U.S. Virgin Islands, Trinidad and Tobago, Barbados, Guadeloupe, Antigua and Barbuda, Montserrat, Saint Kitts and Nevis, Saint Martin, Saint Barthélemy, Martinique, Archipelago of San Andrés, Providencia and Santa Catalina [Colombia], Ivory Coast, Benín, Nigeria, Mozambique, Malawi, and South Africa) and non-source locations (gray) for *Stenophysa marmorata* climate matching. Source locations from GBIF Secretariat (2023), with additional source locations from Bony et al. (2008), Koudenouko et al. (2020), and Oloyede et al. (2017). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

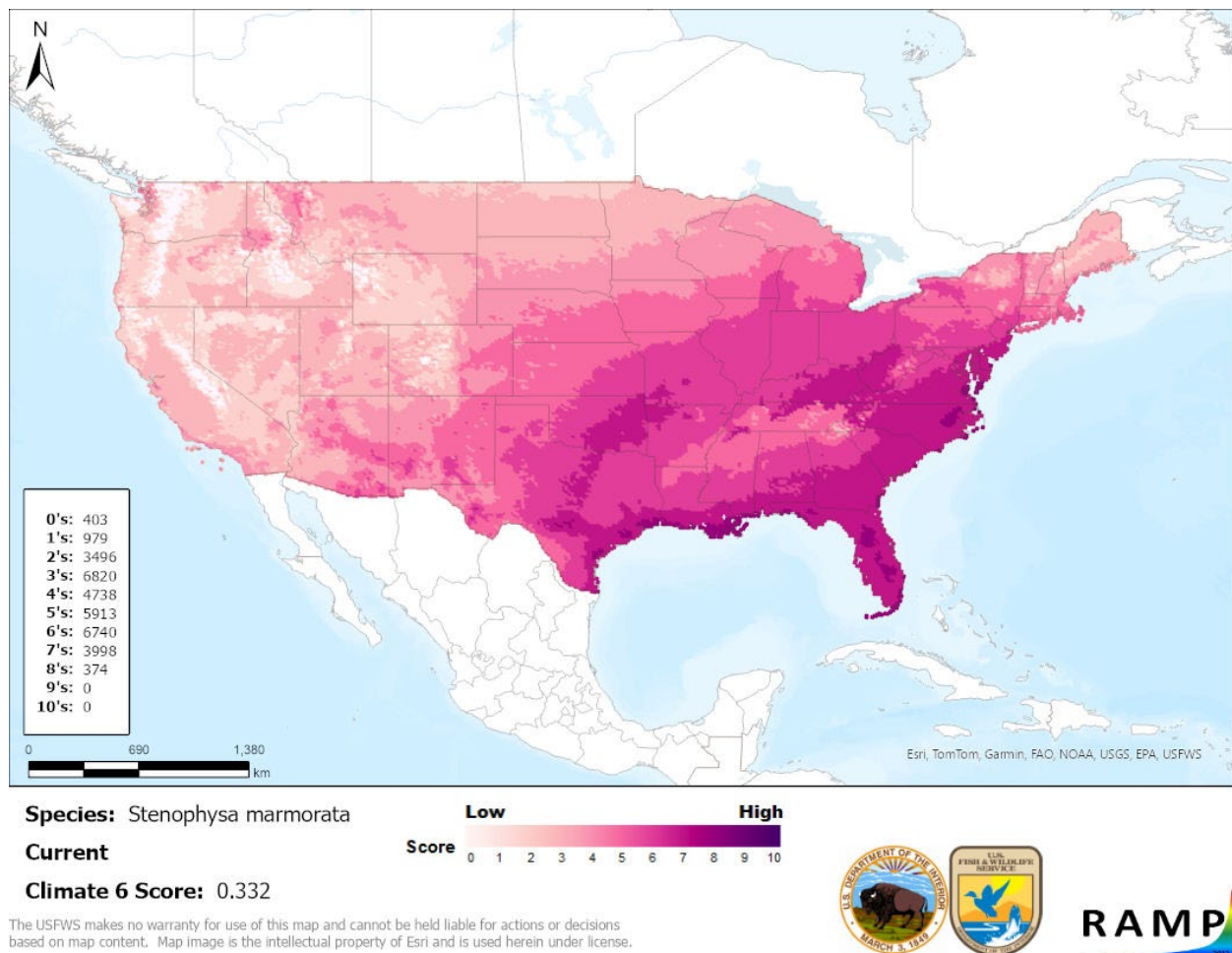


Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Stenophysa marmorata* in the contiguous United States based on source locations reported by GBIF Secretariat (2023), Bony et al. (2008), Koudenouko et al. (2020), and Oloyede et al. (2017). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Stenophysa marmorata* is classified as Low. There is some information pertaining to the distribution of *S. marmorata*, including its native range, but there is also uncertainty over whether there are misidentifications or cryptic species currently recorded under the name of *S. marmorata* or its synonyms. The biology of *S. marmorata* is adequately documented. There is no information on the History of Invasiveness other than documentation that this species is established outside of its native range. Information on what impacts, if any, *S. marmorata* is having outside of its native range is needed to adequately assess the risk this species poses to the contiguous United States.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Stenophysa marmorata, Marbled Aplexa, is an aquatic snail that is native to parts of South and Central America and the Caribbean. *S. marmorata* is a hermaphroditic species generally found in lentic habitats with macrophytes. This species has been introduced to multiple countries in Africa and a botanical garden in Europe, possibly through the aquatic plant trade. Populations have become established in the wild in multiple African countries. However, there is currently no information on the impact of these introductions. While *S. marmorata* has been reported from Texas, there is no specific distribution information available, and its current status is unknown. *S. marmorata* is a host of a parasitic trematode which has been known to cause cercarial dermatitis in humans. The History of Invasiveness for *Stenophysa marmorata* is classified as Data Deficient due to the lack of information regarding the impact of introduced populations. The climate matching analysis for the contiguous United States indicates establishment concern for this species, with the highest climate matches occurring along the Atlantic and Gulf coasts from New York to Texas. The Certainty of Assessment for this ERSS is classified as Low due to the lack of information on the invasive potential of *S. marmorata* and possible misidentifications that could affect understanding of the species range. The Overall Risk Assessment Category for *Stenophysa marmorata* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (see section 4): Data Deficient**
- **Establishment Concern (see section 7): Yes**
- **Certainty of Assessment (see section 8): Low**
- **Remarks, Important additional information: None**
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in section 11.

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11 Literature Cited in Quoted Material

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Appendix

Summary of Future Climate Matching Analysis

Future climate projections represent two Shared Socioeconomic Pathways (SSP) developed by the Intergovernmental Panel on Climate Change (IPCC 2021): SSP5, in which emissions triple by the end of the century; and SSP3, in which emissions double by the end of the century. Future climate matches were based on source locations reported by GBIF Secretariat (2023), Bony et al. (2008), Oloyede et al. (2017), and Koudenouko et al. (2020).

Under the future climate scenarios (figure A1), no regions of the contiguous United States were projected to have an especially high climate match for *Stenophysa marmorata*. Medium-high match was projected for the Mid-Atlantic, Gulf Coast, and Southern Florida regions under the 2055 time step. Areas of low climate match were projected to occur in the Great Basin and Western Mountains regions under all scenarios, and climate match was low to medium-low more generally across the western contiguous United States. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.135 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.391 (model: MRI-ESM2-0, SSP3, 2085). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species under future scenarios. The Climate 6 score for the current climate match (0.332, figure 4) falls within the range of scores for future projections. The time step and climate scenario with the most change relative to current conditions was SSP5, 2085, the most extreme climate change scenario. The magnitude of change relative to current conditions was generally small for both SSPs at the 2055 time step. Under the 2085 time step, areas within the Great Lakes and Northeast saw a large increase in the climate match relative to current conditions. Additionally, areas within the Colorado Plateau, Northern Pacific Coast, Northern Plains, and Western Mountains saw a moderate increase in the climate match relative to current conditions. Primarily under the 2085 time step and SSP5 scenario, areas within the Appalachian Range, Gulf Coast, Mid-Atlantic, Southeast, and Southern Plains saw a moderate decrease in the climate match relative to current conditions. No large decreases were observed regardless of time step and climate scenarios. Additional, very small areas of large or moderate change may be visible on the maps (figure A3).

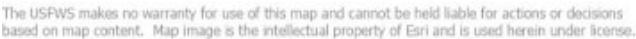


Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Stenophysa marmorata* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023), Bony et al. (2008), Oloyede et al. (2017), and Koudenouko et al. (2020). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

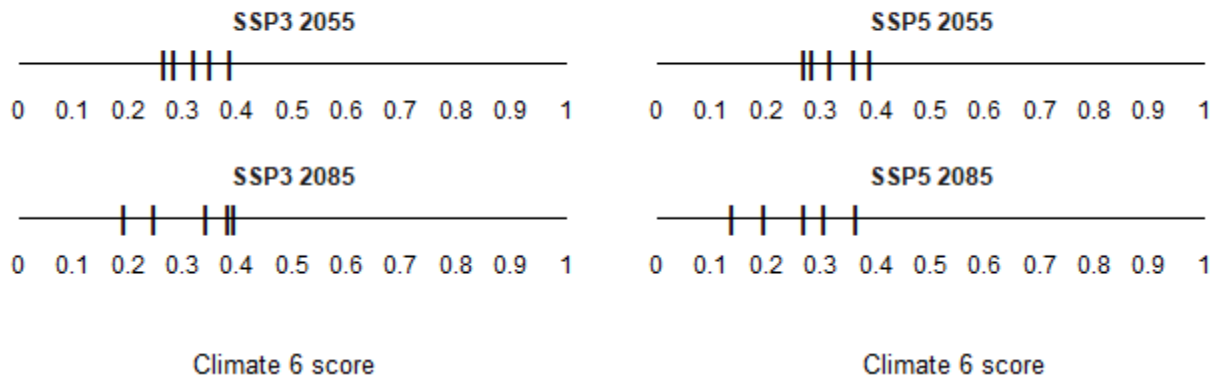


Figure A2. Comparison of projected future Climate 6 scores for *Stenophysa marmorata* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0.

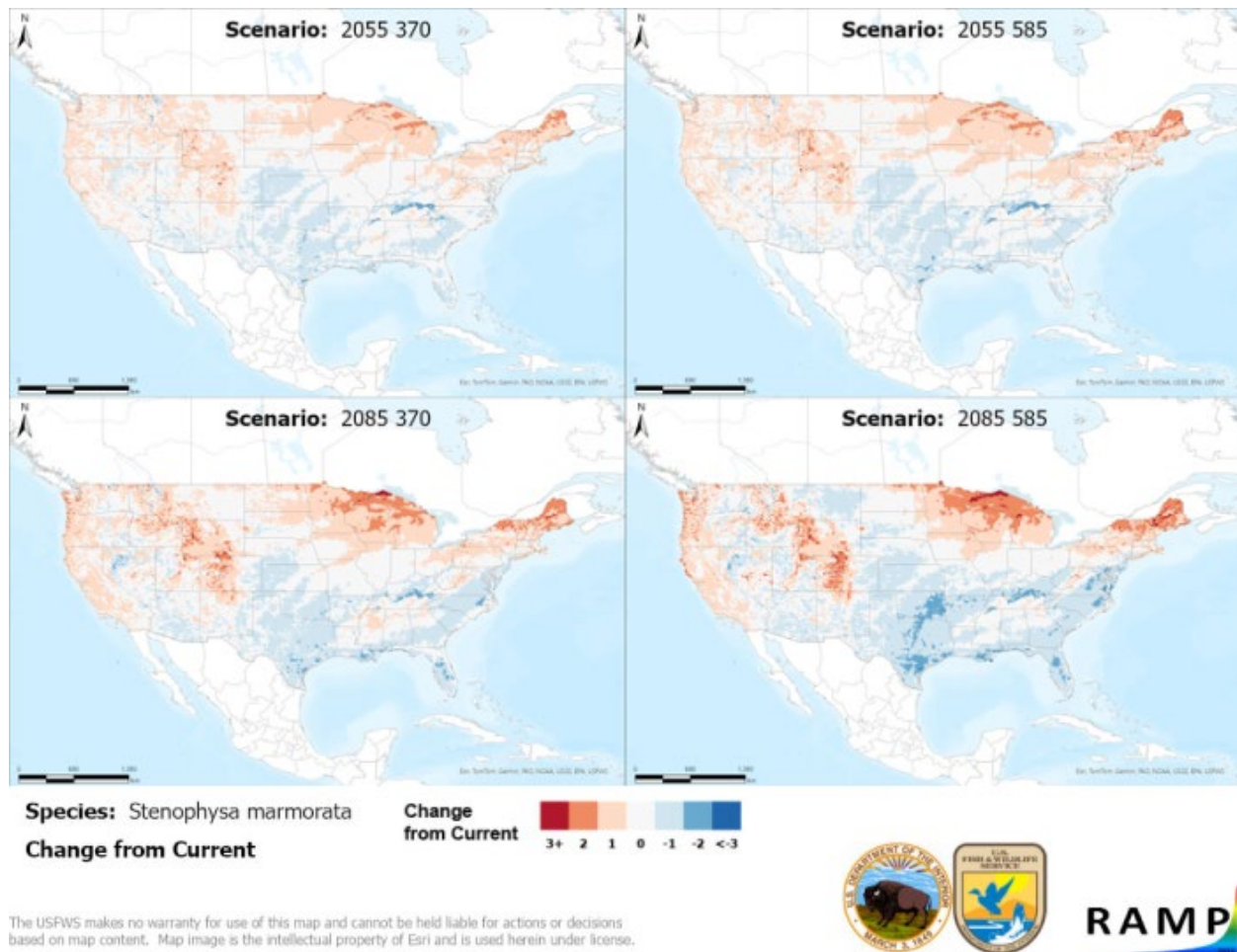


Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Stenophysa marmorata* based on source locations reported by GBIF Secretariat (2023), Bony et al. (2008), Oloyede et al. (2017), and Koudenouko et al. (2020). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. Shades of blue indicate a lower target point score under future scenarios than under current conditions. Shades of red indicate a higher target point score under future scenarios than under current conditions. Darker shades indicate greater change.

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