Cockscomb Hydrobe (*Littoridinops monroensis*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, January 2023
Revised, March 2023
Web Version, 12/30/2024

Organism Type: Mollusk
Overall Risk Assessment Category: Uncertain

Photo: Smithsonian Environmental Research Center. Licensed under: CC BY 2.0. Available: https://commons.wikimedia.org/wiki/File:Littoridinops_monroensis_(I0958)_(27074189285).jpg (January 2023).

1 Native Range and Status in the United States

Native Range

From Burch (1982):

"Florida and Bahama Islands; in Florida it is generally distributed along both coasts and the Florida Keys, […] and occurs throughout the St. Johns drainage system (Thompson, 1968)."

From Mollusca Base (2023):

"USA: Maryland, North Carolina, Florida; Florida: East Florida, West Florida, Florida Keys; Bahamas; Bahamas: Grand Bahama Island, Andros, Cat Island, Crooked Islands, Acklins Island"

From Fofonoff et al. (2018):

"*Littoridinops monroensis* is native to estuarine waters from Maryland to Florida, Alabama (and possibly Texas) […]"

Status in the United States

From Hershler and Liu (2017):

"Distribution: Florida […]. Introduced to San Francisco Bay (Hershler et al. 2007)."

From Fofonoff et al. (2018):

"*Littoridinops monroensis* is native to estuarine waters from Maryland to Florida, Alabama (and possibly Texas) […]"

"*Littoridinops monroensis* was discovered in 2005 in tidal marshes of Suisun Bay, California in the San Francisco Delta region and in marshes of San Pablo Bay, about 30 km west (seaward), […]. The snails were very abundant, over a 3-year period and appear to be well-established."

From MolluscaBase (2023):

"USA: Maryland, North Carolina, Florida; Florida: East Florida, West Florida, Florida Keys […]"

No records of *Littoridinops monroensis* in trade in the United States were found.

Regulations

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

Means of Introductions within the United States

From Fofonoff et al. (2018):

"This snail lacks a planktonic larval stage, but could be transported in ballast water sediments (Hershler et al. 2007). An earlier introduction in dry ballast or an introduction from freshwater populations in Florida, with ornamental aquatic plants, is also possible."

Remarks

No additional remarks.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to MolluscaBase (2023), *Littoridinops monroensis* (Frauenfeld, 1863) is the current valid name for this species.

From ITIS (2023):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Lophozoa
Phylum Mollusca
Class Gastropoda
Order Neotaenioglossa
Family Cochliopidae
Genus *Littoridinops*
Species *Littoridinops monroensis* (Frauenfeld, 1863)

Size, Weight, and Age Range

From Thompson (2000):

"[…] about 3.5-4.5 mm long."

Environment

From Burch (1982):

"[…] primarily in brackish water, but it has invaded marginal fresh water […]"

From Fofonoff et al. (2018):

"[…] including interior freshwaters and estuaries from 1 to 31 PSU (Thompson 2004; Hershler et al. 2007; Vazquez et al. 2012)."

From Heard (1982):

"On mud-silt bottoms or submerged vegetation; in fresh and brackish water coastal lakes, ponds, and tide pools […] This snail was common in several oligohaline ponds on Galveston Island [Texas] in 1975, and large populations exist in several fresh and oligohaline ponds on Horn Island, Mississippi. I have also examined specimens from tidally influenced, freshwater ponds near Georgetown, South Carolina, Specimens have been collected from tide pools in Juncus and spartina marshes at St. Marks, Florida, and Dauphin Island, Alabama."

From Heard et al. (2002):

"Along the coast of the northern Gulf, it commonly occurs in brackish ponds, often in high densities, associated with submerged aquatic vegetation (e.g., widgeon grass and water-hyssop) and filamentous algae. It appears to be especially well adapted for living in the brackish water ponds that commonly occur on the barrier islands along the northern Gulf (Heard 1982)."

Climate

From MolluscaBase (2022):

"Range: 38.55°N to 23.5°N; 84.1°W to 74°W."

From Fofonoff et al. (2018):

"*Littoridinops monroensis* ranges from temperate climates (e.g. Maryland) to subtropical climates (e.g. Florida, Bahamas, Cuba)"

Distribution Outside the United States

Native

From Hershler and Liu (2017):

"[…] Bahama Islands, and Cuba (Thompson 1968; Vázquez et al. 2012)."

From Mollusca Base (2023):

"Bahamas: Grand Bahama Island, Andros, Cat Island, Crooked Islands, Acklins Island."

Introduced

From Vázquez et al. (2012):

"The assumed introduction of *L. monroensis* [to Cuba] seems to be a recent one compared with other examples of introduced taxa like the thiarid *Melanoides tuberculata* (Müller, 1774) (Perera et al. 1987), as none of the previous large-scale mollusc surveys have showed the presence of the species (Aguayo and Jaume 1954; Yong 1998)."

"Currently *L. monroensis* occurs only inside the protected area in Guanahacabibes Peninsula, where human access is very limited. Snail surveys carried out in other places of western Cuba have not shown the presence of this species, nor have they been found in the central region of the country."

Means of Introduction Outside the United States

From Vázquez et al. (2012):

"[…] a natural introduction as migratory birds [e.g., *Anas discors* Linnaeus, 1766 (Blue-Winged Teal), *Aix sponsa* Linnaeus, 1758 (Wood Duck), *Jacana spinosa* Linnaeus, 1758 (Northern

Jacana)], that could potentially carry some individuals frequently move between these two areas [western tip of Cuba and Peninsular Florida] (Zimmerman, 1998; Mujica et al. 2006)."

"We suggest that a human introduction is unlikely given the lack of access [to where the species was found]."

Short Description

From Fofonoff et al. (2018):

"*Littoridinops monroensis* is a very small estuarine snail. Its shell is conical and dextrally coiled, with a sharp, pointed apex, consisting of 5-6 whorls. The whorls are slightly convex with shallow sutures. The aperture is about 1/2 the shell height, ovate to sub-circular, and sharply angled above. The inner lip is moderately thick, while the outer lip is a 'slight glaze'. The shell has a narrow umbilicus. The periostracum is tan or brown, but with spirals in juvenile snails."

From Heard (1982):

"Recognition Characters [of *Littoridinops monroensis*]: Shell smooth, similar to *Littoridinops palustris*; verge with 2 or 3 rows of papillae on convex margin, 2 to 3 individual glands on concave margin."

From Thompson (2000):

"Parietal margin of operculum slightly convex in outline […]. Shell highly variable in shape; freshwater forms olivaceous or brown; adults with about 4.5-6.0 whorls"

Biology

From Fofonoff et al. (2018):

"Sexes are separate and eggs are fertilized by copulation. Development is direct, without a planktonic larva (Hershler et al. 2007)."

From Heard (1982):

"The development of its young is similar to that of *Heleobops* with young snails hatching directly from relatively large egg capsules attached to mollusk shells and other hard substrata."

Human Uses

No information was found on human uses of *Littoridinops monroensis*.

Diseases

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

MolluscaBase (2023) lists *Littoridinops monroensis* as the host of the larval stage of the endoparasite *Ascocotyle gemina.*

Threat to Humans

No information was found on threats to humans from *Littoridinops monroensis*.

3 Impacts of Introductions

From Fofonoff et al. (2018):

"*Littoridinops monroensis* is abundant in some marshes in the San Francisco Bay, but no impacts are reported."

There were no U.S. State or federal regulations found for this species.

4 History of Invasiveness

The History of Invasiveness for *Littoridinops monroensis* is classified as Data Deficient. There are known introductions resulting in established populations in California and Cuba. However, there are no documented impacts or clear evidence stating there have been no impacts from introduced populations in California or Cuba. *L. monroensis* was not found to be in trade.

5 Global Distribution

Figure 1. Reported global distribution of *Littoridinops monroensis*. Map from GBIF Secretariat (2023). Observations are reported from the United States, Cuba, the Cayman Islands, Mexico, and Bahamas. The observations from the Cayman Islands and Mexico were not used to select source points for the climate match; no evidence suggests that there are any established populations of *Littoridinops monroensis* in those locations.

6 Distribution Within the United States

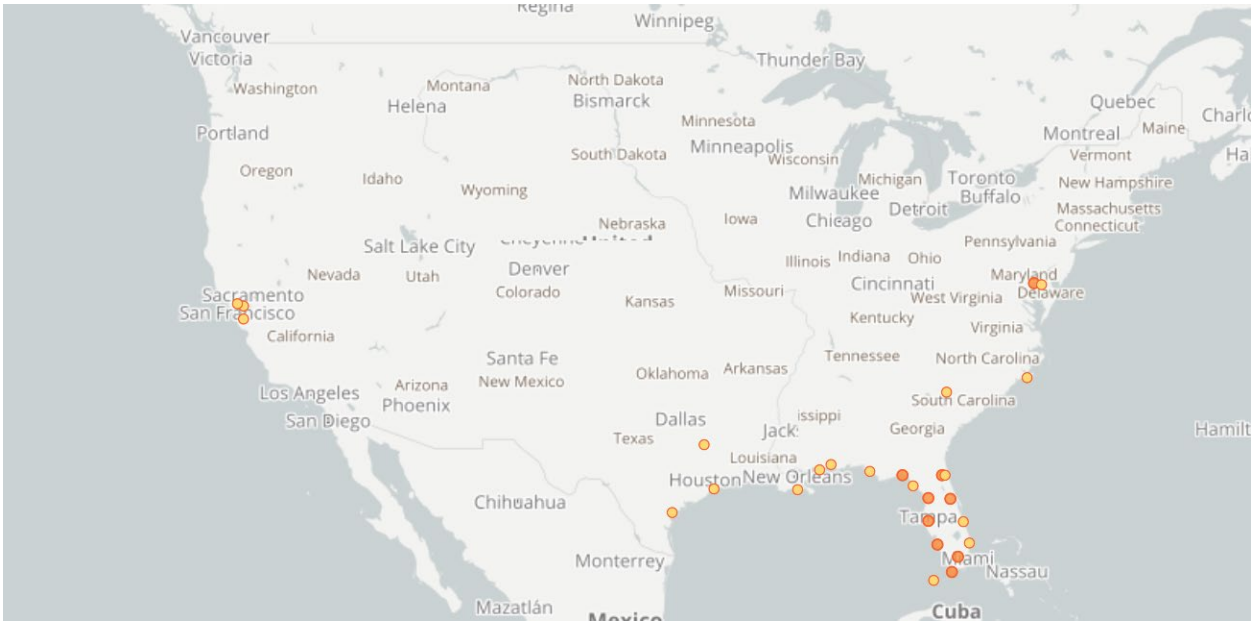

Figure 2. Reported distribution of *Littoridinops monroensis* in the United States. Map from GBIF-US (2023). Observations are reported from Alabama, Delaware, California, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, and Texas.

7 Climate Matching

Summary of Climate Matching Analysis

The highest climate matches were found from Texas to southern Wisconsin and to the Atlantic Coast including the southern Northeast. Sporadic low and medium matches occurred along the Appalachian Mountains and the far northeast region. The rest of the Midwest and Rocky Mountain areas resulted in low and medium matches. California mostly had high matches, mainly closer to the coast, and mixed high and low matches occurred in the Pacific Northwest. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.443, indicating that Yes, there is establishment concern for this species outside its native range. 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 *Littoridinops monroensis* (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.

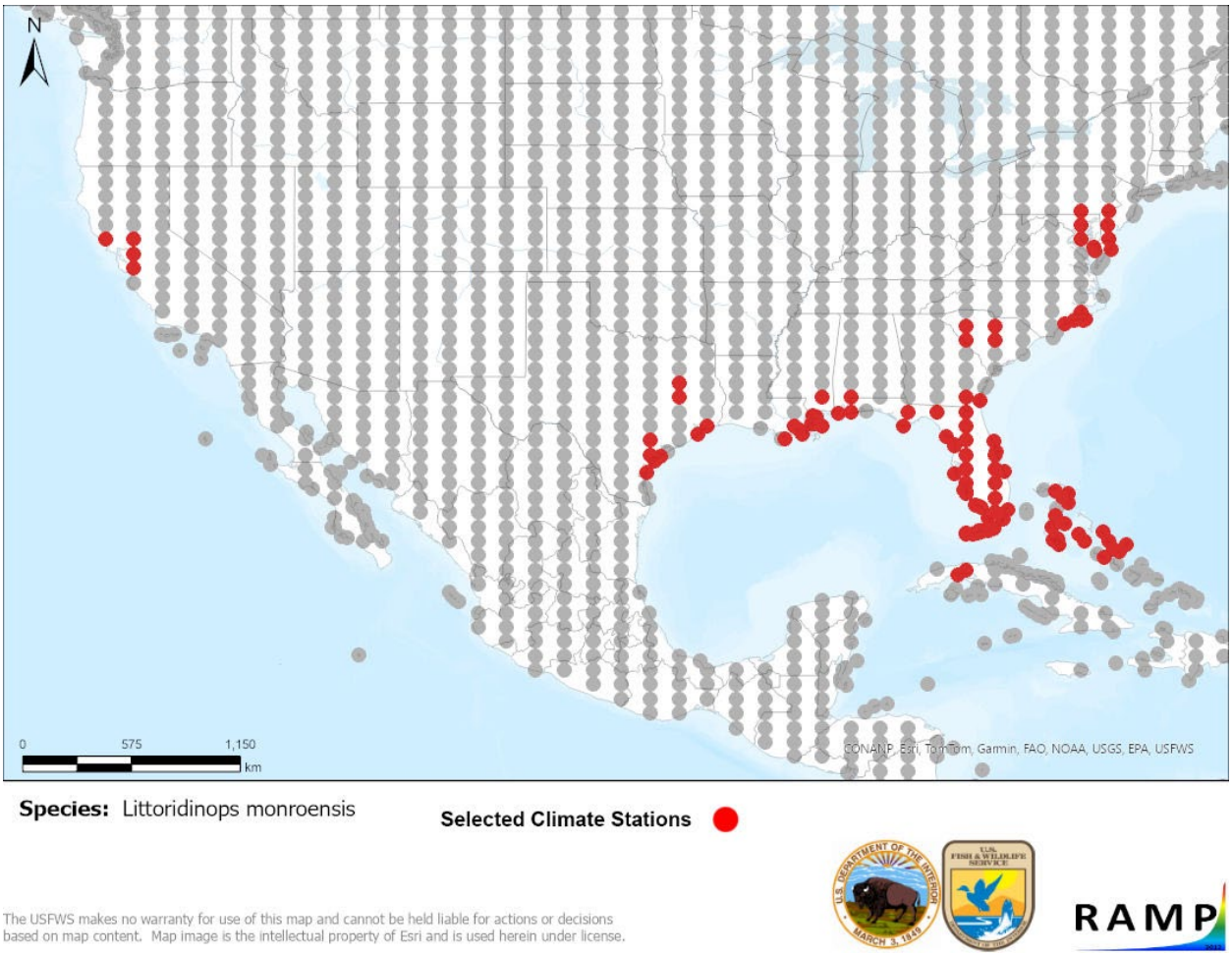

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in North America selected as source locations (red; Bahamas, Cuba, United States) and non-source locations (gray) for *Littoridinops monroensis* climate matching. Source locations from GBIF Secretariat (2023). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

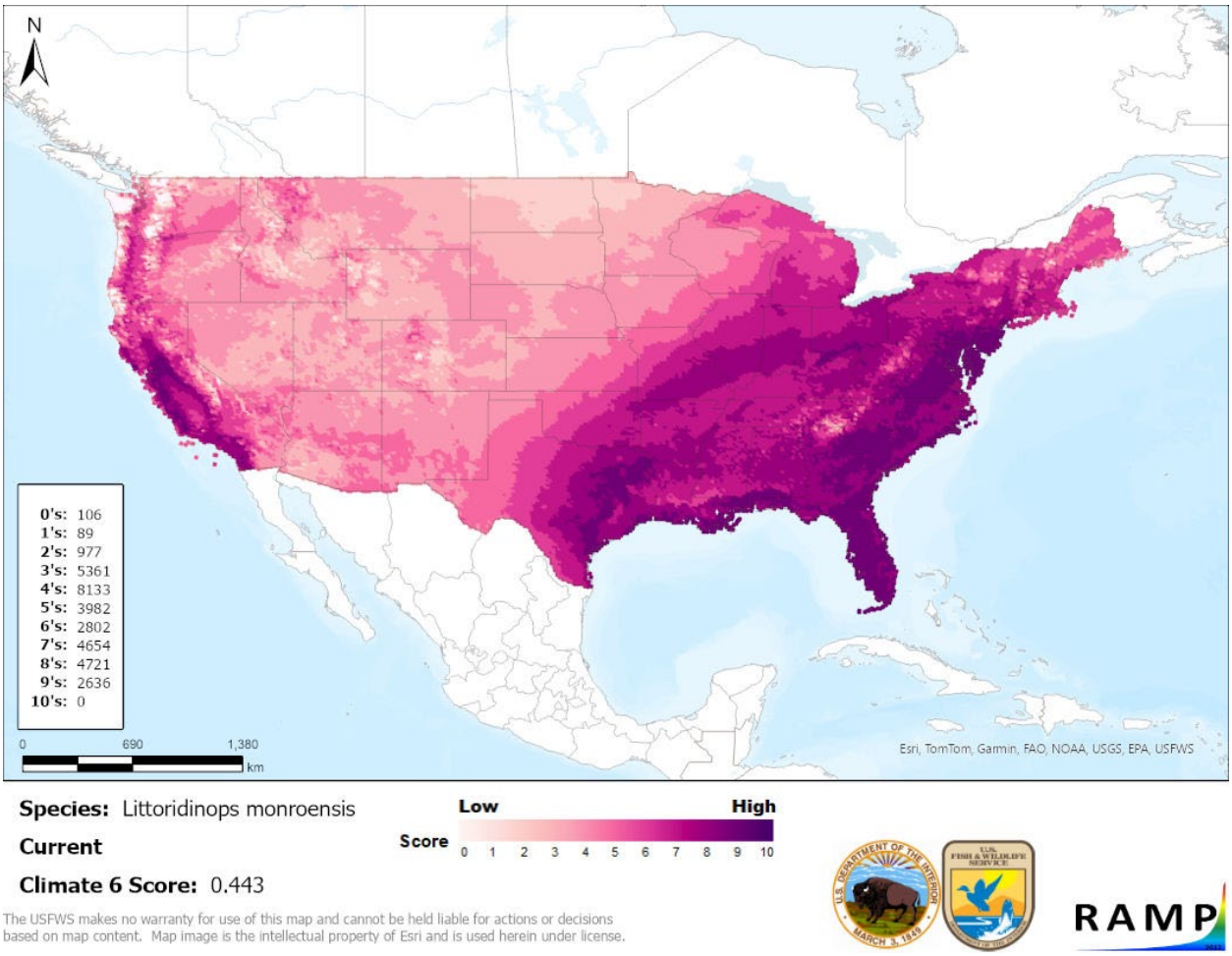

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Littoridinops monroensis* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Littoridinops monroensis* is classified as Low. Adequate and reliable information was available regarding the species' biology and ecology. The distribution is well described and represented in the climate match. Credible information is lacking regarding any impacts from introductions of this species both within the United States and outside the United States.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Littoridinops monroensis, the Cockscomb Hydrobe, is a mollusk that is native to the Bahamas, Cuba, and the southeastern United States. *L. monroensis* is a small snail that lives in brackish and freshwater. There are no known uses for *Littoridinops monroensis* and it doesn't appear to be

available for sale within the United States, nor are there any regulations regarding the species. *Littoridinops monroensis* can be a host of the endoparasite *Ascocotyle gemina*. The History of Invasiveness for *Littoridinops monroensis* is classified as Data Deficient due to no information being available on the impacts of introduction, despite documented nonnative populations becoming established in California and western Cuba. The climate matching analysis for the contiguous United States indicates establishment concern for this species outside its native range. Areas of high match were found in the east and southeast, primarily from eastern Texas to southern New York, as well as in California. The Certainty of Assessment for this ERSS is classified as Low due to the lack of information available regarding impacts from the known introductions. The Overall Risk Assessment Category for *Littoridinops monroensis* 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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Fofonoff PW, Ruiz GM, Steves B, Simkanin C, Carlton JT. 2018. *Littoridinops monroensis*. National Exotic Marine and Estuarine Species Information System. Edgewater, Maryland: Smithsonian Environmental Research Center. Available: https://invasions.si.edu/nemesis/species_summary/70530 (March 2023).

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11 Literature Cited in Quoted Material

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.

Aguayo CG, Jaume ML. 1954. Catálogo de los moluscos Cubanos. Edición Mimeografiada. La Habana.

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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).

Under the future climate scenarios (figure A1), on average, high climate match for *Littoridinops monroensis* was projected to occur in the Appalachian Range, Mid-Atlantic, Southern Atlantic Coast, and Southern Florida regions of the contiguous United States. There were also smaller areas of high match along the Gulf Coast and in California in some scenarios. Areas of high match contracted toward the north and east with time and between SSP3 and SSP5. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.434 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.488 (model: GFDL-ESM4, SSP5, 2085). All future scenario Climate 6 scores were above the establishment concern threshold, indicating that Yes, there was an establishment concern for this species outside of its native range. The Climate 6 score for the current climate match (0.443, 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 (figure A3). Under one or more time step and climate scenarios, areas within the Colorado Plateau, Great Lakes, Northeast, Northern Plains, and Western Mountains saw a moderate increase in the climate match relative to current conditions. No large increases were observed regardless of time step and climate scenarios. Under one or more time step and climate scenarios, areas within California and the Southeast saw a large decrease in the climate match relative to current conditions. Additionally, areas within the Appalachian Range, Gulf Coast, Mid-Atlantic, Northern Pacific Coast, Southern Atlantic Coast, Southern Florida, Southwest, and Western Mountains saw a moderate decrease in the climate match relative to current conditions. The degree of change increased with time and between SSP3 and SSP5.

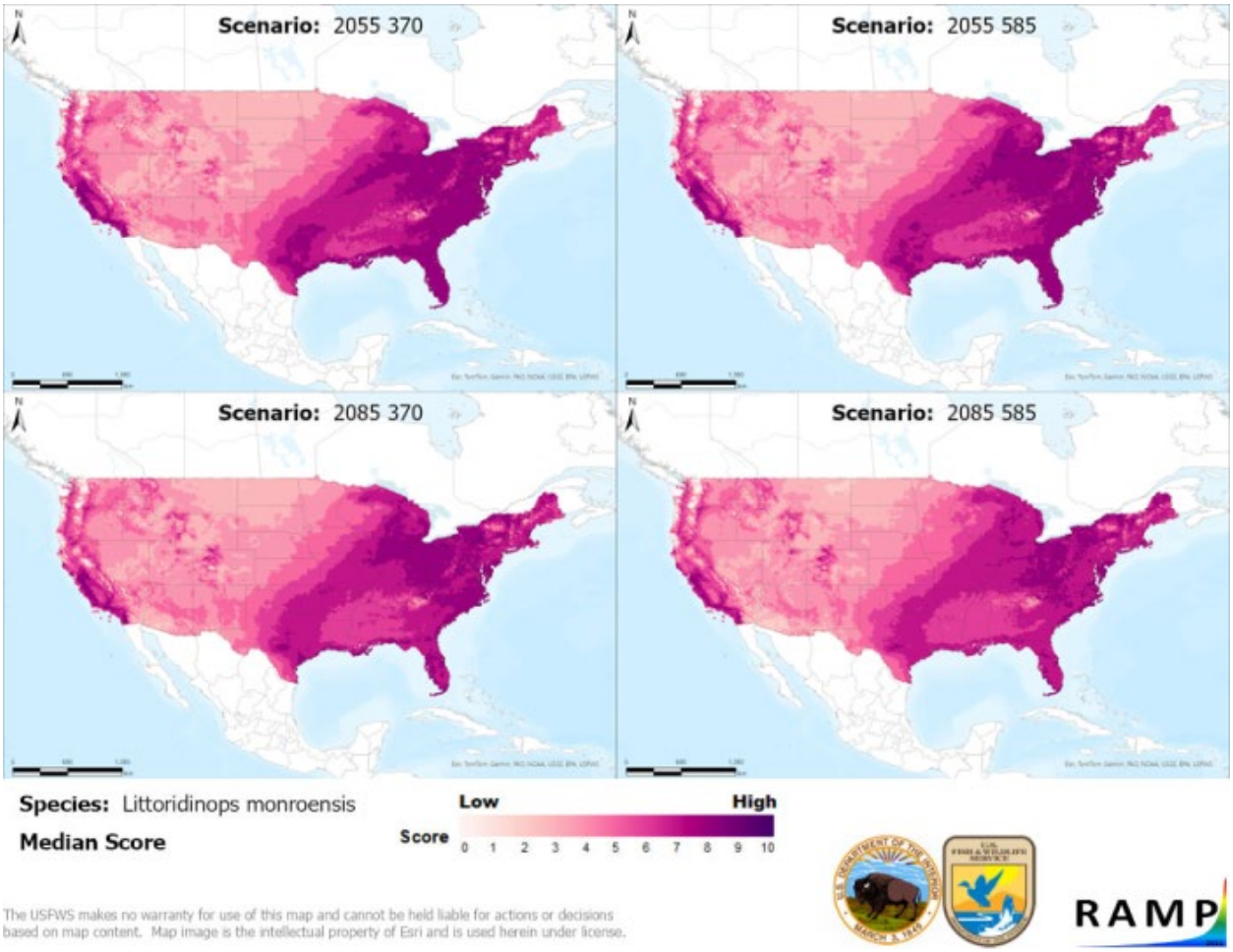

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Littoridinops monroensis* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023). 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.

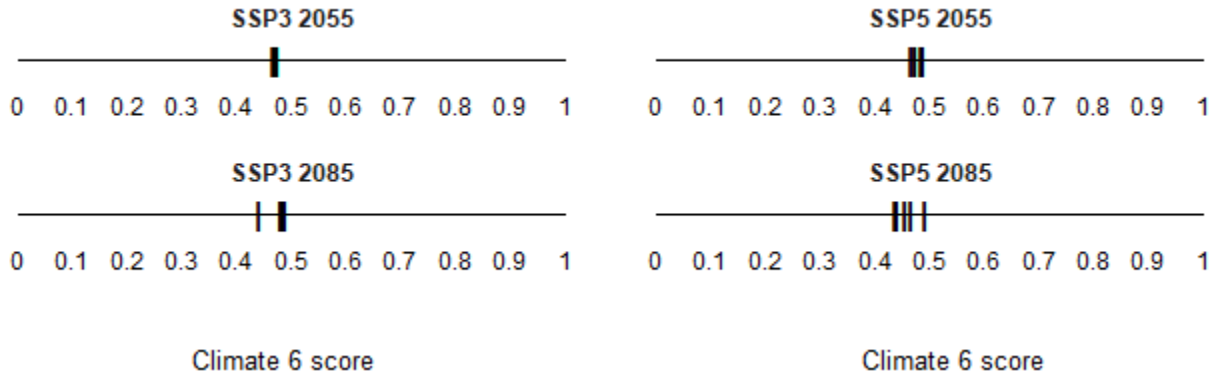

Figure A2. Comparison of projected future Climate 6 scores for *Littoridinops monroensis* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 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.

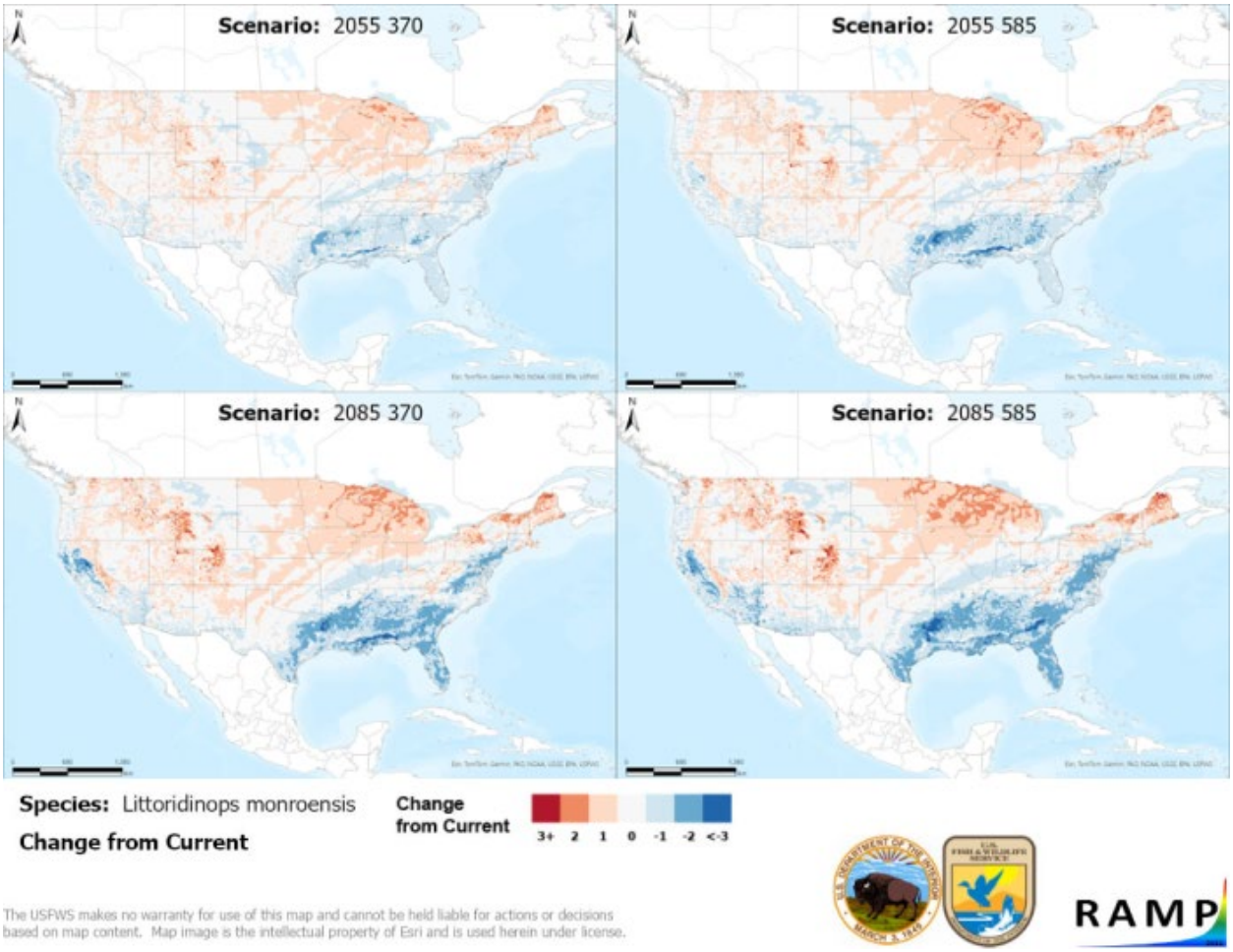

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Littoridinops monroensis* based on source locations reported by GBIF Secretariat (2023). 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.

Literature Cited

GBIF Secretariat. 2023. GBIF backbone taxonomy: *Littoridinops monroensis* (Frauenfeld, 1863). Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/2299954 (January 2023).

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Karger DN, Conrad O, Böhner J, Kawohl T, Kreft H, Soria-Auza RW, Zimmermann NE, Linder HP, Kessler M. 2018. Data from: Climatologies at high resolution for the earth's land surface areas. EnviDat. Available: https://doi.org/10.16904/envidat.228.v2.1.

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