Atlantic Needlefish (*Strongylura marina*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, January 2023
Revised, February 2023
Web Version, 8/2/2024

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

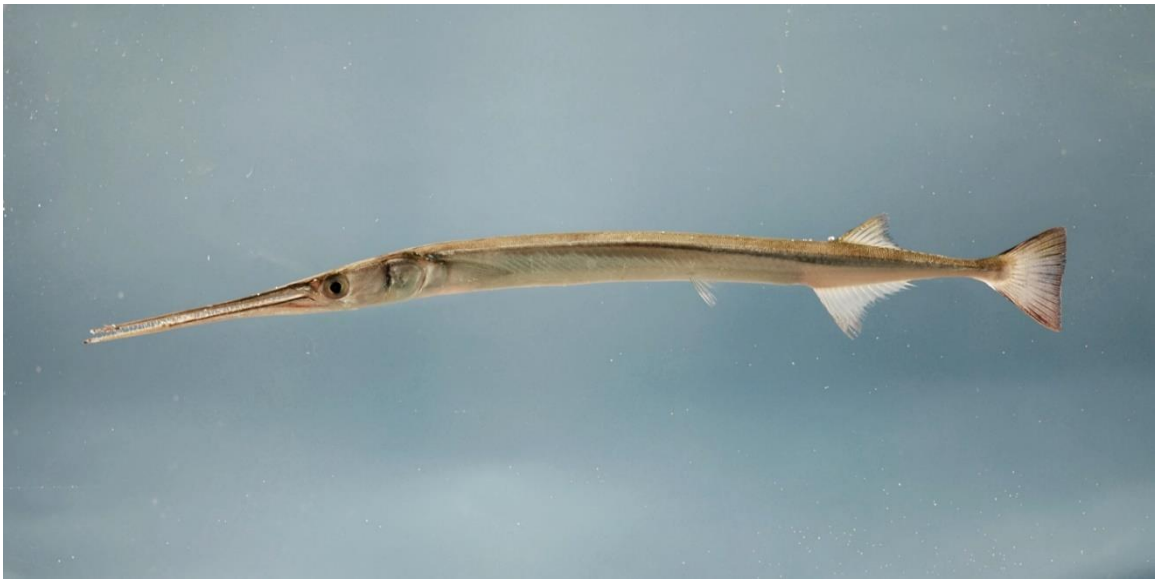

Photo: SEFSC Pascagoula Laboratory; Collection of Brandi Noble. Licensed under CC BY 2.0. Available: https://www.flickr.com/photos/noaaphotolib/5187509591 (January 2023).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2023):

"Western Atlantic: Maine, USA and northern Gulf of Mexico to Brazil. Absent from the Bahamas and Antilles [Collette 1978]"

From Fuller (2023):

"[…] western Atlantic from Massachusetts to Rio de Janeiro, including coasts of the Gulf of Mexico and the western Caribbean Sea (Boschung 1992)"

Status in the United States

From Fuller (2023):

"Native Range: […] western Atlantic from Massachusetts […], including coasts of the Gulf of Mexico […] (Boschung 1992)"

"This belonid occurs naturally in many coastal streams of the southern United States. Mettee et al. (1996) reported evidence that the adults live and spawn in the Alabama, Black Warrior, Coosa, and lower Tombigbee rivers."

"Established [outside native range] in Alabama and Tennessee. Large schools have been seen in the lower Cumberland River, Tennessee in 2010."

From Hassan-Williams and Bonner (2023):

"[Native] Texas distribution: Warren et al. (2000) listed the following drainage units for distribution of *Strongylura marina* in the state: Sabine Lake (including minor coastal drainages west to Galveston Bay), Galveston Bay (including minor coastal drainages west to mouth of Brazos River), Brazos River, Colorado River, San Antonio Bay (including minor coastal drainages west of mouth of Colorado River to mouth of Nueces River), Nueces River."

No records of *Strongylura marina* 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 Fuller (2023):

"[*Strongylura marina*] Gained access to the Tennessee River drainage in Alabama and Tennessee via the Tennessee-Tombigbee Waterway, an artificial canal completed in 1985 (Boschung 1992; Etnier and Starnes 1993)."

Remarks

Fricke et al. (2023) list *Belone almeida, Belone galeata, Esox houttuynia, Esox longirostris, Esox marinus, Esox belone marinus, Belone scrutator, Esox timucu, Belona truncata* as synonyms of *Strongylura marina*. These names along with the valid name were used in information searches for this screening.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Fricke et al. (2023):

"Valid as *Strongylura marina*"

From ITIS (2023):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Acanthopterygii
Order Beloniformes
Suborder Belonoidei
Superfamily Scomberesocoidea
Family Belonidae
Genus *Strongylura* van Hasselt, 1824
Species *Strongylura marina* (Walbaum, 1792)

Size, Weight, and Age Range

From Froese and Pauly (2023):

"Max length: 111 cm TL [total length] male/unsexed; [IGFA 2001]; common length: 60.0 cm TL male/unsexed; [Cervigón et al. 1992]; max. published weight: 2.3 kg [IGFA 2001]"

Environment

From Froese and Pauly (2023):

"Marine; freshwater; brackish"

Climate

From Froese and Pauly (2023):

"Subtropical; 45°N – 9°S, 88°W – 34°W"

Distribution Outside the United States

Native

Part of the native range for this species is within the United States, see section 1 for a complete description of the native range.

From Froese and Pauly (2023):

"Western Atlantic: […] northern Gulf of Mexico to Brazil. Absent from the Bahamas and Antilles [Collette 1978]"

From Fuller (2023):

"[…] western Atlantic […] to Rio de Janeiro, including coasts of the Gulf of Mexico and the western Caribbean Sea (Boschung 1992)"

Introduced

No records were found for introduction of *Strongylura marina* in the wild outside the United States.

Means of Introduction Outside the United States

No records were found of introduction of *Strongylura marina* in the wild outside the United States.

Short Description

From Froese and Pauly (2023):

"Black pigment behind eye, not extending below level of middle of eye [Smith 1997]"

From Robertson and Tassel (2019):

"Body very elongate, rounded; extremely elongate jaws form a long beak, with numerous needle-like teeth; rear of top jaw-bone exposed when mouth is closed; no gill rakers; fins without spines; low lobes at front of dorsal and anal fins; dorsal 14-17 rays; anal fin 16-20 rays; pectoral 10-12; small, rounded pelvic fins; no keel on round tail base; tail fin slightly concave; operculum completely scaled; 213-304 scales on center of nape before dorsal fin; only right gonad present."

Biology

From Froese and Pauly (2023):

"Inhabits coastal areas and mangrove-lined lagoons. […] Feeds mainly on small fishes. Oviparous [Breder and Rosen 1966]. Eggs may be found attached to objects in the water by tendrils on the egg's surface [Breder and Rosen 1966]. Only the right gonad is developed [Smith 1997]"

From Fuller (2023):

"Mettee et al. (1996) reported evidence that the adults live and spawn in the Alabama, Black Warrior, Coosa, and lower Tombigbee rivers."

Human Uses

No information was found on human uses of *Strongylura marina*.

Diseases

No information was found associating *Strongylura marina* with any diseases listed by the World Organisation for Animal Health (2023).

No information was found on diseases associated with *Strongylura marina*.

Threat to Humans

No information was found on threats to humans from *Strongylura marina*.

3 Impacts of Introductions

From Fuller (2023):

"The impacts of this species [*Strongylura marina*] are currently unknown, as no studies have been done to determine how it has affected ecosystems in the invaded range. The absence of data does not equate to lack of effects. It does, however, mean that research is required to evaluate effects before conclusions can be made."

4 History of Invasiveness

The History of Invasiveness for *Strongylura marina* is classified as Data Deficient. *Strongylura marina* is established outside of its native range in the United States. There is no information on impacts of introductions.

5 Global Distribution

Figure 1. Reported global distribution of *Strongylura marina*. Map from GBIF Secretariat (2023). Observations are reported from Atlantic and Gulf coasts of South, Central, and North America. Points in Europe, on the Pacific Coast of Mexico, and in the Bahamas and Antilles do not represent established populations and were not used to select source locations for the climate match. Additionally, a reported occurrence in northern New York was not used to select source locations for the climate matching analysis because the coordinates did not match the verbal description of the occurrence location. Finally, because the climate matching analysis (section 7) is not valid for marine waters, no marine occurrences were used in the climate matching analysis.

No georeferenced occurrences were available for the part of the native range between Massachusetts and Maine in the United States.

6 Distribution Within the United States

Figure 2. Reported distribution of *Strongylura marina* in the United States. Map from Fuller (2023). Observations outside the native range (orange diamonds) are reported from Tennessee and Alabama. The orange shading indicates the native range of the species. Because the climate matching analysis (section 7) is not valid for marine waters, no marine occurrences were used in the climate matching analysis.

7 Climate Matching

Summary of Climate Matching Analysis

Areas of high climate match for *Strongylura marina* occurred throughout the northeastern and southeastern United States, centered on but expanding outside the area where *Strongylura marina* is either native or has become established. The highest matches were found in coastal regions along the Gulf of Mexico and the Atlantic seaboard. Smaller, isolated locations of high match occurred in the Southwest and Rocky Mountain regions. Medium matches were found in the Great Lakes region and the remainder of the Southwest, while most of the Great Plains and areas west of the Rocky Mountains had low climate matching scores. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.486, 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 GBIF Secretariat (2023) (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.

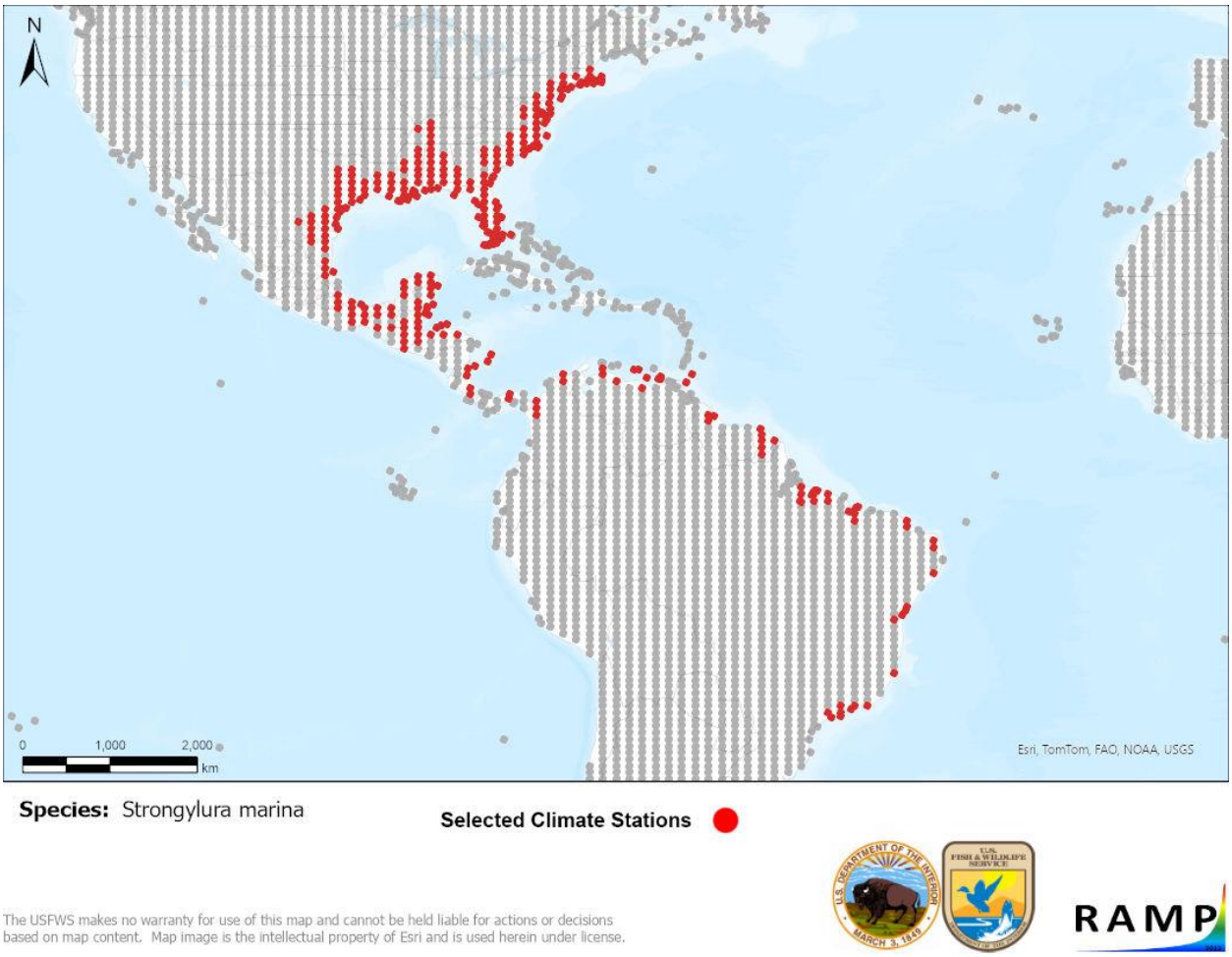

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in North and South America selected as source locations (red; United States, Belize, Brazil, Colombia, Costa Rica, Guatemala, Guyana, French Guiana, Honduras, Mexico, Nicaragua, Panama, Trinidad and Tobago, Venezuela) and non-source locations (gray) for *Strongylura marina* 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.

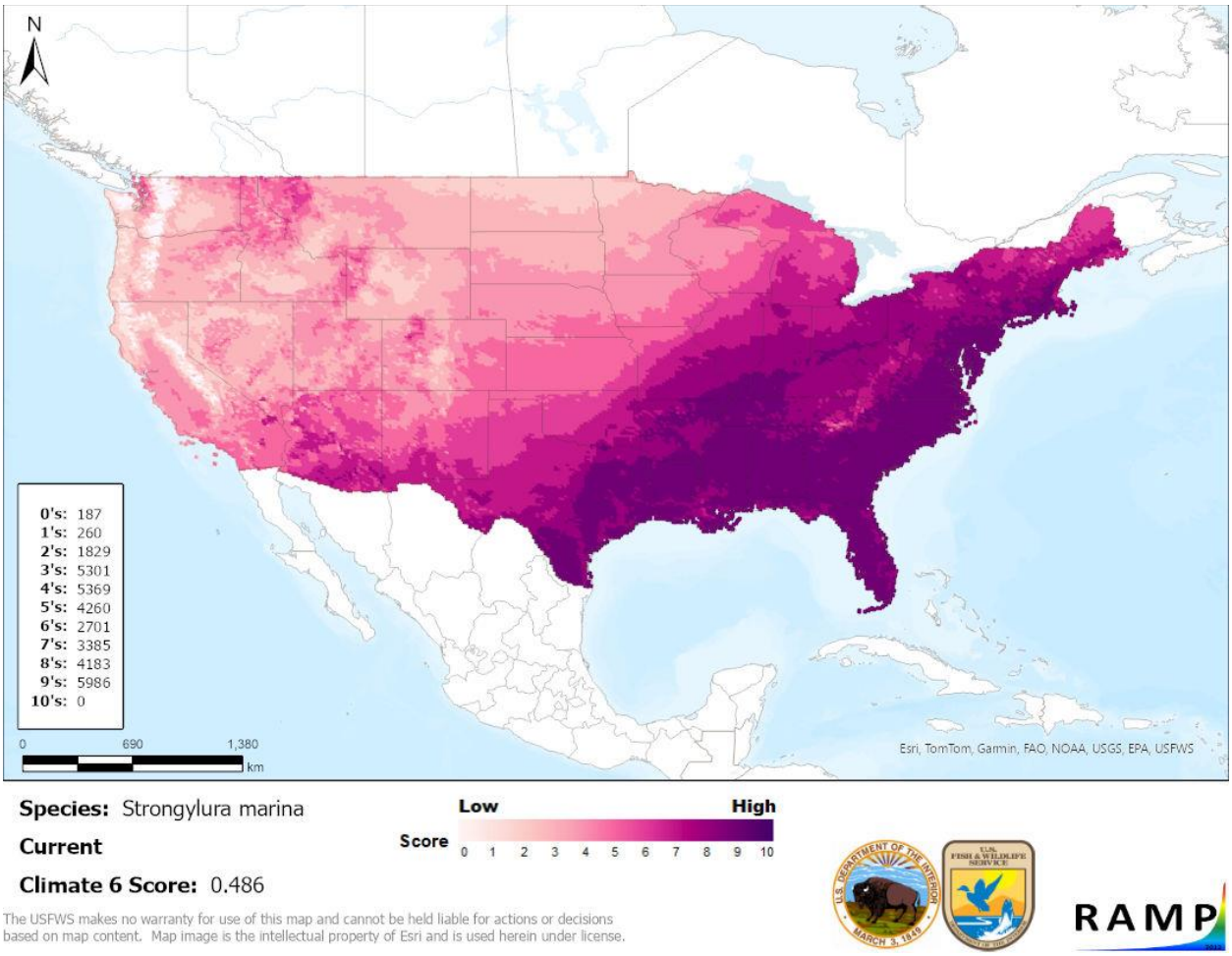

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Strongylura marina* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Strongylura marina* is classified as Low. There is sufficient information regarding species biology and distribution, and records of introduction and an established population are available. However, there is no information on impacts of introductions.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Strongylura marina, the Atlantic Needlefish, is a fish native to the western Atlantic from Maine to Brazil including the coasts of the Gulf of Mexico and the Caribbean Sea. This species lives in marine, brackish, and freshwater environments. They can spawn in freshwater. *S. marina* has been introduced to Tennessee in the lower Cumberland River via a connecting canal where it has become established. There are no state specific regulations for this species and no World Organisation for Animal Health reportable diseases associated with the species. The History of Invasiveness for *Strongylura marina* is classified as Data Deficient due to the lack of information regarding impacts of introductions. The climate matching analysis for the contiguous United States indicates establishment concern for this species outside its native range. Much of the Northeast, Southeast, and south-central United States had high climate matches. The Certainty of Assessment for this ERSS is classified as Low due to a lack of information regarding the impacts of introduction. The Overall Risk Assessment Category for *Strongylura marina* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (see section 4): Data Deficient**
- **Establishment Concern Category (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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Hassan-Williams C, Bonner TH. 2023. Texas freshwater fishes. Texas State University- San Marcos. Available: http://txstate.fishesoftexas.org/index.htm (February 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.

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Breder CM, Rosen DE. 1966. Modes of reproduction in fishes. Neptune City, New Jersey: T.F.H. Publications.

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Mettee MF, O'Neil PE, Pierson J. 1996. Fishes of Alabama and the Mobile basin: Alabama Geological Survey Monograph 15.

Smith CL. 1997. National Audubon Society field guide to tropical marine fishes of the Caribbean, the Gulf of Mexico, Florida, the Bahamas, and Bermuda. New York: Alfred A. Knopf.

Warren ML Jr, Burr BM, Walsh SJ, Bart HL Jr, Cashner RC, Etnier DA, Freeman BJ, Kuhajda BR, Mayden RL, Robison HW, Ross ST, Starnes WC. 2000. Diversity, distribution and conservation status of the native freshwater fishes of the southern United States. Fisheries 25(10):7–29.

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 *Strongylura marina* was projected to occur in the Appalachian Range, Great Lakes, Gulf Coast, Mid-Atlantic, Northeast, Southeast, Southern Atlantic Coast, and Southern Florida regions of the contiguous United States. In some scenarios, there was also an area of high match in Texas. Areas of low climate match were projected to occur in the Northern Pacific Coast region into the Rocky Mountains, as well as in the Northern Plains. In general, areas of high match decreased in extent with time and from SSP3 to SSP5. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.516 (model: MPI-ESM1-2-HR, SSP5, 2085) to a high of 0.720 (model: UKESM1-0-LL, SSP5, 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 (0.486, figure 4) falls below 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 Northeast saw a large increase in the climate match relative to current conditions. Additionally, areas within the Colorado Plateau, Great Basin, Great Lakes, Northern Pacific Coast, Northern Plains, Southern Plains, Southwest, and Western Mountains saw a moderate increase in the climate match relative to current conditions. Under one or more time step and climate scenarios, areas within the Appalachian Range, Gulf Coast, Mid-Atlantic, Northeast, Southeast, Southern Atlantic Coast, Southern Florida, Southern Plains, and Southwest 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). The degree of change increased with time and between SSP3 and SSP5.

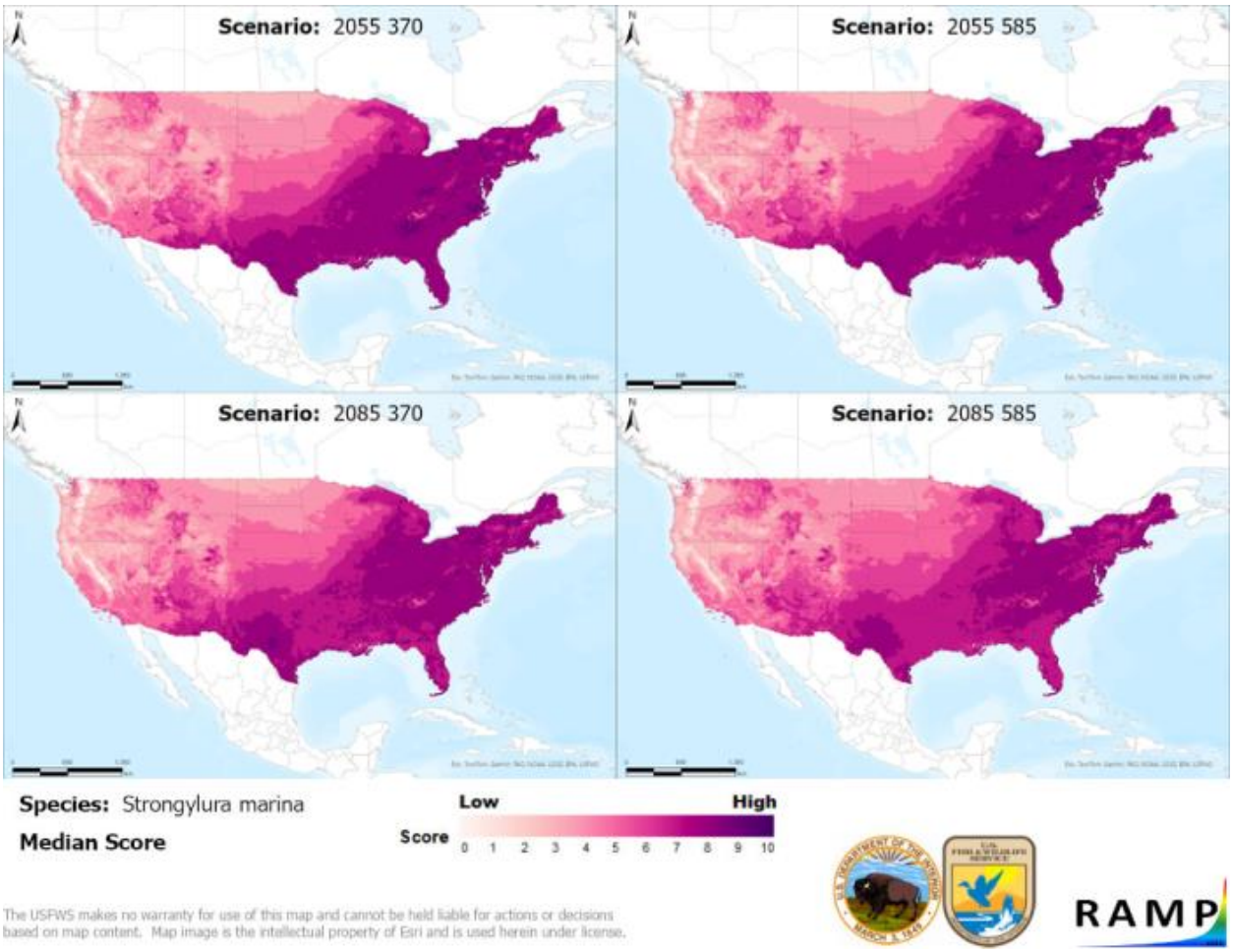

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Strongylura marina* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023). Shared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

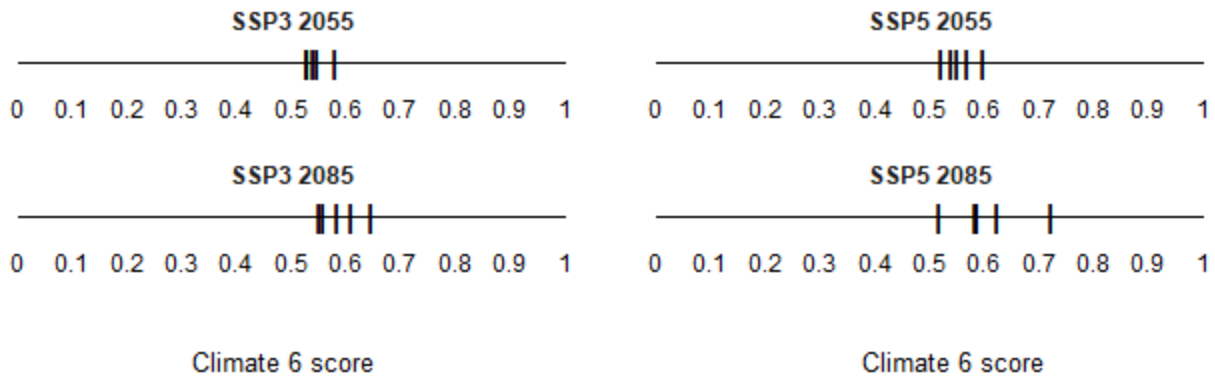

Figure A2. Comparison of projected future Climate 6 scores for *Strongylura marina* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; 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.

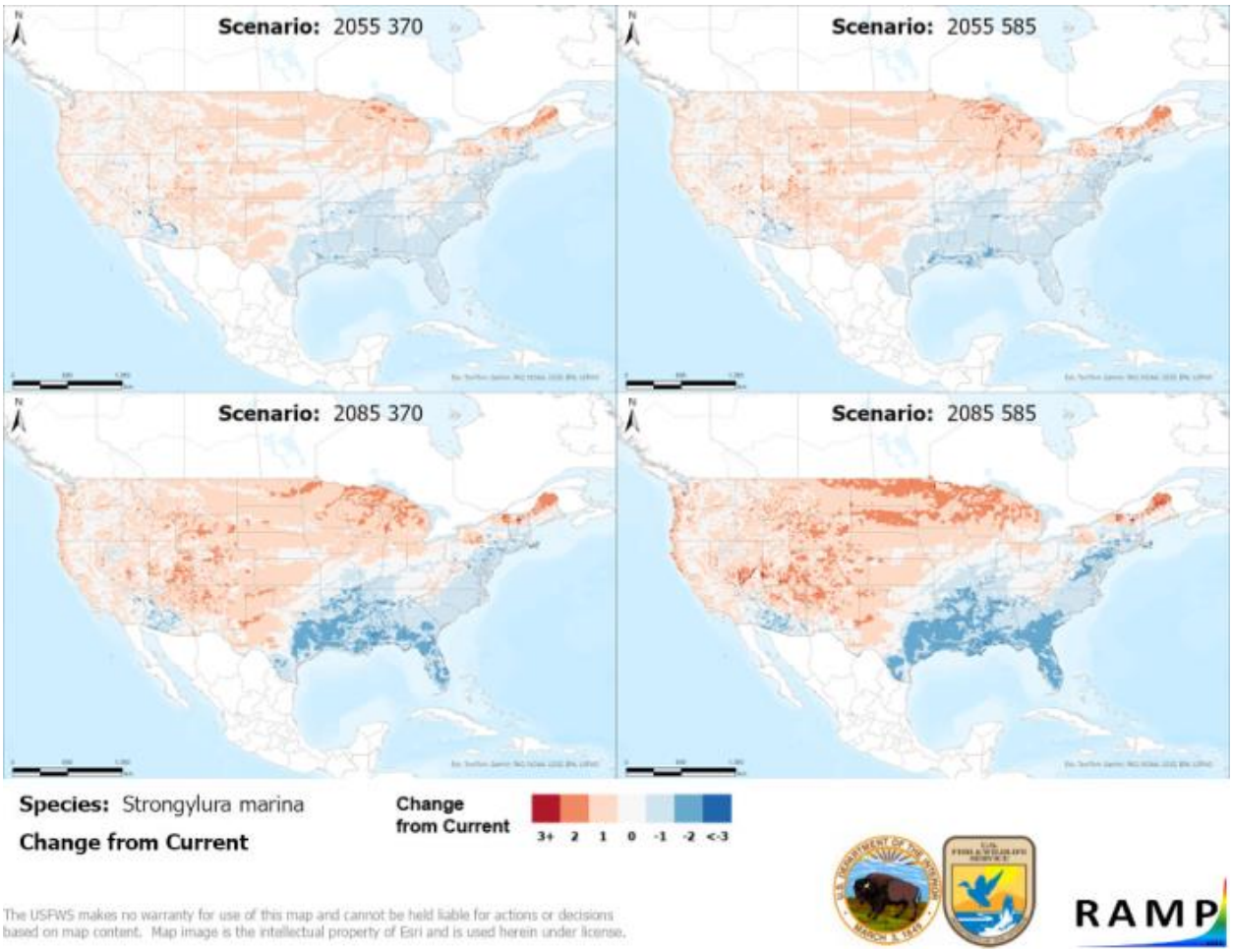

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Strongylura marina* based on source locations reported by GBIF 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: *Strongylura marina*. Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/5208028 (February 2023).

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