Blackstripe Topminnow (*Fundulus notatus*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, March 2023
Revised, April 2023
Web Version, 3/18/2024

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

Photo: Daryl Coldren. Licensed under Creative Commons Attribution-NonCommercial 4.0 International. Available: https://www.inaturalist.org/observations/64405234 (March 2023).

1 Native Range and Status in the United States

Native Range

From NatureServe (2023):

"The large range encompasses the Gulf Slope from the Mobile Bay drainage, western Alabama, to San Antonio Bay drainage, Texas, and extends northward in the Mississippi Valley north to

Iowa and southern Wisconsin, and includes the Lake Michigan and Lake Erie drainages from Wisconsin to Ohio and Ontario (Lee et al. 1980, Page and Burr 2011)."

From COSEWIC (2012):

"The Canadian range is limited to an area of approximately 500 km^2 in the Sydenham River watershed, Little Bear Creek, Bear Creek, Black Creek, Maxwell Creek, and Whitebread Drain in southwestern Ontario."

Status in the United States

From NatureServe (2023):

"The large range encompasses the Gulf Slope from the Mobile Bay drainage, western Alabama, to San Antonio Bay drainage, Texas, and extends northward in the Mississippi Valley north to Iowa and southern Wisconsin, and includes the Lake Michigan and Lake Erie drainages from Wisconsin to Ohio […] (Lee et al. 1980, Page and Burr 2011)."

According to Fuller (2023), nonindigenous occurrences of *Fundulus notatus* have been reported in the following States. Range of observation years, watersheds, and population status (one or more watershed) where reported in parentheses. Reports are located just outside of the species' native range.

- Arkansas (2018; Frog-Mulberry; established)
- Ohio (1962-1995; Cedar-Portage, Hocking, Muskingum; established)

From Fuller (2023):

"A population was discovered in Burr Oak Reservoir in 1962 (Trautman 1981). Established in Ohio."

Individuals of *Fundulus notatus* were found for sale in the United States (e.g., Jonah's Aquarium 2023).

Regulations

Possession or importation of *Fundulus notatus* has been prohibited or regulated in three States (Arkansas, Hawaii, and Utah). While effort has been made to list all applicable State laws and regulations pertaining to this species, this list may not be comprehensive.

Fundulus notatus is listed as a regulated commercial aquaculture species in Arkansas (Arkansas Game and Fish Commission 2022).

Fundulus notatus is listed as regulated in Hawaii (Hawaii Department of Agriculture 2019)

All species of the family Fundulidae are listed as prohibited for collection, importation, and possession (Utah Division of Wildlife Resources 2020).

Means of Introductions within the United States

From Fuller (2023):

"Probably inadvertently stocked into Burr Oak Reservoir [Ohio] (Trautman 1981). Access to Buckeye Lake [Ohio] via the Ohio and Erie canals (Trautman 1981)."

Remarks

No additional remarks.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2023):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Acanthopterygii
Order Cyprinodontiformes
Suborder Cyprinodontoidei
Family Fundulidae
Genus *Fundulus*
Species *Fundulus notatus* (Rafinesque, 1820)

According to Fricke et al. (2023), *Fundulus notatus* is the current accepted name for this species.

Size, Weight, and Age Range

From Fuller (2023):

"7.4 cm."

From Froese and Pauly (2023):

"Max length: 8.0 cm TL [total length] male/unsexed; [Huber 1996]; common length: 5.8 cm TL male/unsexed; [Hugg 1996]"

From COSEWIC (2012):

"The species has a short lifespan. The oldest individuals in most populations examined were 2 to 3 years old."

Environment

From NatureServe (2023):

"This species inhabits small to large, lowland, low-gradient streams and sloughs with water of moderate to high turbidity; quiet water of creeks, rivers, lakes, swamps, drainage ditches, highwater pools of rivers, and ponds. It winters in deeper water. It is common in lowlands, rare to absent in uplands (Page and Burr 2011)."

From COSEWIC (2012):

"In Canada, the Blackstripe Topminnow occurs in small to medium-sized streams with clay/silt bottoms and turbid water. It prefers areas containing submerged and emergent aquatic vegetation and overhanging riparian vegetation."

"It is relatively tolerant of high temperatures and low oxygen concentrations."

Climate

From Froese and Pauly (2023):

"Temperate"

Distribution Outside the United States

Native

The majority of the native range of *Fundulus notatus* is within the United States, see Native Range in Section 1.

From COSEWIC (2012):

"The Canadian range is limited to an area of approximately 500 km^2 in the Sydenham River watershed, Little Bear Creek, Bear Creek, Black Creek, Maxwell Creek, and Whitebread Drain in southwestern Ontario."

Introduced

No records were found for introductions of *Fundulus notatus* in the wild outside of the United States.

Means of Introduction Outside the United States

No records were found for introductions of *Fundulus notatus* in the wild outside of the United States.

Short Description

From COSEWIC (2012):

"The Blackstripe Topminnow, *Fundulus notatus*, is a small (74 mm maximum length) freshwater fish characterized by an upturned mouth, flat head and a black horizontal stripe extending from the snout to the caudal fin base."

Biology

From NatureServe (2023):

"Spawns in late spring and summer. Sexually mature at age I (Becker 1983)."

"Eggs are attached to aquatic vegetation, leaf litter, or detritus (Becker 1983)."

"Feeding activity mainly diurnal."

"Eats various arthropods, snails, and algae; often feeds at surface (Becker 1983, Lee et al. 1980)."

From Froese and Pauly (2023):

"Feeds primarily on terrestrial arthropods, emergent stages of aquatic insects, benthic larvae, and midwater insects (Etnier and Starnes 1993)."

From COSEWIC (2012):

"The Blackstripe Topminnow spends much of its time swimming at the surface where it feeds largely on terrestrial arthropods."

Human Uses

From Froese and Pauly (2023):

"Aquarium: commercial"

"Is easy to maintain in the aquarium (Huber 1996)."

Diseases

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

According to Poelen et al. (2014), *Fundulus notatus* hosts the following parasites: *Acanthocephalus dirus, Clepsine* sp., *Creptotrema fundulid, Distomum* sp., *Eustrongylides* sp., *Fundulotrema* sp., *Homalometron pallidum, Nematoda* sp., *Phagicola angrensis, Proteocephalus* sp., *Salsuginus bermudae*, and *Urocleidus umbraensis.*

Threat to Humans

From Froese and Pauly (2023):

"Harmless"

3 Impacts of Introductions

Although *Fundulus notatus* has been reported as introduced and established beyond its native range, no information on impacts was found.

From Fuller (2023):

"The impacts of this species 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."

The importation, possession, and/or trade of *Fundulus notatus* is regulated in the following States (see Section 1 for detailed information): Arkansas (Arkansas Game and Fish Commission 2022), Hawaii (Hawaii Department of Agriculture 2019), and Utah (Utah Division of Wildlife Resources 2020).

4 History of Invasiveness

The History of Invasiveness for *Fundulus notatus* is classified as Data Deficient. Although established populations of *F. notatus* have been found outside of its native ranges, there was no information found regarding actual impacts of introduction. *F. notatus* also appears to be available from retail vendors in the United States. However, there were no records found quantifying the duration or number of individuals in-trade.

5 Global Distribution

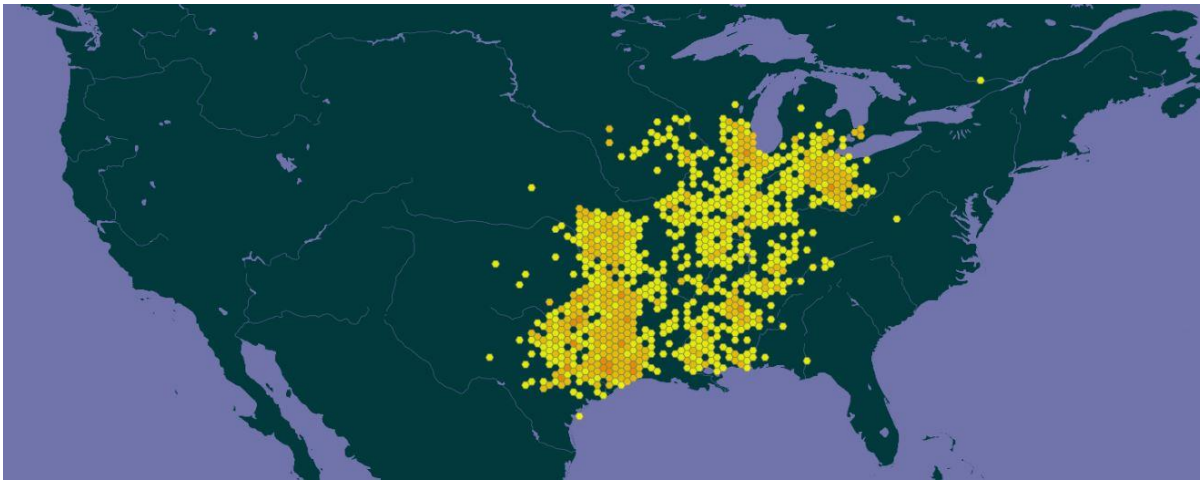

Figure 1. Known global distribution of *Fundulus notatus*. Observations are from the Gulf of Mexico drainages from Alabama to Texas, extending northward into the Great Lakes. Map from GBIF Secretariat (2022). Points in China reported by GBIF Secretariat (2022) are not included in this figure because they were incorrect coordinates (correct coordinates are in Kansas). Points in Ottawa (Ontario, Canada), West Virginia and Florida were not found to be indicative of established populations and were excluded from the climate matching analysis.

COSEWIC (2012) provided additional locations in southwestern Ontario, Canada.

6 Distribution Within the United States

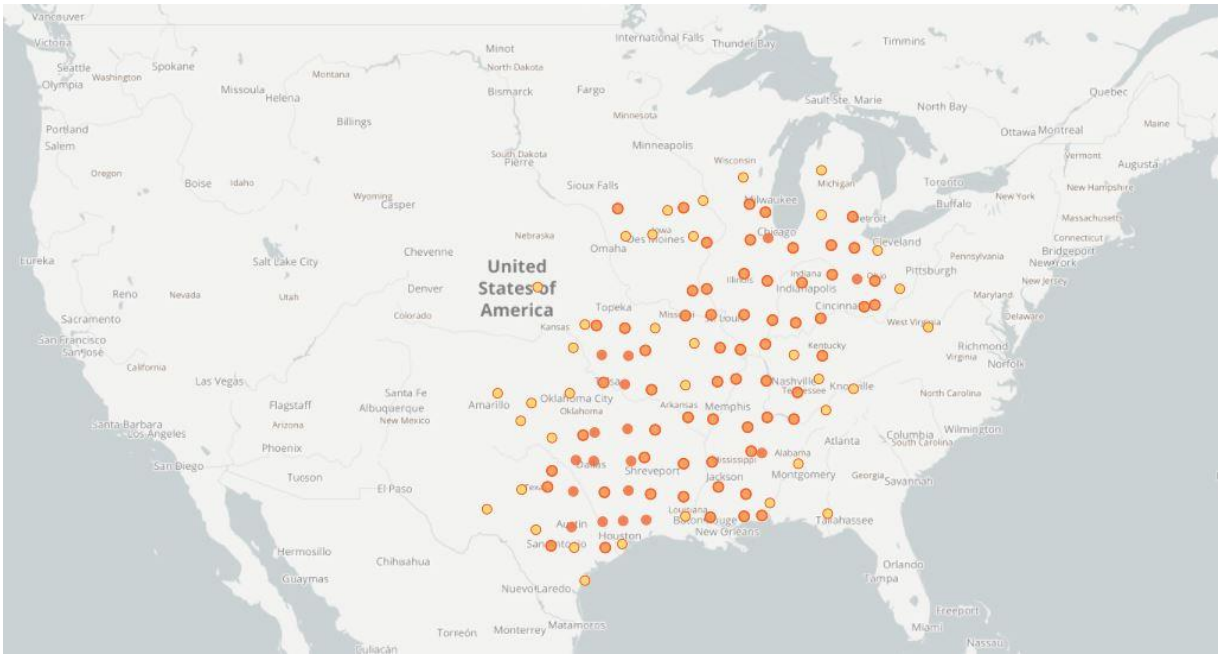

Figure 2. Reported distribution of *Fundulus notatus* in the United States. Map from GBIF-US (2023). Observations are from the Gulf of Mexico drainages from Alabama to Texas, extending northward to the southern Great Lakes. Points in West Virginia and Florida were not found to be indicative of established populations and were excluded from the climate matching analysis.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Fundulus notatus* in the contiguous United States was generally High in the southcentral and southeastern regions and along the Gulf coast, spanning upward to the Midwest regions of the United States, which encompasses this species' native range. Medium matches were found in the Intermountain West and in isolated portions of the Northeast and Florida. The lowest matches were restricted to the coastal Pacific Northwest, Cascade-Sierra Mountains and sparsely scattered in the Rocky Mountains. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.812, 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 *Fundulus notatus* (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.

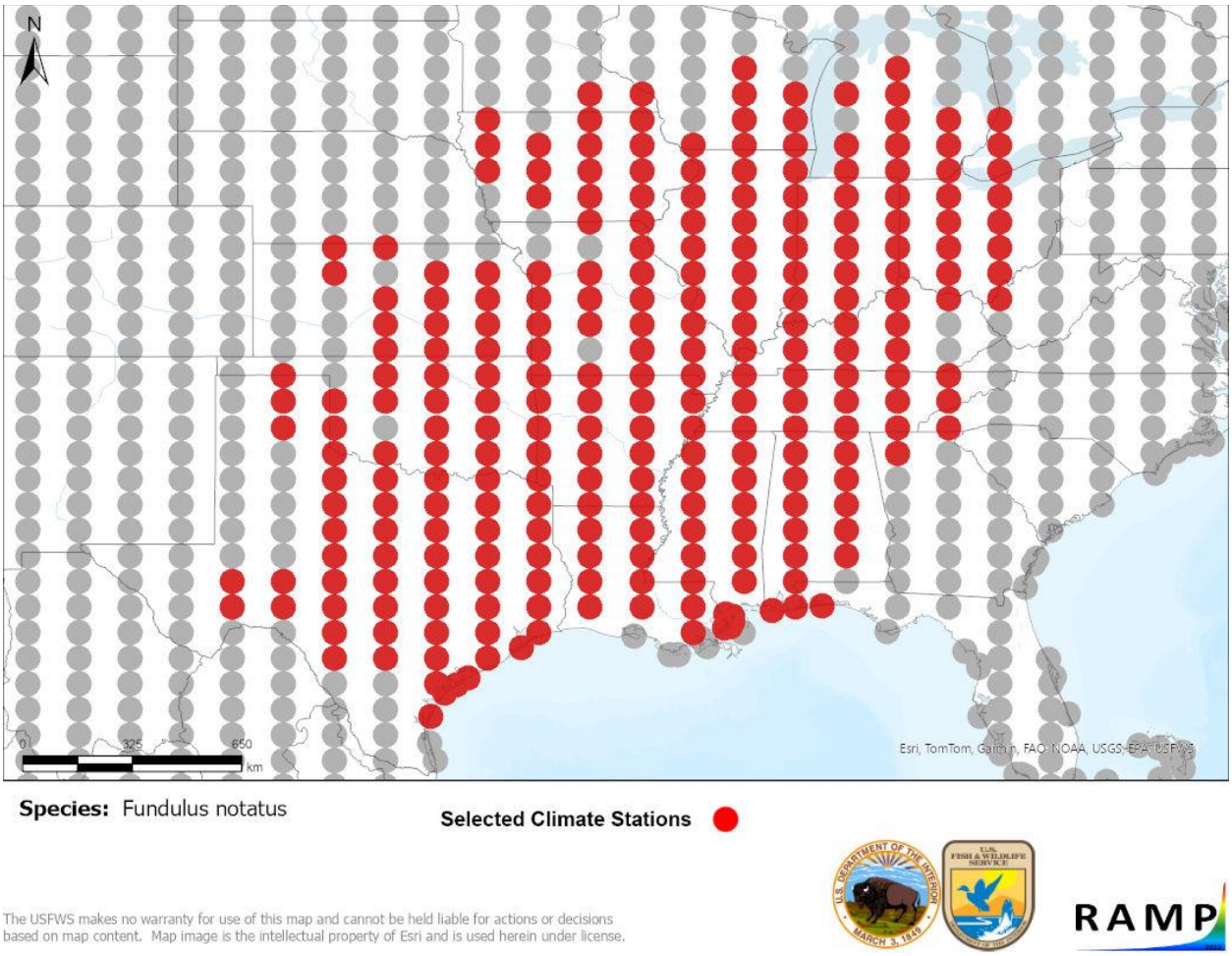

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in the Gulf of Mexico drainages from Alabama to Texas, extending northward in the Mississippi River to the Midwest, including the Lake Michigan and Lake Erie watershed, and southern Ontario, Canada near Lake St. Clair selected as source locations (red; Alabama, Arkansas, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, Texas) and non-source locations (gray) for *Fundulus notatus* climate matching. Source locations are from GBIF Secretariat (2022) and COSEWIC (2012). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

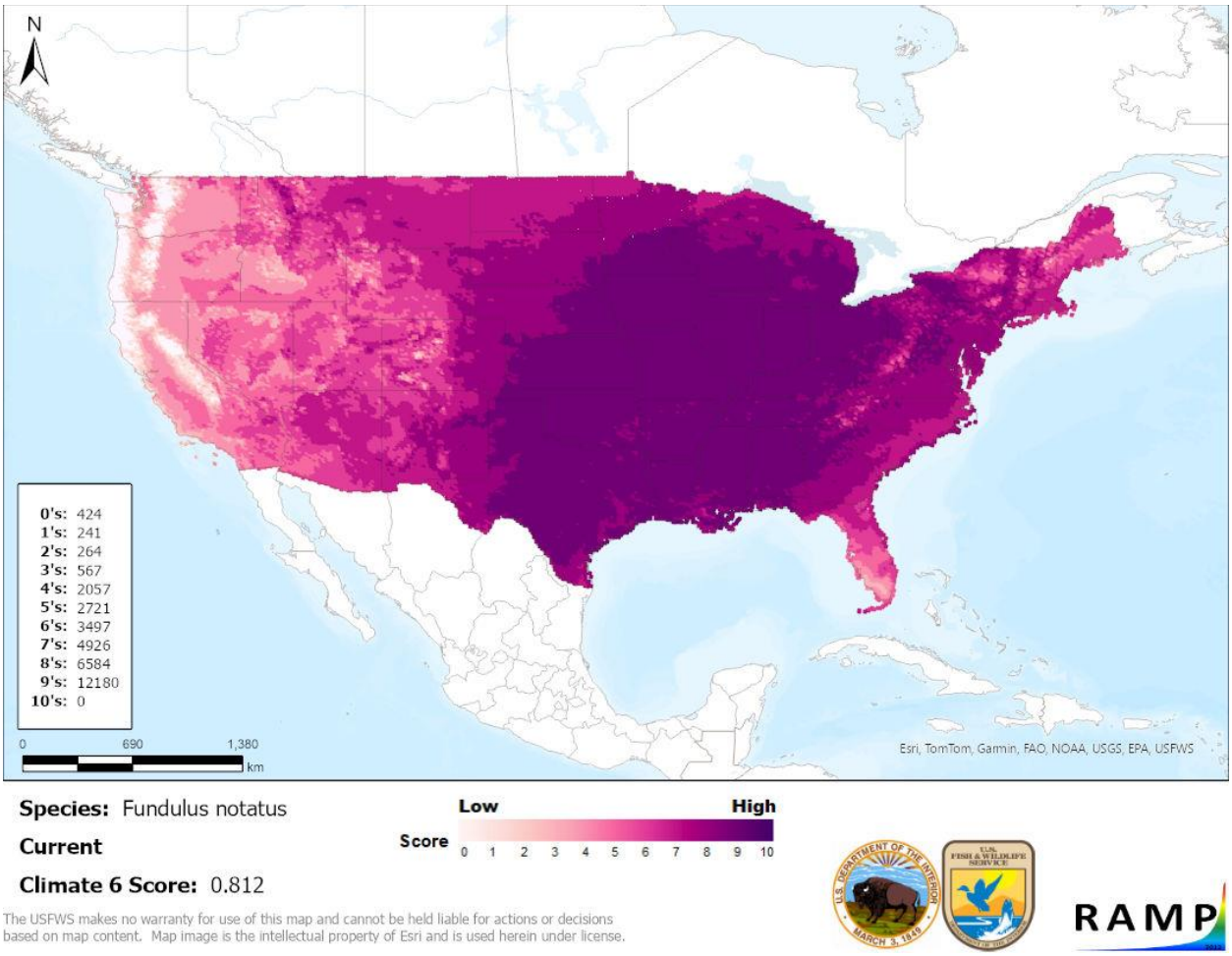

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Fundulus notatus* in the contiguous United States based on source locations reported by GBIF Secretariat (2022) and COSEWIC (2012). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Fundulus notatus* is classified as Low. Information was available on the biology, ecology, and distribution of *F. notatus*, however, no information was available on actual impacts of introduction, and minimal information was available on the use of *F. notatus* in trade.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Fundulus notatus, Blackstripe Topminnow, is a freshwater fish that is native to the south-central and southeastern regions of the contiguous United States, along the Gulf coast from Texas to Alabama and up the Mississippi River to the Midwest region, and into southern Ontario, Canada. *F. notatus* is found in quiet surface waters such as pools of creeks and streams, ponds, lakes and swamps and prefer areas with submerged and emergent aquatic vegetation. They are tolerant of

high temperatures and low oxygenated waters. They are not often targeted by anglers but are common in the aquarium trade. *F. notatus* has been introduced to watersheds adjacent to its native range. The History of Invasiveness for *F. notatus* is classified as Data Deficient due a 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. Areas of high match were found in the south-central and southeastern regions, along the Gulf coast, and spanning upward to the Midwest regions of the United States, which encompasses this species' native range. The Certainty of Assessment is classified as Low due to lack of information regarding impacts of introduction and trade. The Overall Risk Assessment Category for *Fundulus notatus* 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.

Arkansas Game and Fish Commission. 2022. Certain exotic species prohibited. Arkansas Game and Fish Commission Code Book 26.13.

COSEWIC. 2012. COSEWIC assessment and status report on the blackstripe topminnow *Fundulus notatus* in Canada. Ottawa, Ontario: Committee on the Status of Endangered Wildlife in Canada.

Fricke R, Eschmeyer WN, van der Laan R, editors. 2023. Eschmeyer's catalog of fishes: genera, species, references. California Academy of Science. Available: http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp (March 2023).

Froese R, Pauly D, editors. 2023. *Fundulus notatus* (Rafinesque, 1820). FishBase. Available: https://www.fishbase.us/summary/SpeciesSummary.php?ID=3197&AT=blackstripe+topminnow (March 2023).

Fuller P. 2023. *Fundulus notatus* (blackstripe topminnow). Gainesville, Florida: U.S. Geological Survey, Nonindigenous Aquatic Species Database. Available: https://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=690 (March 2023).

GBIF Secretariat. 2022. GBIF backbone taxonomy: *Fundulus notatus* (Rafinesque, 1820). Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/5203690.

GBIF-US. 2023. Species occurrences: *Fundulus notatus*. Available: https://www.gbif.us/data/?taxonKey=5203690&view=MAP (March 2023).

Hawaii Department of Agriculture. 2019. Non-domestic animal import rules. Hawaii Administrative Rules Chapter 4-71.

[ITIS] Integrated Taxonomic Information System. 2023. *Fundulus notatus* (Rafinesque, 1820). Reston, Virginia: Integrated Taxonomic Information System. Available: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=165663#null (March 2023).

Jonah's Aquarium. 2023. *Fundulus notatus*, blackstripe topminnow. Jonah's Aquarium. Available: http://jonahsaquarium.com/jonahsite/fishlist.htm (March 2023).

NatureServe. 2023. NatureServe Explorer: an online encyclopedia of life. Arlington, Virginia: NatureServe. Available: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.100269/Fundulus_notatus (March 2023).

Poelen JH, Simons JD, Mungall CJ. 2014. Global Biotic Interactions: an open infrastructure to share and analyze species-interaction datasets. Ecological Informatics 24:148–159.

Sanders S, Castiglione C, Hoff M. 2023. Risk Assessment Mapping Program: RAMP. Version 5.0. U.S. Fish and Wildlife Service.

[USFWS] U.S. Fish and Wildlife Service. 2024. Standard operating procedure: how to prepare an "Ecological Risk Screening Summary." Version 3.

Utah Division of Wildlife Resources. 2020. Collection, importation, possession (CIP). Administrative rule R657-3.

World Organisation for Animal Health. 2023. Animal diseases. Paris: World Organisation for Animal Health. Available: https://www.woah.org/en/what-we-do/animal-health-and-welfare/animal-diseases/ (March 2023).

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.

Becker GC 1983. Fishes of Wisconsin. Madison: University of Wisconsin Press.

Etnier DA, Starnes WC. 1993. The fishes of Tennessee. Knoxville: University of Tennessee Press.

Huber JH. 1996. Killi-Data 1996. Updated checklist of taxonomic names, collecting localities and bibliographic references of oviparous Cyprinodont fishes (Atherinomorpha, Pisces). Paris, France: Société Française d'Ichtyologie, Muséum National d'Histoire Naturelle.

Hugg DO. 1996. MAPFISH georeferenced mapping database. Freshwater and estuarine fishes of North America. Life Science Software. Edgewater, Maryland: Dennis O. and Steven Hugg.

Lee DS, Gilbert CR, Hocutt CH, Jenkens RE, McAllister DE, Stauffer JR Jr. 1980. Atlas of North American freshwater fishes. Raleigh: North Carolina State Museum of Natural History.

Page LM, Burr BM. 1991. A field guide of freshwater fishes of North America north of Mexico. Boston: Houghton Mifflin Company. The Peterson Field Guide Series 42.

Page LM, Burr BM. 2011. Peterson field guide to freshwater fishes of North America north of Mexico. Second edition. Boston: Houghton Mifflin Harcourt.

Trautman MB. 1981. The fishes of Ohio. Columbus: Ohio State University Press.

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 (2022) and COSEWIC (2012).

Under the future climate scenarios (figure A1), on average, high climate match for *Fundulus notatus* was projected to occur in the Appalachian Range, Great Lakes, Gulf Coast, Mid-Atlantic, Northeast, Northern Plains, Southeast, and Southern Plains regions of the contiguous United States. Areas of high match decrease with time and from SSP3 to SSP5. Areas of low climate match were projected to occur in the Northern Pacific Coast region and along the Sierra-Nevada Range. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.802 (model: MPI-ESM1-2-HR, SSP5, 2085) to a high of 0.845 (model: IPSL-CM6A-LR, SSP5, 2055). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species outside its native range. The Climate 6 score for the current climate match (0.812, 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 SSP3, 2055 (figure A3). Under multiple time step and climate scenarios, areas within the Colorado Plateau, Great Basin, Northeast, 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 multiple time step and climate scenarios, areas within the Appalachian Range, Gulf Coast, Mid-Atlantic, Southeast, 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. The degree of change increased with time. The areas of decrease in match also got larger with time and from SSP3 to SSP5.

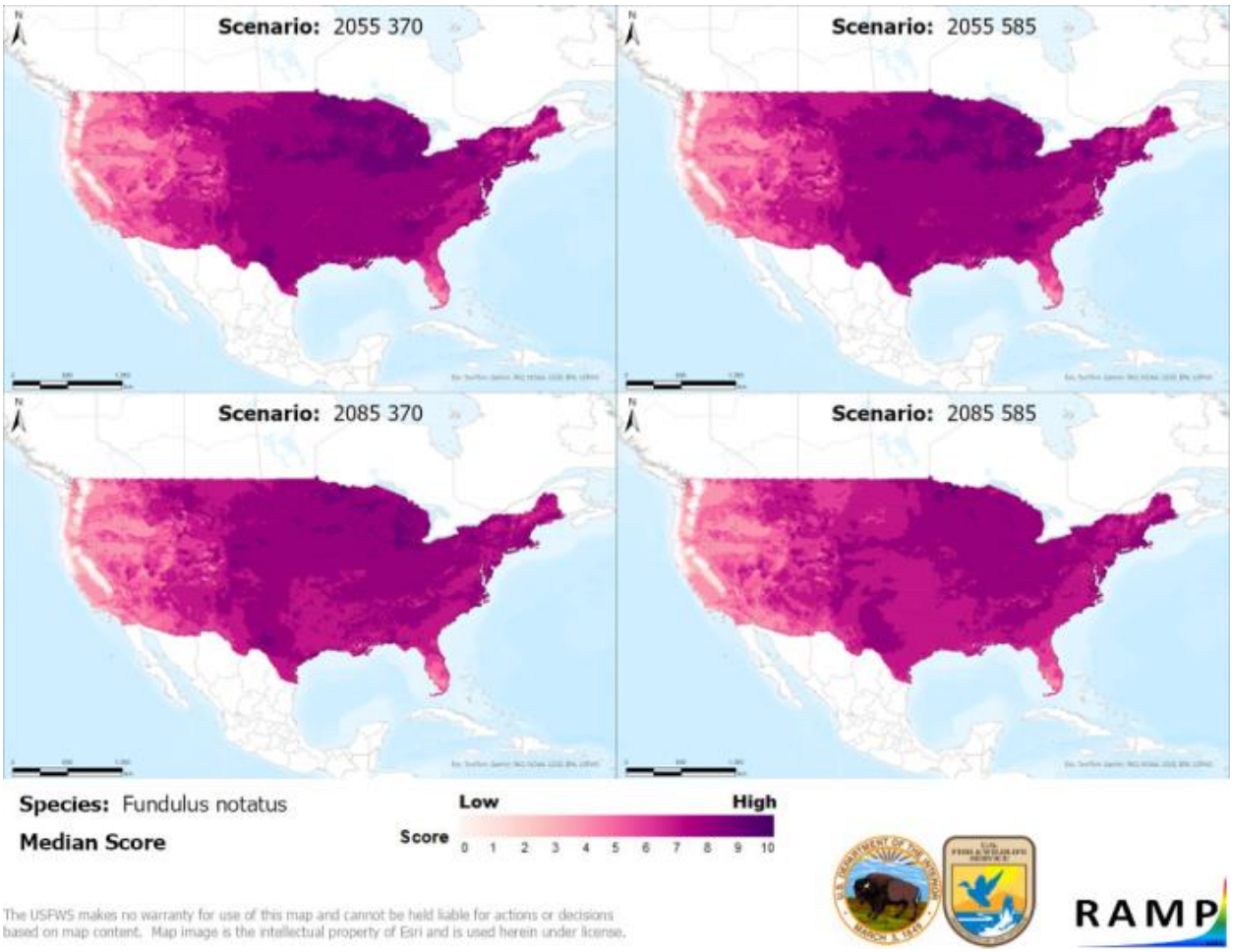

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Fundulus notatus* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2022) and COSEWIC (2012). 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.

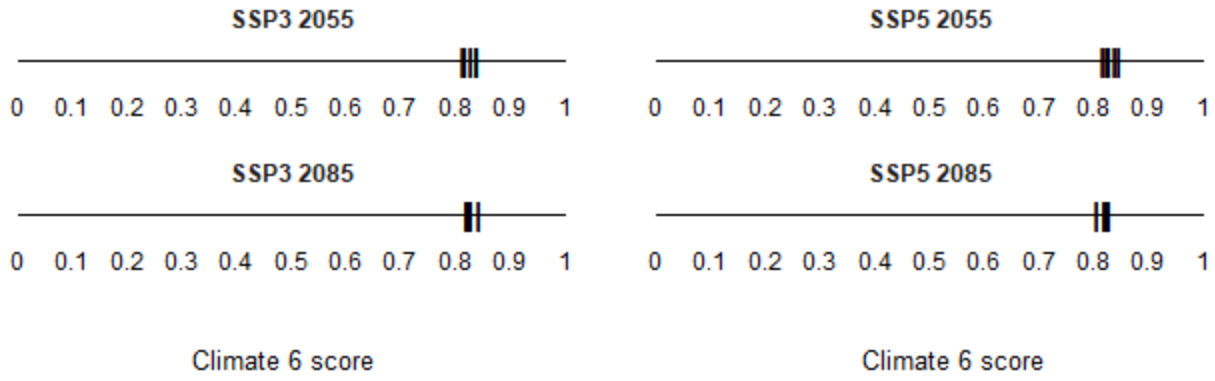

Figure A2. Comparison of projected future Climate 6 scores for *Fundulus notatus* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC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

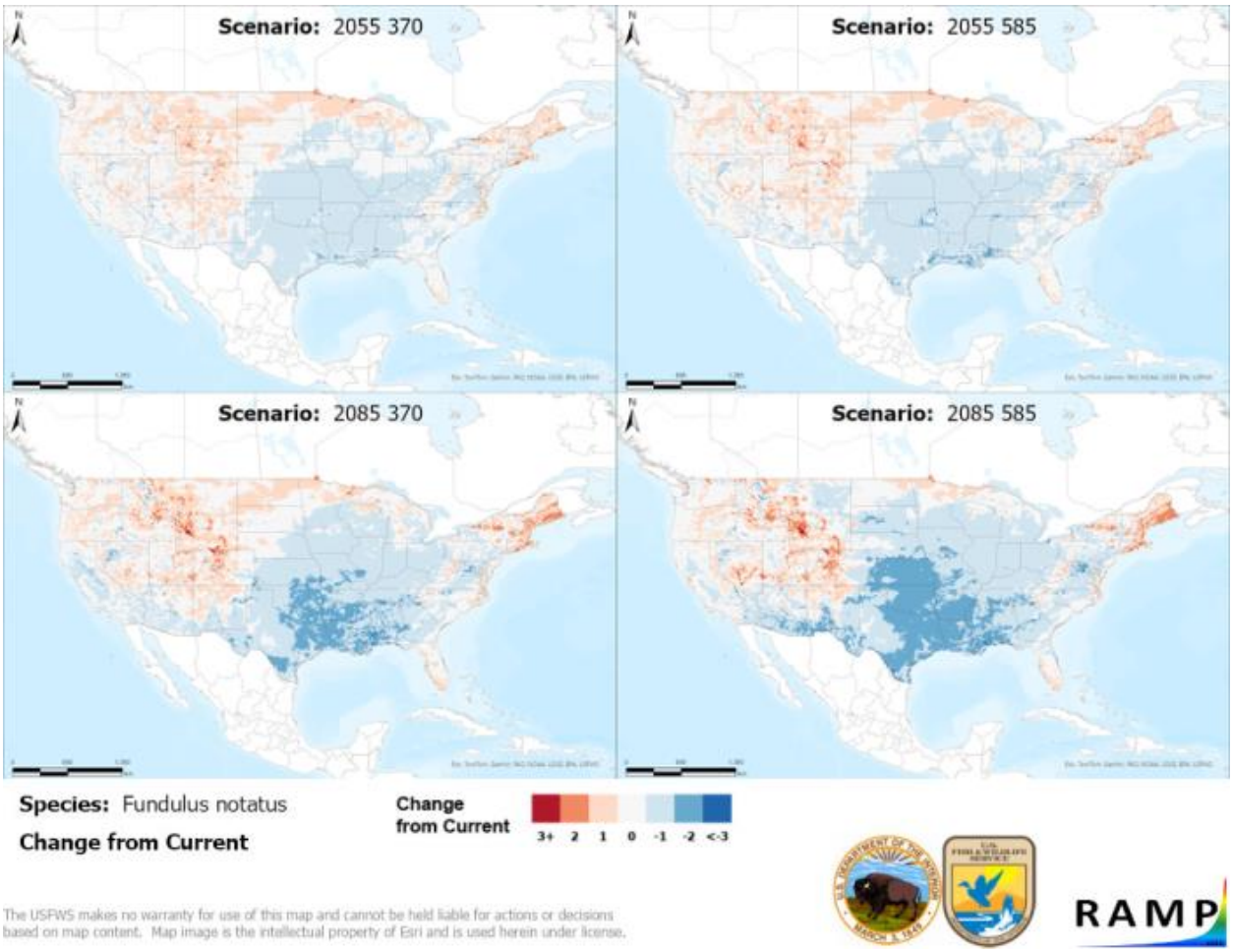

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Fundulus notatus* based on source locations reported by GBIF Secretariat (2022) and COSEWIC (2012). 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

COSEWIC. 2012. COSEWIC assessment and status report on the Blackstripe Topminnow *Fundulus notatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, Ontario 29pp.

GBIF Secretariat. 2022. GBIF backbone taxonomy: *Fundulus notatus* (Rafinesque, 1820). Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/5203690.

[IPCC] Intergovernmental Panel on Climate Change. 2021. Climate change 2021: the physical science basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

Karger DN, Conrad O, Böhner J, Kawohl T, Kreft H, Soria-Auza RW, Zimmermann NE, Linder P, Kessler M. 2017. Climatologies at high resolution for the Earth land surface areas. Scientific Data 4:170122.

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.

Sanders S, Castiglione C, Hoff M. 2023. Risk Assessment Mapping Program: RAMP. Version 5.0. U.S. Fish and Wildlife Service.