Redeye Bass (*Micropterus coosae*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, January 2023
Revised, March 2023, March 2024
Web Version, 5/2/2024

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

Photo: Peter Wilson. Licensed under Creative Commons (CC BY-NC 4.0). Available: https://www.inaturalist.org/observations/100456882 (January 2023).

1 Native Range and Status in the United States

Native Range

From Baker et al. (2013):

"[…] endemic to the Coosa River System in the Piedmont region of east Alabama and west Georgia […]"

Status in the United States

From Baker et al. (2013):

"[…] endemic to the Coosa River System in the Piedmont region of east Alabama and west Georgia […]"

From Valente et al. (2021):

"We report genetic and morphological evidence for the presence of Redeye Bass *Micropterus coosae*, in the Verde River of Arizona, previously thought to be Smallmouth Bass *Micropterus dolomieu*. […] These results support the hypothesis that at least one of the introductions of black bass in Arizona's Verde River founded a previously unrecognized population of Redeye Bass."

It is unknown whether the following reports of introductions of *M. coosae* refer strictly to that species or to one of the other species recently described (or recognized but undescribed; see Remarks).

From NatureServe (2013):

"Introduced in Altamaha River, Georgia; Sisquoc River, California; Puerto Rico; Arkansas; upper Cumberland River drainage, Kentucky, and elsewhere below Fall Line [i.e., in the coastal plain] in southeastern U.S. (Lee et al. 1980, Page and Burr 1991)."

According to Fuller et al. (2023), nonindigenous occurrences of the *Micropterus coosae* species group have been reported in the following U.S. jurisdictions. Range of observation years, number of watersheds (8-digit hydrologic unit), and population status ("established" status indicates record of establishment in at least one watershed) in parentheses.

- Alabama (1972-2015; Guntersville Lake, Middle Chattachoochee-Lake Harding, Middle Chattahoochee-Walter F; Established)
- Arizona (2018; Upper Verde; Unknown)
- Arkansas (1973-1988; Spring; Established)
- California (1963-1986; California Region, Honcut Headwaters-Lower Feather, Lower American, San Joaquin, Santa Ana, Santa Margarita, Santa Maria, Truckee, Upper Stanislaus, Upper Yuba; Established)
- Florida (1960; Apalachicola; Unknown)
- Georgia (1929-2015; Etowah, Hiwassee, Middle Chattahoochee-Lake Harding, Middle Tennessee-Chickamauga, Ocoee, Saluda, Upper Chattahoochee, Upper Flint, Upper Ocmulgee, Upper Oconee, Upper Ogeechee; Established)
- Kentucky (1950-1986; Lower Levisa, Upper Cumberland; Established)
- North Carolina (1991-2015; Nolichucky, Upper Broad, Upper Catawba, Upper French Broad, Upper Tennessee; Established)
- Puerto Rico (1963-2007; Cibuco-Guajataca, Culebrinas-Guanajibo, Puerto Rico; Established)
- South Carolina (2015; Enoree; Established)

- Tennessee (1940-1999; Caney, Emory, Hiwassee, Middle Tennessee-Chickamauga, Ocoee, Upper Cumberland-Cordell Hull Reservoir; Established)
- Texas (1992; Texas-Gulf Region; Established)

From Fuller et al. (2023):

"Introduced into California between 1962 and 1964 (Moyle [1976]). Goodson ([1966]) gave exact dates and numbers of fish introduced. Introduced into Kentucky around 1950 with stock obtained from Georgia (Burr and Warren 1986). Populations in the Hiwassee system in Tennessee are the result of introductions in 1943 (MacCrimmon and Robbins 1975; Etnier and Starnes 1993). Populations in the Cumberland Plateau were introduced in 1953 (MacCrimmon and Robbins 1975; Etnier and Starnes 1993)."

"Status: Presumably extirpated in Arkansas (Robison and Buchanan 1988). In California, only the Sisquoc River introduction was successful (Moyle [1976]). This location was the only one in California to receive a sizeable number of stocked fish (Goodson [1966]). Established in Georgia (Dahlberg and Scott 1971a, 1971b; Page and Burr 1991), Kentucky (Burr and Warren 1986), and Tennessee (Etnier and Starnes 1993). Unknown in North Carolina."

No individuals of *Micropterus coosae* were found for sale in the United States.

Regulations

Micropterus spp. other than *M. salmoides* and *M. dolomieu* are listed as potentially dangerous fish and are prohibited in New Jersey (New Jersey Division of Fish and Wildlife 2022).

While every effort has been made to list all applicable State laws and regulations pertaining to this species, this list may not be comprehensive.

Means of Introductions within the United States

From Fuller et al. (2023):

"Intentional stocking for sportfishing."

From Baker et al. (2013):

"Because *M. coosae* is a game species, the possibility of introductions across drainage boundaries was considered, but no evidence of such human-mediated transfers was observed [within the native range of the *M. coosae* complex, see Remarks], and no records supporting such transfers were found, except those involving stocking outside the native range of the *M. coosae* complex, such as in Tennessee and Kentucky river systems (Etnier & Starnes 1993)."

Remarks

From Baker et al. (2013):

"The Redeye Bass, *Micropterus coosae*, was described from the Mobile River basin, Chattahoochee, and Savannah rivers in Alabama and Georgia, USA, by Hubbs and Bailey (1940). At that time the authors recognized significant variation in the Black Warrior River population, and noted that with further study this form may be recognized as a separate taxon. An examination of variation in morphology and mitochondrial DNA supported this observation, and highlighted additional species-level variation, resulting in descriptions of a total of four new species: *Micropterus cahabae*, new sp., restricted to the Cahaba River system; *Micropterus tallapoosae*, new sp., restricted to the Tallapoosa River system; *Micropterus warriorensis*, new sp., from the Black Warrior River system; and *Micropterus chattahoochae*, new sp., from the Chattahoochee River system. *Micropterus coosae* is restricted to the Coosa River system. The new species differ from each other and from *M. coosae* by a combination of pigmentation and scale count characteristics, development of the tooth patch, and divergence within the ND2 gene."

From Freeman et al. (2015):

"The undescribed black basses from the Altamaha, Ogeechee, and Savannah River systems and the recently described Chattahoochee Bass (Baker et al. 2013), referred to in this paper as members of the shoal bass clade, have previously been synonymized with Redeye Bass, pending formal taxonomic description. However, the two undescribed species in Atlantic slope drainages (Altamaha, Ogeechee, and Savannah River systems) along with the Chattahoochee Bass are genetically distinct from the Redeye Bass native to the Mobile River drainage, which was described by Hubbs and Bailey (1940)."

With the recent taxonomic revisions of the *M. coosae* species group, every effort was made to base this assessment on information specific to *M. coosae* as currently described (Baker et al. 2013). In cases where the applicability of a source's information to the new description of *M. coosae* was uncertain, this uncertainty has been noted.

From Fofonoff et al. (2018):

"The fish introduced to California came from the Sheeds Creek, a tributary to the Conasauga River which is a tributary of the Coosa River (Dill and Cordone 1997), and so are likely to be *M. coosae* (Moyle 2002)."

M. coosae has been intentionally stocked outside its native range within the United States by State fishery managers to achieve fishery management objectives. State fish and wildlife management agencies are responsible for balancing multiple fish and wildlife management objectives. The potential for a species to become invasive is now one important consideration when balancing multiple management objectives and advancing sound, science-based management of fish and wildlife and their habitat in the public interest.

From Valente et al. (2021):

"The meristic results [of this study] support the hypothesis that the black bass we collected from the Verde River [Arizona] are Redeye Bass and not Smallmouth Bass [*M. dolomieu*]. […] The implications of this misidentification, possibly as far back as their introduction, include that a large body of literature on the interactions of native and nonnative fish in the Verde River needs be revisited with a strong possibility that Redeye Bass were misidentified."

From Baker et al. (2013):

"At several localities, morphologically intermediate hybrids between *M. coosae* and the sympatric *M. henshalli* were observed […]. No intermediate forms, suggestive of a contact or intergrade zone, were observed between any of the *M. coosae* species described herein [i.e., *M. cahabae*, *M. tallapoosae*, *M. warriorensis*, *M. chattahoochae*, *M. coosae*]."

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 Perciformes
Suborder Percoidei
Family Centrarchidae
Genus *Micropterus*
Species *Micropterus coosae* (Hubbs and Bailey, 1855)

According to Fricke et al. (2023), *Micropterus coosae* is the current valid name for this species.

Size, Weight, and Age Range

From Baker et al. (2013):

"*Micropterus coosae* is a small species of bass that attains 360 mm SL and 0.7 kg."

Environment
From Froese and Pauly (2022):

"Inhabits rocky runs and pools of creeks and small to medium rivers [Breder and Rosen 1966]; also found in upland streams [Etnier and Starnes 1993]."

"Freshwater; demersal."

From Fofonoff et al. (2018):

"Exact temperature tolerances are not published, but these fish tolerate cool winters and warm summers. […] they tolerate higher temperatures than trout […] They have not been reported from brackish water."

Climate
From Froese and Pauly (2022):

"Temperate"

Distribution Outside the United States
Native
The native range of *Micropterus coosae* is entirely within the United States, see Native Range in Section 1.

Introduced
No records were found for introduction of *Micropterus coosae* in the wild outside of the United States.

Means of Introduction Outside the United States
No records were found of introduction of *Micropterus coosae* in the wild outside of the United States.

Short Description
From Warren (2009):

"Elongate body […] increasing with size. Mouth large, terminal, lower jaw slightly projecting, upper jaw extends little or not at all beyond posterior edge of eye."

From Froese and Pauly (2022):

"[…] having red on the distal one-half of second-dorsal, caudal, and anal fins, and entire length of pectoral-fin […] and midline row of blotches partial to lacking, typically with 6 or fewer anterior vertical blotches with the remainder too diffuse to recognize as blotches or spots […]"

Biology

From NatureServe (2023):

"Opportunistic feeder; relies heavily on terrestrial insects. Also consumes aquatic insects, fishes, fish eggs, crayfish, and salamanders (Moyle 1976)."

"Spawns in late spring when temperatures rise to 17-21 C; sexually mature presumably in 2-4 years; spawning behavior similar to smallmouth bass (Moyle 1976)."

From Froese and Pauly (2022):

"Breed in shallow ponds, lakes, or creeks [Breder and Rosen 1966]. Distinct pairing [Breder and Rosen 1966]."

From Warren (2009):

"Nests are shallow, circular depressions in coarse gravel at the heads of pools (Parsons 1954). Fertilized, water-hardened eggs average 3.5 mm in diameter (Smitherman and Ramsey 1972). […] Eggs hatch in about 2 days at 22.8 °C; yolk-sac larvae are 6.0mm TL, and larvae are free swimming at 7 to 8mm TL about 5 days after hatching (Smitherman and Ramsey 1972)."

Human Uses

From Froese and Pauly (2022):

"Gamefish: yes"

From Warren (2009):

"The attractive redeye bass is regarded as a somewhat wary, but scrappy fighter in small, wadeable streams, where it provides an exciting catch on ultralight gear combined with small lures and spinners, popping bugs and flies, or natural bait (Parsons 1954; Etnier and Starnes 1993)."

Diseases

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

According to Poelen et al. (2014), *Micropterus coosae* hosts the following parasites: *Acanthocephalus alabamensis, Acolpenteron ureteroecetes, Actinocleidus, Clavunculus, Contracaecum spiculigerum, Echinochasmus donaldsoni, Haplocleidus, Leptorhynchoides apoglyphicus, Posthodiplostomum minimum,* and *Uvulifer.* It is unknown how many of these parasites have been documented in *M. coosae* as currently defined versus the earlier, broader definition of the species (see Remarks).

Threat to Humans

From Froese and Pauly (2022):

"Harmless"

3 Impacts of Introductions

Although *Micropterus coosae* has been reported as introduced and established beyond its native range, some of these populations may actually be introductions of other closely related species in the *M. coosae* species group. Only the established population in the Verde River, Arizona (Valente et al. 2021) has been confirmed, genetically and morphologically, as *M. coosae* under the current species definition.

From Fofonoff et al. (2018):

"Cavallo et al. (2014) found that removal of predators dominated by Redeye and Spotted Bass (*M. punctulatus*), enhanced the survival of tagged Chinook Salmon (*Oncorhynchus tshawytscha*) smolts."

From Fuller et al. (2023):

"Introduced predatory centrarchids [including *Micropterus coosae*] are likely responsible for the decline of native ranid frogs in California and for the decline of California tiger salamander *Ambystoma californiense* populations (Hayes and Jennings 1986; Dill and Cordone 1997)."

The importation, possession, and/or trade of *Micropterus coosae* is regulated in the following State (see Section 1 for detailed information): New Jersey (New Jersey Division of Fish and Wildlife 2022).

4 History of Invasiveness

The History of Invasiveness for *Micropterus coosae* is classified as Data Deficient. At least one established population of *M. coosae* has been confirmed in Arizona, and others may be confirmed in the future through further genetic and morphological examination. *M. coosae* is used as a gamefish and is a prohibited species in one U.S. State. Impacts of introduction have been reported for groups of species including *M. coosae*, but not for *M. coosae* alone, so the impacts of *M. coosae* cannot be isolated from the impacts of other introduced species.

5 Global Distribution

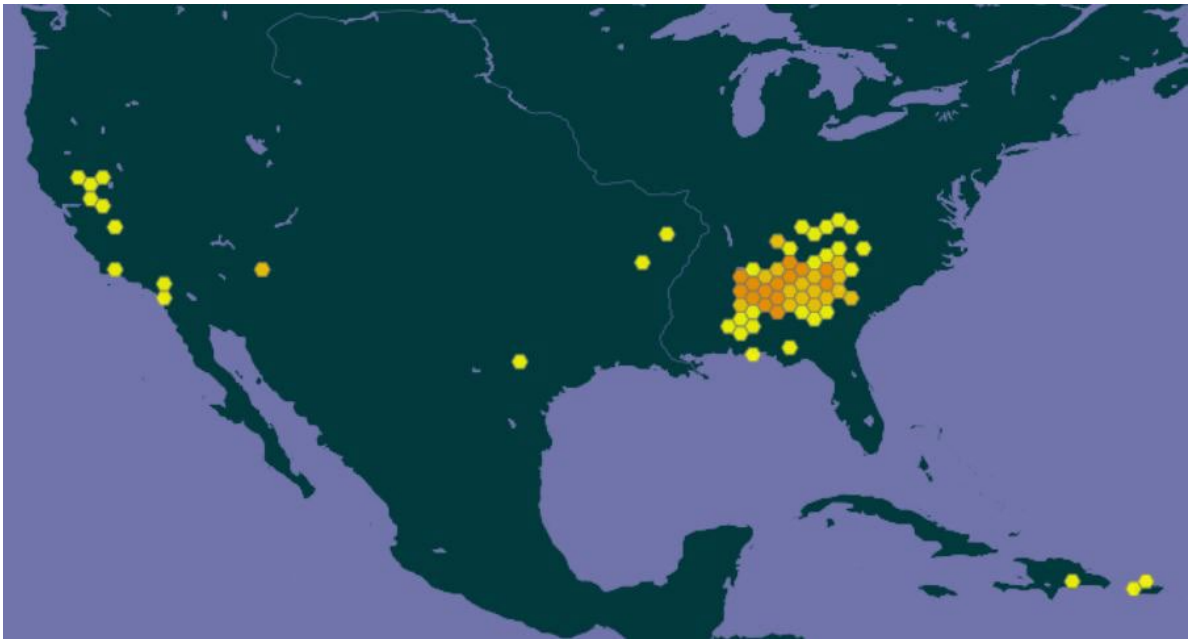

Figure 1. Reported global distribution of *Micropterus coosae*. Observations are reported from the contiguous United States, Puerto Rico, and the Dominican Republic. Map from GBIF Secretariat (2023). Points in the Dominican Republic, Arkansas, California, Puerto Rico, Texas, and areas in the southeast United States outside the Coosa River basin were excluded from the climate matching analysis as they were not confirmed to represent established populations of *M. coosae*.

6 Distribution Within the United States

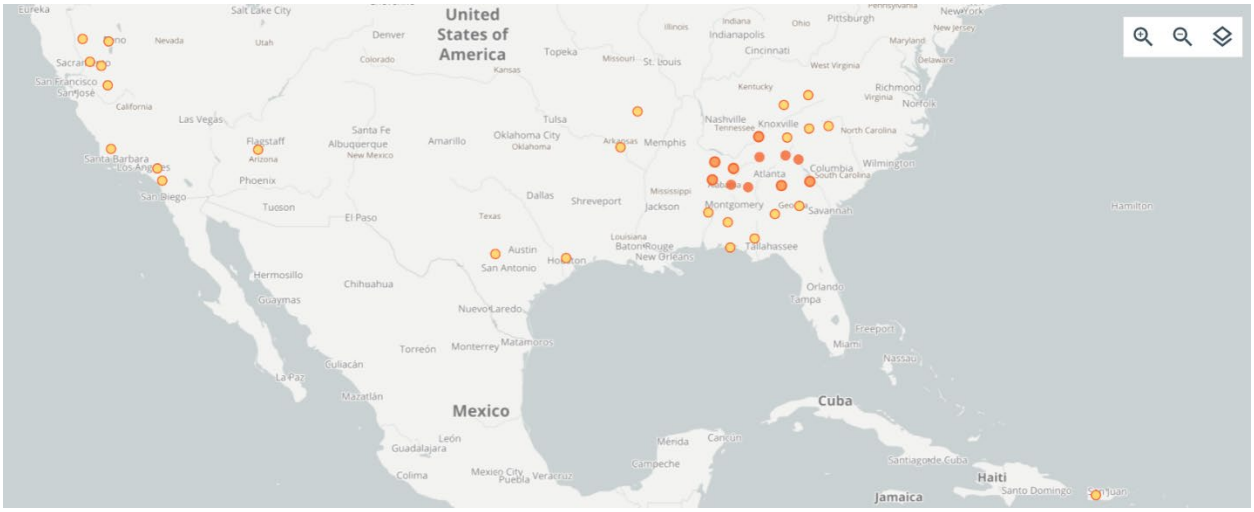

Figure 2. Reported distribution of *Micropterus coosae* in the United States. Map from GBIF-US (2024). Points in Arkansas, California, Puerto Rico, Texas, and areas in the southeastern United States outside the Coosa River basin were excluded from the climate matching analysis as they were not confirmed to represent established populations of *M. coosae*.

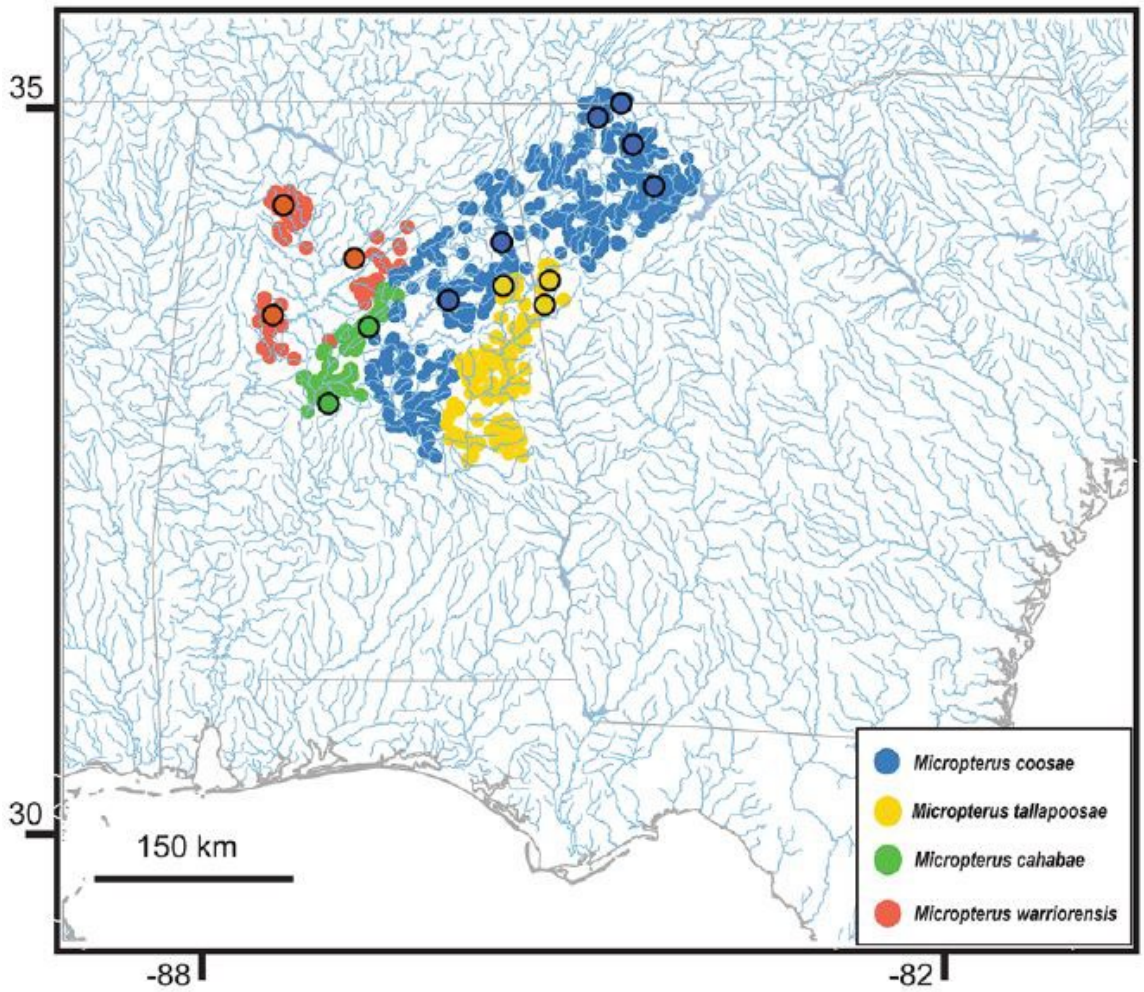

Figure 3. Reported native range of *Micropterus coosae* and three other species in the *M. coosae* species group in the southeastern United States, following redescription of *M. coosae* (Baker et al. 2013). Map from Kim et al. (2022, licensed under Creative Commons, CC-BY 4.0).

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Micropterus coosae* in the contiguous United States was high in the Southeast, including the native range of the species and extending west into Louisiana and north into the southern Ohio River basin. There were also smaller areas of high match in the Southwest, extending from western Texas to approximately northwestern Arizona. Low matches were found for the Pacific Coast, Cascade Mountains, Sierra Nevada, scattered areas of the Rocky Mountains, southern Florida, and northern New England. Medium matches were predicted across the rest of the contiguous United States. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.517, 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 *Micropterus coosae* (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.

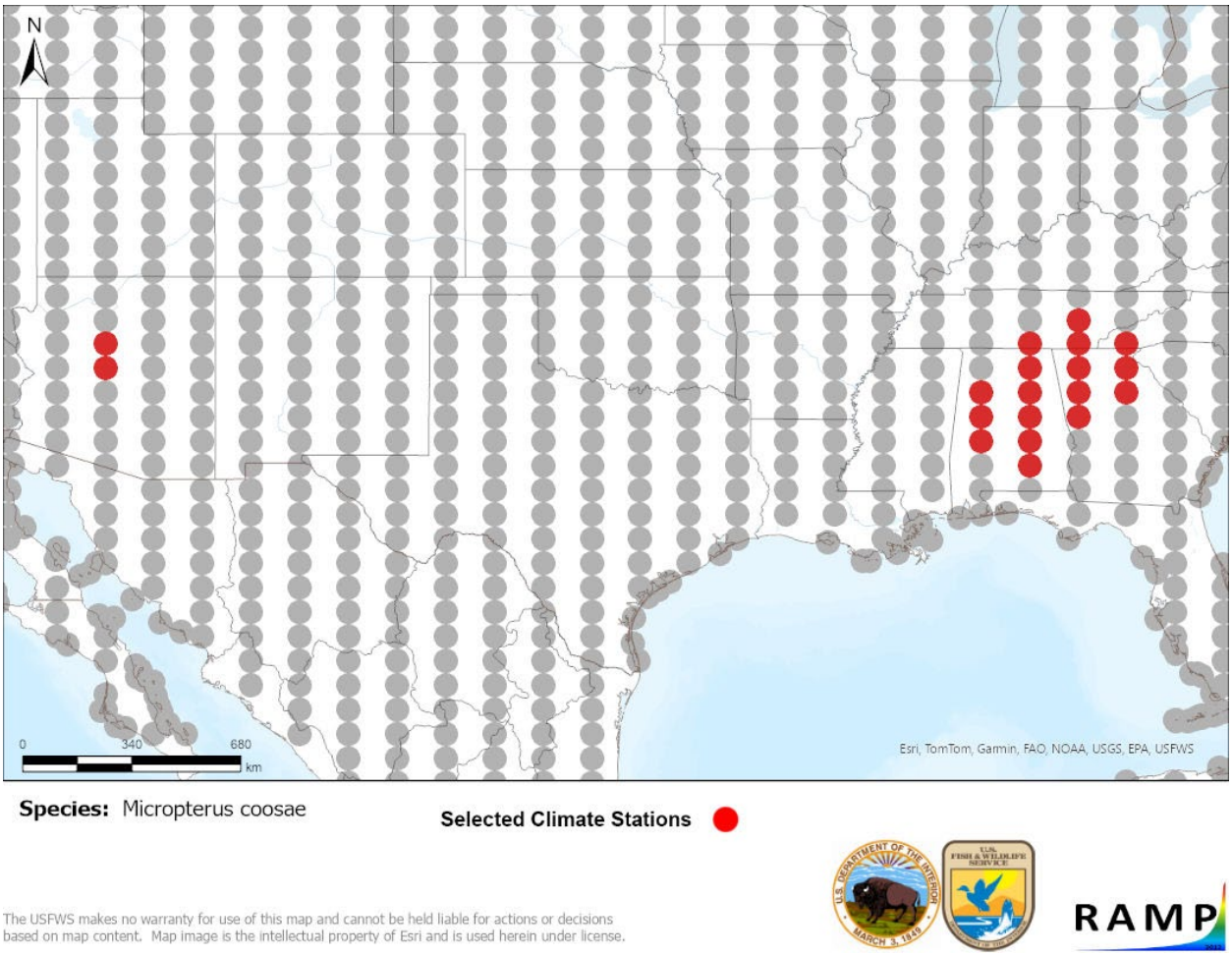

Figure 4. RAMP (Sanders et al. 2023) source map showing weather stations in the United States selected as source locations (red) and non-source locations (gray) for *Micropterus coosae* climate matching. Source locations from GBIF Secretariat (2023). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

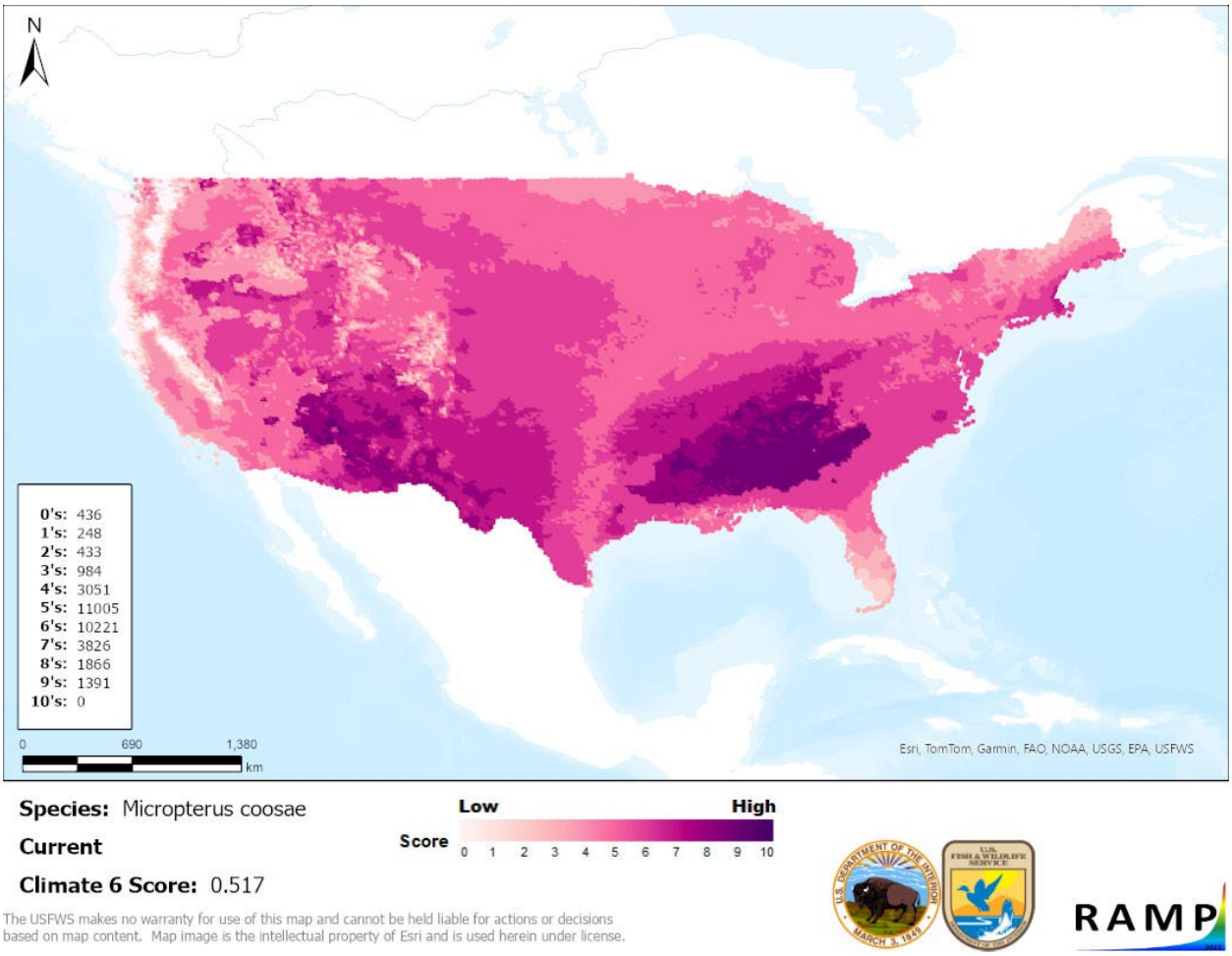

Figure 5. Map of RAMP (Sanders et al. 2023) climate matches for *Micropterus coosae* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Micropterus coosae* is classified as Low. Information is available on the biology, ecology, and distribution of *M. coosae*. However, limited information is available on actual impacts of introduction, and that information does not separate potential impacts of *M. coosae* from impacts of other introduced species. Furthermore, minimal information is available on the use of *M. coosae* in trade.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Micropterus coosae, the Redeye Bass, is a freshwater fish that is native to the Coosa River basin in the southeastern United States. *M. coosae* is relatively small compared to other species of black bass (*Micropterus* spp.) and commonly found in rocky runs and pools of creeks and in small to medium sized rivers. They are often targeted by anglers and have been stocked for

sportfishing outside of their native range in several U.S. States and Puerto Rico. However, the species *M. coosae* was recently taxonomically redefined, so some of these introductions may have involved closely related species in the *M. coosae* species group rather than *M. coosae* itself. New Jersey is the only U.S. State that regulates this species. The History of Invasiveness for *M. coosae* is classified as Data Deficient due to a lack of information regarding impacts of introduction and trade. The climate matching analysis for the contiguous United States indicates establishment concern for this species outside its native range, with the highest climate matches occurring in the Southeast and Southwest. The Certainty of Assessment for this ERSS is classified as Low due to lack of information regarding impacts of introduction and trade. The Overall Risk Assessment Category for *Micropterus coosae* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (sec. 4): Data Deficient**
- **Overall Climate Match Category (sec. 7): High**
- **Certainty of Assessment (sec. 8): Low**
- **Remarks, Important additional information:** The *M. coosae* species group underwent significant taxonomic revision in 2013.
- **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

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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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 SSP3 scenarios (figure A1), the projected future climate match for *Micropterus coosae* was highest in the Southeast and Southwest, similar to the current climate match, as well as along the northeast Atlantic coast. Under the SSP5 scenarios (figure A1), the pattern was similar except that the area of high match in the Southeast became smaller and shifted to the northeast. Areas of low climate match were projected to occur in the Northern Pacific Coast and Southern Florida regions under all future scenarios. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.390 (model: MPI-ESM1-2-HR, SSP5, 2085) to a high of 0.586 (model: GFDL-ESM4, SSP5, 2085). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there was establishment concern for this species under future climate scenarios. The Climate 6 score for the current climate match (0.517, figure 4) falls within the range of scores for future projections. At the 2085 time step, areas within the Mid-Atlantic and Northeast regions saw a large increase in the climate match relative to current conditions (figure A3). Additionally, areas within the Appalachian Range, Colorado Plateau, Great Lakes, and Western Mountains saw a moderate increase in the climate match relative to current conditions under multiple time step and SSP combinations. Under multiple time step and climate scenarios, areas within the Southeast and Southwest saw a large decrease in the climate match relative to current conditions. Additionally, areas within the Appalachian Range, California, Great Basin, Gulf Coast, Southern Atlantic Coast, and Western Mountains saw a moderate decrease in the climate match relative to current conditions. The changes relative to the current climate match increased from SSP3 to SSP 5 and from the 2055 time step to the 2085 time step.

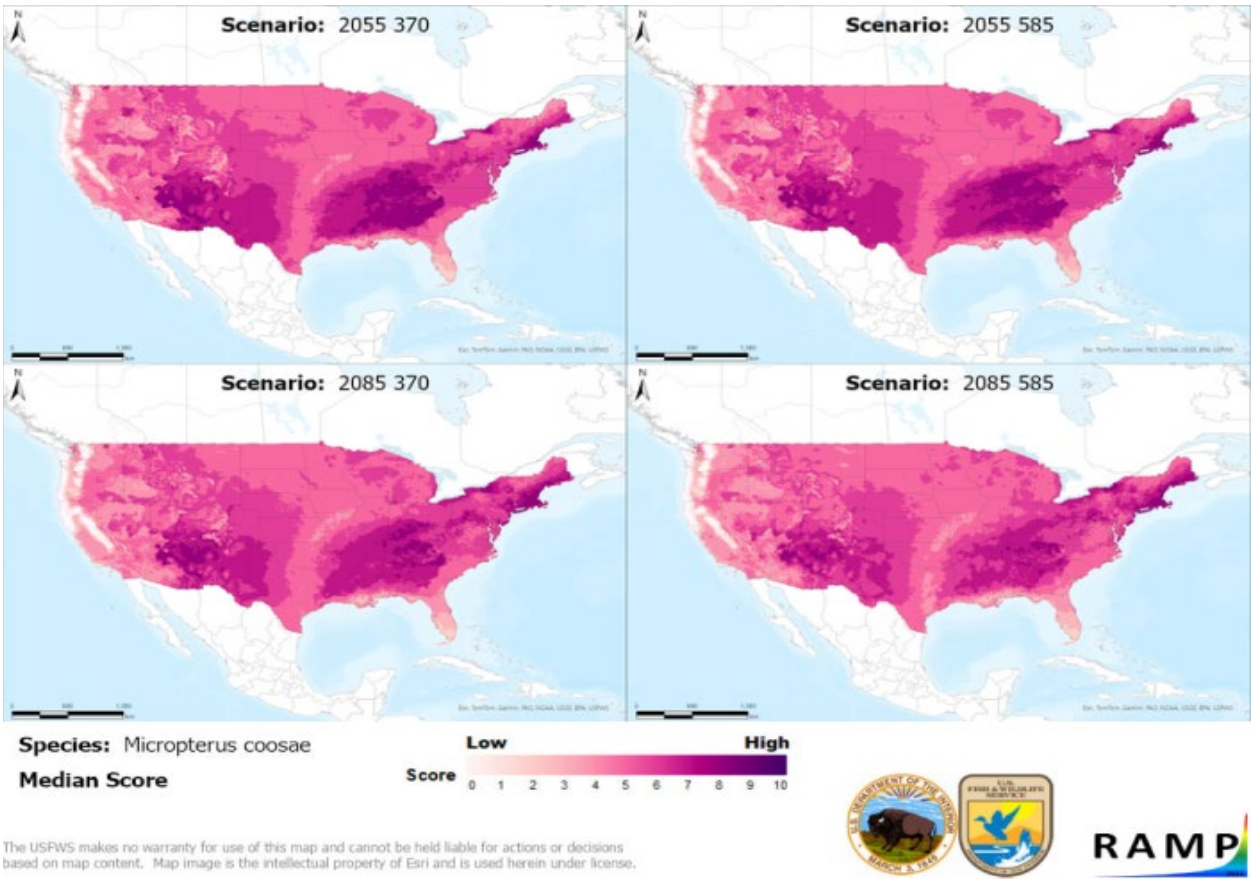

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Micropterus coosae* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023). Shared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

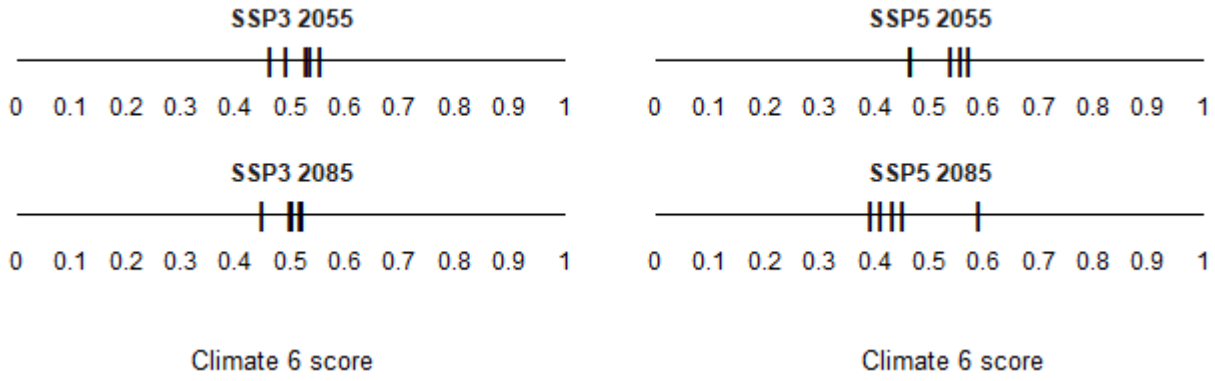

Figure A2. Comparison of projected future Climate 6 scores for *Micropterus coosae* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018;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

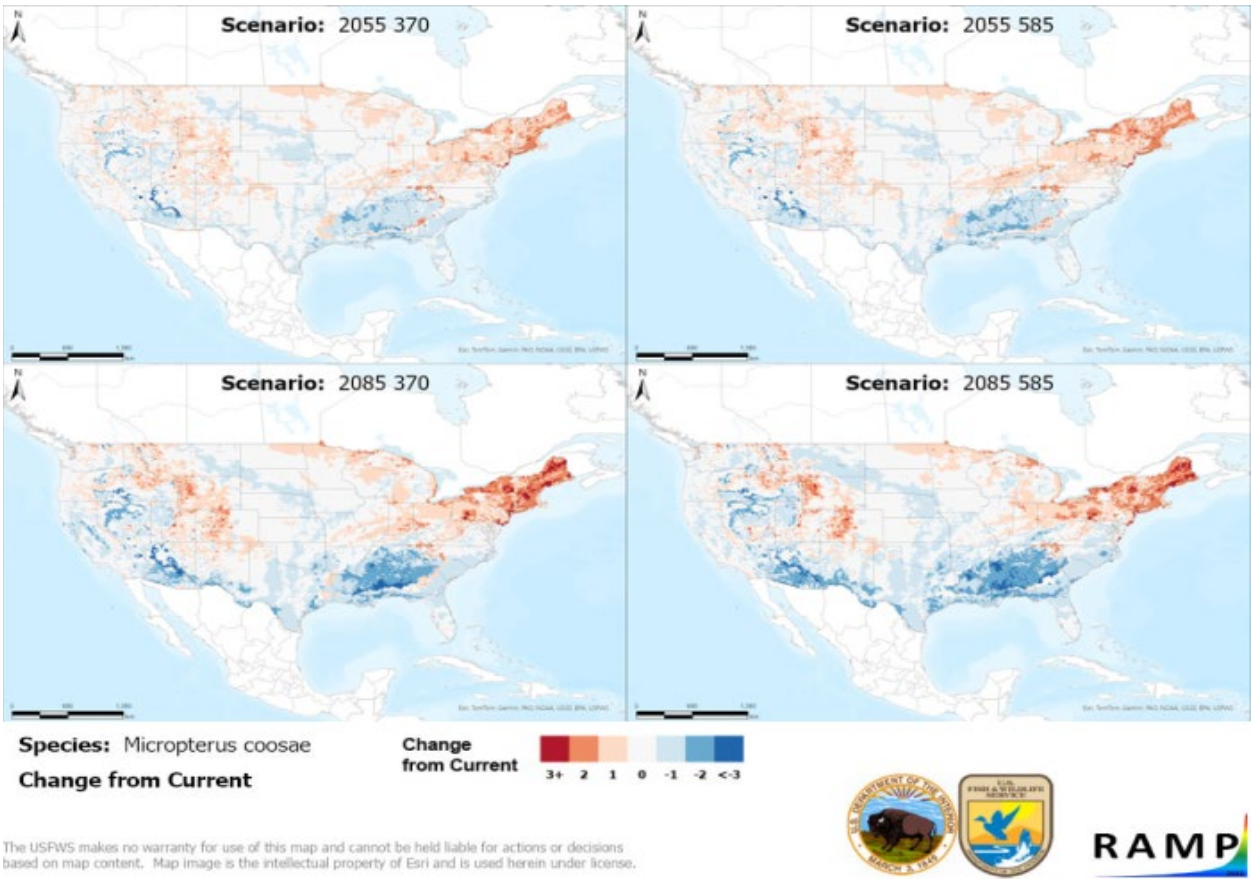

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Micropterus coosae* based on source locations reported by GBIF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

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