Cuchia (*Ophichthys cuchia*)
Ecological Risk Screening Summary

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

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

Photo: Haplochromis. Public Domain. Available: http://www.tsusinvasives.org/home/database/amphipnous-cuchia (February 2023).

1 Native Range and Status in the United States

Native Range

From Jordan et al. (2019):

"A. cuchia is native to parts of Bangladesh, India, Myanmar, Nepal, and Pakistan (Nico et al. 2019)."

From Best et al. (2022):

"The native range of *Ophichthys cuchia* includes part of Bangladesh, Bhutan, India, Myanmar, and Nepal."

Status in the United States

From Jordan et al. (2020):

"Cuchia have been introduced into several water bodies in the United States, but there has been no evidence of their establishment or reproduction in the wild (Nico et al. 2019). We herein describe the discovery of an established population of cuchia in an urban waterway in southeastern Louisiana, USA."

"In Asia, swamp eels are commonly harvested for human consumption and several Asian taxa, including cuchia, are exported alive and sold as food in ethnic food markets in the United States, Canada, and elsewhere (Nico et al 2019)"

From Best et al. (2022):

"*Ophichthys cuchia* has also been collected within six states in the USA (Louisiana, Maryland, Michigan, New Jersey, New York, and Pennsylvania) and an established invasive population exists in New Orleans (Louisiana). We provide the first record of *O. cuchia* from Texas and the second report of an established non-native population in the USA based on 26 museum vouchered specimens collected from a series of urban ponds within the Houston metro area (Fort Bend Co.)."

"It is possible that these large individuals of *O. cuchia* were purchased in local markets and then released at this location, but like Jordan et al. (2020), we are convinced that this species is reproducing within Buffalo Run Park [Texas] based on the collection of multiple smaller specimens."

From Nico et al. (2019):

"Prevalence of *A. cuchia* in US markets since 2001 indicates the species is the principal swamp eel imported, largely replacing members of the Asian complex *Monopterus albus/javanensis*. LEMIS records (July 1996–January 2017) document 972 shipments containing an estimated 832,897 live swamp eels entering the USA, although these data underestimate actual numbers due to undeclared and false reporting. LEMIS data reveal most imports originate in Bangladesh, Vietnam, and China. However, LEMIS wrongly identifies many imported swamp eels as "*Monopterus albus*"; none are identified as *A. cuchia* although specimens from Bangladesh and India are almost certainly this species. Some imported *A. cuchia* are erroneously declared on import forms as *Anguilla bengalensis*."

As noted above, this species is imported for markets as food and sold within the United States. No evidence of presence in the U.S. aquarium trade was found for this species.

Regulations

Possession of all species of Synbranchidae is regulated in Louisiana (Louisiana Revised Statutes 2022), Tennessee (TWRA 2022), Texas (TPW 2022), and Utah (Utah DWR 2020). The genus *Monopterus* is regulated in Nevada (Nevada Board of Wildlife Commissioners 2022;

Monopterus cuchia is a synonym of *Ophichthys cuchia*). Please refer back to state agency regulatory documents for details on the regulations, including restrictions on activities involving this species. While effort was made to find all applicable regulations, this list may not be comprehensive. Notably, it does not include regulations that do not explicitly name this species or its genus or family, for example, when omitted from a list of authorized species with blanket regulation for all unnamed species.

Means of Introductions within the United States

From Jordan et al. (2020):

"[…] the actual source of the cuchia population in Bayou St. John cannot be deduced with certainty and previous introductions of Asian swamp eels have been linked to the live food trade, Buddhist prayer release rituals, the pet trade, and even use of swamp eels as live bait by anglers (Nico et al. 2019)."

"In Asia, swamp eels are commonly harvested for human consumption and several Asian taxa, including cuchia, are exported alive and sold as food in ethnic food markets in the United States, Canada, and elsewhere (Nico et al. 2019)."

From Nico et al. (2019):

"The international live-food trade constitutes the major introduction pathway, a conclusion based on: (1) United States Fish and Wildlife Service's Law Enforcement Management Information System (LEMIS) database records revealing regular swamp eel imports from Asia since at least the mid-1990s; (2) surveys (2001– 2018) documenting widespread distribution of live *A. cuchia* among ethnic food markets in the USA and Canada; (3) indications that food markets are the only source of live *A. cuchia* in North America; and (4) presence of live *A. cuchia* in markets close to introduction sites. Prayer release appears to be an important pathway component, whereby religious practitioners purchase live *A. cuchia* from markets and set them free."

From Best et al. (2022):

"Our investigation of COI sequences of *O. cuchia* suggests that the potential source of the invasive Texas population was likely specimens collected in the Ganges Delta region of Bangladesh and/ or India."

Remarks

The taxonomic authorities used in this Ecological Risk Screening Summary are defined in Standard Operating Procedures, which can be found online (https://www.fws.gov/node/415801). This report follows the chosen taxonomic authority for fish, the Catalog of Fishes (Fricke et al. 2023), in treating *Ophichthys cuchia* as the valid scientific name for the subject taxon. However, there is substantial uncertainty surrounding the taxonomy of this species and several recent publications recognize either *Amphipnous cuchia* or *Monopterus cuchia* as the valid scientific name (see information below). Information for this assessment was searched for using the valid name according to Catalog of Fishes, *Ophichthys cuchia*, and the synonyms *Amphipnous cuchia* and *Monopterus cuchia.*

From Jordan et al. (2020):

"*Amphipnous cuchia* (Hamilton, 1822), also recently referred to as *Monopterus cuchia* (Hamilton, 1822) and *Ophichthys cuchia* (Hamilton, 1822), is a species of swamp eel (Actinopterygii: Synbranchiformes: Synbranchidae). Commonly referred to as cuchia (kuchia) or mud eel […]"

"The history of swamp eel taxonomy and identification is long and complicated (Nico et al. 2019 and references therein). Fortunately, many of the taxonomic problems plaguing the Synbranchidae, especially with respect to generic divisions, are expected to be resolved by the ichthyologist Tyson Roberts upon conclusion of his ongoing systematic revision of the family. Until that work is published, most modern researchers have depended on Rosen and Greenwood (1976) who recognized only four genera in the family: *Ophisternon* McClelland, 1844, *Synbranchus* Bloch, 1795, *Monopterus* Lacepède, 1800, and *Macrotrema* Regan, 1906. Tyson Roberts (Smithsonian Tropical Research Institute, pers. comm., March 2020) recognizes an additional genus, *Amphipnous* Müller, 1841, to be valid (distinct from *Monopterus*) and assigns cuchia to this group. Recently, Britz et al. (2020) proposed revival of the genus *Ophichthys* Swainson, 1839, calling for use of the combination *Ophichthys cuchia*. Roberts (pers. comm., March 2020) considers *Ophichthys* to be a nomen oblitum, a forgotten or unused name. Based on this recommendation, and consistent with Nico et al. (2019), we use the binomial combination *Amphipnous cuchia* in lieu of either *Monopterus cuchia* or *Ophichthys cuchia*."

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 Synbranchiformes
Suborder Synbranchoidei
Family Synbranchidae
Genus *Monopterus*
Species *Monopterus cuchia* (Hamilton, 1822)

The following synonyms of *Ophichthys cuchia* from ITIS (2023) were used to search for information for this report: *Monopterus cuchia, Amphipnous cuchia*.

From Fricke et al. (2023):

“Current status: Valid as *Ophichthys cuchia* (Hamilton 1822)”

Size, Weight, and Age Range

From Jordan et al. (2020):

“The species may reach maturity at 25-cm total length (TL) and is known to attain a maximum size of about 90-cm TL (Narejo et al. 2002).”

Environment

From Islam et al. (2020):

“Freshwater mud eel (FWME) (*Monopterus cuchia*), belonging to the family synbranchidae [sic] of the order synbranchiformes [sic], is commonly available in freshwater bodies such as ponds, rivers, haors, baors, canals, beels, and flood plains of Southeast Asian countries.”

From Froese and Pauly (2023):

“Freshwater; brackish; demersal.”

Climate

From Froese and Pauly (2023):

“Tropical. 40°N - 10°N”

Distribution Outside the United States

Native

From Jordan et al. (2019):

“A. cuchia is native to parts of Bangladesh, India, Myanmar, Nepal, and Pakistan (Nico et al. 2019).”

From Best et al. (2022):

“The native range of *Ophichthys cuchia* includes part of Bangladesh, Bhutan, India, Myanmar, and Nepal.”

Introduced

No records were found for introduction of *Ophichthys cuchia* in the wild outside the United States.

Means of Introduction Outside the United States

No records were found of introduction of *Ophichthys cuchia* in the wild outside the United States.

Short Description

From Miah et al. (2015b):

"The body of the freshwater mud eel, *M. cuchia* is a slender shaped streamline with a tapering tail [Jhingran and Talwar 1991]. They do not have pectoral, pelvic and dorsal fin. The dorsal and anal fins are fused with caudal or tail fins forming a single ribbon along the whole length of the fish. The gills of *M. cuchia* are reduced and the fish has a pair of air breathing organ [sic] in the form of a sac on two sides of the head [Mittal and Agarwal 1977]. A pair of supra branchial chambers are present and each contain a complicated labyrinthine organ."

From Froese and Pauly (2023):

"A rudimentary dorsal fin originates a little anterior to vertical from anus. Presence of numerous spots all over tail."

Biology

From Miah et al. (2015a):

"This freshwater mud eel are [sic] generally available in open water resources including mud holes, paddy field, pits and swamps, etc. The fish lay their eggs in the [sic] March to June each year."

From Miah et al. (2015b):

"The mud eel (*M. cuchia*) is a carnivorous and nocturnal prefers animal based food like small fishes, mollusks and worms."

From Froese and Pauly (2023):

"Obligate air-breathing [Müller et al. 2022]; Adults known to hibernate in mud during cold season [Shrestha 1990]. Feed mainly on small fishes, tadpoles and aquatic insects [Shrestha 1990]. The male guards and builds nest or burrow [Breder and Rosen 1966]."

Human Uses

From Jordan et al. (2020):

"In Asia, swamp eels are commonly harvested for human consumption and several Asian taxa, including cuchia, are exported alive and sold as food in ethnic food markets in the United States, Canada, and elsewhere (Nico et al. 2019)."

From Jahan et al. (2019):

“Due to nutrition and medicinal value, Eel is in great demand in the world market. Nutritional consideration is richer than any other fish.”

Diseases

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

Poelen et al. (2014) lists *Ophichthys cuchia* as having the following parasites: *Gnathostoma spinigerum* and *Stomachicola muraenesocis*.

From Jordan et al. (2020):

“Finally, cuchia and other Asian swamp eels imported live and introduced into the wild are a potential health risk because they are host to multiple parasites (Nico et al. 2011), including at least one non-native nematode that causes disease in humans (Cole et al. 2014).”

Threat to Humans

From Jordan et al. (2020):

“Finally, cuchia and other Asian swamp eels imported live and introduced into the wild are a potential health risk because they are host to multiple parasites (Nico et al. 2011), including at least one non-native nematode that causes disease in humans (Cole et al. 2014).”

3 Impacts of Introductions

There are records of known, nonnative populations of *Ophichthys cuchia.* However, there was no information found regarding any impacts from those introduced populations.

Ophichthys cuchia is regulated at the family level (Synbranchidae) in Louisiana (Louisiana Revised Statutes 2022), Tennessee (TWRA 2022), Texas (TPW 2022), and Utah (Utah DWR 2020). It may be regulated at the genus level under a synonym (*Monopterus*) in Nevada (Nevada Board of Wildlife Commissioners 2022). See section 1 for more information.

4 History of Invasiveness

The History of Invasiveness for *Ophichthys cuchia* is classified as Data Deficient. *Ophichthys cuchia* has become established in the United States. The species was most likely introduced through live fish markets. However, no information was found on actual impacts of introductions.

5 Global Distribution

Figure 1. Reported global distribution of *Ophichthys cuchia*. Map from GBIF Secretariat (2023). Observations are reported from mainland southeast Asia, Mexico, and the United States. The points in China, Taiwan, Mexico, Canada, and outside of Louisiana in the United States do not represent established populations and were not used in the climate matching analysis.

6 Distribution Within the United States

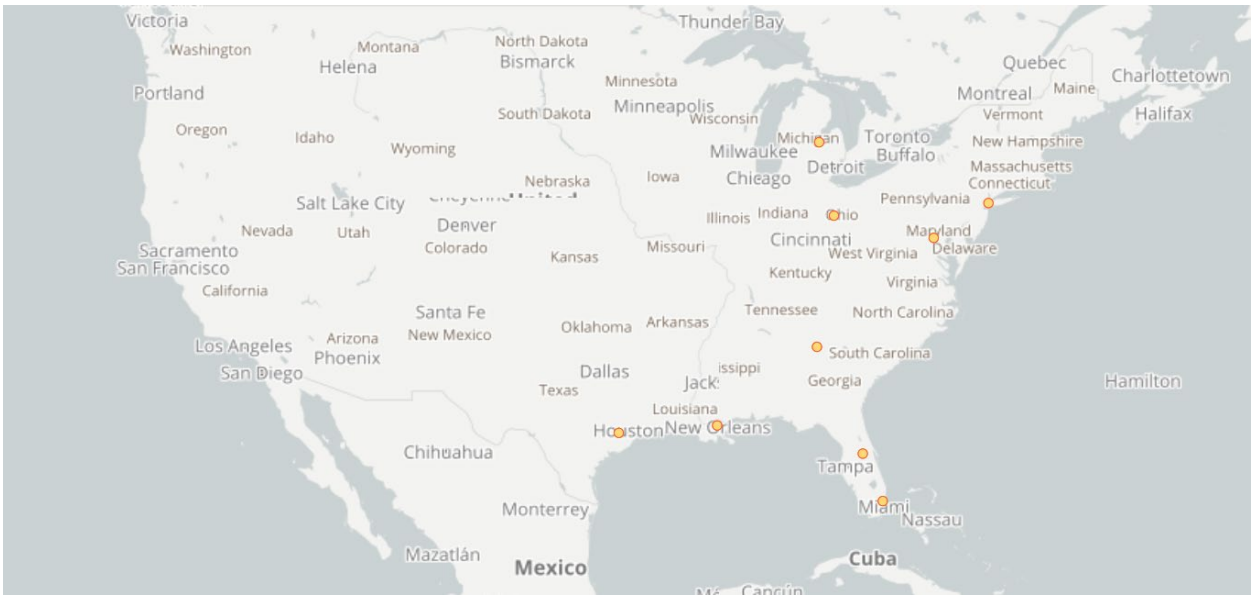

Figure 2. Reported distribution of *Ophichthys cuchia* in the United States. Map from GBIF-US (2023). Observations are reported from Louisiana and Texas. Points in South Carolina, Florida, and the Northeast and Great Lakes regions are not from established populations and were not used to select source points for the climate matching analysis.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Ophichthys cuchia* was high in the South and Southeastern United States, particularly along the Gulf Coast of Texas, Louisiana, Mississippi, Alabama, and the panhandle of Florida. The Northeast, North, and the entire Western United States all had low climate matches. The Midwest was transitionary going from high climate matching in southern States to lower climate matching in northern States. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.230, indicating that Yes, there is establishment concern for this species. The Climate 6 score is calculated as: (count of target points with scores ≥ 6)/(count of all target points). Establishment concern is warranted for Climate 6 scores greater than or equal to 0.002 based on an analysis of the establishment success of 356 nonnative aquatic species introduced to the United States (USFWS 2024).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Ophichthys cuchia* (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.

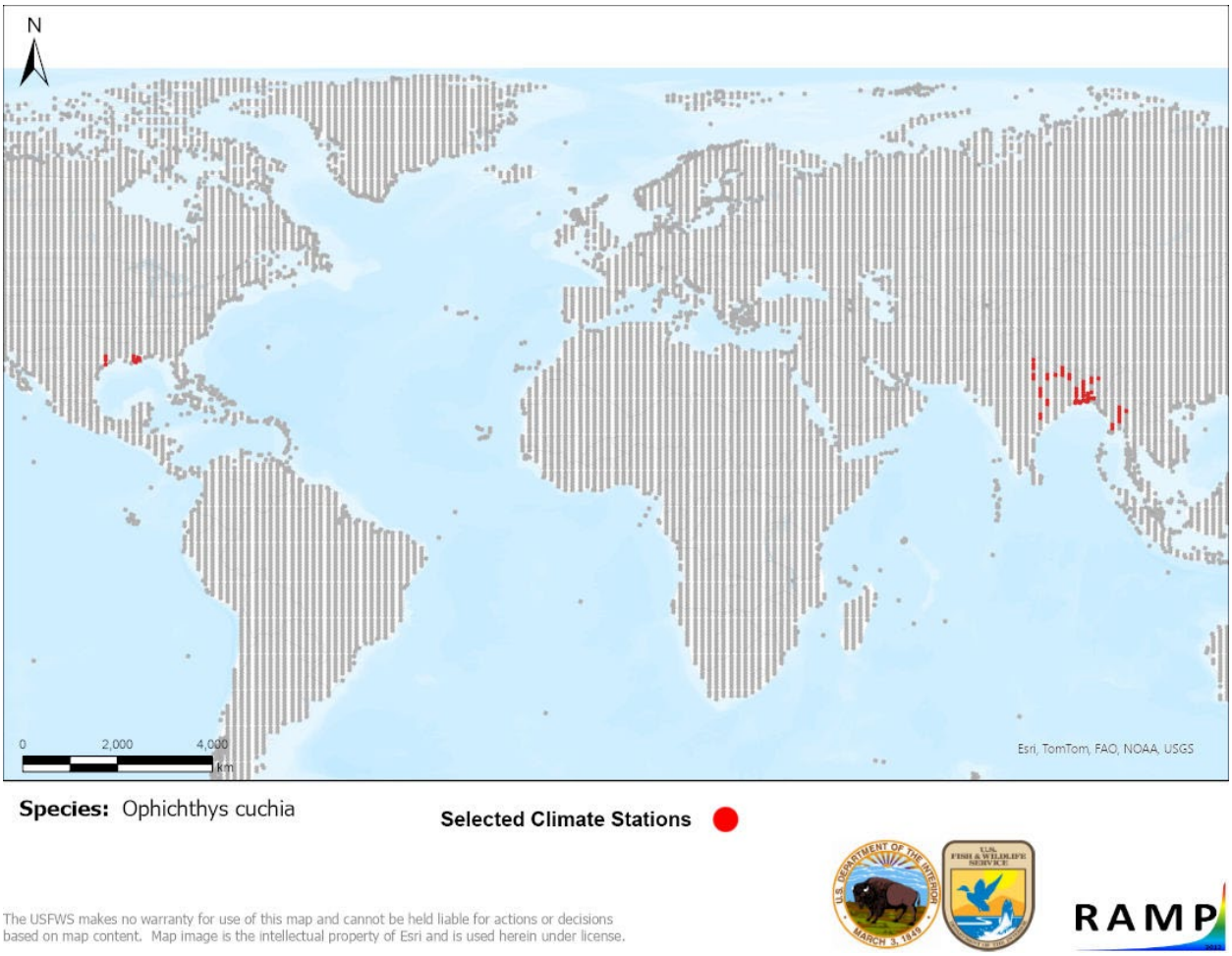

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in the world selected as source locations (red; United States, India, Nepal, Bangladesh, Myanmar) and non-source locations (gray) for *Ophichthys cuchia* climate matching. Source locations from GBIF Secretariat (2023) and GBIF-US (2023). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

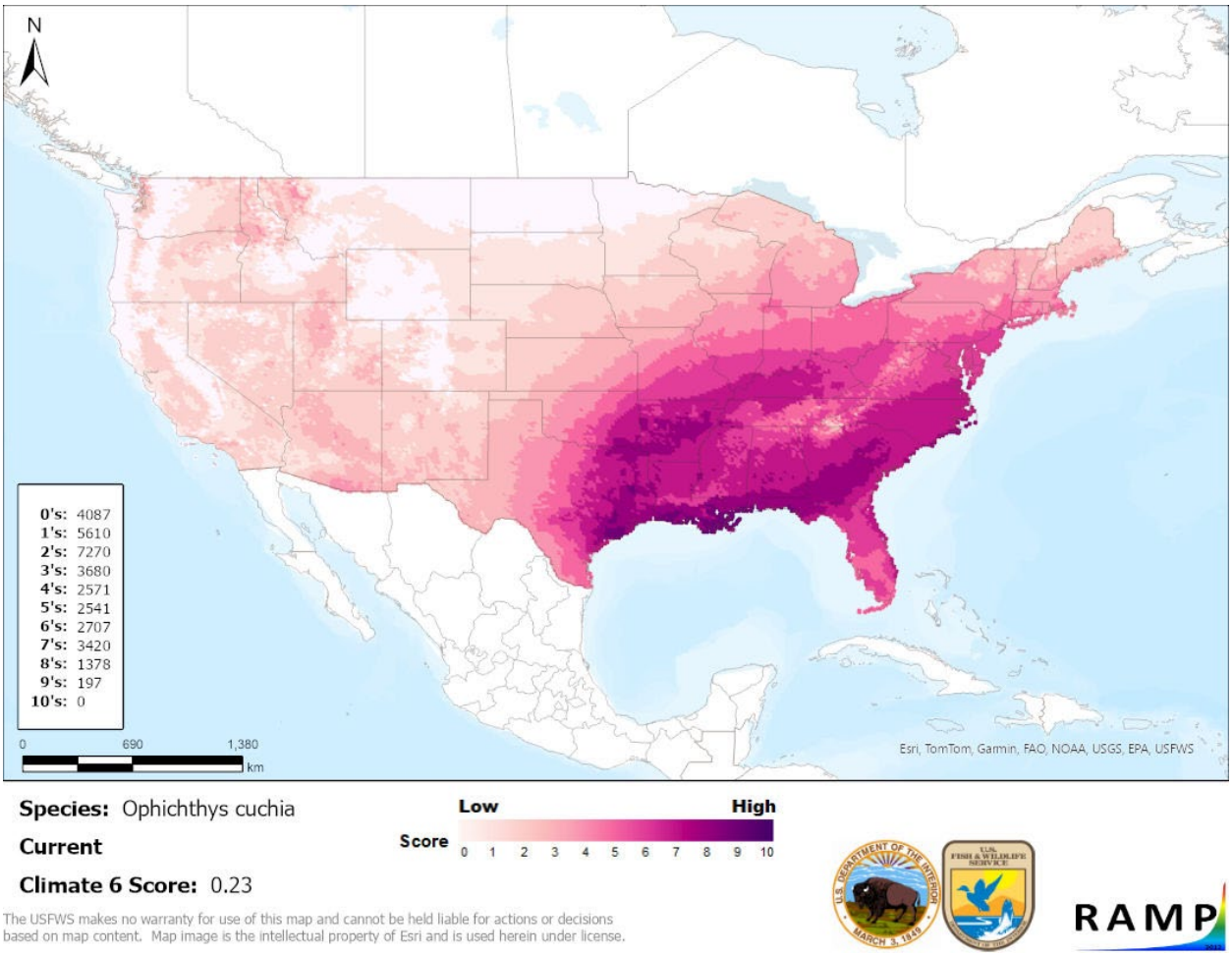

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for in the contiguous United States based on source locations reported by GBIF Secretariat (2023) and GBIF-US (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Ophichthys cuchia* is classified as Low. There is reasonably complete information regarding species distribution. Information was also available regarding the biology and ecology of the species. There is contention regarding the taxonomic placement of *Ophichthys cuchia*, which could affect the quality of the distribution, biological, and ecological information available. This species has become established within the United States, but information on any impacts of introduction is lacking.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Ophichthys cuchia, Cuchia, is a fish that is native to Bangladesh, Bhutan, India, Myanmar, Nepal, and Pakistan. This species has multiple common names and may be mistaken for other species within the Synbranchidae family. It prefers open waters such as ponds, canals and

swamps and can breathe air. *Ophichthys cuchia* is in trade around the world as a food commodity. It is prevalent in the live fish markets of the United States. It has become established in both Louisiana and Texas, however there was no information found on impacts from these introduced populations. The States of Louisiana, Utah, Texas, and Tennessee prohibit the possession of all species in the Synbranchidae family while Nevada lists species in the *Monopterus* genus as injurious. The History of Invasiveness for *Ophichthys cuchia* 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. The highest climate matches centered around where *Ophichthys cuchia* is already established in the Gulf Coast region. Climate match was low across the entire western portion of the United States. The Certainty of Assessment for this ERSS is classified as Low due to the lack of information regarding impacts from introductions of this species. The Overall Risk Assessment Category for *Ophichthys cuchia* 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: No additional remarks.**
- **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) and GBIF-US (2023).

Under the future climate scenarios (figure A1), no regions of the contiguous United States were projected to have a high climate match for *Ophichthys cuchia*. Areas of low climate match were projected to occur in California, the Colorado Plateau, Great Basin, Northern Pacific Coast, Northern Plains, Southwest, and Western Mountains regions. The Southeast, Ohio River Basin, and Mid-Atlantic regions had mainly medium matches under all scenarios. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.257 (model: MPI-ESM1-2-HR, SSP5, 2085) to a high of 0.334 (model: UKESM1-0-LL, SSP3, 2085). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species under future scenarios. The Climate 6 score for the current climate match (0.230, 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, the most extreme climate change scenario. Under both SSP3 and SSP5 at the 2085 time step, areas within the Great Lakes and Northeast saw a large increase in the climate match relative to current conditions. Additionally, areas within the Appalachian Range, California, Colorado Plateau, Great Basin, Mid-Atlantic, 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 Gulf Coast and Southeast regions saw a moderate decrease in the climate match relative to current conditions. No large decreases were observed regardless of time step and climate scenarios. Additional, very small areas of large or moderate change may be visible on the maps (figure A3).

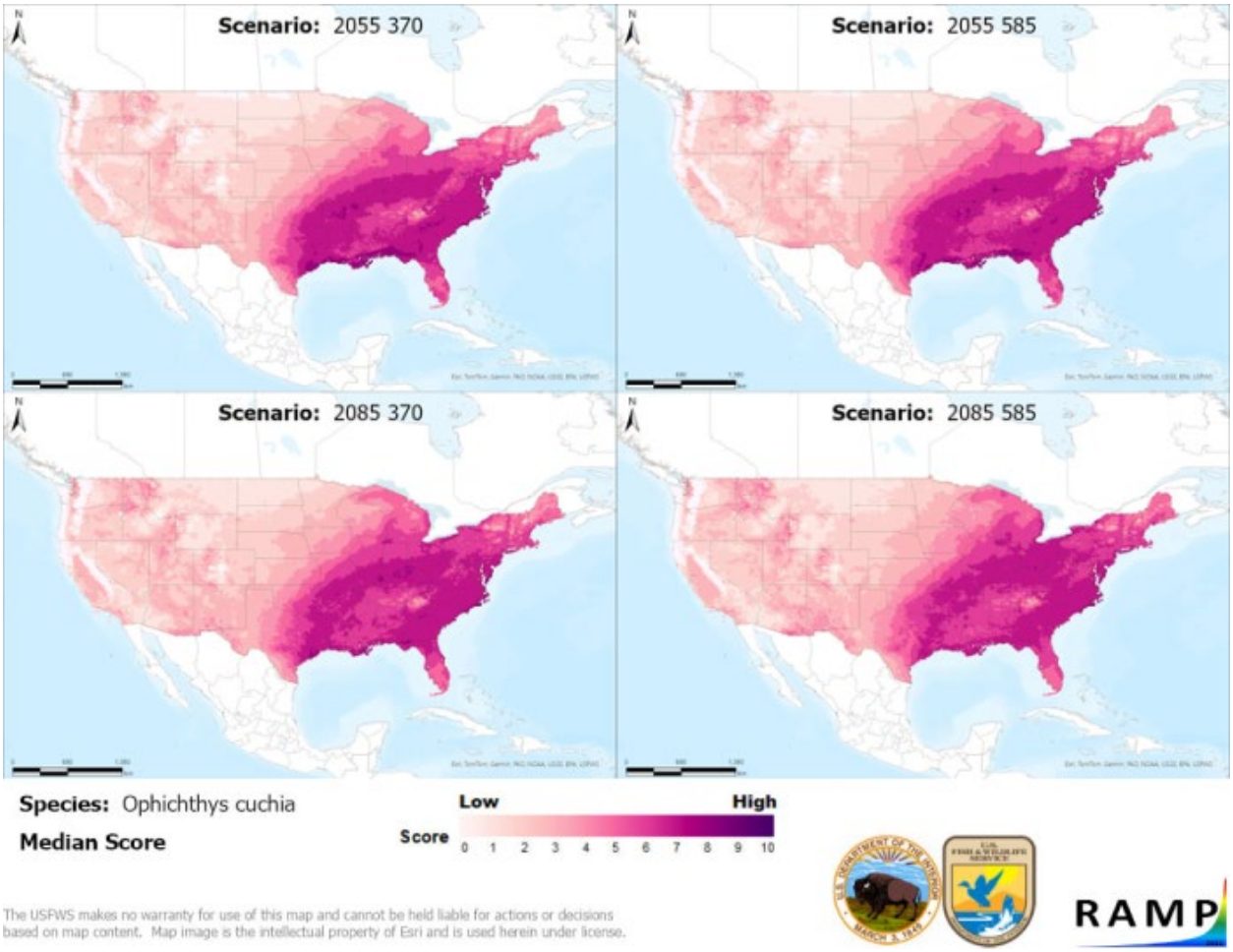

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Ophichthys cuchia* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023) and GBIF-US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

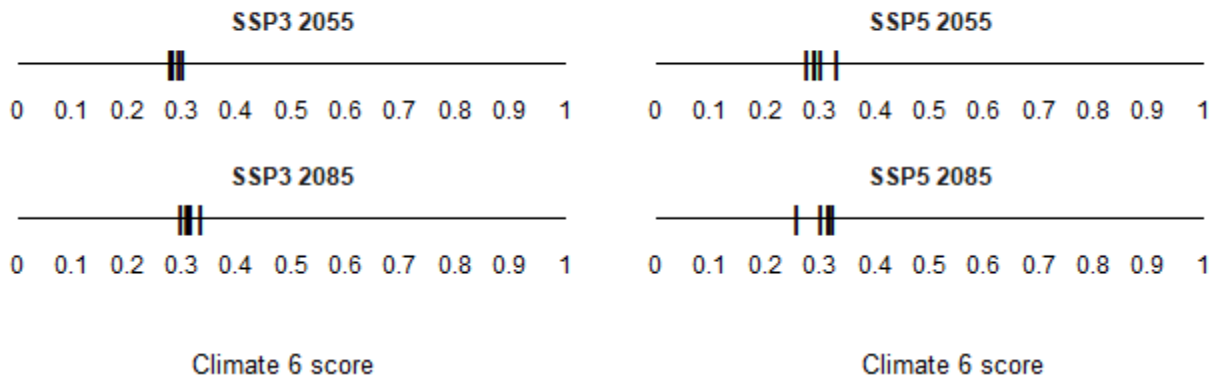

Figure A2. Comparison of projected future Climate 6 scores for *Ophichthys cuchia* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018;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

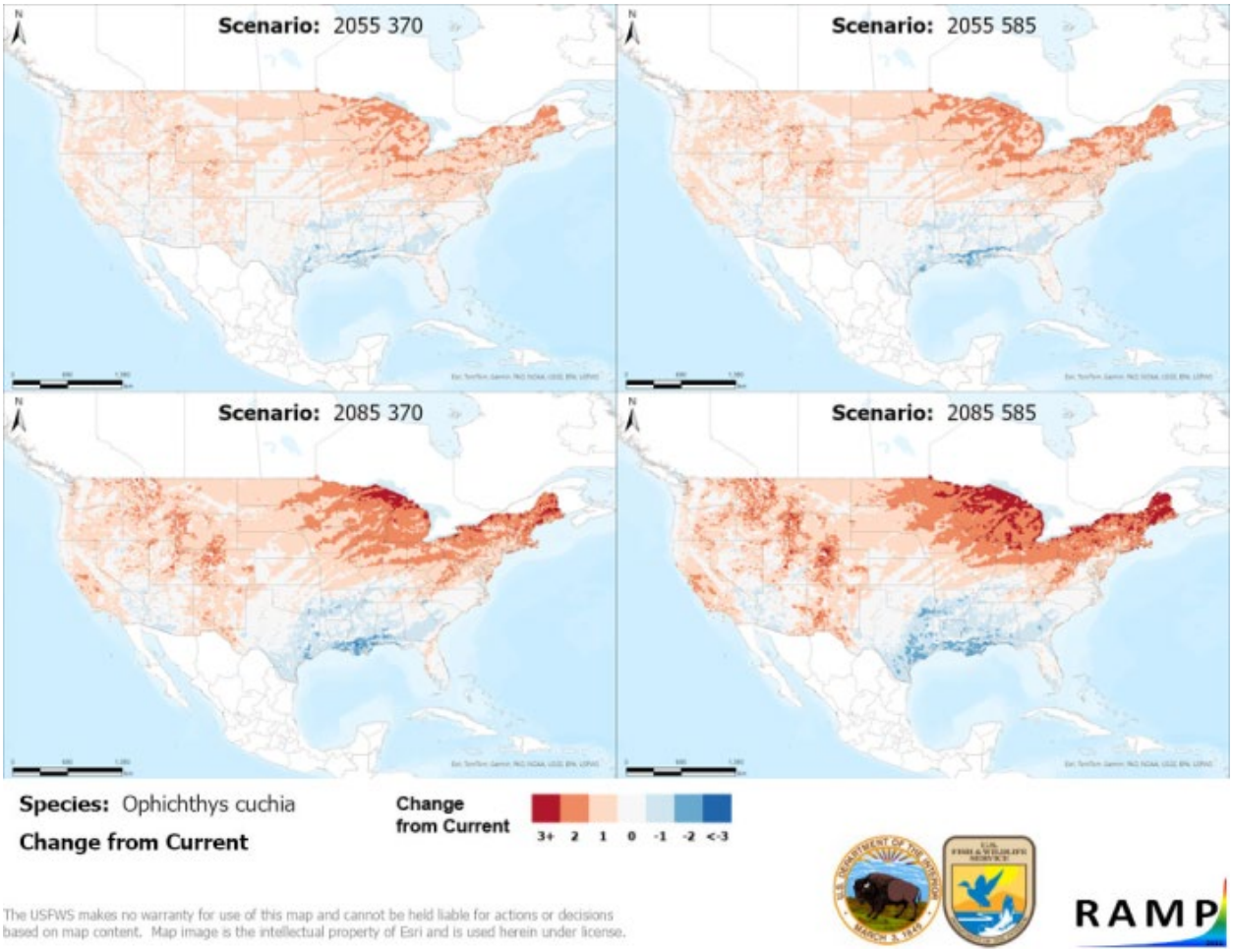

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Ophichthys cuchia* based on source locations reported by GBIF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