

Bold Characodon (*Characodon audax*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, June 2017

Revised, September 2017

Web Version, 11/30/2017



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1 Native Range and Status in the United States

Native Range

From Goodeid Working Group (2017):

“This species is known from springs and creeks along the upper part of the Río Mezquital (Río Tunal above the waterfalls of El Salto) in Durango. The northernmost population had ben [sic] found in the Río La Saucedá at Ciudad Canatán, the southernmost can be found in the Arroyo La Zorra at José María Pino Suárez. The center of the distribution is around the town of Victoria de Durango.”

Status in the United States

This species has not been reported as introduced or established in the United States.

From Borstein (no date):

“[...] within the livebearer hobby in the USA, [...] has achieved a near cult-like status among livebearing hobbyists.”

Means of Introductions in the United States

This species has not been reported as introduced or established in the United States.

Remarks

From Froese and Pauly (2017):

“IUCN Red List Status [IUCN 2017]
Vulnerable (VU)”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2017):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Acanthopterygii
Order Cyprinodontiformes
Suborder Cyprinodontoidae
Family Goodeidae
Subfamily Goodeinae
Genus *Characodon*
Species *Characodon audax* Smith and Miller, 1986”

“Current Standing: Valid”

Size, Weight, and Age Range

From Goodeid Working Group (2017):

“The Holotype is a mature male of 38.5mm SL [...]”

Environment

From Froese and Pauly (2017):

“Freshwater; demersal.”

From Goodeid Working Group (2017):

“The habitats of *Characodon audax* are[]mostly spring-fed ponds and small creeks with currents slight to none and substrates made of sand, gravel and deep silty mud. The species prefers depths from 0.2 to 0.5m.”

Climate/Range

From Froese and Pauly (2017):

“Subtropical; 25°N - 24°N”

Distribution Outside the United States

Native

From Goodeid Working Group (2017):

“This species is known from springs and creeks along the upper part of the Río Mezquital (Río Tunal above the waterfalls of El Salto) in Durango. The northernmost population had ben [*sic*] found in the Río La Saucedá at Ciudad Canatán, the southernmost can be found in the Arroyo La Zorra at José María Pino Suárez. The center of the distribution is around the town of Victoria de Durango.”

Introduced

No introductions of this species have been reported.

Means of Introduction Outside the United States

No introductions of this species have been reported.

Short Description

From Smith and Miller (1986):

“A medium-size goodeid (to 48 mm SL) with dorsal-fin rays typically 11 in males, 10 in females; outer-series teeth mostly bicuspid, occasionally blunt or conic, attached firmly to jaws; pelvic fins not reaching anus in males; dorsal profile indented at nape among adults; male coloration unique in goodeids, black over entire back and upper sides of body (above level of pupil) except for basal one-third of pectoral and pelvic fins, breast, and underside of head which are yellowish orange; outer two-thirds of interradial membranes of paired fins are black; some scales on sides of body have an iridescent silvery or light blue sheen.”

Biology

From Goodeid Working Group (2017):

“The vegetation in the habitats comprises mainly green algae, Duckweed (*Lemna*), Pondweed (*Potamogeton*) and *Nymphaea*.”

“There are some facts about the dentition of this species, but an unclear situation concerning the diet. We find mostly bicuspid teeth in the outer series of adult *Characodon audax* (a few smaller ones are conical) and small conical in the inner series. This dentition suggests an omnivorous feeding habit. Young fish have only conical teeth. Concerning the gut, we find authors describing it as short (suggesting a carnivorous tendency), others describing it as long (suggesting a vegetarian tendency). These different statements and different observations of feeding preferences in captivity lead [sic] to a diversity of care sheets, but it seems like *Characodon audax* is preferring [sic] *Daphnia* or other small invertebrates. However, it has been seen feeding on green filamentous algae in the wild, too, so probably this species is feeding omnivorous indeed, maybe with changing preferences in the growing, as the change [sic] of the dentition suggests.”

Human Uses

From Froese and Pauly (2017):

“Fisheries: of no interest; aquarium: commercial”

Diseases

From Pérez-Ponce de León et al. (2009):

“Host-Parasite list. Parasites previously recorded in the same host species in the region are marked with an asterisk, followed with the bibliographical reference in parenthesis. [...] *Characodon audax*

**Allocreadium mexicanum* (Adult, D[igenea]) [unknown reference]

Allocreadium sp. (Adult, D[igenea])

Bothriocephalus acheilognathi (Adult, C[estoda])

**Bothriocephalus acheilognathi* (Adult, C[estoda]) [unknown reference]

**Caryophylloidea* gen. sp. (Adult, C[estoda]) [unknown reference]

Clinostomum complanatum (Metacercariae, D[igenea])

**Clinostomum complanatum* (Metacercariae, D[igenea]) [unknown reference]

Contracaecum sp. (Larvae, N[ematoda])

**Contracaecum* sp. (Larvae, N[ematoda]) [unknown reference]

**Margotrema bravoe* (Adult, D[igenea]) [unknown reference]

Margotrema guillerminae (Adult, D[igenea])

**Margotrema guillerminae* (Adult, D[igenea]) [unknown reference]

Margotrema sp. (Adult, D[igenea])

Polymorphus brevis (Cysthacant, A[canthocephala])

Posthodiplostomum minimum (Metacercariae, D[igenea])

**Posthodiplostomum minimum* (Metacercariae, D[igenea]) [unknown reference]

**Rhabdochona lichtenfelsi* (Adult, N[ematoda]) [unknown reference]
**Serpinema trispinosum* (Adult, N[ematoda]) [unknown reference]
Spiroxys sp. (Larvae, N[ematoda])
**Spiroxys* sp. (Larvae, N[ematoda]) [unknown reference]”

From Martínez-Aquino et al. (2007):

“The helminth species recovered from *C. audax* included an undescribed monogenean species, *Salsuginus* sp.; the adult digenean *Margotrema bravoae* Lamothe-Argumedo, 1970; metacercariae of *Clinostomum complanatum* (Rudolphi, 1814) and of *Posthodiplostomum minimum* (MacCallum, 1921); an unidentified metacestode of the order Caryophylloidea; and larvae of the nematodes *Contracaecum* sp., *Serpinema trispinosum* (Leidy, 1852), and *Spiroxys* sp. Two of these helminth species, *Salsuginus* sp. and *M. bravoae*, are considered goodeid specialists, the latter being the only helminth species found in the intestine of this fish.”

“All *C. audax* hosts were infected with at least one helminth species, with the number of helminth species per host ranging from 1 to 6.”

No OIE-reportable diseases have been documented for this species.

Threat to Humans

From Froese and Pauly (2017):

“Harmless”

3 Impacts of Introductions

No introductions of this species have been reported.

4 Global Distribution



Figure 1. Known global distribution of *C. audax*. Map from GBIF (2017). The more northern location was excluded from the climate matching analysis because it is outside the described range of *C. audax* (see Native Range in Section 1).

5 Distribution Within the United States

This species has not been reported as introduced or established in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean distance) was medium-high along the U.S.-Mexico border in western Texas, New Mexico, and southeastern Arizona. Climate match was medium in much of California and the Southwest, and low elsewhere in the contiguous U.S. Climate 6 score indicated a medium climate match for the contiguous U.S. overall. The range of scores indicating a medium match is 0.005 to 0.103; Climate 6 score for *C. audax* was 0.016.

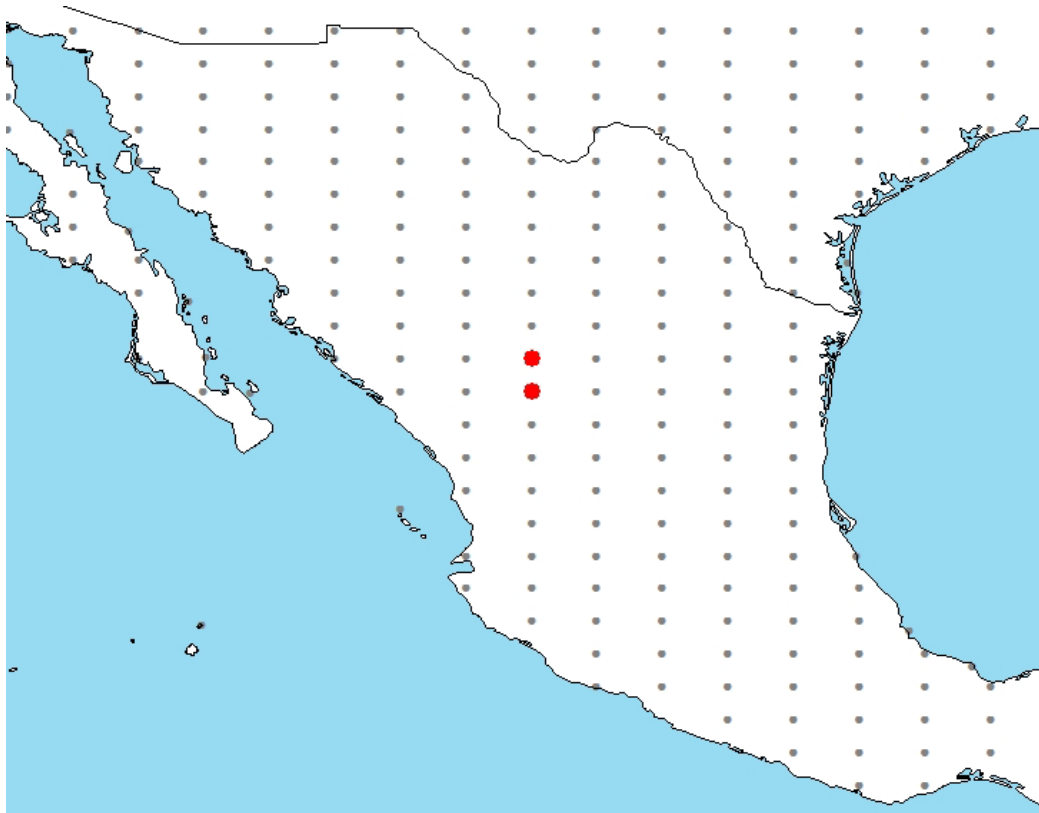


Figure 2. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *C. audax* climate matching. Source locations from GBIF (2017).

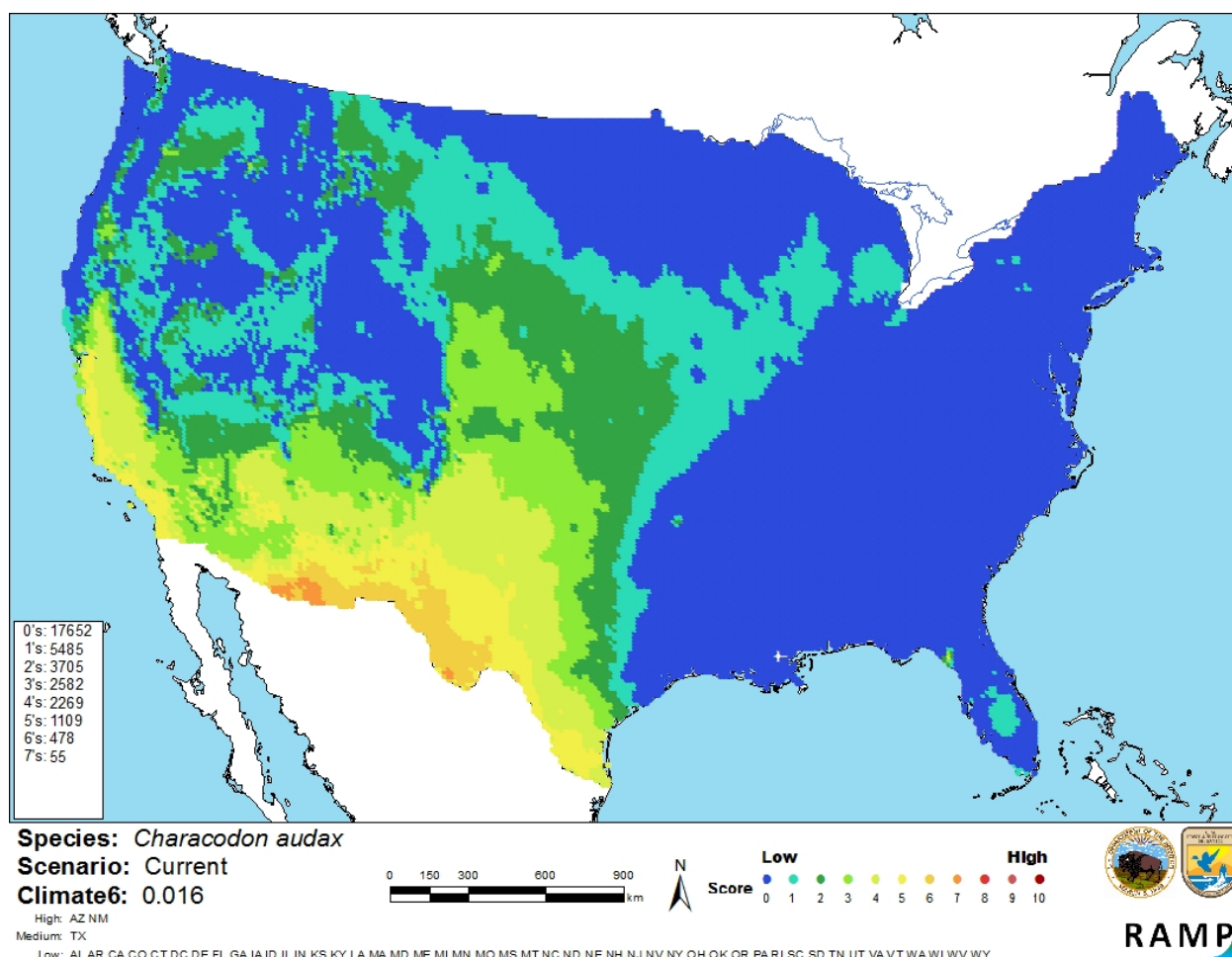


Figure 3. Map of RAMP (Sanders et al. 2014) climate matches for *C. audax* in the contiguous United States based on source locations reported by GBIF (2017). 0=Lowest match, 10=Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

Information on the biology and distribution of this species is available, but the information is not abundant and some is speculative. No information is available on impacts of introduction because no introductions have been documented for this species. Certainty of assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Characodon audax is known from only a few locations in central Mexico. It has been designated as a “vulnerable” species by the International Union for Conservation of Nature (IUCN). *C. audax* has a medium climate match in the contiguous United States, with the area along the U.S.-Mexico border showing the highest match. Although no *C. audax* have been documented in the wild in the United States, there remains the potential for introduction via the aquarium trade pathway. The species has not been documented as introduced elsewhere in the world, either. Without being able to observe introductions in other parts of the world, it is impossible to know the potential impacts of introduction of *C. audax* to the U.S. The overall risk posed by *C. audax* is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): Uncertain**
- **Climate Match (Sec. 6): Medium**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

Borstein, R. No date. *Characodon audax* “El Toboso”. Chicago Livebearer Society. Available: <https://www.chicagolivebearer.com/index.php/livebearer-profiles/80-characodon-audax-el-toboso>. (June 2017).

Froese, R., and D. Pauly, editors. 2017. *Characodon audax* Smith & Miller, 1986. FishBase. Available: <http://www.fishbase.org/summary/Characodon-audax.html>. (September 2017).

GBIF (Global Biodiversity Information Facility). 2017. GBIF backbone taxonomy: *Characodon audax* Smith & Miller, 1986. GBIF Secretariat, Copenhagen. Available: <https://www.gbif.org/species/2347672>. (September 2017).

Goodeid Working Group. 2017. *Characodon audax*. Available: <http://www.goodeidworkinggroup.com/characodon-audax>. (June 2017).

ITIS (Integrated Taxonomic Information System). 2017. *Characodon audax* Smith and Miller, 1986. Integrated Taxonomic Information System, Reston, Virginia. Available: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=647192#null. (June 2017).

Martínez-Aquino, A., G. Salgado-Maldonado, R. Aguilar-Aguilar, G. Cabañas-Carranza, and C. Mendoza-Palmero. 2007. Helminth parasite communities of *Characodon audax* and *C.*

lateralis (Pisces: Goodeidae), endemic freshwater fishes from Durango, Mexico. The Southwestern Naturalist 52(1):125-130.

Pérez-Ponce de León, G., R. Rosas-Valdez, B. Mendoza-Garfias, R. Aguilar-Aguilar, J. Falcón-Ordaz, L. Garrido-Olvera, and R. Pérez-Rodríguez. 2009. Survey of the endohelminth parasites of freshwater fishes in the upper Mezquital River Basin, Durango State, Mexico. Zootaxa 2164:1-20.

Sanders, S., C. Castiglione, and M. H. Hoff. 2014. Risk Assessment Mapping Program: RAMP. U.S. Fish and Wildlife Service.

Smith, M. L., and R. R. Miller. 1986. Mexican goodeid fishes of the genus *Characodon*, with description of a new species. American Museum Novitates 2851:1-14.

10 References Quoted But Not Accessed

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.

IUCN (International Union for Conservation of Nature). 2017. The IUCN Red List of Threatened Species, version 2017-1. (May 2017).