

Four-eyed Sleeper (*Bostrychus sinensis*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, November 2020
Revised, November 2020
Web Version, 9/3/2021

Organism Type: Fish

Overall Risk Assessment Category: Uncertain



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<https://www.inaturalist.org/photos/2398731>. (November 2020).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2020a):

“Indo-Pacific: India to Australia and Taiwan [Kottelat et al. 1993]. Also found in Japan and China [Masuda et al. 1984].”

From Larson (2019):

“The species [*Bostrychus sinensis*] has an Indo-West Pacific distribution; throughout coastal south and southeast Asia, including Viet Nam [H. Larson, personal communication 2019], India (Andaman and Nicobar Islands, Coromandel Coast (Tamil Nadu and Andhra Pradesh)), Indonesia, Philippines, north to southern Japan, south to northern-eastern Australia (Masuda *et al.* 1984; Kottelat *et al.* 1993) and east to Solomon Islands, Fiji and Samoa. There is a specimen from Palau that needs to be verified. It has not been recorded from southern Papua New Guinea,

but this may be due to confusion with the very similar *Bostrychus strigogenys*, which occurs in rivers upstream, not in estuaries (Hoese and Larson in prep.).”

Status in the United States

No records of *Bostrychus sinensis* in trade or in the wild in the United States were found.

New Mexico Department of Game and Fish (2010) lists all species of Eleotridae, which includes *Bostrychus sinensis*, as part of Group I under the special permits program. Group I species are “designated semi-domesticated animals and do not require an importation permit;”

Means of Introductions in the United States

No records of *Bostrychus sinensis* in the wild in the United States were found.

Remarks

Information for this assessment was searched for using the valid name *Bostrychus sinensis* and the synonyms *Philypnus ocellicauda*, *P. ophicephalus*, and *Bostrichthys sinensis* (Fricke et al. 2020; Froese and Pauly 2020b). Other common names in use are Chinese black sleeper and Chinese gudgeon (Hong et al. 2006; Larson 2019).

Bostrychus sinensis can survive in fresh, brackish, and marine waters (Froese and Pauly 2020a). The conclusions of this ERSS are valid for only fresh and brackish water areas.

Since the environmental reproduction requirements (e.g., salinity) for this species are unknown, the conclusions of this screening are valid only for fresh and brackish water populations and portions of the life cycle.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to Fricke et al. (2020), *Bostrychus sinensis* (Lacepède, 1801) is the current valid name for this species.

From ITIS (2020):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Acanthopterygii
Order Perciformes
Suborder Gobioidi

Family Eleotridae
Genus *Bostrychus*
Species *Bostrychus sinensis* (Lacepède, 1801)

Size, Weight, and Age Range

From Froese and Pauly (2020a):

“Max length : 22.0 cm SL male/unsexed; [Rainboth 1996]”

Environment

From Froese and Pauly (2020a):

“Marine; freshwater; brackish; demersal; amphidromous [McDowall 1997]. Inhabits inshore waters, sometimes entering fresh water [Huang et al. 1987].”

Climate

From Froese and Pauly (2020a):

“Tropical”

Distribution Outside the United States

Native

From Froese and Pauly (2020a):

“Indo-Pacific: India to Australia and Taiwan [Kottelat et al. 1993]. Also found in Japan and China [Masuda et al. 1984].”

From Larson (2019):

“The species [*Bostrychus sinensis*] has an Indo-West Pacific distribution; throughout coastal south and southeast Asia, including Viet Nam [H. Larson, personal communication 2019], India (Andaman and Nicobar Islands, Coromandel Coast (Tamil Nadu and Andhra Pradesh)), Indonesia, Philippines, north to southern Japan, south to northern-eastern Australia (Masuda *et al.* 1984; Kottelat *et al.* 1993) and east to Solomon Islands, Fiji and Samoa. There is a specimen from Palau that needs to be verified. It has not been recorded from southern Papua New Guinea, but this may be due to confusion with the very similar *Bostrychus strigogenys*, which occurs in rivers upstream, not in estuaries (Hoese and Larson in prep.).”

Introduced

From Larson (2019):

“[...] in China, it has been introduced from its native range to other regions in the country for intensive culture in ponds.”

Means of Introduction Outside the United States

From Larson (2019):

“In some parts of these areas [the countries encompassing the native range], it may have been deliberately introduced to areas outside of its natural ranges for aquaculture purposes. For example, in China, it has been introduced from its native range to other regions in the country for intensive culture in ponds.”

Short Description

From Froese and Pauly (2020a):

“Anal spines: 1; Anal soft rays: 8 - 10; Vertebrae: 26 – 27”

From Inger and Kong (1962):

“Dorsal [fin] VI–I [spines], 10–11 [rays]; pectoral i, 15–16; ventral [pelvic] i, 5; anal I, 8–9; head 0.280–0.313 [proportion of standard length] [...]; depth 0.216–0.231 [proportion of standard length] [...];”

“Color in alcohol dark brown; a large black spot in upper corner of base of caudal fin; caudal and second dorsal fins with narrow black bands; anal, pectoral, and first dorsal dusky, pectoral and anal black near tips.”

Biology

From Froese and Pauly (2020a):

“Feeds on crustaceans and small fishes.”

From Larson (2019):

“This species is found in lower reaches of coastal freshwaters, brackish and coastal marine habitats, and is usually associated with muddy mangroves, where the fish appear to live in burrows among mangrove roots. The species has also been collected from muddy tidepools [sic] near rocky mangrove shorelines. The species prefers a substrate of mud, but is also found over sandy mud and broken shell in mangroves.”

From Hong et al. (2006):

“This species inhabits intertidal zones. On the surface of mudflats, fish build ‘Y’-shaped muddy burrows of 40–65 cm depth, with one entrance and one exit. It is a seasonal breeding fish. During the non-spawning season, females and males live in individual burrows, but during the spawning season, a pair of fish mate and spawn inside the same burrow (Zhong & Li 2002).”

From Miyake et al. (2019):

“*Bostrychus sinensis* is known as a facultative air-breathing fish [Peh et al. 2009], and can survive out of water for more than a day [Ip et al. 2001].”

Human Uses

From Larson (2019):

“It is a popular food fish in areas around the Mekong Delta and in Viet Nam, but it is less popular elsewhere. This species is cultured in China, and in Viet Nam, for local and international consumption. The numbers of this species being seen in international markets is increasing, however it is uncertain if these are from wild caught or aquaculture sources.”

From Hong et al. (2006):

“The Chinese black sleeper [*Bostrychus sinensis*] is a commercially important fish and fry production does not meet the needs for farming in southeastern parts of China (Hong & Zhang 2003). Following the natural reproductive habits of the fish, hatchery operators usually use artificial nests as burrows for the broodfish [sic] to mate and spawn (Li, Xiao & She 1999). However, the broodfish [sic] often mate and lay eggs outside the artificial nests.”

From Froese and Pauly (2020a):

“Marketed fresh [Rainboth 1996].”

Diseases

No records of OIE-reportable diseases (OIE 2020) were found for *Bostrychus sinensis*. No records of diseases were found for *B. sinensis*.

Threat to Humans

From Froese and Pauly (2020a):

“Harmless”

3 Impacts of Introductions

No records of introductions were found for *Bostrychus sinensis*; therefore there is no information on impacts of introduction.

4 History of Invasiveness

Bostrychus sinensis may have been introduced beyond its native range for aquaculture purposes but no evidence of escape and establishment in the wild was found. Therefore the history of invasiveness is classified as No Known Nonnative Populations.

5 Global Distribution



Figure 1. Known global distribution of *Bostrychus sinensis*. Observations are reported from Japan (southernmost islands of the country), China, Australia, Philippines, Indonesia, Hong Kong, Malaysia, Palau, Papua New Guinea, Solomon Islands, and Taiwan. Map from GBIF Secretariat (2020). The observation in Papua New Guinea was not used to select source points for the climate match as that specimen was only originally identified to the genus level (GBIF Secretariat 2020) and there is a closely related species in Papua New Guinea that it could be confused with (Larsen 2019). Because the climate matching analysis (section 7) is not valid for marine waters, no marine occurrences were used in the climate matching analysis.

6 Distribution Within the United States

No records of *Bostrychus sinensis* in trade or in the wild in the United States were found.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Bostrychus sinensis* was low across most of the western, upper Midwest, and north eastern portions of the contiguous United States. Areas of high match were found in the coastal States in the Southeast from North Carolina to Florida. As well as in the west-south central portion of the United States from eastern Texas north through Missouri. The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.054, medium (scores between 0.005 and 0.103, exclusive, are classified as medium). Arkansas, Florida, Georgia, North Carolina, Oklahoma, South Carolina, and Texas each had a high individual Climate 6 score. Arizona, Kansas, Missouri, and Virginia had medium individual scores. All other States had low individual Climate 6 scores. Since the environmental reproduction requirements for this species are unknown this climate match only refers to where the species might survive and not necessarily where it could reproduce.

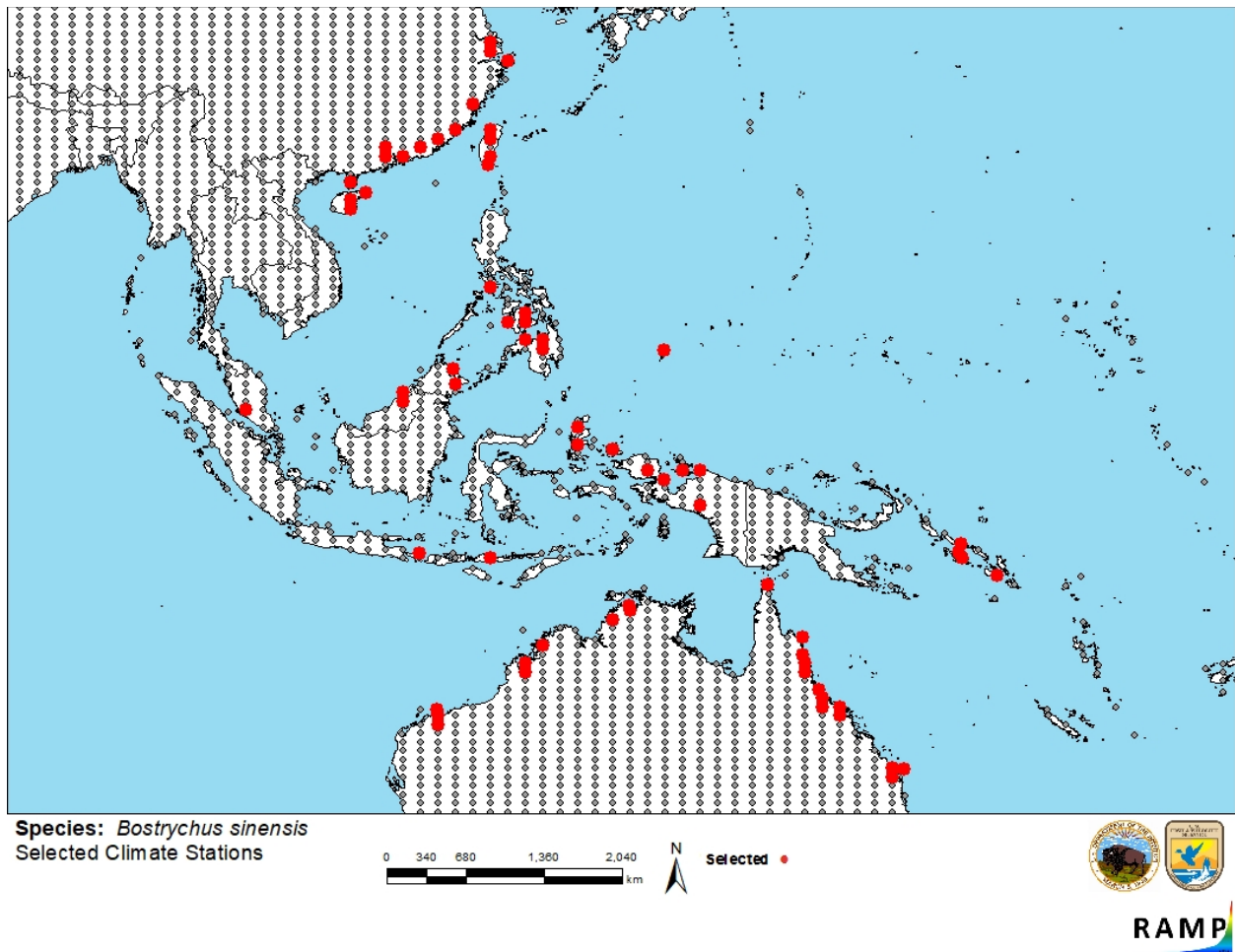


Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations in southeastern Asia and northern Australia selected as source locations (red; China, Australia, Philippines, Indonesia, Hong Kong, Malaysia, Palau, Solomon Islands, Taiwan) and non-source locations (gray) for *Bostrychus sinensis* climate matching. Source locations from GBIF Secretariat (2020). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

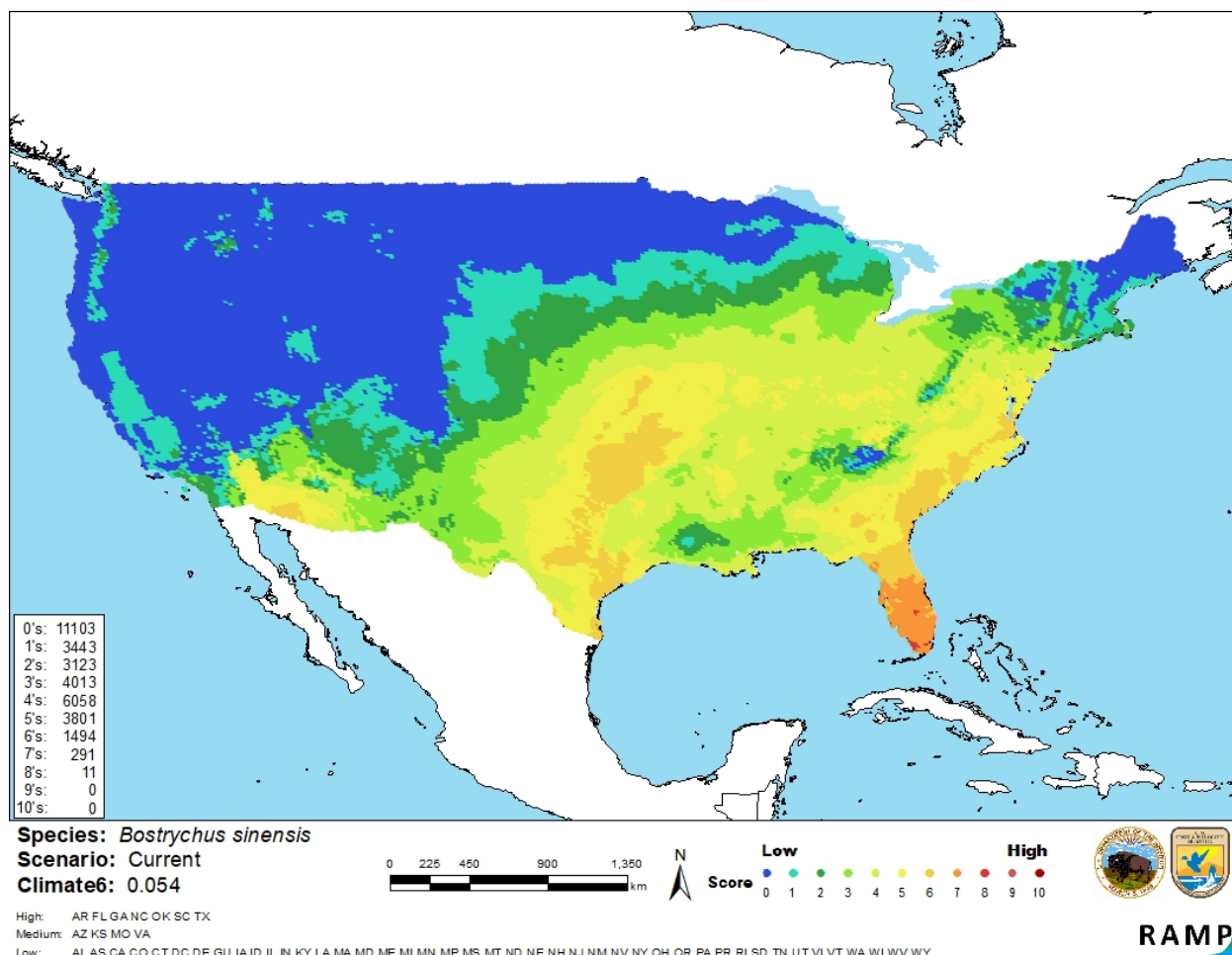


Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *Bostrychus sinensis* in the contiguous United States based on source locations reported by GBIF Secretariat (2020). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

8 Certainty of Assessment

The certainty of assessment for *Bostrychus sinensis* is low. There was limited biological information available for this species. Although this species may have been introduced beyond its native range for aquaculture purposes, there are no specific records of introduction. Therefore there was no information on impacts of introduction. Georeferenced locations were available for

the climate match however, nearly all were coastal locations in southeastern Asia. Given the lack of presumed freshwater locations and the paucity of environmental reproductive requirements found in the literature, it is uncertain if this species could establish a population in the strictly freshwater interior portions of the United States where the climate match was high (e.g., Oklahoma). Additionally, taxonomic discrepancy for this species persists with information from peer-reviewed sources concurrently using both the valid (*Bostrychus sinensis*) and invalid names (*Bostrichthys sinensis*) for a span of time.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Bostrychus sinensis is a tropical sleeper goby native to the Indo-Pacific region including Australia and southeastern Asia. It primarily occurs in coastal freshwater, estuarine, and coastal marine habitats and is commonly found in muddy mangroves. Its native distribution suggests a broad salinity tolerance. However, specific environmental parameters are not well documented in the literature. Although several sources indicate the species may have been introduced beyond its native range in Viet Nam and China for aquaculture purposes, no known nonnative populations were identified and thus there is no information on impacts from introductions. Therefore the history of invasiveness is classified as No Known Nonnative Population. The overall climate match for the contiguous United States was Medium. Climate match was highest along the southeastern Atlantic coast and Gulf of Mexico. Given the lack of climate match source points verified as freshwater observations and the paucity of environmental reproductive requirements for this species, it is uncertain if *B. sinensis* could establish a population in the strictly freshwater interior portions of the United States where the climate match was high (e.g., Oklahoma). The certainty of assessment is Low due to a general lack of information. The overall risk assessment category is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Overall Climate Match Category (Sec. 7): Medium**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information: No additional remark.**
- **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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- Sanders S, Castiglione C, Hoff M. 2018. Risk Assessment Mapping Program: RAMP. Version 3.1. U.S. Fish and Wildlife Service.

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.

Hoesle DF, Bray DJ, Paxton JR, Allen GR. 2006. Fishes. Pages 934–948 in Beesley PL, Wells A, editors. Zoological catalogue of Australia. Volume 35, part 2. Collingwood, Australia: ABRS & CSIRO Publishing.

Hong W, Zhang Q. 2003. Review of captive bred species and fry production of marine fish in China. *Aquaculture* 227:305-318.

Huang H, et al. 1987. The freshwater fishes of China in coloured illustrations. [Source material did not give full citation for this reference.]

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