

Mangrove Goby (*Mugilogobius cavifrons*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2011

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Photo: J. E. Randall. Licensed under CC BY-NC 3.0. Available:
<http://www.fishbase.org/photos/PicturesSummary.php?StartRow=0&ID=15878&what=species&TotRec=2>. (January 2018).

1 Native Range and Status in the United States

Native Range

From Neilson (2018):

“Tropical Indo-Pacific: Indonesia, Papua New Guinea, Phillippines, Taiwan, Ryukyu Islands, Kosrae (Caroline Islands), Guam (Greenfield and Randall 2004)”

Status in the United States

From Neilson (2018):

“The mangrove goby is established on the island of Oahu, Hawaii (Staples and Cowie 2001; Greenfield and Randall 2004)”

“Not known from any other islands in Hawaiian archipelago.”

From Englund (2002):

“The nonindigenous goby *M. cavifrons* was first observed in 1987 in Pearl Harbor (Randall et al. 1993) and is now common in estuaries throughout windward and leeward Oahu (Englund et al. [2000a]).”

“This small (< 50 mm) estuarine goby species from the Philippines is cryptically colored and is not found in the aquarium trade nor used as a potential food source.”

Means of Introductions in the United States

From Greenfield and Randall (2004):

“This species was most likely unintentionally introduced into Hawaiian waters perhaps via ballast water of a ship.”

From Englund et al. (2000a):

“*Mugilogobius cavifrons* was probably inadvertently introduced to Hawaii in the ballast water of ships or possibly attached on the hulls of ships (Randall et al. 1993, Mundy in press). It is also possible that this goby came to Hawaii with aquacultural shipments as it was found in aquaculture research ponds in 1990 (Randall 1993). However, aquaculture material from Asia to Hawaii is monitored, while there has been no monitoring (until recently) of shipping traffic between the western Pacific and Hawaii (Mundy in press).”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Acanthopterygii
Order Perciformes
Suborder Gobioidi
Family Gobiidae
Genus *Mugilogobius*
Species *Mugilogobius cavifrons* (Weber, 1909)”

From Eschmeyer et al. (2018):

“Current status: Valid as *Mugilogobius cavifrons* (Weber 1909). Gobiidae: Gobionellinae.”

Size, Weight, and Age Range

From Greenfield and Randall (2004):

“Attains 58 mm TL.”

Environment

From Froese and Pauly (2017):

“Marine; freshwater; brackish; demersal; amphidromous [Donaldson and Myers 2002].”

From Englund (2000):

“This species was found in the lowest sections of streams, and inhabits water from 0-36 ppt salinity.”

Climate/Range

From Froese and Pauly (2017):

“Tropical”

Distribution Outside the United States

Native

From Neilson (2018):

“Tropical Indo-Pacific: Indonesia, Papua New Guinea, Phillippines, Taiwan, Ryukyu Islands, Kosrae (Caroline Islands), Guam (Greenfield and Randall 2004)”

Introduced

This species has not been reported outside of its native range and Hawaii.

Means of Introduction Outside the United States

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Short Description

From Greenfield and Randall (2004):

“Dorsal-fin elements V-I,7-VI-I,8 (VI-I,8). Anal-fin elements I,7-I,8 (I,8). Pectoral-fin rays 15-16 (16). Lateral scales 37-46 (39-40). Interorbital wide, greater than one eye diameter in individuals 37 mm SL or larger, and covered with very small cirri that extend onto snout and under eye on cheek. Pelvic sucking disc longer than wide, but short, space between posterior end

of fin and anal-fin origin greater than pelvic-fin length; frenum broad. Body covered with scaled, lateral scales anterior to second dorsal fin smaller than those under second dorsal fin and on caudal peduncle. Scales extending onto top of head meeting cirri on interorbital and onto operculum. No scales on cheek. Caudal fin rounded. Depth of body about five in SL. Jaws extending to posterior margin of eye. Gill membranes broadly united to isthmus.”

“Background color tan, color patterns overlaying tan are black. Head with a series of distinct lines: One from snout to anterodorsal portion of eye; another from middle of side of upper jaw to ventral margin of eye; a line from posteroventral eye margin to edge of preopercle; a long wavy line from end of jaws across ventral portion of cheek onto opercle. Opercle, preopercle, and nape with scattered irregular marks. Side of body with a number of irregular, broken narrow bars. Ventral surface of body light tan. Pectoral, pelvic, and anal fins dusky. Caudal fin crossed by four irregular, black bars. First dorsal fin crossed by two black bars, the first on distal one-quarter of fin and second on second quarter up from base, expanded to cover basal one-half posteriorly. Second dorsal fin dusky with some darker areas.”

Biology

From Froese and Pauly (2017):

“Benthic on mud and sand in brackish to freshwaters, often in mangroves [Mundy 2005]. Adults feed primarily on worms and other small benthic invertebrates; breeding habits are unknown [Yamamoto and Tagawa 2000].”

From Neilson (2018):

“*Mugiligobius cavifrons* is highly carnivorous and will consume any prey item smaller than itself. In Hawaii, its diet includes ostracods, chironomid larvae, juvenile fishes, and small crustaceans (Englund et al 2000[a]).”

“Displays little climbing ability, cannot pass waterfalls.”

From Larson (2012):

“The species is known mostly from estuarine to freshwater habitats, in mangroves (including *Nypa* forest), shallow coastal and island streams and lakes, over mud, sandy-mud, sandy to rocky and coral-rock substrates. It occupies a wide range of habitats and appears capable of living in less than ideal conditions (e.g. a concrete drainage canal (Larson 2001)).”

Human Uses

From Englund (2002):

“This small (< 50 mm) estuarine goby species from the Philippines is cryptically colored and is not found in the aquarium trade nor used as a potential food source.”

Diseases

No information available. No OIE-listed diseases have been documented for this species.

Threat to Humans

From Froese and Pauly (2017):

“Harmless”

3 Impacts of Introductions

From Neilson (2018):

“This species is highly aggressive and predatory; eats native species during their migration from the ocean to streams; readily consumes juvenile 'o'opu nakea (a native stream goby, *Awaous guamensis*). Likely competes with native gobies (particularly *A. guamensis*) for both food and space (Englund et al 2000[a]).”

From Englund (2002):

“The impacts of predation by *M. cavifrons* on native biota are unknown, but the fact that it will prey on native species is disconcerting, especially as it was much more abundant than any native stream goby.”

From Englund et al. (2000a):

“[...] the introduced goby *Mugilogobius cavifrons* was found in high numbers, even though it occupies the same difficult to sample lower stream reaches as *A. guamensis*. Although *M. cavifrons* was not captured in any of the more saline Waianae coast sampling stations, this species was found in as many stations as the native *A. guamensis*, but always in greater numbers. Similar to the native goby species, *M. cavifrons* is cryptic and benthic in nature, and our capture of this species at an equal number of stations (including Manoa/Palolo, Ala Moana Park, and Kalihi Stream) as compared to *A. guamensis* indicates gear limitations may not have been the reason that *A. guamensis* were so uncommon during this study.”

“The effects of *M. cavifrons* on native species are unknown, but native crustacean species have been found in their stomachs (Englund et al. 2000[b]). In aquaria, this species was observed to be highly aggressive and predaceous, and readily consumed native *Awaous guamensis* post-larvae.”

4 Global Distribution



Figure 1. Known global distribution of *Mugilogobius cavifrons*, reported from Taiwan, the Philippines, Indonesia, East Timor, and the United States (Hawaii). Map from GBIF Secretariat (2019). Only freshwater and brackish locations were used in the climate matching analysis.

5 Distribution Within the United States

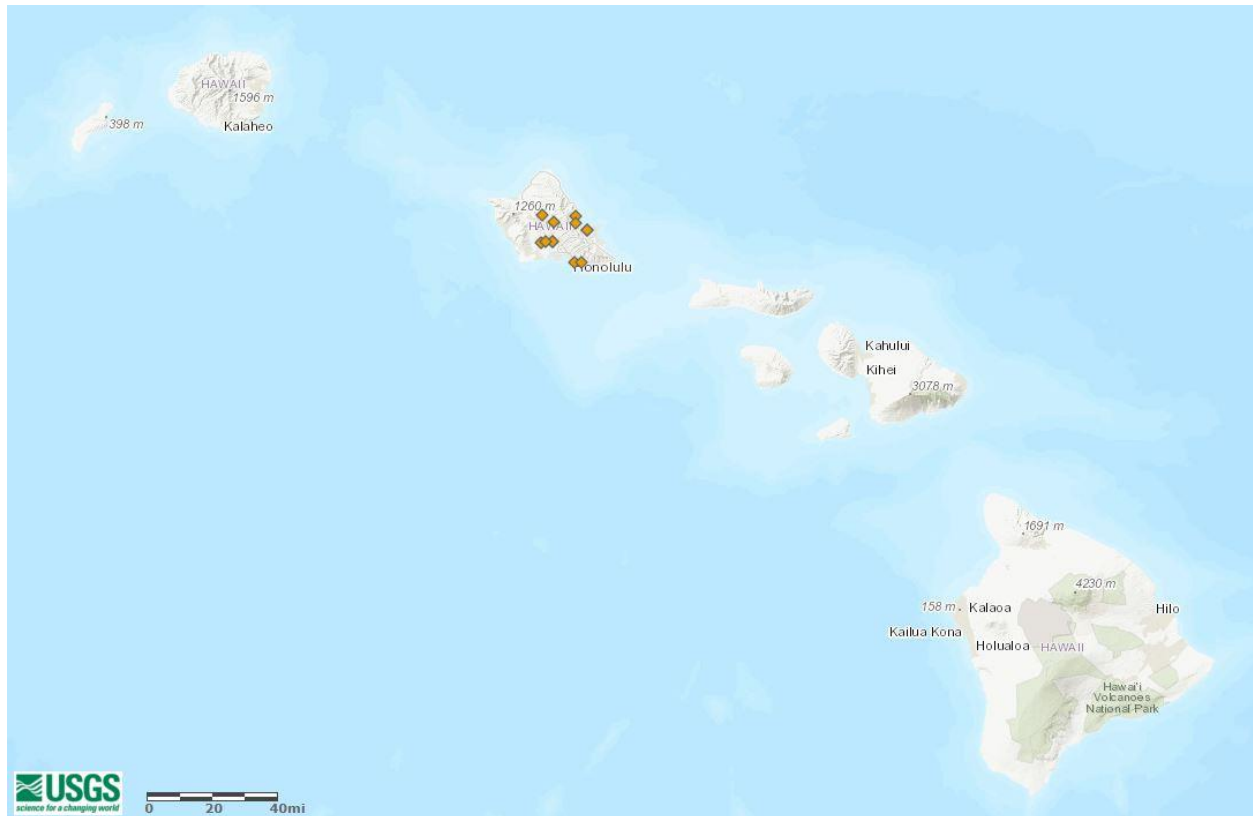


Figure 2. Known distribution of *Mugilogobius cavifrons* in the United States (O’ahu, Hawaii). Map from Neilson (2018). Only freshwater and brackish locations were used in the climate matching analysis.

6 Climate Matching

Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.0, indicating a low overall climate match. Locally, climate matches were low across the entire contiguous United States, except for medium matches in southern coastal areas of Florida, Louisiana, Texas, and California. All States within the contiguous United States had a low Climate 6 score.

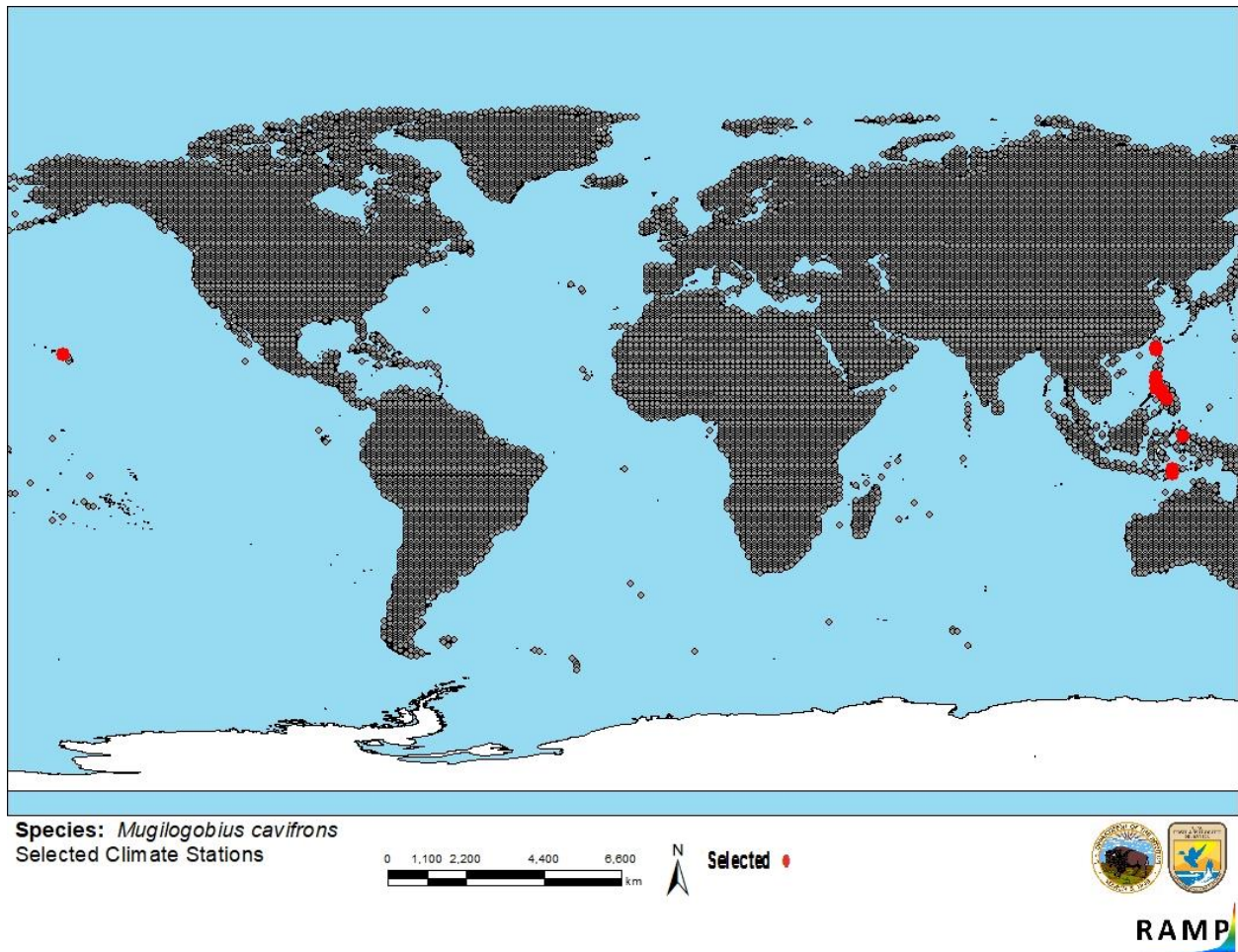


Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red; United States (Hawaii), Taiwan, Philippines, Indonesia, East Timor) and non-source locations (gray) for *Mugilogobius cavifrons* climate matching. Source locations from GBIF Secretariat (2019).

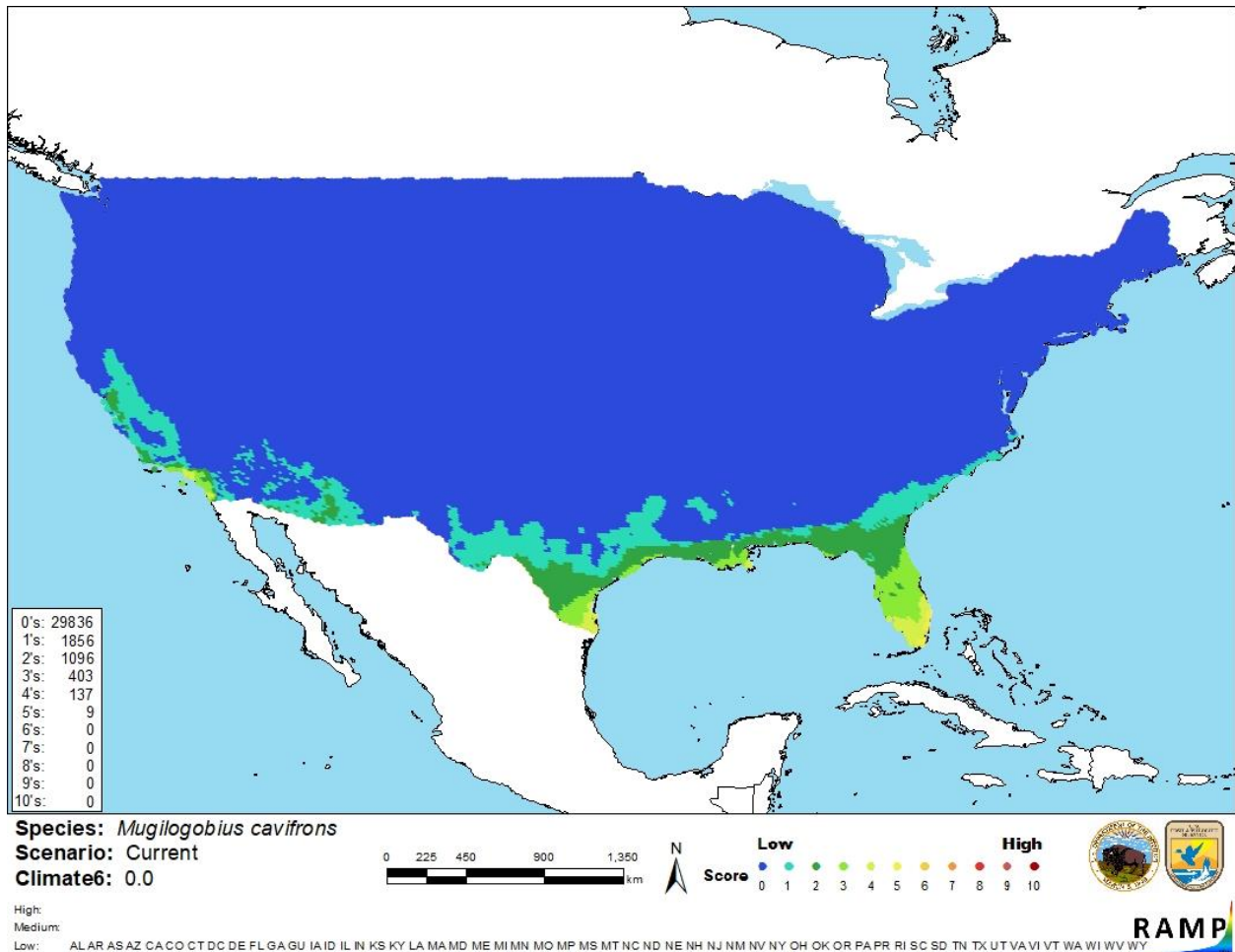


Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Mugilogobius cavifrons* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). Counts of climate match scores are tabulated on the left. 0= Lowest match, 10= Highest match.

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
$0.000 \leq X < 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

There is adequate information available on the biology and habitat requirements of *Mugilogobius cavifrons*. Its introduction and establishment in Hawaii has been well-documented; despite this, there are no clear scientific studies showing impacts of its introduction. Predation upon native fish and a high abundance relative to native fish in some areas has been observed, but these observations do not rise to the level of clear, convincing, and scientifically defensible evidence of negative impacts on native species. This species inhabits a wide range of salinities, so the

climate match is based only on fresh and brackish water occurrences and it is unclear under what salinity regime the species reproduces. Further information is needed to adequately assess the risk this species poses. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Mugilogobius cavifrons is an amphidromous goby native to the Indo-Pacific region. This species has become established in O’ahu, Hawaii, where it preys upon native fish and exists in greater numbers in some habitats than native species. Other impacts of *M. cavifrons* on native ecosystems are unknown. Because documentation of impacts observed thus far does not meet the criteria of being clear, convincing, and scientifically defensible, history of invasiveness is classified as “none documented.” *M. cavifrons* has a low climate match with the contiguous United States, with small isolated areas of medium match in southern Florida, Louisiana, Texas, and California. Further research is needed to document any impacts this species is having in Hawaii, and what threat it poses to the contiguous United States. Certainty of this assessment is low, and the overall risk assessment category is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): Low**
- **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.

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- Sanders, S., C. Castiglione, and M. H. Hoff. 2018. Risk Assessment Mapping Program: RAMP, version 3.1. U.S. Fish and Wildlife Service.

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.

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