

Yellowfin Goby (*Acanthogobius flavimanus*)

Ecological Risk Screening Summary

Web Version—08/19/2014



Photo: Chinese Academy of Fishery Sciences from Froese and Pauly (2011).

1 Native Range, and Status in the United States

Native Range

From Masuda et al. (1984):

“Asia: Japan, Korea and Siberia.”

Status in the United States

From Nico et al. (2014):

“Established in coastal and inland waters of central and southern California.”

“Introduced to California; the first records in that state were based on two specimens found in the Sacramento-San Joaquin Delta region, San Joaquin County, in early 1963. The first of these fish was trawled from the lower San Joaquin River near Venice Island, and the second specimen was taken from the Stockton Deepwater Channel near the Calaveras River (Brittan et al. 1963, Shapovalov et al. 1981). The species later was found in surrounding areas including Suisun, San

Pablo, and San Francisco bays, the Sacramento Delta, the Yolo Bypass, Bolinas Lagoon, Delta-Mendota Canal, and the San Luis Reservoir in Alameda, Contra Costa, Marin, Merced, Napa (possibly), San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties (Brittan et al. 1970, Moyle 1976, Courtenay et al. 1986, Wang 1986, Sommer et al. 2001). Specimens also were taken in Elkhorn Slough, Monterey County (Kukowski 1972, Wang 1986), and Tomales Bay, Moss Landing Harbor, Golden Gate National Recreation Area, and Point Reyes National Seashore, Marin County (Miller and Lea 1972, Wang 1986, Tilmant 1999). The first records of this species in southern California were from the Los Angeles Harbor area, Los Angeles County, in 1977 (Haaker 1979); subsequently specimens were found in Long Beach Harbor and near the mouth of the Los Angeles River, Los Angeles County; in the San Gabriel River, Upper Newport Bay, and upstream to San Diego Creek, Orange County; and in Ballona Marsh and Mugu Lagoon (Haaker 1979, Allen 1982, Swift et al. 1993). This species was reported as rare or absent from other coastal areas of southern California including Malibu Lagoon, San Onofre, San Mateo, Las Pulgas, and Santa Margarita lagoons, and Morro Bay (Swift et al. 1993). In 1980, the species was reported as occurring in San Diego (perhaps extending as far south as Baja California Norte, Mexico) (Courtenay et al. 1986). Williams et al. (1998) reported them from southeastern San Diego Bay tidal marshes beginning in 1989, but gave the first date for San Diego County as 1984.”

Means of Introductions in the United States

From Nico et al. (2014):

“Initial and possibly later introductions were probably by way of ballast water carried in transoceanic ships (Brittan et al. 1963). It also is hypothesized that introduced gobies arrived as eggs on fouling organisms, such as oysters, growing on ship hulls (Hubbs and Miller 1965, Eschmeyer et al. 1983). Although first collected in 1963, the yellowfin goby was probably introduced into California in 1959 or 1960, likely about the same time as the chameleon goby (Brittan et al. 1970, Meng et al. 1994). Once established, this species spread in California, probably as a result of its own dispersal abilities, and sometimes with the aid of currents; in addition, dispersal may have resulted from the species' use as a baitfish (Brittan et al. 1970, Courtenay and Hensley 1979).”

Remarks

From Nico et al. (2014):

“The yellowfin goby underwent a population explosion in the San Francisco area in the late 1960s and early 1970s (Brittan et al. 1970). In 1967, a fish kill occurred in the San Luis Reservoir, which receives freshwater from the Sacramento-San Joaquin River Delta. About half of the approximately 10,000 fishes killed in this incident were *A. flavimanus* (Brittan et al. 1970). Apparently another massive die-off occurred in Rodeo Lagoon in 1981 and was thought to be caused by low salinity (<5 ppt) (Wang 1986).”

“The species first was reported from Suisun Marsh, a portion of the San Francisco Bay estuary, in 1967 (Brittan et al. 1970); by the early 1980s its population in that area had grown and it was reported as the third most abundant fish in 1980-1982 trawl catches by Meng et al. (1994). Recent drought conditions in California have reduced freshwater outflows and may have allowed

this goby to gain an advantage over native freshwater and estuarine fishes less able to tolerate high salinity conditions (Herbold et al. 1992, Meng et al. 1994). Meng et al. (1994) presented a figure showing the annual relative abundance of chameleon and yellowfin gobies taken in trawls over the period 1979 to 1992. Brittan et al. (1970), Courtenay and Hensley (1979), and Lee et al. (1980 et seq.) provided maps showing this species distribution in California.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2011):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Osteichthyes
Class Actinopterygii
Subclass Neopterygii
Infraclass Teleostei
Superorder Acanthopterygii
Order Perciformes
Suborder Gobioidi
Family Gobiidae
Genus *Acanthogobius*
Species *Acanthogobius flavimanus*
(Temminck and Schlegel, 1845)

Taxonomic Status: Valid.”

Size, Weight, and Age Range

From Masuda et al. (1984):

“Maturity: Lm ? range ? - ? cm; Max length : 30.0 cm TL male/unsexed; (Eschmeyer et al. 1983); common length : 14.5 cm TL male/unsexed; (Hugg 1996).”

Environment

From Masuda et al. (1984):

“Marine; freshwater; brackish; demersal; amphidromous (Riede 2004).”

Climate/Range

From Masuda et al. (1984):

“Temperate; 52°N - 23°N, 116°E - 143°E.”

Distribution Outside the United States

Native

From Masuda et al. (1984):

“Asia: Japan, Korea and Siberia.”

Introduced

From Masuda et al. (1984):

This species is listed as introduced in Baja California Norte in Mexico, and Australia.

Means of Introduction Outside the United States

From Masuda et al. (1984):

Both introduced locations list accidental with ships as the reason for the introduction. It is established in both locations with unknown ecological effects.

Short description

From Siriwardena (2014):

“*A. flavimanus* is a gobiid fish growing to 25-30 cm long. The average longevity of *A. flavimanus* is 3 years, but there have been examples of older specimens (Moyle 2002). It has a slender pale-brownish body with a series of dark saddles and spots (Nico and Fuller 2008). The mid-sides and dorsal fin also have brown patches or spots. Head is of moderate size (28-30% SL), triangular in cross section; interorbital space is narrow and less than eye diameter; mouth oblique, rear end of the jaws just in front and below the middle of eye (NIMPIS 2002). The arrangement of pores on the head is a key characteristic in identifying this species, with one adjacent to posterior nostril each side, median between rear part of eye, one behind eye, three above each operculum, and two on each preoperculum (NIMPIS 2002).”

“Juvenile fish have pale-yellow ventral and anal fins, whereas all ages possess yellow ventral fins. There are two dorsal fins, first originating above ventral fin insertions and the second originating just behind the first; first dorsal-fin margin rounded; anal fin origin below and behind second dorsal-fin origin; caudal and pectoral fins with rounded margins; ventral fins fused to form cup-shaped disc, originating below pectoral fin insertions (Gomon et al. 1994, Hoese and Larson 1994, Lockett and Gomon 1999).”

“This species is separable from other gobies by the presence of eight to nine spines in the first dorsal fin, 12-14 segmented rays in the second dorsal fin, the top of the head with 24-30 transverse rows of small scales, scaled cheeks and a transverse line of sensory papillae on cheek (Masuda et al. 1984, Hoese and Larson 1994, Lockett and Gomon 1999). It is also separable from other gobies that all have clear, white, grey or black ventral fins (Barham 1998).”

Biology

From Masuda et al. (1984):

“Inhabits muddy and sandy bottoms along the shore of bays and estuaries, sometimes ascends rivers. Oviparous, spawn in winter to early spring (Breder and Rosen 1966). Eggs are deposited in Y-shaped nests (Breder and Rosen 1966).”

From Siriwardena (2014):

“*A. flavimanus* feeds on benthic organisms such as crustaceans, polychaetes and small teleost fish (NIMPIS 2002). It consumes a large variety of crustaceans such as copepods, amphipods, stomatopods and mysids, and has been reported as aggressively feeding on smaller fish (Barham 1998). Wang (1986) reports that, major food items for small juvenile *A. flavimanus* are harpacticoid copepods and other copepods, whereas the large juveniles eat amphipods, mysid shrimp, and small fish.”

“*A. flavimanus* can withstand abrupt changes between fresh and salt water, and can survive temperatures greater than 28°C. They can complete their entire life cycle in fresh water, although usually at least the larval stages are spent in salt water (Moyle 1976).”

Human uses

From Masuda et al. (1984):

“Fisheries: commercial; aquarium: public aquariums.”

“Used in Chinese medicine (Tang 1987).”

From Nico et al. (2014):

“In the San Francisco Estuary system yellowfin gobies are used as a baitfish (both fresh and frozen), being sold with both longjaw mudsucker (*Gillichthys mirabilis*) and staghorn sculpin (*Leptocottus armatus*) under the common names "mudsucker" or "bullhead".”

Diseases

Host to a myxozoan parasite, *Henneguya* sp. (Baxa et al. 2013).

Host to a myxosporean parasite, *Myxobolus acanthogobii* (Yokoyama et al. 2004).

There are no OIE-reportable diseases listed for this species.

Threat to humans

Harmless.

3 Impacts of Introductions

From Nico et al. (2014):

“In at least one saltwater location, yellowfin gobies were reported to have partially replaced Pacific staghorn sculpins *Leptocottus armatus* (Brittan et al. 1970). There also is concern that the yellowfin goby might outcompete and possibly eliminate freshwater populations of the small and endangered tidewater goby *Eucyclogobius newberryi* (Moyle 1976). Meng et al. (1994) suggested that environmental disturbances, coupled with the introduction of this and other foreign species, are altering fish communities and hastening declines of native fishes in California. Although Meng et al. (1994) found that the yellowfin goby has an impact on the introduced chameleon goby *Tridentiger trigonocephalus*, recent investigations have shown this species is actually the shimofuri goby *Tridentiger bifasciatus* (not the chameleon goby) that occurs in Suisun Bay where the study was conducted (Fleming, personal communication). Hence, it is the shimofuri goby that is affected.”

From GISD (2014):

“The introduction of *Acanthogobius flavimanus* alters fish communities and hastens the decline of native species. In California introductions of *A. flavimanus* have been associated with extirpations of an endangered species of fish - the tidewater goby (*Eucyclogobius newberryi*) from certain bodies of water. It also competes with native species for food sources (Meng et al. 1994, Lafferty et al. 1999, Nico and Fuller 2004).”

“Reduction in native biodiversity: Yellowfin gobies have been reported to have partially replaced Pacific staghorn sculpins *Leptocottus armatus* (Brittan et al. 1970) (Nico and Fuller 2004). Threat to endangered species: The tidewater goby (please see *Eucyclogobius newberryi*), an endangered species in the United States, occurs in a series of isolated coastal wetlands in California. Habitat degradation and introduced predators have led to extirpations. Tidewater gobies usually occur in habitats where large piscivorous fishes are rare or absent. Several extirpations of tidewater gobies in the San Francisco Bay area followed the invasion of rainwater killifish and *A. flavimanus* (Lafferty et al. 1999).”

4 Global Distribution



Figure 1. Global distribution of *Acanthogobius flavimanus*. Map from GBIF (2014). Location in South Pacific Ocean was removed because it was incorrectly located.

5 Distribution within the United States

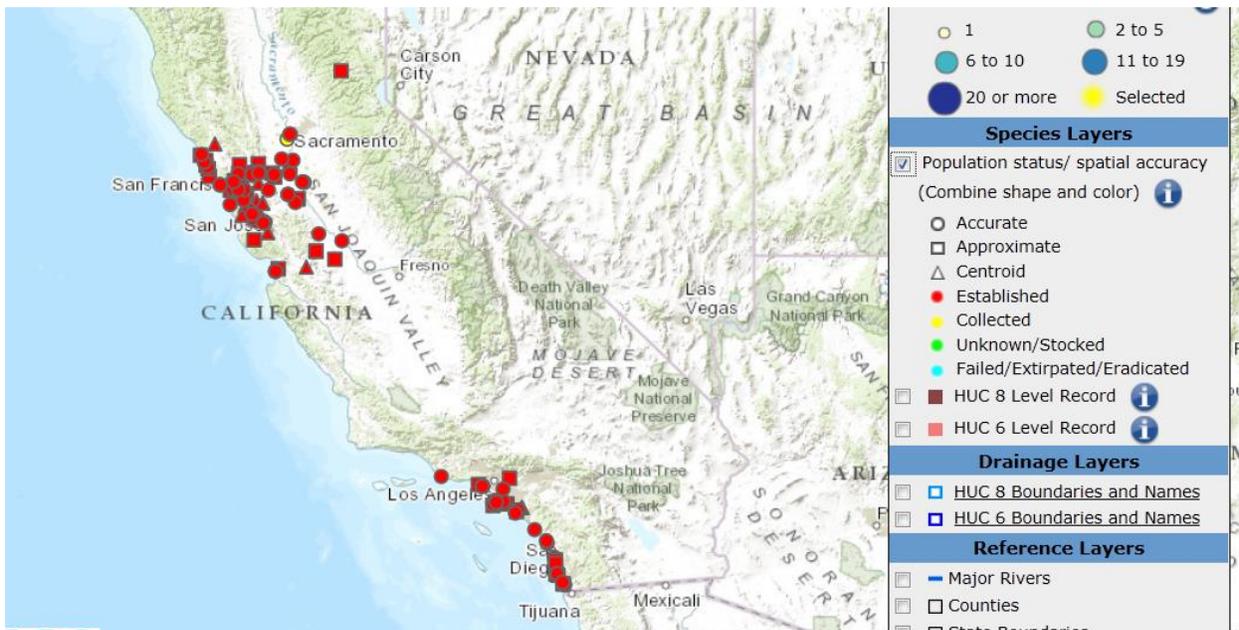


Figure 2. Distribution of *Acanthogobius flavimanus* in the U.S. Map from Nico et al. (2014).

6 CLIMATCH

Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2008; 16 climate variables; Euclidean Distance) for the contiguous U.S. was high along the West Coast, the Central Plains, along the rust belt, and throughout the Mid-Atlantic. Medium matches covered most of the rest of the contiguous U.S. Low matches occurred at high elevations. Climate 6 proportion indicated that the contiguous U.S. has a high climate match. The range for a high climate match is 0.103 and greater; climate match of *Acanthogobius flavimanus* is 0.338.

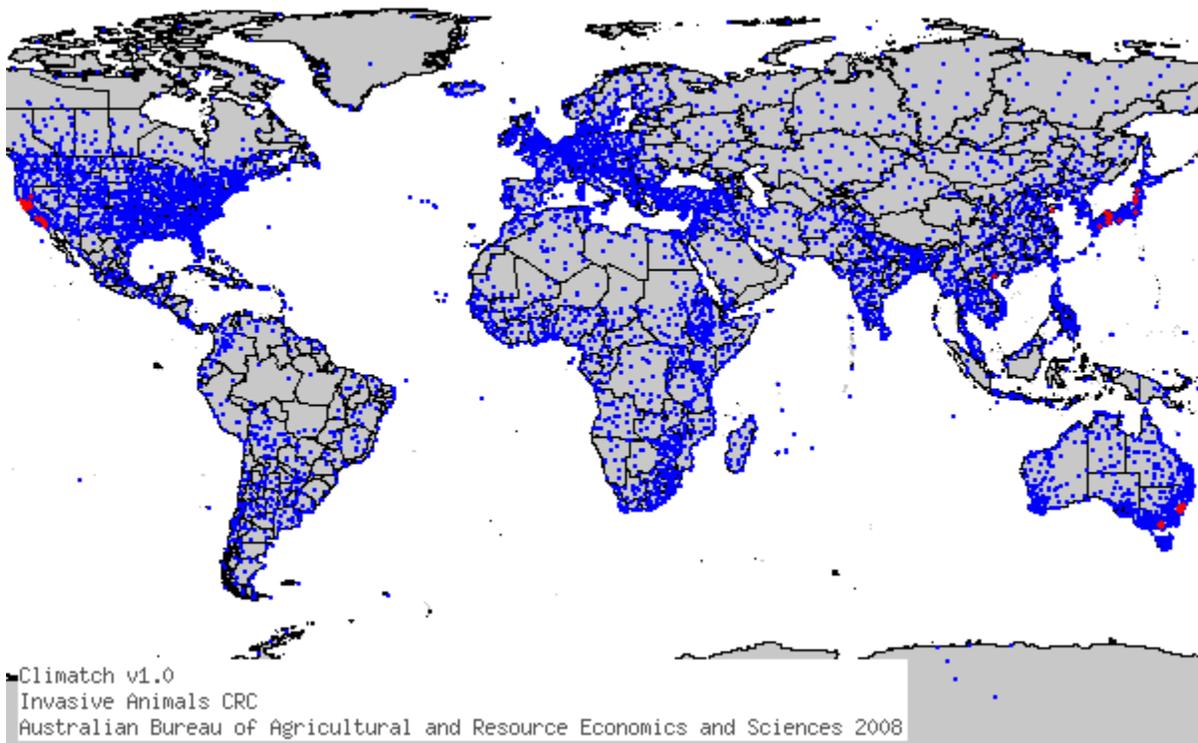


Figure 3. CLIMATCH (Australian Bureau of Rural Sciences 2008) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *Acanthogobius flavimanus* climate matching. Source locations from GBIF (2014) and Nico et al. (2014).

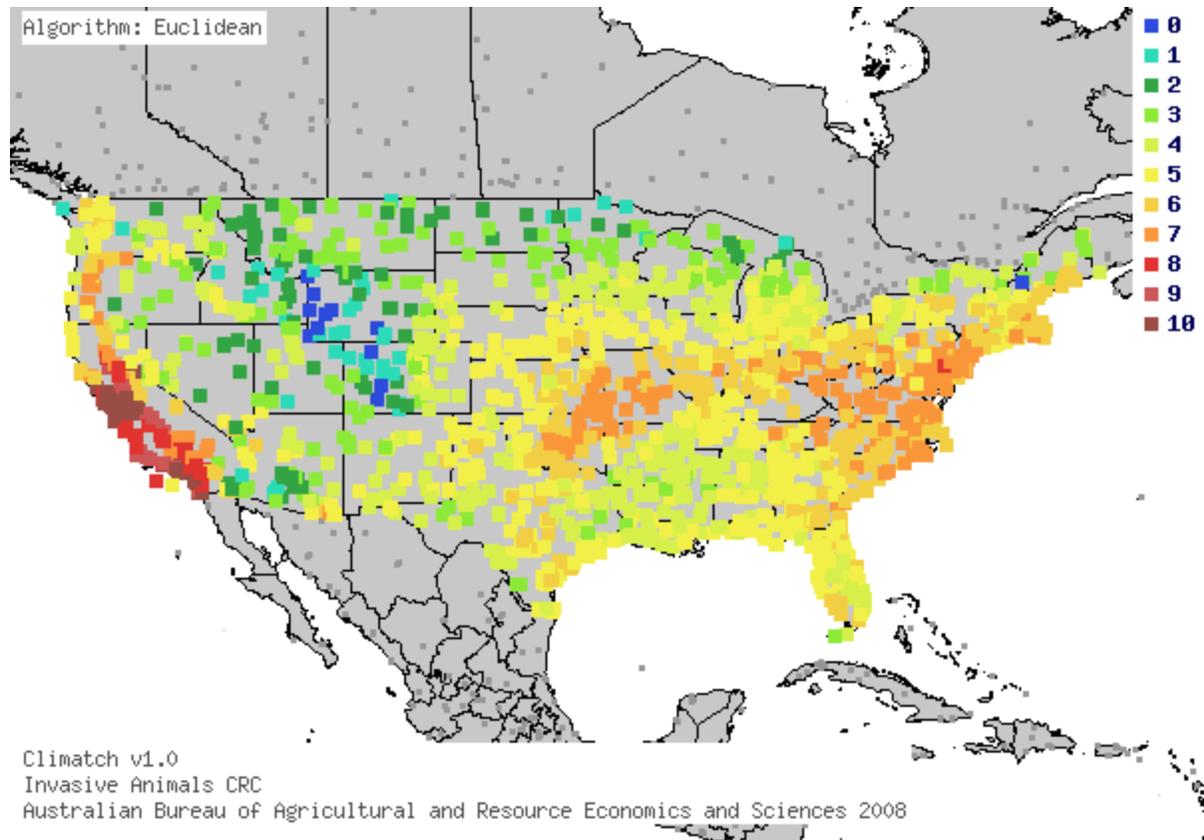


Figure 4. Map of CLIMATCH (Australian Bureau of Rural Sciences 2008) climate matches for *Acanthogobius flavimanus* in the contiguous United States based on source locations reported by GBIF (2014) and Nico et al. (2014). 0= Lowest match, 10=Highest match.

Table 1. CLIMATCH (Australian Bureau of Rural Sciences 2008) climate match scores.

CLIMATCH Score	0	1	2	3	4	5	6	7	8	9	10
Count	12	48	91	177	423	556	339	211	39	24	54
Climate 6 Proportion =		0.338									

7 Certainty of Assessment

Information on the biology, impacts, and distribution of this species is readily available. Certainty of assessment for this species is high.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Acanthogobius flavimanus is a marine and freshwater fish native to eastern Asia. This species has been introduced to Australia, Mexico, and the United States. *Acanthogobius flavimanus* has established populations in estuaries in California. The main impact of these newly established populations is competition with native sculpins and the endangered Tidewater Goby, which has led to reduced abundance and extirpations. This species has a high climate match with the contiguous U.S. Overall risk for this species is high.

Assessment Elements

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

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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