Rhinogobius brunneus
Amur Goby
Yoshinobori
Order: Perciformes
Family: Gobiidae
Genus: Rhinogobius
Species: brunneus

**Identification Key**

Members of the R. brunneus species complex have 6 dorsal spines and 9-10 dorsal rays, with extended second and third dorsal spines (Berg 1965). The males have 8-9 anal rays. They also have 8-9 anal rays. The eyes are set prominently on top of the head with a more elongated dorsal fin than the females of this species (Suk and Choe 2002). The males have dorsal rays, with extended second and third dorsal spines (Berg 1965).

**Species Overview**

The following cited papers all reference different types or species within Rhinogobius brunneus, including Kohda and Takahashi (2004), Keith (2003), Katoh (1996), Masuda (1984), and Chen and Huang (2007). Sawara (1978) actually describes Rhinogobius brunneus. All of these authors describe differences between the suspected various forms of this species. There is an amphidromous form, meaning that as embryos these fish are born in freshwater and migrate out to sea, returning to the streams as juveniles (Masuda and Takezawa 1997). There is also a land-locked river form that has been determined to be a separate species, Rhinogobius flumineus, which migrates out to lakes. It is still recognized by some authors of the genus, which is why R. brunneus was still considered a single species by some authors (Kohda and Takahashi 2004, Keith 2003).

**Species Distribution**

This species is distributed along the Amur River in Russia and China. It is also found in the Ussuri River in Russia and China. It is found in the Korean Peninsula and Japan. It is also found in the Primorsky Krai region of Russia and the Zhejiang and Shanghai provinces of China.

**Habitat**

Rhinogobius brunneus is found in freshwater habitats, including rivers, streams, and lakes. It is often found in areas with a rocky bottom.

**Behavior**

Rhinogobius brunneus is a schooling fish that is often found in groups. It is known to be a voracious predator, feeding on small fish and invertebrates.

**Conservation Status**

Rhinogobius brunneus is not currently listed as a threatened species, but it is important to monitor its population due to habitat loss and fragmentation.
patterns, life history strategies, and egg size. These include the "cross-band", "dark", "large-dark", and "cobalt" types. Masuda (1984) also recognizes the "medium egg", "orange", and "mosaic" types. There are up to 10 different types within the complex and it is clear the taxonomy of this group of fish remains complicated and uncertain (2), therefore the information presented in this profile refers to the Rhinogobius brunneus species complex in general and does not refer to specific types.

Origin and Distribution
The R. brunneus species complex has a widespread native range throughout the rivers of East Asia, in Korea, Japan, Taiwan (Suk and Choe 2002a) Hainan and the Phillipines, China, Vietnam, Laos, Cambodia, Korea, Japan, Taiwan (Suk and Choe 2002a). The first dorsal fin on the male is usually longer and more extravagant in color and shape compared to the females. The males have their idioscent dorsal fins to intimidate and provoke rivals. They use elaborate courtship displays to attract females (Suk and Choe 2002a). The first dorsal fin is adapted as April 2007 (1)(2) recently collected from the Columbia River and the Ramsey Wetland in Portland, Oregon, as that they have already established and are reproducing. Other specimens have been collected from the Columbia River in Washington and the Ramsey Wetland in Portland, Oregon, as in 2004, specimens were discovered on the east fork of the Lewis River in Washington and it is suspected that they have already established and are reproducing. Therefore the information presented in this profile refers to the Rhinogobius brunneus species complex in general and does not refer to specific types.

Life-history and Ecology
Reproductive Strategies
L. brunneus species complex has an annual breeding period that lasts from April to July (Sawara 1978; Keith 2003) during which the males build nests under rocks and use elaborate courtship displays to attract females (Suk and Choe 2002a). The first dorsal fin on the male is usually longer and more extravagant in color and shape compared to the females. The males have their idioscent dorsal fins to intimidate and provoke rivals. They use elaborate courtship displays to attract females (Suk and Choe 2002a). The first dorsal fin is adapted as April 2007 (1)(2) recently collected from the Columbia River and the Ramsey Wetland in Portland, Oregon, as that they have already established and are reproducing. Other specimens have been collected from the Columbia River in Washington and the Ramsey Wetland in Portland, Oregon, as in 2004, specimens were discovered on the east fork of the Lewis River in Washington and it is suspected that they have already established and are reproducing. Therefore the information presented in this profile refers to the Rhinogobius brunneus species complex in general and does not refer to specific types.

Extents of the non-native range for the Alroy Goby

The ability of a male to court in faster currents was more likely than body size and dorsal fin length to direct female choice. The theory behind this determination was that stronger males, capable of performing in faster currents, would ensure the survival of more offspring (Kohda and Takahashi 2004; Keith 2003). Females lay 600-1,700 eggs in a single layer on the ceiling of a nest and then abandon the males to care for the clutch, fanning the eggs and defending them from predators. The eggs are elliptical in shape and about 1.48 mm long (Keith 2003). As adults, Amur yolk reserves are consumed a few days after hatching (Keith 2003). At 3-7 days after hatching, the larvae migrate down the river to saltwater or freshwater lakes depending on the species type. The planktonic stage is spent feeding and growing, reaching lengths of 17 mm TL (Keith 2003; Iguchi and Mizuno 1999). The returning juveniles migrate upstream, losing the light colored translucent body and the former yolk sac. The fish then undergoes metamorphosis in the transition from freshwater to freshwaters. The adult male guards the nest until the eggs hatch (Suk and Choe 2002b). Newborn hatchlings are about 3.1-3.3 mm TL and are nourished by their yolk sacks for 3-7 days before beginning to feed (Keith 2003). The return migration upstream takes place from July to September and is marked by morphological changes in the transition from freshwater to freshwaters. From a light colored translucent body, the fish develops more pigmentation and changes in appearance, with the development of pigments and growth in size. The pectoral fins also develop from the pectoral fins. The fish then begins to feed on a variety of food sources, including rotifers, benthic organisms, and algae. The feeding habits are diverse, allowing the fish to adapt to changes in the environment and food availability. During the larval stage, the fish feeds on a variety of prey items, including copepods, ostracods, and plankton. As adults, the feeding habits are more specialized, with a diet consisting of crustaceans, mollusks, and other invertebrates.
habits of R. brunneus influence the distribution of fishes within their native streams. Fish densities are often highest in areas with little plant cover since sunnier areas encourage primary production of the algae, providing a greater abundance of a major food source for this species. Ample sunlight in these areas also contributes to the intensity of the male courtship displays during the breeding season (Keith 2003).

Environmental optima and tolerances

April 1985 at 72 Israel mussels. Year round, there was a peak in the average number of glochidia attached to each fish in the goby, A. woodiana and the Amur goby. At a small pond in Osaka, Japan (1986) documented the parasitic relationship between A. woodiana, a larval form of the goby and A. woodiana. Aside from predator and prey relationships, Rhinogobius and A. woodiana are known about the symbiotic relationships that exist between the Amur goby and other organisms.

Biotic associations

and beetle. would be ideal for Rhinogobius brunneus. A primary food source in addition to healthy populations of various fly species, amphipods, that provides the goby with ample areas of sunlight to encourage algal production, a freshwater source would ensure a better chance for survival for their offspring. Habitat development (Keith 2003). Nesting male goby, which are hole-digging close to streams, can lead to higher mortality rates and smaller larval and juvenile mortality. Better adapted to living in a saltwater environment, since from late April to July (Suk and Choe 2002). Studies have suggested that newly hatched larvae are physiologically better adapted to living in a saltwater environment. Tolerance for developing goby embryos are between 9°C and 21°C. The ideal temperatures for developing goby embryos are between 9°C and 21°C.

Invasion process

Pathways, vectors, and routes of introduction

The most likely vector for the introduction of this species into the Arabian Gulf was ballast water from ships. The goby was also introduced into the Kumashirin Gulf in April of 1985 at 72 Israel mussels.

Habitats of R. brunneus influence the distribution of fishes within their native streams. Fish
China in 1963 from an unknown vector. It is unclear how the goby was introduced into the states of Oregon and Washington; however, it is possible that the aquarium trade was a potential vector (2).

Factors influencing establishment and spread

The Amur goby has a high tolerance for a wide range of salinity levels, from marine to brackish and freshwater environments (Kohda and Takahashi 2004). In Washington and Oregon, a general concern is that they will compete with juvenile salmon for food, as they feed on the same prey sources. It is possible that the introduction of planktonic larva via ballast water exchange could be picked up and transported to an estuarine location close to the mouth of a river. These goby could migrate upstream, transitioning into the benthic feeding adult form and establish in freshwater environments (Keith, 2003). Based on the ideal conditions for this species, it is feasible that planktonic larvae could establish themselves in freshwater environments (Keith, 2003). A potential vector (2) is unclear how the goby was introduced into the states of Oregon and Washington. It is unclear how the goby was introduced into Washington and Oregon.

Potential ecological and economic impacts

Little is known about how the Amur goby is currently impacting the environments in Washington and Oregon. A general concern is that they will compete with juvenile salmon for food, as they feed on the same prey sources. It is possible that the introduction of the goby could have devastating impacts on the already depleted salmon populations of the Pacific Northwest.


Literature Cited


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Expert Contacts
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