

Freshwater Fishes

Courtesy Annette Tagawa



‘O‘opu ‘akupa or Sandwich Island sleeper *Eleotris sandwicensis*

SPECIES STATUS:
IUCN Red List – Data Deficient
Endemic

SPECIES INFORMATION: ‘O‘opu ‘akupa or Sandwich Island sleeper (*Eleotris sandwicensis*) is Hawaii’s only endemic eleotrid. Adult ‘o‘opu ‘akupa are ambush predators that feed on a variety of invertebrates and fishes, including other native adult and post-larval gobies and some exotic fishes. One study shows that they are also opportunistic feeders. It can grow to 33 centimeters (13 inches) in length. Unlike Hawaii’s native gobies, its pelvic fins are not fused into a disc. Without this sucking disc, they are unable to hold on to substrates and are not good climbers. Spawning occurs in freshwater; nests are made in crevices at the stream bottom. Eggs hatch within a day and are washed to the sea where they spend a few months as oceanic plankton. Post-larvae or hinana recruit to streams indiscriminately, and they depend on waves and currents to bring them inshore. This recruitment occurs year round but is most prevalent in the spring and usually takes place during nighttime hours. ‘O‘opu ‘akupa usually stay hidden, but can be seen darting and diving into leaf litter or mud or searching for shelter in rocks. There are two head morphs of the species.

DISTRIBUTION: Historically, ‘o‘opu ‘akupa were found on all the Main Hawaiian Islands. Today, they also are found on all the Main Hawaiian Islands in the lower reaches of streams and in estuaries below all man-made obstructions. Post-larvae are found in oceanic waters, but little is known of its oceanic distribution, but post-larvae do not show natal stream fidelity.

ABUNDANCE: Most common on O‘ahu. One study shows that ‘o‘opu ‘akupa are present in Pelekunu stream but rare in Waikolu stream, both on Moloka‘i. ‘O‘opu ‘akupa populations are stable in both altered and unaltered streams.

LOCATION AND CONDITION OF KEY HABITAT: ‘O‘opu ‘akupa are found only in estuaries and the lower reaches of streams. Their feeding habitat is primarily on the bottom of these streams and estuaries. Although they prefer clear, cool streams like the other gobies, they are better adapted than most gobies to live in degraded habitat. They can often be found living in cans and other trash items at the bottom of streams. Condition of key habitat varies depending on whether streams flow through protected or forested areas versus urban areas, but ‘o‘opu ‘akupa populations are stable in both altered and unaltered streams. For specific information on stream biota, the Division of Aquatic Resources of the Department of Land and

Natural Resources has a database of surveyed streams. Oceanic waters are important to the survival of post-larvae, but little is known of its oceanic distribution or habitat requirements.

THREATS:

- Habitat degradation results from water diversion, stream channelization, and dams. Water diversion, stream channelization, and dams result in habitat degradation through altered stream flows, which also causes a loss of riparian vegetation, shelter and erosion control; higher water temperatures; and lower dissolved oxygen levels. Because of their higher tolerance to stress, 'o'opu 'akupa are not as threatened by altered streams as other Hawaiian gobies. However, reduced water flows can still limit larvae from reaching the ocean and recruitment back into streams;
- Non-point source water pollution such as nutrients, sedimentation, and chemicals may threaten 'o'opu 'akupa; however, the consequence of these pollutants is relatively unknown and needs to be further studied;
- Introduction of exotic species, diseases and parasites such as tilapia are significant threats to 'o'opu 'akupa. Historical introductions of game fish and more recent unwanted exotic fish from the aquarium trade are both problems. These exotic fish species prey on native fish, they compete native fish for food, and spread parasites and diseases;
- Fishing for 'o'opu 'akupa occurs today and it is used as bait. In conjunction with the above threats, overfishing could become a threat in the future.

CONSERVATION ACTIONS: The goals of conservation actions are to not only protect current populations, but to also establish further populations to reduce the risk of extinction. Past actions to restore fish populations have consisted of a ban on gill, drag, draw, and seine netting; stream clean-up efforts, and public outreach. In addition to common state-wide and island conservation actions, specific actions include:

- Improve altered or diverted streams;
 - Modify or remove gratings or diversions to allow for instream passage of fish;
 - Restore riparian vegetation to help decrease instream heating and reduce sediment loads;
 - Remove alien species;
 - Create pools in frequently dewatered stretches to provide safe usable habitat between flows.
- Collaborate with the Commission on Water Resources Management and the Land Board to ensure adequate Instream Flow and biological integrity of riparian areas;
- Work to clean streams with significant pollution;
- Continue developing GIS database and making it web-accessible;
- Use science-based management of recreational fishing;
- Increase education and outreach efforts, particularly on issues of fishing related life history, water pollution, and how to deal with unwanted aquarium pets;
- Continue on-going partnerships focused on environmental and fisheries education and conservation and expand partnerships.

MONITORING:

- Establish survey schedule to determine population size and distribution;
- Monitor number of returning hinana;

- Monitor number of fish taken in recreational fishing each year.

RESEARCH PRIORITIES:

- Determine effects of pollution on population;
- Better understand the role of estuaries in species ecology;
- Continue researching effects of stream channelization and diversion-specifically how this goby is able to have high numbers in altered streams;
- Initiate research to study source-sink population structure;
- Research impacts and methodologies to deal with alien species;
- Research effect of fishing on total population size and distribution.

References:

- Brasher AM. 1997. Habitat use by fish ('o'opu), snails (hihiwai), shrimp ('opae) and prawns in two streams on the island of Moloka'i. Technical Report. Honolulu HI: Cooperative National Park Resources Studies Unit University of Hawaii at Manoa. Report no 116. 92 pp.
- Hau S. 1996. Post-larval migration of three native gobies (*Lentipes concolor*, *Awaous guamensis*, and *Sicyopterus stimpsoni*) in Iao stream on the island of Maui. Proceedings of the October 1994 Hawaii Stream Restoration Symposium; 1994; Hawai'i. State of Hawai'i, Department of Land and Natural Resources, Division of Aquatic Resources. 159 pp.
- Kinzie RA III. 1990. Species profiles: life histories and environmental requirements of coastal vertebrates and invertebrates, Pacific Ocean region; Report 3, Amphidromous macrofauna of island streams. Technical Report EL-89-10. Vicksburg, MS: US Army Engineer Waterways Experiment Station.
- Tate DC. 1997. The role of behavioral interactions of immature Hawaiian stream fishes (Pisces: Gobiodei) in population dispersal and distribution. *Micronesica* 30 (1): 51-70.
- Yamamoto M, Tagawa A. 2000. Hawaii's native and exotic freshwater animals. Honolulu, HI: Mutual Publishing. 200 pp.

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