# University of Guam-4H
# Rabbit Fish (Manahak) Project 2014-2015

May 2015

Western Pacific Regional Fishery Management Council
1164 Bishop St., Ste. 1400
Honolulu, Hawai'i, 96813

Photo on cover from NOAA Photo Library. Photo taken by David Burdick.

A report of the Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400, Honolulu, HI 96813

Prepared by Cliff Kyota.



Published in the United States by the Western Pacific Regional Fishery Management Council

ISBN 978-1-944827-51-9

Funded by the Western Pacific Sustainable Fisheries Fund through the Western Pacific Regional Fishery Management Council.

**Contract Number:** 13-SFFII-01

**Award Period:** 12/01/2013 - 12/1/2014 (extended through April 2015)

**Project Title:** Guam Manahak Project

**Recipient Name:** University of Guam - 4H Youth Development Program

**PIs/PDs:** Cliff Kyota

**Purpose**

Harvesting of manahak has been low in recent years. This reduction in harvest could be related in several factors: 1) resource depletion; 2) less fishing; 3) less reporting; and/or, 4) less fishable areas due to MPAs. However, it is also believed that juvenile rabbit fish are subject to high levels of predation from other fish species, as well as subject to mortality from starvation related to lack of juvenile habitat.

**Project Scope**

Traditional fisherman and 4H youth development program members (4H club members or youth) will work together to raise 1,500 manahak for a duration of 5-6 months. Once the stocks reach maturity, the project participants will properly measure the weight and length of each manahak, and then apply a conventional mark and recapture tag prior to release at a predestinated site. The data collected from this project will be recorded and stored at the 4H program which will help our community to better understand the manahak's life cycle, movement patterns, reproduction and environmental needs. The project will also help improve our youth involvement in marine science and mariculture. Youth will learn about the biological cycles of the manahak, traditional fishing methods, mariculture operations, animal husbandry, and technical construction of marine aquaculture facilities.

**Approach**

This project delivered non-formal education workshops for 4H youth project participants on all aspects of the project. It also brings awareness and education about the demonstration sites that will promote Guam manahak fishing methods to the island youth and community. The project's general educational enrichment activities on manahak fishing methods and life cycle will be provided to middle and high school students both in the public and private schools, as well as to the island community. A series of demonstrations and public awareness sessions will be conducted at selected sites on Guam to promote and sustain this project.

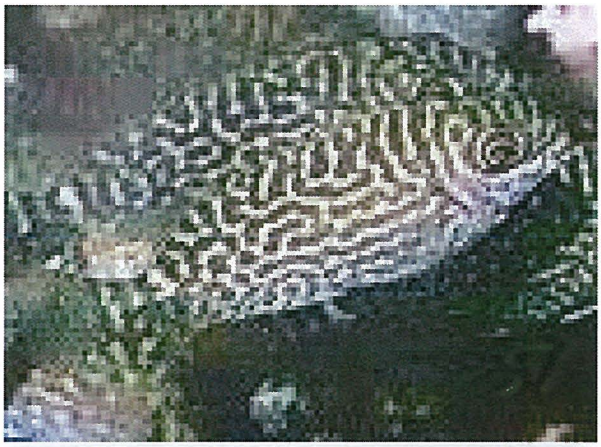
**Results, Evaluation, and Conclusions**

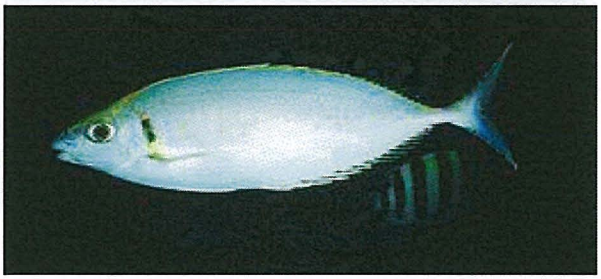
Pre- and post-evaluations will be used as an instrument to measure the knowledge gained from this project. This evaluation will provide the ideal number of interested youth who will pursue their study in science-related fields. The information obtained from the evaluations will help the project promote capacity building at the University level for future projects.

**Final Report Outcomes**

Based on Palau community college study on rabbit fish, from the *Acanthuroidei*

*suborder*, is a highly diverse family that can be found along coastal areas. It is apparent that some species of the rabbit fish, particularly the *Siganidae* family, have a high tolerance to marine environments as they can also be found in brackish estuarine waters. Other species in this family are known to occur in fresh water environments.





The rabbit fish has adapted to its natural environment with oddly characteristic oval shaped bodies that are flat and thin. Distinct, slightly protruding mouths with bare sharp teeth are used for munching on dead coral branches and flora that is found on hard substrata such as rocks and corals. As the rabbit fish feed, the continuous action crops off bits and pieces with their teeth.

Rabbit fish all have razor sharp fin rays that can inflict a painful cut. In fact, some species have poisonous glands along their spines, which immediately release a toxic substance into the inflicted cut. Both the poisonous and non-poisonous species of the rabbit fish are very popular as aquarium specimens. One of the most well known of these is the yellow rabbit fish, a beautifully colored fish with a bright yellow body punctuated by a large black dot near the tail. Although it is wary of other fish in the tank, it is very seldom known to display aggressiveness.

Even though little is known about the habits of the rabbit fish, approximately eighteen species have been identified living in reef areas or along the shallow rocky bottoms of the ocean. Most species are small, growing to a length of around five to six inches. All are colorful, and much like the surgeonfish, some species change colors when they are threatened. Rabbit fish are distributed throughout mangrove, sea grass, and even the inner reef. The outer reef is the most dangerous place, where they are susceptible to predators. But there is another species of rabbit fish that live in the deeper part of the ocean, the mottled rabbit fish. Rabbit fish eat live food, for example, brine shrimp and worms.

Their body is compressed, fairly slender. The head is concave above the eye. Snout is blunt. And, the anterior nostril is with a long flap in juveniles (shortening with age, absent in old fish). The tip of the flap reaches less than halfway to posterior nostril in specimens larger than 12 cm standard length.

A forward-directed spine is present in front of dorsal fin; last dorsal spine the shortest, contained 0.5 to 0.6 times of the longest dorsal spine; last anal spine contained 1.2 to 1.5 times of the longest anal spine (usually the third). Caudal fin is almost emarginated in specimens under 10 cm standard length, forked in larger fish (but median rays never less than half length of longest rays). Scales minute; cheeks scale less, or with few to many very fine scales; 21 to 27 scale rows between lateral line and bases of leading dorsal spines. Color in live fish is highly variable from greenish grey on dorsal side to silver on ventral side; numerous pearly blue matching head size spots covering nape and sides, arranged more or less in horizontal rows. Caudal fin plain grey or irregularly barred with pale and dark grey; pectoral fins hyaline; dorsal, anal and pelvic spines and rays have same color as adjacent areas of sides; fin membranes grey. After death, fins usually with pale and dark grey, dorsal fin rays banded.

**Project Outcomes**

Rabbit fishes are important food fishes in Guam. There are five varieties. Three of the species are relatively uncommon deep-bodied types that occur in small groups or pairs below the edge of the reef flat. The two most abundant kinds, *Siganus argenteus* and *Siganus spinus*, are each subject to two major fisheries. The first fishery occurs when young rabbit fish arrive from the open sea as tiny silvery, transparent post-larvae, called *manahak* in Chamorro. This usually happens during a few days around the time of the moon's last quarter in April or May, and occasionally in October.

The harvesting of *manahak* is seasonal and has been a longstanding cultural tradition with the Chamorro people. With the increase in jet ski and other motorized craft activity in east Agana Bay, where fishermen usually await the runs, an Executive Order was issued by the Governor of Guam in 1991 which provided for the closure of the bay by the Department of Parks and Recreation during the peak of the *manahak* season. Although *manahak* are caught off most Guam coasts, east Agana Bay is considered the traditional site for the *manahak* to arrive.

*Manahak* arrive in large tightly packed schools containing thousands of individuals. Fishermen scoop them up in fine-mesh nets. A highly prized delicacy, *manahak* is eaten fried or pickled in salt and lemon juice, and served as a condiment.

On October of 2014, the University of Guam 4H Youth Development Program collaborated with local fishermen to catch manahak, or juvenile rabbit fish, for growing and stocking projects. Although, the run was less than the normal run, we were able to capture a good amount. On November 2014, another run came in and fishermen were able to catch approximately 2,500 juveniles for the grow out tank. It was three weeks between each run.

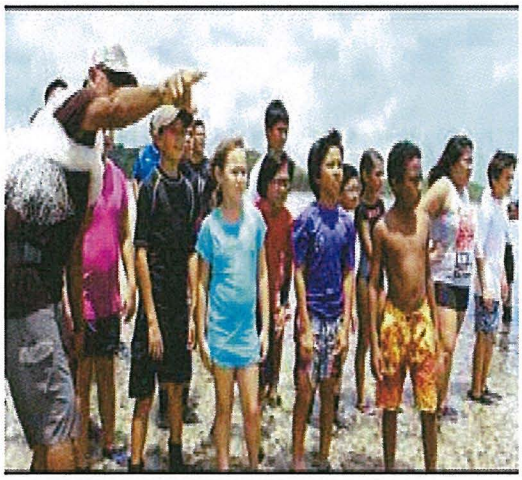
Sustaining the brood stock for this project required constant monitoring of water quality and other factors by project participants. Several studies were developed and conducted to help assess and document the challenges that could occur during the operation. Based on these monitoring and assessment studies, project participants were able to determine the following. Juvenile manahak held in captivity are able to tolerate a wide range in salinity from 17 to 37 ppt. They grow well in temperatures between 23° and 30° C. Juvenile manahak can tolerate low dissolved oxygen levels down to 2 ppm and high (basic) pH levels up to 9. It was clearly demonstrated that these fish can also be sustained in high stocking densities when held within aquaculture systems. All these characteristics make this species suitable for culture. *Siganus canaliculatus* grows to a mean standard length:

| Grow rate | Period |
|---|---|
| 2-4 1/2 cm | 2-2 1/2 months |
| 3-4 cm | 4 1/2 months |
| 3-3 1/2 inches | 5-5 1/2 months |

The juveniles and adults are primarily herbivorous, feeding on different kinds of benthic algae. In captivity, they are omnivorous, feeding on a variety of food, both of vegetable and animal origin, including shrimp feed pellets in the culture system. The results of recent feeding trials with *S. canaliculatus* have suggested that the

dietary protein requirement for this species is above 30 percent. Fish fed with high dietary protein levels display faster growth than fish fed low protein diets or live seaweed. Furthermore, the fact that rabbit fish have also been reported to eat amphipods, copepods, sponges, foraminifera, crustaceans, and brittle stars, which suggest that these species may in fact be opportunistic omnivores. The juvenile can be fed with a mixture of phytoplankton, rotifers, copepods and the larvae of Artemia in culture. It is reported that the results of fry being fed algae and fish feed pellets over a 7-week period are two fold, an increase in their length and weight.

**Impacts/Outcome to Community**



The rabbit fish project was successfully implemented by 4H in the community. 4H youth were recruited and selected to augment their knowledge in marine science, marine management, and marine career path. 4H youth program collaborated with UOG marine for grow out knowledge on rabbit fish. However, most of the knowledge applied to the youth on culturing the species is mainly from the Palau community college partnership. Along with the knowledge delivered, a two hours training was delivered to the youth. The youth were able to demonstrate and gain knowledge on the measurable outcome. This project promoted change in the general operation of Guam's fishermen who target rabbit fish or other inshore fish species. Guam is listed as a fishing community pursuant to the Magnuson-Stevens Act. The Western Pacific Regional Fishery Management Council has developed fishery ecosystem plans that recognize the importance of community-based management approaches (WPFMC 2005). This recognizes that responsible actions by citizens and communities are necessary for long-term wise use of marine resources. The Council's fishery ecosystem plans are focused on community collaboration, participation, and partnerships (WPFMC 2005). In Guam, where village-level systems still maintain a strong level of influence over fishing and marine resource use, the involvement of local communities in natural resource management is critical (Allen and Bartram 2008).

***Future Considerations***

*Approach 1 (No Action) would not have a significant impact on Guam's fishing community, which would continue to rely on rabbit fish (although not the less popular dagge) as a traditional food.*

*Approach 2 (Proposed Action) would result in the opportunity for 4-H personnel to conduct outreach activities that could have positive impacts on enhancing community education on the importance of maintaining healthy coral reef fisheries.*

When compared the approaches would positively impact fishery participants and communities in Guam by increasing local expertise. Approach 2 (Proposed Action) would also be positive as scientific information and human needs are integrated in a manner that would increase the involvement of local communities in the management and conservation of inshore fishery resources. This shift toward ecosystem-based management should be done in a manner that is understandable to fishery participants and with minimum regulatory burden.

Implementation of management changes or regulatory amendments could impact the Guam community favorably. These would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

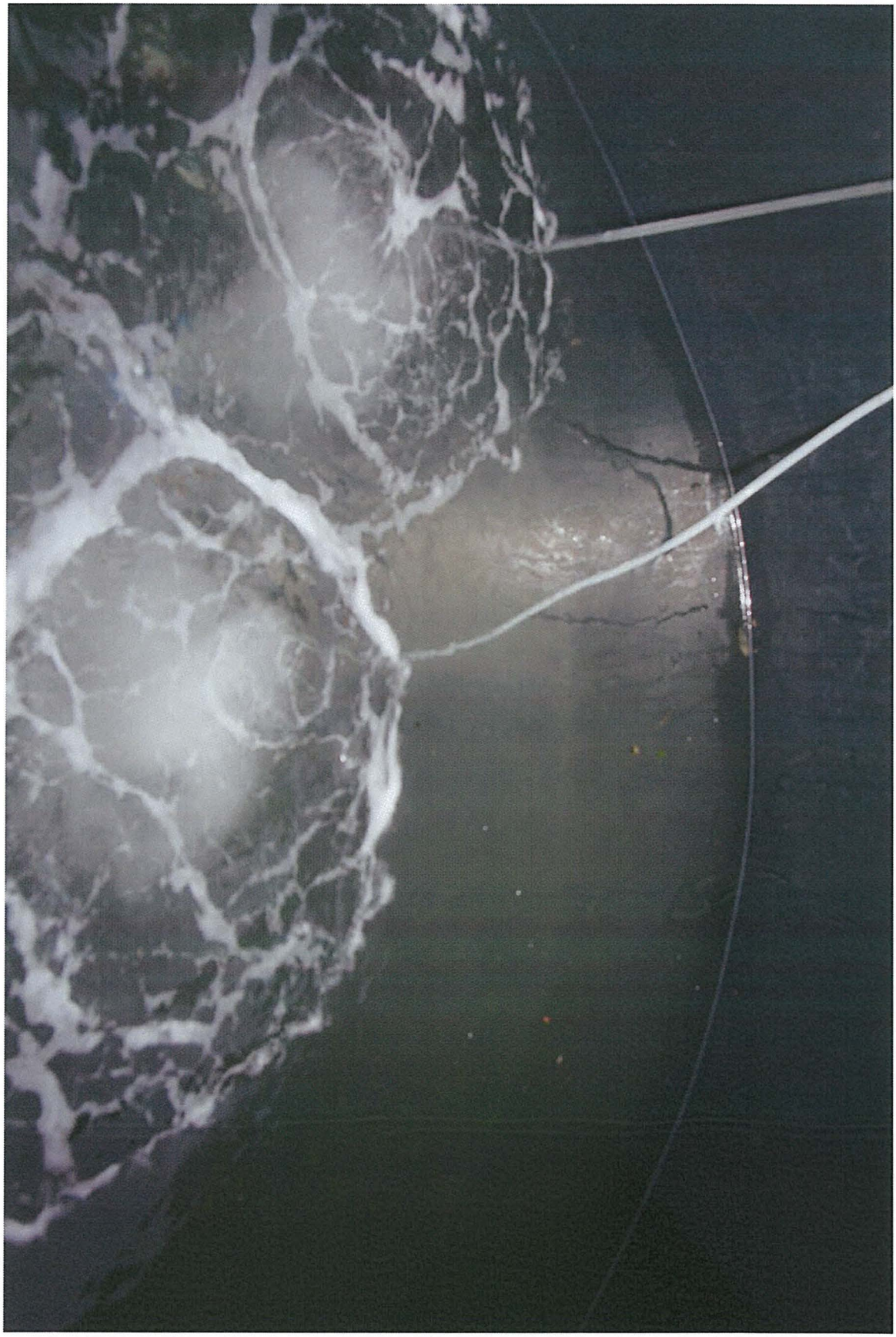
**Impacts/ Sustainability**

In April 17, 2015, five University of Guam biology majors were able to participate in tagging and releasing of 300 adult manahak (rabbit fish) at the Agana boat basin. By integrating the University of Guam, college students can help the manahak project elevate its sustainability and promote UOG capacity building in science. These students are designated as 4H volunteers and serve as future mentors for rabbit fish tagging projects. Their role will include community awareness and school presentations on sustaining marine resources in Guam and other Micronesian islands. Moreover, this project will help start the rabbit fish aquaculture in Guam. Raising rabbit fish will be promoted among the potential farmers. The cost break down on how to raise rabbit fish will be made available for promoting culturing species.

Harvesting the manahak at east agana

Stocking the tank the day of harvest

Stocking the holding tank with the stocks



Transport tank

Mid quarter measurement

Measurement

Catching the stocks for release

Tagging

Tagged and ready for release

Releasing point at agana

Releasing the stocks

Releasing the stocks