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THE 1992 AMERICAN SAMOA SUBSISTENCE FISHING SURVEY

by

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SUBSISTENCE FISHING SURVEY, TUTUILA ISLAND, AMERICAN SAMOA

Introduction

The exploitation of reefs, sea grass beds, mangroves, and lagoons for shellfish, crustaceans, fish, and turtles has been a significant part of Samoan life. Before the arrival of Europeans, the people of Tutuila Island utilized a wide variety of fishing methods and obtained the bulk of their protein from the sea. Marine resources, which were controlled by village chiefs, were harvested in moderation to ensure a plentiful supply of fish and other organisms for future generations. However, continued contact with western cultures, which had neither a conservation ethic or a tolerance for traditional customs and practices that regulated and protected resources, resulted in profound changes in the Samoan culture and subsistence economy.

Today, American Samoa's rapidly expanding population has placed increasing pressure on its marine and coastal environments. Overfishing and harvesting, erosion of traditional conservation practices, shoreline development, road building and land clearing activities have severely degraded reefs, mangroves, and coastal ecosystems. In addition to the collection of quantitative fisheries data, the observations of local resource users can be used to gauge changes that are occurring in the marine environment.

The primary purpose of this report is summarize current marine resource use patterns and their trends and supplement an earlier study of the shoreline fishery by staff at the Department of Marine and Wildlife Resources.

Methodology

Over a five week period, from February 3 through March 7 1992, subsistence fishing surveys were conducted in 42 villages on Tutuila Island. The surveys were conducted primarily in Samoan by Department of Marine and Wildlife Resources staff member, Fale Tuilagi. Three individuals from each village, generally a village elder or someone known in the community as a fishing expert, were interviewed and an effort was made to ensure that one of the interviewees was female. Interviews generally were conducted during the day and lasted anywhere from one to three hours. It was sometimes necessary for Fale Tuilagi to return to a village in the evening in order to catch someone who worked during the day. For each interview session, a brief introduction describing the purpose of the project and explaining the survey questionnaire was given.

The survey questionnaire (Table 1) was developed by Fale Tuilagi and Bonnie Ponwith, fisheries biologist (also from the American Samoan Department of Marine and Wildlife Resources), with assistance from Kim Des Rochers of the University of Hawaii Sea Grant Extension Service.

Topographical maps and nautical charts were used to identify the location of certain marine resources (e.g., turtle nesting beaches) or use areas (e.g., where a particular fishing technique is carried out).

Table 1. American Samoa Fishing Survey Questionnaire

Fishing practices of the interviewee

1. How is the fishing in your village (day, night, high or low tide)?

2. How often do you go fishing on the reef adjacent to your village and what methods do you use?

3. What species do you catch with each method?

4. What is an average catch for one of your fishing trips?

5. Do you sell any portion of your catch?

6. How many meals per week does your fishing provide for you and your family?

7. Do you fish on reefs other than the one by your village?

Fishing practices of the village

8. How many people from this village fish here?

9. Can you list the methods they use and the species they catch?

Abundance trends

10. How does fishing now compare to ten years ago?

11. Are there any species of fish you use to catch here that are now either gone or extremely rare?

Village control of reef resources

12. Are people from other villages allowed to fish here? Do they need permission to do so?

Fishing Practices on Tutuila Island

A detailed account of early fishing techniques and gear used in Samoa is found in Buck's, **Samoan Material Culture** (1930). Buck described numerous techniques which required highly refined gear e.g., hooks from pearl shell or turtle, nets from traditional hibiscus fiber, spears and harpoons, and planked and dugout canoes. In addition, many fishing techniques required a large number of people and a leader, **tautai**, who directed and coordinated the efforts of the other fishermen. Reefs and reef resources were controlled by a village chief or council of chiefs. These individuals would occasionally restrict fishing efforts by way of seasons, closure of fishing grounds, and taboos thereby protecting the reefs from overharvesting.

Buck (1930) and Hill (1977) have noted that "fishing" is primarily a men's activity, whereas, reef gleaning is practiced predominantly by women and children. Similar divisions of labor in fishing activities are found elsewhere in Oceania.

Today, several fishing methods are used to harvest fin-fish and invertebrates from the reefs on Tutuila Island (Table 2). The primary methods include hook and line, net fishing, gleaning, free diving, and palolo harvesting.

Samoans use three hook and line methods: handlining, bamboo pole, and rod and reel. Handline fishing consists of a weighted hook on a length of monofilament line which is secured to and wrapped around an aluminum beverage can. Handline fishing occurs from docks and small boats

and throughout the reef area from the shoreline to the reef edge and in a channel, **ava**, through the reef. According to Ponwith (1991), bamboo pole fishing is the least commonly used of the three hook and line methods, perhaps due to its short casting distance. Rod and reel is the most commonly used fishing method accounting for 37% of the annual shoreline subsistence catch (Craig et al., 1992). Rod and reel fishing is done in a variety of marine habitats or zones and has a much greater casting range than either handlining or bamboo pole fishing. Hook and line techniques primarily target jacks, snappers, and groupers.

Gillnetting and throw netting are the two net fishing methods used. According to the Department of Marine and Wildlife Resources, gillnetting accounts for 9% of the annual subsistence catch and is reported to be the most efficient subsistence technique (12.2 pounds/gear-hour). Most gillnets range from 50 to 300 feet in length and three feet in depth and are made of monofilament nylon with mesh sizes between 1.5 and 4 inches. The size of the mesh determines the size of fish caught.

The gill net is set in a semi-circle on the reef flat or across an **ava**. Several individuals pound and splash the water while approaching the open end of the net in order to drive the fish into the net. Throw netting employs a circular net (also made of monofilament nylon), ranging five to eight feet in diameter with weights around the perimeter. The net is cast out and then retrieved by a line secured to the center of the net. Throw netting accounts for 5% of the annual subsistence catch. Net fishing activities harvest mackerel, surgeonfish, and mullet.

Reef gleaning, *naonao*, is a collective term which refers to the gathering of invertebrates and small fish on the reef flat at low tide. Gleaning, which is generally done by women and children, involves turning over loose coral rubble and rocks and probing with either bare hands or a tool such as a knife or stick in search of octopus, clams, urchins, or other prey. The primary species harvested bye gleaning include octopus, small snails, eels, and miscellaneous small fish. Gleaning accounts for 8% of the total annual subsistence catch on Tutuila although in 1976 it was estimated to have accounted for over 28% of the catch (Hill, 1977). This decline is probably due to several factors: 1) overharvesting, 2) degradation of reef and mangrove habitat, and 3) a preference (by some) towards canned, commercially caught species of fish e.g., tuna. Gleaning in many areas of the Pacific has been a much overlooked fishing activity both in the literature and by fisheries biologists. This may be because gleaning does not require special gear or skill and is generally practiced by women and thus, not considered "fishing". However, on many islands of the Pacific, gleaning provides a consistent daily supply of protein for a household (Des Rochers, 1992).

Free diving for fish and invertebrates takes place on both the reef flat and the reef front. A small boat or *paopao* is sometimes used to reach diving areas. Free diving is done during the day or at night with a flashlight. Equipment consists of a steel rod sharpened to a point to use as a spear or to be shot from a hand-made slingshot using surgical tubing. Occasionally, divers use mask and snorkel and a three-prong spear. Catches are strung on fishing line which is attached to the

diver's waist or suspended from a styrofoam float. Traditionally, two types of wood spears were used: the three-pronged *tao mata tolu*, used primarily for deep water spear fishing and the shorter *tao mata tasi*. According to Ponwith (1991), diving is the only method which contributes more than 10% to both catch and effort totals. Diving catches generally consist of lobster, octopus, groupers and other fish.

The harvesting of the pololo worm, *Eunice viridis*, is an important community event which occurs once a year. Samoans consider the burrowing polychaete a delicacy and gather in large groups at midnight of the night of the worm's emergence with lanterns or flashlights, buckets, and scoop nets. Once a year at the beginning of the last lunar quarter of October or November the worms release egg- and sperm-filled body segments into the water. Ponwith (1991) found that the villages between Faga`alu and Nu`uuli had the greatest number of participants in palolo harvesting. Palolo harvesting is the only community or group fishing activity that remains in American Samoa.

Frequency of fishing activities

Most fishermen and women reported that they fish anywhere from one to four times per week depending on the weather and tide. Fishing most commonly occurs on Saturdays and non-religious holidays. Funerals and other religious customs greatly restrict fishing frequency. Depending on the method used, fishing may be carried out during the day or night. During the

day, most fishing efforts focus on gleaning, bamboo pole fishing, and handlining. Most night fishing is restricted to night diving.

The harvesting of fish and invertebrates along Tutuila's shoreline occurs within a number of different reef zones, each with unique biological and physical environments. The type of fishing activity which occurs in these areas is determined by the tides and weather.

The tides are the primary environmental factor governing accessibility to the reefs. American Samoa experiences semi-diurnal tides, i.e. there are two high and two low tides within a 24 hour period. During periods of low tide, when the fish move to deeper water, women and children glean the reef flats for urchins, eels, octopus, and other molluscs. Hill (1977) observed that most gleaning activities are concentrated on the outer and mid sections of the reef flat where these organisms are commonly found.

During periods of mid and high tide, the fish move from deeper water to the reef flat to feed. These fish are caught primarily by line fishing techniques (bamboo pole, rod and reel, and handlining) and throw nets from the shore and by diving anywhere along the reef. In addition, gillnets are set at reef passes to catch the fish which exit through the *avas* when the tide falls.

Hill (1977) reported that, "...the weather was found to be of secondary importance in determining reef use patterns by Samoan subsistence fishermen." The fringing reef, where most subsistence

fishing takes place, is somewhat protected from the effects of foul weather conditions on the sea's surface.

Location of fishing activities

The majority of fishermen and women who were interviewed reported that they fish primarily on the reefs directly adjacent to their village. However, it is not uncommon to fish on neighboring reefs. Although interviews were not conducted in the inner Pago Pago Harbor area, it can be assumed fishermen and women from those villages go elsewhere to fish. The reefs within Pago Pago Harbor have been severely degraded by dredging, filling, siltation, and pollution. Wass (1980) reports that 95% of the reefs at the back end of the harbor have been filled. Hill (1977) found that although 79% of the fishermen he interviewed fished on their village's reefs, there was a growing trend toward fishing in neighboring villages.

Amount of fish harvested

When asked what the average catch (in pounds) for a typical fishing trip, interview responses varied greatly (Table 2). These responses are highly suspect and probably indicate that subsistence fishermen and women are not use to thinking of their catch in terms of weight but rather in the number and type of fish they catch.

Abundance Trends in the Shoreline Subsistence Fishery

Ponwith (1991) compared catch and effort data with that from twelve years ago. In 1991, catch had dropped from 136,541 pounds per year to 63,414 and effort had declined from 65,179 gear-hours to 36,587. Ponwith (1991) notes that in spite of a 26% decline since 1979, the shoreline fishery landed more fish than the offshore fishery and while only a small portion of the shoreline fishery is sold, its overall value (as of 1990) is estimated at over US$760,000. Although the shoreline fishery harvested over four times as many pounds of fish and invertebrates as the offshore fishery in 1990, it required thirty times the amount of effort. Therefore, although the shoreline fishery accounts for a significantly higher catch, it is not as efficient as the boat-based offshore fishery.

According to the fishing survey conducted by Tuilagi, many people feel that fishing today is not as good as it was 10 years ago. Some fishermen complained that habitat destruction of habitat, particularly from hurricanes, the use of dynamite for construction projects, and pollution e.g., the dumping of cannery wastes into inner Pago Pago Harbor, has been responsible for the decline in fish species. A recent study by the American Samoa Environmental Protection Agency has noted the presence of heavy petals and PCBs in the tissue of fish from inner Pago Pago Harbor. Health advisories have been issued recommending that fish from the inner harbor not be consumed. According to Ponwith (1991), the sale of fish caught from inner Pago Pago Harbor has been banned.

One fishermen complained that street lights were negatively affecting fish catches in his village. Other fishermen and women commented that much of the coral on the reefs is dead and that fish are considerably smaller and more difficult to find. A number of fishermen commented that there are many more people fishing now than in the past and, that one has to fish for three to four hours to catch the same number of fish caught ten years ago in one hour. Women generally commented that fe'e (octopus) is becoming much more difficult to find. The general consensus was that there are less fish to be caught and those that are present are becoming difficult to find.

In addition to habitat destruction and overfishing, some seemingly beneficial developments and changes in fishing technology, such as monofilament gillnets, may also have significantly impacted the nearshore or reef fishery. On Kosrae Island, the introduction of the gillnet drastically improved fishing efficiency (Des Rochers, 1992). New technologies such as this can result in increased pressure on marine resources unless they are monitored and regulated. Biological data such as catch per unit effort is extremely important in order to determine whether or not a particular resource can withstand an increase in fishing pressure.

Other changes in technology during the last fifty years include the use of rods and reels, power-driven boats, SCUBA, synthetic lines and nets, diving masks and fins, underwater lights, and dynamite.

Some interviewees, however, felt that fishing was the same today as it was ten years ago and hadn't noticed any physical or other changes in the marine environment. This is typically the response from younger fishermen and women (generally 30 years old or less) who are less experienced and knowledgeable than their elders. They do not have the benefit of years of fishing to distinguish subtle changes in the marine environment. Many young people in American Samoa today are educated in public schools and so spend very little time with their elders learning fishing techniques and marine ecology.

The main species of fish and invertebrates reported to be less abundant than ten years ago include octopus, lobster, giant clam, crabs, sea urchins, heart urchins, big-eye scad, rabbitfish, mullet, and palolo.

Table 2. Results of Fishing Survey.

VILLAGE	# PEOPLE USING REEF	AMT FISH/ TRIP(lbs)	#MEALS/ WEEK	METHODS USED
Fagamalo	12-15	20-60	2-6	gleaning pole r/r spear h/l paopao
Maloata	10-13	20	1-2	r/r h/l paopao gleaning diving
Fagali`i	8-18	40-60	1-4	diving gleaning r/r h/l paopao
Poloa	18-20	40-80	2-5	diving gleaning h/l paopao r/r
Amanave	12-20	10-80	1-6	diving gleaning gill net throw net r/r pole
Failolo	11-15	10-80	2-4	diving r/r throw net gill net pole spear gleaning

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VILLAGE	# PEOPLE USING REEF	AMT FISH/ TRIP(lbs)	#MEALS/ WEEK	METHODS USED
Agugulu	9-11	10-80	3	r/r gleaning pole throw net spear
Utumea west	7-11	10-30	2-3	gleaning diving pole r/r
Nua & Se`etaga	13-20	10-40	2-4	r/r diving
Afao	7-20	10-80	1-4	pole gleaning throw net diving r/r diving
Asili	15-17	10-20	1-4	r/r gleaning throw net gill net diving
Amaluia	8-12	10-20	1-2	r/r throw net gleaning pole diving

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VILLAGE	# PEOPLE USING REEF	AMT FISH/ TRIP(lbs)	#MEALS/ WEEK	METHODS USED
Leone	12-17 20	2-3		throw net r/r diving gleaning pole gillnet
Taputimu & Vailoa	8-12	10-80	2-4	r/r throw net diving gleaning pole
Vaitogi	8-14	10-20	2-3	r/r pole diving
Fagasa	40-150 40-120	4-5	diving	throw net r/r pole gill net gleaning spear h/l paopao
Vatia	40-50	40-80	2-4	throw net diving r/r pole gillnet gleaning diving h/l paopao

Table 2. Results of Fishing Survey

VILLAGE	# PEOPLE USING REEF	AMT FISH/ TRIP(lbs)	#MEALS/ WEEK	METHODS USED
Afono	30-40	20-80	3-5	gleaning diving pole h/l paopao r/r
Masefau	23-33	10-80	1-5	gleaning throw net r/r gill net h/l paopao h/l
Masausi	7-9	10-20	1-4	gleaning r/r diving h/l paopao pole gill net throw net
Sa`ilele	8-20	10-160	2-3	pole h/l paopao gleaning throw net diving r/r
Aoa	13-20	15-60	2-4	throw net diving r/r pole gill net h/l paopao

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VILLAGE	# PEOPLE USING REEF	AMT FISH/ TRIP(lbs)	#MEALS/ WEEK	METHODS USED
Onenoa	20	10-20	2-4	r/r diving gleaning throw net spear h/l h/l paopao gill net
Tula	30-40	10-20	1-4	h/l r/r gleaning spear
Alao	18-28	10-20	1-3	r/r diving throw net gleaning gill net h/l
Utumea east	9-14	10-40	2-3	gleaning r/r diving pole throw net
Auasi	12-16	10-40	2-4	r/r diving gleaning pole throw net

Table 2. Results of Fishing Survey

VILLAGE	# PEOPLE USING REEF	AMT FISH/ TRIP(lbs)	#MEALS/ WEEK	METHODS USED
Amouli	20-30	20-60	2-3	gleaning r/r h/l paopao throw net gill net pole diving
Alofau	14-30	10-30	2-4	gleaning r/r throw net spear gill net diving
Pagai	20-30	10-120	2-4	r/r gill net pole diving h/l paopao
Faga`itua	17-30	10-20	1-4	r/r gleaning diving pole h/l paopao
Amaua	8-30	10-80	2-4	diving pole diving throw net gill net r/r gleaning

Table 2. Results of Fishing Survey

VILLAGE	# PEOPLE USING REEF	AMT FISH/ TRIP(lbs)	#MEALS/ WEEK	METHODS USED
Auto	9-12	10-40	1-3	r/r gleaning throw net diving gill net pole
Avaio	7-8	10-80	1-5	diving gleaning r/r gill net pole throw net
Aumi	11-14	10-20	1-2	diving r/r diving throw net gleaning