

## Subsistence fishing and fish consumption patterns of the saltwater people of Lau Lagoon, Malaita, Solomon Islands: A case study of Funaafou and Niuleni Islanders

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### Introduction

The Solomon Islands lie in the south latitudes 5° S and 12° S, and longitudes 152° E and 170° E. The country consists of six major islands and 900 other smaller islands. Malaita is the second largest island in terms of land area and is the most densely populated. The northern region of Malaita includes the Lau Lagoon and is the most densely populated rural area in the country.

Two artificial islands, Funaafou and Niuleni (New Land), are among 50 artificial islands that constitute the Lau Lagoon off Malaita's northern coast. Unlike Niuleni, which was built primarily by piling reef stones into mounds on the shallow reef flats, Funaafou has a pre-existing natural base made from coral knobs or rocky outcroppings that have been on the reef flat before any people arrived. Early inhabitants constructed the island by walling the submerged rocky knobs with limestone boulders gathered from the reefs at low tide or along the shore of the mainland. At a height of about one metre above the highest high tide mark, the enclosure was filled with earth and the surface level graded with dead coral, rubble and sand.

The movement of the first migrants from mainland Malaita to Lau Lagoon began some 300 to 400 years ago. Among the causes of these out migrations were tribal fighting, headhunting and cannibalism. Migrations to the artificial islands were also directly related to in-fighting among clans and family feuds. It was also believed that people from the mainland wanted to escape from mosquitoes and mosquito-borne diseases such as malaria.

The original inhabitants were foragers who gleaned for small fish, shellfish and seaweed on the reef flats. Their population gradually increased over time. Gleaning was done during both low and high tides after which the gatherers retired back to the mainland. Rafts were built as a form of transportation and later used to carry reef stones and boulders to

build the artificial islands. Life was dependent on the Malaita mainland during this transition period. Animosity, however, grew between the inhabitants of the artificial and mainland Malaitans and many of the original inhabitants of the small islands were killed, forcing them to break their ties with the mainland and settle permanently on these artificial islands.

The early settlers were animists whose beliefs were ingrained in superstitions and as such much of the islanders' fisheries activities were associated with numerous ritualistic practices. However, when Christianity was introduced in the 1900s, many young converts abandoned these practices and followed the new religion. Tensions grew between the island's elders and the converts over the newly introduced teachings of Christianity, which the former believed to be desecrating the ancestral island of Funaafou. As a result, the converts resorted to building the artificial island of Niuleni where they could build a church and escape the pagan practices of Funaafou.

The livelihood of Funaafou and Niuleni Islanders depends heavily on marine resources as many islanders do not own land on the mainland to grow root crops or vegetables. To remedy the situation, the islanders established a "barter" system of trade with the hill people, whereby fish, shell fish and other marine products were exchanged for root crops, vegetables and other garden produce brought by the hill people. This exchange became vitally important for the survival of the islanders of Funaafou and Niuleni. Today, the barter system of trade is still practiced in Lau Lagoon but is becoming less important as staples such as rice, noodles and flour can be obtained from shops.

Fish and other marine resources are important for the islanders of Funaafou and Niuleni, both as a source of daily food as well as items for food exchanged at the local markets. Because of this, fishing skills are crucially important for sustaining life in these environments. Men are expected to be

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**Figure 1.** Northern part of Malaita and the artificial islands (source: Google Earth).

proficient in the different fishing methods and so, fishing has evolved to become the most developed subsistence activity within a household. Akimichi (1978) reported that the Lau people used over 100 fishing techniques, including different types of nets, kite, hook and line, fish poison and spears.

The objectives of this survey were to 1) assess the status of fish in the diet of Funaafou and Niuleni Islanders, and 2) determine the quantity of edible fishery resources harvested from Lau Lagoon. The level of fishing pressure and its impact on the ecology of the reefs was also assessed in relation to the fishing technology currently used. It must be noted, however, that it is beyond the scope of this study to quantify the resources harvested from the whole of Lau Lagoon because there are other neighbouring artificial islands in the group that also have traditional rights of access to the reefs and lagoonal areas. Their fishing activities were not included in this survey.

### Methods

Twenty-four households were surveyed: thirteen from Funaafou and eleven from Niuleni. Interviews were conducted in the Lauan dialect with a senior member of each household interviewed in the evening after the family meal.

The main focus of the survey was threefold. First, the socioeconomic status of each household was considered in order to give an overview of the general economic situation of the islanders. Second, details of fishing activities — including fishing methods,

area of fishing effort, and species caught — were recorded and analysed to determine whether there was a relationship between the economies of each household and the type of fishing method used. Third, an estimate of the quantity of fish (by species), and invertebrates consumed the previous day was also recorded to ascertain whether fish consumption was influenced by the type of fish caught. This study was based on fieldwork conducted in Lau Lagoon between 1996 and 1997.

### Study area

The Lau Lagoon and adjacent area is sometimes referred to as the “North” because of the region’s geographic location on Malaita’s northern end. The islanders are often referred to as “saltwater people” because of their close association with the marine environment. The domain of the saltwater people is generally considered to extend from Suava Bay on the north, to Ata Cove on the northeast. There are around 50 artificial islands in Lau Lagoon. The islands that are built on reef flats are well protected by a natural system of barrier reefs. This study was confined to the artificial islands of Funaafou and Niuleni, which are on the edge of Makwanu Passage.

### Results

#### *Population and household income*

Men made up 51.4% of the 24 surveyed households on Funaafou and Niuleni (women made up 48.6%). The average number of people per household was

six, with 47.2% of surveyed households made up of children and 52.8% adults. The average income per household per week was SBD 95, which mainly came from the sales of finfish, trochus and beche-de-mer. The islanders' income ranged from SBD 10–600 per household per week.<sup>3</sup>

### Fishing households

All of the surveyed households were involved in both subsistence and semi-commercial fishing. Of all the families interviewed, 29% sold marine products such as trochus and beche-de-mer. They also indicated that their main income source came from fish sales. The bulk of the fish caught were exchanged for root crops and vegetables, or were sold to local markets to individual fish buyers to sell at the Auki market (the provincial centre for Malaita) or Honiara fish outlets. Only a small proportion of the fish caught were consumed. Fishers from Lau Lagoon are serviced by the Takwa Fisheries Center, which is about eight kilometers from Funaafou and Niuleni. The center provides ice blocks and cubes to fishers who wish to transport their fish to Auki or Honiara. At the time of the survey, the Takwa Fisheries Center serviced the islands but they no longer do so.

### Fishing methods

Fishing methods vary from family to family. The most common method is gillnetting (drive in), practiced by 25% of the households surveyed, followed by handlining, practiced by 17.8% of the surveyed households. *Okoi* is a special hand-held spear fishing technique used to catch rabbitfish. It involves two people pulling the two ends of a rope as they walk along the reef, while fishermen snorkel after the rope spearing rabbitfish. *Okoi* was done by 14.3% of all surveyed households. Beach seining and torchlight (flashlight) fishing were each practiced by 10.7% of all surveyed households, while mantis shrimp (*Lysiosquilla maculata*) fishing (*siki*), and other line fishing were each practiced by 7.0% of all surveyed households. Dropline fishing and scuba fishing were each practiced by 3.6% of surveyed households.

Shellfish collecting was mainly done during low tide by women and children. Our surveys revealed that elderly women actively collected shellfish, which provided quick cash to help buy household grocery needs.

### Seafood consumption patterns

On average, 1.54 kg of fish were eaten by each household per day. This represents a calculated

average of 225 g of fish consumed per person per day. The survey further revealed that islanders eat fish seven days a week. In some households, fish was consumed twice a day (at morning and evening meals), while in others, fish was consumed three times a day (at morning, mid-day and evening meals).

Typically, three meals a day are eaten, although meals are not confined to any specific time. Fish consumption did not dominate any of the three meals, with the exception of Friday evening meals and Saturday morning and mid-day meals. At these times, all Niuleni households and more than 50% of Funaafou households consumed fish during these meals. This is because all Niuleni Islanders and some Funaafou Islanders belong to the Seventh-Day Adventist Church, which considers Sabbath, and so no work is carried out on that day. Friday then is "preparation day" and fishing is done for both Friday and Saturday.

Most of the fish consumed were smaller in size than those sold. The survey found that fish retained for home consumption were actually remnants of the catch after the larger and more valuable fish were selected to be sold. High-grade fish often fetch higher prices than ordinary fish in the local markets. All fish species sold to buyers supplying the Honiara market were sold at the same rate. Fish prices fluctuate according to supply and demand in Honiara. The sale price of all grades of fish during the time of the survey was SBD 3.00 per kg. A list of fish species from the Lau Lagoon is presented in Table 1.

A relatively low amount of shellfish consumption was noted because Seventh-Day Adventist beliefs do not allow consumption of shellfish. A few people, despite their beliefs, still consume shellfish and the most frequently consumed shellfish was the flesh of the highly valued trochus shell (*Trochus niloticus*). This was boiled in seawater then tapped against a piece of wood to remove the edible content. The shells are then sold to trochus dealers.

The interviews revealed that shellfish meat was a delicacy and often provided extra protein in the saltwater people's diet (besides fish). Shellfish included giant clams (e.g. *Tridacna gigas*, *T. squamosa*, *T. maxima*, *T. crocea* and *Hippopus hippopus*), turbo shell (*Turbo* sp.) and the gastropod *Lambis lambis*. The sea urchin, *Tripneustes gratilla* (*bibinu*) is also considered a delicacy, and is regularly gleaned by women at low tide for its eggs (just before the monthly spawning periods).

3. All monetary values stated in this paper are in Solomon Island dollars (SBD). In 1996–1997, when the fieldwork was conducted, USD 1.00 was approximately equivalent to SBD 3.80.

**Table 1.** Fish, shellfish and sea anemone species found in Lau Lagoon.

Lau name	Common name	Scientific name
<b>Fish</b>		
Aifatarao	Longsnout flathead	<i>Platycephalus</i> spp.
Bali	Yellowfin parrotfish	<i>Scarus flavipectoralis</i>
Balu	Titan triggerfish	<i>Balistoides viridescens</i>
Bokofu	Crocodile longtom	<i>Tylosurus crocodilus</i>
Bolo	Finelined surgeonfish	<i>Acanthurus grammoptilus</i>
Bubu ni one	Whitebanded triggerfish	<i>Rhinecanthus aculeatus</i>
Dafi	Slender parrotfish	<i>Leptoscarus vaigiensis</i>
E'eno	Honeycomb rockcod	<i>Epinephus</i> spp.
Faau	Anchor tuskfish	<i>Choerodon anchorago</i>
Falata Kwao	Goldlined rabbitfish	<i>Siganus lineatus</i>
Fotobala	Spangled emperor	<i>Lethrinus nebulosa</i>
Gela	Yellowfin tuna	<i>Thunnus albacares</i>
Gougou saru	Floral Maori wrasse	<i>Cheilinus</i> spp.
Hatamela	Thumbprint emperor	<i>Lethrinus harak</i>
Hau Inito	Skipjack	<i>Katsuwonus pelamis</i>
Isiofu	Smooth flutemouth	<i>Fistularia commersonii</i>
Kakaboa	Crescent grunter	<i>Therapon jarbua</i>
Kwaibia	Yellow-stripe goatfish	<i>Mulloides flavolineatus</i>
Maelafu	Raggedtooth parrotfish	<i>Calotomus spinidens</i>
Maeto	Blackstreak surgeonfish	<i>Acanthurus nigricauda</i>
Mara	Bluebarred parrotfish	<i>Scarus ghobban</i>
Modomu	Great trevally	<i>Caranx ignobilis</i>
Moua	Pacific longnose parrotfish	<i>Hipposcarus longiceps</i>
Mu	Rabbitfish	<i>Siganus</i> sp.
Nara kedea	Coral rabbitfish	<i>Siganus corallinus</i>
Niginigi	Dussumier's garfish	<i>Hyporhamphus dussumieri</i>
Ragaraga	Blackspot goatfish	<i>Parupeneus spilurus</i>
Sinu	Cinnabar goatfish	<i>Parupeneus leptacanthus</i>
Suru gou	Yellow-tail emperor	<i>Lethrinus atkinsoni</i>
Takwalao	Orangespine unicornfish	<i>Naso lituratus</i>
Unuunu	Barred garfish	<i>Hemiramphus far</i>
<b>Shellfish and sea anemones</b>		
Bibinu	Sea urchin	<i>Tripneustes gratilla</i>
Kikii	Giant clam	<i>Tridacna</i> spp.
Hae fulione	Sea anemone	<i>Cerianthus</i> spp.
Hae akoako	Sea anemone	<i>Cerianthus</i> spp.
Hae mailade	Sea anemone	<i>Cerianthus</i> spp.
Hae gime	Sea anemone	<i>Actinia</i> spp.
Hae lesu	Sea anemone	<i>Actinia</i> spp.
Karongo	Trochus	<i>Trochus niloticus</i>

Five species of sea anemone (*Cerianthus* spp. and *Actinia* spp.) are frequently collected (Table 1). Local names for the five species are *hae fulione*, *hae akoako*, *hae mailade*, *hae gime* and *hae lesu*. Sea anemones are combined with mangrove seeds (*Bruguiera gymnorrhiza*) to make a *koa ana takomai*, a sea anemone delicacy. Sea anemones were often cooked in hot stones for an hour by placing them in wooden bowls and covering them with swamp taro leaves. Sea anemones were either consumed or sold at the local market.

### Fishing habitats and efforts

Fishing was carried out in the lagoon, barrier reef, on the reef edges and offshore. According to Lau tradition, the lagoon areas, reef flats, reef edges and surge areas are zoned into fishing grounds called *alata*. Each *alata* is associated with specific species of fish, and is targeted during different seasons, tides, currents and weather.

A typical fishing trip lasted about 3.5 hours per day, although fishers remained fishing for as many as 8 hours and as few as 0.5 hours. The number of hours spent fishing depended on the fish catches, and the fisher's skills, and experiences.

### Fishing craft

A smaller number of fibreglass boats powered by outboard motors (15–30 hp) were used mainly for offshore trolling. All fishing craft used during the time of the survey were local dugout canoes. According to the islanders, modern boats are difficult to handle during fishing operations, especially during bad weather; whereas dugout canoes are easy to handle during fishing operations and can be used by a single person. Most dugout canoes were between 10 feet and 15 feet long, and capable of carrying up to two people, with one person sitting at each end and the fishing gear placed in the centre. A fishing trip comprising a father and son was very typical at both Funaafofu and Niuleni.

### Fishing times

Fishing was mainly done during the day, although night fishing was done if family members had to attend to other commitments during the day. Some fishing techniques were often associated with certain nocturnal fish species, for example, moonlit trolling for soldierfish (*Myripristis* spp.). Fishing is often done only at night when the soldier fish come out to feed.

The survey revealed that 73% of all fishing was done during the day, 19% at night and 8% done at "other times". Other times refers to fishing only at dusk or dawn for specific species of fish. For example, fishing

for trevally is usually done at dusk because schools of trevally (carangids) hunt for herring (*Herklotsichthys* spp.) and purse-eyed scad (*Selar* spp.) as they return to deeper waters at night. Trevally fishing also takes place at dawn when schools of herrings and scads are often seen in shallow waters. Dawn and dusk fishing is very specific and can be as short as a couple of minutes; fishers must be skilful and alert in order to catch trevallies before they return to deeper water.

### Discussion

Household surveys revealed that fish formed the major component of the diet of the saltwater people of Lau Lagoon. The average daily fish consumption per household was 1.54 kg per day. This represents a daily fish consumption of 225g per person per day, or about 90 kg per person per year. The Solomon Islands national average in 1990 was 56 kg per person per year, which indicates that the Lauans consume almost double the national average. Our surveys also showed that fish consumed at the household level constituted a small proportion of the day's catch because the larger fish were sold at market outlets.

It was evident that some households did not have food gardens on Malaita. Fish were used to exchange for food crops and other agricultural produce from the mainland hill people. Some fish were also sold for cash. Fish is not only an important protein source for the islanders, but also for cash and for trading to obtain root crops.

The islanders' main source of regular income comes primarily from fishing, either by selling fish at local markets or to dealers who re-sell the fish at the Honiara market. At the local markets, marine products were either sold cooked or raw, and specifically by women.

For the Honiara market, fish were sold to dealers who packed the fish in crushed ice inside fibreglass coolers. The coolers were transported to Honiara in order to re-sell the fish at a higher price. At the time of the survey, there were at least five individuals who were engaged in buying fish from local fishermen. Interviews with local residents revealed that the number of fish buyers for the Honiara market had increased because of the high demand for fresh fish. There were additional people who did this on a part-time basis. Sometimes, fish buyers from Honiara left their ice-filled containers with different groups of fishermen and came back and collected them in several days when they were full. Women and children were involved in cleaning and processing the fish before they were transported to Honiara. Ice was purchased at Takwa government station.

A relatively low amount of shellfish consumption was recorded during the survey. The main reason for this was that almost all inhabitants of Niuleni, and a smaller proportion of Funaafou Islanders, are members of the Seventh-Day Adventist church. Members of this church believe that all marine invertebrates and fish without scales are unclean and so must not be eaten.

Fishing activity and the amount of fish caught depend also on tidal patterns in Lau Lagoon. Fishers stated that fishing operations were planned according to tides. If they planned well, fishing operations could be undertaken continuously during the day for different fish species, using different fishing techniques and gear.

The islanders of the artificial islands also associate lunar phases with the feeding habits of different fish species. Fishers revealed that certain fish only come out to feed during the new moon phase. A good example is the herbivorous long-finned drummer fish, *Kyphosus vaigiensis*, called *unasi* in the Lauan dialect. These fish aggregate to feed during the new moon phase at high tide, and the islanders catch them during that time.

Fishing has shifted from a traditional communal activity, to more of a family or individual enterprise. Several factors account for this. Fishing

gear that was not readily available in the past to families or individuals is now readily accessible through government fisheries centres in rural areas or through a commercial shop in Honiara. Modern fishing gear is also preferred because it is easy to handle and user-friendly. An individual fisher can go fishing alone without the help of others in the village, unlike some traditional fishing gear where the whole community must be mobilised. Modern fishing gear is also affordable and can be purchased using cash instead of custom money.

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