

1. Introduction

1.1 Background

Atiu is the fourth largest island of the Cook Islands and is referred to as a raised or makatea type island. Atiu is approximately 115km North-East of Rarotonga with a population of 960 which reside in five villages in the centre of the island. The land mass of 27 square kilometres (km²) comprises five distinct geographical areas of hilly terrain. These include; (1) makatea or upraised coral which surrounds the island, (2) fertile soil of where crops are grown primarily for subsistence purposes, (3) infertile rugged predominantly clay area where pineapples were once grown, (4) swamp area of where taro crops are abundant and (5) a large freshwater lake. Important food resources which occupy the lake include fresh water eels (*itiki*), tilapia (*tirapia*). The island has one reef passage suitable for boats between 4-8 meters in length with several small passages which are navigable by canoes.

During the 70's, 80's and early 90's pineapples and coffee were propagated for export, currently the island is economically supported by hand crafts, the export of taro and coffee and a limited tourist industry. Due to the recent government restructuring many inhabitants lost their regular source of income thus having a major impact on the economy. Subsistence farming (goats and pigs) and fishing produce much of the island's locally derived protein. Like all islands in the Cooks the possibilities for revenue generating ventures remain high on the agenda.

1.2 Existing Fisheries

Fishing is carried out primarily on a subsistence basis, to supply the immediate household food requirements. The fishing areas are: 1) the narrow reef flat where gill nets, spear and pole fishing occur to harvest various shallow coral reef species, 2) the mid-water reef slope, where hand-line fishing is used to capture tuna, snake mackerel and other bottom fish species and 3) reef slope trolling, targeting surface swimming species such as tuna, mahi mahi and wahoo. Occasionally Atiu fishermen would venture to Takutea situated some 12 nautical miles to harvest its abundant fish resources.

The majority of reef slope fishing activities is carried out in canoes (2 - 2.5 meters in length) which are either hand paddled or powered by small outboard motors (1.5 - 3 horse power (hp)). There are a total of 37 fishing vessels on Atiu, comprising 26 canoes, eight aluminium and three ply wood constructed type boats. These larger boats range between 4 to 6 meters in length. Flying fishing using battery operated lights and scoop nets is increasing becoming popular. Fresh locally caught fish are sold on the local market at NZ\$5.00/kg

2. Training: Objectives

In order to enhance the knowledge of fishing and to encourage fishermen to fish along the reef slope, the Ministry of Marine Resources developed a Small Scale Fisheries Training Program. Similar workshops have so far been conducted on Aitutaki, Mauke, Mitiaro and Rarotonga with varying degrees of success. It is hoped that as a result of this extension program, fishermen will be better able to improve and diversify fishing practices targeting a larger variety of species. The overall goal of these workshops is to focus on the development of modern fisheries skills to provide sufficient fish for the island of concern, secondary goals are to develop semi-commercial fishing to supply the high demand for fresh fish locally or on Rarotonga. It is anticipated that the long term result is that some outer islands will have sufficient efficient small scale commercial fishers, which could supply the seafood demand for the growing tourist industry hence increase self employment.

The primary objective of the Atiu small scale fisheries workshop was to transfer knowledge of various small scale fishing techniques which are employed successfully elsewhere in the Pacific. These include: -

- Ø theoretical and practical training in the methods of vertical and horizontal longlining and paru-ahi for the capture of deep swimming tuna species,
- Ø training in the methods of deep reef slope bottom fishing, to target snapper,
- Ø introduce a cost effective hand reel and various types of relatively simple and inexpensive fishing gear, and
- Ø promote safety at sea issues.

3. Gear Configuration

Samoan hand reel

The Samoan hand reel is a simple, inexpensive, multi-use piece of fishing equipment. It can be used for vertical long lining, paru-ahi, bottom-fishing, mackerel fishing and trolling. A complete reel is within the order of NZD120.00, and all materials for construction are available in Rarotonga. Figure 1 illustrates the hand reel used during the workshop.

Grapnel & Parachute sea anchor

The grapnel anchor (Figure 2) is standard among most fishermen. It comprises of two lengths (2m) of D12 reinforcing rod bent in half then further bent to take the form of a double fishing hook. Both sets are welded together with a length of 10 –15 mm chain (3-5 m)

attached, from which the anchor line (approx 6-8 mm) is attached. For deep water fishing a length of No. 8 fencing wire is attached to the anchor line about 5 meters from the chain. This allows simple retrieval of the anchor (Figure 3).

During retrieving a float (15 Kg buoyancy) is attached to the anchor line via a shackle the boat then steams sea-ward where the float lifts the anchor (Figure 3). The parachute sea anchor is used for slow drift fishing (Figure 4) and is within the order of NZD300.00.

Vertical long line

Vertical long line gear comprises of several hooks (10-25) attached to a mainline with some form of a sinker and flotation device. Snood lines (150-200 lb test), approximately 4-5 meters in length contain a relatively large Mustard tuna circle hook (No. 14/0) and a shark clip. On the main line (300-500 lb test) several large lead swivels (60-80 g) are fixed for the attachment of snoods via the shark clip. The distance between each lead swivel range from 10 to 20 meters (depending on fishers preference) (Figure 5). A 15 kg float and two kg weight is attached to either end of the long line. Optimum depths for tuna are within the order of 100 – m 300 meters.

Horizontal long line

The horizontal long line (Figure 6) is primarily used to target tuna by large scale commercial fishing. Although not suitable for the types and sizes of boats on Mitiaro the fisher's were briefed on various aspects of the gear.

Paru ahi

Paru-ahi fishing is similar to the traditional method of fishing tuna (ii). Apart from the standard hook and line, the traditional method comprises a rock (for sinker) and leaves (to encase the chum and bait). The recent modification (originated from Hawaii) utilises a lead weight (500g) and a cloth (20x20cm) in replacement of rocks and leaves (Figure 7). The preparation require the coiling on a baited snood line and placing it in a cloth bag with chum. A simple yet slip note is tied and the package placed at a predetermine depth, the line is given a quick jerk which release the bait and chum. This paru-ahi techniques requires less preparation time and positions the baited hook at a predetermined depth.

Bottom fish rig

The bottom fishing rig consists of a chum bag, three to five branch-lines with hooks attached and a one to two kilogram weight (Figure 8). The rig can be made out of monofilament or wire. The latter being particularly useful for areas with high occurrence of sharks and other sharp toothed fishes. Optimum fishing depths for snapper range from 200 to 300 meters. This rig can also be used to fish groupers, jacks and various shallow reef slope species.

4. Training Operations

There were a total of 45 participants with traditional fishing experience ranging from five to fifty years (appendix 1). The training program was conducted over five days covering both theoretical and practical issues. Theoretical issues were discussed on the first two days, with practical training following. The fifth day was allowed for discussion and workshop evaluation, safety issues were also discussed. The workshop was fortunate to include two resources personnel from the Telecom (Mr. Tupuna Rau) and Police department (Mr. Michael Akava) to address the importance of safety at sea. The safety at sea issue appeared to be very important as two teenagers went fishing during November 1997 and never returned.

Vessels

Three fishing boats were provided by fishermen for the fishing trials they include:

Two six meter plywood boats, those typically used for the capture of flyfish which were powered by a 50 and 60hp motor, and

One 5.5 meter aluminium dingy powered by a 30hp motor.

These boats were fitted with hand-reels, for vertical long-lining, paru-ahii and bottom fishing. Bottom fishing was also demonstrated using polyester line unravelled in a plastic bucket, this was also used for tuna fishing (Figure 9).

With limited boat space the fishing trials only manage to take 24 participants for demonstrations.

Reef slope fishing for deep swimming Tunas

The fishing trial was conducted at Taunganui site (Figure 10). The boat equipped with vertical long line gear used 400lb test monofilament main line rigged with 10 hooks and the other set gear used Kuralon main line also rigged with 10 hooks per set. With limited boat space the fishing trial only manage to take four participants per fishing trip.

A grapnel anchor was used for anchoring while both vertical long line gear was set, soaked and retrieved. During soaking time, the paru ahi fishing method was apparently being demonstrated. Taunganui fishing ground is virtually where the steep reef slope drop off not more than 100 meters from the reef edge. Occasionally, the main current flow along the lee side of the island was easterly with rate being influenced by wind rather than tide. Positioning the boat was accomplished by dropping the anchor in 100 - 120 meters, then paying out the anchor rope, letting the offshore wind position the boat out to deeper water.

Bottom fishing for snapper

Based on an interview with some of the experienced fishermen in Atiu, deep bottom fishing is usually never practiced during daylight hours. It was felt that the only time catching the deep slope specie such as groupers, snappers and other variety fish only possible at night fall.

Two boats were equipped with bottom fishing gear used monofilament terminal rig with two fishing hand reels. Fishing effort was concentrated at Konakonako, Totiko, Kau Poto, Te Pari and Tarapaku site. (Figure 9). One boat used the parachute anchor while the other tied to the stern, slowly drift fishing. The most productive depths range from 240 to 320 meters which suggested snapper are shallower in Atiu than in Rarotonga.

5. Results & Discussion

Two fishing trips were completed during the workshop. As a result of the vertical long line and paru ahi methods used, did not yield any fish. After the training workshop, a fisherman tried the vertical long line method in Takutea (about 12 kilometers from Atiu) which yield 7 yellow fin and 1 dog tooth tuna, a total of 134 kilograms, valued locally at NZ\$670 and on the Rarotonga market NZ\$870. The result of not catching any tuna at Taunganui could be due to the fact that there was no fish at the time of fishing or poor fishing season. However, fishing for tuna can be improved by increasing the efforts of fishing at various known tuna holes on the island.

The total 23 bottom fish weighing 47kg were caught during the workshop. At the current selling price for snapper species in Rarotonga of NZD11.00/kg, the catch is worth NZD517.00 and on Atiu NZ\$235. The Rarotonga restaurant market prefers snapper between 1.5 to 2.5 kilograms, fishes caught at Atiu appear to be well suited for sale on Rarotonga. As yet, it is difficult to determine the potential yield of bottom fish species in Atiu. However with regards to the lightly fished deep bottom species, there seems to be a potential for increased fisheries yield to supply food supplementary and the excess can be sold locally on Atiu or Rarotonga market.

Summary and Recommendations

Prospects for the development of a semi-commercial fisheries to supply the local market appear to be restrictive due to high freight cost. However there appears to be a limited market for fresh fish on Atiu, the volume is yet unknown.

In order to enhance a more effective way to catch pelagic species and to assist the development of an artisanal fishery in Atiu, the Atiu fishing Club recommended that :-

- (a): Ministry of Marine Resources assist with a FAD project for the future.
- (b): There is a need to have safety equipment such as :-
 - life jackets (16)
 - 1 base VHF radio communication
 - 4 hand held VHF radio
- (c) There is a need to establish a gear store on Atiu to supply fishermen with suitable fishing gear
- (d): A follow up workshop is required in future regarding:
 - fish handling
 - outboard maintenance
 - explore possible markets
- (d) The program should run for a period of ten to fourteen days in order to ensure satisfactory completion.

Acknowledgement.

The Ministry of Marine Resources would like to thank the New Zealand Overseas Development Assistance (NZODA) for funding the training workshop. Thanks are also due to EMFM and PSC for their administrative assistance and the CEO of Atiu, Mr. Tekorona Tekorona for the assistance provided during our stay in Atiu. Finally to all the participants, meitaki maata for your support and active participation.