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FIELD REPORT No. 18

on

THE COMMERCIAL TUNA LONGLINE WORKSHOP FOR THE DEVELOPMENT OF THE PELAGIC FRESH FISH EXPORT INDUSTRY IN THE COOK ISLANDS

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by

William Sokimi
Fisheries Development Officer

and

Lindsay Chapman
Fisheries Development Adviser

Secretariat of the Pacific Community
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Secretariat of the Pacific Community
BP D5
98848 Noumea Cedex
New Caledonia

Tel: (687) 26 20 00
Fax: (687) 26 38 18
Email: fishdev@spc.int
http://www.spc.int/coastfish

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SUMMARY

Technical assistance in the form of a workshop on tuna longlining was provided to the Ministry of Marine Resources (MMR) in the Cook Islands following an official request in early April 2002. A Memorandum of Agreement was agreed and signed in mid June, to specify the objectives, roles and responsibilities of both parties for this technical assistance project. The objectives of this project were to advise on proper selection of tuna longline vessels, operations procedures and maintenance standards; discuss and demonstrate wheelhouse duties while travelling to and from fishing grounds or during any watchkeeping period; cover fishing strategies that involve the choice of fishing grounds, observance of the seawater temperature, selection of fishing depths, methods of setting the line appropriately to achieve the desired depth, and hauling techniques that involve careful monitoring of the mainline in relation to the hauling passage of the vessel; discuss and demonstrate practical seamanship and deck work during fishing operations such as setting and hauling duties, boarding the fish and fish handling, fish processing methods and chilling on ice for on board storage, fishing gear fabrication and fishing gear repairs; demonstrate and discuss unloading procedures, fish grading, marketing considerations; and discuss insights into the requirements for operating a tuna longline vessel in a business entity with an overview of commercial aspects that relate to tuna longline operations. Once the Fisheries Development Officer arrived in the Cook Islands, and additional objective to outline strategic ideas that may assist MMR to implement its development project for the tuna fishing industry was added to the project.

The tuna longline workshop was conducted from 26 August to 27 September 2002. Twenty-four participants from 12 of the 15 islands in the Cook Islands group attended the workshop. This included five of the training vessel's crew and two MMR staff. The workshop was conducted in several stages to allow the participants to settle in gradually. All participants were required to undergo basic training before embarking on the tuna longline fishing trips, which consisted of basic on board sea safety awareness, basic first aid, basic fire fighting, life raft and emergency drills/procedures, and tuna longline fishing requirements.

The at-sea component of the training was conducted on board the F/V *Mahr Leena*. This vessel is 23 m in length and is 144 GRT, with a fish hold capacity of up to 30 t. It has a forward wheelhouse with an aft working deck. The workshop participants were divided into two groups, as F/V *Mahr Leena* could only accommodate 14 people including the skipper and crew. Therefore, while one group was at sea, the other group received training from MMR staff on fish aggregating device (FAD) fishing methods.

The first fishing trip resulted in only two sets of the longline gear, due to a malfunction of the steering system on the boat after the gear was set the second time. It took almost four days to fix the steering system so that the gear could be retrieved. This resulted in fish that had been caught on the line in the first few days being spoiled and discarded. Overall the catch for the two fishing trips was 68 fish weighing an estimated 1194 kg. Mahi mahi was the most predominant species, both by number and weight (40 fish weighing 400 kg).

The second trip was conducted in adverse weather conditions, with the smaller 3.0 mm diameter sections of the monofilament mainline breaking several times. Six sets were made on this trip with a total catch of 149 fish weighing 3643 kg. Mahi mahi was the most predominant species by number (55 fish weighing 515 kg), with striped marlin being the main species by weight (9 fish weighing 972 kg). Over half of the fish were exported from both trips, mainly to US markets and one consignment to Japan.

The workshop was very well received and several of the participants were employed on the local longline vessels at the end of the course. The structure of the workshop, with the sea safety component at the start, also set the stage for a successful workshop with participants already aware of the sea safety side of the boating operation, so that at sea training could focus on fishing.

The Fisheries Development Officer also provided advice to MMR staff on domestic tuna industry development needs, with a focus on the infrastructure needed including a berthing facility for tuna

longline vessels. The advice is based on the experience he has gained from working in other countries in the region.

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1. INTRODUCTION AND BACKGROUND

1.1 General

The Cook Islands group (Figure 1) is comprised of 15 islands that are spread over 2 million km^2 of ocean (Anon. 2002a) and located around 21˚14'S, 159˚46'W. The group has a total land area that covers 240 km^2 and is made up of mainly low coral atolls in the north, and mountainous, volcanic islands in the south. Kiribati, Niue, Tokelau, American Samoa, and French Polynesia all share borders with the Cook Islands while close to half of the Cook Islands EEZ borders international waters (Anon. 2002b).

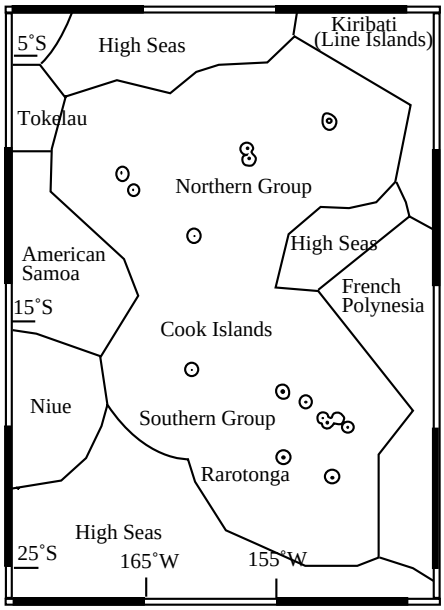

Figure 1: The Cook Islands

The Northern Islands consists of Manihiki, Nassau, Penrhyn, Pukapuka, Rakahanga, and Suwarrow while the Southern Islands consists of Rarotonga, Aitutaki, Atiu, Mangaia, Manuae, Mauke, Mitiaro, Palmerston, and Takutea (Anon. 2002c). The Cook Islands generally has a tropical climate that is warm and sunny all year round with the cyclone season experienced during the months of November to March, which also marks the warmer season. Occasional tropical showers occur at this time. The cooler months are from June to August, while the dry periods are experienced during the months of April to November (Anon. 2002d).

Like most Pacific Island countries, the Cook Islands share some similar constraints in industrial and economic development. Impediments such as the relatively limited natural mineral resources and isolation from the major trade and industrial centres discourage foreign investors and trade. Regardless of the difficulties encountered, a small successful tourism industry has developed and has government support to encourage further development.

1.2 Fisheries

The Cook Islands' large EEZ and the success of the black pearl industry has propelled government to place priority on the development of marine resources and the offshoot industries that would determine the sustainability of the tourism and fishing industries. Commercial tuna longline fishing for the 'sashimi' market in Japan and the US is now having an impact on the economy and government has to tackle several sensitive issues to direct the industry on a sustainable development path.

The Secretariat of the Pacific Community has provided technical assistance on many occasions in the past, to assist the Ministry of Marine Resources (MMR) develop its fisheries activities. Several projects were targeted at gathering information by conducting surveys on the potential of deepwater bottom species and pelagic species and the training of local fishermen to diversify their fishing abilities by using revised fishing techniques and equipment, especially those associated with FADs. The fishing activities included vertical longline fishing around FADs, deep bottom handlining using handreels, trolling, and mid-water horizontal longlining. The projects undertaken by SPC to achieve these goals included the Outer Reef Fisheries Project in December 1975 – May 1976 (Hume 1976); Deep Sea Fisheries Development Project (DSFDP) in September 1981 – March 1982 (Taumaia and Preston 1985); DSFDP in February – July 1983 (Mead 1997); DSFDP November 1985 – July 1986 (Chapman and Cusack 1997); and FAD assistance in November – December 1990 (Desurmont 1992).

The output of these projects has made the artisanal and small-craft fishermen aware of the potential associated with offshore fisheries development and its role in the economy and food security for the country, especially tuna and commercial pelagic species. In 1997, SPC assigned a Masterfisherman to

the Cook Islands to participate in a tuna longline trial project that involved the use of a single tuna longline vessel, the F/V *Farquest* (Beverly and Chapman 1998). This was the only vessel contracted to fish for the Cook Islands Seafood Company Ltd. The vessel's catch was sold on the domestic market but this proved detrimental to the longevity of the company. Previous to that, several local based larger foreign vessels had tried experimental trips but those missions did not last and the vessels left (Beverly and Chapman 1997).

Despite the failure of these earlier ventures, the Cook Islands fishermen were persistent in their pursuit to capitalise on the tuna that passed through their waters. Local fishermen approached government to assist them in their plight to at least be self-sufficient on the domestic market. This has led to the Cook Islands being one of the more recent Pacific Island countries to show interest in the development of its own domestic commercial tuna longline fishing industry. Although there were previous attempts to venture into commercial offshore tuna longline fishing, concentrated effort is only recently being attempted. Local business entrepreneurs and fishermen have intensified their drive to request government to provide infrastructure that will assist industry development, so they would be on the same competitive level as other Pacific Island countries that already have an established longlining industry. As a result, MMR requested SPC to assist them in compiling a Tuna Fishery Development Plan for the Cook Islands (Chapman 2001) and to assist with their FAD programme.

Samoa, American Samoa, Fiji, FSM, PNG, Tonga, New Caledonia, and French Polynesia already have a fleet of locally based vessels that are engaged in catching tuna mainly for the export 'sashimi' markets in Japan, US mainland and Hawaii. Other island states such as Kiribati, Nauru, Tuvalu, Wallis and Futuna, Tokelau, Palau and the Solomon Islands are still contemplating methods of effectively engaging a domestic fleet in the tuna longline sashimi trade.

In 2001, serious moves were made by local entrepreneurs to develop their commercial tuna longline fishing fleet. At one stage, the F/V *Margaret* (ex F/V *Farquest*) was the only fishing vessel doing tuna longline fishing on a commercial scale, but only for the domestic market. The fishing vessel was operated under the Taio Fishing Company banner. This is an affiliated company of Taio Shipping Company that operates cargo freighters servicing the Cook Islands. In the beginning, the fishing operations were laid back as they needed only to supply sufficient fish for the local market. As other business entities started taking an interest in becoming fishing vessel owners or operators, the pace started to pick up and hasty plans were implemented to bring in more boats and to set up processing facilities. Having progressed with vulnerable operational plans and having learnt the realities of the industry, operators are now turning to government to assist them in maintaining their personal stake in the industry by assisting in providing the necessary technical assistance and infrastructure.

The Cook Islands now has 11 locally registered tuna longline vessels, one locally based foreign fishing vessel and four test fishing licensed vessels fishing in the Cook Islands' EEZ for tuna and pelagic species. Appendix A provides a list of the vessels currently licensed to fish in the Cook Islands EEZ. Several of the larger vessels working in the north of the group discharge their catch in Samoa or American Samoa, and not Rarotonga. This may make monitoring of the catch difficult.

Most of the locally registered vessels are all second-hand fishing vessels that were converted to tuna longliners. There are at present two privately operated facilities for processing and packing fish for the overseas markets. The owners of both facilities also own fishing vessels or have fishing vessels contracted to export through them.

1.3 Initiation of the project and its objectives

The sudden expansion of the domestic commercial tuna longline fleet has prompted the Cook Islands Government, through MMR, to consider implementing measures that would encourage and support the growth of the industry and address the requests of those who have invested in the industry. MMR decided that a workshop would be the best approach to address the specific needs of the developing tuna longline fisheries based in Rarotonga. To achieve this, the government of the Cook Islands requested technical

assistance from SPC in early April 2002, with a Memorandum of Agreement agreed and signed in mid June, to specify the objectives, roles and responsibilities of both parties. The workshop objectives were to:

- advise on proper selection of tuna longline vessels, operations procedures and maintenance standards;
- discuss and demonstrate wheelhouse duties while travelling to and from fishing grounds or during any watchkeeping period;
- cover fishing strategies that involve the choice of fishing grounds, observance of the seawater temperature, selection of fishing depths, methods of setting the line appropriately to achieve the desired depth, and hauling techniques that involve careful monitoring of the mainline while hauling;
- discuss and demonstrate practical seamanship and deck work during fishing operations such as setting and hauling, boarding the fish and fish handling, fish processing methods and chilling on ice for on board storage, fishing gear fabrication and fishing gear repairs;
- demonstrate and discuss unloading procedures, fish grading, marketing considerations; and
- discuss insights into the requirements for operating a tuna longline vessel as a business entity with an overview of commercial aspects that relate to tuna longline operations.

During the initial discussions with MMR staff, an additional objective was included to outline strategic ideas that may assist MMR to implement its development project for the tuna fishing industry.

On 24 August 2002, the Secretariat of the Pacific Community despatched Fisheries Development Officer, William Sokimi, to the Cook Islands to implement the project. The project concluded on 27 September with the Minister for Fisheries, Dr. Robert Woonton (also the Prime Minister of the Cook Islands), issuing the participants their workshop attendance certificates and giving a speech on the relevance of the workshop to the industry and the country.

2. PROJECT ACTIVITIES

2.1 General

The tuna longline workshop was conducted from 26 August to 27 September 2002. Twenty-four participants from 12 of the 15 islands in the Cook Islands group attended the workshop. This included five of the training vessel's crew and two MMR staff. Appendix B provides a list of all those that attended the workshop. Although all the participants have had an affiliation with the sea most of their lives, they were regarded as raw recruits and were required to undergo basic training before embarking on the tuna longline fishing trips. The workshop was conducted in several stages to allow the participants to settle in gradually. The five stages prior to at-sea training were basic on board sea safety awareness, basic first aid, basic fire fighting, life raft and emergency drills/procedures, and tuna longline fishing requirements. Appendix C contains the workshop timetable for the different phases.

Several organisations assisted in conducting the basic courses for the participants. The Cook Islands Health Centre conducted the first aid course, the Cook Islands Fire Department conducted the basic fire fighting course, Captain Don Silk of the MMR Training unit conducted the basic on board safety and life raft and emergency drills/procedures, and Michel Blanc from SPC's Fisheries Training Section conducted a one week course on fish handling and preservation techniques. He also held another workshop during the same week for tuna grading and packing for the export market.

Aside from the preliminary courses to enhance the participants' safety on board the training vessel, the workshop focussed on delivering the necessary skills and general background of tuna longline fishing. This included gear construction, sea surface temperature monitoring, the monitoring of weather conditions, moon phases, environmental awareness, bycatch issues, preservation and handling of fish, marketing issues, and the cost of operations. Since some of the participants have the potential to be fishing vessel owners or managers, an in depth briefing was conducted on the machinery used for longline fishing and

the different methods of longline fishing that exist today. The hydraulic reel system was highlighted as this system requires fewer personnel to operate and is now widely used in the region. The participants were given an insight into the principals and operations of the mainline reel, shooter, timer, beeper and line setting speed readout.

The participants of the workshop were also given an insight into the background of the development of the industry, the problems that may be encountered with different aspects of the industry, the motivating factors and the constraints in the industry that would need perseverance and dedication to overcome.

2.2 Workshop training vessel, F/V *Mahr Leena*.

The F/V *Mahr Leena* was originally built to work as part of the US fleet of boats fishing for swordfish in US territorial and international waters. The vessel worked out of Fiji for a while, until the company went bankrupt and the assets, including the boats, were sold off. Raro Fishing Company Ltd of the Cook Islands tendered for the vessel and won the bid. A Fijian skipper, engineer and crew were engaged to deliver and operate the vessel and to train Cook Islanders to eventually manage the fishing operations in their own EEZ.

F/V *Mahr Leena* is 23 m in length and is 144 GRT, with a fish hold capacity of up to 30 t. It has a forward wheelhouse with an aft working deck (Figure 2). F/V *Mahr Leena* was bought with the intention of being able to fish the wide expanse of sea that make up the Cook Islands EEZ. Details of the vessel's specifications can be found in Appendix D.

***Figure 2: Aft working deck of F/V* Mahr Leena**

F/V *Mahr Leena* is equipped with a Lindgren Pitman Super Spool II, mounted on the cabin roof (Figure 2), which is capable of holding 73 nm (135 km) of 3.0 mm monofilament line or 44 nm (81 km) of 4.0 mm monofilament line. The reel currently holds a mixture of old and new line as well as mixed sizes of 3.0 mm, 3.5 mm and 4.0 mm lines. During the workshop 15 nm of new 4.0 mm monofilament line was topped onto the reel as the old line was in the process of being phased out by removing the older sections during each hauling session — weather permitting. This process was not complete and the crew of the F/V *Mahr Leena* will continue with this in the forthcoming trips.

For a vessel the size of F/V *Mahr Leena* it would be advisable to use 3.6 mm or 4.0 mm monofilament mainline. The stronger mainline will reduce the chances of breakage. Some operators prefer loading smaller lines so that they can fit more on a reel as this would enable them to set their line over a greater distance, but with the reel on the vessel, 4.0 mm monofilament line is sufficient for one operation. The time factor required to set and haul 44 nm of line falls within a day's operation. When setting 2000 to 3000 hooks, it is preferable to have one operation within 24 hours.

Most vessels setting speed average around seven knots, so to set at least 40 nm of line by running the line off the stern would take around five to six hours. If a shooter is used and 50 m spacing between branchlines is expected every 6 seconds, the setting time can be reduced to 3 hours provided 400 RPM is used as the setter speed and the setter drive wheel circumference is 1.0 m (around 30 cm or 12 inch diameter). Hauling back time normally averages around 14 hours when working 2000 to 3000 hooks but can be shortened or lengthened depending on several factors such as operators' proficiency, weather, fish catches, etc. In all, if the operation maintains averages, the fishing operation should take up to 20 hours leaving four hours for soaking time, travelling, maintenance or rest. This was the pattern experienced during the workshop trips when no problems were experienced with the vessel's machinery, but improvements can still be made.

One of the important strategies of tuna longline fishing is to maintain consistent sets once the fish feeding layer is located. To do this, proper records have to be kept for each set that is deployed and hauled back in. While setting the line, the vessel speed, shooter speed, and timing between hooks is relevant. The shooter speed and timing between hooks will determine the spacing between the hooks while the vessel speed will determine the depth at which the line settles. With a constant shooter speed, a slower vessel speed should give a deeper catenary curve while a faster speed will stretch the line to settle at a shallower depth. On the other hand, if a vessel maintains a constant travelling speed, a deeper depth can be achieved by increasing the speed of the shooter and a shallower depth by reducing the shooter speed. To maintain line setting consistency, the shooter speed can be kept constant by using a hand-held speed tachometer to take readings of the shooter main drive wheel speed, while the frequency of snapping on the branchlines are timed by a timer unit (Figure 3) that is commonly located in the wheelhouse. The signal is normally relayed to the crew via a beeper speaker, located at the line setting working station. A recent innovation to replace the hand-held tachometer is the digital speed readout unit (Figure 3) connected to the line setter that shows the speed readings in knots.

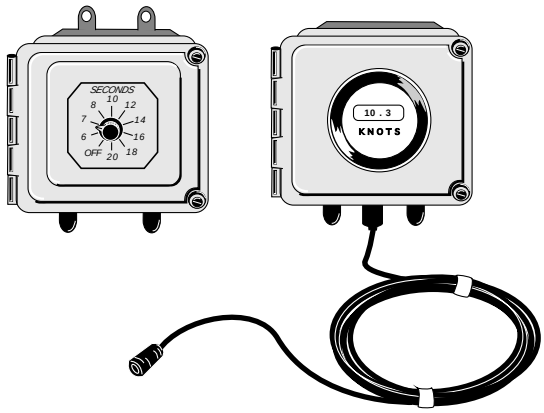

Figure 3: Setting timer and line setter digital speed readout unit

During the workshop fishing trips, the crew were coached on keeping these relevant records and made to observe the shooter readings and take note of the vessel speeds. Unfortunately, when the shooter was used, only half of the line on the reel could be deployed as the reel speed and shooter combination could not be coordinated to maintain a constant match with the boat speed. Once the inconsistencies were noticed, the shooter was gradually shut down to allow for a smooth transition and the line was free spooled off the stern.

2.3 Workshop activities and fishing trips

The activities of the workshops were grouped into two stages, shore side activities and fishing activities. The activities were programmed so that the participants would gradually follow through the consecutive stages of a tuna longline operation and it was hoped that by the end of the workshop, each participant would clearly understand the different roles of a tuna longline operation and the importance of gear construction and maintenance.

2.3.1 Shore side activities

All shore activities were either done at the MMR training shed or on the F/V *Mahr Leena*. Preliminary demonstrations were conducted before the participants were given the opportunity to construct the rest of the fishing gear. The demonstrations involved a detailed coverage of the components and methods of construction for the assorted gear. Once all the participants had worked together on one third of the gear that was required for the first fishing trip, they were divided into two teams, group 1 and group 2. Group 2 was to remain in the shed to continue constructing gear for the first fishing trip while group 1 concentrated on preparing the vessel for the first fishing trip on which they would go on as crew members. The main work done on shore was the construction of branchlines, repairing branchline bins to hold the branchlines; making floatlines, attaching joining lines to floats, and repairing damaged branchlines and gear off the F/V *Mahr Leena.*

Fabricating Branchlines: during the project most of the branchlines were made with leaded barrel swivels to assist the mainline in getting to deeper depths. The length of the branchlines were generally maintained at 15 m. The different branchlines were based on these components:

- Snap (3.5 x 125 mm) with swivel / clear protector tubes / D size crimps / 15 m x 2.0 mm monofilament line / luminous beads or tubes / 16/0 tuna circle hook;
- Snap (3.5 x 125 mm) with swivel / clear protector tube / D size crimp / 13 m x 2.0 mm monofilament line / 45 g leaded barrel swivel / 2 m x 1.8 mm monofilament line / 16/0 tuna circle hook (Figure 4);
- Same components as above plus 30 cm x 1.20 mm, 7 x 7 stainless steel wire; and
- Same components as all of the above plus 1 m of 4 mm Kurolon rope spliced onto the snap swivel before the monofilament branchline is connected.

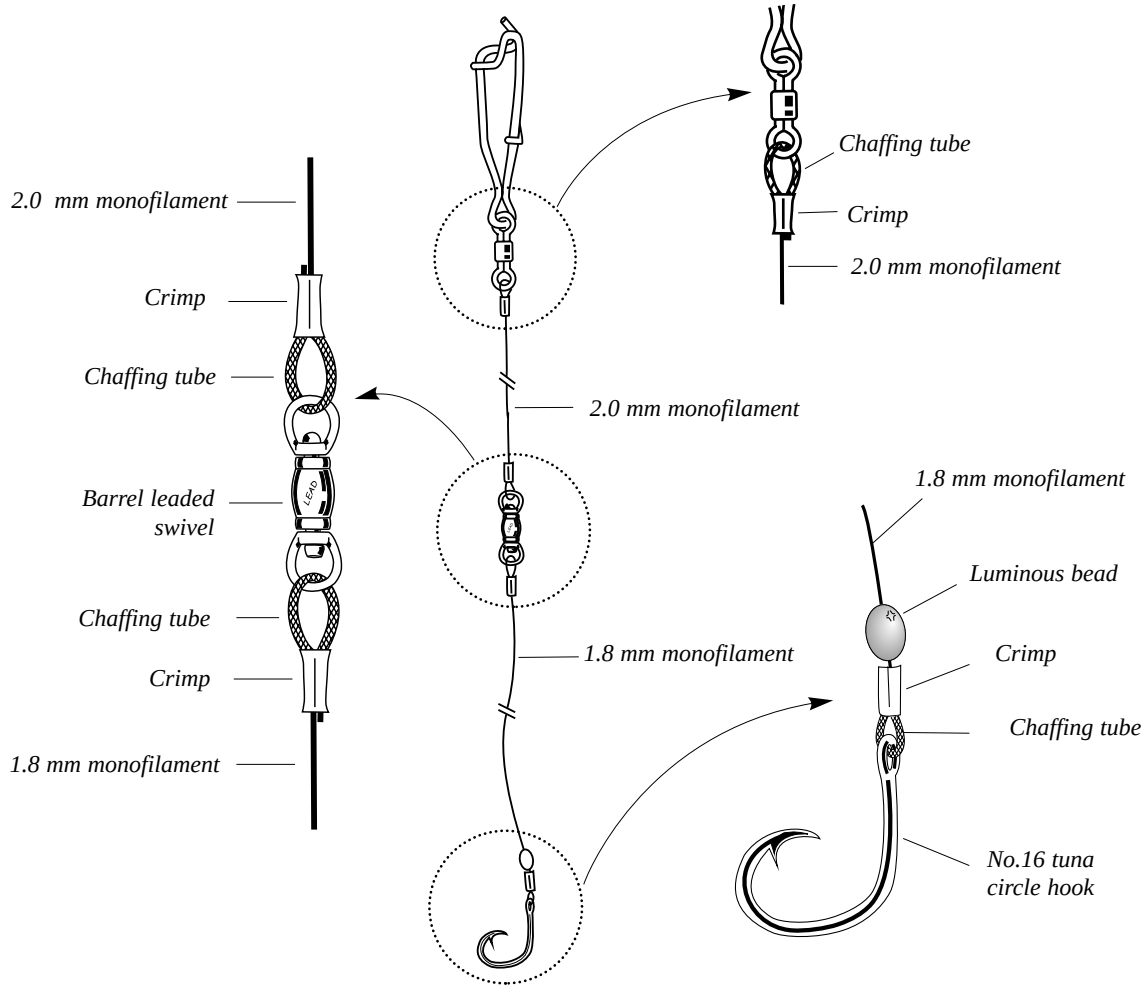

Figure 4: Branchline with weighted swivel attached

The different types of branchlines and the reasons for using these were demonstrated to the workshop participants as part of their build up in understanding the gear that they would work with. In deciding which type of branchlines to use, the following factors may influence the fisherman's decision:

- *Weather conditions:* can play a major role in determining the settling depth of the mainline. The type of branchlines used during adverse weather conditions can assist the mainline to settle quickly at the desired depth. Information gathered from the tuna longline skippers operating vessels out of Rarotonga depicted strong currents in the Cook Islands at this time of the year, that prevented the mainline from settling at deeper depths, so most of the skippers deemed it necessary to have weighted swivels attached to their branchlines. Observations during the two fishing trips of the workshops attributed this mainly to adverse weather conditions that were rife at the time and not the strength of the current, which remained around 1 to 1.5 knots.

- *Availability of the necessary components to make the fishing gear:* it can sometimes be very difficult in the Pacific Islands due to delays in money transactions causing a delay in receiving the fishing gear previously ordered, delay in flights, flights not coinciding with the vessels next trip, etc. Whatever the causes of not having the required gear, the participants were trained to improvise with whatever gear was readily available to them but particularly to keep all old hooks, snap and reasonable lengths of used branchlines that may be useful in emergency situations. The ideal situation would be to have all the necessary accessories when making branchlines and other fishing gear, but when circumstances do not permit this, a fisherman's ability to improvise can make the difference in the amount of hooks that are set in a fishing trip or whether the vessel goes fishing at all.

- *Cost of branchline materials:* this was highlighted to participants and they were encouraged to be aware of cost cutting measures when making branchlines, but at the same time, maintaining their fishing efficiency. This can be very handy in companies that are struggling to get on a level plane with the others. The use of leaded barrel swivels is ideal to have on branchlines because it assists in settling the mainline quickly at deeper depths. Despite this, previous experience has shown that these can be done away with in favour of longer soak times or the use of a shooter while setting the line. It would be preferable to maintain leaded swivels on the branchline, but if circumstances occur that the swivels are not available, these can be done away with for the time being. Leaded barrel swivels have several disadvantages. They are an added cost that increases the price of branchlines, pose a danger to the fisherman when hauling in a fish (if the line breaks while under tension, the swivel may get slung back and cause injury to anyone in the vicinity, but as with all fishing gear caution should be used at all times), and slows the deployment of the branchlines if the leaded swivel is connected far from the hook.

2.3.2 Fishing trips

Two weeklong fishing trips were conducted as a culmination to the tuna longline workshop. Since the F/V *Mahr Leena* can only accommodate fourteen crew on a given trip, the workshop participants were divided into two groups so they could be fitted in one of the two weeklong trips. Although it was unintended, circumstances led to both trips being conducted in adverse weather conditions, more so during the first trip.

Preparations for the line setting operation

Two methods of line setting were demonstrated to the crew before they actually took charge of the operations — setting without a line setter (line shooter), and setting with a line setter. The crew were made aware that routine duties were easy to be acquainted with but familiarity can sometimes breed carelessness that could result in a loss of thousands of dollars of gear. The point was stressed that the line setting operation is the most important part of a tuna longline fishing operation. It is at this stage that measures are taken to attract fish to the hook. Preparation of the gear before line setting is important to ensure that the operation goes off without a hitch. Once this was understood, the participants were progressively given different tasks until they were fully in control of all the line setting functions.

The emphasis was to make the crew aware of each part of the line setting duties and its importance to the whole fishing operation. Parameters were set so that during the line setting operation each crew would have a turn at the different duties. The crew were briefed on the normal procedures for setting up a line setting operation. At the end of the line setting operation the crew knew how to do the following: line up the mainline through the line guide in preparation for deployment (or through the line setter when this was used), open and change batteries in a radio beacon, test and switch on a radio beacon to ensure that it was functioning correctly and the batteries were fully charged for the operation, connect the radio beacon and support floats to the mainline, check radio beacon and strobe light batteries at least four hours earlier, position the branchline bins for easy access and deployment, stow floats on the work deck for easy access, prepare floatlines and floats for deployment, position float numbering tags in sequence, thaw out bait at least four hours before line setting and fill up the bait box with bait imme-

diately before line setting, set timer/beeper sequence, notify the wheelhouse that all was in order, attach snaps to the mainline, correctly unhitch branchlines from the branchline bin, hook bait so that it remained on the hook, deploy the branchlines from the bin and attaching it to the mainline, and ensure that the mainline leaves the spool unhindered.

The line setting sequence and branchline spacing was another aspect that the crew were made to comprehend clearly before starting the line setting operation. The normal procedure on any longline vessel is that, in trying to determine the depth that he would like the line to settle at, the skipper would let the crew know the pattern of setting, that is, the timing between floats, the number of hooks between floats, the number of floats in a basket and the number of baskets in the set. This information was given to the participants so that they could organise themselves accordingly and sort out any doubts they may have had of any necessary functions of line setting.

Setting times: During the actual line setting operation, it was attempted to have all the line in the water before 0700 hours. The starting time for the line setting operation was set at 0200 hours for each day, unless the hauling operation carried over into the later hours of the morning. Bait was thawed out at 1800 hours the previous evening. It was attempted to maintain this pattern during the workshop. The important thing for the participant to realise was that the line setting time depended on the skipper's preference and the type of species targeted. For tuna longlining most operators, especially those who normally set large number of hooks (1500 to 3000), prefer setting the lines before daybreak and finishing just after daybreak. As line setting can take from 3 to 8 hours, depending on the number of hooks set, setting times normally begin from 0200 hours onwards. Normally the end section of the line is in the water by 0800 hours but if hiccups are encountered it can be later than this. Some skippers prefer to commence setting right on daybreak to prevent their fresh bait from being taken by bycatch species.

Setting the line with a line setter: Different setters have different setting valves and adjusting methods. There are several methods of conducting the setting operations using a line setter and, again, all skippers have their own methods. The line setter on F/V *Mahr Leena* has a 30 cm (12 inch) main drive wheel. The preparations for line setting is the same, with or without the use of a line setter except that the line is rove through the setter rollers and drive wheel. The rollers and drive wheel create a grabbing tension to pull the mainline off the mainline spool and maintain a constant speed set by the operator.

Before line setting, the appointed operator was made to adjust the line setter speed with the speed control valve according to the preference laid out. This setting was done with the main 'on/off' valve at its maximum 'on' position. Readings were taken with a tachometer (some vessels have a speed control metre) and once the desired RPM was achieved the speed control valve was left in position and the main valve was then shut down. The mainline was then rove through the line setter as previously explained. Once the vessel had steadied on the preferred setting course, word was given to deploy the radio beacon and supporting buoys. The vessel speed was set on dead slow ahead and the mainline spool set on 'free spool' mode. The line was paid out as the vessel moved progressively through the water, with the vessel speed slowly increased. This set the shooter drive wheel and the mainline spool in a warm up rotating rhythm. As the vessel speed increased and the mainline spool built up speed the 'on/off' valve on the shooter was cracked open and slowly adjusted till the valve settled in the full 'on' position and the mainline spool rotated with rhythm. Since the speed control valve had already been set to the desired line setting speed during the preparations stage, the line was deployed according to the preferred line setter RPM.

While the line setting operation was underway (Figure 5) several working tips were given to the participants and demonstrations were given to get the message across. The participants were shown that care should be taken when establishing coordination between the line setter and the mainline spool. A sudden increase in line setter speed may lead to jerky movements. When this happened, the line setter speed was slowly eased off and then restarted with a gradual build up. While all was running smoothly, the line setter speed was regularly checked and adjusted when necessary.

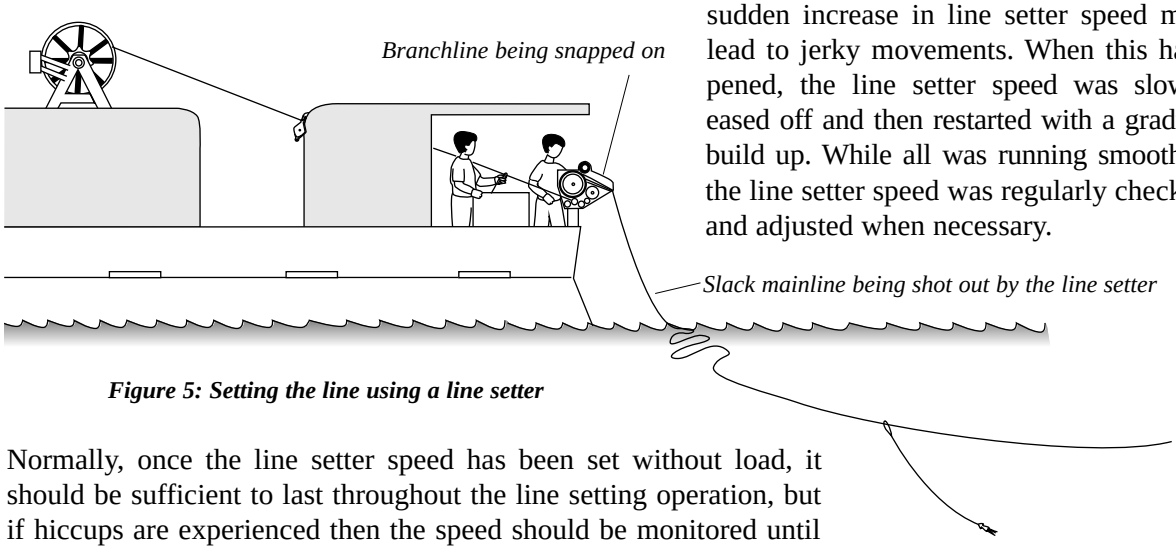

Figure 5: Setting the line using a line setter

Normally, once the line setter speed has been set without load, it should be sufficient to last throughout the line setting operation, but if hiccups are experienced then the speed should be monitored until the operator is satisfied that the appropriate rhythm has returned. Consistent sets can be achieved with the use of a line setter as long as the same perimeters are noted and used again. Close estimates of fishing depths can be worked out using these perimeters although weather conditions and the current factor play an important role in deciding the actual settling depth. Line setter speed can be set to attain the approximate desired depth.

Setting the mainline without a line setter: Setting the mainline without a line setter (Figure 6) took much longer. The frequency at which the snaps were connected to the mainline depended on the speed of the vessel through the water, so it was attempted to maintain an average boat speed of 7 knots and to snap on the branchlines every 10 seconds. This gave an approximate branchline spacing of 40 m (taking into account the slack in the deployed line) and a setting time of 5.5 hours for 2000 hooks. Most of the branchlines on F/V *Mahr Leena* were 15 m in length, so the approximate free space between two extended branchlines was 10 m. The 10 second spacing was the minimum time preferred for spacing the branchlines while travelling at 7 knots. There were several instances where the timer/beeper was not available due to fault in the wiring. During these times the spacing between branchlines depended on the person's judgement of distance. With a vessel averaging 7 knots the adequate distance for snapping on was when the snap of the previous branchline disappeared at the point the mainline entered the sea. At the beginning of the line setting operation, the vessel speed was reduced to dead slow ahead and the ships heading was set on the desired course for the mainline to run. Once the vessel had steadied on its course, the radio beacon and support floats were deployed overboard and the line was eased off the spool by the forward motion of the vessel. The vessel speed was gradually increased until the preferred setting speed was reached. Meanwhile the timer/beeper had already been switched on and the timer frequency checked for accuracy. A float was snapped on and the crew then followed the branchline setting pattern.

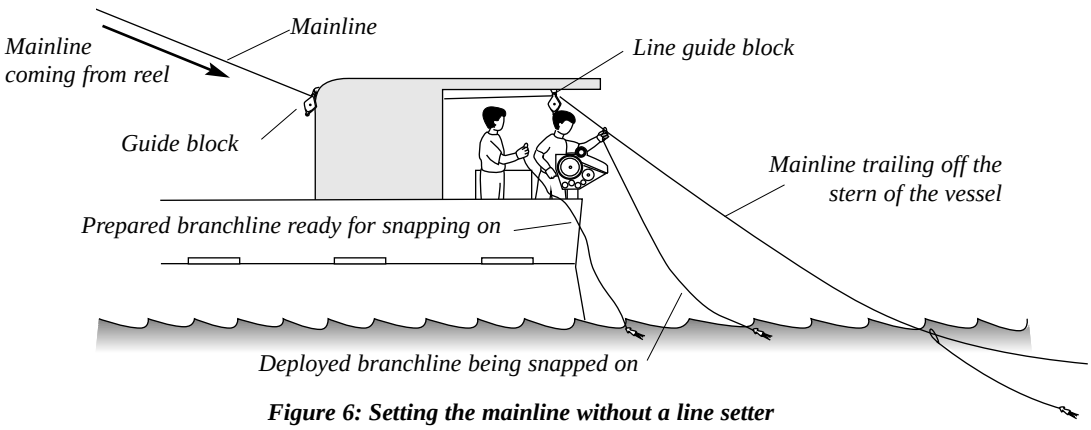

Figure 6: Setting the mainline without a line setter

Hazards during line setting: While deploying the branchlines from the bin, the crew were briefed to always ensure that all the line had cleared the bin and the baited hook had already been cast before the snaps were attached to the mainline (Figure 7). They had to be aware that failure to do this could result in serious and sometimes expensive, accidents. The crew had several near misses despite being told of the dangers involved. The problem was, and this involved the old hands as well as the new crew, that as the operation progressed and the crew settled in to the rhythm of the work, laxity set in and some of the crew got careless and snapped the branchline on before it had cleared the branchline bin or the hands of the baitman.

Figure 7: Branchline being deployed before snap is attached to mainline

Some Skippers consider line setting as the most dangerous time of the longline fishing operations. Not only does the danger of getting hooked exist, all the machinery and rotating parts are moving at high speed and a moment of complacency can be injurious, expensive or fatal. Another danger is that when the line is being run off the stern, the mainline spool is operating in the free spooling mode. If the mainline is held at any stage, this throws off the free spooling rhythm and vessel speed coordination, and may result in a pile of line on the deck that can get tangled and pose a danger or result in jerky tensions on the mainline which may require the operation to restart or cause the mainline to break. In any case, it will spur the crew into action and even this may lead to injury due to rash reactions, dashing from one position to another or getting entangled in the spilled line. One other danger to mention is that when the outgoing mainline on the spool gets caught on a knot (line join) that is still rotating with the spool, the spool will rewind the line back in till it gets tight due to the forward movement of the vessel then unwind again resulting in a backlash and possible line breakage, if immediate action is not taken. When the line winds back in, the branchline that was last deployed comes rushing back to the vessel and through the guide blocks endangering the crew from being hooked. If the line breaks, there's a real danger of the line fatally whipping anyone in the way or getting tangled on someone and jerking them overboard.

Baiting and petroleum products: During line setting, the baiting procedure was carefully attended to. The crew had to understand that the whole reason for having the branchline in the water was that it may get a fish hooked, and to do this, bait had to be properly attached to the hook. There was sometimes a tendency among the crew to recklessly hook bait onto the branchline in order to keep up with the timer but if the bait was not securely attached then this was wasted effort, time and money. To avoid wasting the set hooks, two people carried out the unlatching (Figure 8) and baiting of the branchlines.

Figure 8: Detaching the branchline from the bin during line setting

It was stressed to the crew that if the bait was improperly attached to the hook it may fall off before it reached it's desired settling depth and leave the bare hook hanging off the mainline. This was one chance less of hooking fish. During line setting the pumps in the engine room were disconnected and put on standby so that the bilge water could not be pumped out. Oil pumped overboard will settle on the surface of the water and get drawn aft as the vessel progressed. This will heighten the chances of the oil attaching itself to the mainline and the branchline and bait being deployed. The tainting will follow the line to its settling depth and lessen the chances of fish approaching the bait. The crew were also told to refrain from discarding oily rags and to keep petroleum products well clear of the monofilament line and fishing gear as this can shorten the life span of the line and taint the fishing gear. Care was taken that the person hooking the bait did so with gloved hands that were free of tainted smells.

Preparations for the line hauling operation

At the completion of the line setting operation, the deck and working area was thoroughly cleaned and the gear organised for the hauling operation. Particular attention was given to scrubbing down the operations area and disposing of all bait fragments. The branchline bins were relocated to the hauling station area and secured in place. All the other necessary equipment such as gaffs, knives, meat saw, fish club, sponge mattress, etc, were set in position. The vessel drifted during this period, which is called the soak time for the gear.

Line soaking times varied with the way the line was set and the weather conditions. This took from four to six hours. There was several line setting options that could have been chosen, the 'U' pattern, straight down wind, broadside to the wind and upwind. During the workshop the line was always set down wind with the wind on the port quarter. The weather conditions and the need to have deep sets made it inappropriate to set the line otherwise. This enabled hauling to be safely carried out with the wind off the hauling bow (starboard bow) and ensured that the vessel drifted away from the line whenever there were stoppages. When line breakages occurred, the crew gained first hand experience of having to haul with the wind coming from directions other than off the starboard bow, which is the hauling bow for the F/V *Mahr Leena*. The crew appreciated that retrieving and hauling the line back in was exhaustive and repetitious work where only the hook-up of fish broke the monotony. As with line setting, while the line was hauled back in the gear was relocated to positions in preparation for the next line setting operation.

After the line had been allowed to soak for 4 to 6 hours, the vessel was manoeuvred to approach the last radio buoy set from the starboard bow. A grapnel (Figure 9) was used to retrieve the mainline, and the radio buoy and support float were hauled onboard, detached from the mainline, and stowed. The mainline was then passed through guide blocks and attached to the mainline reel. Hauling then commenced (Figure 10). As each the branchline snap came up on the mainline, it was detached if there was no fish on it and passed to the coiler, who attached the snap to the branchline bin in order, pulled in the line, took any bait off the hook, and put the hook through its snap for storage. When a fish came up on a branchline, hauling stopped and the branchline was left attached to the mainline until the fish was boated. Once the fish was boated, the branchline snap was removed from the mainline and hauling commenced. Hauling continued using this process until all the mainline and branchlines were retrieved.

Figure 9: Grapnel ready to retrieve the mainline as the first radio buoy is approached

Figure 10: Hauling operation commenced

One person was assigned the task of killing (Figure 11), bleeding and cleaning the boated catch while the hauling operation was underway, although everyone rotated through each task to learn each operation. Once cleaned, each fish was placed in ice to chill and preserve it.

Figure 11: Spiking a mahi mahi to kill it

2.3.3 Problems encountered at sea

During the first trip, only two longline sets were made. The second set took four days to haul back in because of a failure in the steering system and the lack of a manual backup system. This was rectified out at sea but, among other things, very rough seas contributed to the delay in correcting the problem sooner. The root of the problem was a jammed steering solenoid. Had there been an operations or maintenance manual for the steering system, the problem would have been remedied sooner. Because of inadequate knowledge of the system, a problem elimination process had to be followed before the cause was identified. To compound the problem, the vessel was designed without a manual or emergency steering backup system. A filed Lloyd's delivery trip survey report confirmed this, but the surveyor permitted the vessel ocean passage approval because the vessel has two steering pumps with individual separate solenoids. The catch here is that the whole steering system is connected to a third solenoid that drives the vessels autopilot and remote control systems. Should this solenoid pack up, the whole steering system would become defunct and the only way to bypass the system would be to remove the auto pilot steering solenoid and join the reciprocal hydraulic steering hoses together to have powered manual steering. Inexperience with the system and the hesitancy to remove the autopilot solenoid contributed to the delay.

After the preliminary problem elimination process was complete and a drawing was made of the hydraulic steering system (Figure 12), the autopilot and remote steering solenoid was opened up. A wood splinter was found jammed in the solenoid directional arm. The splinter was removed and the steering hydraulic oil and filter was changed. This set the power steering back to its normal operational mode but unfortunately, the days had passed and it was time to return to port.

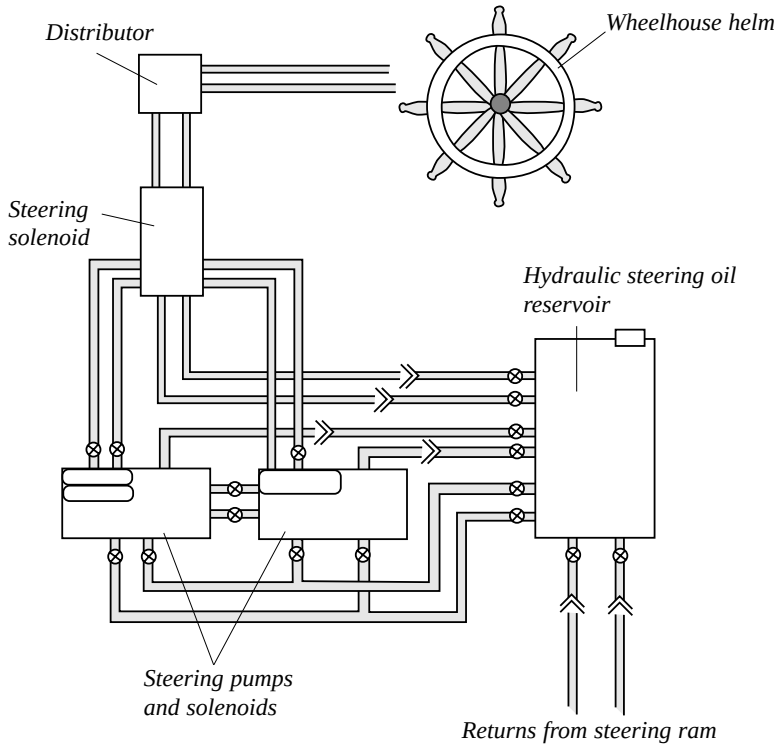

***Figure 12: Diagram made of the hydraulic steering system on F/V* Mahr Leena**

While the steering problem was being addressed, the vessel continued to drift away from the mainline. Trial temporary steering methods, using the system, were tried out in order to get back into the vicinity of the mainline. Although these steering methods were sufficient to steer the vessel back to the mainline, they were insufficient for hauling purposes. This was confirmed when trial hauling was tried from a substitute hauling location. The work formation was improvised to allow steering to be conducted from within the wheelhouse instead of the aft steering console.

Despite the problems encountered during this trip, the experience served the participants as a good example on dealing with malfunctions while on a fishing trip. The participants gained added experience on practical steering, watch keeping, trouble shooting mechanical problems, and hauling from a substitute location.

It was noticed that during the hauling operation, the sections of the mainline that had the 3.0 mm mainline kept parting and led to the operations being delayed. On several occasions, a bit of luck assisted in retrieving all the fishing gear. The section that broke while hauling up wind also broke while hauling downwind where no direction-indicating marker was available. Spotting this loose line that was drifting without markers in rough seas was a stroke of luck.

2.3.4 Results of fishing activities

One of the purposes of the workshop was to educate the participants through the preliminary stages to enable them to make practical fishing trips where their abilities could be assessed and the catch potential determined. Eight sets were made during the two trips of the workshop. The vessel departed on the 03 September for the first trip and returned on 11 September.

Two sets were achieved in the first trip and this resulted in a catch of 68 fish weighing an estimated 1194kg. Table 1 summarises the catch for trip one, while Appendix E provides a breakdown of the catch by set. While hauling in the line during the second set (up to four days), a considerable amount of fish were discarded as these had deteriorated due to being caught in the earlier stages of the line being in the water. Unfortunately, no records were kept of the discarded fish.

Table 1: Catch taken by trip for the fishing component of the tuna longline workshop

		Catch from trip 1		**Catch from trip 2**	
Species	**Scientific name**	**Number**	**Estimated weight (kg)**	**Number**	**Estimated weight (kg)**
Albacore	*Thunnus alalunga*	8	184	29	688
Bigeye tuna	*Thunnus obesus*	3	75	7	138
Yellowfin tuna	*Thunnus albacares*			8	59
Skipjack tuna	*Katsuwonus pelamis*			1	6
Mahi mahi	*Coryphaena hippurus*	40	400	55	515
Wahoo	*Acanthocybium solandri*	6	156	12	295
Sailfish	*Istiophorus platypterus*	1	22		
Shortbill spearfish	*Tetrapturus angustirostris*	2	26	5	60
Striped marlin	*Tetrapturus audax*	1	90	9	972
Blue marlin	*Makaira mazara*	1	90	3	260
Broadbill swordfish	*Xiphias gladius*			7	380
Opah	*Lampris guttatus*			3	60
Great barracuda	*Sphyraena barracuda*			1	15
Oilfish	*Revettus pretiosus*	1	8	5	40
Escolar	*Lepidocybium flavobrunneum*	1	4		
Blue shark	*Prionace glauca*	1	25	4	155
Overall total		**68**	**1194**	**149**	**3643**

The second trip was conducted from 14 to 22 September. Six sets were made on this trip, resulting in a catch of 149 fish weighing 3643 kg. Table 1 summarises the catch for trip two, while Appendix E provides a breakdown of the catch by set. No problems were encountered during the second trip, apart from rough weather, so no fish were discarded. Mahi mahi was the most predominant species by number during the two trips, with a total of 95 fish weighing 915 kg.

During the fishing trips, most of the fish on board were gilled and gutted before icing. The exceptions were sharks, marlins, and sailfish, which were all headed and gutted, and albacore tuna which were retained whole.

Table 2 summarised the catch that was exported from the two fishing trips. Of the fish caught on trip one, 48 fish weighing 550.5 kg were exported to US at USD $5.00/kg. Two consignments of export fish were made from the catch of the second trip, one to the US (78 fish weighing 1101.1 kg) and the other to Japan (13 fish weighing 733.0 kg). The price paid for the second consignment to the US was not known, while the fish send to Japan received USD $5.00/kg. The rest of the fish were either sold on the local market or given away as a token of goodwill.

Table 2: Summary of fish exports to the US and Japan

	Trip 1 exports to US			**Trip 2 exports to US**			**Trip 2 exports to Japan**		
Species	**Number**	**Weight (kg)**	**Price (USD)**	**Number**	**Weight (kg)**	**Price (USD)**	**Number**	**Weight (kg)**	**Price (USD)**
Mahi mahi	38	302	5	47	453	-			
Opah				3	57	-			
Bigeye	2	93.5	5	1	18.4	-	2	61	5
Wahoo	3	51.6	5	11	245.9	-			
Albacore	5	103.4	5	16	327.4	-			
Broadbill							4	187.5	5
Yellowfin							1	32	5
Striped marlin							6	452.5	5
Total	**48**	**550.5**		**78**	**1101.7**		**13**	**733**	

3. DEVELOPING THE COOK ISLANDS LONGLINE INDUSTRY

3.1 General

There are a few basic but necessary components of the commercial longline industry that need to be carefully approached in order to set the base for secure operations later. These components are basic in the sense that they are clearly understandable aspects to undertake when managing a tuna fishing operation, and principally, not difficult to execute. It can become complex though, when industrial politics present themselves and the main operators in the industry start to put personal and company agendas above the development of the industry.

The struggle for success of every fishing company within the industry is understandable. Of course company survival is at the forefront and competition sets the challenge for progress, but when policies are targeted at undermining a competitor, this can be damaging for the industry. In the Cook Islands, the local fishing industry operators are new to the game. Past errors that were indulged in by operators in other Pacific islands should be noted as a deterrent to a harmonised development process. Cook Island operators need to learn from the experiences of other operators in the region and not make the same mistakes.

3.2 Some common constraints to the development of a domestic tuna longline industry

Common deterrents are faced by all the Island nations in the development of a tuna longline industry. For some countries, trying to overcome the deterrents are realistically unpractical, as it would require colossal investments to set in place infrastructures to at least attempt commercial longline fishing without guaranteeing sustainability or viability. Location, political stability, the presence of a tourism industry, regular flights, infrastructure, domestic and export markets and fish stocks are some of the major factors that contribute to the outcomes of the industry's development. The availability of a domestic workforce is another essential factor, and this is where activities such as workshops, courses, and promotions can be instrumental in luring or training the right calibre of fishermen for the industry.

Aside from transportation issues, one of the main obstacles that the Pacific Island countries encounter in the development of commercial tuna longlining is the uncooperative attitude that develops between the operators in the industry — boat owners, crew, exporters and processing plant owners. This originally stemmed from distrust that cropped up in the early stages of an industry's development and the 'cut throat' management styles that were experienced then, and are still used by some in the industry today. Substantial evidence of mismanagement and fraud when dealing with the packing and exporting of catches also prevented strengthening cooperation between the parties.

Most fishing boat owners feel that the proprietors of some processing plants (some of whom have their own boats) have established systems that allow them to dictate the destination and prices of fish on the export market and have indulged in double dealings at the boat owners expense. On the other hand the processors/exporters, claim that the system used is essential to the sustainability of their company, if not the industry, and that the accusations of fraudulent dealings stem from insecurity and paranoia.

This lack of cooperative attitude also affects the operators' relationship with the Fisheries Division. In most instances the initial advice by Fisheries Divisions to discuss plans for infrastructure and operations procedures are totally ignored in favour of progressing as circumstances permit. For those in the private sector with ready finance, material difficulties are easily smoothed over, but they later face difficulties with laws and limitations. Those with limited finance that haphazardly blunder through the fishing operations without heeding advice to wait for the right infrastructures to be established first, eventually find that they need all the infrastructures necessary for the industry to be in place as soon as possible. Eventually the pressure is put on the Fisheries Division to produce miracle cures and amendment of the laws to suit all sorts of notions, some constructive for the industry and some for personal gain.

In highlighting these constraints, it is hoped that those engaged in the commercial tuna fishing industry in the Cook Islands will have a broader view of the complexities involved in managing and participating in the industry as experienced elsewhere. Although the Cook Islands is in the early stages of commercial tuna longline development, fishing operators have already voiced similar complaints in the industry. Whether these allegations are justified or not the fact remains that these are common issues that need to be addressed.

3.3 Examples of fraudulent dealings experienced by fishing operators in the region

Generally, one of the distrusts that exists in the industry is that the boat owners sometimes believe that the fish processors and exporters reveal lower sales figures than what the fish was actually sold for. A manufactured bill of sale is revealed to the boat owner while the actual document is filed away by the processor/exporter. Another distrust high on the list is that again, the boat owners sometimes find evidence that they have been conned out of proper grading for their fish, even before it is exported. An example of this is when a high-grade fish is taken into the processing room and marked as second grade. When the fish is sold all the deductions are worked on the second grade price and at the end the boat owner takes the final returns based on the price for second grade fish while the processing/exporting company skims everything left over from a first grade price. In the first instance, the price is altered although the fish grading remains actual while in the second example the fish grade is altered to suit the current price for a lower grade. Another example of grading fraud is when fish that are suitable for export as second

grade are rejected for the local market then repacked and exported under the exporting company's label. Sometimes fish are swapped or the labels on the export coffins are swapped.

Unscrupulous fish exporters also deceive unaware fishing vessel operators by tailoring the exchange rates in their favour. When there is a fluctuation in the exchange rates, the fishing operators are given the rate that will provide a lower return, while the exporter pockets the extra that was skimmed by using the actual rates.

There are issues more complex than those mentioned above and examples of double-dealings also involve overseas agents, boat owners and their crew, crew duping boat owners, etcetera. In all these cases, the onus is on the honest operators to be constantly vigilant and to move with the times in resolving a safe passage for their product to the export market.

3.4 Infrastructure

There is a range of infrastructure needs within a country to assist the development of the domestic tuna fishery. This section looks at the main infrastructure areas where governments can assist.

3.4.1 Air transportation, commercial tuna longline fishing, and tourism

The major aspect in establishing a successful fresh-fish tuna longline industry is to have a regular airline service to a country where the market is located. Therefore, the airline company (flights and freight costs), the airports and airport storage facilities should be closely researched. The more direct the route and the more flights there are, the better the chances of success. The flights should also have cargo carrying capacity while the fishing vessels should produce a consistent discharge figure to make the airlines effort viable. Inconsistency in filling cargo space will not entice the airline companies to maintain a flight to market destinations.

The present trend of the airline companies is to minimise the carriage of cargo on passenger planes so this can place a strain on the industry throughout the Pacific, if the airline companies enforce this seriously. The option here is for the countries to produce enough consistent cargo at certain times of the week that would encourage cargo freighters to fill the void — if the situation occurs. Chain pickup is another option, where several bordering countries produce enough fish cargo to make a flight viable. However, whatever the situation, the monitoring of airlines and their schedules to the country is important to sustain a domestic tuna longline industry.

The role of tourism in the current arrangement is crucial to the survival of the commercial fishing industry. The advancement of tourism would require the airline to consider increasing flight numbers to a destination and the decision to do so can be bolstered if there is sufficient cargo to fill the return flights, a factor that the fishing industry can provide should the operators amalgamate their resources and work together.

The Cook Islands currently have international flights every day of the week by Air New Zealand and, more recently, Aloha Airlines. Air New Zealand has flights from Tuesdays through to Sundays to overseas destinations like Auckland, Nadi, Papeete and Los Angeles while Aloha Airlines operate flights from Honolulu to Rarotonga on Mondays, Tuesdays, Fridays and Saturdays. These ports are all transit ports to Japan and the US markets. Honolulu and Los Angeles markets are major buyers of 'sashimi' grade tuna and at times have been on par with prices offered by the Japanese markets.

3.4.2 Berthing facilities

Most operators in the Pacific region normally develop their fisheries berthing facility by improving on existing structures that were intended for other purposes. This does not always provide efficiency for the boat operators and sometimes results in longer downtimes for vessels. Part of the Cook Islands development plans for the commercial tuna longline industry is the construction of a berth designated specifically for fishing vessels.

In developing a purpose built berthing facility for commercial tuna longliners and other offshore fishing vessels, the design should be focussed on ensuring a flow in operations where a vessel will move from one operation to the other after completing each consecutive step. Several factors should be taken into account in planning the berth design.

a) Knowing the type and size of vessel is important, as this information is necessary for management when allocating berths that will ensure a flow in operations. For example, a refrigerated seawater vessel will not have to go through the full berth movements as an ice vessel when preparing for sea, so if this is known before hand the design should be such that this vessel can miss the unnecessary steps and skip to the next operation down the line instead of having to stick with the group.

   Presently four types of offshore fishing vessels are used in the region's domestic fleet, fully refrigerated vessels, refrigerated seawater vessels, chilled seawater (ice slurry) vessels, and ice vessels. The berths should be divided into several sections to deal concurrently with loading, offloading, bunkering, replenishment (water, food), repairs, maintenance and resting stations. The movement should be such that the vessel shifts from resting station to departure and from offloading to resting station in a chain of movements that will not hinder the progress of another vessel.

b) Consideration should be given to strategically locating the bunkering stations to be away from the loading and offloading zones. Not only will this ensure fewer chances of contamination it will also free up space for vessels waiting to offload or load.

c) In the loading sequence, the ice chute should also be strategically located away from all other areas to free up space and lessen the chances of contamination. Replenishment of the vessel's food and water can be carried out at this point.

d) The processing plant should be strategically located close to the offloading berth to ensure that the fish is less exposed after leaving the fish hold on its way to the processing table. The design should include measures such as a moveable overhead covering or a channelling chute with chilling medium to ensure that the fish reaches the processing table in a chilled state. If, due to lack of space, such an arrangement cannot be met, then at least a moveable overhead covering and a channelling chute should be located at the offloading area to reduce the chances of the fish's exposure from the vessel to the transport vehicle. The transport vehicle should also be insulated to maintain a chilled atmosphere in which to transport the fish.

e) A repairs and maintenance area should be located well away from the fuel, loading and offloading area. The area should include a derrick or crane to load/unload heavy engine parts.

f) A resting station should be established for vessels to tie up while its crew takes a break.

g) In most instances (especially in the Pacific Islands) the amount of space allocated for the fishing operations berths is insufficient to segregate the different areas for load/replenishing /offloading, bunkering, maintenance/repairs and rest stations. In situations like these, proper management arrangements should be looked at to ensure a flow in operations and reduction of congestion at the berth, something that is lacking in most berthing facilities around the Pacific.

3.4.3 Chilling the catch

At present, the two major ice plants in the Cook Islands can only supply ice for around four vessels at a time, approximately 20 tons. These ice plants belong to companies that own fishing vessels and export their own fish so the boat owners who do not have their own ice plants have to stagger their departure or arrival times to occasions that the export/processing company's vessels are not around. When the schedules of flights dictate the movement of the vessel or an emergency arises, the boat owners

have no choice but to return to port and bargain their way into a 'first come, first serve' deal. This creates animosity and frustration between the fishing operators and is sometimes used as a bargaining tool in business transactions.

3.4.4 Refrigerated seawater (RSW) system

Refrigerated seawater is one method of getting around the 'queuing for ice' problem. Earlier designs of the RSW system have made it possible only for the bigger vessels to use this system as the refrigeration plants were bulky and could only fit in the engine room of larger vessels. Recent designs have come with smaller compressors and refrigeration systems that are user friendly and compact for small and medium sized fishing vessels, particularly those with small engine rooms and ice holds. There are many vessels in the region (second-hand and purpose built) that are successfully using the RSW system.

The cost of running an RSW vessel compared to an ice storage vessel needs to be contemplated. An RSW system will require at least one auxiliary engine to be constantly running to power the compressor until the fish hold has reached the desired temperature, so fuel consumption will be higher than that of an ice vessel. Despite this, the rising cost of producing ice in the region compared to the cost of running an RSW vessel may see RSW as the better alternative.

The RSW system is simple to employ. Fish is stored in seawater that has been chilled between –0.5ºC to –1ºC. As this is colder than ice and the fish is fully submerged in chilled water, it removes the heat faster from the fish without freezing the fish but the temperature should be regulated in accordance to the intake of fish. On board handling of fish is minimised. As soon as fish is gilled and gutted, it is immediately covered and hung in the RSW tank. Upon discharge, the fish goes straight from the tank to the transport vehicle. With ice, the fish is gilled and gutted then transferred to slurry to quickly reduce the temperature and after a few hours, to the ice bin where it is packed in ice.

The RSW system maintains the fish quality, so the storage time is the same as that for fish stored in ice (14 days at the most), but fish stored in ice has an advantage. During adverse weather conditions, the fish is stationary whereas with RSW there is the tendency for fish to move about in the fish hold. The storage of fish using RSW will need a more competent crew to run the system then the ice system.

3.4.5 Processing plant

Processing plants should be strategically located to ensure efficient transfer from the vessel to the processing room with minimum risks of exposure to the elements. Since the US market is influential in the export market scene, all fish handling and processing measures should comply with a HACCP (Hazard Analysis and Critical Control Point) plan that has been developed for each plant, plus each processing plant should meet all Sanitation Standard Operating Procedures (SSOP) for the country. This would ensure that the plant is hygienically set up to handle food for consumption. At least with these measures in place the exporter has the option of trading his products, including the byproducts, to either the Japanese or the US markets.

Basically, a processing plant focuses on six operations for preparing fish for the market. These are:

- Entry point, where the fish is first offloaded on the receiving tables.
- Preliminary preparation. Here the fish is headed, if required, and given a general wash-down with chilled water.
- Third step where the fish then gets properly checked to see if it has properly been bled, gilled, and gutted then thoroughly washed with chilled water. Any remaining entrails are removed. A grader/sorter decides the grade of fish and whether the species should go on the local market or exported. The fish is marked accordingly with a tab.
- Fourth step where the fish is weighed.

- Fifth step in which the packing group ensure that sufficient fish is packed in the box to capitalise on the space available; sufficient gel ice is put into the box to maintain the temperature throughout the trip; sufficient padding and wrapping is used; the box is properly sealed, numbered and marked with weight, number and species of pieces and destination.
- The sixth step is to transfer the packed box to the loading bay where it is loaded on a refrigerated vehicle, ready for transportation to the airport.

The processing plant should also include sufficient freezer storage space for keeping surplus or local market fish and other necessities for their operation such as bait, gel ice etc; an accessories storage space for storing fish boxes and insulation wrappings; and office space to manage and compile the necessary paperwork for the operations.

One major factor in setting up a processing plant is the control and management of discharged effluents, but this should be covered under the SSOP.

3.4.6 Motor pool, vessel maintenance and repairs unit, quick turn around (QTR)

It would be ideal for the tuna longline shore support operations to have a motor pool, maintenance, and repairs unit to attend immediately to requests. This makes for a short down time but again the costs for having such a set up has to be contemplated and weighed off against hiring outside operators. Some shore support operators around the region though, have set up their operations to be self-sufficient, especially in vessel repairs, maintenance (mechanical, welding, reconstructing, etc) motor vehicle repairs, servicing, electrical work, and carpentry. Electronics and annual slipping are normally done by outside operators.

The motor pool mainly deals with maintaining the company's vehicles and shore side machinery including refrigeration containers, air conditioning, desalination and ice plants, etc; while the maintenance and repairs pool takes care of the fishing vessels. Their main function is to ensure that the best advice is given to maintain the vessels so that it engages in continuous fishing operations and have a quick turn around (QTR) when they return to port.

Once a fleet has sufficient vessels to support a shore facility, the demand for QTR will be more urgent. Vessels requiring repairs to defects call in their defects while still out at sea and preparations are made onshore to counter the defects. When the vessel berths, the necessary equipment or skilled operator is on hand to take care of the defects while the ship's crew takes a break after discharging their fish.

In organised operations, as soon as the vessel berths, a system of events is put in place. The skipper checks in and hands his trip report to his liaison officer or the operations manager. He is then given the port movement plan and discusses this and other outstanding issues before returning to the vessel to carry out the prearranged plan. He and the crew will manage the vessel until all the fish have been discharged and the vessel is tidied up. The shore crew and replacement crew will then prepare the vessel for its next trip. The work includes restocking the vessel according to the orders list, carrying out all defects, replenishing the vessel with food and water, bunkering fuel and restocking necessary oils, loading ice, bait and replacement fishing gear, and testing all gear.

4. DISCUSSION AND CONCLUSIONS

The following conclusions and discussion resulted from the work undertaken in the Cook Islands in line with the objectives of the project.

4.1 Workshop

The methodology in which the workshop was conducted gave the participants and the personnel of the Ministry of Marine Resources a better understanding of the technicalities involved in running a tuna

longlining operation and the basics required to form a tuna longline industry. The fishing vessel owners also gained knowledge that would perfect their present operations to be compatible with the requirements of overseas markets and to 'move with the times'. As the fishery expands or as more people enter the fishery, additional workshops should be run.

The participants of the workshop showed interest in the proceedings right from the very start and used the basic preparation courses to full advantage. The concept of putting the participants through the basic preparation courses before going out on fishing trips served them well and made a marked difference to their performance on board. The Fisheries Development Officer (FDO) was able to focus on perfecting the principles they had picked up for fish handling and spend more time on advanced training on vessel control and general ship practices during a longline fishing trip. The adverse weather conditions that were experienced during the workshop fishing trips stressed the importance of having to conduct the basic safety courses first before going to sea.

The exceptional performance of the workshop participants should encourage the local fishing business entrepreneurs to have confidence in their own local fishers. The boat owners and fish processors should look at developing their own people to be the workforce on their offshore fishing vessels instead of readily recruiting overseas crew.

The participants of the workshop have proven that Cook Islanders are able seamen and fishermen. Like every other country, fishing and seafaring is the passion or necessity of select individuals. The Cook Island tuna longline operators should encourage more Cook Islanders to participate in the industry by giving them the opportunity to try out the different operations of the industry and find a niche that would best suit their abilities. Workshops, training programmes and attractive incentives will bring forth the required manpower for the industry.

If local expertise is not available to coordinate the different aspects of the industry then expatriate assistance should be sought providing the person(s) are well screened so that they will bring genuine knowledge into the industry and not learn at the expense of the industry, as is now the case in some of the Rarotonga fishing operations.

In the effort to encourage more local participation in the tuna longline industry, operators should employ only the necessary expatriate expertise. This should be done on the condition that training of locals will be undertaken to fill the post within a certain time frame if the local counterpart is competent for the job.

4.2 Fish processing, berthing and exporting facility

A role of government institutions/Ministries is to instigate legitimate concepts beneficial to the economic development of the country and encourage the private sector to invest in the concept and progress profitably. The establishment of proper infrastructure should encourage stronger participation by the private sector and increase the chances of success which is what the fishermen of the Cook Islands are asking for now. They request that proper berthing facilities for fishing vessels be constructed; an independent processing and exporting facility put in place; Government to have established arrangements (through lobbying) for the transportation of their products; and proper legislation and trading laws to protect the fishermen's trading rights. These are necessary topics to be dealt with to ensure the sustainability of the industry. In addressing this, several issues should be looked at.

There are two fish processing and exporting facilities in Rarotonga. Both are privately owned and have their own company boats to sustain their operations. The rest of the boat owners including small craft fishermen who wish to have their fish exported, have to export through the operations of these two companies. Complaints from the boat operators and fishermen suggest that these companies charge exorbitant rates that are not viable for their operations. This is the reason the fishing vessel operators are requesting government, through the Ministry of Marine Resources, to construct an independent fish processing and exporting facility. With this facility in place the fishermen hope that their operations costs would be more bearable and their fishing business would have a chance to progress.

But is this really the solution to their problems? Government can install a processing and exporting plant to placate the fishermen but how effective will the operation be and at what cost to government. The concept of having a neutral processing and exporting facility to cater for the independent fishing boat owner is an attractive one and a practical solution to the fishermen's problems but should government be competing with the private sector and is government organised to operate the facility. If government was to capitulate to the idea of establishing the facility then the following question should be asked.

Who will manage the facility? Government cannot afford to get involved in operating (managing) a fish processing facility. The Ministry of Marine Resources does not have industrially trained personnel to manage such an operation and what professional staff they have should not be tasked with the duty of performing their normal fisheries responsibilities plus the added burden of being attached to a fish processing facility. Dual duties will definitely lead to one of the duties being less performed than the other. The fisheries officer, being more familiar with fisheries duties will more likely neglect the duties at the fish plant, but should he excel at that, then his fisheries responsibilities may suffer.

Were government to run the facility, they would have to do so at a competitive level on par with the private sector. That would mean employing professional personnel and a separate management team with access to funds obtainable outside of the system used by government. Workers will need to have the proper incentives and urgency such as that demanded in private sector operations. The government system (including finance and accounting) is not set up to do this. Also, operations wise and ethically, government should not engage in competition with the private sector as it holds all the aces to stabilise its operations (but not necessarily profitably) and burden the private operations with unfair competition. It would also be contradictory to the government's role of instigating and advocating private sector industrial growth.

The first step the Ministry of Marine Resources can take is to suggest legislation that would enforce fair trading guidelines relevant to the industries needs – a fair trades act for the tuna longline industry. If funds are found to develop the necessary infrastructure to support the industry, government should consider tendering bids from the private sector for the management of berthing and processing facilities. Operations and strategic procedures should be clearly defined to safeguard the fishers from undue operational stresses. Levies paid to the management of the facilities should ensure sufficient funding that would make the facility autonomous and turn around adequate profit at the end of the year. One of the main clauses in the agreement that should be considered by the management of the facilities and government is the percentage of allowable mark-up that can be applied to make the operation sustainable and worth getting into but not detrimental to the fishermen's operations. Also important is that the management company should not own or be affiliated with the owners or operators of fishing vessels. A clear policy should be established for fair services of vessels, such as 'First in, first served'.

Installation of a berthing facility for fishing vessels is a necessity. Thought should be given to facilitating a flow operation for vessels returning from sea and those preparing for a fishing trip. The berth should be planned to compensate for berthing on arrival; discharging of fish cargo; cleaning, repairing and maintenance; bunkering; re-icing and replenishing; and a resting area.

4.3 Controlling measures on vessel numbers and flight cargo space

The number of fishing vessels operating in the Cook Islands should be limited to be appropriate with the area covered by the countries EEZ, fish stock, and/or the industries export cargo space capabilities. Over congestion can only lead to the possibilities of less fish being landed by each vessel resulting in a struggle for financial profit.

The tuna longline fishing industry should be monitored and controlled so that the industry progresses concurrently with the capabilities of transportation allotment. The number of fish lifted off the island should coordinate with the flight cargo space availability. If surplus fish is landed, this will have to be sold locally for a lesser price or held for the next available flight thus risking a drop in quality, hence a drop in income.

5. RECOMMENDATIONS

Based on the outcomes of the tuna longline workshop and observations of fishing operations in the Cook Islands, the following recommendations are made for consideration.

5.1 Workshop

It is recommended that:

a) The Ministry of Marine Resources should arrange and run more workshops when and if the need arises in the future;

b) The same format that was used in the last workshop should be used for future workshops;

c) Sea safety training, including fire fighting and first aid should be a prerequisite for anyone entering the tuna longline industry;

d) The local tuna industry should focus on training local crew and not bring in foreign crew;

e) Government should closely monitor the use of foreign crew working on locally registered fishing vessels and restrict this as much as is practicably possible; and

f) If foreign crew is used on local vessels, training of locals is undertaken to fill the post within a certain time frame.

5.2 Fish processing, berthing and export facility

It is recommended that:

a) The government look at the shortfalls in the current infrastructure and work towards fixing these;

b) The government review the principal operations of the tuna longline industry and devise methods of assisting the industry to maintain a consistent output;

c) The government consider implementing fair trading laws that would safeguard the operators in the tuna longline industry from monopolising aspects of the industry and from devious and malicious practices;

d) The government should not get involved in the setting up or running of a neutral processing facility. However, if the government is forced into setting up a neutral processing and exporting facility, this should only be the result of non co-operation by the other processors and exporters in the industry;

e) The government develop and implement a well-planned berthing facility to meet the fishing industry needs, as soon as practical;

f) Any new processing complex should complement the berthing facility in positioning, to maintain a chilled transfer medium for fish from the vessel to the processing table;

g) The berthing facility and processing complex should be independently managed by the private sector, with precise conditions on certain management aspects relating to fair trading acts and marginal profiteering policies; and

h) The people responsible for managing the processing facility and berthing complex have no affiliation or financial involvement with the owners, operators or managers of fishing vessels.

5.3 Controlling measures on vessel numbers and flight cargo space

It is recommended that:

a) The government implement guidelines to license the appropriate vessels to fish within the Cook Islands EEZ to avoid over fishing and congestion; and

b) The government monitor and control the progress of the tuna longline industry.

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Appendix A

Vessels licensed to fish in Cook Islands waters (as at 8 November 2002)

Local licences

1	Vessel:	**F/V *Cheyanne***
	Licence No.	00301
	Size:	11.7 m LOA
	Radio Call sign:	ZK2066
	Registration Number:	N/A
	Colour (Hull/Superstructure):	Off-white/Orange roof
	Authorised fishing area/s:	Cook Islands EEZ, and within Territorial seas, operating no closer than six (6) nautical miles offshore
	Authorised fishing operation:	Longline
	Date issued:	19 November 2001
	Date expires:	18 November 2002
2	Vessel:	**F/V *Island of Pukapuka***
	Licence No.	CK-0102
	Size:	60 GRT, 19.90 m LOA
	Radio Call sign:	ZKWN
	Registration Number:	CI 03/02
	Colour (Hull/Superstructure):	Silver
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	06 February 2002
	Date expires:	05 February 2003
3	Vessel:	**F/V *Amethyst***
	Licence No.	CK-0202
	Size:	30 GRT, 14.40 m LOA
	Radio Call sign:	ZKWM
	Registration Number:	CI 02/02
	Colour (Hull/Superstructure):	Green/White
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	07 February 2002
	Date expires:	06 February 2003
4	Vessel:	**F/V *Margaret***
	Licence No.	CK-0302
	Size:	30.3 GRT, 16.62 m LOA
	Radio Call sign:	ZKWE
	Registration Number:	9346
	Colour (Hull/Superstructure):	Blue/White
	Authorised fishing area/s:	Cook Islands EEZ, and within Territorial seas, operating no closer than six (6) nautical miles offshore
	Authorised fishing operation:	Longline
	Date issued:	26 March 2002
	Date expires:	25 March 2003

5	Vessel:	**F/V *Mahr-Leena***
	Licence No.	CK-0502
	Size:	144 GRT, 23 m LOA
	Radio Call sign:	ZKWF
	Registration Number:	CI 04/02
	Colour (Hull/Superstructure):	Blue/White
	Authorised fishing area/s:	Cook Islands EEZ, and within Territorial seas, operating no closer than six (6) nautical miles offshore
	Authorised fishing operation:	Longline
	Date issued:	06 June 2002
	Date expires:	05 June 2003
6	Vessel:	**F/V *Lady Yolandie***
	Licence No.	CK-1002
	Size:	70 GRT, 19 m LOA
	Radio Call sign:	
	Registration Number:	0038 (Samoa)
	Colour (Hull/Superstructure):	
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	01 August 2002
	Date expires:	30 June 2003
7	Vessel:	**F/V *Lady Mareta***
	Licence No.	CK-1102
	Size:	31 GRT, 18 m LOA
	Radio Call sign:	5WCR
	Registration Number:	0042 (Samoa)
	Colour (Hull/Superstructure):	White/white
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	01 August 2002
	Date expires:	30 June 2003
8	Vessel:	**F/V *Lady Marie***
	Licence No.	CK-1202
	Size:	31 GRT, 19 m LOA
	Radio Call sign:	5WDR
	Registration Number:	0038 (Samoa)
	Colour (Hull/Superstructure):	White/white
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	01 August 2002
	Date expires:	30 June 2003
	Owner:	Cook Islands Marine Export Ltd — Francis Craig
9	Vessel:	**F/V *Young Duk***
	Licence No.	CK-1302
	Size:	138 GRT, 33.3 m LOA
	Radio Call sign:	ZKWS
	Registration Number:	Provisional 1042 (Cook Is) 876352 (Tauranga, NZ)
	Colour (Hull/Superstructure):	
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	27 July 2002
	Date expires:	26 July 2003

10	Vessel:	**F/V *Futura***
	Licence No.	CK-1402
	Size:	6 GRT, 9.7 m LOA
	Radio Call sign:	ZK2069
	Registration Number:	N/A
	Colour (Hull/Superstructure):	Off-white/
	Authorised fishing area/s:	Cook Islands EEZ, and within Territorial seas, operating no closer than six (6) nautical miles offshore
	Authorised fishing operation:	Longline
	Date issued:	16 September 2002
	Date expires:	15 September 2003
11	Vessel:	**F/V *Moana***
	Licence No.	CK-1502
	Size:	10.5 GRT, 13.8 m LOA
	Radio Call sign:	ZKVB
	Registration Number:	1046
	Colour (Hull/Superstructure):	Silver - Aluminium
	Authorised fishing area/s:	Cook Islands EEZ, and within Territorial seas, operating no closer than twelve (12) nautical miles offshore
	Authorised fishing operation:	Longline
	Date issued:	02 October 2002
	Date expires:	01 October 2003

Locally–based foreign fishing vessels

12	Vessel:	**F/V *Viking Spirit***
	Licence No.	00602
	Size:	275 GRT, 33.5 m LOA
	Radio Call sign:	ZKWY
	Registration Number:	CI-0102
	Colour (Hull/Superstructure):	
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	01 March 2002
	Date expires:	28 February 2003

Foreign Test fishing licences

13	Vessel:	**F/V *Apera II***
	Licence No.	01702
	Size:	60 GRT, 28 m LOA
	Radio Call sign:	ZM2054
	Registration Number:	NZMSA 876284
	Colour (Hull/Superstructure):	
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	06 September 2002
	Date expires:	06 December 2002

14	Vessel:	**F/V *Faivaimoana***
	Licence No:	01702
	Size:	148 GRT, 27m LOA
	Radio Call sign:	1059247
	Registration Number:	1059247-US
	Colour (Hull/Superstructure):	Blue/White
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	13 November 2002
	Date expires:	12 February 2003
	Fax. (684) 633- 2953	
15	Vessel:	**F/V *Fetuolemoana***
	Licence No:	01802
	Size:	108 GRT, 21m LOA
	Radio Call sign:	1107783
	Registration Number:	1107783-US
	Colour (Hull/Superstructure):	Blue/White
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	13 November 2002
	Date expires:	12 February 2003
16	Vessel:	**F/V *Sivaimoana***
	Licence No:	01902
	Size:	108 GRT, 22m LOA
	Radio Call sign:	1107782
	Registration Number:	1107782-US
	Colour (Hull/Superstructure):	Blue/White
	Authorised fishing area/s:	Cook Islands EEZ, outside 12nm Territorial seas
	Authorised fishing operation:	Longline
	Date issued:	13 November 2002
	Date expires:	12 February 2003

Appendix B

List of workshop participants

Name	Island
1. Tokoa Kea	Atiu
2. Tura Koronui	Atiu
3. Tai Toko	Aitutaki
4. Ngarouru Pokino	Mangaia
5. Ngatokorua Urarii	Mauke
6. Raina Piniata	Manihiki
7. Ngatokorua Tiputoa	Mitiaro
8. Matauri Ngatuakana	Mitiaro
9. George Marsters	Palmerston
10. Mataora Marsters	Penrhyn
11. John Solomona	Penrhyn
12. Roland Long	Penrhyn
13. Teauki Kiriuyi	Nassau
14. Pataku Manurere	Pukapuka
15. Lal Narayan	Rakahanga
16. Apii Temata	Rarotonga
17. Pupuke Robati (Jnr)	Rarotonga
18. Faimou Robati	Rarotonga
Boat crew	
19. Jannot Wilson (Skipper)	Tahiti
20. Borneo Moekaa	
21. Tutai Vaine	
22. Stewart Henry	
Fisheries Staff	
23. Sonny Tuatava	
24. Teariki Buckley	

Appendix C

Workshop timetable

Component 1: Fish Handling and Processing for Export

	Tuesday 20th August	*Wednesday 21st*	*Thursday 22nd*
0900 – 10.00	***Opening.***	Recap of Tuesday fish handling lecture	Tuna grading lecture
10.00 – 10.15	Morning tea	Morning tea	Morning tea
10.15 – 10.00	Introduction to fish processing and marketing	Processing fish in pack houses	Grading tuna for export (sashimi market)
12.00 – 13.00	Lunch	Lunch	Lunch
13.00 – 14.00	On board fish handling lecture	Market expectation and standards	Tuna grading continue
14.00 – 14.15	Afternoon tea	Afternoon tea	Afternoon tea
14.15 – 16.00	Fish handling (practical)	Fish processing (practical)	End of fish handling and processing component

Delivered by Mr Michel Blanc Fisheries Education and Training Adviser (Secretariat of the Pacific Community)

Component 2: Safety at sea and vessel safety

	Friday 23rd	*Monday 26th*	*Tuesday 27th*
0900– 10.00	***First aid*** (by Cook Islands Red Cross)	Fire fighting (by fire service department)	Safety at sea (SPC, MMR, and Capt. D Silk)
10.00 – 10.15	Morning tea	Morning tea	Morning tea
10.15 – 10.00	***First aid*** (by Cook Islands Red Cross)	Fire fighting (by fire service department)	Safety at sea (SPC, MMR, and Capt. D Silk)
12.00 – 13.00	Lunch	Lunch	Lunch
13.00 – 14.00	***First aid*** (by Cook Islands Red Cross)	Fire fighting (by fire service department)	Safety at sea (SPC, MMR, and Capt. D Silk)
14.00 – 14.15	Afternoon tea	Afternoon tea	Afternoon tea
14.15 – 16.00	***First aid*** (by Cook Islands Red Cross)	Fire fighting (by fire service department)	Safety at sea (SPC, MMR, and Capt. D Silk)

First Aid training conducted by Miss Nukutai Pokura. Fire fighting sessions conducted by Mr. Nga Jessie. Captain Don Silk delivered the session on safety at sea with the assistance of Mr William Sokimi Fisheries Development Officer from the Secretariat of the Pacific Community and Mr Sonny Tatuava, MMR Director of Fisheries Development and Extension Services.

<u>Component 3</u>: Fishing strategy, Gear Fabrication, Vessel Preparations

	Wednesday 28th	*Thursday 29th*	*Friday 30th*	*Monday 2nd September*
0900–10.00	Introduction, commercial longline	Recap session covered 28th	Gear maintenance	Vessel preparation
10.00 – 10.15	Morning tea	Morning tea	Morning tea	Morning tea
10.15 – 10.00	Fishing strategy and vessel electronics	Gear fabrication	Gear maintenance	Vessel preparation
12.00 – 13.00	Lunch	Lunch	Lunch	Lunch
13.00 – 14.00	Fishing gear and purpose	Gear fabrication	Gear maintenance	Vessel preparation
14.00 – 14.15	Afternoon tea	Afternoon tea	Afternoon tea	Afternoon tea
14.15 – 16.00	Familiarization of fishing vessel (practical)	Gear fabrication	Gear maintenance	Vessel preparation

Component 3 run by Mr William Sokimi Fisheries Development Officer from the Secretariat of the Pacific Community and Mr Sonny Tatuava Director of Fisheries Development and Extension Services.

<u>Component 4</u>: At sea practical sessions

Participants to the training were divided into two groups, each group underwent a 6 day at sea practical session on board F/V *Mahr Leena*. The group that remained on shore underwent FAD fishing theory and strategy training.

	Tuesday 3rd	*Wednesdays 4th*	*Thursday 5th*	*Friday 6th*	*Monday 9th*
0900 – 10.00	Final preparations prior to departure, loading vessel	Cook Islands FAD programme	FAD Maintenance	Vertical longlining	Vertical longlining
10.00 – 10.15	Morning tea	Morning tea	Morning tea	Morning tea	Morning tea
10.15 – 10.00	Final preparations prior to departure, loading vessel	Fishing methods associated with FADs	FAD maintenance	Vertical longlining	Vertical longlining
11.00 – 13.00	Lunch	Lunch	Lunch	Lunch	Lunch
13.00 – 14. 00	Vessel departs with group 1	FAD maintenance	FAD Maintenance	Vertical longlining	Vertical longlining
14.00 – 14.15		Afternoon tea	Afternoon tea	Afternoon tea	Afternoon tea
14.15 – 16.00		Vertical longline gear fabrication	FAD maintenance	Vertical longlining	Vertical longlining

At sea practical sessions on board the F/V *Mahr Leena* were run by Mr William Sokimi Fisheries Development Officer from the Secretariat of the Pacific Community and Mr Sonny Tatuava Director of Fisheries Development and Extension Services. Mr. Ian Bertram and Mr. Ngametua Tangatakino conducted the FAD theory and practical sessions.

Appendix D

Workshop training vessel details

Vessel name: F/V *Mahr Leena*
Call sign: ZKWF
Gross tonnage: 144
Net tonnage: 88
Cruising speed: 10 knots
Complement: 14

Navigational Aids:

2 x magnetic compass
SSB radio
Autopilot
Radar
Echo sounder/fish finder
Automatic direction finder
House hailer
2 x GPS
2 x VHF radio

Fishing Equipment

1 longline reel with 60nm x 4.0mm monofilament line
2500 branchlines (fully constructed with snaps, leaded barrel swivels and hooks)
6 radio beacons
1 line setter
6 marker buoys
100 floats x 360mm

Appendix E

Catch details by set for the two fishing trips

During the fishing trips, most of the fish on board were gilled and gutted. The exceptions were sharks, marlins, and sailfish, which were all headed and gutted, and albacore tuna which were retained whole.

Fishing trip No.1

Set 1:

Date: 04/09/2002
Location of set: 19˚59.8'S; 161˚02.2'W
Hooks: 1920
Duration of set: 0330 hours to 0845 hours
Duration of haul: 1330 hours to 0045 hours on 05th

Catch details

Species	Number	Processing	Estimated weight (kg)
Mahi mahi	26	H&G	260
Albacore	4	Whole	92
Wahoo	3	G&G	78
Bigeye tuna	3	G&G	75
Shortbill spearfish	2	G&G	26
Striped marlin	1	H&G	100
Sailfish	1	H&G	22
Oilfish	1	G&G	8
Blue shark	1	H&G	25
TOTAL	**42**		**686**

Set 2:

Date: 05/02/2002
Location of set: 20˚00.4'S; 158˚51.3'W
Hooks: 1800
Duration of set: 0030 hours to 0530 hours
Duration of haul: 1300 hrs to 0900 hours on 10/2002 – hauling was hampered by the failure of the steering system.

Catch details

Species	Number	Processing	Estimated weight (kg)
Mahi mahi	14	H&G	140
Albacore	4	Whole	92
Wahoo	3	G&G	78
Bigeye tuna	1	G&G	25
Swordfish	1	H&G	54
Blue marlin	1	H&G	90
Escolar	1	G&G	4
Blue shark	1	H&G	25
TOTAL	**26**		**508**

Fishing trip No. 2

Set 1:

Date: 14/09/200
Location of set: 20˚30.1'S; 159˚40.7'W
Hooks: 1750
Duration of set: 1300 hours to 1715 hours
Duration of haul: 0445 hours to 2035 hours on 15th.

Catch details

Species	Number	Processing	Estimated weight (kg)
Albacore	1	Whole	18
Mahi mahi	5	H&G	40
Striped marlin	2	H&G	180
Wahoo	1	G&G	20
Swordfish	1	H&G	50
Blue shark	1	H&G	25
Oilfish	1	G&G	15
TOTAL	**13**		**348**

Set 2:

Date: 16/09/2002
Location of set: 20˚25.0'S; 158˚53.0'W
Hooks: 1700
Duration of set: 0650 hours to 1220 hours
Duration of haul: 1745 hours to 0900 hours on17th. Hauling disrupted by line breakage and search time.

Catch details

Species	Number	Processing	Estimated weight (kg)
Bigeye tuna	1	G&G	18
Yellowfin tuna	2	G&G	16
Albacore	4	Whole	120
Mahi mahi	21	H&G	200
Wahoo	7	G&G	156
Striped marlin	1	H&G	103
Swordfish	1	H&G	60
Opah	2	H&G	40
Shortbill spearfish	1	G&G	15
Blue shark	1	H&G	25
TOTAL	**42**		**853**

Set 3:

Date: 17/09/2002
Location of set: 19˚ 59.10'S; 158˚ 45.40'W
Hooks: 1700
Duration of set: 0946 hours to 1515 hours
Duration of haul: 2124 hours to 1115 hours on the18th.

Catch details

Species	Number	Processing	Estimated weight (kg)
Big eye tuna	3	G&G	85
Yellowfin tuna	2	G&G	20
Albacore	6	Whole	160
Stripe Marlin	2	H&G	300
Dolphin fish	2	H&G	135
Wahoo	1	G&G	34
Blue Shark	1	H&G	25
Barracuda	1	G&G	15
Skipjack	1	G&G	6
TOTAL	**32**		**780**

Set 4:

Date: 18/09/2002
Location of set: 19˚48.30'S; 158˚ 29.70'W.
Hooks: 1700
Duration of set: 1420 hours to 1940 hours.
Duration of Haul: 0215 hours on the19th to 1425 hours on the19th.

Catch details

Species	Number	Processing	Estimated weight (kg)
Big eye tuna	1	G&G	15
Yellowfin tuna	3	G&G	15
Albacore	3	Whole	60
Swordfish	2	H&G	120
Dolphin fish	3	H&G	30
Wahoo	2	G&G	60
Spearfish	1	G&G	15
Blue Shark	1	H&G	80
TOTAL	**16**		**395**

Set 5:

Date: 20/09/2002
Location of set: 20˚ 10.70'S; 158˚ 47.10'W.
Hooks: 1675
Duration of set: 0040 hours to 0720 hours.
Duration of Haul: 0910 hours to 1040 hours on the 21st.

Catch details

Species	Number	Processing	Estimated weight (kg)
Big eye tuna	2	G&G	20
Albacore	7	Whole	150
Stripe Marlin	1	H&G	109
Blue marlin	2	H&G	160
Spearfish	3	G&G	30
Swordfish	1	H&G	50
Dolphin fish	9	H&G	80
Wahoo	1	G&G	25
TOTAL	**26**		**624**

Set 6:

Date: 21/09/2002
Location of set: 20˚ 18.00'S; 159˚ 14.70'W.
Hooks: 1629
Duration of set: 1200 hours to 1615 hours.
Duration of Haul: 2140 hours to 1000 hours on the 22nd.

Catch details

Species	Number	Processing	Estimated weight (kg)
Yellowfin tuna	1	G&G	8
Albacore	8	Whole	180
Stripe Marlin	3	H&G	280
Swordfish	2	H&G	100
Dolphin fish	2	H&G	30
Oilfish	3	G&G	25
Opah	1	G&G	20
TOTAL	**20**		**643**