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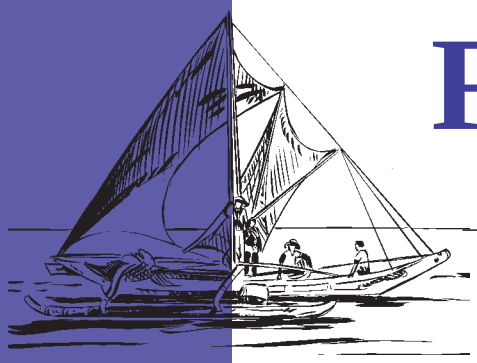

# FISHERIES

## *Newsletter*

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THE RAPIDLY EXPANDING AND CHANGING TUNA LONGLINE FISHERY IN SAMOA Page 18
*by Lindsay Chapman*

**Fishing for *kaloama* (yellow striped goatfish) in Niue is a family affair. Using their *kafika* rods made from native timber, family members patiently stand for hours catching this local delicacy.**

Secretariat of the Pacific Community
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# SPC REGIONAL COASTAL FISHERIES MEETING

The SPC governing body, the South Pacific Conference (renamed the Conference of the Pacific Community on 6 February 1998), consisting of SPC member Ministers and Foreign Affairs departments, has ruled that SPC sectoral technical meetings like the Regional Technical Meeting on Fisheries (RTMF) will only be funded from the SPC core budget every three years. Conference itself is now on a two-yearly cycle. The last RTMF was in August 1996 and thus the next meeting is budgeted for 1999.

However, there has been considerable expression of interest by SPC member fisheries departments in meeting to discuss coastal fisheries issues on a more frequent basis, to the extent that several departmental heads have suggested that national funds would be forthcoming to support national participation in such a meeting.

After canvassing support from a number of quarters late last year, and after much examination of the pros and cons, we have decided to convene such a meeting in the traditional RTMF August timeslot (from 3 to 7 August 1998), at SPC headquarters in Noumea.

This will probably not be called the 'SPC Regional Technical Meeting on Fisheries', since the authority to pass recommendations to CRGA (the SPC Committee of Representatives of Governments and Administrations) is vested in the official triennial fisheries meeting.

**Provisional Agenda**

1. ***Introduction***

2. ***Workshop procedures***
   - 2.1 Administrative issues
   - 2.2 Selection of chairman
   - 2.3 Agreement of agenda

3. ***Resource and Post-harvest issues (Resource Assessment & Post-harvest Sections)***
   - 3.1 Review of ICFMaP, with presentations on national sub-projects
   - 3.2 Review of SPC member post-harvest activities, problems and priorities
   - 3.3 Review of SPC member coastal resource activities, problems and priorities
   - 3.4 Assessment of future needs and opportunities for further assistance to the region
   - 3.5 Fishbase and fisheries biodiversity issues

4. ***Development issues – progress and problems***
   - 4.1 Small-scale longlining issues (Capture Section)
   - 4.2 Women's fisheries development issues (Women's Fisheries Development Section)
   - 4.3 Training issues (Training Section)

5. ***Marine Resources Information issues (Information Section)***

6. ***Oceanic Fisheries issues***
   - 6.1 Summary of Standing Committee on Tuna and Billfish (SCTB) and Multilateral High Level Consultation (MHLC) reports on status of stocks
   - 6.2 Update on MHLC progress and possibilities
   - 6.3 Discussion of future review of SPC Oceanic Fisheries Programme & long-term plan for contiued SPC support to member countries in oceanic fisheries stock assessment

7. ***Aquaculture issues***

8. ***Fisheries Research issues***

9. ***Other issues***

10. ***Recommendations on Priorities and Action Items for the region***

However, the discussions involving member countries and territories will naturally have considerable influence on the direction of the SPC Marine Resources Division work programme.

A convenient nucleus for this meeting is the summing-up of national coastal fisheries management issues to assist in reviewing the UK/SPC Integrated Coastal Fisheries Management Project (ICFMaP), and thus we will call this the '2nd Coastal Fisheries Management Workshop', in series with the meeting held three years ago just after the start of the ICFMaP project. This workshop recommended that a follow-up meeting be held, intercalary with the (then) biennial RTMF.

Please note that fisheries management is a broad umbrella, covering assessment, development, augmentation and post-harvest issues as well as regulation, and there will be plenty of scope in the agenda for discussing a whole range of fisheries issues that are not covered by our more frequent international tuna fishery meetings.

Most importantly, the meeting will provide a means of putting SPC fisheries staff into close contact with member country needs and capabilities. We can only visit a few member countries every year and this kind of contact is important if we are to maintain our relevance to the region and obtain our direction from member countries.

Although the meeting is being run 'on a shoestring', the SPC HQ venue in Noumea will allow simultaneous French/English interpretation of all presentations and discussion, and will thus be able to continue the tradition of being the only regional forum where dependent territories and independent countries can meet on an equal footing to discuss fisheries issues.

*Note: Because this will be an ad-hoc, as-yet-unfunded meeting, any written papers will not be circulated in advance but only at the workshop itself, and we do not have the capacity to make advance translation of any papers into another language. However, we would hope to publish any submitted technical papers that prove to be of broad interest, in both language issues of the SPC* Fisheries Newsletter.

# ■ CAPTURE SECTION

*The first three months of 1998 have been very busy for the Capture Section's two Masterfishermen following the Christmas and New Year break. Steve Beverly commenced the year with a three-day sashimi tuna handling workshop in Port Moresby, and a one-week fish aggregating device (FAD) fishing skills workshop, held in Fiji. Following the Fiji workshop, Steve headed to Nelson, New Zealand to meet up with Peter Watt. Both Masterfishermen then assisted in a two-week regional skippers' course. The month of March saw both Steve and Peter conducting follow-up visits with participants from the skippers' course, helping them implement what they had learnt in their respective countries, under their own conditions.*

## Regional skipper's course

A regional course on vessel operation management and electronic equipment aids was held for Pacific Island national skippers from 16–27 February 1998 at the New Zealand School of Fisheries in Nelson, with funding provided by UNDP.

Thirteen skippers from ten countries participated in the course. Training sessions for the course were designed to provide the skippers with methodologies for increasing the profitability of their fishing operations. Methods included determining the costs associated with running fishing operations and identifying areas where financial inefficiencies occur.

Methods were also presented for increasing efficiency through proper management of crew while at sea and onshore. The skippers were provided with the latest international marine legislation concerning safety at sea, protection of the marine environment, and salvage practices. Instruction was given to the participants in the use of a wide range of modern electronic equipment to increase efficiency, profitability and safety of their fishing operations. The electronic equipment included Inmarsat C, Global Positioning System (GPS) and plotter, radar, fish-finding echo-sounder, and weather track.

Also, informal sessions were held to facilitate a flow and exchange of ideas between participants and tutors about tricks of the trade which were found to be useful in their fishing operations.

Nelson, being the centre of the New Zealand fishing industry, provided an ideal venue for the course. The participants were exposed to the most recent advances in the development and management of New

Zealand's fisheries resources. They were able to visit one of Nelson's high-tech factory trawlers, electronics shops and ships' chandlers. Many guest speakers involved in New Zealand's fishing industry were brought in by the school to conduct sessions on a variety of topics including vessel operational economics, safe-ship management, fishing business structures and improving fish quality.

As a follow up to the course, SPC's Masterfishermen will visit and work with all the skippers in their own countries to assist them in the operation of their fishing vessels and to assess their abilities in managing the operation of their vessels.

During March, Steve Beverly worked with the two skippers from Tonga, one on board the new Tongan fisheries research and training vessel and one from a private company, while Peter Watt travelled to Kiribati and the Marshall Islands.

## Tonga receives new 39.5 m longline vessel from Japan

The Government of Japan has donated a 39.5 m longline vessel (Figure 1) to the Government of Tonga in a grant-aid scheme. The keel was laid for the vessel in August 1997 and work was completed by January 1998. The vessel was made by Niigata Engineering Company of Tokyo and is equipped with a Japanese basket-gear longline system and an American monofilament longline system.

The vessel, named M/V *Takuo* ('yellowfin tuna' in Tongan) arrived in Tonga on 21 February 1998. On March 3 there was a handing-over ceremony held at Queen Salote Wharf in Nuku'alofa, which was attended by the King and Queen, the Acting Prime Minister, delegates from Japan, and several hundred other invited dignitaries.

After the prayers and speeches and the official blessing, everyone was taken on a harbour tour. Even the Royal Band went along. Captain Siua Finau and Mate Tevita Ha'unga were dressed in their finest uniforms for the occasion (Figure 2).

Initial preparations for the maiden voyage and first fishing trip for M/V *Takuo* took about three weeks. M/V *Takuo* departed on 21 March to fish for albacore tuna in Tonga's EEZ. Although M/V *Takuo* is billed as a research and training vessel there were no trainees taken on the first voyage. There are room on the vessel for 20 crew and six trainees. Besides the Captain and Mate, there is a First and


**Figure 1: M/V *Takuo***

Second Engineer, two engine room greasers, and fourteen Able-Bodied seamen. One of the A-B seamen acts as cook.

SPC Masterfisherman Steve Beverly went on the maiden voyage for the first two weeks and SPC Port Sampler Martin Finau signed up for the duration to measure and record all of the catch. The Mate, Tevita Ha'unga, also received his follow-up training to the skippers' course.

During the first eleven sets, using both Japanese fishing gear and the monofilament fishing gear, M/V *Takuo* caught about 5.5 t of fish, of which about 3 t were the target species, albacore tuna (*Thunnus alalunga*).

All fish were frozen in the blast freezer and then stored in one of the freezer holds. The albacore tuna will eventually be offloaded at one of the canneries in Pago Pago, American Samoa.

M/V *Takuo* is equipped with every electronic device needed to find fish and to operate a safe vessel. The electronics include everything necessary to comply with the new GMDSS system (Global Maritime Distress and Safety System) that will come into effect next year. M/V *Takuo* even has a bathythermograph (BTG) for finding the thermocline. A printed graph is given out each time the BTG is used, which shows the exact depth where the temperature changes rapidly. This is where the bigeye and albacore are likely to be.

M/V *Takuo* also has an Inmarsat C system that is capable of sending faxes, telexes, and distress messages. The Inmarsat C can receive important weather and distress messages as well. There is also a colour plotter, a sea-surface temperature monitor, a colour echo sounder, a weather fax receiver, a Doppler current meter, and two radars. With all of these aids to fishing and navigation, Captain Finau should have no trouble locating any fish in the area. Captain Finau planned to be away for 54 days on the first trip.

The particulars of M/V *Takuo* are as follows:

- Length—39.39 m
- Breadth—7.5 m
- Depth—3.1 m
- Gross tonnage—337 t
- Net tonnage—102 t
- Speed—11 knots
- Fish holds—137 $m^3$
- Fuel oil—147 $m^3$
- Fresh water—24 $m^3$
- Lube oil—6.88 $m^3$
- Main engine—600 HP Yanmar
- Generators—2 X 200 HP Yanmars with 170 kVA

**Figure 2: Captain Siua Finau and Mate Tevita Ha'unga**

## Other project activities

The Fisheries Development Adviser, Lindsay Chapman, travelled to Samoa, American Samoa and Fiji during March 1998.

In Samoa, Lindsay observed the expanding domestic tuna-fishing operations (see article in this Newsletter) to better understand the success of this fishery. In American Samoa, Lindsay was asked to provide advice on infrastructure requirements for the expanding domestic tuna-longline operations there.

In Noumea, progress was made with reports. Two reports are now in the final stages of formatting for publication and three unpublished reports have been released for country comment and acceptance. A consultant has also been hired to write two manuals from the materials held by the section. These manuals are: FAD Volume III, site surveys, deployment and maintenance; and Vertical Longlines and other fishing methods that can be used in association with FADs. It is anticipated that both manuals will be published and distributed during the latter part of 1998.

# TRAINING SECTION

## Second regional course for managers of fisheries enterprises

In response to a recommendation from the 25th Regional Technical Meeting on Fisheries (1994) that the Fisheries Training Section should implement organisational and enterprise management training, funding was obtained to operate a regional training programme on the management of fisheries enterprises.

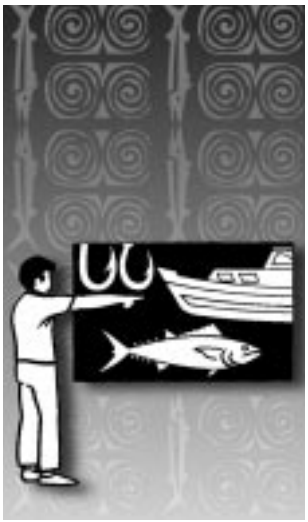
A workshop for trainers of small-boat operators was run at Santo, Vanuatu in March 1996 with 14 participants from 11 member countries and territories. This was followed by a series of in-country training programmes implemented by the workshop participants.

In March 1997, a two-week regional course for managers of medium-to-large size fisheries enterprises was run in Nelson, the biggest fishing port in New Zealand. This course, the first of this kind to be organised by the SPC Fisheries Training Section, was very successful in exposing participants to modern fishing industries and management practices.

As part of the evaluation process, more than thirty persons from the participants' own companies or similar fishing enterprises were identified as potential trainees for future courses.

The SPC Fisheries Training Section wishes to continue with the implementation of training programmes targeting commercial fisheries enterprises in the Pacific with the aim of assisting an emerging regional fishing industry and as a means of creating job opportunities.

With funding from the governments of Australia and France, the Section is organising the second regional course for managers of medium-to-large fishing enterprises. The course will be held at the New Zealand School of Fisheries in Nelson. It will be two weeks in duration, in August 1998.



This course will address those skills which will give the most immediate benefit to participants. Skills will include principles of enterprise management, the commercial ethic, accounting practices, personnel management, sales and marketing, the principles of quality management, and the language and machines used in business.

As the participants will be from different backgrounds, the course will be operated in a participatory manner. Formal lectures will be kept to a minimum. Most of the sessions will be conducted by guest speakers. Learning will be achieved through the sharing of experiences and small-group discussions. If required, the course content will be altered at short notice to take into account participants' specific training needs. The six main course topics and associated sessions delivered under each topic are given below:

*Business accounting and computers*: several sessions covering accounting and financial statements (profit and loss, balance

sheet, and cash-flow statements), overheads, and the use of computers (spreadsheets);

*Business planning*: several sessions on business planning using a computer software as a planning tool;

*Quality for profit and marketing*: sessions covering seafood handling and quality control, HACCP principles, production systems, value adding, marketing and trading practices, site visits;

*Management practices*: problems specific to Pacific Island countries, staff management and leadership, staff development and training;

The persons selected to attend this course will be those responsible for the management of some aspects of a commercial fisheries enterprise. A suitable participant may be a general manager of a company involved in fisheries activities (including commercial aquaculture), assistant to the manager or responsible for one branch of the company, e.g. in the area of quality control, personnel, marketing; or a factory or fleet manager. If you meet the selection criteria and are interested in this course, feel free to contact the Fisheries Training Section to receive the course application forms. The deadline for nominations is 1 June 1998.

## Nelson Course

On a recent trip to Nelson to attend the Fishing Skippers' workshop, Terii Luciani, SPC Fisheries Training Officer, asked the participants of the 19th SPC-Nelson Polytechnic Pacific Island Fisheries Officers' Course if they would send him an account of their impressions of the first period in Nelson. Following is their collective reply:

*Dear Pacific Islands readers*

*Kia ora, and greetings from New Zealand. We hope you will enjoy reading this article which has been written by ten participants from Samoa, Vanuatu, Tonga, Marshall Islands, Nauru, Kiribati, the Federated States of Micronesia and New Caledonia.*

*Each of us prepared our own comments on what life is like in Nelson during our initial four weeks and eventually these were amalgamated into this letter. So, in fact, the article is a combined effort by all of the participants.*

***The course and contents***

*The first four weeks in New Zealand have been very exciting and challenging. The course has introduced us to more knowledge than we have previously encountered. For example, we have now learnt of ways to identify and solve problems, especially problems that involve situations within villages. We are finding this course to be very useful and the knowledge we are learning from it is awesome.*

*On the first morning we were welcomed by some of the Polytechnic staff and had lunch at Valentine's Restaurant. During the first two days, as well as completing the administration, we tripped around the city and went to the Maitai River and to the Whenuaiti Outdoor Pursuits Centre. This was a very good experience for us, as some of the activities and outdoor games we practised there will be very appropriate for us when dealing with village communities. The most realistic thing about what we did at the centre was the games we played in groups. These allow you to get to know each other and, more important, to rely on all of the members of the group.*

*On our first week it was quite hard to settle down, as some of the participants did not arrive until the following week. We did finally manage to get settled down. We started with exercises to 'break the ice'; this was a way to get to know each other and our tutors at the same time. Classes got underway, picking up slowly, like tying knots, tapping on computers, report writing, welding, engineering and stripping down a two-stroke motor in our outboard motor class.*

*In the same week we met one of our tutors, Claire Guy, who taught us some communication skills which will also help with our work in villages. She was a very nice person and lots of fun. One day she took us to the Polytechnic social room and taught us a Scottish dance. On the same day each student made individual presentations on subjects of our interest and these were recorded on video. Our course co-ordinator and principal tutor is Alastair Robertson.*

*If we need anything, we talk first to him and he helps us. We have learning reviews every Friday afternoon, which is really good, as this is a good chance for students to*

*express what they have learnt and what they would like to learn in weeks to come.*

*Our lessons have been mostly practical which makes them clearer and easier to understand, although the theory is always taught to back it up. Throughout the four weeks, most of us have picked up a few skills. We still have about 14 weeks to go until we come to the practical fishing module. We are looking forward to this so that we can try out our skills and techniques in fishing and chartwork. We are looking forward to succeeding in the course and, one day, to pass on this knowledge and practice to our own people at home.*

***Accommodation, transportation, and the weather***

*The Kiwis say the weather in Nelson is warm and as we arrived by plane, the air hostess', words were, 'Welcome to sunny Nelson'. Well, to all of us, sun or no sun, this place is freezing cold and it is not yet winter time.*

*On our arrival a staff member from the School of Fisheries met us at the airport. It was a relief to meet him and find that our transportation was well arranged from the airport to the Nelson Polytechnic student accommodation at 'Franklin Hall'. Transport is also provided from Franklin Hall to Nelson Polytechnic each morning and afternoon by shuttle bus. We would appreciate if this service could also be made available during lunch hour. Franklin Hall has an outstanding atmosphere. We each have a single room with a desk and all bedding made available; each floor also has a private lounge with video, TV, microwave and electric jug. We can also use a student's kitchen if we wish. We are enjoying ourselves here. Our rooms are warm enough to keep us warm, which we appreciate as we are finding the New Zealand weather to be cold. We all really appreciate the arrangements made for us to live in this situation.*

*Meals are served at the Hall twice a day at breakfast and dinner. We purchase our own lunches in town or at the Polytechnic canteen but some of us would like it if lunch could also be served at Franklin Hall. We have not yet become used to the Kiwi type of food, as we are used to Island food such as taro, kumala, bananas etc. We are hoping the cooks might provide some island food in future, especially as there are quite a number of Pacific Island students attending courses in Nelson and they also find it quite hard to get used to Kiwi food.*

***Recreations and outings***

*Early on we went for a drive up the Maitai River which flows from the nearby hills through Nelson. The*

**Participants at the SPC-Nelson Polytechnic Pacific Island Fisheries Officers' Course, from back to front and left to right: Ansor Enos (FSM), Brian Fossett (tutor), Wilson Yuri (Vanuatu), Haani Lave (Tonga), Mikaele Lafaele (Samoa), Samuel Kare (New Caledonia), Ms Veisinia Topui (Tonga), Ms A'a Mauletaua (Samoa), Kautu Kamatie (Kiribati), Alastair Robertson (tutor), Daniel Daniel (FSM), John Temaki (Nauru).**

*river is a nice place and we enjoyed the riverbank. Although we did not swim in the river our visit was worthwhile as the river banks have some nice parks for picnics and we hope to spend some weekends there in the future.*

*Another Sunday we went rapid-river rafting down the mighty Buller River. This was a very exciting and enjoyable event. We went together with the participants of the SPC-Nelson Polytechnic Skippers' Course, which was running at the same time as ours. We have seen these rafting activities on TV and we were very happy to do it ourselves and we won't forget about it in a hurry. We hope we will be able to do another rafting trip before we go home in June.*

*Last Sunday, our group of fisheries people (8 men and 2 women) went to a barbecue at Alastair's small farm called Glanderston. There was plenty of food, including two big fish. We thank Alastair for everything, except the swimming part.*

*For some reason most of the Kiwis did not go in and we were in the water before finding the river was very very cold, perhaps the two women and one man from our course who had a swim will end up with pneumonia.*

*We are planning to go mountain biking in a week's time, quite a challenge as four of us cannot ride a bicycle.*

*We are looking forward to some more exciting events and to have a great time here in Nelson. But not to worry, we will not forget our purpose and why we are here. Well we are signing off now, its Smoko time.*

*See you back in the islands!*

# WOMEN'S FISHERIES DEVELOPMENT SECTION

During the first few months of 1998 the Section has been finalising national assessment reports for the Marshall Islands and Nauru, carrying out research for Niue, and preparing for a workshop in Nauru. In addition, to meet the increasing demand for assistance from member countries, the Section has begun advertising for the recruitment of a Women's Fisheries Development Officer.

The last SPC *Fisheries Newsletter* featured excerpts from the report entitled, *An assessment of the role of women in fisheries in the Republic of Nauru*. Excerpts from both the Nauru and the Marshall Islands reports can be found in the second edition of the SPC *Women in Fisheries Information Bulletin*, March 1998.

A study was carried out in Niue from 26 February to 12 March 1998 by the Women's Fisheries Development Officer, to collect information for and about women in the fisheries sector. With the assistance of Ms Charlene Funaki and Mr Brendon Pasisi of the Dept of Agriculture, Forestry, Fisheries and MFN, the study involved interviews with women involved in

**Charlene Funaki demonstrates how women rid the *hihi vao* (small yellow snail) of its internal animal. The snail, stored in bottles of seawater for up to 3 weeks, is cleaned each week by shaking in fresh seawater. Once rid of the animal, the shells are used to make necklaces which cost from NZ$ 4–8 on the local market.**

fisheries activities, government agencies (dealing with fisheries, women's development, education, health, the media, island development, and commerce) and non-government agencies (including representatives from women's village working groups, church groups, business, the banking sector, and fishing clubs).

In addition to interviews, visits were made to fishing, processing, and marketing sites to observe the women engaged in activity. A forum with the Niue Council of Women was held to discuss the SPC Women's Fisheries Development Project, and the Niue survey.

The national assessment report on Niue is in draft form with the date for publication set in the second half of 1998. Requests for assistance from Niue include training on smoking, salting and drying of fish; novel seafood recipes; and new designs in shell handicraft.

In addition, the women requested seafood recipes, assistance to purchase equipment, and information on export markets for their products.

In response to these requests, a workshop is being planned for October this year (and pending available funding a second workshop in 1999). Seafood recipes have been mailed out to representatives of village working groups. Discussions have been held concerning assistance to fund equipment, and the Forum Secretariat has been contacted for information on market research.

The Nauru Women's Workshop on Alternative Techniques in Harvesting and Processing Seafood is being held from 20–24 April 1998. This workshop is a follow-up to the national assessment survey carried out in November 1997. Details of the workshop will feature in the next edition of the SPC *Fisheries Newsletter*.

The recruitment notice advertising the post of Women's Fisheries Development Officer has been sent to all member countries. The closing date for applications was 30 April 1998, and it is envisaged that the successful candidate would be in office by July 1998.

**At the Alofi South women's working group, one woman makes a necklace of *hihi vao* shells.**

## THREE SUBSTANCES ACTIVE AGAINST DENGUE FEVER DISCOVERED IN PACIFIC MARINE INVERTEBRATES

As part of the Marine Substances of Therapeutic Value Programme, co-ordinated by the French Scientific Research Institute for Development in Co-operation (ORSTOM) and carried out in collaboration with the New Caledonia Pasteur Institute, researchers have isolated certain substances from Pacific marine invertebrates which, in vitro, appeared to be active against the dengue fever virus. These are the first substances active against this virus to be identified.

Dengue fever, a viral illness found in about 100 tropical countries—up to 50 million cases are recorded each year in the world according to WHO (World Health Organisation)—is caused by four viruses (dengue fever serotypes 1, 2, 3 and 4) from the Flavivirus family and transmitted to man by the *Aedes aegyptii* mosquito.

There are two forms of dengue fever: the first causes symptoms which vary in gravity (fever, muscular pain, headaches, digestive problems), whereas the second form, which is very serious and even fatal in 2 to 15% of cases, brings about haemorrhaging and, occasionally, encephalitis.

As there are currently no specific preventive or curative treatments for this illness, researchers from ORSTOM and the New Caledonia Pasteur Institute tried to determine if metabolites (organic substances) isolated from marine invertebrates living in the waters of New Caledonia, contained any substances which were active against the dengue (serotype 1) fever virus. In vitro analyses carried out on these substances had, in fact, already shown the antiviral activity of these substances, against both the herpes and HIV viruses.

Researchers extracted these metabolites from sponges (*Callippelta* sp.) of the Lithistida group, starfish (*Celerina heffernani* and *Fromia monilis*) and a crinoid (*Gymnocrinus richeri*) which turned out to be a living fossil (an organism which, since its appearance on earth, has continued to exist without any major changes).

The latter, which was thought to have been extinct since the Jurassic age, was 'rediscovered' during the MUSORSTOM oceanographic cruise, a joint research programme between ORSTOM and the French National Natural History Museum, designed to describe the deep-sea fauna of the Indo-Pacific region.

Of the seven substances tested, only three—those extracted from *Gymnocrinus richeri*—proved to be able to inhibit reproduction of the dengue fever virus at very low concentrations. This antiviral activity is even more interesting as, in vitro, these substances did not appear to be cytotoxic. While many difficult stages still have to be undertaken before these substances can be used medicinally, the discovery of these antiviral properties opens up some interesting possibilities.

These metabolites do, in fact, offer the first-known chemical model of substances active against the dengue fever virus and should allow research methods for new chemical therapy agents to be refined.

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**Bibliography**

LAILLE, M., F. GERALD & C. DEBITUS. (in press). In vitro antiviral activity on dengue virus of marine natural products, Cell and Molecular Life Science, 1998.

(Source: ORSTOM, Fiche d'actualité scientifique, no. 60)

## THE JAPANESE TUNA MARKET

*Tuna consumption in Japan appears to have reached its upper limit. With high domestic production, increasing imports were still needed to fulfil demand. However in recent years a declining trend is noted in production, import and consumption.*

Tuna generally includes skipjack in international trade, but is deemed to be different for the Japanese. So, in this article, sometimes skipjack will be treated separately from other tunas.

Domestic production of tuna remained at a high level of more

than 300 000 t/year for over 20 years. In 1996, total tuna catch dropped to 280 000 t, the lowest level during this period. The decline is due to a number of reasons such as a decrease in abundance of some tuna stocks, a reduction in the number of longline fishing vessels and a drop in the catch of yellowfin tuna by purse seiners. According to many scientists, the decline in catch by purse seiners is not attributed to reduced stock size but to a change in water condition.

Skipjack catch on the other hand has fluctuated between 300 000 and 400 000 t while in some years it exceeded 400 000 t. In 1996, the catch dropped to 273 000 t, the lowest in more than 20 years, probably due to the current sea conditions.

Japanese purse seiners operate mainly in the western Pacific, while a couple of vessels operate in the Indian Ocean. Catch by purse seiners in the Indian Ocean decreased sharply in recent years, from 42 000 t in 1993 to 11 000 t in 1996. All tunas caught by Japanese purse seiners in the Indian Ocean are landed at a Thai port and exported.

## Fresh and frozen tuna

Between 1985 and 1993, total tuna imports into Japan increased yearly as the yen strengthened, to reach a plateau at 320 000–330 000 t. Of the tuna imports fresh tuna continued to expand until 1995 but decreased slightly in 1996. Tuna imports expanded to the 330 000 t level in 1993 due to a sharp increase in yellowfin imports caught in large volumes in the western Indian Ocean by Taiwanese longliners.

However the big catch level did not continue and yellowfin imports have declined since then. On the other hand, bigeye imports have increased to offset the decline. While skipjack imports were stable until 1989 at a level of 2 000 to 4 000 t, they increased to 26 000 t in 1990 and 54 000 t in 1993.

Since then, the imports have stabilised at a current level of 50 000 t. As skipjack caught with pole and line began to be used for *sashimi* instead of raw material for *katsuobushi* (dried and cured fish product) or canned product, imports for the production of *katsuobushi* increased.

The biggest supplier of tuna to the Japanese market continues to be Taiwan. Imports from Taiwan in 1996 were 95 640 t, which accounted for 30% of total tuna imports. Indonesia is ranked second, with 47 876 t, just half the volume from Taiwan. Indonesia is followed by Korea, the Solomon Islands, Singapore and Honduras. About half of the total tuna imports from Indonesia consist of skipjack. Until 1994, tuna imports from the Solomon Islands were 4 000 t or less and never reached the top-ten-suppliers rank, but since then, Solomon Islands' exports to Japan have sharply increased.

Japanese tuna exports are much lower than the imports. The exports of skipjack have shown a downward trend (from 57 000 t in 1993 to 19 000 t in 1996). Major countries of destination are Thailand, Singapore and Indonesia. In 1996, the Thai market was by far the biggest importer with 17 000 t.

Skipjack exported to Thailand is used for canning. The second main species exported is yellowfin tuna. As in the case of skipjack, yellowfin also showed a downward trend declining steadily from 47 000 t in 1992 to 32 000 t in 1996. The main markets was Thailand, followed by Guam and Puerto Rico. Japan

**Table 1: Tuna production by type of fishing (t) — Japan**

| | Longline | Pole and line | Purse seine | Others | Total |
|---|---|---|---|---|---|
| **1990** | 210 079 | 19 405 | 47 167 | 16 622 | 293 273 |
| **1991** | 212 887 | 17 764 | 62 724 | 11 969 | 305 344 |
| **1992** | 230 507 | 22 018 | 82 609 | 10 689 | 345 823 |
| **1993** | 246 039 | 20 327 | 82 137 | 6 283 | 354 786 |
| **1994** | 231 473 | 35 248 | 63 304 | 10 397 | 340 422 |
| **1995** | 226 242 | 32 864 | 59 049 | 13 510 | 331 665 |
| **1996** | | | | | 280 000 |

Excluding skipjack
1996: Preliminary

**Table 2: Production of skipjack by type of fishing (t) — Japan**

| | Pole and line | Purse seine | Others | Total |
|---|---|---|---|---|
| 1990 | 137 872 | 144 885 | 18 474 | 301 231 |
| 1991 | 199 190 | 178 011 | 20 128 | 397 329 |
| 1992 | 140 707 | 166 934 | 15 329 | 322 970 |
| 1993 | 172 147 | 161 731 | 11 403 | 345 281 |
| 1994 | 121 999 | 170 786 | 7 210 | 299 995 |
| 1995 | 137 971 | 156 676 | 14 296 | 308 943 |
| 1996 | | | | 273 000 |

1996: Preliminary

exported 13 000 t of yellowfin tuna in 1996 to Thailand for its canning industry. The principal reason attributed for declining exports of tuna is the appreciation of the value of the yen.

## Tuna products

In Japan, tuna is used for *sashimi* (raw fish), canned tuna and *katsuobushi*. *Katsuobushi* is made from fillets of skipjack which are boiled, dried, smoked and moulded. Limited quantities of tuna are also processed into other products, but they are much less important.

Bluefin, southern bluefin, bigeye and yellowfin tuna, caught using longlines, are used for *sashimi*. Of these, bluefin and southern bluefin are the most valuable fish, followed by bigeye tuna. The belly flesh, which contains a lot of fat, is highly appreciated. Marlin caught with longlines are also used for *sashimi*.

Skipjack harvested with pole and line were used for a long time as raw material for *katsuobushi* and canned tuna as well as for *sashimi*, but recently skipjack are used mainly for *sashimi*. Albacore, which were used only as raw material for canned tuna, are increasingly used for *sashimi* today. Yellowfin caught by purse seines are mainly used for canned products both in domestic and foreign canneries. The majority of skipjack caught by purse seines are used for processing *katsuobushi*. A small portion is used as raw material for canned tuna both in domestic and foreign canneries. Limited quantities of yellowfin and skipjack are eaten raw.

## Demand for *sashimi* tuna

With the appreciation of the yen in 1995, imports of tuna increased and the total supply of tuna in the Japanese market expanded. As a result, the price of tuna declined and consumption grew. However consumption almost levelled off after 1990, and decreased in 1996.

This was partly due to reduced supply and partly due to a disease breakout caused by pathogenic *E. coli*. In addition, the tuna market had trouble with carbon monoxide. If tuna is packed in an air-tight container filled with carbon monoxide, its bright red colour does not fade even after a long time and it looks fresh. In fact the flesh deteriorates and occasionally this may cause food poisoning. To prevent this, the Ministry of Health and Welfare strengthened its inspection system. As a result of these developments, an unfavourable image of *sashimi* tuna was created among consumers and this also led to a decline in consumption.

*Sashimi* consumption has two main components: consumption in the food service industry, and consumption at home.

According to statistics compiled by the Prime Minister's Office, the annual per capita household consumption of *sashimi* tuna increased until 1995 and decreased subsequently, for reasons mentioned earlier.

Total household consumption increased annually, from 118 000 t in 1992 to 133 000 t in 1995 and declined to 123 000 t in 1996. The estimated consumption in the food service industry was 373 000 t in 1992 and 409 000 t in 1993, but later dropped to 346 000 t in 1996.

Data on skipjack, based on a Statistical Year Book compiled by the Ministry of Agriculture, Forestry and Fisheries, and estimates by the Japan *katsuobushi* Association show that the demand for skipjack *sashimi* increased until 1991 but since then has fluctuated widely. The

**Table 3: Imports of fresh and frozen tunas — Japan**

| | 1990 Quantity | 1991 Quantity | 1992 Quantity | 1993 Quantity | 1994 Quantity | 1995 Quantity | 1996 Quantity |
|---|---|---|---|---|---|---|---|
| **Skipjack** | 25 633 | 29 662 | 29 271 | 54 187 | 52 383 | 58 261 | 51 122 |
| **Albacore** | 1 808 | 4 375 | 9 397 | 2 438 | 2 324 | 2 305 | 2 941 |
| **Yellowfin** | 134 360 | 114 964 | 133 687 | 175 935 | 143 784 | 132 352 | 135 659 |
| **Bigeye** | 88 715 | 109 926 | 98 571 | 92 373 | 115 227 | 126 665 | 123 838 |
| **Bluefin** | 6 956 | 6 488 | 4 932 | 5 091 | 6 437 | 8 632 | 6 589 |
| **Southern bluefin** | | | | 2 742 | 3 998 | 5 173 | 5 804 |
| **Other tuna** | 49 | 13 | 2 506 | 24 | 16 | 7 | 35 |
| **Total tuna** | 257 521 | 265 428 | 278 364 | 332 790 | 324 169 | 333 395 | 325 988 |

Southern bluefin tuna were included in "Bluefin tuna" in 1990 and 1991 and in "Other tunas" in 1992

1991 level could be considered as the upper limit of consumption. Skipjack caught with pole and line is most often used for *sashimi* and fetches the highest price. Limited quantities of skipjack caught by purse seines are also used for *sashimi*.

## Demand for *katsuobushi*

*Katsuobushi* is sliced and packed in small plastic bags to be sold in retail stores or used as raw material for broth or seasoning. The rate of consumption is level or increasing only slightly. While the consumption of sliced and packed product is stable, the raw material use is slightly increasing. Skipjack caught with pole and line is sometimes used as raw material for *katsuobushi* but is almost exclusively consumed raw today. Accordingly, imports of skipjack have increased. In recent years, around 50 000 t of skipjack have been imported and almost entirely used for the production of *katsuobushi*. Skipjack used for *katsuobushi* should be of low fat content. It is said that skipjack imported from Indonesia is of the highest quality for *katsuobushi*. Recently, however, users have had problems with the quality of fish which varied widely.

## Conclusion

The Domestic production of tuna, excluding skipjack, has been stable for a long period of time. On the other hand, imports of tuna have increased since 1985 due to the appreciation of the yen. Accordingly, the demand for *sashimi* tuna has expanded. However, in the past few years, imports have fluctuated and subsequently levelled off with demand. Considering this trend together with the stock condition of each tuna species, it is expected that the current balance between supply and demand will be maintained. Initially the demand for skipjack *sashimi* increased, but later began to fluctuate. As the skipjack use shifted from *katsuobushi* and canned tuna to sashimi, raw material for *katsuobushi* was in short supply and consequently skipjack imports expanded sharply.

However, today, the demand for *katsuobushi* is approaching its upper limit and it is said that products of inferior quality are detected in imports from time to time. Therefore, further expansion of imports is not envisaged.

(Source: *INFOFISH International*, 1/98, 19–23)

**Table 4: Demand for sahimi tuna (in 1000 t)**

| | Domestic production | | | Imports | | | |
|---|---|---|---|---|---|---|---|
| | Frozen | Fresh | Total | Frozen | Fresh | Total | Grand total |
| **1992** | 196 | 69 | 265 | 170 | 57 | 227 | 492 |
| **1993** | 208 | 67 | 275 | 190 | 63 | 253 | 528 |
| **1994** | 214 | 65 | 279 | 166 | 72 | 238 | 517 |
| **1995** | 206 | 64 | 270 | 176 | 73 | 249 | 519 |
| **1996** | 170 | 56 | 226 | 172 | 71 | 243 | 469 |

**Table 5: Supply and consumption of skipjack (in 1000 t)**

| | | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|
| **Supply** | Domestic production | 397 | 323 | 345 | 300 | 309 |
| | Import | 30 | 29 | 54 | 52 | 58 |
| | Carry over | 36 | 40 | 35 | 35 | 35 |
| | Total supply | 463 | 392 | 434 | 387 | 402 |
| **Consumption** | Canned products | 37 | 35 | 31 | 29 | 29 |
| | *Katsuobuschi* | 174 | 165 | 173 | 187 | 187 |
| | *Sashimi* | 124 | 103 | 138 | 110 | 106 |
| | Export | 88 | 54 | 57 | 26 | 45 |
| | Carry over | 40 | 35 | 35 | 35 | 35 |
| | Total consumption | 463 | 392 | 434 | 387 | 402 |

## CULTURED SPONGES MAKE A SPLASH WITH A LONDON COMPANY

Ten years of Center for Tropical and Subtropical Aquaculture funding ceased in April 1998, with the end of the project entitled 'Differential Growth Rate Studies in Cultured Commercial Sponges'. But, as a result of connections made through the project, sponge farmers in Micronesia have a guaranteed market for their product through the turn of the century.

Dick Croft, who developed the sponge-culture techniques employed in the projects by local farmers, also owns Pohnpei Natural Products, a sponge culture and marketing company. He was the principal investigator on both the five-year 'Sponge Aquaculture Demonstration Project' and the five-year 'Differential Growth Rate Studies in Cultured Commercial Sponges'. Under the first project, he trained five Pohnpei nationals in sponge-aquaculture techniques and assisted them with starting their own sponge farms.

Under the second project, Croft collaborated with Dr Michelle Kelly-Borges, a sponge systematist and ecologist with the Natural History Museum in London, UK, to increase the efficiency of sponge farming. Kelly-Borges designed several of the experiments that are being concluded now.

She proved a strong supporter of the project. She initiated talks with a London-based company, convincing the company that sponge farming was the wave of the future. Sea sponges traditionally were harvested in the Mediterranean Sea and in waters off Florida and the Caribbean Islands.

However over-harvesting led to closure of many harvest grounds, and disease devastated others. She strongly advocates sponge farming as an 'environmentally friendly, ecologically sound alternative to harvesting wild sponges'. She then put the company in touch with Dick Croft.

As a result the company entered an exclusive contract with Croft to buy up to 70 000 cultured sponges per year through Pohnpei Natural Products.

'The company wanted an exclusive agreement because they didn't want to do all the marketing and then have some other company step in and take advantage of that,' Croft said.

'We are not producing that many sponges right now. But all of our activities here are focused on expanding the sponge farms and starting new ones as fast as we can to reach the production level,' he added.

Those activities are going full tilt. The four remaining original farmers have been expanding their farms, and a new farm has started in Kitti, a municipality of Pohnpei. Early this year, Croft conducted a two-week, hands-on sponge-culture workshop in Chuuk, FSM, sponsored by the United Nations Food and Agriculture Organisation.

The outlook is good, Croft feels. Chuuk has good stocks of wild sponges that can be used to start farms, he said, so sponge culture is 'definitely' extending past Pohnpei. With the popularity of natural products and increased awareness of environmental concerns, cultured sponges are sure to make a big splash on the international scene.

(Source: *CTSA Regional Notes*, Vol #9, No. 2)

## DEMAND FOR PACIFIC SHARK INCREASES

A rapid rise in the amount of sharks landed in Hawaii— from 91 tonnes estimated whole-weight in 1991 to 2 041 tonnes in 1996—has gained the attention of the Western Pacific Regional Fishery Management Council.

The sharks were caught as 'incidental' or non-targeted species, by longliners fishing for tuna and swordfish. Ninety-nine per cent of the landed sharks were retained for their fins only. Only one per cent of the sharks were landed for their flesh.

Some members of the general public, government and fishing industry consider the fishing of shark to be a cruel or wasteful practice.

'Lots of people can use that, so to speak, low-end type of fish,' says Nelson Aberilla, fresh-seafood auction buyer for Garden and Valley Isle Seafood. He said that demand for shark meat by markets on the U.S. Mainland—where the company ships about 85 per cent of its sharks—has been increasing.

Garret Kitazaki of Diamond Head Seafood Company says he would like to see management measures that would make more shark meat available. During the

six months longliners are landing fish in Honolulu, the company purchases about 136 kg of shark a month. The shark is retailed for about US$ 8.8/kg and served at Waikiki hotels.

But, according to Sean Martin, co-principal of the gear-and-bait supply company Pacific Ocean Producers and of Vessel Management Associates, which owns five longline vessels, only the flesh of mako and thresher sharks has a market value. The flesh of other sharks that are caught—for example blue shark and white tips—does not.

However, the fins of these sharks are worth up to US$ 66/kg at Honolulu docks (the average price increased from US$ 33/kg in 1991 to US$ 57/kg in 1996). And tradition around the world is to allow crew members to take fins to earn extra money.

The value of shark fins landed annually by Hawaii-based longliners is approximately one million dollars. Several million dollars more of shark fins landed annually in Hawaii are caught outside the U.S. Exclusive Economic Zone around Hawaii by foreign longliners. The vessels sell their shark-fin catches to U.S.-registered vessels with receiving permits that allow them to transport the fins through the EEZ to be landed in Honolulu.

Although there is no evidence that sharks are being harvested beyond sustainable limits in the Council's area of jurisdiction, the Council is closely monitoring the situation.

Records from American Samoa show shark-fin landings in the territory have declined since the mid 1970s and 1980s as the fleet sizes of the foreign longliners home-ported in Pago Pago have progressively reduced and fishing methods have changed.

However, total landings for 1996 by both domestic and foreign vessels (longline and purse seine) is estimated to be as high as 39 916 kg with a total value of US$ 1 million. Prices for fins range from US$ 6.6/kg to US$ 70.5/kg.

As a major port for tuna transhipment in the Pacific, Guam is believed to land substantial quantities of shark fins.

However, in the neighbouring Northern Mariana Islands, there is thought to be minimal shark-finning activity as little transhipment of tuna is taking place since the departure of the tuna fleet from Tinian.

The Council addresses oceanic sharks in its Pelagic Fishery Management Plan (FMP), which defines overfishing for pelagic sharks as a decrease in the spawning potential ratio below 35 per cent. The Pelagic FMP also requires the keeping of logbooks of all species caught—including the number of sharks finned or discarded.

The Council has requested that National Marine Fisheries Service and the Pelagic Fisheries Research Program provide it with biological and other fishery information on Pacific blue sharks so the species' susceptibility to overfishing due to longline catches can be assessed.

The Council contracted a consultant to document all Pacific data holdings on blue and other sharks; the project was completed last year. The Council is working to estimate the volume and the value of the fins being landed and transhipped through Guam. It is also working on an economic feasibility study that will review options for incidental shark catch utilisation in hopes of reducing the level of wastage. It is also considering supporting a state or territorial fee or tax on shark fins landed in the U.S. Pacific Islands.

(Source: *Pacific Islands Fishery News*)

## AMERICAN SAMOA'S LONGLINE FISHERY CONCERNS FISHERMEN

According to the recent FAO Expert Consultation on Interactions of Pacific Tuna Fisheries, the number of cases of fisheries interactions in the central and western Pacific is growing rapidly with the development and the expansion of the pelagic fisheries. In most Pacific Islands, small-scale artisanal, subsistence and recreational fishing is important for the economic, social and nutritional well-being of a large percentage of the population.

Therefore, questions regarding the possible effects of industrial fisheries, both foreign and domestic, on small-boat fisheries are frequently raised.

There are still, however, few scientific analyses to evaluate the practical effects of regulations intended to resolve local pelagic fisheries interaction issues.

Nevertheless, various management measures have been implemented in the United States and elsewhere to reduce interactions between pelagic fisheries. For example, retention of billfish by U.S. longline vessels fishing off the Atlantic coast

is prohibited to protect recreational fisheries. Other management measures have closed part of the U.S. EEZ to large-scale pelagic fishing. A portion of the U.S. EEZ around Hawaii has been closed to large-scale longline vessels, and longline vessels registered in California are prohibited from fishing in the U.S. EEZ off the West Coast.

Recently, artisanal and recreational fishermen in American Samoa have been increasingly concerned about the possible negative impacts of industrial pelagic fishing in the U.S. EEZ around the territory. This concern has become more acute due to the rapid expansion of the artisanal longline fishery since 1994.

Longline catches have risen from zero prior to 1994 to more than 136 tonnes in 1996. The Western Pacific Regional Fishery Management Council was asked at the 92nd Council Meeting in April 1997 to assist in forming a fishermen's working group to consider various management proposals for the fishery. The Council and American Samoa's Department of Marine and Wildlife Resources arranged for the working group and other fishermen to meet at various times between June and October 1997.

Local fishermen note that American Samoa's narrow economic base and small private sector have caused high levels of unemployment and severe labour-force retention problems. The single largest employer of American Samoans is the territorial government, which is facing mounting debts and a major budget deficit.

Developing fish-harvesting and marketing capability sufficient to support substantial participation in fisheries will expand and diversify the local economy and help the territory to attain a higher level of economic self-sufficiency.

However, a major concern of the American Samoan fishermen is that larger U.S. longline vessels may seek new fishing opportunities or relocate, as fisheries in other areas of the U.S. EEZ collapse or become increasingly restricted. Currently 32 permits have been issued for the American Samoa fishery by the National Marine Fishery Service's Pacific Islands Area Office, although a dozen vessels are active on a full time basis. The fishing fleet consists mainly of 8.5 to 9.1 metres *alia* catamarans. The *alia* catamarans deploy 200–300 hooks from a hand-powered reel and harvest mainly albacore tuna, which are sold to the local canneries. Another large fleet of *alia* longliners, which similarly targets albacore, is based in nearby Samoa.

The preferred management option to prevent any interaction problems would be to establish a closed area around the islands of the territory in which only pelagic fishing vessels smaller than 15 metres in length would be permitted to fish. There is a general consensus in American Samoa that, at some point, limited entry to the small-boat fishery may also be required to prevent over-capitalisation.

(Source: *Pacific Islands Fishery News*)

## ■ 'SHARK-SKIN' PLANES

*A striated coating like a shark's skin makes them fly faster*

Here's one of those riddles that defies common sense. Take two objects with exactly the same shape, one perfectly smooth, the other slightly furrowed: which will glide faster through water?

Answer: the latter, because the micro-turbulence engendered by water friction is decreased when it remains confined in the grooves.

Starting from this fact, verified with shark skin, which is naturally striated, research scientists developed a special outer coating for aircraft, 'having grooves a few hundredths of a millimetre deep with a tenth of a millimetre between them', explains Jean-Jacques Thibert, an engineer with the French National Aerospace Consulting and Research Bureau.

Glued over 80% of the aircraft's surface, these sheets of synthetic material are currently being trialled on an Airbus A340 belonging to Cathay Pacific. Although its cost is still high—some thousands of dollars—this new material results in substantial savings on fuel (about 3%).

(Source: *L'Express*, 16/4/98)

# THE RAPIDLY EXPANDING AND CHANGING TUNA LONGLINE FISHERY IN SAMOA

*by Lindsay Chapman,*
*Secretariat of the Pacific Community*
*Noumea, New Caledonia*

Who would have thought in 1994, that there would be a domestic fleet of small-scale catamarans, longlining for tunas in Samoa's exclusive economic zone (EEZ)—the smallest zone in the region at around 120 000 km$^2$—in 1996/97 and beyond.

This is the reality of what has occurred in Samoa in the space of a few years, and it continues to expand. With this expansion, processors and buyers are changing their marketing practices and upgrading their facilities to better handle and market the increasing catches of tuna by this fleet.

Larger vessels are entering the fishery to fish outside the current limited range fished by the smaller vessels. Safety issues are at the forefront with lives and vessels having being lost during the recent expansion. Vessel design is also being examined as fishermen and entrepreneurs look to the future of the fishery. This was the scene in Apia, Samoa in March 1998.

## The *alia* catamaran and its background in Samoan fisheries

The original *alia* catamaran was developed in Samoa under a joint FAO/DANIDA project in the 1970s (Fa'asili & Time, 1997). The original *alia* was constructed of plywood, 8.5 m in length, and powered by a 25 hp outboard motor. Around 120 of these vessels were built between 1975 and 1979.

At the end of the 1970s, boat builders started to use aluminium for the construction of the *alias*. The vessels were lengthened to 9.0 m and powered by a 40 hp outboard (Figure 1). Over 200 of these vessels were built, and some were exported to other countries (King & Fa'asili, 1997).

In Samoa, these vessels were fitted with four handreels, also developed in Samoa at the time (now called Samoan handreels, see Figure 2) and trolling booms as depicted in Figure 1.

The *alias* were involved in two main offshore fisheries. These vessels provided a stable fishing platform for offshore bottom fishing in depths to 400 m for deep-water snappers. Catches of deep-water species were consistent through the late 1970s and early 1980s at around 400 t annually. This catch increased to over 500 t in 1984, and peaked in 1986 at around 950 t (Anon, 1998).

Offshore trolling was the other main fishery the *alias* were used in. Much of this fishing activity took place around fish aggregating devices (FADs), which were maintained by the Fisheries Division. The trolling catch mainly comprised skipjack tuna (*Katsuwonus pelamis*) and small yellowfin tuna (*Thunnus albacares*), with peak landings of over 1 600 t recorded in 1986 and 1988 (Anon, 1998).

The *alia* fleet was devastated in 1990 and 1991 by two cyclones (Ofa and Valelia respectively) which destroyed over half of the vessels, and damaged many others. It was estimated that there were only 40 useable *alias* left after the cyclone in 1991 (Fa'asili, 1997). US Treaty funds administered by the Forum Fisheries Agency (FFA) were used to rebuild the fleet, with around 60 *alias* being brought back into operation in 1993 (Fa'asili & Time, 1997).

Following the cyclone in 1991, the SPC Fisheries Programme was approached for technical assistance to promote offshore fishing. As a result of this

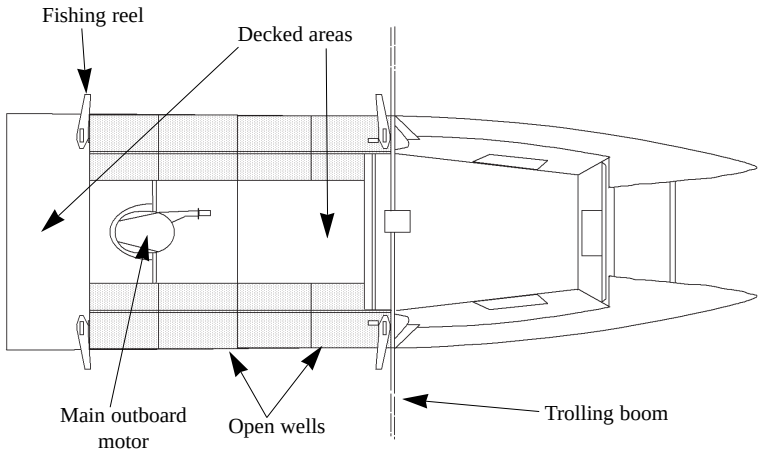



**Figure 1: The original aluminium *alia* catamaran rigged with handreels and trolling booms**

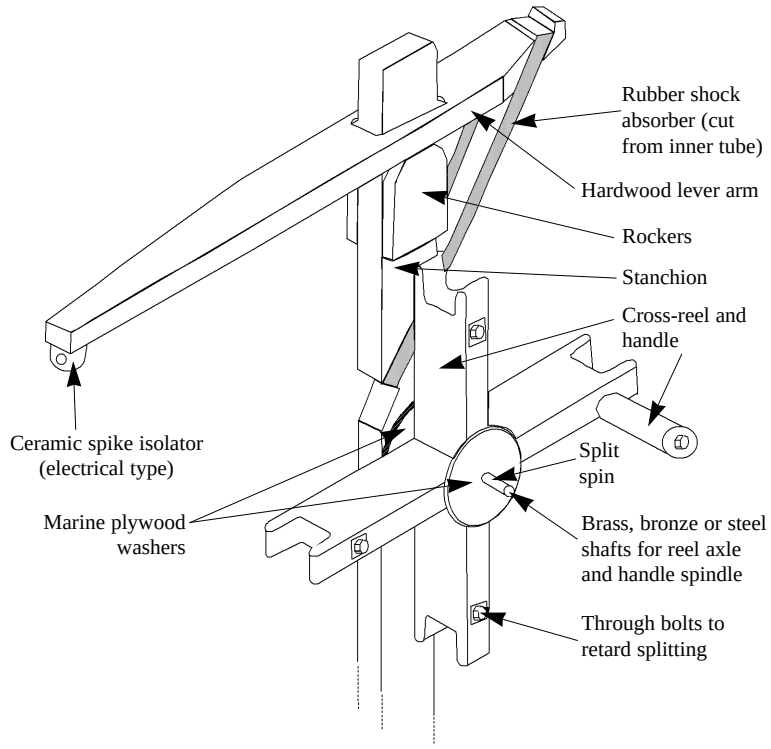



**Figure 2: The original wooden Samoan handreel**

request, a six-month Masterfisherman assignment commenced in September 1991, to develop and rig the fisheries research vessel R/V *Tautai Matapalapala* with tuna fishing gear, and to conduct experimental vertical and horizontal longlining trials targeting albacore tuna (*T. alalunga*), bigeye tuna (*T. obesus*) and yellowfin tuna (Watt et al., in press).

These fishing trials proved successful with 1 866 kg of fish being caught in 13 trips spent vertical longlining mainly around FADs. With the success of this project, a second phase was instigated to transfer the equipment and technology used on the research vessel to an *alia* catamaran, which was the style of vessel local fishermen were using.

A wooden reel (Figure 3) was constructed on which to wind and store the vertical longlines. The reel was mounted in the centre of the *alia* (Figure 4) with snoods stored in a wooden box. Again the catches were good (Figure 5) with a total of 2 819 kg of fish taken in 20 fishing trips (Watt et al., in press).

Local fishermen became involved in the project and several constructed reels for their own *alias*. Some local fishermen continued fishing using vertical longlines after the SPC Masterfisherman left Samoa. The project showed that vertical longlining could be conducted successfully from the *alia* in association with FADs.

## The new interest in the *alia* catamaran—private sector development

In 1994/95, some fishermen started to trial horizontal longlines from *alias* as a way to exploit the tuna resource in Samoa's EEZ. These trials proved very successful and other fishermen started to change their vessels over to longlining. With the money that was being generated from this fishery, there was a huge demand for new vessels. The boat building industry of the 1980s, which had shrunk to almost nothing in the early to mid 1990s, was expanded suddenly to meet the demands of the fishing industry.

**Figure 3: Wooden reel constructed for storing and using vertical longlines**

**Figure 4: Wooden reel with vertical longlines mounted on an *alia* catamaran**

**Figure 5: The catch being unloaded from a day's vertical longlining around FADs**

Some boat builders stuck with the original 9.0 m *alia* design only modifying it slightly by increasing the height of the gunwale by 20 cm, and leaving the hulls (Figure 6) still constructed from 2.5 mm-thick aluminium plate. Other boat builders 'stretched' the *alia* design to 10.5 m and added an aluminium wheelhouse (Figure 7), to replace the standard plywood version. The mounting area for the outboard(s) was also strengthened as some fishermen started using two 40 hp or one 65 hp outboards. Vessels using one outboard, in most cases carry a spare one as a safety precaution.

In the space of a couple of years, the *alia* fleet expanded to over 200 vessels with just about all of them involved in tuna longlining. In addition to the *alias*, several fishermen imported 11.5 m aluminium catamaran vessels, mainly from New Zealand (Figure 8).

These vessels are powered by either twin outboards up to 115 hp each, or twin diesel inboard-outboards. They have insulated fish holds for storing the catch, as well as a far greater carrying capacity, which allows more gear to be set per day, and longer trips to be undertaken.

Several of the Samoan boat builders are now looking into constructing larger, 11.5 m, computer designed aluminium catamarans with diesel inboard-outboard propulsion.

They would be used as an alternative vessel to the *alia*, which was not really designed for this style of fishing. These ventures are in 'partnership' with New Zealand companies and allow for Samoan welders to be trained and qualified in New Zealand.

The long-term aim of these 'partnerships' is to have the aluminium plate cut to size in New Zealand and shipped to Samoa in a kit form. The kit would be assembled in Samoa with all welding being done by the Samoan welders that had been trained and qualified in New Zealand.

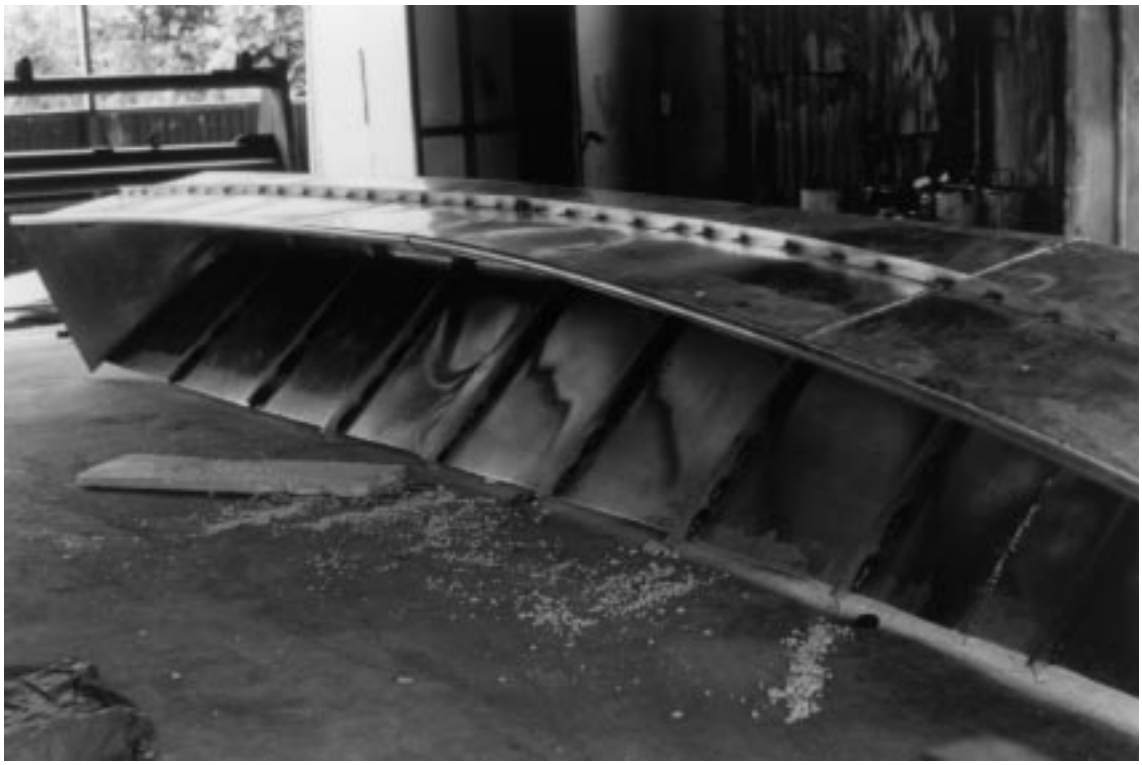


**Figure 6: Construction of a hull for a 9.0 m *alia* catamaran**

**Figure 7: Aluminium cabin arrangement on the 'stretched' 10.5 m *alia* catamaran**

**Figure 8: A 11.5 m catamaran design**

## Fishing gear and technique used

There are over 200 *alia* catamarans involved in the tuna longline fishery in Samoa. It is estimated that around 130 of these *alias* work in the vicinity of Apia (Figure 9), the capital of Samoa, landing their catch daily to processors. With the limited range of these vessels, most fishing occurs within a 40-nautical-mile radius of the Apia harbour. Gear conflict is becoming a problem with such a large number of vessels fishing in such a small area.

The average fishing day for an *alia* starts at 01:00–04:00 hours, when the vessels leave port for the fishing ground. Travel time is one to four hours depending on fishing location. When the fishing location is reached, the direction of set is determined taking into consideration the prevailing and predicted weather and sea conditions. In most cases the setting of the gear is made downwind. For the regular *alias* (9.0 m vessels), between 150 and 300 hooks are set. The 'stretched' *alias* (10.5 m vessels) may set up to 400–450 hooks, while the larger 11.5 m catamarans may set up to 700 hooks per day. The number of hooks set is also influenced by the expected catch and the carrying capacity of individual vessels.

Most of the vessels are using hand-crank reels constructed from aluminium (Figure 10) or steel. Depending on the size of vessel and the size and capacity of the reel, 5–9 nautical miles of 3.0, 3.5 or 4.0 mm monofilament mainline is stored on the reel. The three sizes of monofilament have been tested by different fishermen, with most now using the 3.5 mm mainline. Many fishermen use knots in the mainline as markers for the distance between branchlines to assist during line setting.

A few vessels, especially the larger 11.5 m vessels, are using hydraulically powered mainline reels. In some cases, these reels are larger and hold 12–15 nautical miles of mainline.

When commencing the set, the movable hand-crank reel is tied in position so the mainline can run straight off the reel over the stern of the vessel without the need for any pulleys. A marker flag (see Figure 9) is attached to the end of the mainline and the vessel motors forward. One crew member cranks the reel in reverse to wind the mainline off the reel as the vessel moves forward. Once sufficient mainline is out, the drag of the mainline is enough to pull the line off the reel for the rest of the set. One crew member still watches the reel to ensure there is no overrun or tangling of the mainline.

Branchlines (constructed using 5–7 m of mainly 1.8 mm monofilament with a tuna snap with swivel on one end and a No.14–16 circle hook on the other) are attached at around

**Figure 9: Some *alia* catamarans rigged with tuna longlining gear in Apia harbour**

30–40 m intervals along the length of the mainline. The preferred bait is pilchards (*Sardinops neopilchardus*), which are imported from Australia and New Zealand.

Floatlines around 35–40 m long are attached to the mainline at regular intervals. The spacing of the floatlines changes from vessel to vessel and depends on the desired fishing depth.

Anywhere from 20–35 branchlines are set between floats and floatlines. At the end of setting, a flag pole is attached to the end of the mainline, and the gear is allowed in most cases to drift freely. A few operators attach the end of the mainline to the vessel during the line soak period. Setting time varies with the number of hooks being set, the weather conditions and the experience of the crew, with around 200 to 400 hooks being set per hour.

The lines are generally allowed to soak for 5–9 hours before hauling commences. Hauling is the reverse of the setting process and is generally conducted into the wind. Firstly, the reel is turned 90° from the setting position to the hauling position, and securely tied in place so the mainline will come

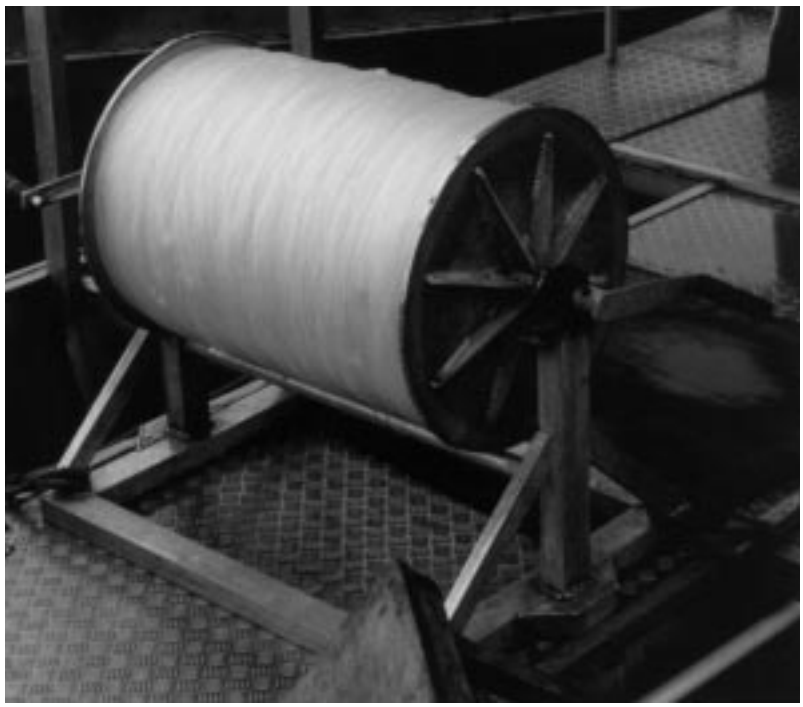


**Figure 10: Longline reel constructed from aluminium with a hand-crank on both ends**

over the side, through a pulley attached to an aluminium frame mounted on the gunwale and onto the reel (Figure 11).

The marker flag on the end of the mainline last set is retrieved, and the end of the mainline is attached to the reel. One or two crew then commence the hand-cranking to retrieve the mainline as the vessel is motored forward along the line.

As a branchline comes up with no fish, it is unclipped from the mainline, the bait if any removed, and the branchline clipped in order in a storage bin. If a fish (tuna) is on the branchline when it is retrieved, the fish in most cases is swum alongside the vessel where one of the crew slips his hand into the gill area to hold the fish.

The fish is stunned with a club, lifted on board, and then the clip is detached from the mainline. For larger species or lively fish (and those with sharp teeth), a gaff is used to bring the fish on board the vessel.

The hauling process continues until all of the mainline is retrieved. The hauling time for hand-crank reels can be from 2.5–4.0 hours per 200 hooks depending on the weather conditions, the number of fish being caught, and the number of tangles and mainline breakages. The hauling time for hydraulic reels is less, at around 1.5–3.0 hours per 200 hooks. Once the gear is on board, the vessels head back to port, generally arriving at 19:00–22:00 hours. The catch is unloaded on arrival in port and the vessel made ready for the next day's fishing. Most fishing trips take around 18 hours and many of the vessels fish 6 days per week when weather permits.

The fishery is not restricted to just *alia* and catamaran type vessels. One company has larger mono-hull vessels that fish for a week at a time in waters outside the range of the smaller alias. These vessels set more gear, chill the catch at sea and are able to move with the fish through the Samoan EEZ.

New regulations that were being introduced in March 1998 would allow vessels of over 15 m into the fishery, however, they would not be allowed to fish within 50 nautical miles of the coast.

## Sea safety issues

Unfortunately, the development and expansion of the *alia* tuna longline fishery has not been without safety problems. In the space of 15 months during 1997 and early 1998, at least 14 major accidents occurred, many resulting in the loss of human life.

From the 14 accidents, 25 fishermen were lost at sea, with another 24 rescued. In addition to the loss of life, 9 vessels were not recovered.

**Figure 11: Steel hand-crank reel lashed in the hauling position with frame for pulley mounted on the gunwale**

The cause of these accidents in many cases is unclear, as the vessels and crew have disappeared without trace. It is believed that the causes could be attributed to a range of possibilities including: the lack of seaworthiness and stability of the *alia* when loaded in rough weather; the design, strength and stability of the 'stretched' *alia*; the inadequate level of basic skills among many of the skippers; lack of navigational skills; limited (or non-existent) safety equipment being carried; and the rough weather being worked by some skippers and crew.

The Fisheries Division is working with other Government Departments to address sea-safety issues. Construction of a radio base station in Apia and 9 repeater stations around Samoa was completed and operational in June 1997. The radio is manned around the clock. A vessel registration programme has also been started with one of the main requirements being that every vessel be fitted with a radio. Fishermen are required to radio in when they head to sea, while they are at sea, and when they return to port.

Apart from the radio requirement for registration, each vessel now has a one-time inspection that covers:

- Check for flotation (foam) as per the original FAO design;
- Hull in good condition (no leaks);
- Main engine in good running condition;
- Spare engine in good running condition;
- Boat number clearly displayed; and
- Radio in good working condition.

To further highlight the need for safety at sea, a 'Safety Week' was organised in September 1997 by the Fisheries Division, Ministry of Transport, Police Department, Fire Brigade and others. There were demonstrations on navigation, radios, compasses, life jackets, outboard motors and other safety factors. In addition, the Fisheries Department set up a safety-at-sea stall during the last Agriculture Show, to show and demonstrate safety equipment.

The next sea-safety issue being addressed is the drafting and implementation of regulations regarding the qualifications of vessel skippers and crew, as well as manning levels. Given the lack of qualified personnel in the fishery at present, a training programme will need to be implemented in conjunction with the regulations with a suitable 'phase-in' period. This will allow the 200 or more *alia* skippers and all their crew to continue to operate their vessels whilst working towards the attainment of the necessary qualification under the proposed regulations.

## Catches and the resource

The expanding tuna longline fishery is targeting the deeper-swimming and larger tuna species: albacore tuna (*Thunnus alalunga*); bigeye tuna (*Thunnus obesus*); and yellowfin tuna (*Thunnus albacares*). Important by-catch species include: mahi mahi (*Coryphaena hippurus*); broadbill swordfish (*Xiphias gladius*); wahoo (*Acanthocybium solandri*) and marlins (family Istiophoridae).

These species are highly migratory and their abundance and location is influenced by climatic and oceanographic conditions and changes. These variables mean that in any given location, such as the EEZ of Samoa, there will be a seasonal fluctuation in abundance of these species (summer vs winter) with the possibility of fluctuations between a particular season from year to year (summer of one year vs the summer of another year).

It is difficult to tally the entire catch from the longline fishery in Samoa as there are no catch or logbook returns from the fishery. The Fisheries Division does monitor the export of fish, however, these figures are incomplete, and they only cover one component of the catch.

Table 1 provides the best estimate of the export of catch from the longline fishery based on figures obtained from the Fisheries Division database, the tuna canneries in American Samoa and the processors, and is considered to be a conservative estimate.

It should be noted that there is a considerable domestic market for fish taken as part of the long-

**Table 1: Estimated exports of fish (all species) from the Samoan longline fishery by year with weights in metric tonnes**

| Year | Canneries | Fresh export | Total |
|---|---|---|---|
| 1994 | 8 | 7 | 15 |
| 1995 | 66 | 91 | 157 |
| 1996 | 1 230 | 125 | 1 355 |
| 1997 | 3 450 | 180 | 3 630 |

line fishery, as well as the consumption by the crew and their families and relatives. It is thought that this component could be as high as 20–30 percent of the export figures. Based on this assumption, in 1997 the actual catch from the longline fishery was probably more in the vicinity of 4 500 t, although it could have exceeded 5 000 t.

It is difficult to explain the trebling of catch from 1996 to 1997 as indicated in Table 1. Possible reasons include: the figure from the canneries did not include the rejected fish in 1996 (not confirmed); the increase in vessel numbers (and hence catch) during the course of 1997 compared to the numbers fishing in 1996; fishermen who supplied the domestic market in 1996 switched to supplying exporters in 1997; and better record keeping in 1997 compared to 1996, which could have under estimated the 1996 catch.

The fish going to the canneries was almost exclusively albacore tuna. When comparing the 1997 catch (3 450 t) to the average Pacific tuna longline catch of albacore (1994–1996) of around 30 000 t (Lawson, 1997), the Samoa fishery now accounts for over 10 per cent of the Pacific longline catch of albacore tuna. This has occurred in the space of two – three years.

To get a better understanding of the fishery, the Fisheries Division in conjunction with the South Pacific Regional Tuna Resource Assessment and Monitoring Programme (SPRTRAMP) port sampling programme, has been sampling the landings from the tuna longline fleet. Vessels are met when they return from fishing by the port sampler.

He then interviews the fishermen and completes a data form detailing the amount of gear fished, location (grid square), number of crew, amount of fuel used, and then measures the entire catch by species.

The data collected shows there is a large variance in the catch per unit of effort (CPUE) throughout the year. CPUE varied from around 20 kg/100 hooks to over 230 kg/100 hooks on individual fishing trips. For the period August to December 1997, the CPUE from the sampling data averaged 90 kg/100 hooks.

In February 1998, the average CPUE was 73.5 kg/100 hooks. One commercial operator with a larger vessel had an overall CPUE for 1997 of 89 kg/100 hooks. Around 80 per cent of the sampled catch by weight was albacore tuna with an average size of 18 kg and a general size range of 15–23 kg.

## Processing and marketing

The rapid development of the tuna longline fishery meant that marketing needed to expand at the same rate. The two tuna canneries close by in American Samoa (annually processing around 200 000 t of product), provided a unique opportunity and a logical market for the volumes of albacore tuna being caught.

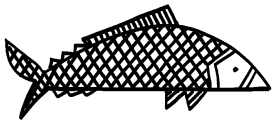
Other species—bigeye tuna, yellowfin tuna, wahoo, mahi mahi, and some albacore tuna—are exported as fresh chilled product, while some are sold on the domestic market, or taken home and eaten by the crew, their families and their relatives.

One of the biggest problems facing the fishery at present is the issue of fish quality. To date, only a few fishermen take ice to sea to chill the catch. The reasons for this have been fourfold:

- the attitude of the fishermen: they feel there is no need to chill their catch as they are only doing 'day trips';
- shortage of physical space on the *alias* (especially the 9.0 m version) to place ice chests and store ice;
- the fact that fish buyers are accepting the fish even though it has not been iced; and
- to a lesser extent, the problem of availability of ice.

The attitude of fishermen towards using ice has started to change as some processors and buyers are refusing to purchase fish that has not been iced at sea. Most processors are installing new ice-making facilities to cater for the expected increase in demand by fishermen. The one area that is going to be difficult to change is the ability of fishermen to carry sufficient ice on their *alias* whilst maintaining the stability of these vessels, especially when a good catch is taken and the weather is rough.

The price paid for different species fluctuates between the different buyers. Albacore tuna was purchased for around $ 3.55–3.96/kg (US$ 1.36–1.52/kg, exchange rate of 2.6 tala to one US dollar – in this article $ will refer to tala), while yellowfin tuna and bigeye tuna were purchased according to size of fish with fish under 20 kg bringing from $ 2.64–4.20/kg (US$ 1.01–1.62/kg); fish from 20–30 kg bringing $ 4.40–6.00/kg (US$ 1.69–2.30/kg); and fish over 30 kg bringing $ 5.72–9.00/kg (US$ 2.20–3.46/kg). Other species such as mahi mahi and wahoo brought a price of around $ 3.50–3.80/kg (US$ 1.35–1.46/kg).



## Fish quality—the canneries' experience

Raw material (fish) quality is a major problem faced by the tuna canneries in American Samoa. Up to mid 1996, the rejection rate of albacore tuna arriving in refrigerated containers from Samoa was very high—up to 80 per cent on some consignments.

Overall, the rejection rate up to then probably averaged out at around 20 per cent. The rejection rate fluctuated considerably between individual suppliers and this was due to the handling, chilling, and freezing practices employed.

In some cases, refrigerated containers were being used to freeze large volumes of albacore tuna. This is not considered an acceptable process because the freezing rates are so slow that the fish can continue to spoil.

Refrigerated containers or 'reefers' are designed for holding product that has already been frozen, not for freezing down fresh produce.

In response to the problem, both canneries sent experienced technical people to Samoa to help raise quality standards. Seminars were held to get the important message across about proper handling, chilling and freezing of the catch from the moment the fish hits the deck.

Furthermore, all the main exporters in Samoa have received training and technical assistance from SPC and FAO in establishing HACCP into their processing operations. HACCP, or Hazard Analysis and Critical Control Point, is a food-safety processing system that is designed to make food products safer to eat. The USA authorities (including US territories such as American Samoa) require all seafood destined for the US market to be processed according to HACCP principles. These measures proved very successful as the rejection rate had dropped to around one to two per cent, although there was still the odd 'bad' consignment received.

The two main reasons for rejection by the canneries are excessive levels of histamine in the flesh and a condition called 'honeycombing'. Histamine is a toxin, also referred to as scombrotoxin because the problem is mostly associated with scombroid fish species. It becomes a problem if certain bacteria found naturally on tuna are allowed to flourish when landed fish are left un-iced (time/temperature abuse). The histamine content is analysed when each consignment of tuna arrives at the cannery.

Honeycombing can only be detected after the fish has been cooked. The cooked flesh appears to be porous or looking like honeycomb, hence the name. Again it is a result of time/temperature abuse, appearing in flesh that has started to decompose.

Histamine formation and honeycombing are completely eliminated in fish that are chilled soon after capture and then frozen quickly when landed back in port by an approved low-temperature method (e.g. air blast frozen or brine frozen).

## Fresh export and future value adding

There are five main processors in Samoa involved with the tuna longline fishery. These processors have all had training in HACCP requirements for exporting to US markets (with SPC and FAO assistance) and have developed approved HACCP plans (with help from SPC and UNDP). These processors are continuing to up-grade their facilities in line with their individual HACCP plans to achieve the best quality product.

Processors are starting to look to the future of the Samoan longline fishery, and at ways in which they can add value to the product and attain a higher price, plus generate local employment. At present the fish is being exported as fresh chilled product to markets in the US mainland, Hawaii, Australia and New Zealand. Exporting of product in this form is now coming under pressure, as processors compete for the availability of freight space on the limited number of flights.

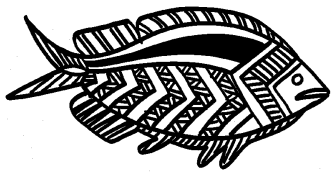
To overcome the problem of limited air freight space, processors are looking at alternative freight arrangements and product forms. The main focus is on albacore tuna which processors believe is greatly under-valued in its qualities, especially as a table fish.

Several processors are gearing up to loin and steak albacore tuna, vacuum pack the processed product and freeze it. In this form refrigerated containers can be shipped to markets in both Europe and the US mainland.

## Economics of fishing operations based on 1997 catch rates

### *Subsidies and incentives*

The Fisheries Division and the Samoan Government are encouraging the development and expansion of the fishing sector as well as other primary-producing sectors.



To assist the fishing sector, subsidies or incentives were put in place to foster development and expansion. These were adding to the success of fishing ventures. Incentives include:

- Only five per cent tax paid on vessel materials;
- Only five per cent tax paid on outboards by commercial fishermen;
- Only five per cent tax paid on fishing gear and safety equipment;
- No income tax paid (by primary producers); and

– A 14.5 per cent rebate on fuel (a rebate of $ 35.10 (US$ 13.5)) on a 200 litre drum of fuel costing $ 242.22 (US$ 93.1)).

In addition, government charges for export permits and clearance documentation were kept to a minimum, although the process of getting the different documents could be streamlined. For exporting product the following documents and charges apply:

(a) A 'Certification of Fisheries Product Exports' from the Fisheries Division (fish supposed to be weighed and inspected by fisheries staff); charge: $ 2.00;

(b) An 'Exchange Control Export Licence' from the Central Bank of Samoa and an official stamp for the fisheries certificate, no charge;

(c) An 'Export Entry' certificate from the Customs in town; no charge. The weights of the cartons of fish are checked at the airport to ensure accuracy and to prevent over-loading of aircraft;

(d) For the export of containers, a 'Wharfage Entry' certificate is required from the Department of Transport; charge: $ 22.50 (US$ 8.6) per container.

### Loans

The Development Bank of Samoa (DBS) was also very supportive of the fishing industry which was the DBS's main client in 1997. Loans for new vessels were spread over 5 years, while loans for second-hand vessels (cheaper vessels) were over 3–3.5 years.

Financing of loans had some basic requirements: a minimum of 25 per cent to be paid in cash by applicant; additional security required in excess of the value of the vessel / loan (preference was for land or mortgage over other vessels); and insurance cover for the vessel. The average interest rate was around 12 per cent, based on assessed risk of each client.

The DBS was also providing loans to the processing sector for new plant, machinery etc. The bank would lend up to 65 per cent of the value of the fixed assets. There was also a ceiling on any loan of $ 2.3 million.

### Wages for those working on fishing vessels

The cost of employing people is relatively low in Samoa with the minimum wage set at around $ 1.20 / hour (US$ 0.46 / hour). A casual employee at the Fisheries Division would earn $ 12.00 / day (US$ 4.62 / day—pers. comm. Mr A. Mulipola). There were several positions being advertised in the Fisheries Division and the salaries for these were: Fisheries Assistant $ 5,143–5,977 per annum ($ 2.47–2.87 / hour—US$ 0.95–1.10 / hour); and Training Officer $ 10,295–11,671 per annum ($ 4.95–5.61 / hour—US$ 1.90–2.16 / hour).

On the fishing vessels, the wages being paid depended on the position of the individual and the experience each person had, and were paid in tala per fish caught.

For a skipper, the going rate was around $ 5.00–10.00 / albacore tuna (US$ 1.92–3.85 / albacore tuna). For each crew it was $ 1.00–2.00 / albacore tuna (US$ 0.38–0.77 / albacore tuna) depending on experience.

For other species, the same ratio applied, that is, if a yellowfin tuna was sold for twice the amount as an average albacore tuna then everyone was paid twice the normal price for an albacore tuna.

With a good catch of albacore tuna, say 20 fish, a crew member could earn from $ 20.00–40.00 / fishing day (US$ 7.69–15.38 / fishing day).

### Insurance of fishing vessels

Insurance companies were reluctant to insure fishing vessels due to the number of accidents and loss of vessels that had occurred. One company had stopped insuring vessels, and cancelled existing policies, refunding the portion of the premium left on the policy to the holders.

There were two other insurance companies that were going to insure vessels; however, the premium levels on their policies had not been set as at March 1998. This was making it difficult for operators wishing to take out loans for new and used vessels.

### Fishing gear and bait

Several of the processors imported fishing gear and bait to sell to operators, mainly those that supplied them with

product. Fishing gear was also sold in local stores. In some cases, fishermen imported their own gear from overseas. The preferred bait in Samoa was pilchards, and these were mainly imported from Australia and New Zealand. The cost fluctuated depending on the overseas supplier of bait, although generally pilchards sold for around $ 100.00/20 kg carton (US$ 38.5).

## *Estimated economics of* alia *fishing craft*

The following estimation of the economics of a fishing operation (Table 2) is based on the average catch rate from samples recorded in late 1997 and early 1998, of 80 kg/100 hooks and the approximate prices of goods as at March 1998. Given that fishing does not occur on Sundays, the number of days fished in a year is estimated to be 180. The average price for albacore tuna ($ 3.70/kg (US$ 1.4)) has been applied to the entire catch, which is an under-estimate given that many other species command a higher price.

The value of the *alias* was estimated to be $ 60,000 (US$ 23 077) for the 9.0 m vessels and around $ 120,000 (US$ 46 154) for the 'stretched' 10.5 m vessel. These prices included the outboard(s) and all fishing gear. Insurance on *alias* was difficult to get and there were no premium values available. For the calculations presented in Table 2, an estimate of 12.5 per cent of the value of the vessel and gear is used.

Table 2 estimates a significant profit from fishing operations for both the 9.0 m and 10.5 m *alias*, not accounting for loan repayments and depreciation of the vessel and outboard(s).

Also, the use of ice has not been included, although this may

**Table 2: Estimated income and expenditure for two sizes of *alia* catamaran based on prices obtained from different sources in Samoa in March 1998 (1 tala = US$ 0.38)**

| Items of income and expenditure | Based on a 9.0 m *alia* with one 40 hp ourboard, setting 300 hooks per day<br>Tala | Based on a 10.5 m 'stretched' *alia* with two 40 hp outboards, setting 450 hooks per day<br>Tala |
|---|---|---|
| Income based on 180 fishing days with a catch rate of 80 kg/100 hooks (all species) and average price of $ 3.70/kg | 159 840 | 239 760 |
| ***Total income*** | **159 840** | **239 760** |
| Cost of fuel at $ 207.12/200 l drum (60 l/trip/40 hp outboard) | 11 185 | 22 369 |
| Oil for fuel mix | 2 500 | 5 000 |
| Wages based on $ 6.50/fish for the skipper and $ 1.50/fish for each of three crew with a catch rate of 80 kg/100 hooks equating to 5 fish/100 hooks | 29 700 | 44 550 |
| Bait (pilchards at around 200 baits/20 kg carton at $ 100.00/carton) | 27 000 | 40 500 |
| Insurance at 12.5% of the vessel's value | 7 500 | 15 000 |
| Replacement fishing gear | 7 000 | 10 000 |
| Repairs and maintenance of vessel and outboard(s) | 3 000 | 6 500 |
| ***Total expenditure*** | **87 885** | **143 919** |
| Profit without bank loan payments and not considering depreciation of the vessel | **71 955** | **95 841** |

become a requirement of most processors in the near future. Given the current catch rates of 80 kg / 100 hooks, which equates to 240 kg / trip for a 9.0 m vessel and 360 kg / trip for the 10.5 m vessel, and the usual ice to fish ratio of 2:1, *alias* would need around 480 kg and 720 kg of ice for the 9.0 m and 10.5 m vessels respectively. If ice was purchased at $ 0.15 / kg, the annual cost would be around $ 12 960 for the 9.0 m *alia* and $ 19 440 for the 10.5 m *alia*. This may decrease the profit margin if a higher price was not paid for the fish; however, it still provides a good profit, or rate of return on capital invested.

It should be noted that smaller *alias* will probably have difficulty carrying ice because of the increased space needed to store insulated containers and the weight of the ice. Therefore, the restricting factor for the use of ice by some operators may be physical rather than financial.

## Multiplier effect from this fishery

The multiplier effect generated by the tuna longline fishery is huge, although difficult to measure. Increased employment, not just on fishing vessels, but in the processing sector and the direct and indirect support services is one obvious benefit.

There is a large increase in the need for people to build the vessels in Samoa, to unload and process catches, to provide food for the fishermen to buy, to provide maintenance services for the outboards and vessels, as well as to organise the importing of outboards.

## Possible reasons for success

There is no doubt about the success of the Samoan tuna longline fishery. The catches speak for themselves and the marketing is expanding to meet the needs of the catching sector.

Safety issues are being addressed and vessel design options are being explored. However, the question still remains, 'why is the tuna longline fishery so successful in Samoa?' It is felt that there are many factors that contribute to this success, and it is in the combination of these that success lies.

The factors described below are not meant as an exhaustive list, but rather as a guide based on the success of this fishery.

### *Development by the private sector*

The development of this fishery has been driven and achieved by the private sector, following on from early development work conducted by the Fisheries Division (vessel construction in the 1970s and 1980s) and SPC (vertical longlining trials around FADs in the early 1990s).

The private sector is now considering new vessel designs, refining the fishing gear and technique used, better processing facilities designed around the fishery, and better marketing of product.

### *Location and availability of resource*

Samoan fishermen have enjoyed two very lucrative fishing years (1996 and 1997) where the majority of fishing effort has been within 40 nautical miles of Apia. The close proximity of the fishing grounds minimises the running costs of the fishing operations, and allows the vessels to fish on a daily basis. It also allows smaller vessels to enter the fishery as they only have to be at sea for around 18 hours.

### *Catch rates*

The high CPUE recorded for this fishery (70–90kg / 100 hooks) allows small vessels to set a limited amount of gear, with a good chance of attaining a reasonable catch. This, together with the close location of the fishing grounds and minimal running costs adds to the chances of a small-scale fishing venture being profitable.

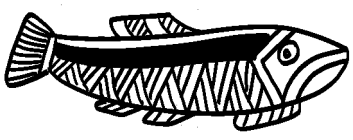
### *Market for albacore*

The close proximity of the two canneries in American Samoa allows the catch from Samoa to be exported at minimal cost. The freight for a container of frozen fish from Samoa to American Samoa is US$ 1 000 ($ 2,600). A container holds around 13–14 t which equates to a freight charge of around US$ 0.07 / kg ($ 0.19 / kg).

The cannery price for albacore tuna in March 1998 was US$ 2 200 / t ($ 5 720 / t) or US$ 2.20 / kg ($ 5.72 / kg).

### *Value of the local currency*

The tala is a relatively weak currency against the US dollar (which is the currency used by the main markets for Samoan fish), with an exchange rate of around 2.6 tala to one US dollar. This is a very favourable exchange rate for exports.



### *Cost of vessels and financing*

The cost of a fully equipped *alia* is fairly low at around $ 60 000 (US$ 23 077) for a 9.0 m version and $ 120 000 (US$ 46 154) for the 10.5 m version. DBS loans can be obtained over a five-year period which makes the payments quite affordable considering the current catch rates and prices paid for fish. An investor can get a very good rate of return on invested capital in a short period of time (see Table 2).

### *Wages*

The level of wages paid in Samoa on the fishing vessels allows the fishermen to earn a reasonable income by Samoan standards, and allows the vessel owners to make a significant profit on their investment over and above vessel repayments.

### *Strong fishing tradition*

Samoan fishermen have a strong tradition in offshore fishing, and this has continued through to the present time. Samoans are used to spending time at sea under difficult conditions as part of their offshore fishing background.

The conditions that fishermen are working under at present are very basic. Hand-crank reels for retrieving the gear are labour intensive. The vessels also work six days per week (weather permitting) with people working up to 18 hour days (with some rest periods during travel and gear-soak times). The vessels are also very cramped with very little cabin space and no bunks.

However, there does not appear to be a shortage of willing people to head to sea under these conditions and work for the pay that is offered. In fact, people are seeking work on these vessels with the same skippers and crew fishing day after day.

### *Government support and assistance*

The Fisheries Department and the Samoan Government are fully supportive of the development and expansion of the tuna longline fleet. Reduced taxes on gear and vessel materials; a 14.5 per cent rebate on fuel; no income tax for primary producers (includes vessel owners and all fishermen); plus minimal fees being charged for exporting documentation foster development in the fisheries sector are concrete examples of this support.

## Could this fishery be duplicated in other Pacific Island countries?

Delegates from several Pacific countries have been to Samoa to look closely at the tuna longline fishery, to see if the same type of fishery could be developed in their respective countries. The reality is that the chance of duplicating the Samoan fishery in another country is very low unless it is driven by the private sector.

However, other countries could look closely at this fishery to see if changes could be made within their own system to provide incentives that will encourage private sector development or expansion in their fisheries sector. Another approach could be to focus on developing a smaller-volume fishery, adding value through processing the catch to increase earnings.

An important final point for everyone to consider is the size and design of vessel to be used. The *alia* catamaran is not necessarily the best-designed vessel for this type of fishery, especially in other countries in the region, where factors such as distance to fishing grounds and catch rates may differ to those experienced in Samoa.

## References

ANON. (1998). Annual Report – 1996/97. Fisheries Division, Ministry of Agriculture, Forests, Fisheries, and Meteorology. Samoa. 34 p.

FA'ASILI, U. (1997). Review, Redesigning and Construction Demonstration of *alia* Fishing Boats in Samoa. A project proposal submitted for funding assistance from UNDP/FFA. 5 p.

FA'ASILI, U. & S. TIME. (1997). *Alia* longline fishery in Samoa. Paper to the Conference on Building Sustainable Tuna Industry in Pacific Islands, Maui Centre, United States (3–8 November 1997). 4 p.

KING, M. & U. FA'ASILI. (1997). Fisheries in Western Samoa. Fisheries situation report, Fisheries Division, Ministry of Agriculture, Forests, Fisheries, & Meteorology. 3 p.

LAWSON, T. (ed.). (1997). South Pacific Commission Tuna Fishery Yearbook 1996. Oceanic Fisheries Programme, South Pacific Commission, Noumea, New Caledonia. 104 p.

WATT, P., L. CHAPMAN & P. CUSACK. (in press). Report on small-scale tuna fisheries development in Western Samoa (27 September 1990 – 27 July 1991). Capture Section, Unpublished Report No. 22. South Pacific Commission, Noumea, New Caledonia.

# LATE NEWS....

## Maritime school receives grant

The French Development Bank (*Caisse Française de Développement*) will provide a grant of US$ 430 000 to the Tuvalu government for the electrification of the Tuvalu Maritime School.

The project will provide a new electrical power plant. It will enable the school to fully utilise tools and equipment in their workshop for practical training which at the moment cannot be used because of the poor electrical supply.

The project will also include the assistance of the New Caledonian Energy Company (ENERCAL) to the Tuvalu Electricity Corporation for the implementation of the project.

(Source: *Pacnews*)

## Solomon Islands to issue fishing licences under a new evaluation system

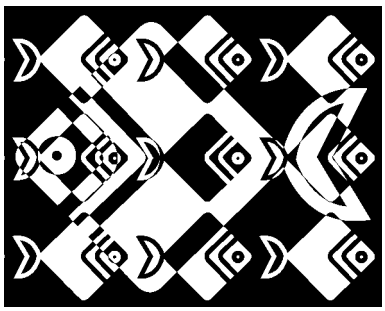
Solomon Islands fisheries minister, Doctor Steven Aumanu, has declared that all current licences issued to foreign fishing vessels to fish in Solomon Islands waters will not be renewed on expiry after 31 May 1999.

Aumanu said after this date new licences for foreign fishing vessels will only be issued if they meet the criteria under a new evaluation system following approval by the Foreign Investment Board.

These criteria include equity, flag of vessel, number of Solomon islanders employed, use of local goods and services, and onshore investment.

Doctor Aumanu said his ministry has also decided to reduce the quota allocations on tuna catches in the country's waters. The current quota of 128 500 metric tonnes is viewed by the government as exceedingly unsustainable.

(Source: *Pacnews*)





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