



Fisheries

Newsletter

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Editorial

Welcome to this new issue of the *Fisheries Newsletter*, the first for the year 2000. We have decided to 'rejuvenate' the newsletter; our graphic artist, Jipé Lebars, has put all his talent to work on finding a new 'look' for us.

The first issue of the *Fisheries Newsletter* appeared in April 1971 with the name *South Pacific Islands Fisheries Newsletter*. At that time, the newsletter was published by the South Pacific Islands Fisheries Development Agency (SPIFDA) and the United National Development Programme, and responsibility for it was given to FAO, with SPC co-operating on behalf of its member governments.

In December 1973, the SPIFDA was officially dissolved. The participants at the Sixth Technical Meeting on Fisheries asked SPC (then called South Pacific Commission) to take over the role of publishing the newsletter, now called the SPC *Fisheries Newsletter*.

In this issue, you will find our regular columns. The various Marine Resources Division sections have been very active during this first quarter, particularly the Communities Fisheries Section which held a workshop on processing and marketing seafood in the Marshall Islands, published a manual on managing fisheries at the community level, and helped the Vanuatu Department of Fisheries examine social and gender aspects in the preparation of their tuna industry management plan.

I would like to call your attention to an in-depth article by Steve Beverly, our Fisheries Development Officer, on page 20. Steve explains how to use altimetric charts and temperature recorders to obtain information on the best tuna fishing areas.

We welcome your comments on the Newsletter's contents and format. In the meantime, pleasant reading!

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Eucheima seaweed is being farmed successfully in Kiribati and Fiji as an export crop



SECRETARIAT OF THE PACIFIC COMMUNITY

Prepared by the Information Section of the Marine Resources Division and printed with financial assistance from France.

SPC ACTIVITIES

■ COMMUNITY FISHERIES SECTION

Marshall Islands seafood processing and marketing workshop

The Community Fisheries Adviser travelled to the Marshall Islands in January 2000 to conduct a workshop on seafood processing and marketing on the atoll of Jaluit. The workshop was requested by the Marshall Islands Marine Resources authority and was a follow-on from the Ebeye workshop held in 1998.

Twenty-three women and five men participated in the workshop which aimed to provide the par-

ticipants with skills in processing and marketing their marine resources. The workshop, held from 17 to 21 January, was a joint venture between the SPC Community Fisheries Section and the Marshall Islands Marine Resources Authority.

The five-day workshop covered the following topics:

- Marine conservation and sustainable management;

- Seafood nutrition;
- Seafood quality, handling, hygiene and processing;
- Dry and wet salting of fish;
- Seafood diseases; and
- Preparation, packaging and marketing.



Participants learning fish salting and drying

Community Fisheries Adviser departs SPC

At the end of February 2000, Patricia Tuara, Community Fisheries Adviser, left SPC to pursue a new direction. Patricia and her husband, Andreas Demmke, are moving to New York where Andreas will take up a position as demographer with the United Nations. Patricia worked with SPC for five years and has been the driving force behind the growth and direction of the Women's Fisheries Devel-

opment Section, now the Community Fisheries Section. Her energy and dedication will be missed at SPC and around the region. The work of the section will continue to benefit from the groundwork done by Patricia, and her colleagues at SPC wish her and Andreas all the best for the future. Patricia's position has been advertised and a new Community Fisheries Adviser will be appointed shortly.



Vanuatu tuna industry management plan

In March 2000 the Community Fisheries Officer travelled to Vanuatu to undertake the field work for a report on the potential impacts of the development of the tuna fishing industry in Vanuatu on social and gender issues. The Community Fisheries Officer worked with the Forum Secretariat Gender Issues Adviser in this study which will result in a report for government, investors, donors and social agencies.

The work was undertaken as a component of the FFA-assisted Vanuatu Fisheries Department project to develop a Vanuatu Tuna Industry Management Plan. The objective of this component of the management plan is to present: i) information on women's and men's roles in the tuna industry at commercial and subsistence levels and ii) a

gender analysis of the general issues concerning the commercial industry. The draft report resulting from this trip will examine the potential social impacts of various development options for the tuna industry on health, labour and workers rights, human rights, environmental and cultural issues.



Fisheries Management for Communities

A manual on promoting the management of subsistence fisheries by Pacific Island Communities

This manual has been written by Dr Mike King of the AusAID Fisheries Project, Samoa, and Lyn Lambeth, SPC Community Fisheries Officer. Both authors worked on a community-based fisheries extension in Samoa. The manual has been written in response to a growing regional interest, from fisheries and environmental agencies as well as non-government organisations, in how to motivate communities to manage their own marine resources.

The manual suggests some practical answers to the following questions:

- How can villages be encouraged to manage their own fisheries?
- What can be done to support village communities in their efforts to conserve fish stocks and protect their marine environment?
- What particular conservation actions can communities take?
- What can be done by communities and what must be done by governments?

The manual describes the work being done in Samoa as demon-

strating a working model of community-based fisheries management in the Pacific. In the words of Ueta Faasili, the Assistant Director of Fisheries in Samoa, 'I believe the model used in Samoa is transportable to other island countries in the Pacific, perhaps with some alterations to suit local conditions and culture.'

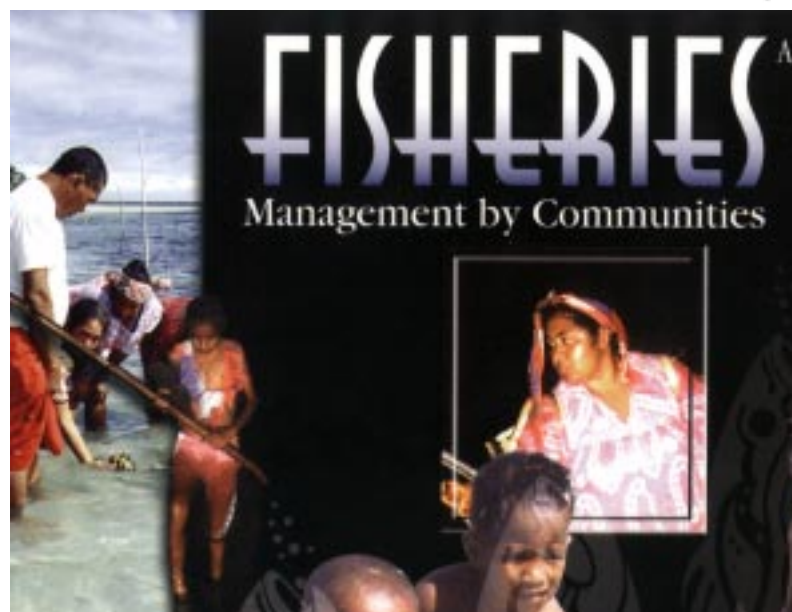
Complimentary copies of the manual have been sent to national contacts in fisheries and environmental agencies as well as libraries around the

region. All others interested in obtaining copies of this or other Community Fisheries Section manuals should contact:

The Distribution Assistant
SPC, B.P. D5, 98848 Noumea
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Fax: +687 263818
E-mail: IdaT@spc.int

The manual is also available on the SPC Coastal Fisheries website:

<http://www.spc.int/coastfish>



■ FISHERIES DEVELOPMENT SECTION

In March 2000, the Capture Section became the Fisheries Development Section and the title of Masterfishermen was changed to Fisheries Development Officers, to better reflect the actual work of the Section. These changes were recommended when an internal review of the Section was completed, in early 2000. Representatives to the first 'Heads of Fisheries Meeting' (9–13 August 1999) probably remember the discussions on this and the support provided for the change.

The review also looked at streamlining the internal processes and services the Section provides to member countries and territories, with a focus on working more with the private sector through shorter, more targeted assistance. In this regard, the work programme for the Section is now being developed for late 2000 and early 2001, and we invite requests for technical assistance from both the private and public sectors of member countries and territories. For more information on making requests or the type of assistance available from the Section, please contact the Fisheries Development Adviser, Lindsay Chapman.

Technical assistance to the private sector in Tonga

In January 2000, SPC Fisheries Development Officer, Steve Beverly, travelled to Tonga to assist the developing tuna long-line private sector. Steve mainly worked with 'Alatini Fisheries

Company during this time, who were using altimetric data to identify potential fishing locations, based on oceanographic anomalies. In addition, Steve used temperature/depth recording

equipment to better target the gear in the desired depth range for the target species. A full report of his results is given on page 20 of this newsletter.



FAD assistance to Nauru

William Sokimi, Fisheries Development Officer, spent 10 days in Nauru in early February 2000, assisting the Nauru Fisheries and Marine Resources Authority (NFMRA) with their FAD programme.

Using the SPC deep-water echosounder, William refreshed the memories of NFMRA staff in conducting a site survey in a location previously selected for an FAD deployment. The site was to the south-south-west of the runway, where the previous FAD had produced landings of over 25,000 kg in a four-month period before it went off-station.

The site survey showed that the best site for deployment was very close to the previous location, with a depth of 2,320 m. Over the next few days, the mooring was assembled in accordance with the SPC-recommended design. The buoy system used was a rectangular frame with purse-seine floats

attached (Figure 1). A central flag pole with a radar reflector was also attached for ease of finding the FAD. All of the materials, including around 2–3 t of old mooring chain, were loaded onboard a *Nauru Phosphate Corporation (NPC)* barge (Figure 1).

The barge was towed to the chosen position by an NPC towing craft. The NFMRA vessel with the echo-sounding equipment was at the proposed deployment position, with William directing the operation from this vessel.

At the site, the buoy system was deployed, along with the top hardware. The towing craft and barge then followed the NFMRA vessel as they circled around the deployment site, paying out rope as they went (Figure 2). The aim was to have all the rope deployed as the vessel reached the chosen deployment site for the anchor.

Unfortunately, just when the anchor was to be deployed, the wrong end of the anchor chain was kicked over the wrong side of the barge. The result was that the rope was pulled out of the water and back across the barge under the weight of the sinking anchor, until it caught and snapped. A very good lesson was learnt from this, as all involved saw the need for careful planning and being aware of the movements of everyone involved.

With the anchor lost, the FAD buoy was retrieved along with the mooring line. It was estimated that around 200 m of polypropylene rope was lost with the anchor. Unfortunately William had to depart Nauru before a replacement anchor could be found, although the NFMRA staff are confident they can redo the deployment once they have the materials.





Figure 1: Loading FAD materials on to the towing barge in Nauru



Figure 2: Setting the FAD mooring line at the deployment site

Tuna longline trials in Kiribati

Fishing trials on board the Ministry of Natural Resources Development's (MNRD) new twin-hull tuna longliner F/V *Tekokona II* (Figure 3) commenced in mid-February out of Tarawa, when Fisheries Development Officer William Sokimi arrived.

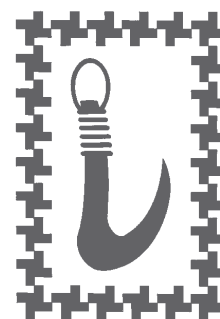
SPC reported on this new vessel in *Fisheries Newsletter 88*, when the vessel was first launched and the hydraulic system and fishing equipment were being installed. A run of problems with the hydraulic system and the difficulties of getting equipment to overcome these problems have plagued this project for over a year.

With the fishing gear all made up and the hydraulic system operational, William was able to get straight into the fishing trials. Unfortunately, bad weather restricted fishing to the leeward side of Tarawa. During four fishing trips, 10 sets were made

with a total of 4,185 hooks set. The saleable catch amounted to 68 fish weighing 1,791 kg (gilled and gutted), mainly yellowfin tuna (33 fish weighing 922,5 kg). All sharks were retained and landed gilled and gutted (19 fish weighing 713.5 kg) for sale.

F/V *Tekokona II* was constructed as a prototype vessel, so part of William's work was to suggest modifications to the vessel that would improve its suitability as a tuna longliner.

These included changing the horsepower rating of the main engine; adding an auxiliary engine to drive the hydraulic system; increasing ice- and fuel-carrying capacities; altering the superstructure, safety railing, and starboard cabin door; improving the steering system; and installing lights in specific areas. Not all of these suggestions can be acted upon now, however, if a second vessel were



to be constructed, these changes should be considered and incorporated where possible.

Training the vessel skipper and crew in the use of the gear, and the setting and hauling techniques, was also a main focus of the project, as well as streamlining the process wherever possible. William worked closely with the crew to develop efficient setting and hauling routines.

Additionally, training was given in correct on-board handling, processing and icing of the



Figure 3: The MNRD's new longline vessel F/V *Tekokona II*



Figure 4: Unloading the catch from F/V *Tekokona II* into a skiff to take ashore

catch to export standards. This worked well on the vessel, however, the unloading practices were basic, with the catch unloaded into a skiff (Figure 4) to get it to shore, then an open truck to take it to MNRD, where it was cut into chunks for local sale.

These preliminary fishing trials indicate that the F/V *Tekokona II* is a suitable vessel for conducting tuna longlining, although continued fishing is needed to prove the economic viability of the vessel. The unloading and marketing practices will need to

improve for fish destined for export; these will be covered in a follow-up visit by the Section later this year.



Activities in Noumea

Lindsay finalised arrangements for several future projects for the Section, whilst progressing others. The first two 'Field Reports' were sent out for coun-

try clearance and William's Samoa Reports are currently being published. The Section's Project Assistant, Ms Marie-Ange Roberts, was responsible for the

art work for these reports, and worked on getting previous country reports ready to go on the SPC web site.



■ TRAINING SECTION

Teriihauroa Luciani represented SPC Fisheries Training Section at the Bangkok Declaration and Strategy Conference on Aquaculture Development in the Third Millennium, from 21 to 25 February. For details, please see page 10.

Seaweed-farm training in Vanuatu

The Vanuatu Department of Fisheries is intending to expand its current seaweed farm programme into a large-scale development project in 2001.

This follows the success the Department has achieved through the farming trials carried out in 1999 and the first quarter of 2000. This project has received

praise from rural communities and thus has drawn a lot of real interest from the coastal communities.

The Department needs a comprehensive in-country training programme on seaweed-farming techniques that would ensure smooth implementation of the large-scale project to be developed in 2001.

With the funds obtained from the Government of Taiwan/ROC, the SPC Fisheries Training Section will be able to assist the Vanuatu Department of Fisheries initiate a seaweed-training programme.

A train-the-trainer course will be run in Port Vila, Vanuatu from 6 May to 16 June 2000. The seaweed course is designed for persons (mainly Fisheries and Extension Officers) who will introduce and promote seaweed farming among coastal villagers.



In Fiji Islands and Kiribati, the old system is used, whereby lines are tied from stakes driven in to the seabed.



In Fiji, drying platforms are built on the water (next to the village).



Farm maintenance is important: This young farmer is replacing lost plants and cleaning lines.

Second regional course for fishing vessel skippers held in Nelson

From March 27 to April 7 2000, 12 fishing vessel skippers attended a course on vessel operation management and electronic aids at the New Zealand School of Fisheries. The course was funded by the Government of Taiwan/ROC through its annual small-grant scheme to the region.

The first Skippers course was held in Nelson, in February 98. This initial course was attended by the two SPC masterfishermen to prepare an in-country follow-up of all participants (the course and the follow-ups were funded by the United Nations Development Programme (UNDP).

This year, only one masterfisherman (William Sokimi) came to Nelson to act as resource person, and meet those skippers who may require additional assistance from SPC.

Having William there was extremely useful: he was always available to get discussions started and ask course tutors interesting questions. His extensive background as a Pacific Islander in tuna longlining also helped significantly to enhance the group cohesion.

The 2000 course programme was very similar to the 1998 edition, with only minor changes made to the list of guest speakers and the inclusion of a couple of new topics. The programme covered two main themes: electronics for fishing operations, and fishing vessel management.

A total of 13 sessions on electronic aids took place. A wide range of equipment was introduced to trainees, sometimes in detail: ARPA (Automatic Radar Plotting Aid) radar, GPS/plotter, GPS, weather fax and Sea Surface Temperatures (SSTs), Inmarsat C, EPIRBs, vessel

monitoring systems (VMS), and echo sounders. Those sessions were covered by Simon Reid (Head of School) and Bill De Beer, using the School's two bridge simulators (only one simulator was available in 98).

The theme "Fishing Vessel Management" was divided into 4 areas:

- ☞ Introduction to computers (not one trainee had touched a computer before the course!): this was a basic introduction to the keyboard, Microsoft word (typing a letter, doing basic layout), e-mail and Internet (exercises on how to access relevant information on the web). All participants enjoyed and benefited from this part of the course. A couple of them left Nelson with the intention of persuading their boss to buy a computer for their vessel!

- ☞ Vessel economics (SPC software): these sessions were run by Alastair Robertson, using the SPC software for vessel economics. This part of the course was again very popular. The software had been developed for the 1998 course but at that time it was not working properly. This

time, the software was working perfectly and proved very useful in getting the trainees to understand the financial management of a fishing vessel.

- ☞ Organisation and planning: this included several sessions on vessel turn-around, fuel use and costs, port infrastructure (visit to Nelson's fishing port), tuna longlining, fish handling and quality control, tuna grading and marketing, using Sea Surface Temperatures (SSTs) for fishing, and crew management. Most sessions were covered by guest speakers, including Talbot Murray (NIWA, for SSTs), John Cleal (Fleet manager of Amaltal Co.), and Charles Hufflet (Manager of Solander Fishing Co.). Most presentations were extremely relevant and interesting.

- ☞ Compliance and Protocols: some drier topics were covered there, with International Maritime Law, Safe Ship Management systems, HACCP (introduction), and Insurance.

On the last day of the course, the trainees were asked to formally evaluate the course. In addition,



a debriefing session was conducted with all New Zealand School of Fish-ing tutors who had been involved in the course. A few important points came out of these evaluations, including the decision to run a third regional course in 2001. It was

also decided that the course duration will be increased to three weeks, with the additional time used to expand the sessions on computers and tuna handling and to carry out more site visits. Overall, I believe this second regional course was a success.

The twelve skippers have gained lots of new ideas and knowledge about electronic aids and the management of a fishing vessel. Their challenge will be to apply some of these ideas to make their vessel more profitable.



■ REEF FISHERIES AND MANAGEMENT SECTION

In Thailand

Pierre Labrosse, the Reef Fisheries Management Adviser participated in the 'Aquaculture in the Third Millennium' Conference organised by NACA, FAO and the Department of Fisheries of Thailand, held in Bangkok from 21 to 25 February. The Pacific Islands were well represented at this conference since in addition to Teriihaurora Luciani and Pierre Labrosse from SPC, Mafi 'Akau'ola of the Kingdom of Tonga, Esaroma Ledua of Fiji and Edwin Oreihaka of the Solomon Islands also attended.

This meeting brought together more than 400 people. Johann Bell (ICLARM), gave a presentation on the status of aquaculture in Pacific Island countries, that he had written together with Tim Adams and Pierre Labrosse. During this conference, a meeting was organised by NACA to discuss co-operative actions between NACA and Pacific Island countries, particularly as part of the projects conducted by APEC.

Conditions seem now to be ripe for beginning more formal co-operation between NACA and the Pacific Island countries. The Director of NACA highlighted the favourable conditions for aquacultural development that exist in Pacific Island countries and emphasised the availability of appropriate sites, free of diseases and viruses, which had

Aquaculture Development Beyond 2000

The first major international Conference on Aquaculture organised by FAO was held in Kyoto, Japan in 1976. The Conference adopted the "Kyoto Declaration on Aquaculture." In February 2000, some 540 participants from 66 countries and more than 200 governmental and non-governmental organisations participated in the "Conference on Aquaculture in the Third Millennium" in Bangkok, Thailand. This conference was organised by the Network of Aquaculture Centres in Asia-Pacific (NACA) and the FAO and hosted by the Government of Thailand. Additional support was provided by the European Union (EU), the Australian Agency for International Development (AusAID), the Canadian International Development Agency (CIDA), the Danish Centre for Environment and Development (DANCED), the Department of Agriculture, Forestry and Fisheries of Australia (AFFA), the Rockefeller Brothers Fund, and the World Bank-Netherlands Partnership Program.

Throughout 1999, NACA and the FAO facilitated the preparation of reviews on aquaculture developments in Africa, Asia, Europe, Latin America, North America, the countries of the former USSR, the Near East, and the Pacific Island nations and held expert meetings to consider major trends in aquaculture development. Fourteen Thematic Reviews on selected aspects of aquaculture were promoted and eight overviews on key issues were prepared for presentation and discussion at the Conference. All participants to the Conference received extended summaries of all material prepared. Twenty plenary presentations and discussions, and 12 workshop sessions facilitated by expert panels enabled participants to discuss and prioritise major issues and strategic actions for follow-up.

Major themes discussed included policy-making and planning for sustainable aquaculture development (covering food security and poverty alleviation, rural development, stakeholder involvement, incentives, and legal and institutional frameworks); technological and R&D priorities (including systems/species, genetics, health management, nutrition/feeding, and culture-based fisheries); human resource development; international trade; product quality, safety and marketing; regional/inter-regional co-operation; financing; and institutional support.

Against this background, the Conference participants discussed priorities and strategies for the development of aquaculture for the next two decades, in the light of the future economic, social and environmental issues and advances in aquaculture technologies. Based on these deliberations, the participants adopted the Bangkok Declaration and Strategy for Aquaculture Development Beyond 2000. The Conference encouraged States, the private sector and other concerned stakeholders to incorporate in their strategies for aquaculture development the key strategy elements identified during this Conference.

The proceedings of the Conference, including global and regional reviews on trends in aquaculture development, thematic reviews, keynote addresses and other invited presentations will be published by NACA and FAO. NACA and FAO acknowledge all individuals and agencies who assisted in the conference process.

(Source: NACA)

potential for developing products with a “green” label. The next Heads of Fisheries Meeting will provide an opportunity to

assemble all the interested parties to discuss opportunities for collaboration and possible activities to be implemented to further

the development of aquaculture in the region.



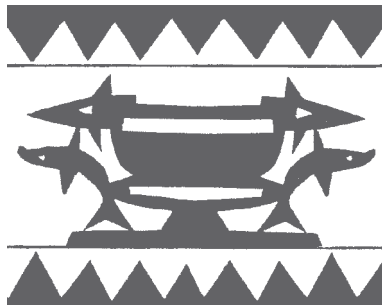
In Solomon Islands

Being Yeeting, Integrated Fisheries Management Associate, was engaged in a consultancy with the Asian Development Bank from 29 January to 17 March 2000.

The underlying objective was to provide a strategy for controlling the Live Reef Fish Trade (LRFT) industry in Solomon Islands to ensure its sustainable development.

The work involved conducting an assessment of the socio-economic, environmental, policy and institutional issues relating to LRFT; designing a Global Environment Facility (GEF) project component covering development and the implementation of a comprehensive plan for managing and regulating the LRFT; and building the national, provincial and local institutional and human resources capacity to implement the plan.

For the engagement, Being carried out a series of field visits to former and new potential sites for LRF operations and conducted interviews and briefings with government and non-government department officials, local fishermen, community leaders and industry representatives.



These were important to gain perspective of:

- a) the present status of the live reef fish resources;
- b) the cultural values and priority concerns with regard to marine resource management;
- c) the use and ecological validity of community-based traditional marine tenure systems;
- d) perceived barriers to the sustainable harvest of fish species of great importance to the communities; and
- e) the need and potential for establishing demonstration sites to test sustainable harvest techniques and management strategies.

Findings from the site visits and various interviews were further examined and discussed during a week-long participatory workshop with representation from four government ministries, four international NGOs (The Nature Conservancy (TNC), World Wildlife Fund (WWF), International Marinelife Alliance (IMA) and World Resource Institute (WRI)). A local NGO (Solomon Islands Development Trust), several paramount chiefs from various large island areas, and industry representatives were also present.

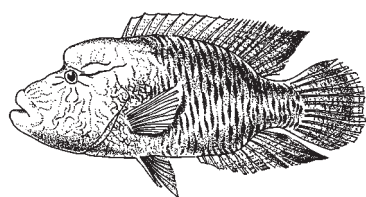
A full report of the findings and recommendations from the short study has been submitted to the Asian Development Bank (ADB) and may be later released as a SPC Technical

Report if ADB approves. A summary of the main findings and important issues from the study are described below.

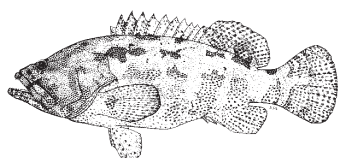
1. The LRFT industry has two main components, the first is the Live Reef Food Fish (LRFF) component that is dominated by the Hong Kong market and has an estimated retail value of about US\$ 1 billion per annum. The second component is the Aquarium Fish (AF) which is dominated by the US market and has an estimated annual value of US\$ 2 billion.
2. The two main threats to coral reef ecosystems that are related to the LRFF and AF trades include: a) the use of destructive fishing methods that mostly use cyanide; and b) the fishing of spawning aggregations of coral trouts and groupers. At present, destructive fishing does not seem to be actively practised in the Solomon Islands, but targeting spawning grounds has been a common practice that needs to be managed and controlled to avoid the demise of coral trout and grouper stocks.
3. The LRFF Trade started in Solomon Islands in 1994 with a company based in Hong Kong, called *Ika Holdings Ltd* that later became *Asian Pacific Import and Export Ltd*, and later again became *South Pacific Live Reef and Marine Products Ltd*. It started in Vella La Vella in the Western Province, and expanded into Marovo Lagoon, Roviana Lagoon

and later to Ontong Java. The LRFF target species include the coral trouts: *Plectropomus areolatus* and *P. leopardus*; the flowery grouper *Epinephelus fuscoguttatus*; the camouflage grouper *E. polyphemus*; and the maori wrasse *Cheilinus undulatus*. These were bought from local fishers by the company at a price of S\$5.50 per kg in 1997. In 1997 the total LRFF export was 33 tons. The flowery grouper dominated this, making up 53%, the camouflage grouper made up 23% and the coral trout 21%.

4. The Aquarium Fish (AF) trade also started in 1994 under a company called *Solomon Island Marine Exports* (SIME) which later gave rise to a separately managed company called *Aquarium Arts Solomon Islands*. Although the two companies have separate licences and facilities, they work closely together and export to the same buyer in the US, *Aquarium Arts Los Angeles*. For the AF Trade, at least 100 fish species are usually targeted. These include clownfish, tangs, gobies, damselfishes, wrasses, blennies, angelfish, triggerfish, pufferfish, and eels. In addition,



Cheilinus undulatus



Epinephelus fuscoguttatus

invertebrates, corals and live rock also form part of the regular exports. Most of the fish species are bought from local collectors at a price ranging from S\$2-4 per individual fish. In 1999 a total of about 148,000 pieces were exported.

5. The present LRF trade (both food fish and aquarium fish) in Solomon Islands has been operating without any management controls or proper monitoring. These are essential to ensure the sustainable development of the industry and therefore should be developed as soon as possible.

6. There is presently a weak and unclear government fisheries policy concerning fisheries development in general, despite the government's intentions to develop the fisheries sector. Effort is urgently required to strengthen this policy area to build strong supports for the overall sustainable development of fisheries activities that would maximise benefits from marine resources and provide income-generating opportunities to local rural communities. All government policies need to be properly co-ordinated to avoid conflicts of interest between government departments. The Foreign Investment Policy and the Fisheries Policy are two examples of government policies that need better integration and co-ordination.

7. The legal framework and support for managing Solomon Islands' fisheries resources exists under the new Fisheries Act 1998. It clearly points out the importance of sustainable utilisation of fisheries resources and the need for management. These however need the further development of

regulations to provide a more effective and more specific control of the fisheries resources that need it. The regulations for the LRFF trade are currently under preparation. However there is no present consideration for preparing regulations for the aquarium trade.

8. The local NGOs have worked considerably with local communities. Although most of their experience is land-based, their good relations with the local communities are very important and should be made use of in any future LRF community-related activities, especially awareness training for the management plans and regulations.

9. The LRFF operators feel that they were treated unfairly when the moratorium was introduced in early 1999. They strongly feel that they have been helping the local rural fishing communities in providing an alternative means of earning an instant income. They say the rural communities were happy with their deal until the Fisheries Division came in. The fish-handling methods taught to local fishers by the live fish operators are questionable, especially with the still-quite-high mortality of 30 to 40% experienced throughout the operations. This can be lowered by providing training in the best handling practices for live fish.

10. The general feelings of the fishing communities with regard to the LRFF are varied. In Marovo Lagoon, fishers wanted the moratorium to be lifted so they can restart selling their fish to the live reef fish operators. The communities in Roviana Lagoon were not worried

about the moratorium since they saw the LRFF trade as just another income-generating activity. They also believe that the intention of the Fisheries Division in putting up the moratorium is to help them find ways to improving their fish resources and therefore is a positive step. In Ontong Java, fishers did not like the market arrangements demanded by the live reef food fish operators, so they chose not to participate in the trade. However, due to the remoteness of the atoll and high population growth they are seeking income opportunities, and are interested in starting their own community-based operations that would be managed and controlled by the village itself. They seek assistance to start such enterprises.

11. The Aquarium Fish Trade is presently uncontrolled and is expanding. The main limitation at the moment is the amount of available air cargo space for shipping fish and the lack of good international air connections to the US market. Approximately 50% or more of the aquarium fish and invertebrates come from the Nggela Islands, about two hours by small boat from Honiara. Local village divers (non-scuba) collect the aquarium fish and invertebrates using barrier and scoop nets. The collectors then transport them to Honiara where the aquarium fish companies are based. The company sorts them and stores them in their facilities. It then organises the packing and air shipment to the US overseas market.

12. The local aquarium companies intend to begin collecting fish using scuba, to

enable them to get the deeper, more valuable aquarium fish species. They are however aware of the dangers of using scuba in rural village communities and are making sure that dive safety facilities, dive safety training and awareness programmes are properly designed and available, before they introduce the new method.

13. Coral farming is a potential option for generating income for rural communities in the future. It potentially provides an environmentally friendly approach to the harvesting and sale of corals. This is likely to become very important if the United States proceeds with the ban on the sale and importation of wild live corals into the US.

14. There seems to be good potential for collecting reef fish larvae from the wild and rearing them in tanks for the aquarium fish trade. This is being investigated by the ACIAR-funded project based in Nusatupe off Gizo. The potential for using the same principal for the live reef food fish trade does not look as good, but the project is still very much in its early stages.

15. A development and management plan for the Live Reef Food or Aquarium Trade in Solomon Islands currently does not exist and is urgently needed. Some minimum guidelines for a development and management plan have been prepared. The LRF trade also needs to be monitored carefully. A monitoring programme is proposed that collects data and information on fishing activities at the resource-owner level as well as data at the buyer/exporter level. The information is necessary in order to better understand

the industry and refine management decisions.

16. The cultural and socioeconomic environment within Solomon Islands is so diverse that considerable care must be taken in formulating LRF regulatory mechanisms for any particular province or even village. This means that there cannot be any one common overall development and management plan for Solomon Islands, but rather a number of them, designed to fit the specific areas they relate to. Various parts of the LRF trade need to be looked at in order to develop a long-term sustainable industry that maximises benefits to the local resource owners. These are noted herein, and have been built into the components of the proposed project:

- a) an assessment of LRF resources, including identification and monitoring of spawning aggregations, and establishment of a network of 'no-take' areas to restock 'take' areas;
- b) cost/benefit and market analysis of the LRF Trade;
- c) capacity building for LRF management and monitoring, including building a stronger policy base through government avenues and stronger site-based compliance which builds on and links traditional management practices and conservation science as relevant for the LRF Trade;
- d) training in best practices for LRF operations; and
- e) a LRF trade awareness programme.



■ SHARK CARTILAGE: FALSE HOPES

Sharks can have cancer, too. Researchers from John Hopkins (Baltimore) and George Washington (Washington D.C.) Universities have recently observed benign and malignant tumours in several of these fish and their close relatives. This discovery, which was announced at the annual meeting of the American Association for Cancer Research (AACR), is raising quite a stir among those companies which market shark cartilage for therapeutic purposes.

By applying strict diagnostic criteria to data from the Registry of Tumors in Lower Animals at the National Cancer Institute, these scientists were able to identify 40 cases of chondroma and chondrosarcoma, respectively benign and malignant cartilage disorders, in sharks and related fish such as rays. "Sharks are being killed for their cartilage due to a mistaken idea," announced Gary Ostrander, a member of the team and professor of biology and

comparative medicine at John Hopkins University. "Not only does this give patients false hopes for recovery but it also removes a higher level predator from the ecosystem."

Nevertheless, the American researchers did not reject the possibility that shark cartilage could some day provide valuable substances against cancer. They also admitted that 'folk' medicine sometimes offers interesting solutions to biomedical sciences. But for the time being, there is no evidence that shark cartilage has any effect on tumour development.

In fact, several factors are the basis of this myth. It is true that sharks seem to have a lower cancer rate than other animals. But for Gary Ostrander and his colleagues, this protection should be attributed to their isolation. Located far from human activities, they are less exposed to carcinogenic pollutants.

Adepts of cartilage extract have also stressed certain scientific results. All attempts to develop tumours in sharks in the laboratory have, in fact, failed. "However, attempts have also failed on other fish which frequently develop cancer in their natural habitats," pointed out Gary Ostrander. Another argument is the early interest of oncologists for cartilaginous tissues. Specialists rapidly took an interest in the inhibition of angiogenesis, i.e. the ability of tumours to encourage the growth of new blood vessels. For that reason they turned to cartilage, a tissue which is poor in blood vessels. "All these tissues have their own anti-angiogenesis factors," explained Gary Ostrander. "Shark cartilage has them as do people or chickens. But it does not in no way appear to be the panacea for anti-cancer treatments [sic]."

(Source: *American Association for Cancer Research*)



■ STARKIST PROPOSES NEW PLANT IN SAMOA

American Samoa's largest tuna cannery and a commuter airline are seeking approval to expand their operations into nearby Samoa. *StarKist Samoa*, the territory's largest employer, wants to build a fish processing plant in the coastal village of Asau on the Samoan island of Savaii, general manager Phil Thirkell said.

The new plant would process albacore, freeze it and ship it to American Samoa for canning and exporting. The plant would employ about 1,700 people. Samoan fish workers regularly sell their catch to the American Samoa canneries.

Thirkell said StarKist is not seeking to move all its opera-

tions to Samoa. He said establishing operations in Samoa may take years but ultimately will increase the tonnage of fish processed at the American Samoa plant. "The plan is to utilise the resources there to support the local StarKist operation," he said.

Labour costs also are a factor. Minimum wage in the American Samoa cannery is US\$3.27 an hour, while the minimum wage in Samoa is 35 cents.

Simultaneously, the commuter airline Samoa Air is seeking Samoan government approval for landing rights at the Asau Airstrip. If that application is granted, Samoa air will start

charter flights from Pago Pago International airport to the airstrip, said Billy Meredith, Samoa Air's station manager in Samoa's capital of Apia. Meredith said the charter flights would serve the needs of StarKist Samoa as it moves into the area. The market is not good right now for regularly scheduled service, he said.

If the Samoa government grants Samoa Air's application, that paves the way for setting up immigration and customs services in Asau and for declaring the airport an international port of entry from American Samoa.

(Source: *The Honolulu Advertiser*, 29/4/2000)



■ NEW FISH MARKET OPENED IN MAJURO

The opening of Marshall Island Marine Resources Authority's (MIMRA) new outer islands fish market centre in Majuro, brought President Kessai Note, top government leaders and many in the private sector to witness the event.

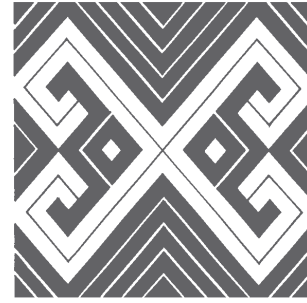
Japan's Overseas Fisheries Cooperation Foundation (OFCF) was praised for its support of the new market and the overall Republic of the Marshall Islands (RMI) outer islands fisheries strategy into which the new markets fits. Japan's Chargé d'affaires Takashi Suzuki said that the OFCF-MIMRA co-operation in this fisheries project was having a "direct, positive impact on people in the Marshall Islands."

"OFCF's assistance in 'capacity building' for fisheries staff and outer islands fishermen is an important step in the direction

of self-reliance for the RMI." Suzuki added.

Resources and Development Minister John Silk recognised the Japanese government, OFCF, and the Japan International Cooperation Agency for assistance in developing fisheries programmes to benefit people on the outer islands.

The new market, which is located lagoonside of the Ministry of Resources and Development, is part of a larger project involving OFCF and MIMRA, aimed primarily at the outer islands of Aur, Jaluit and Mili. A training vessel, *Lentanir*, and smaller fishing vessels are being provided to fishermen from these islands to spur exports of fish from these islands to the Majuro market, he said. One aspect of the project is to train local fishermen in deep sea bottom fishing techniques.



"We all know that some deep sea fish types have high value in foreign markets, particularly in Hawaii and Japan," he said.

"If the project proves that such fish types are available and abundant, it will open a much greater opportunity for our fishermen, especially in the outer islands, to earn higher income."

(Source: *The Marshall Islands Journal*, 24/3/2000)



■ MAJURO EYED AS A TRANSSHIPMENT HUB

A Taiwan businessman is proposing to establish a major shore-side repair and service facility for fishing vessels that would cement Majuro's role as a transshipment centre in the central Pacific.

Officials in Majuro expressed strong support for the investment plan of Koo Kwang Ming, a Taipei-based businessman who has already invested more than half a million dollars in the Bank of Marshall Islands.

Marshall Islands Marine Resources Authority (MIMRA) director Danny Wase said that "diplomatic ties with Taiwan have played a great role" in Koo's interest in developing major fishing service and maintenance facilities in Majuro and the overall boom of Taiwan fish-

ing vessels using Majuro to transship tuna. Of the 266 purse seiners that visited Majuro in the past year to transship their tuna catches, 172 (65 percent) were Taiwanese, according to Wase.

Koo, who heads the Taipei-based *Koo Holdings Co. Ltd.*, and owns five purse seiners, said he wants to make Majuro the home port for his fleet. He was in Majuro late last week meeting with government leaders and fisheries officials about his plan.

Koo said he wants to invest in a net repair and salt storage facility in Majuro. These two are critical to the operation of the huge purse seiner fleet operating in the central Pacific, services for which the boats now must travel to Guam and Fiji.

Koo said that this facility would bring many vessels to Majuro, establishing the Marshall's capital as a centre for transshipment. The government's Resources and Development Minister John Silk, who met with Koo, said he supported the Taiwan businessman's plans.

"He wants to make Majuro a transshipment hub for the Pacific," Silk said. The Marshall Islands earned US\$5.4 million from the transshipment operation, said Silk. "Two things will keep the transshipment operation going in Majuro," Silk said. If the fish are near the Marshalls and if Majuro has infrastructure to service the fleet, transshipment will grow", he said.

Koo said that purse seiners would prefer to use Majuro for

repair, if the facilities were here, because it will cut many days off their travel time away from the fishing grounds, resulting in significant cost savings to the fishing companies. "Other fishing companies would use Majuro if the service was available," he said. He described Majuro's transshipment centre

potential as a tremendous opportunity for the new government to bring benefit to the Marshall Islands.

Koo indicated that he was hiring a local lawyer to assist him with the needed foreign investment requirements and to identify land for the facilities.

Wase said that MIMRA was assisting Koo to search for a suitable location for the proposed facility. "Net repair and salt storage is a major need," Wase said.

(Source: *Marianas Variety News*, 21/1/2000)



■ FSM GETS US\$ 2.8 MILLION AID FROM JAPAN

Japan is providing the Federated States of Micronesia US\$ 2.8 million in technical aid for a three-year project to train fishermen and seafarers of the FSM. The three-year co-operation will begin on the 1 August at the FSM Fisheries and maritime Institute in the State of Yap.

The Institute is organised under the auspices of the college of Micronesia-FSM, established to train Micronesians in obtaining international qualifications for fishermen and seafarers.

This is the first time that the Japanese government will engage in large-scale technical co-operation to FSM, according to Larry Raigetel, deputy assistant secretary for Asian Affairs. The Japanese Implementation Study team organised by the Japan International Cooperation

Agency visited the FSM in February 2000 to work out the details of the fishery training programme project. As a result, the team and the FSM agreed to start the project.

Ieske K. Iehsi, deputy secretary of the Department of Foreign Affairs; Susan J. Moses, president of the College of Micronesia - FSM; and Kano Yoshiaki, Implementation Study Team leader signed the Record of Discussion for the project in March at Palikir.

To strengthen the Institute, four Japanese experts will be sent to the Institute for three years, and six to eight Micronesian counterparts from the Institute will go to Japan to upgrade their teaching skills, according to Mathias Uwermai, executive director for the Institute.

Japan will provide the equipment to implement the training, said Raigetel.

Trainees will be selected from all states of the FSM. The Institute trains students who have completed at least the ninth grade and those already working as fishermen and seafarers. There are big potentials for fishing in the FSM, however, the FSM lacks qualified fishermen, said Raigetel.

As a result, many foreign fishermen are employed aboard FSM's fishing vessels instead. The project is expected to produce qualified fishermen and generate job opportunities for young Micronesians.

(Source: *Marianas Variety News*, 20/3/2000)



■ KIRIBATI LICENSES SPANISH FLEET IN ITS EEZ

A taste of Spain has been netted by Kiribati in the way of the first fishing licence issued to a European fishing organisation by a country belonging to the 16-member Forum Fisheries Agency (FFA). The Kiribati government has allowed up to 14 Spanish purse seine vessels to fish in the country's 1 million square mile exclusive economic zone (EEZ) for 12 months, beginning last October. Kiribati says the agreement will be

renewed if the Spanish, who in other parts of the world have a dodgy reputation, stick to the terms of an agreement signed in September 1999 with a fishing association, the *Organizacion De Productores Asociados De Grandes Atuneros Congeladores (OPAGAC)*.

The Spanish have apparently agreed to pay more for their licence than the Asians, mainly Japanese, Taiwanese, China and Korean boats licensed under FFA rules.

According to Kaburoro Ruaia, secretary for Natural Resources Development, the total revenue from the agreement will be "in excess of 6%" of the catch value. Current agreements bring FFA members only 4-5% of the catch value. Japan, in particular, resists requests for a 6-7% cut of a total catch estimated by FFA to have had a value in 1998/99 of about US\$2 billion.



Asian countries and United States fishing boats have had the central and western Pacific tuna fishery, the world's biggest, to themselves since heavy exploitation of it began in the 1960s.

With pressure on Atlantic and Indian Ocean tuna stocks mounting, the European Union in recent years has mentioned access to the Pacific fishing grounds for its tuna fleets as a reciprocal benefit for the aid it gives to Pacific Island countries.

Spanish fishing people have fished in the eastern Pacific for a long time by agreement with Panama, Ecuador and Guatemala. Mr Ruaia mentioned that some Spanish ships recently moved eastwards towards the Line islands, which form the eastern boundary of the Kiribati EEZ. Their Ecuador and Guatemala bases became too distant for them. In late 1997 OPAGAC asked for the use of Kiritimati, the largest of the Line islands, as a transshipment port.

With only one small patrol boat to cover its EEZ, and with Kiritimati more than 2000 miles from Tarawa, the Kiribati government decided that unless Spanish ships were also licensed to fish in its water, it would be impossible to allow them to use the island only for transshipment since they'd fish illegally moving in and out of port.

Kiribati's deal with OPAGAS was for economic reasons, but was within the Palau Agreement, Ruaia said. The agreement sets a limit of 205 on the number of purse seiners allowed to fish in the Micronesian region. Kiribati isn't happy with how the agreement works since it doesn't take into account the capacity of vessels or that some are too small to viably work as far eastwards as Kiribati. The Palau Agreement is to be reviewed early this year at Kiribati's request.

Ruaia said that in assessing the Spanish application Kiribati was aware that its people are almost totally reliant on fishing. Kiribati's priority is to build up its own long-range fishing fleet. Until this can be done, it is ready to issue licences to foreign fishermen who are prepared to help it develop its own fleet.

Spanish ships need to register with the FFA in Honiara, to carry the FFA's satellite monitor, to accept the presence of FFA observers for a specified percentage of trips, to transship fish at Kiritimati, and to fully comply with other minimum terms and conditions.

Ruaia said that after talks with OPAGAC, Kiribati is confident that the Spanish will eventually have "full involvement" in developing local fishing ability. Substantial shore fishing facilities are planned

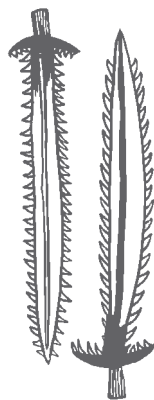
at Kiritimati by Kiribati itself. About 70 nationals have been hired for transshipment work and 14 more will get jobs aboard the Spanish vessels with room to increase the number in future. The Spanish will also invest in shore facilities. "This type of domestic development is absolutely vital to the ongoing viability of the Kiribati economy and people," Ruaia said.

Kiribati has kept the FFA fully briefed on its deal-making with the Spanish. Ideally, Ruaia said, it would have liked to wait until the completion of the Palau Agreement review and a new agreement, nearing completion, for a Pacific international seas area fishing agency. "However Kiribati has vital short-term economic imperatives to meet and already the discussion with OPAGAC has been for almost two years.

"To wait for too long would mean foregoing additional licence revenue badly needed to balance the government's budget." Past fishing licence revenue has been more than half the US\$30 million plus annual Kiribati budget. In 1998, fees from the United States, Japan, Korea and Taiwan boats exceeded US\$25 million.

Since the OPAGAC deal will bring better returns than from most traditional fishing partners individually, the deal with the Spanish is desirable, Ruaia said. "While the present agreement is for one year only, its extension will be dependent on OPAGAC's performance in honouring its commitments, as well as its ability to make further improvements on the present terms and conditions."

(Source: *Islands Business*)



■ AUSTRALIA RESTRICTS FINFISH IMPORTS FROM THE PACIFIC

The Australian Quarantine and Inspection Service (AQIS) has placed new quarantine regulations for imports of finfish products from the Pacific region. The new restrictions came into effect in 1999.

A press release issued by AQIS said, "fresh or frozen finfish such as tuna, kingfish, coral trout, cod, snapper, Spanish mackerel, bream, dory, grouper, parrot fish, emperor and sea perch for non-commercial use are allowed into Australia provided the fish is accompanied by the person importing it, the consignment does not exceed three kilograms and the fish is gutted." For unaccompanied

consignments and consignments greater than five kilograms, commercial import conditions must be met.

These involve certification that confirms the fish meets Australia's import requirements, and a permit that allows entry of the product. AQIS Sydney Airport Manager Erik Lielkjis said over the past few months a large number of consignments of ungutted fish brought in by passengers have been seized.

"There are no treatment options or storage facilities for ungutted fish, which unfortunately has to be destroyed. If a consignment is greater than five kilograms, it

must be accompanied by a quarantine entry or import permit," Lielkjis said.

"One passenger arrived with 60 kilograms of fish without official certification. As you can imagine, he wasn't happy when told he couldn't bring the fish in.

"AQIS protects Australia from exotic pest and diseases and because we are free from many of the pests and diseases that affect other parts of the world, we have to maintain that freedom by restricting or regulating imports such as finfish," Lielkjis said.

(Source: Pacnews)



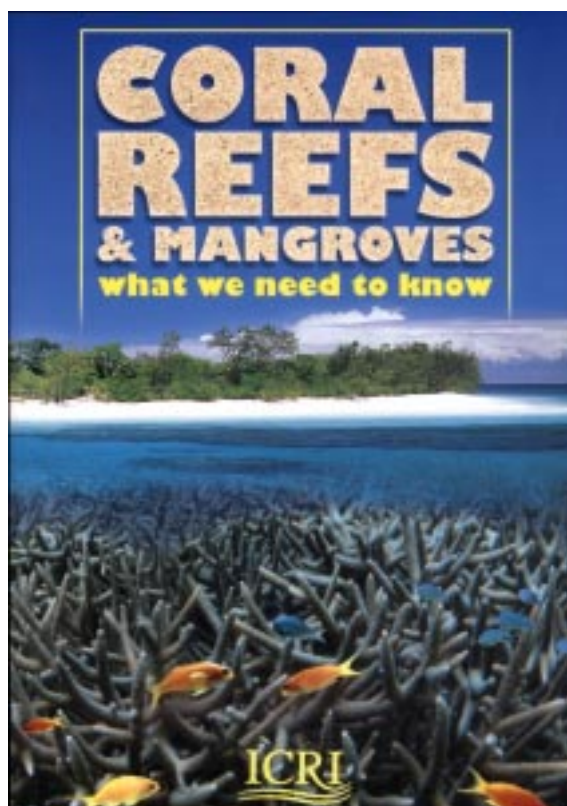
■ BOOKLET ON CORAL REEFS AND MANGROVES NOW AVAILABLE

At the occasion of the ICRI conference in May 2000 in Nouméa, the Environmental Awareness Centre of New Caledonia published a booklet entitled *Coral Reefs and Mangrove Swamps – what we need to know*.

This booklet has been inspired by a document published by SPREP on coral reefs in the Pacific. Its objective is to inform and sensitise the populations of the Pacific on the richness and fragility of coastal environments. One notices that the deterioration of these environments is often due to ignorance rather than malevolence. This booklet therefore provides an illustrated overview of life on the reef and in the mangrove swamp and gives some advice on how to behave in these environments.

It is available in English and French at SPC. The person to contact is:

The Distribution Assistant
SPC, BP D5, 98848 Noumea Cedex
New Caledonia
Fax: +687 263818
E-mail: IdaT@spc.org.nc



■ JAPAN GRANTS KIRIBATI US\$ 4.5 MILLION IN FISHERIES AID

The Japanese Government has signed an agreement to provide US\$5.4 million to develop the fisheries sector in Kiribati. The agreement was signed by the Japanese Ambassador, Hisato Murayama and Kiribati's Acting Deputy Secretary for Foreign Affairs, Elliot Ali in the capital on 9 March 2000.

The project involves the integration of Te Mautari Limited (TML) and the Outer Islands Fisheries Project (OIFP) which are two of the four industrial fisheries companies in Kiribati.

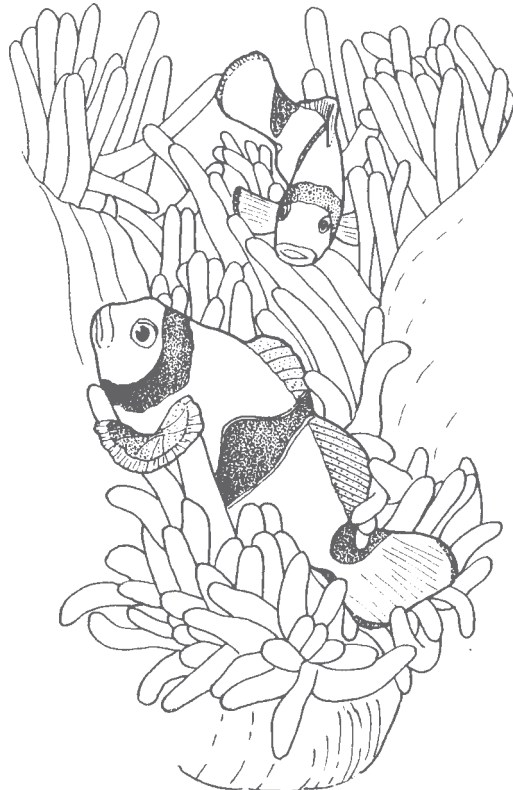
TML was established in 1981 to develop offshore tuna fisheries and improve fish exports while OIFP was established to cater for the local fish demand in Tarawa.

A statement from the Suva-based Japanese Embassy said Japanese help was sought by the Kiribati Government which saw an increasing need to integrate the two companies to help improve fish exports and local fish supply. Under the funding agreement, a new facility will be built in Betio.

It will include a new processing centre, ice making/storage facilities, freezing plant, fish product preparation room, fish retail shop, machinery and maintenance rooms, and offices. Machinery, equipment and furniture will also be provided under the grant.

Murayama said the development of an efficient and effective fisheries foundation would help the Government of Kiribati to harness the economic power of its fisheries industry.

(Source: *Marianas Variety News*, 9/3/2000)



FISHERIES DEVELOPMENT SECTION EXPLORES NEW TECHNOLOGIES ON A TONGAN LONGLINE BOAT, F/V *KYLIE*

Background

In mid 1999 'Alatini Fisheries Company Ltd (Tonga) were in the process of acquiring a newly reconditioned 18-m longliner from New Zealand. Bill Holden, one of the principals at 'Alatini and captain of the new boat, F/V *Kylie*, wanted some technical assistance from one of SPC's Fisheries Development Officers.

To obtain this assistance, Bill organised an official request from the Government of Tonga to the Director-General at SPC. He had also been in contact with an Australian company, CLS Australasia (contact details at end of article), that produces an altimetric fish-finding map.

*by Steve Beverly,
Fisheries Development Officer
Secretariat of the Pacific
Community*

The company wanted to trial the map on a longline boat somewhere in the Pacific. Bill had an arrangement whereby CLS would provide the services free for a one- or two-month period. As it turns out, similar, but less precise information can also be found on the Internet (address at end of article).

Altimetric maps show anomalies in sea-surface height. These allow for predictions of currents, eddies, and temperature fronts—all-important indi-

cators of spots likely to be good for tuna fishing. Altimetric maps have proved to be valuable for surface fisheries such as the purse-seine fishery in the Indian Ocean and the albacore fishery in the Atlantic, but not yet for tuna longlining.

At about the same time that dialogue was going on between 'Alatini, CLS, and SPC, the Fisheries Development Section purchased two sets of Vemco Minilog (contact details at end of article) temperature/depth recorders (TDRs). TDRs, often called mini-loggers, are attached to the mainline of a longline and record temperature and depth at set intervals.

The data are later downloaded onto a computer and can be viewed as a graph. The graph provides the longline skipper with valuable feedback about what his line was doing while it was fishing. It was decided to use both new technologies during the technical assistance project in Tonga. Although this was just a brief look at the use of alti-



F/V *Kylie*

metric maps and TDRs, they both seemed to be of value in enhancing tuna longline catches.

Knowing where to fish

At the beginning of a fishing trip, longline fishermen have to decide which direction to go and where to begin fishing. This decision is usually based on where they fished during the last trip, where the rest of the fleet is fishing, and where there were historical catches for the season.

Typically, longliners set their line following some type of geographic feature on the chart such as contour lines (1,000 or 2,000 m lines) or near seamounts. They may also rely on remote-sensing data—or satellite imagery—for sea-surface temperature and sea-surface colour, both of which may give clues as to where the fish may be. Once the boat has arrived in the general area chosen, longline fishermen have to make daily decisions on where, exactly, to set the line, and how deep to set it. They also have to decide whether or not to move each day, depending on the results from the previous set.

These decisions are based on a number of factors. Tuna and swordfish generally tend to stay within a range of temperatures; and to aggregate around temperature fronts, current convergences, eddies, upwellings, or near seamounts or undersea canyons. All available information is considered when choosing the position, direction, and depth of each set.

This may include: previous catch results, sea-surface temperature, bottom topography, current direction, bird sightings, fish sightings, bait visible on the echo sounder, water colour, proximity to reefs or land, other boats fishing in the area, weath-

er conditions, and wind and sea direction. Two important new tools that can be used by longline fishermen to decide where and how to fish are the altimetric fish-finding map and the TDRs.

Altimetric fish-finding maps

Sea-surface-temperature (SST) maps were the first satellite information used by fishermen to help locate tuna and other pelagic species. SST data are obtained by satellites using infra-red light scanners. More recently, colour maps that show concentrations of plankton have also been available. Sea-surface colour is obtained by satellites measuring visible light. Both SST

and ocean-colour maps are affected by the presence of clouds, because infra-red and visible light cannot penetrate heavy cloud cover. It is not unusual to have days or even weeks of missing SST and ocean-colour data for certain areas.

Radar, however, is able to penetrate cloud cover. Satellite radar altimetry (the measurement of sea-surface heights by satellite radar) is available even on cloudy days and nights. The altimetric maps available from CLS are made weekly (every Wednesday) and show sea-surface anomalies and associated currents for large areas of ocean or for smaller, 10° by 10° squares as requested by the user (Figure 1).

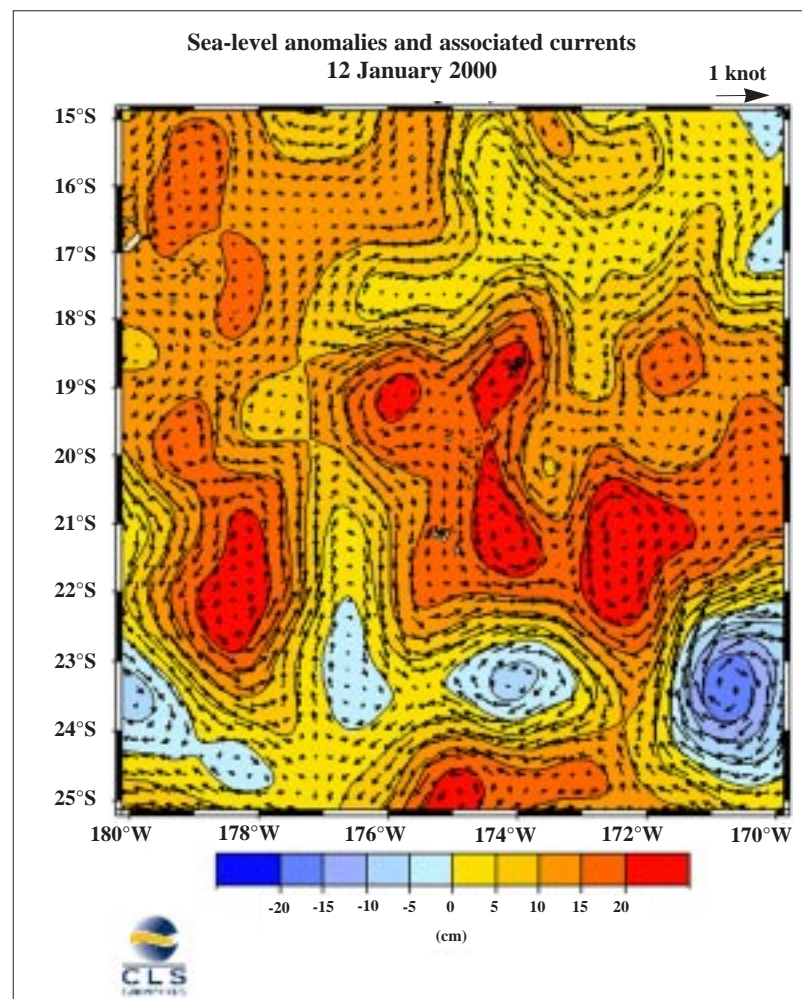


Figure 1: Altimetric map of Tonga area for 12 January 2000 (darkest areas denote areas of highest sea level amplitude)



Currents, shown on the maps by small arrows, indicate the presence of oceanic eddies and fronts. Fishermen know that eddies and fronts are often good places to look for fish. Bait species may become concentrated in these areas and the bait attracts larger fish. Altimetry is a good tool for locating eddies and fronts and for predicting surface currents.

The sea level on an altimetric map is expressed to a reference level which is zero or mean sea level. Concentric lines connect

places with the same sea level and different levels are denoted by different shades of gray on the map in increments of 5 cm.

Differences between actual sea level and mean sea level are called anomalies. Areas where the sea level is greater than the mean sea level are called positive anomalies, or 'peaks', while areas where the actual sea level is less than the mean sea level are called negative anomalies, or 'holes'. Peaks are warmer than surrounding water and holes are cooler.

Anomalies produce currents as water flows from higher levels to lower levels. Currents rotate around the peaks and holes because of the Coriolis effect. Currents are reflected clockwise in the Northern Hemisphere and counter clockwise in the Southern Hemisphere. This movement is what produces eddies (often called gyres). Frontal zones are found on the boundaries between peaks and

holes. A frontal zone, or front, is an area where the SST changes rapidly over a short distance. Both eddies and fronts are areas that longline fishermen seek, as they are known to be associated with good catches.

Temperature and depth

Longline fishermen need to know where to go to find fish but they also need to know how deep to fish their gear so they can target the right temperature and depth ranges for the target species. Different species tend to favour different temperature ranges and depths (Table 1).

There is usually quite a bit of guesswork and experimentation in setting a longline. Typically, if something does not work then the strategy is changed the next day. Boat speed, line-setter speed, number of hooks in a basket, and floatline lengths can all be varied to achieve different set depths and to target different

Table 1. Parameters for catching the four main longline species.

Species	Capture depth	Temperature range	Best baits	Season	Set/haul times (hours)
Bigeye tuna (<i>Thunnus obesus</i>)	50 to 600 m — thermocline	10 to 17°C	Saury, bigeye scad, pilchard, squid)	Winter	0400 to 0800; 1400 to 1800
Yellowfin tuna (<i>Thunnus albacares</i>)	50 to 350 m — mixed layer*	18 to 28°C	Saury, bigeye scad, milkfish, squid)	Summer	0400 to 0800; 1400 to 1800
Albacore (<i>Thunnus alalunga</i>)	50 to 600 m — thermocline**	10 to 17°C	Saury, pilchard, sardine)	Late summer, autumn, early winter	0400 to 0800; 1400 to 1800
Broadbill swordfish (<i>Xiphias gladius</i>)	50 to 150 m — top of mixed layer	18 to 22°C	<i>Illex</i> spp. squid, light sticks	Late winter and spring	1800 to 2000; 0600 to 0800

* The mixed layer is that portion of the water column where the temperature of the water remains fairly constant, or decreases gradually. It extends from the place in the water column where the temperature is 1° C less than the surface temperature, down to the thermocline. The 27° C isotherm usually marks the upper boundary of the mixed layer in the tropical Pacific Ocean. Yellowfin tuna and broadbill swordfish are associated with the mixed layer. When these fish are being targeted, the line should be set so that the hooks reach the depths of the mixed layer. The depth ranges of the mixed layer vary with latitude in the central Pacific Ocean.

** The thermocline is that place in the water column where temperature decreases sharply over a relatively small depth range. The thermocline shows up on a single vertical profile as a bend in the graph. A temperature profile is a graph showing temperature against depth for one position, for a line of position (e.g. along a line of longitude), or over a period of time. The 15° C isotherm usually defines the thermocline. Bigeye tuna and albacore tuna are associated with the thermocline.

species. Much of the guesswork can be eliminated, however, by using TDRs.

The Vemco Minilog system consists of a computer interface that connects to a computer via a serial port. It is a small box with an infrared optical link. The interface is used to initialise the TDRs, also called mini-loggers, and to read the data and transfer it to the computer after deployment and retrieval.

The mini-loggers are actually microprocessors that measure and store temperature and depth data. When the mini-loggers are activated they can be set to take a reading at a range of different times from one second to several minutes or hours. For typical longline fishing, a reading every one or two minutes is sufficient.

The mini-logger is attached to the mainline as the line is being set, exactly the same way a branchline is attached. It remains on the mainline recording data throughout the soak and is recovered during the haul.

The data stored in the mini-loggers are downloaded into a computer, then converted to a

graphic display that shows temperature and depth against time (Figure 2). For this trial, four mini-loggers were used.

This particular mini-logger (Figure 2) was set at about 0730 hours on 26 January 2000 and was hauled at about 0430 hours the following day. It initially sank to about 220 m and then rose to 110 m before descending again to 230 m. The temperature remained fairly steady at around 21–23°C.

Aside from the fact that the line was in the mixed layer and in the right place for yellowfin tuna, it is obvious that the line was affected by a current. There could have been a current perpendicular to the mainline that peaked in intensity at about 1600 hours, but was slack at 0930 hours and at 0300 hours, or the floats could have been pulled apart and then pushed back closer together by converging and diverging currents.

Mini-loggers give a detailed account of the temperature and depth reached by the branchlines throughout the entire soaking time. As an aside, they can often give indications of the time when a fish has bitten the

line. There will be a spike (up or down movement of the graph) corresponding to when the fish bit. Mini-loggers can also give information on currents (refer Figure 2).

If the line changes depth and it was not due to fish bite, then it was probably due to a change in the current around the line. A current perpendicular to the mainline would tend to make the mini-logger rise in the water column along with the branchlines and baited hooks. An increasing current parallel to the mainline would tend to cause the line to sink, or collapse. Mini-loggers can also be helpful in locating the thermocline.

The vessel, F/V *Kylie*

The vessel used for testing these technologies was F/V *Kylie* (see photo on page 20). F/V *Kylie* is an Australian-made (Tasmania) 18 m steel, forward-wheelhouse, hard-chine vessel, with the engine room aft of the fish hold.

It is powered by a single, 230 HP Fiat diesel engine and has a 50 kva auxiliary. The fishing gear consists of a Lindgren-Pitman Super Spool II longline reel with about 50 nm of 3.5 mm

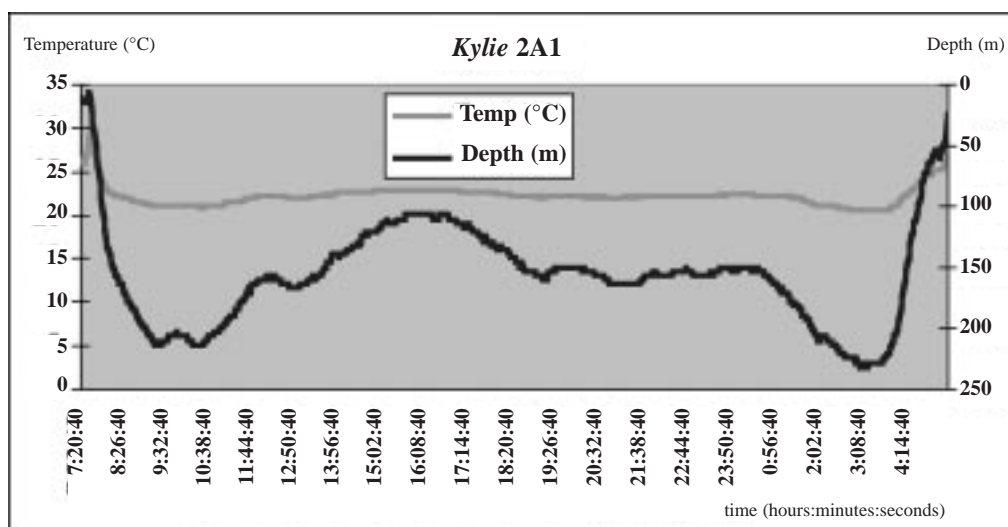


Figure 2: Depth and temperature profile over time for the first set, second trip on F/V *Kylie*

monofilament mainline and an LS-4 line setter. The reel is powered by an electric hydraulic system, with a power take-off (PTO) backup from the main engine in case of power failure.

The wheelhouse electronics consist of SSB and VHF radios, raster scan radar, echo sounder, GPS with colour plotter (including chart cards), radio direction finder, and auto-pilot. For the fishing trials, a computer and a mini-log system with four mini-loggers were added to the list of vessel electronics.

There was a full array of safety gear on F/V *Kylie* including two EPIRBs, life raft, life jackets, flares, fire extinguishers, all within the expiry date. The fish hold is a single ice hold with bins, approximately 40 m³ volume.

There are two slurry boxes on deck for pre-icing fish that hold about one tonne in total. There are five hook bins that hold a total of 1,750 branchlines, ample floats and floatlines for 1,750 hooks, and four radio buoys. The crew complement is five to seven men.

Fishing effort

Trip No. 1

F/V *Kylie* got underway from Nuku'alofa at 1900 hours on 17 January 2000, and steamed towards the north-east. Four sets were made during the week in an area roughly bordered by 20–21°S and 174°00'–174°30' W, just to the east of the Ha'apai Group. The sets were all done roughly following the 1,000 m and 2,000 m contours. On the first set the baskets' size was 25 hooks per basket. The lines were all set in the morning and hauled in the evening.

The mini-loggers revealed that the line was deeper than had been planned. Because yellowfin tuna were being targeted, the plan was to get the line into the mixed layer—above 350 m. The line actually achieved depths of 400–500 m. As it turned out, there were some unexpected bigeye lurking at those depths, so all was not lost.

In fact, two bigeye in two different baskets took hooks right next to the mini-loggers. The results were very interesting but, alas, all data from the first trip were lost after being viewed,

except for data from one mini-logger on the first set. This data was only recovered because the mini-logger malfunctioned and could not be downloaded until later, with a different computer. The graph for that mini-logger (Figure 3) revealed that the line reached a depth of 475 m and a temperature of 10°C.

Notes taken during the trials on the other mini-loggers revealed some interesting information. The two bigeye tuna ascended to 200 m after taking the hook at 450 m. Both fish were in the 30–40 kg range, both bit at about 1800 hours and both ascended from 450 m to 200 m. One fish was landed live and had stayed at 200 m until hauled. The other fish was landed dead and had sunk back down to 425 m after 15 hours, presumably after it died. The temperature at 450 m was 13°C.

The mini-loggers provided more than temperature depth data: a look at the graphs revealed when the fish were biting and how long they lived on the hook, all interesting information for a fisherman. The catch from the first set was 835 kg (126 kg albacore, 109 kg bigeye, 556 kg yellowfin, plus

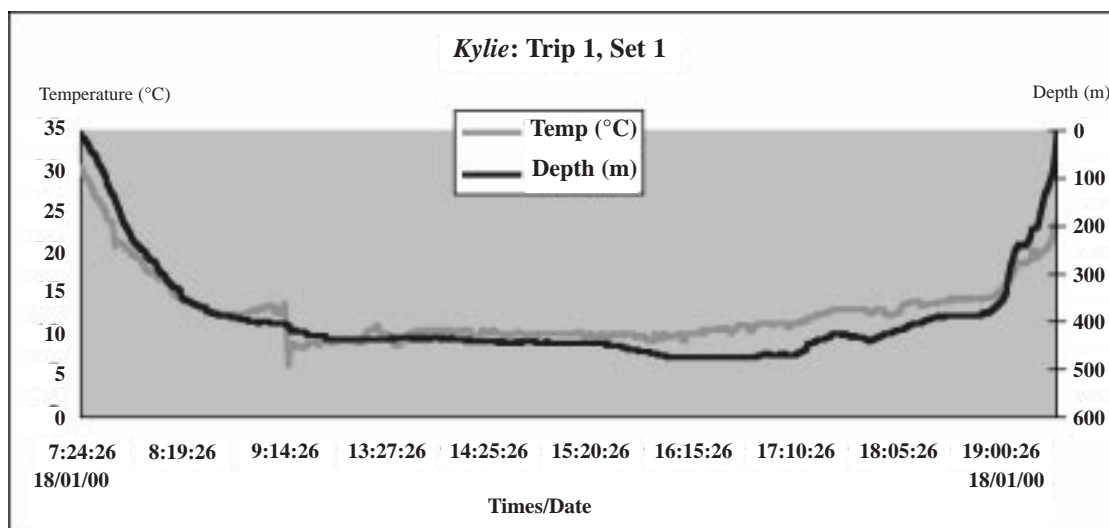


Figure 3: TDR graph for the first set of the first trip on F/V *Kylie*

bycatch) for 1,730 hooks. The resulting CPUE was 48 kg/100 hooks.

On the second set, the line-setter speed was slowed down and the number of hooks in a basket decreased to 20. The catch from this set was 688 kg of mostly yellowfin on 1,380 hooks. The CPUE was 50 kg/100 hooks. Yellowfin were found in 180 m and 22°C water and the fish were biting at 1800 hours.

On the third set, two strategies were tried. Half of the line was set with 25-hook baskets and the other half with 20-hook baskets. 1,600 hooks yielded 1,360 kg of mostly yellowfin for a CPUE of 85 kg/100 hooks. Yellowfin were found at 200 m and were biting at 1400 hours in 20–22°C water. They behaved differently than the bigeye. After biting they descended to 300 m. This could have been partly a function of currents as one mini-logger with no fish in the basket stayed at 250 m for 2 hours and then descended to 340 m for the duration of the soak.

On the fourth set, only 550 hooks were set as the boat was out of bait. The baskets were 20 hooks each. A total of 646 kg of mostly yellowfin were caught, giving a CPUE of 117 kg/100 hooks. Yellowfin were biting at 200 m and in 20–23°C water. One fish bit at 1800 hours in 200 m water and descended to 400 m. Lots of small yellowfin (<15 kg) were found between 150–250 m depth with temperatures ranging from 23–20°C.

A total of 3.5 tonnes of saleable fish were caught on the first trip on 5,260 hooks. The overall CPUE was 67 kg/100 hooks.

'Alatini's other longline boat, F/V *Akina*, was fishing 30 to 40 nm south of F/V *Kylie* during the same week. They landed

2,420 kg of saleable fish (mostly yellowfin) on 3,300 hooks. The CPUE was 73 kg/100 hooks. Basket size varied between 25 and 30 hooks.

Trip No. 2

The second trip was made during the week of 25–30 January on F/V *Kylie*. F/V *Kylie* headed for the south-eastern edge of a large positive anomaly that was approximately three degrees long and two degrees wide, with the tightest lines being on the southern and south-eastern edges. Four sets were made, the first near the south-eastern edge of the anomaly. All four sets were made in an area roughly bounded by 21–22°S and 173°30'–174°30'W.

The catch from the first set on trip two (26/01/00) was about 650 kg of saleable fish caught on 1,750 hooks in 20-hook baskets. The catch included 2 bigeye, 7 yellowfin, 13 albacore, and one 50 kg broadbill swordfish. The CPUE for this set was only 0.37 kg/100 hooks. It was decided to move north-east, closer to Nuku'alofa.

The second set, consisted of 1,550 hooks set in two styles: half the line was set with 30-hook baskets while the other half was set with 25-hook baskets. 555 kg of saleable fish were caught on this set including 10 bigeye, 14 albacore, 3 wahoo, and an assortment of bycatch. The CPUE for this set was 36 kg/100 hooks.

On the third set 1,720 hooks were set in 30-hook baskets. Catch was about 570 kg including 6 bigeye, 18 albacore, 1 broadbill swordfish, 3 wahoo, and assorted bycatch. The CPUE for this set was 33 kg/100 hooks.

The fourth set consisted of 1,100 hooks set in 25- and 30-hook

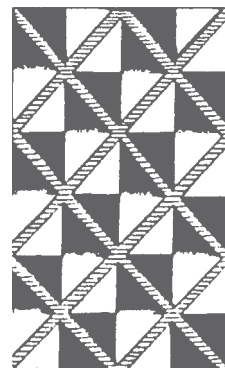
baskets. Total catch for the trip was about two tonnes. The CPUE for this trip was about 33 kg/100 hooks, a considerable drop from that the previous week (67 kg/100 hooks).

Comparing results with altimetric maps

A look at the altimetric map for 19/01/00 (Figure 4), shows a positive anomaly (20 cm higher than average sea surface height) stretching from the south-east of Nuku'alofa up to Vava'u, covering about four degrees of latitude. Just to the east of the positive anomaly is a lower area (5 cm above average) that covers only one degree of latitude and one degree of longitude and is partly encircled by the peak.

These two areas are separated by only one degree of longitude, and the area where F/V *Kylie* was fishing was right on this border. As it turns out, catch results from F/V *Kylie* were above average (CPUE of 67 kg/100 hooks for the week).

F/V *Akina* was fishing in an area roughly centred on 21°S 174°W, and had good results as well (CPUE of 73 kg/100 hooks for the same week). F/V *Akina* was also fishing near the boundary of these two areas but closer to the high (warmer) side. The predicted current in the boundary between these two areas was northerly, and that is what was experienced from F/V *Kylie*.



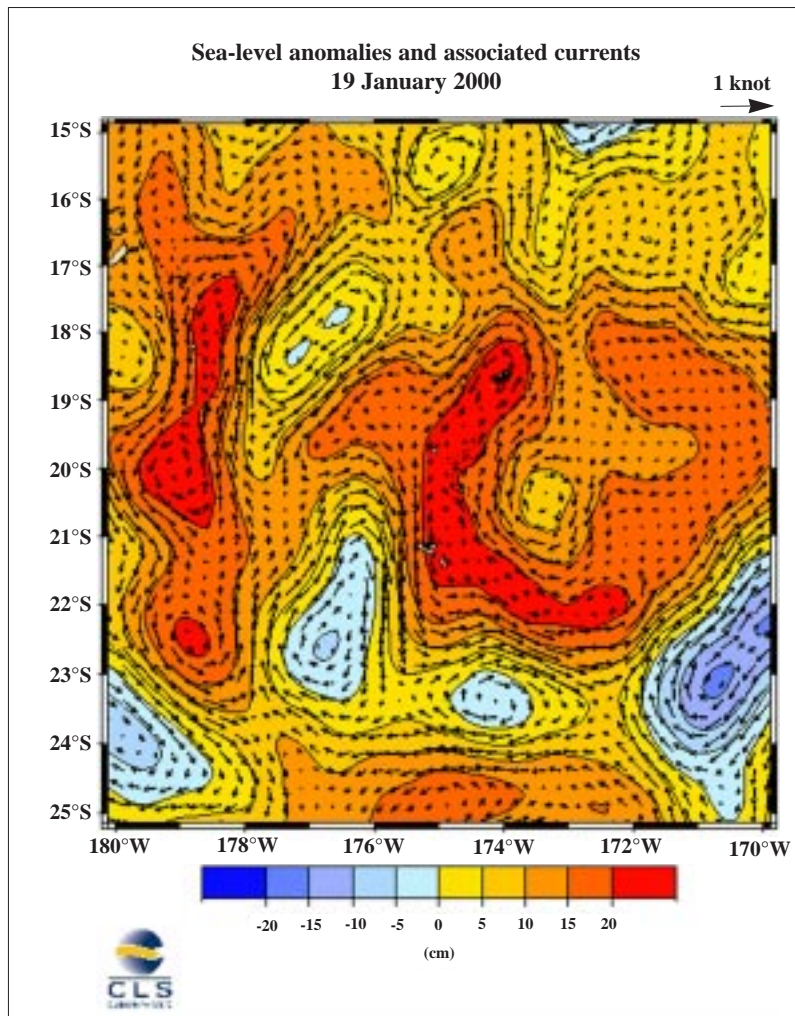
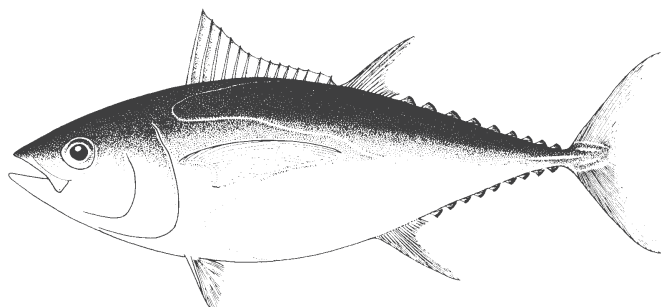


Figure 4: Altimetric map for 19 January 2000
(darkest areas denote areas of highest sea level amplitude)

As a point of reference, Tongatapu is located at about 21°S and 175°W, and shows as a white spot on the altimetric maps. Vava'u, to the north, shows as a dark spot. Another good area based on the altimetric map (Figure 4) was just to the south-west of Nuku'alofa in the area around 22°S and 175°30' W. There appears to be a frontal zone on the boundary between the aforementioned peak and the hole located at 22°30'S and 176°45'W.

Reportedly, there were some other boats fishing in this area and they were doing well, although they were targeting and catching mostly albacore tuna.

The altimetric map for 26 January 2000 (Figure 5, page 27) shows a large positive anomaly bounded by 18°30'–22°30'S and 171°–174°W. The interesting place to fish, based on this anomaly and the author's opinion would have been the south-east edge, about 22° S and 171°–172° W.



Unfortunately, this was a little out of range for F/V *Kylie*, considering the time available; and this area lies within the EEZ boundary of Niue. Results of fishing from F/V *Kylie* during the week of 26 January were not so impressive. CPUE was 33 kg/100 hooks.

The area that was fished was just to the west of the positive anomaly, in a comparatively bland looking area. In retrospect it may have been better if F/V *Kylie* had gone to the south-west of Nuku'alofa as the frontal zone from the previous week appeared to be still in the same general position (22°S and 175°30'W). Reportedly, other boats targeting albacore did well in this area once again.

Summary

The TDRs, or temperature depth recorders proved to be very valuable tools for monitoring the setting parameters of the longline. Adjustments made after viewing the data in graph form allowed for more accurate targeting of specific depths and temperatures (and species).

The TDRs also gave insights into sea conditions and fish behaviour, all valuable information for the longline fisherman. Future work with TDRs could be to develop a table showing depths versus sagging-rates for various basket sizes and float-line lengths.

It would also be valuable to repeat the above trial in the winter (bigeye) season in Tonga.

In this short trial period, the altimetric fish finding maps also proved to be of some value, although a longer and more in-depth look is probably needed.

The map of 19 January showed an area that corresponded very well with good catch results while results from 26 January were inconclusive. Also, the predicted currents corresponded with the actual currents experienced. That alone is good information for a longline fisherman.

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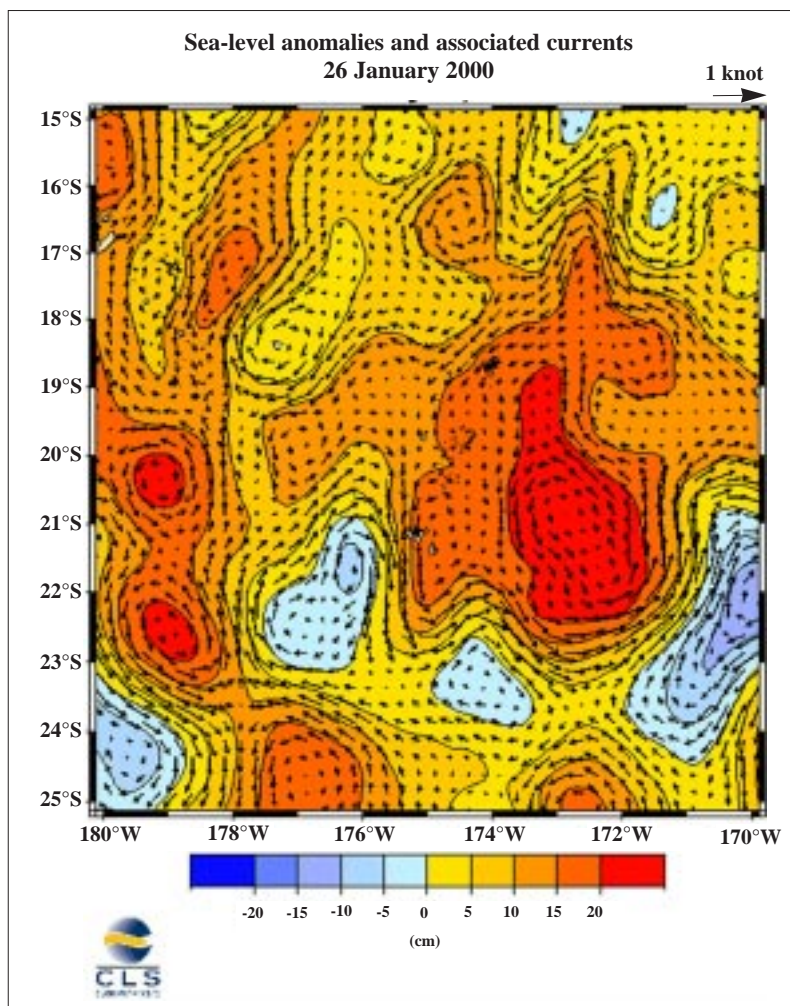
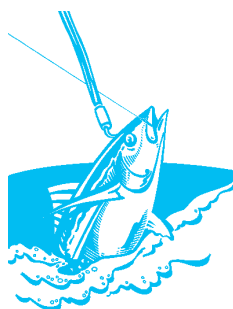


Figure 5: Altimetric map for 26 January 2000 (darkest areas denote areas of highest sea level amplitude)



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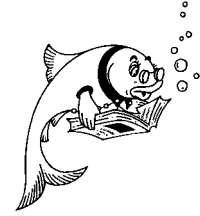
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LATE NEWS



Workshop on Interannual Climate Variability and Pelagic Fisheries

Noumea, New Caledonia (6th – 24th November 2000)

International Research Institute for Climate Prediction (IRI) Training Program
(Co-sponsored by IRD (DIC/DME), SPC, IOC, NASA, GLOBEC)

Interannual climate variability and associated environmental changes have profound effects on marine ecosystems and fisheries. Better prediction of climate and its impact on fisheries may contribute to more efficient sustainable management of regional fish stocks. The focus of this workshop is on pelagic and small pelagic fish stock variations. The workshop will provide opportunity for: (i) presentation and stimulation of current scientific thinking by a multi-disciplinary team of invited expert lecturers (hereafter referred to as the workshop lecturers), (ii) training of emerging scientists and regional fishery management scientists (hereafter referred to as the workshop participants – see application instructions below), and (iii) analysis of climate, marine ecosystem and fishery data by the participants during the workshop. The analyses will benefit from discussions between participants and lecturers, and will help explore how climate monitoring and climate forecasts could better contribute to current operational fishery management.

Goals:

- To review: Our ability to model and observe the climate system and the marine ecosystem as it relates to pelagic fisheries; The evidence for climate impacts on marine ecosystems and fish populations; The use of climate information in fisheries and ecosystem models.
- To identify methodological and theoretical gaps in current knowledge and explore the possibilities for resolving them.
- To conduct analyses which apply the principles covered in the workshop to specific cases and evaluate results in relation to the needs of fisheries management.

Objectives:

There are two distinct training objectives within the workshop, depending on the background of the participant. This is because participants are expected to be involved in either scientific aspects of operational fishery management or pure research:

- For those participants oriented more toward operational fishery management, the goal is to provide an overview of current understanding of the climate impact on fish stock variability and explore how to quantify that impact with a view toward incorporating climate information within operational decision making in fishery management.
- For those participants who are emerging researchers in the field, the goal is to provide the overview of climate and fishery science so that the scientist becomes equipped to undertake further research addressing the key science questions that will lead to further improvements in the incorporation of climate information into fishery management.

The International Steering Committee is currently being formed and is co-chaired by Yves M. Tourre and Neil Ward. Deadline for receipt of application: **1st August 2000**. Applications should be sent to:

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