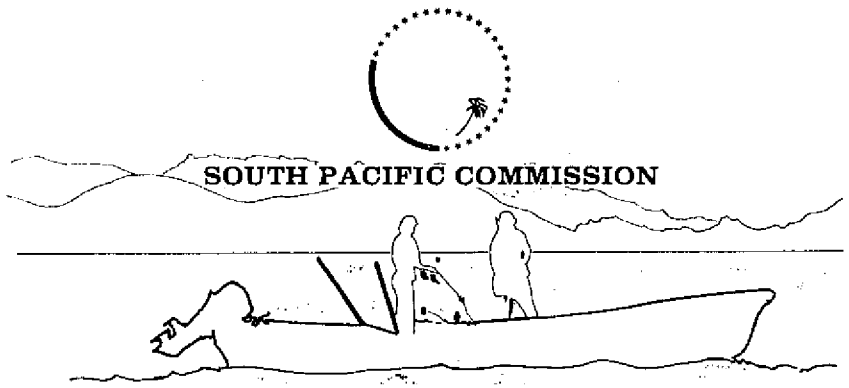

FISHERIES NEWSLETTER

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SPC ACTIVITIES

18th SPC Regional Technical Meeting on Fisheries

The Eighteenth Regional Meeting on Fisheries (RTMF) held at SPC Headquarters, Noumea, New Caledonia from 4 to 8 August 1986, was attended by fifty-four representatives and observers from SPC member countries, international and regional organisations, and educational and fisheries research institutions. For five days, fisheries officers, technical specialists, and representatives from donor agencies dicussed technical aspects of fisheries and exchanged fisheries-related information, technology and ideas in order to identify common problems and needs, and possible responses to them.

First on the agenda after the opening formalities was the review of the SPC Coastal Fisheries Work Programme. Mr Barney Smith, SPC Fisheries Adviser, described the wide-ranging activities of the SPC Deep Sea Fisheries Development (DSFD) Project undertaken during the past year. These included country assignments undertaken by the Master Fishermen in Tonga, New Caledonia, Cook Islands, Tuvalu, and Tokelau, as well as assistance with the five-week practical fishing module of the 1986 SPC/Nelson Polytechnic Pacific Island Fisheries Officer course. Mr Smith commented on the growing tendency for countries to request longer country visits by the Master Fishermen, as well as the increasing variety of tasks that the Project was being asked to undertake. These included many aspects of demonstration and training, fishing gear development, and resource assessment, and demanded a greater range of skills on the part of each individual Master Fisherman. Mr Smith also advised that, in line with the recommendations of the 1985 RTMF, one Master Fisherman would from now on be assigned full-time to gear development work. This would involve longer than usual field visits (of one year or more) which would enable seasonal effects in the local fishery to be avoided, and allow sufficient time for gear development problems to be properly addressed. During these assignments, the Master Fisherman concerned would work on selected gear development priorities identified by the 1985 RTMF. These included improvements to the vertical longline, bottom fishing in depths greater than 400m, deep-trolling around FADs, small-scale bait capture methods, and the development of shallow-water and sub-surface FADs.

Paul Mead and Lindsay Chapman, two of the three SPC Master Fishermen, then gave brief descriptions of the country assignments they had undertaken during the proceding year. Questions and discussions followed on some of the major aspects of their work, including experimental vertical longline fishing around Fish Aggregation Devices (FADs), surveys and charting of seamounts by echo-sounders, and fish handling and processing.

Several delegates queried some administrative aspects of the DSFD Project, in particular the length of time countries normally have to wait between requesting a country visit and having it carried out, and the extreme delay now occurring in the publication of the final reports of country visits after the visits completion. In response, the Fisheries

Adviser outlined the manpower and other difficulties underlying these problems. It was, he advised, becoming more difficult for the Commission to respond rapidly to requests for DSFD Project assistance because of the increasing number of requests being made and their tendency to be for longer periods than in the past (6 months or more, as opposed to 3 months or more previously), and because one Master Fisherman was now assigned full-time to gear development work. Difficulties were now being experienced in the timely production of DSFD reports (as well as other Coastal Fisheries Programme publications) because the programme's field activities had exanded in recent years, while its administrative capacity had remained the same. As a result, headquarters staff were becoming increasingly occupied with administrative work and field programme support, and were finding it difficult to keep up with the preparation of publications, which had now accumulated to a considerable backlog. This situation was also having an adverse effect on duty travel, with the Coastal Fisheries Programme professional staff finding it more and more difficult to spend time doing field work and consulting with member countries.

Following these discussions, the participants acknowledged the importance and value to the region of the SPC Coastal Fisheries Programme, and noted the need to improve both its capacity to provide assistance under the DSFD Project, and its administrative capacity. The meeting therefore made two recommendations: that the Commission increase its complement of Master Fishermen from three to four: and that it recruit additional administrative staff to help alleviate the problems already discussed.

The next item was the SPC Regional Fisheries Training Project. The Fisheries Adviser detailed recently completed, ongoing, and proposed training activities under this project, including the seventh SPC/Nelson Polytechnic Pacific Island Fisheries Officers Training Course, the second SPC/FAO/UNDP Regional Refrigeration course, the SPC Fish Handling and Processing course, two short courses on the use of fish-finding echo sounders, and the forthcoming Fish Catching Methods and Extension Skills course. The Secretariat also described the review of national training needs and opportunities which had been undertaken by the Fisheries Training Officer, Mr Alastair Robertson, through a series of on-site consultations, questionnaires and correspondence with member countries. Although not all member countries had been visited by Mr Robertson at that time, all had been consulted. The outcome of the work had given SPC a better understanding of national training needs within the region, and would form the basis on which future training programmes would be planned.

Under this item the Secretariat also tabled for discussion the draft "Directory of Fisheries Training Opportunities", produced by the Fisheries Training Project in response to a recommendation from the 1985 RTMF. The directory details a wide range of fisheries-related training activities inside and outside the region, and is intended to assist member countries identify appropriate institutions and activities which meet their specific fisheries training requirements. Delegates were asked to provide their comments on the format and content of the report as soon as possible after the meeting to enable the directory to be finalised.

The next agenda item was Oceanic Fisheries. Progress on priority items of the Tuna and Billfish Assessment Programme (TBAP) was outlined by the Programme Coordinator, Dr John Sibert. He reported that the SPC Regional Data Base had continued to increase at a rate of approximately 60,000 daily catch reports per year, and that efforts were being made to resolve the problems of duplicate and missing data. Dr. Sibert noted that progress on several of the Programme's biological priorities had been hampered by a lack of data from American and Japanese sources, and failure to secure funding for a tagging programme. Training had been emphasised during the year and courses had been held on observer methods, statistics, and fisheries stock assessment. TBAP staff had also assisted in several national courses to assist in developing observer programmes, and in establishing systems for the collection and use of small-scale fisheries statistics.

The Secretariat then presented its revised regional logsheet forms for reporting commercial tuna catch and effort statistics back to the TBAP. In doing so, it was explained that the revised forms had been designed to provide continuity of the current data base, improve the usefulness of the data, make the forms easier to fill out, and coincide with the tuna research needs of the SPC region. Following discussions the meeting accepted the new forms with very few modifications, and to ensure more accurate reporting recommended that the forms should be translated into the languages of the major distant-water fishing nations.

The establishment of a port sampling programme within the Tuna Programme also received strong support from the meeting, which requested that a draft review of implementation of this programme be circulated to potential collaborating agencies and those countries where there is a possibility of conducting such sampling.

The report on the Southern Albacore Research workshop jointly sponsored by the SPC and the New Zealand Fisheries Research Division, and held in Auckland, New Zealand was then presented. The Tuna Programme Coordinator stated that the main aims of the workshop had been to determine the size, location and potential interaction with other fisheries of the newly discovered concentration of surface albacore around 40-45 degrees South. A possible follow-up workshop was proposed for 1988.

A proposal to establish a Standing Committee on Tuna and Billfish was the subject of long discussions, in both plenary session and special sub-committees. The Secretariat was called upon to clarify the background to the committee, and discussions centred mainly on its terms of reference and composition, and the proposed agenda for its first meeting. Several participants stressed the importance of restricting the size and composition to technical and scientific personnel if the committee was to effectively carry out its role as a technical advisory and review body for the TBAP. The meeting decided to defer making any recommendation on the establishment of the committee at this time.

The next major item on the agenda was a one-day workshop session on fisheries extension services in the Pacific Islands. Participants were divided into four working groups which discussed at length the requirements for and means of implementing effective extension programmes. The general

concensus was that although there are presently many opportunities for Pacific Islanders to undergo technical training, the mechanisms needed to help technical knowledge to filter back to fishermen, rural communities and others at the `grass roots´ level are often inadequate. After taking into account the conclusions of the group discussions on skills desirable for Fisheries Extension Officers, the meeting recommended that SPC organise training in extension skills suitable for the region, to promote the transfer of knowledge from technically trained individuals to those with less formal training.

The meeting continued with discussions on the Forum Fisheries Agency´s study of "Fisheries Research Needs and Priorities in Pacific Island Countries" which was presented by the representative of Tonga, speaking as one of the consultants who has prepared the report. He explained that most fisheries research effort in the region had arisen directly in response to particular problems and development needs. In summarising the recommendations of the report he highlighted the region´s presently inadequate fisheries information services, the need for specialised technical meetings, to enable Pacific Island countries to keep abreast of current developments in fisheries science, and the desirability of involving Pacific Island nationals in the TBAP. Following his detailed comments the meeting recommended that SPC fisheries programmes and Pacific Island fisheries administrations work together towards satisfying their national and regional research needs.

The meeting continued with discussions on the survey and assessment of inshore fisheries resources. The Fisheries Adviser presented to the meeting a proposal which was an attempt to bring together the considerable resources of both of the SPC Fisheries Programmes to address certain urgent fisheries research issues. These can be broadly divided into three major areas of need: the lack of biological and fisheries related information, including that pertaining to the status of resources; compatible systems of data collection within the ability of individual countries to maintain; and information dissemination. Extensive discussions followed and led to to several related recommendations which supported the establishment of an SPC Inshore Fisheries Research Project. The Secretariat was asked to prepare a review document covering the structure and activities of the proposed project for consideration by the 1987 Regional Technical Meeting on Fisheries. It was also recommended that the forthcoming review of the TBAP, commissioned by the SPC Committee of Representatives of Governments and Administrations, consider the structural relationship between the TBAP, the Coastal Fisheries Programme and the proposed Inshore Fisheries Research Project.

The last main agenda item discussed was regional marine resources information needs. The SPC Librarian, Mrs Bess Flores, presented a paper on the general lack of documented information circulation within the region and stressed the need for improved information dissemination. The Librarian also provided the participants with details of the information functions of the Pacific Information Centre, the University of Papua New Guinea, and the Office de Recherche Scientifique et Technique d´Outre Mer while cautioning as to the problems of competition for funding and incompatibility of computer systems. Following the discussions the meeting endorsed the plans for development of a South Pacific Marine Resources

Information System and supported the concept of a meeting, to be held in early 1987, to discuss cooperation in the area of fisheries information dissemination.

Final discussions concerned brief reports on activities by other organisations. These included: the report of the FAO Regional Aquaculture Study Mission, an FAO proposal for an artisanal fishing vessel workshop; a progress report on the ACIAR funded coconut crab project in Vanautu; a progress report on the joint ICLARM/MMDC/ACIAR regional giant clam project; and a NOAA proposal for regional fishery resource assessment using NOAA vessels.

The RTMF once again provided a forum for frank and open discussions on a wide range of topics of common interest to regional fisheries bodies and provided the technical guidance necessary to ensure that SPC fisheries activities retain their relevance to the needs and requirements of Pacific Island member countries.

Seventh Nelson Course Concludes

The seventh SPC/Nelson Polytechnic Pacific Islands Fisheries Officers Training Course ended on Friday July 18th. The 23-week course consisted of an 18-week segment at the Nelson Polytechnic in Nelson, New Zealand, where the trainees studied a variety of subjects and skills with which fisheries officers should be familiar (see SPC Fisheries Newsletter No 36 p 4). This was followed by a 5-week practical fishing module in Vava'u, Tonga, where the trainees were able to learn a variety of small-boat fishing and boat-handling techniques, as well as developing under working conditions the skills learned at Nelson during the first part of the course.

Demand from Pacific Island countries for this type of training remains strong, and an eighth Nelson course is scheduled to take place commencing in February 1987. A formal call for applications will be circulated by SPC Savingram in early October 1986.

Fish Handling and Processing Course Ends

The SPC Fish Handling and Processing Course, held in Port Vila, Vanuatu, reached its end on Friday 16th August. The 16 participants returned to their various home countries after 10 weeks spent studying all aspects of this subject as it pertains to the operation of a small-to-medium sized fish processing operation in a Pacific Island country. (see SPC Fisheries Newsletter No 37 p 8)

As is usual, the course had its share of unanticipated difficulties, which included an unseasonal low turnover of fish in the Vanuatu Government fish market; and a protracted rainy period which hampered a series of fish drying experiments. The course also suffered some administrative problems, including the late arrival of some tutors due to flight difficulties, and the departure of the SPC Fish Handling and Processing Officer, David Burford, who left the Commission in early August. Fortunately other SPC headquarters staff were able to stand in for the remaining three weeks and the course proceeded with a minimum of disruption.

(Photo: G. Preston)

Students participating in a fish drying experiment.

Overall, the course ran well despite these setbacks. The students participated enthusiastically in the practical aspects of the course, (though some were less enthralled by the theory sessions). Each trainee returned home with a substantial body of new information and many had new ideas or solutions to their own local problems that they were eager to try out.

The course represents the first activity under the auspices of the Commission's Fish Handling and Processing Project. Future programmes will include more specialised short courses held at a national or sub-regional level, assistance to member countries with specific problem areas, the provision of technical advice on fish handling and processing, and related activities.

Echo-Sounder Courses Held in Noumea

Two 3-day courses on the installation and use of accoustic sounding equipment, each attended by six participants, were held at SPC headquarters in August 1986, on either side of the 18th SPC Regional Technical Meeting on Fisheries. The courses were run by Captain Angus Scotland, Senior Tutor with the Nelson Polytechnic School of Fishing (New Zealand), who was representing the Polytechnic at the meeting. Captain Scotland brought with him the Polytechnic's computerised echo-sounder simulator for use in the courses.

The subjects covered included : transducer installation and mounting, installing the recorder; operation of paper recorders and video monitors; interpretation of recordings; effects of sea and bottom conditions on recordings; and service and maintenance of equipment. The course was originally devised specifically for the three SPC Master Fishermen and other Coastal Fisheries staff to enable them to keep abreast of recent developments in colour sounders. These are starting to appear on fishing vessels in the region and are potentially valuable tools when deploying fish aggregation devices. However, holding the courses close to the Fisheries meeting made it possible to offer the courses to selected meeting participants to whom this type of training would be useful.

Fijian Fisheries Officer on Training Attachment With SPC

Senior Fisheries Officer (Northern) with the Fiji Fisheries Division, Mitieli Baleivanualala, spent 6 weeks on a training attachment with SPC between late July and early September 1986. During his attachment period with SPC, Miti worked alongside staff of the Coastal Fisheries Programme and the Tuna and Billfish Assessment Programme in order to become familiar with the type of work undertaken by the Commission. This was done by integrating him into work programme activities as rapidly as possible. During his stay, Miti researched and edited part of the SPC Fisheries Newsletter No 37, assisted in the organisation of the 18th SPC Regional Technical Meeting on Fisheries, helped organise two echo-sounder courses which were held in Noumea, (see article above), and carried out background research on a proposal for a deep-water shrimp survey in Kiribati which the Commission will carry out next year, as well as assisting with routine administrative duties.

Miti's attachment to SPC formed part of a broader training programme which was sponsored by the FAO/UNDP South Pacific Regional Fisheries Development (SPRFD) Programmme in Suva, Fiji. During the programme, Miti attended a 3-month EEC management course in the UK, and visited FAO headquarters in Rome, Italy, and the Bay of Bengal Programme in Madras, India, for one week each. Following the SPC attachment, he will spend similar periods in the Forum Fisheries Agency headquarters in Honiara, Solomon Islands, and the SPRFD headquarters in Suva.

Stock Assessment Course Held in Noumea

A two-week course on fish stock assessment was run at SPC Headquarters in Noumea by Dr Ray Hilborn, Senior Fisheries Scientist with the SPC Tuna and Billfish Assessment Programme, and consultant Dr Carl Walters of the University of British Columbia. Eleven participants from 11 different Pacific Island countries attended the course, the purpose of which was to provide an introduction to general problems in fisheries stock assessment and the tools and approaches that will be useful for SPC countries. Emphasis was placed on a review of approaches and methods, rather than detailed instruction in the application of a few particular techniques.

The topics covered were as follows :

Day 1 Introduction and population dynamics
Day 2 Population dynamics and ecosystem dynamics
Day 3 Fishery dynamics and major stock assessment issues
Day 4 Mathematical models and abundance indices
Day 5 Estimation of growth and natural mortality
Day 6 Estimation of fishing mortality and recruitment rate
Day 7 Stock, recruitment and surplus production
Day 8 Age structured effects and multispecies interaction
Day 9 Integration of data collection and fishery development
Day 10 Summary and evaluation

Since fisheries are just beginning to develop in many locations in the SPC region, it is particularly important that data collection systems be designed to meet the current and future needs for stock assessment. The course therefore concentrated on what kinds of data need to be collected to determine what potential yields are, and if overfishing is occurring.

From the participants written evaluations, discussions during the course and the instructors impressions gained during the two weeks, it is clear that considerable further work in stock assessment is needed in the region. On the last day, a discussion took place on what the participants would find most useful. The following alternatives were listed.

1. Subsequent courses, either for the same participants or others unable to attend this course because of budgetary or other limitations.

2. Short-term in-country visits by stock assessment specialists.

3. Establishment of a regional centre of expertise in stock assessment for reference of problems and occasional advice.

4. Masters degree level training in stock assessment and fisheries management.

5. Medium-term (6-12 months) expert assistance in-country by stock assessment specialists.

Participants felt that all of these were needed, with medium-term expert assistance given the lowest priority. Over half of the participants rated Masters degree training as one of their two top priorities for their own career development. The second highest priority was assigned to the establishment of a regional stock assessment facility. Participants felt they would like to develop their own skills to the point where they could cope with most problems, but recognised that they would need occasional assistance from some regional resource. Further training courses and in-country visits were also considered most useful and strongly encouraged.

Deep Sea Fisheries Development Project Notes

--Tokelau

Master Fisherman Pale Taumaia travelled to Nukunonu, Tokelau early in August to commence his assignment there. The purpose of the mission is to demonstrate to Tokelauan fishermen recent developments in the technique of vertical longlining for large tunas around fish aggregation devices (FADs). This technique was considerably refined by Pale during his earlier visit to Tuvalu, where he used the technique in conjunction with a scaled-down version of the wooden bottom-fishing handreel which could be operated from a canoe or other small boats. The vertical longline technique has many similarities with traditional Tokelauan methods of handlining for tunas. This visit will present a good opportunity to compare the effectiveness of the two systems under the same conditions, as well as testing the receptiveness of Tokelauan fishermen to "modern" modifications to traditional fishing methods.

--New Caledonia

SPC Master Fisherman Lindsay Chapman spent 5 weeks in New Caledonia in August and September, to assist the Fisheries Department (Service de la Marine Marchande and des Pêches Maritimes) in organising and carrying out a training programme for fishermen in the Belep Islands, in the north of the territory. 27 Belep fishermen participated in the training programme which ran from 28 August to 9 September. Training was carried out on board the Department's extension vessel `Dar Mad', and concentrated on techniques for fishing spanish mackerel, although other fishing activities were also covered. Other aims during the training programme included trying out simple equipment that could be adapted for use on the small fishing vessels used in Belep to improve yields when trolling in the lagoon, and improving techniques for processing, packing and freezing the product.

During the two weeks the fishermen participated in practical demonstrations of several different fishing techniques, including trolling within the lagoon, drift fishing within the lagoon, trolling outside the lagoon, deep bottom reel fishing, and seining for garfish (trolling bait). Throughout the course special attention was given to commercial fish processing methods especially preparing fish for marketing by bleeding, gutting, heading, brushing to remove blood, removal of fins to facilitate cold room storage, and icing on board. A large percentage of the fish caught were of high commercial value, especially spanish mackerel and tuna. Trolling within the lagoon yielded the highest average catch rate (5.2 kg per line-hour). Trolling outside the lagoon gave an average catch rate of 4.1 kg per line-hour.

Great interest was shown by the Belep fishermen in deep bottom reel fishing and two days were spent using this method outside the reef. However, strong surface currents in the opposite direction to the wind made fishing conditions difficult and the catch rate obtained of 4.1 kg per reel-hour was not very encouraging. Seining for garfish was also demonstrated using a special net with mesh size 17mm, even though current fishery regulations specify that the mesh size for garfish nets must be 21mm or more.

The training programme demonstrated to the fishermen that the efficiency of lures was improved and yields increased when fishermen `worked the line' by a to-and-fro movement. The fishermen also realised the importance of selecting the right gear, particularly as regards the lures, which should be changed frequently in order to prevent the possiblility of fish becoming accustomed to them. The good catches obtained confirmed the abundance of resources in the area, and the potential for commercial fishing through the existing cooperative, which pays cash for catches when landed, thus encouraging regular fishing among the fishermen. The cooperative now sells fishing gear identical to that used on board the Dar Mar so that the fishermen can improve their gear and probably their trolling yields if they are motivated to do so.

SPC Helps Solomon Islands' Fisheries Assistants' Course

The Solomon Islands Ministry of Natural Resources (MNR) and College of Higher Education (SICHE) are jointly conducting a 19-week induction course for new MNR Fisheries Assistants. In September, the SPC provided tutorial assistance for a one-week segment of the course covering aspects of basic fish handling and processing. The SPC tutors were Fisheries Adviser Barney Smith, and consultants Holmes Saeve, Provincial Fisheries Officer Western Province, and Ray Hesao, a private businessman, both Solomon Islands graduates of the SPC Fish Handling and Processing Course held in Port Vila earlier this year. (See article page 6). The SPC personnel provided assistance with a syllabus and training metholodogy which complemented the work of core course instructors Mike Batty, Extension Adviser with MNR, and Capt. Tom Smith, of the Ranadi Marine and Fisheries Training School, and occasional lecturer Mr Paul Nichols, Senior Fisheries Officer with MNR.

During the fish handling and processing sessions emphasis was placed on practical demonstrations and `hands-on' experience in areas including gutting and washing fish, filleting and skinning different types of fish, steaking large fish, care of knives, cleaning up and basic hygiene. These practical demonstrations of different methods of fish conservation and preservation, including salting, sun-drying, smoking and freezing were carried out and highlighted by showing the SPC video "Handle It Right" and students were shown how to construct a drying rack and solar drier. Half a day was spent on basic hygiene with practical experiments on the importance of temperature, cleanliness and bacterial growth. One day was devoted to processing Beche-de-Mer, including boiling, cleaning, preparation for smoking, and the first stages of smoking.

At the conclusion of this important segment the students had all acquired the basics of fish processing and were aware of the importance of correct handling methods from the moment a fish is landed to the stage of consumption.

Industrial Tuna Fishery Statistics

This brief update provided by the SPC Tuna and Billfish Assessment Programme is the first in what is intended to be a regular feature of the SPC Fisheries Newsletter. The statistics will be updated as more data are received. Other types of summaries will also be presented. Readers of this Newsletter are encouraged to forward suggestions about the type of information they would find most useful.

--Limits of the data

A concise summary of current fishing activities provides an indication of what to expect in the immediate future. The statistics presented below provide a nearly current summary of commercial tuna fishing activities within the SPC area. This summary, however, only reflects data reported to member countries and processed by the SPC up to September 1986. Conclusions may change as more data are received.

Since total catches information for the entire Pacific is not yet available for the years after 1984, the coverage of the summaries cannot be determined. The level of reporting for 1985 is similar to that of previous years and coverage can be assumed to be about the same as previously reported. It ranges from about 40% for the pole-and-line fleet to about 85% for the purse seine fleet. No raising factors have been applied to account for these uncertainties. The summaries combine different types of data (nationality, vessel tonnage, target, species, etc.) so their interpretation should be confined to general qualitative overviews.

--The summaries

Table 1 provides annual summaries of all the data received by the SPC. Tables 2 and 3 provide quarterly summaries for 1985 (nearly complete) and for 1986 to date. Estimates of effort, catch, and catch per unit of effort are given for each gear and major species. Figures 1 and 2 show trends since 1979.

--Interpretation

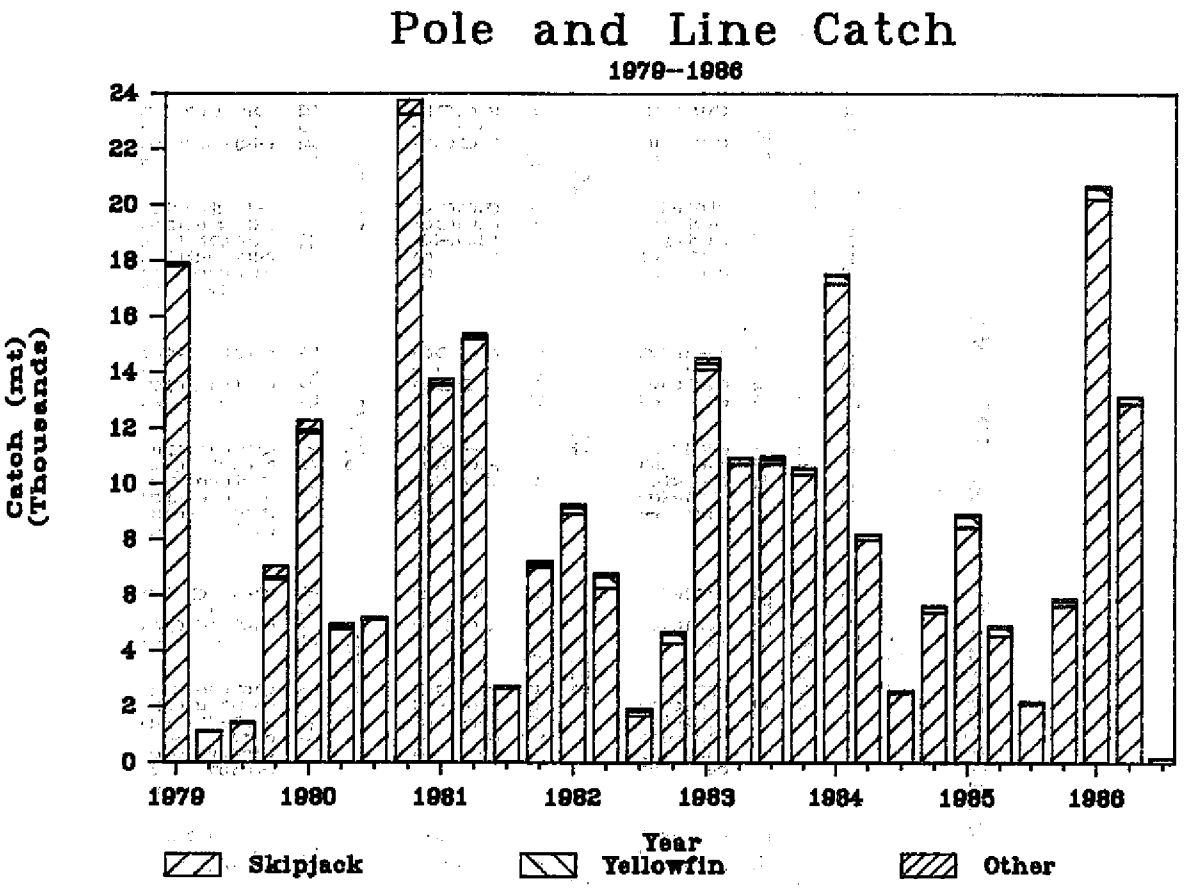
The available data are nearly all in for the 1985 fishing year, and although the fisheries have not been in place long enough to establish a norm, 1985 would seem to have been an average year.

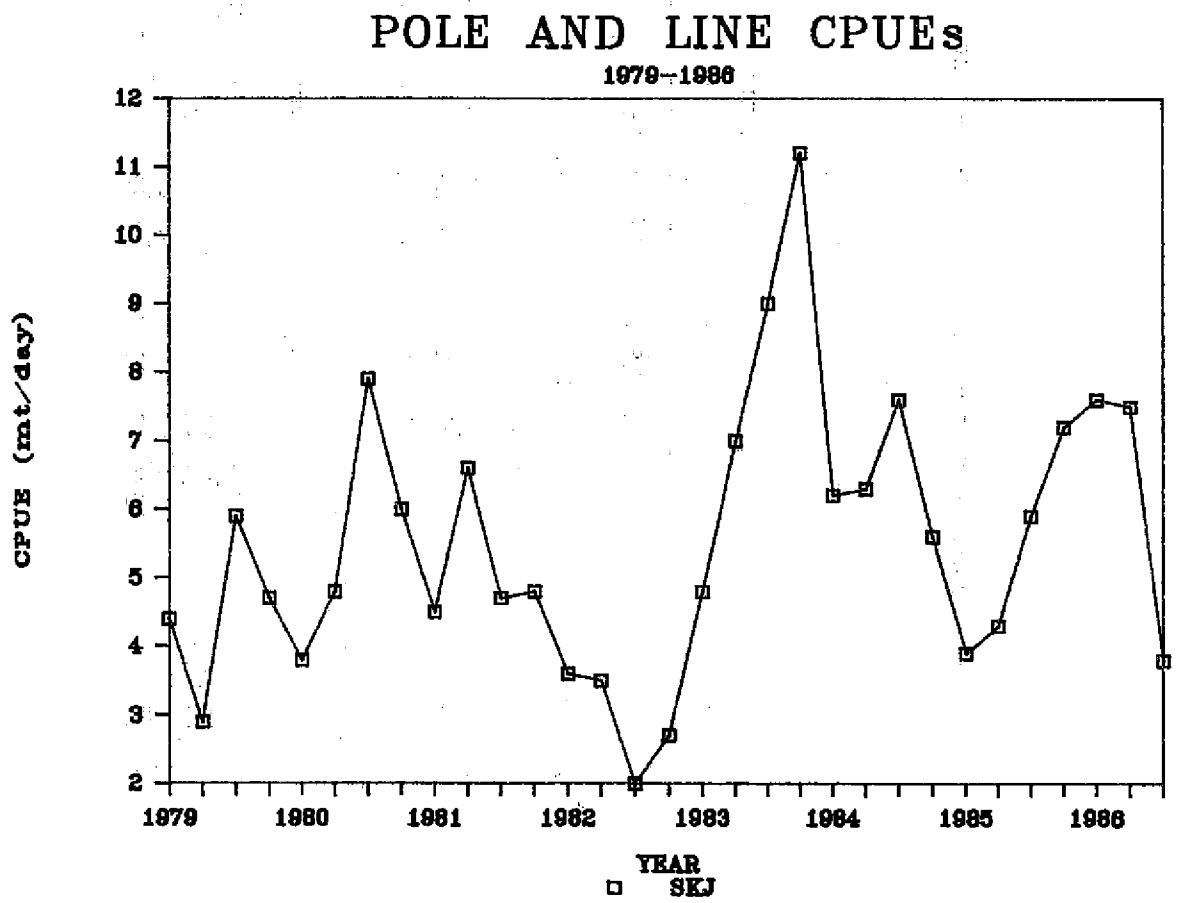
In the purse seine fishery, fishing effort was somewhat lower than previous years, possibly because of very attractive fishing conditions prevalent in the Eastern Pacific in 1985. Catch rates of the major species were about average, therefore total reported catches were slightly below 1984 levels. Effort in the pole-and-line fishery was slightly lower than previous years and skipjack catch rates were also below normal. Longline effort was higher than previous years with hooking rates unchanged, resulting in a somewhat higher total yield.

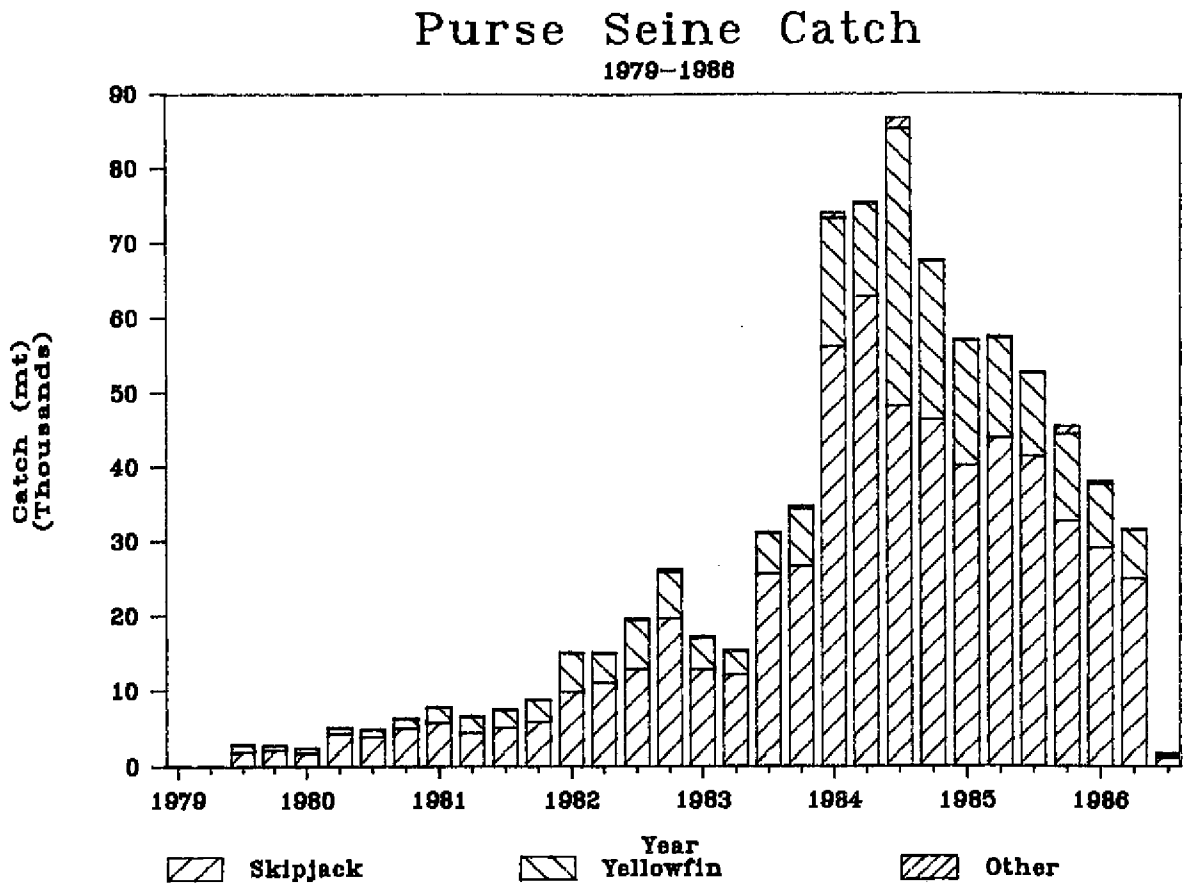
Data for the 1986 fishing year are far from complete, but there is enough information from the early part of the year to attempt some general speculations about the fishery. From the data presented, catch rates for skipjack in both surface fisheries (i.e. purse seine and pole-and-line) were higher than normal and are similar to those obtained during the 1983 El Nino year. Longline catch rates on the other hand appear to be more normal. It remains to be seen whether these trends will continue.

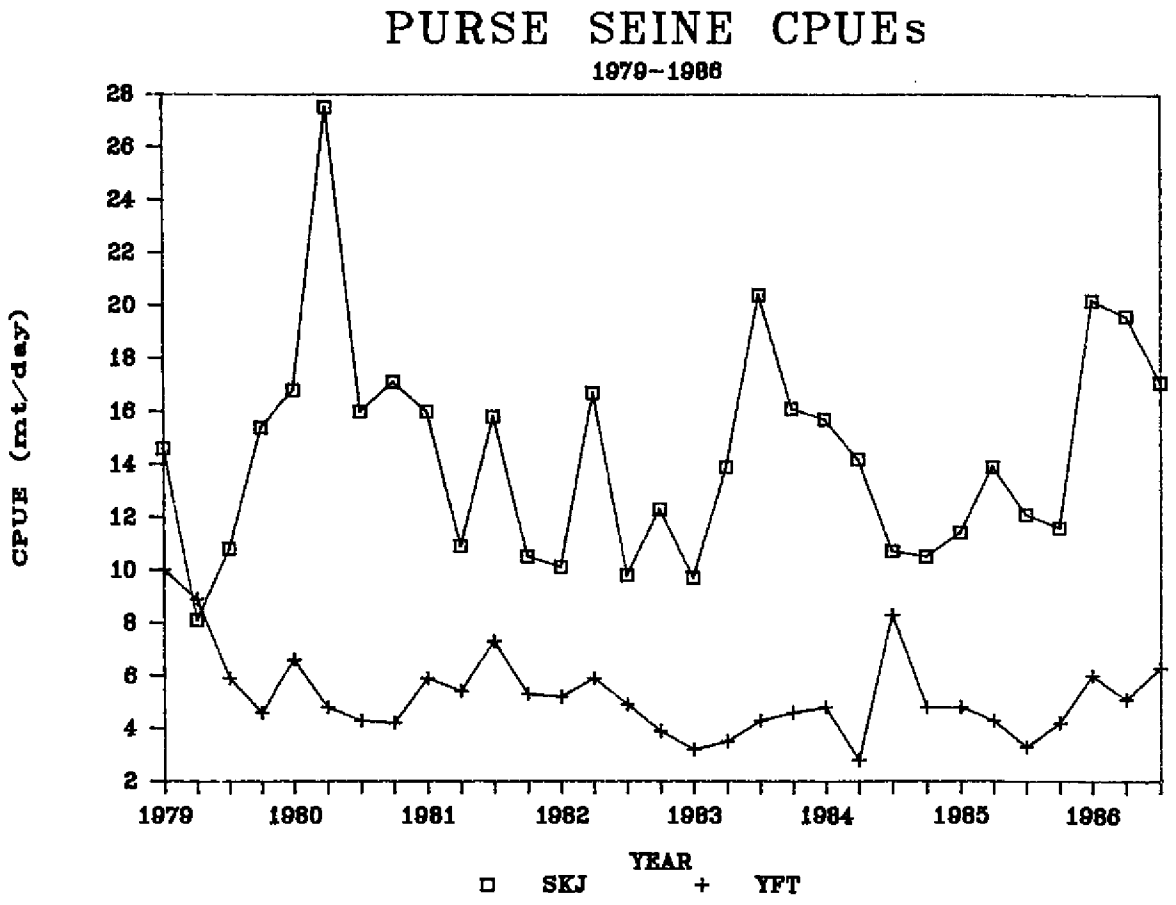
Table 1. Annual summaries of catch and catch per unit of effort by gear and by species, for the years 1981-1986.

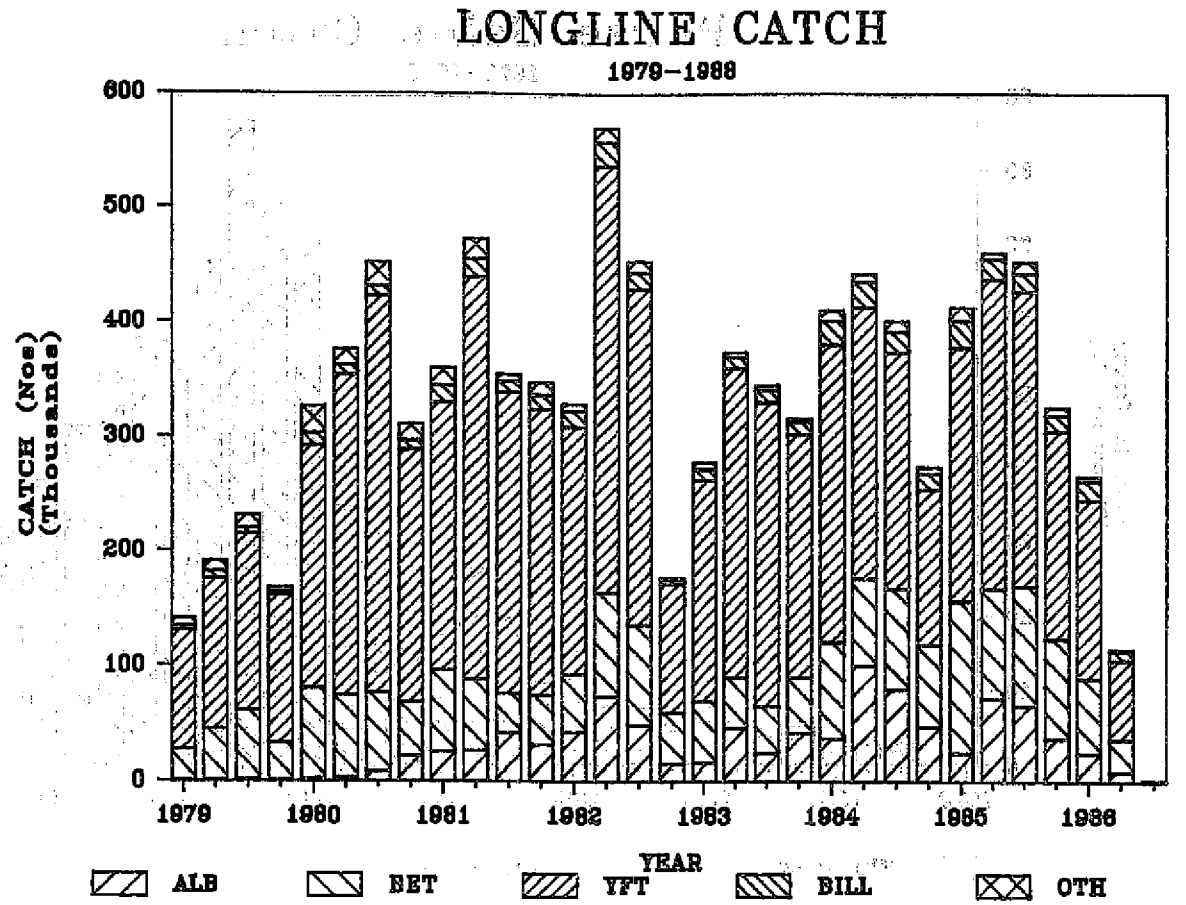
	1981		1982		1983		1984		1985		1986	
	Annual Total		Annual Total		Annual Total		Annual Total		Annual Total		Annual Total	
Purse Seine												
Effort (days)	1633		4545		5095		16868		12921		2766	
	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE
Skipjack	20954	12.8	53487	11.8	77117	15.1	213264	12.6	158371	12.3	54994	19.9
Yellowfin	9522	5.8	21706	4.8	20386	4.0	87638	5.2	53432	4.1	15443	5.6
Other	292	0.2	867	0.2	860	0.1	2482	0.1	1455	0.1	441	0.2
Total	30768	18.8	76060	16.7	98363	19.3	303383	18.0	213257	16.5	70878	25.6
Pole and Line												
Effort (days)	7337		6650		6582		5319		4363		4400	
	(nos.)	CPUE	(nos.)	CPUE	(nos.)	CPUE	(nos.)	CPUE	(nos.)	CPUE	(nos.)	CPUE
Skipjack	38385	5.2	21075	3.2	45775	7.0	33014	6.2	20612	4.7	33219	7.5
Yellowfin	303	0.0	1160	0.2	836	0.1	736	0.1	981	0.2	669	0.2
Other	406	0.1	377	0.1	311	0.0	70	0.0	194	0.0	108	0.0
Total	39094	5.3	22612	3.4	46923	7.1	33820	6.4	21786	5.0	33996	7.7
Longline												
Effort (hks/1000)	70575		71776		49217		78680		87071		19539	
	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE	(mt)	CPUE
Albacore	123125	1.7	178362	2.5	125223	2.5	263590	3.4	196974	2.3	32217	1.6
Bigeye	211250	3.0	272098	3.8	188019	3.8	322368	4.1	420417	4.8	92377	4.7
Yellowfin	1097512	15.6	994871	13.9	939996	19.1	842178	10.7	929241	10.7	226044	11.6
Billfish	51600	0.7	52890	0.7	40659	0.8	75753	0.0	71313	0.8	24730	1.3
Other	50805	0.7	30055	0.4	18273	0.4	31785	0.4	34500	0.4	5764	0.3
Total	1534292	21.7	1528276	21.3	1312170	26.7	1535674	19.5	1652445	19.0	381132	19.5

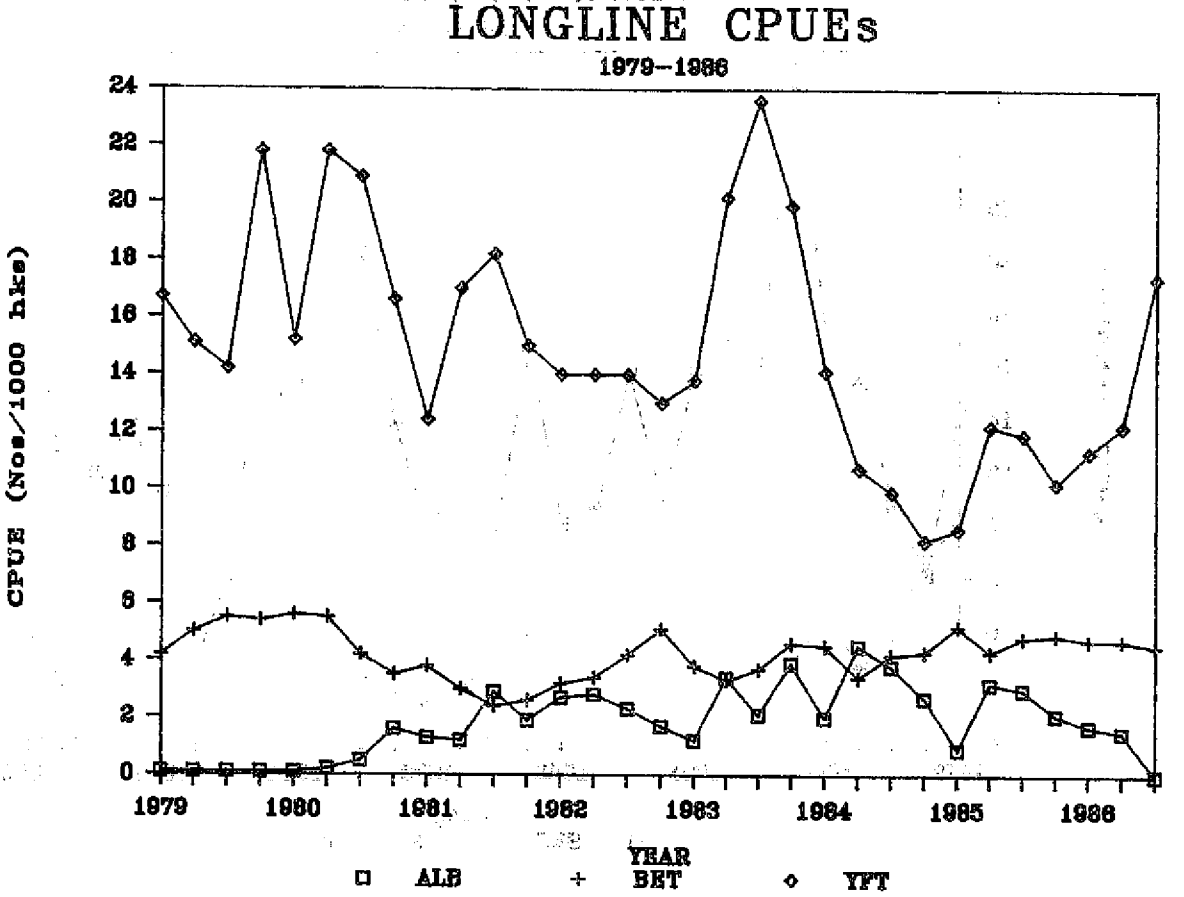

Pole and Line Catch
1979-1986
Catch (mt)
(Thousands)
24
22
20
18
16
14
12
10
8
6
4
2
0
1979
1980
1981
1982
1983
1984
1985
1986
Year
Skipjack
Yellowfin
Other


POLE AND LINE CPUEs
1979-1986
CPUE (mt/day)
12
11
10
9
8
7
6
5
4
3
2
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
SKJ


Purse Seine Catch
1979-1986
Catch (mt)
(Thousands)
90
80
70
60
50
40
30
20
10
0
1979
1980
1981
1982
1983
1984
1985
1986
Year
Skipjack
Yellowfin
Other


PURSE SEINE CPUEs
1979-1986
CPUE (mt/day)
28
26
24
22
20
18
16
14
12
10
8
6
4
2
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
SKJ
YFT


LONGLINE CATCH
1979-1988
CATCH (Nos)
(Thousands)
600
500
400
300
200
100
0
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
ALB
BET
YFT
BILL
OTH


LONGLINE CPUEs
1979-1986
CPUE (Nos/1000 hks)
24
22
20
18
16
14
12
10
8
6
4
2
0
1979
1980
1981
1982
1983
1984
1985
1986
YEAR
ALB
BET
YFT

Summary of catch and effort data by quarter for 1985

Surface Fisheries

Gear		1st quarter		2nd quarter		3rd quarter		4th quarter		Annual Total	
PS	Effort (days)	3504		3134		3395		2888		12921	
		Catch (mt)	CPUE	Catch (mt)	CPUE	Catch (mt)	CPUE	Catch (mt)	CPUE	Catch (mt)	CPUE
	Skipjack	40180	11.5	43958	14.0	41186	12.1	33047	11.4	158371	12.3
	Yellowfin	16688	4.8	13398	4.3	11044	3.3	12303	4.3	53432	4.1
	Other	109	++	159	0.1	174	0.1	1012	0.4	1454	0.1
	Total	56978	16.3	57514	18.4	52404	15.4	46361	16.1	213257	16.5
PL	Effort (days)	2173		1045		358		787		4363	
	Skipjack	8376	3.9	4516	4.3	2092	5.8	5628	7.2	20612	4.7
	Yellowfin	412	0.2	312	0.3	70	0.2	187	0.2	981	0.2
	Other	60	++	55	0.1	6	++	73	0.1	194	++
	Total	8848	4.1	4883	4.7	2168	6.1	5888	7.5	21786	5.0
Total Surface Catch	Skipjack	48557		48474		43278		38675		178983	
	Yellowfin	17100		13710		11114		12490		54414	
	Other	169		214		180		1085		1647	
	Total	65825		62397		54572		52249		235043	

Longline Fisheries

	Effort (hooks x 1000)	25708		22129		21586		17648		87071	
		Catch (nos.)	CPUE	Catch (nos.)	CPUE	Catch (nos.)	CPUE	Catch (nos.)	CPUE	Catch (nos.)	CPUE
	Albacore	23838	0.9	71415	3.2	65445	3.0	36276	2.1	196974	2.3
	Bigeye	132503	5.2	96160	4.3	104479	4.8	87275	4.9	420417	4.8
	Yellowfin	221005	8.6	270031	12.2	257026	11.9	181179	10.3	929241	10.7
	Billfish	23174	0.9	17469	0.8	16050	0.7	14620	0.8	71313	0.8
	Other	11794	0.5	5818	0.3	10257	0.5	6631	0.4	34500	0.4
	Total	412314	16.0	460893	20.8	453257	21.0	325981	18.5	1652445	19.0

Summary of catch and effort data by quarter for 1986

Surface Fisheries

Gear		1st quarter		2nd quarter		3rd quarter		4th quarter		Annual Total	
PS	Effort (days)	1430		1269		67		0		2766	
		Catch (mt)	CPUE	Catch (mt)	CPUE	Catch (mt)	CPUE	Catch (mt)	CPUE	Catch (mt)	CPUE
	Skipjack	28884	20.2	24971	19.7	1139	17.1	0		54994	19.9
	Yellowfin	8516	6.0	6508	5.1	419	6.3	0		15443	5.6
	Other	340	0.2	79	0.1	22	0.3	0		441	0.2
	Total	37740	26.4	31558	24.9	1580	23.8	0		70878	25.6
PL	Effort (days)	2652		1710		38		0		4400	
	Skipjack	20207	7.6	12870	7.5	143	3.8	0		33219	7.5
	Yellowfin	390	0.1	259	0.2	20	0.5	0		669	0.2
	Other	87	++	20	++	0	0.0	0		108	++
	Total	20684	7.8	13150	7.7	162	4.3	0		33996	7.7
Total Surface Catch	Skipjack	49091		37841		1282		0		88213	
	Yellowfin	8906		6767		439		0		16112	
	Other	427		99		22		0		549	
	Total	58424		44708		1742		0		104874	

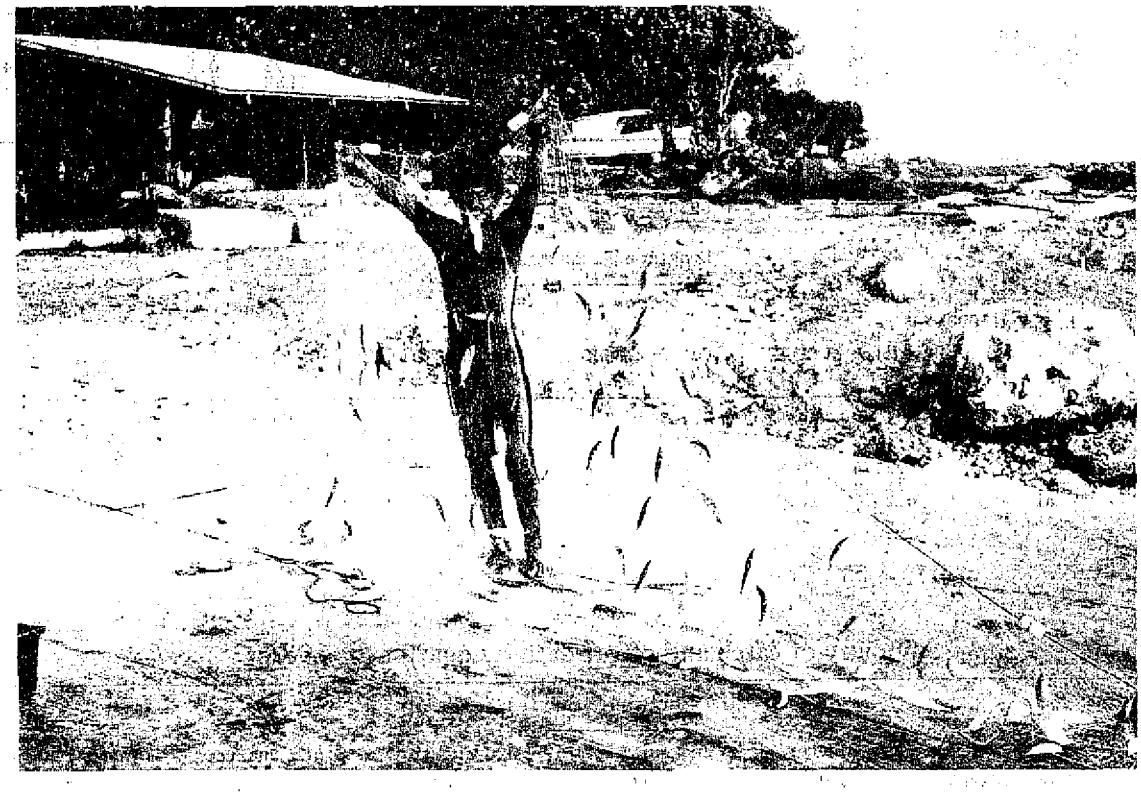
Longline Fisheries

	Effort (hooks x 1000)	13734		5760		45		0		19539	
		Catch (nos.)	CPUE	Catch (nos.)	CPUE	Catch (nos.)	CPUE	Catch (nos.)	CPUE	Catch (nos.)	CPUE
	Albacore	23533	1.7	8684	1.5	0	0.0	0		32217	1.6
	Bigeye	65135	4.7	27042	4.7	200	4.5	0		92377	4.7
	Yellowfin	155243	11.3	70021	12.2	780	17.4	0		226044	11.6
	Billfish	16400	1.2	8264	1.4	66	1.5	0		24730	1.3
	Other	4550	0.3	1212	0.2	2	++	0		5764	0.3
	Total	264861	19.3	115223	20.0	1048	23.4	0		381132	19.5

NEWS FROM IN AND AROUND THE REGION

Obituary - Sema Robati

We are sorry to record the tragic death of Mr Sema Robati, a Fisheries Officer with the Cook Islands' Ministry of Marine Resources, late in September 1986. Sema was an active and enthusiastic individual, who lost his life in a diving accident off Rarotonga.



(Photo: L.B. Chapman)

Sema Robati, Cook Islands Fisheries Officer, shows off the bait catch during the 1986 visit to Rarotonga of the SPC Deep Sea Fisheries Development Project.

Sema has participated in a number of activities sponsored by the South Pacific Commission, and in 1983 he attended the SPC/Nelson Polytechnic Pacific Island Fisheries Officers Course. Most recently, he was assigned as counterpart to SPC Master Fisherman Lindsay Chapman during the 1986 Deep Sea Fisheries Development Project's visit to Cook Islands (see SPC Fisheries Newsletter No 37 p 4). Sema distinguished himself by his willingness to work long and unsociable hours, and by his ability as a fisherman, boat builder and diver. He will be sadly missed by his friends and colleagues in Rarotonga and at the South Pacific Commission.

Marine Shrimp Culture Training In Hawaii

(Source : University of Hawaii)

The Marine Shrimp Research Programme of the University of Hawaii is offering individual training in marine shrimp aquaculture. Training areas include larviculture (hatchery) and pond growout management. Individual training is customised to meet the needs of the trainee, and can include work at collaborating insitutions and commercial firms. Training emphasis is strongly `hands-on´ at the Hawaii Institute of Marine Biology´s indoor wet labs, and the Mariculture Research and Training Centre´s 22-acre pond research facility, which has commercial sized ponds ranging from 0.4 to 1.5 acres. This intensive practical experience is coupled with appropriate literature reviews. Emphasis is on the species Penaeus vannamei, P.monodon and P. marginatus, and on polyculture of shrimp, bivalves and fish. Training is normally for a minimum period of 3 months.

For further details contact :

Arlo W. Fast, Coordinator
Marine Shrimp Training Programme
University of Hawaii
P.O. Box 1346
Kaneohe, Hawaii 96744

Tongan Fisheries Vessels Resume Research Duties

(Source : Tonga Chronicle)

The Tongan Fisheries Division´s two vessels, MFV Takuo and MFV Albacore will resume their role as research vessels towards the end of October, according to Mr Viliami Langi, head of the Fisheries research programme. The vessels were originally given to the Tonga government as research vessels under aid programmes, but have recently been used as commercial fishing boats, with the proceeds from catch sales going into the Government´s general fund.

Mr Langi said that this will mark the start of a programme to assess marine resources in Tongan waters. Under the direction of Capt. Yuzo Matsumoto, the 13m Albacore, which is a purse seiner, will undertake work on the geographical and seasonal abundance of baitfish resources, while the 16m Takuo will explore deep-water bottom fishing in areas of the Kingdom´s exclusive economic zone.

Chinese Prawns, $15,000 Each
(Source : Les Nouvelles)

A hundred or so 'super prawns' will be sent from Peking to New Zealand in October as broodstock for a major new aquaculture project to be carried out by the Kiwi China Prawn Company. The prawns, all females, have been selectively bred for their ability to produce large numbers of eggs - up to 700,000/year - and are valued at over $15,000 each.

The Kiwi China Prawn Company's ultimate aim is to satisfy the New Zealanders appetite for prawns, on which they spend more than $15 million a year. The company plans to rear the prawns in eight large basins containing heated seawater maintained at constant temperature. This is in order to counter problems associated with New Zealand's temperate climate which have limited attempts to culture prawns there in the past.

One consignment of 40,000 one-week old prawns have already been delivered to the Company. These are being grown on to a mature size of about 20 cm and are being tested for the degree to which they have acclimatised to New Zealand conditions. The most resistant, well-adapted males will be used as breeding stock to fertilise the female prawns after their arrival.

Marshall Islands Katsuobushi Plant Plans Expansion
(Source : Marshall Islands Journal)

Katsuobushi, made by boiling and smoking skipjack tuna over a two week period, is a gourmet food in Japan where it is used as fish 'chippings' in the preparation of soup base. This Japanese tradition could bring economic benefit to the Marshall Islands, where for the past seven months the Nankatsu Company has been carrying out fishing and processing trials aimed at establishing a katsuobushi export factory on Majuro.

Nankatsu operations manager, Mr Fumitaki Kikuchi, says that at present it is too early to tell whether the Marshalls has the fish to support the factory. The company plans a five-year testing period to see whether the operations will take off, and has recently taken delivery of a second, 30-ton pole-and-line boat, Sagamyojin Maru to supplement the efforts of its first boat, the 15-ton Suiten Maru. The fishermen on board Suiten Maru have been averaging about six tons of skipjack a week. Their largest catch was 16 tons in a week earlier in the year. But even this is barely half of the four tons a day required to make the plant economically viable.

Nankatsu has a lot of competition from katsuobushi factories in Japan, but, according to the Majuro operations manager, "the Marshalls product is better because the fish are fresh as opposed to being frozen". The plant, while still in the pilot stage, is already one of the biggest employers of local workers, with a Marshallese labour force of 48. With the new boat stepping up operations, Kikuchi says Nankatsu needs to boost that number up to 60 or 70 workers. There are currently 24 Japanese working for the company, four at the plant and 10 on each boat, but the company hopes to replace them with Marshallese workers in the long term.

Katsuobushi has to be made from high quality fish, preferably sashimi-grade. The finished product nust be top quality to compete on the Japanese market, where it commands a price of 500-1000 yen (US$2.50 - $5.00) /lb. The poorest quality fish is processed to fish meal, and this also is exported to Japan. For Nankatsu, the big question mark over the operation is the abundance of fish. During the next year, the company intends to find out to what extent the seasonal changes in catches will affect their operations. In the words of Kikuchi "If the fish goes, the company goes".

(Photo: Marshall Islands Journal)

Top grade skipjack tuna being processed for Katsuobushi.

Status of US Tuna Fishery, 1985
(Source : US National Marine Fisheries Service)

For the U.S. tuna industry, 1985 appeared to be a year of relative calm following three years of turmoil during which four canneries in California and Hawaii were closed and U.S. tuna harvesting capacity was significantly reduced. Although 1985 was not as tumultuous as 1984, recent trends continued. These include the further attrition of the U.S. tuna fleet, decreased cannery deliveries of domestically-caught tuna, a decline in U.S. cannery production, and increased imports of canned tuna.

With the number of vessels making up the U.S. tropical tuna fleet decreasing 15% during 1985, and the reduction in domestic processing

capacity that occurred during 1984, U.S. cannery receipts of imported and domestically-caught albacore (white meat) and tropical (light meat) tunas (skipjack, yellowfin, blackfin, bluefin, and bigeye tuna) fell sharply in 1985. The total volume was 468,956 short tons (tons) (425,550 metric tonnes (t)), a decrease of 11% in total volume from 1984 and 15% below the 1980-1984 average volume of annual cannery receipts. Cannery deliveries by domestic vessels amounted to 213,808 tons (194,018t) in 1985, 16% below deliveries for 1984 and 14% below the 1980-84 (5-year) average. Raw tuna imports made up the 255,145 ton (231,537t) balance in total cannery supplies for 1985, a 5% decrease in imports from 1984 and 16% below the 1980-1984 annual average for imports. Direct exports of domestically-caught tuna totalled 34,797 tons (31,576t) in 1985, up 7% from 1984 and 324% greater than the 5-year average. Total U.S. deliveries (exports of domestically-caught raw tuna plus deliveries of domestically-caught tuna to U.S. canneries) amounted to 248,605 tons (225,594t) for 1985, 13% less than the corresponding amount for 1984 and 4% less than the 5-year average.

The western Pacific Ocean was the predominant production area for the U.S. fleet in 1985, providing 129,431 tons (117,451t) or 52% of the domestic caught cannery receipts and direct exports for the year. Total domestically-caught deliveries from this area decreased 31% from 1984, and as a share of total domestically-caught deliveries by oceanic area, decreased 21% from 1984. The western Pacific was also the area from which most of the raw tuna imports originated in 1985--74,356 tons (67,474t), or 29% of total imports by oceanic area.

The decrease in fishing activity in the western Pacific by the U.S. fleet during 1985 can be largely attributed to prevailing economic conditions. A resurgence of U.S. fishing in the eastern Pacific during 1985 occurred as a result of the lowest ex-vessel prices in five years, particularly for skipjack tuna, and exceptionally good fishing for yellowfin tuna -- the light meat species that commands the highest ex-vessel price in both domestic and foreign markets. A record catch of yellowfin tuna (218,920 tons (198,657t)) was reported from the Inter-American Tropical Tuna Commission's yellowfin regulatory area. The U.S. fleet accounted for almost 39% of the eastern Pacific yellowfin tuna catch in 1985, which represented the largest contribution to tuna cannery receipts of domestically-caught light meat by oceanic area for the year.

The loss of west coast and Hawaii canning capacity and overwhelming imports of foreign packed tuna contributed to a decrease of 11% in overall U.S. canned tuna production (27.9 million standard cases) from 1984. The total addition to U.S. canned supplies--canned imports combined with U.S. production--in 1985 was 38.9 million standard cases which was a 2% decline from that in 1984. Canned imports set a new record in 1985, reaching 11.0 million standard cases, a 32% increase from 1984, and an increase of 237% since 1980. Imports were dominated by tuna packed in water which is subject to a much lower import duty than tuna packed in oil.

The retail composite canned tuna price, which decreased 3% during 1984, fell an additional 2% through mid-1985. The downward price trend contributed to corresponding growth in overall apparent consumption which

increased at a projected annual rate of 0.7% in 1985, following a 2% increase for all of 1984. Sales of water-packed products--except water-packed products in the health/diet category--had increased 8% by mid-year. Since water-packed products amount for more than 60% of total sales, this increase helped offset reduced sales of tuna in oil and of health/diet canned products.

NMFS Southwest Fisheries Centre Reorganised
(Source : US National Marine Fisheries Service)

The NMFS Southwest Fisheries Centre's Oceanic Fisheries Resource Division has reorganised into two new Divisions : the Pelagic Fisheries Resources Division, and the Fishery - Marine Mammal Interactions Division. The reoganisation is due to changed tuna and marine mammal responsibility for the Centre, the need to devote renewed and strengthened emphasis to Pacific tuna studies, the changes in the international tuna fleets and industry structure, and the change from the early days (when the Oceanic Fisheries Resources Division was established) in the character of the tuna fishery-dolphin mortality issues.

Under the new organisation, the Pelagic Fisheries Resources Division has a staff of 25 scientists, technicians, and supporting staff who are responsible for providing basic fishery analysis and management information on tunas, billfishes, and other large pelagic fish species of interest to the United States government.

The staff of the newly-established Fishery-Marine Mammal Interactions Division consists of about 30 scientists and supporting staff. This Division is responsible for monitoring population trends of dolphins in the eastern tropical Pacific and of certain coastal marine mammals of California.

One of the first activities of the re-organised Southwest Fisheries Centre (SWFC) was to convene a meeting with its `sister' Southeast Fisheries Centre (SEFC) to discuss current tuna research within the two organisations and the rationale for future research. The SWFC announced that in 1987 it will add a new focus to tuna research : gathering fisheries data and related information, keeping aware of worldwide matters relating to tuna fisheries and processing and trade in processed tuna, and distributing the information to researchers, fishery managers and constituents. This information gathering, evaluating and distributing is a need identified by persons in the U.S. tuna industry. For tuna in general, the meeting noted that stock assessments and research on improving assessment methods should be high on the list of activities.

Ongoing activities which will be continued by the centre include research on : the economics of tuna fisheries; the relation between albacore fisheries and oceanographic features; local Hawaiian pelagic fisheries (and those in other US Fishery Conservation Zones in the Central and Western Pacific); and the collection of basic fishery data, maintaining data bases and tracking developments in the fisheries. Relatively new projects include efforts to develop an objective, fine spatial-scale forecasting model to forecast the probability of albacore fishing success in one-degree squares of ocean 2 weeks in advance using data on the state-of-the-environment in these areas.

The meeting concluded with a discussion of the rationale and objectives for future tuna research in the NMFS. The discussion emphasised that NMFS's primary responsibilities are to the US government and the US fishing industry. It was noted that, firstly, as the lead US marine fisheries agency, NMFS should monitor US fisheries and gather data to assess the condition of the stocks. Information on the status of the stocks is used by regional management bodies and NMFS officials to manage fisheries as directed by US law, and to develop and evaluate tuna fishing policies. Secondly, as lead US agency, NMFS should monitor developments in world tuna fisheries and evaluate events that affect the supply of tuna to the US market. Information generated is used by government officials to develop and evaluate US tuna fishing policies that affect the US role as the major world market for canned tuna and a major world tuna fishing nation.

That's Incredible
(Source : New Zealand Fishing Industry Board Newsletter)

A videotape entitled `That's Incredible' has been produced by the NZ Market Section of the FIB. The tape uses a comedy line to `sell' interest in the use of seafood, targeting secondary school classes, home economics in particular. The tape can be purchased from the Board at $30 per copy, and is being sold to schools throughout the country. For details write to: NZFIB, Private Bag, Manners Street P.O., Wellington, New Zealand.

High Mercury Levels Found in Tonga Fish
(Source : Tonga Chronicle/SPC)

In January this year, 590 kg of frozen fillets were exported from Tonga to Australia but were prohibited from being sold because analysis revealed a mercury content in excess of the Australian limit of 0.5mg/kg. The high mercury content was disclosed by the Australian Government Analytical Laboratory following obligatory tests imposed on imported seafood products. The fillets, which were taken from large groupers (Epinephelus spp) caught deep-bottom fishing, were returned to Tonga, from where random samples were sent to Japan for further analysis, along with further samples from fish caught in a different location from the rejected shipment. The Japanese results comfirmed that the groupers displayed very high mercury contents : 4.87mg/kg of fish, as compared to values of 2.19 and 3.63 mg/kg recorded from the Australian shipment.

There is nevertheless still some dispute among seafood technologists about the value and meaning of mercury content analyses. Mercury in seafood falls into two categories : inorganic mercury, which usually results from pollution and is highly toxic, having been responsible for a number of serious illnesses and deaths in industrialised countries : and organic mercury, which is mostly natural in orgin and thought to be relatively harmless. However, most mercury testing procedures do not distinguish between the two types and present a total value, which depending on the proportions of inorganic and organic mercury compounds present, may not reflect the actual likely toxicity of the fish. In fact, while always presented as a public health regulation, many countries use mercury content regulations as a non-tariff trade barrier. A case in point is the different mercury content limits in the states of Australia, which effectively protect the New South Wales shark fishery by barring shark imports from Queensland on the grounds of high mercury content. Sharks caught in New South Wales are likely to have a similar mercury content to those from Queensland, but since they are of `local' origin they are not subject to testing.

There has been a good deal of speculation about the origin of the high mercury levels in the Tongan fish. Some observers attribute them to the nuclear testing programme at Mururoa, French Polynesia, while others, perhaps more rationally, suggest a relationship with submarine volcanic activity in Tonga, in particular the eruption of Home Reef in 1984. The most likely cause, however, is more mundane: mercury is a toxin which accumulates with age, and reaches higher levels in old large fish. (This is the reason that canneries impose a maximum size limit on the yellowfin tuna they accept for canning). Groupers are well-known for being long-lived: there are authenticated records of known individuals having reached ages of over 20 years, and it is possible that some may live still longer. The Tongan fish were large, presumably old, and had probably accumulated mercury levels much higher than those of smaller fish of the same species.

Jaws Caught in New York
(Source : Time)

Franck Mundus, the Long Island, N.Y., shark fishermen who served as the model for Quint in the film `Jaws´, recently helped a young charter boat captain land the largest great white shark ever taken on a rod and reel. Mundus and Donnie Braddick had spotted a group of great whites feeding on the carcase of a whale about 25 miles south of Montauk, N.Y., and mobilised for battle. But the monster did not immediately abandon the whale in favour of the crew´s bait. "We were offering him a lollipop when he had a whole candy store" said Mundus.

(Photo: Joe Dimaggio/Time magazine)

Braddick with rod and Mundus holding fin of real 'Jaws'.

Nevertheless, jaws ultimately took the lollipop and was landed after a 2-hour battle. Next day thousands of tourists crowded to the Montauk marina to see the shark, which weighed 3,450 lbs (1565 kg), 800 lbs (363 kg) heavier than the International Game Fishing Association record caught off Australia in 1959. However, Braddicks monster may not qualify for the record books, because the 150-lb (68 kg) test line he used exceeded the allowed strength.

Pacific Fish On Display In Australia
(Source : Vanuatu Weekly)

South Pacific foodstuffs were prominently displayed at the recent Australian International Food and Drink Exhibition. Products from Vanuatu, Tonga, Western Samoa, Fiji, Papua New Guinea and Cook Islands included fresh and frozen fish, many coconut products, fruit and vegetables, coffee and beer. The South Pacific stand, sponsored by the Australian government, effectively promoted a trade (worth almost $5,000,000 in 1985) that has more than doubled in two years. Buyers and exhibitors from 15 countries attended the four-day exhibition held in Melbourne, capital of the State of Victoria.

(Photo: Eric Wadsworth/Vanuatu Weekly)

At left, John Lee, General Manager of 'Natai' (Port Vila Fisheries Ltd), displays a deep water snapper, one of several species for which Vanuatu hopes to develop export markets in Australia and elsewhere.

Book on Tropical Snappers and Groupers to be published

(Source : US National Marine Fisheries Service)

Dr Jeff Polovina and Dr Stephen Ralston have edited a book, `Tropical Snappers and Groupers: Biology and Fisheries Management,´ which will be published in December by Westview Press. The book is the result of a workshop held in May 1985 at the Southwest Fisheries Centre Honolulu Laboratory. This workshop brought together researchers working on the biology and management of regional snapper and grouper stocks. Papers were presented that summarised the knowledge of these two groups, each written with the idea of developing a "resource specific" perspective on either their biology or management.

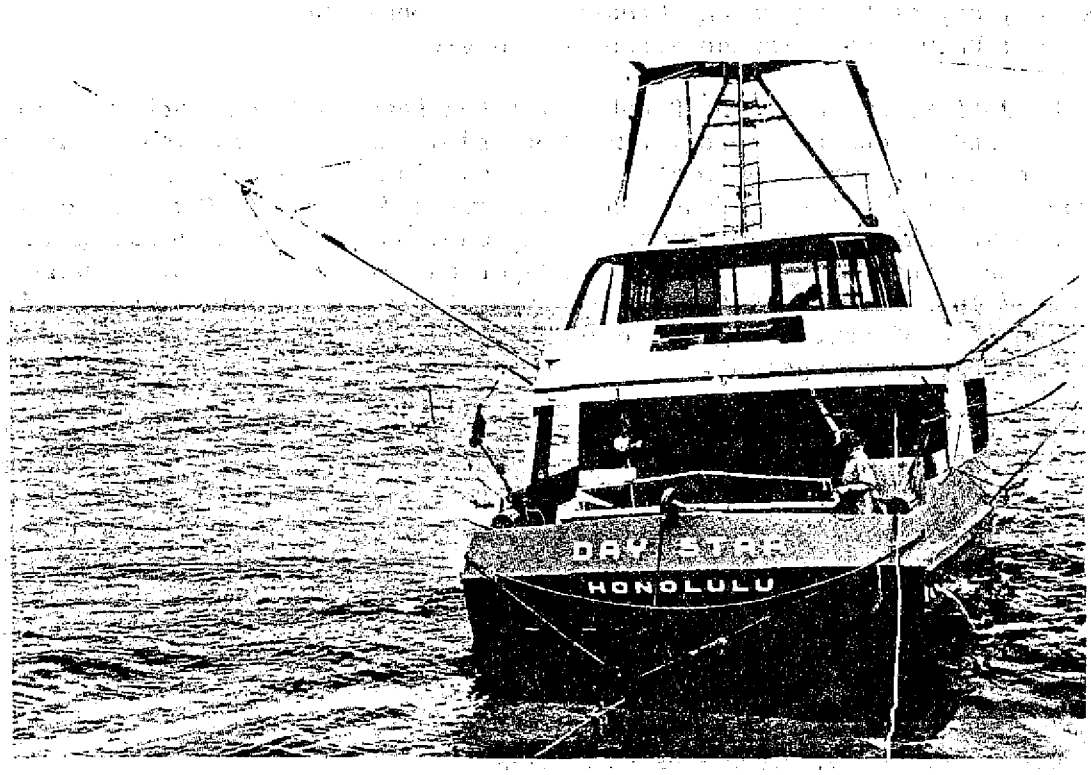
The first nine chapters are review papers that provide up-to-date summaries of the understanding of the biology of snappers and groupers. Included are papers on taxonomy, early life history, reproductive biology, age and growth, mortality, and feeding biology. The final chapter synthesises the main points and identifies criticial information gaps. Regional coverage ranges from fisheries in the western Pacific Ocean to the Caribbean Sea. The book can be purchased from Westview Press, 5500 Centre Avenue, Boulder, CO 80301, USA.

Good Albacore Fishing in Southern Pacific

(Source : Catch Magazine)

The following comments are extracts from a letter from Captain Carroll Hoeppner, skipper of the FV Day Star, to the New Zealand MAF. They add some interesting detail to the article on joint US/New Zealand exploratory albacore trolling surveys in the South Pacific, presented in SPC Fisheries Newsletter No 37.

> "The trip down from San Diego took us 26 days to travel 4300 miles. Our first day of fishing was at 38°S 140°W in 19.1°C water where we caught 160 albacore averaging 7.3 kg each. We moved slowly west to 143°W in water of 17.2° to 18.3°C with an average catch of 250 fish per day.
>
> We then passed through a bulge of cold water to 39°S 145°W where we had good fishing. One day we had 1421 fish averaging 7.3 kg for a 10.3 tonne day. Both Day Star and Bald Eagle averaged 500 fish each for 3 to 6 days.
>
> I went on to meet the Townsend Cromwell ahead of my partner boat. We only did fair to poor moving west to 154°W. Our initial catch of 150 fish dropped to 2 fish per day so we turned back to the south-east, south of our westward track. Around 40°20´S, 150°W we had a wonderful surface show in 17.2° to 17.8°C water and calm weather with around 400 fish per day averaging 7.7 kg each. We then continued east, finding scattered fish (about 150 fish per day) where we again had good fishing 80 miles south of our earlier hot spot. In 30 days from our start we both had about 45 tonnes so we again headed west. Since we were full, we tagged, fishing fewer lines with single, barbless salmon hooks and slowing when we got strikes. We tagged and released 610 fish.



(Photo: Kevin Bailey/Catch magazine)

The working end of the *Day Star*.

Our travels westward in 16.1° to 18.3°C water produced few fish until we turned due north towards Pago Pago around 18 March. On delivery in Pago Pago we had 45.9 tonnes of albacore averaging 8.1 kg each. Bald Eagle had 54.4 tonnes averaging 7.7 kg per fish. The prices offered in Pago Pago were: $US814 per tonne for fish smaller than 4.1 kg, $US1633 per tonne for fish 6.8 to 10.0 kg, and $US1716 per tonne for fish larger than 10 kg. We had so few fish less than 6.8kg that they did not grade them.

While we were in Pago Pago we had many Korean visitors, curious to see how our small vessels (Day Star is 22.3 m long, Bald Eagle 24.4 m) with 3-man family crew could have an average daily catch of 1.5 tonnes per fishing day, when their 25-man longliners with expenses in excess of $US1,000 per day could average only slightly better. "We did spend 75 days at sea, mostly travelling, and are now on our way to Honolulu before going on to our North Pacific albacore grounds. (33°N, 175°W), so we are looking at another 3800 miles travelling before starting our summer fishery.

We plan on returning to the South Pacific and perhaps base out of Pago Pago if we can find 1 or 2 more boats interested in the area".

Reconditioned Japanese Fishery Boats for Sale
(Source : Nichifutsu Shoji Co Ltd)

The Japanese company Nichifutsu Shoji (Société Franco-Japonais de Commerce), which deals in a wide range of fishing gear and equipment, is currently acting as agent for the overseas sale of second-hand 12m Yanmar fibreglass multi-purpose fishing boats. The vessels, model DW-40, are sold fully equipped with a reconditioned 30 hp Yanmar marine diesel engine. The wooden fender is renewed and the hull completely cleaned and repainted before resale.

The DW-40 specifications are as follows :

Length overall : 11.82m
Beam (including wooden fender) : 2.31m
Depth (from bottom to engine room hatch : 1.45m
Engine : choice of Yanmar 3ES35GG or
Yanmar 4MDGG
Stern gear : Pull-up prop shaft and tiller
Loading : 2.5 tons cargo or 30 adult passengers
Maximum speed unladen : 17-17.5 knots
laden : 15-16 knots
Fuel consumption (maximum) : 3ES35EG 21 l/hr
4MDGG 18 l/hr

(Photo: Yanmar Co. Ltd.)

Reconditioned boat sold at promotional price

The resale programme is part of a scheme Yanmar is running in Japan to promote the sale of new larger vessels. Small-scale fishermen owning DW-40s are encouraged to exchange them against newer boats and receive a favourable trade-in price. The DW-40s, built between 1972 and 1977, were a very popular model due to their high stability and manoeuvrability. The exchange programme is also proving popular, and Nichifutsu Shoji expect to have at least 1500 of these vessels to re-sell in the next two years. The price is Y3,400,000 (about $US17,000) including freight to Noumea. Freight charges to other Pacific Island countries would probably be similar.

For further details, contact : Nichifutsu Shoji Co Ltd, P.O. Box Kobe Port 2125, Kobe 651-01, Japan.

FISHERIES SCIENCE AND TECHNOLOGY

Oceanographic Anomalies May Explain High Productivity of Seamounts

(Source : US National Marine Fisheries Service)

Scientists of the US National Oceanic and Atmospheric Administration (NOAA) have recently completed the analysis of oceanographic data collected on and around seamounts during the National Marine Fisheries Services Honolulu Laboratory's research cruises in the Northern Hawaiian chain during summer 1984 and winter 1985. Data from Hancock seamount strongly suggest the presence of Taylor column effects, caused by resistance to vortex stretching in geostrophic (or quasi-geostrophic) flow within a rotating fluid (such as is represented by the ocean on a rotating earth). Ocean water flowing over a seamount must experience vortex stretching (ie, gross distortions of the normal stratified water flow pattern) due to the varying depth of the lower boundary of its motion. The net result is that when an ocean current encountering a seamount is sufficiently slow and steady, water overlying the seamount is prevented from being transported away. Instead, it remains as a parcel of water trapped over the seamount deflecting the incident current in somewhat the same manner as an island or reef.

Retention of reproductive products and planktonic food chain components in such trapped structures may provide part of the explanation of how seamount ecosystems are able to generate and support surprisingly large fish biomasses. In addition, the Taylor column mechanism includes the likelihood of continual local enrichment of the area over the seamount by upwelling which is driven by frictional retardation of the anticyclonic circulation pattern. Variability in the integrity of such Taylor column structures over time could therefore provide an explanation for a cause of variability in fish population size and resilience to exploitation.

Fishing With Lightsticks

(Source : World Fishing)

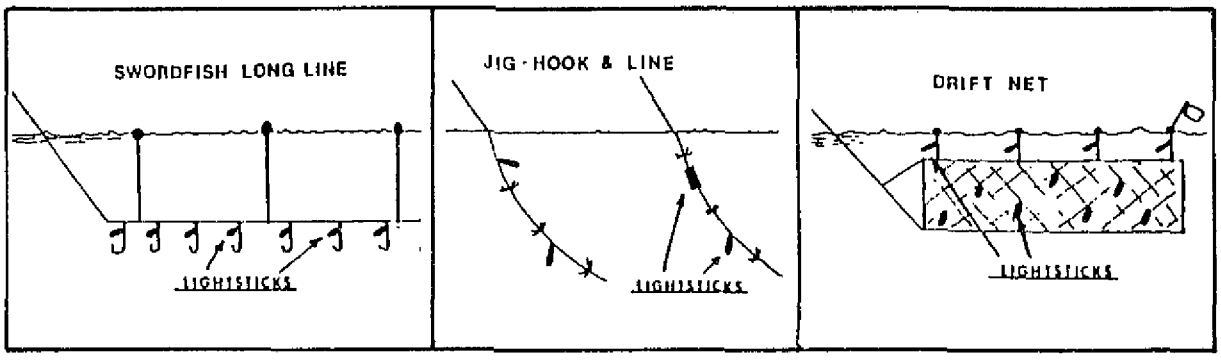
The Cyalume lightstick, introduced in the US more than a decade ago by American Cyanamid Company of Florida, consists of a transparent plastic tube which, when bent, breaks an internal glass container, allowing two

fluids to mix and fluoresce, producing a light that lasts for several hours.

It was instantly successful in a wide variety of applications. However, a few years passed before an enterprising sword-fisherman realised the potential value of the lightsticks to attract fish to the hook in commercial fisheries. Such was the eventual success of the lightstick that sales of Cyalume lightsticks to US commercial fishermen are now estimated to be as high as 6 million units per year, and most of these are for use in the lucrative longline swordfishing sector.

Two ranges of lightsticks are recommended for use in the fisheries. The first are 6in (150mm) long and are available in green, white, blue, orange, red and yellow. The second range is available in 1 1/4in (32mm), 2in (51mm) and 3in (77mm) lengths in green, yellow, red and blue. While it is generally accepted that the fish are attracted to light, the type, colour and configuration of light favoured varies from skipper to skipper and none will reveal his secret of success. Sales figures of Cyalume lightsticks however show a marked preference for green lights, while red and yellow are the least popular colours.

Since the lightsticks can only be used once, they seem to have found most favour in lining for high value species. The method of attaching lightsticks varies according to both the fishing method to be employed and the skipper's own preference. Some of the most popular methods are illustrated in the diagrams, but the sticks have also proved beneficial in trap fishing, salmon trolling and bottom longline applications.



Three ways of using lightsticks, which come in several colours and sizes.

The shelf life of the lightsticks is estimated to be two years, provided they are properly stored in the protective pouches supplied by the manufacturer.

The company produces another range of lightsticks, the Personnel Marker Light (PML), designed especially for use as distress or emergency lights. The PML has a self-contained pin for attachment to a life-jacket, it is easily activated with one hand, and emits light which is visible over one nautical mile in favourable conditions.

Hawaii Researchers Track Skipjack Tuna
(Source : US National Marine Fisheries Service)

As part of a larger study by NMFS to determine the behaviour of commercially important pelagic fish species associated with fish aggregating devices (FADs), and to predict optimal FAD placement strategies, three skipjack tuna, Katsuwonus pelamis, were tracked using ultrasonic depth sensitive transmitters. The fish were caught near FADs located off leeward Oahu, Hawaii, and followed using the RV Kaahele'ale for up to 56 hours. Unlike the yellowfin tuna that have been tracked as part of this project (see SPC Fisheries Newsletter No 32), all skipjack tuna remained essentially near the buoys for all the time they were followed. Yellowfin tuna usually move offshore away from the FADs at night and return the next morning. Also, unlike skipjack tuna tracked away from FADs some years earlier, which regularly moved up down in the water column, the FAD-associated skipjack tuna remained continuously in the upper 50 m. Further skipjack tuna tracking is planned for the remainder of the summer and autumn.

ABSTRACTS

This is an occasional feature intended to announce the existence of fisheries-related publications or documents specific to the SPC region, but which may receive only a limited circulation. Readers interested in obtaining copies should write to the contact addresses given (not to SPC) for information on how to do so.

1. Report on a Study of the Market for Giant Clam Products in Taiwan, Japan, Hongkong and Singapore by Bob Dawson, 1986 (FFA Report No. 86/37)

This market survey was carried out as a follow up to an initial study of markets for miscellaneous marine products conducted by Crick Carleton and published by the FFA last year. The specific focus on giant clams reflects a rapidly growing interest region-wide in farming these animals for ultimate sale to south-east Asian markets.

The primary market to be investigated in this survey was Taiwan (Republic of China) where there was known to be a market for giant clam meat. Unconfirmed reports of markets for giant clam adductor muscle in Japan, Hong Kong and Singapore required that those countries be included in the survey. Knowledge of the scope of potential and existing demand is vital to the future of giant clam mariculture and to the creation of a clam farming industry.

The findings of the survey indicate clearly that Taiwan is the only one of the four locations visited in which there is an established market for giant clam meat. The demand there is specifically for adductor muscle and is confined to the exclusive restaurant trade. Collective expert opinion placed the market ceiling for adductor muscle at approximately 100 tonnes per annum. It was estimated that the volume which reached the market in 1985 was about half that figure and the supply trend showed a gradual decline.

The consultant was faced with two major problems which hampered the collection of the data required to provide accurate, detailed analyses of existing demand in Taiwan and the potential market in the other three locations. In Taiwan, giant clam meat is imported illegally, so statistics are not available; however, the consultant did have the confidence of many people directly involved in the illegal giant clamming industry. Although some were reluctant to comment in specific detail at times, they were generally cooperative on the understanding that their names would not be included in his report. Under the circumstances, it was felt that the findings of the survey regarding Taiwan present as accurate picture as is possible to obtain.

The off-the-boat price for adductor muscle varies according to species, size and colour. In January 1986, the base price for the lowest grade muscle was US$7.50/kg and the highest grade prices range from US$21.25 upwards. It is not known to what extent the price is affected by inadequate supply but it would appear that the steady increase in price over the years has been influenced by usual inflationary pressures. It is the widely-held view of people in the clamming industry, in particular, and in the fishing industry, generally, that increased supply and legal importation of adductor muscle would result in a dramatic drop in price. The cultural aspect of the adventure of "eating the forbidden fruit" was given as a major consideration in forecasting a price drop. Restauranteurs, generally, were not so supportive of this view.

It was the consultants's view that the market for giant clam adductor muscle does not have significant growth potential within the confines of the exclusive restaurant trade. To broaden the market to include lower quality restaurants and other retail outlets could only be achieved at a much lower price for the product. Taiwanese sources all reacted negatively to the idea of such a broader market.

In Japan, Hong Kong and Singapore, giant clam meat is virtually unknown as a product and it would not be available in consistent supply for at least five or six years, even if farming commenced on a large scale in the immediate future. In these circumstances, appraisal of the potential for giant clam products in these three locations must remain largely speculative.

Overall the report concludes that the current market for giant clam adductor muscle is effectively confined to the Taiwanese exlusive restaurant trade. The capacity of this market does not exceed 100 tonnes per annum. Price levels range from US$7.50 to US$21.25 kg and above depending on species and size (delivered Taiwan). It would be possible to establish volume markets for fresh/frozen adductor muscle in such countries as Hong Kong or Japan at total levels of several hundred tonnes per annum. The securing of any significant new markets would likely have to occur at price levels around US$10.00/kg delivered. The prospects for successfully marketing giant clam adductor muscle as a substitute for scallop, dried or in other forms, are poor.

CONTACT ADDRESS: Forum Fisheries Agency, P.O. Box 629, Honiara, Solomon Islands.

2. Bibliography of Marine Ecosystems of the Pacific Islands
by Lucius G. Eldredge, 1986

The idea for this bibliography (currently in draft form) resulted from meetings of the consultative network of the South Pacific Regional Environmental Programme (SPREP). The scope, which is somewhat selective, was designed to include the shorelines of the islands within the SPC region. These ecosystems include reefs (fringing, barrier, atoll, etc.), mangroves, seagrasses, estuaries, lagoons, and the like, and their associated flora and fauna. Water movements, trophic analysis, nutrient studies, and other related "functional" aspects of these ecosystems are included. Specific taxonomic works on the flora and fauna, purely technical fisheries data, most aspects of physical oceanography, and strictly pollution information are not included, since each of these should be a compilation unto itself.

The audience for this bibliography is intended to be as broad as possible to include island adminstrators, educators, planners, managers, and environmentalists. The coverage is inclusive enough to be of value to interested people (educators, environmentalists, planners) outside the region and to others such as students who are considering conducting research within the area.

A detailed approach to searching the literature will be provided within the final copy. An in-depth index including subject-matter and geographic listings will also be included in the final bibliography.

CONTACT ADDRESS: Author, University of Guam, Marine Laboratory, VOE Station, Mangilao, Guam 96923

3. A Socioeconomic Appraisal of Fish Aggregation Devices in Hawaii
by Karl C. Samples, 1986

Fish aggregation devices (FADs) have been deployed in nearshore Hawaiian waters for the benefit of commercial and recreational fishermen. This report describes the socioeconomic characteristics, attitudes, and motives of FAD users based on a 1984 survey. It also describes the costs of Hawaii's FAD programme and the monetary benefits that accrue to users. The 622 surveyed fishermen made 13,819 visits to FADs, or 26.4 visits each during a 12-month period in 1983-84. An average of 4.4 fish, consisting primarily of various tuna species, were caught per FAD visit. Fishermen generally claimed that fish catch and overall fishing fun were improved around FADs, but they also frequently identified crowding as a detracting factor. Statistically significant differences exist between commercial and recreational fishermen using FADs in terms of their fishing activity, vessel type, catch, and attitudes about the effectiveness of the devices. A benefit-cost analysis of Hawaii's FAD programme shows that, on an annual basis, users' willingness to pay for FADs ($184,906) slightly exeeds estimated average annual programme costs ($182,000)

The report also makes a number of conclusions which seem to run counter to commonly-held ideas regarding FAD use. For example, FAD deployment in Pacific Island countries are often partly justified on the grounds

that they lead to reduced searching time and increased fuel savings on the part of small-scale fishermen. However, this report found that recreational (non-commercial) fishermen in Hawaii tend to use the FADs as navigational reference points which encourage them to make trips further offshore. If fish are not biting at one FAD, or several boats are already working it, the fishermen will travel to the next, and may visit several in a single trip. This ultimately results in longer trips, which involve more travelling than was the case prior to the deployment of the FADs.

CONTACT ADDRESS: UH Sea Grant College Programme, University of Hawaii, Honolulu, Hawaii 96822

4. Considerations of Preparing an Aquaculture Feasibility Study In The Pacific Islands Region
by K. Roger Uwate, 1985

The author of this report also co-authored an earlier PIDP review of the successes and failures of aquaculture in the region. In this volume, he contends that most aquaculture projects and their proposals have addressed the technical aspects of aquaculture, while neglecting the economic and financial aspects. In most cases, only a simplistic budget is developed and perhaps rate of return is calculated.

By developing this procedural manual for doing aquaculture feasibility studies (how to construct an aquaculture business plan), the author hopes that future feasibility studies will include more complete economic and financial analyses. By including such components in a feasibility study, poorly conceived ventures or those with no chance of success can be identified and terminated prior to the investment of significant resources.

The primary audience of this work is the agencies in the Pacific Islands region that are responsible for approving and/or initiating aquaculture projects. These include government fisheries and marine resource offices. By processing and using this source document, the author hopes that the success rate of aquaculture projects in the region can be improved.

Two basic uses are envisaged for this work. The first use is as a reference for island officials when they are called upon to evaluate aquaculture feasibility studies submitted by the private sector for approval. The second use is as a guide to island officials for construction of their own aquaculture feasibility studies.

Strict adherence to the format outline presented in the report is not anticipated, nor desired. Each proposed project must be analysed based on its own unique characteristics. The materials in the report should, however, provide a basis for flexible analysis to determine project feasibility.

CONTACT ADDRESS: Pacific Islands Development Programme, East-West Centre, Honolulu, Hawaii

SPC Fisheries Newsletter No 38
July - September 1986

A SUMMARY OF THE TOKELAU TROCHUS TRANSPLANT PROJECT

by

Robert D. Gillett
FAO South Pacific Regional Fisheries Development Programme
Suva, Fiji

In May 1985, in conjunction with the Co-ordinator of the UNDP Integrated Atoll Development Project the author prepared a list of potential development projects relating to the marine resources of Fakaofo atoll. One suggestion was that the Tokelau Department of Agriculture and Fisheries consider introducing trochus to Fakaofo. In January 1986, Tokelau authorities indicated that they wished to proceed with such a project. The subsequent trochus introduction was performed in March 1986, funded by the Integrated Atoll Development Project and carried out by staff of the South Pacific Regional Fisheries Development Programme with the help of the Tokelau Department of Agriculture and Fisheries and the Fiji Fisheries Division.

Previous attempts to introduce trochus to various Pacific Islands are listed in Table 1. The transplantation from Palau to Truk was observed for 5 years before it was judged to be a success (McGowan 1958). Based on this and other trochus transplants, McGowan (1958) states that the "introduced animal and their progeny must not be disturbed for a period of at least 5 years". In the Cook Islands about 3 years elapsed before it was evident that the stock transferred to Aitutaki was breeding (Devambez 1960). Eight years later trochus were described as plentiful (Sims 1985). Transplantations from Aitutaki to Palmerston Atoll in 1981 and 1982 resulted in "abundant" quantities by 1984 (Sims, pers.comm.). With the exception of the work done by Sims in the Cook Islands, the technical details of previous trochus transfer operations were not available for the present project.

Extreme caution should be exercised when considering the introduction of an exotic species to an area. The decision to proceed with the Tokelau transplantation was based on discussions with trochus experts, a review of the literature on trochus introductions, and a consideration of historical information.

In the preparatory phase of this project discussions were carried out with 12 people who were knowledgeable about trochus and/or trochus introductions. Included in this group were individuals who have voiced concern in the past over the unrestricted movement of biological material between Pacific Islands. Based primarily on historical experience these authorities did not feel that the transfer of trochus 400 miles eastward of the limit of its natural distribution would be biologically harmful to Tokelau.

TABLE 1: PACIFIC ISLANDS TROCHUS INTRODUCTIONS

Date	Areas	Details	Source
Before 1927	Palau to Truk Palau to Ponape	Unsuccessful attempt	McGowan 1957
1927-1931	Palau to Truk	Total of 6 724 shells transferred in bait wells of skipjack boats; 5 years elapsed before judged successful. First harvest 1939, greatest annual harvest (1952) 230 tons	McGowan 1957 McGowan 1958
1937	Palau to Phoenix Is.	No details of transfer available; 1986 status unknown to Kiribati officials	Bour et al 1982 Onorio, per. comm.
1939	Palau to Saipan Palau to Ponape Palau to Satawal	2 974 shells transferred; 6 745 shells transferred; greatest harvest (1951) 180 tons; 5 000 shells transferred; success not known	McGowan 1957 McGowan 1958
1939 or 1940	Yap to Ulithi	Very successful	McGowan 1957 McGowan 1958 McCoy, per. comm.
1939	Palau and Yap to various sites in Caroline Islands	Japanese Govt. and private companies transferred shells to many islands including Ngulu, Ngatik, Mokil, Pulawat. Transfers to Sorol, Woleai, Ifaluk, Kapingamarangi, and Nukuoro not successful	McGowan 1957
1939	Palau to Jaluit	Shells transferred to other atolls of the Marshalls including Majuro and Ailinglaplap; transfer to Ebon not successful	McGowan 1957 Bour et al 1982
1940s or early 1950s	Ponape to Kosrae	Unsuccessful operation	McGowan 1958
Early 1950s	Saipan to Guam	Shells transplanted by two fishermen; very successful	Smith, per. comm.
1957	Fiji (Viti Levu) to Aitutaki	2 transfers; one in sea water, other damp in crates (40 shells). seaplane used; trochus population plentiful in 1965. First harvest 1981 (200 tonnes).	Van Pel 1957 Devambez 1960 Sims 1984 Powell, per. comm.
1957	Vanuatu to Tahiti	1 200 shells shipped in circulatory water tanks. 40 survived the 15 day trip	Yen 1985 Yen per. comm.
1958	Fiji to American Samoa	No details available	Bour et al 1982
1958	New Caledonia to Tahiti	40 shells transferred by aircraft in damp sacks. First harvest 1971; greatest annual harvest (1973) 261 tonnes	Van pel 1957 Anon. 1972 Powell 1960
1959	Ponape to Kosrae	500 live trochus released at 13 locations	Gawel 1982
1963	Guam to Hawaii	1967 survey showed trochus surviving, but no indication of reproduction observed	Kanayama 1967
1963	Tahiti to Moorea	No details available	Anon. 1972
1964	Tahiti to Raiatea	No details available	Anon. 1972
?	Tahiti to Tuamotu and Austral Is.	No details available	Anon. 1972
1981-1983	Aitutaki to Southern Cook Islands	Palmerston Is, 3 000 shells transferred, abundant, at date of report. Manuae, 500 shells, status unknown; Mitiaro, 300 shells, rare/extinct; Atiu, 300 shells, rare/extinct; Mangaia, 300 shells, rare; Rarotonga, 200 shells, rare/extinct	Sims 1984
1982	Aitutaki to Rakahanga and Manihiki	Shells carried on deck in wet sacks. Unsuccessful; all dead before arrival	Sims 1985
1984	Yap to Outer Islands Yap	12 attempts including air drops; 2 were successful; more planned for 1986	Gawel 1986

. . . . (continued)

TABLE 1: PACIFIC ISLANDS TROCHUS INTRODUCTIONS (CONTINUED)

Date	Areas	Details	Source
1985	Aitutaki to Northern Cook Islands	Penrhyn, 439 shells, carried 6 days in bait tanks; Manihiki, 398 shells, carried 9 days in bait tank; Rakahanga, 693 shells, carried 10 days in bait tank; Pukapuka, all dead, carried 13 days in bait tank	Sims 1985
1985	Fiji (Viti Levu) to Funafuti	181 shells transferred in 3 air shipments; successful; larger transfer planned	Parkinson 1984 Pita 1985 Adams, per. comm. Batty, per. comm.
1986	Aitutaki to Northern Cook Islands	1 200 trochus shipped using flooded skiff on domestic vessel. Very good survival rate	Dashwood, per. comm.
1986	Fiji (Viti Levu) to Tokelau	1029 shells transferred; 584 sent by ship via Western Samoa; 161 flown to Western Samoa to join original shipment; 284 subsequently air-dropped from military aircraft after direct flight Suva-Tokelau.	Present report

Parkinson (1984) discusses the concern over the effect that a trochus introduction would have on the indigenous fauna and environment. On the basis of habitat, diet, and other factors, he concludes that a trochus introduction would "not be detrimental if carried out". It was reported by McGowan (1958) that in the 1920s the scientist, Asano, "after several years of research" decided to proceed with a transplantation of trochus from Palau to Truk. McGowan himself, after studying trochus for two and a half years in Micronesia, concluded that attempts should be made to introduce trochus to areas where it does not exist (McGowan 1958).

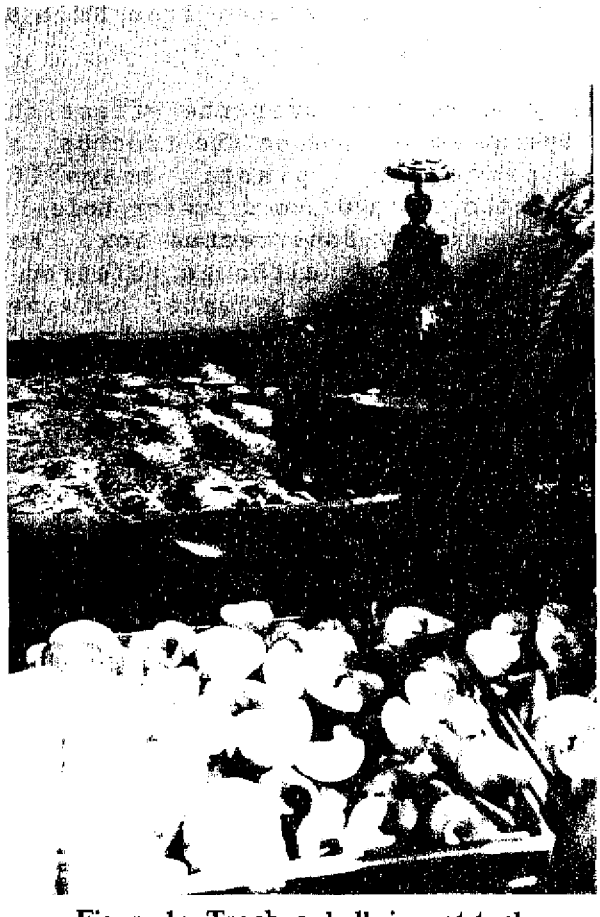
Table 1 lists approximately 40 trochus introductions including transfers to the north, south, east, and west of Tokelau. Negative repercussions of these introductions have not been noted with the possible exception of the suggestion by Sims (1984) that on Aitutaki trochus may compete with the green snail, Turbo setosus. This snail species, however, is not utilised by Fakaofo residents (Toloa, pers.comm.). Discussions with local residents and fisheries officials in other trochus recipient countries of the Federated States of Micronesia, French Polynesia, Guam and Tuvalu failed to uncover additional detrimental effects. On the contrary, local enthusiasm for secondary trochus transplants within the recipient country, in some case decades after the original operation, gave support to the project to transfer trochus to Tokelau.

Plans for the actual trochus transportation were formulated anticipating major difficulties. It can be seen that many of the previous transplantations listed in Table 1 ended in failure. Furthermore, the Tokelau operation was viewed as being logistically more difficult than any operation attempted to date. There is no aircraft service to Tokelau and

the only direct shipping service is to Apia, where trochus do not occur. This would necessitate a long period of shipboard transit for the trochus during which they would be subjected to the additional trauma associated with large salinity fluctuations in harbours.

Considering the above difficulties, and the paucity of detailed technical information on previous trochus transplants, it was thought that a `buckshot´ approach to the Tokelau project would be best. Accordingly, it was planned that the trochus would be transported using a variety of techniques to minimise the risk of a major disaster. Another advantage of this approach is that it would give additional insight into trochus mortality which could be useful for future trochus transplants in other Pacific Island countries.

Two sites in Fiji were chosen for the trochus collection operation. Nukubuco Passage and Namuka Passage are located respectively two nautical miles southeast and six miles west of Suva point. The areas were selected more for their proximity to the main wharf at Suva than for the abundance of trochus. Diving was carried out during four expeditions; the first was a two-day trip by seven divers using the M/V Sasalu ni Waitui (11 GRT) and an eight metre skiff both belonging to the Fiji Fisheries Division. Subsequently, eight to fourteen divers made three day-trips using only the skiff. During the first diving trip, 584 trochus were collected (7 trochus per man-diving-hour) and during the latter trips, 161, 160 and 124 trochus were collected (5, 4, and 3 trochus per man-diving-hour).



(Photo: R.D. Gillett 1986 Apia - Tokelau)

Figure 1: Trochus shells in wet tanks on route to Tokelau.

The first indication that the 1958 Cook Island trochus transplant was a success came from length frequency information (Devambez 1960). Accordingly all shells collected in the present operation were measured twice. Only those larger than 8cm were retained.

The M/V "Wairua", a passenger/cargo vessel of 617 tonnes is routinely chartered by the Tokelau Administration to provide ship transport to Tokelau. Based in Fiji, the "Wairua" normally departs Suva prior to the contract period, arrives in Apia, embarks passengers and cargo, and then proceeds to Tokelau. With the cooperation of the vessel owners, the vessel schedule was altered to allow a convenient connection with the aircraft service between Fiji and Apia.

In March, six different methods of transporting the trochus were utilised simultaneously. Four of the methods utilized ship transport exclusively while two involved a combination of air and shipping service.

1) The aluminium skiff of the "Wairua" was vigorously cleaned by a work gang for several hours, placed on deck, and flooded by the ship's fire hose. The water flow of about 25 litres per minute, continuous throughout the entire voyage, was drained by both a plug at the base of the transom and by flow over the gunwales. One group of trochus was placed in the skiff during the voyage.

2) A second group of trochus was carried in four shallow wooden boxes (100cm x 100cm x 20cm), lined with thick plastic shower curtain material and flooded with water using the ship's fire hose at a flow rate somewhat reduced from No.1 above. Water flowed out over the top edges.

3) As there was some concern over the effect that the ships bronze plumbing system would have on the trochus, a third group of animals were placed on 3 plastic trays (60cm x 60cm, perforated on the bottom with 0.5cm diameter holes). The 3 trays were placed in a specially constructed box. Each tray was covered with a burlap sack and, although referred to as `dry', was soaked at least once per hour by water obtained by plastic bucket directly from the sea (not from the ship's plumbing).

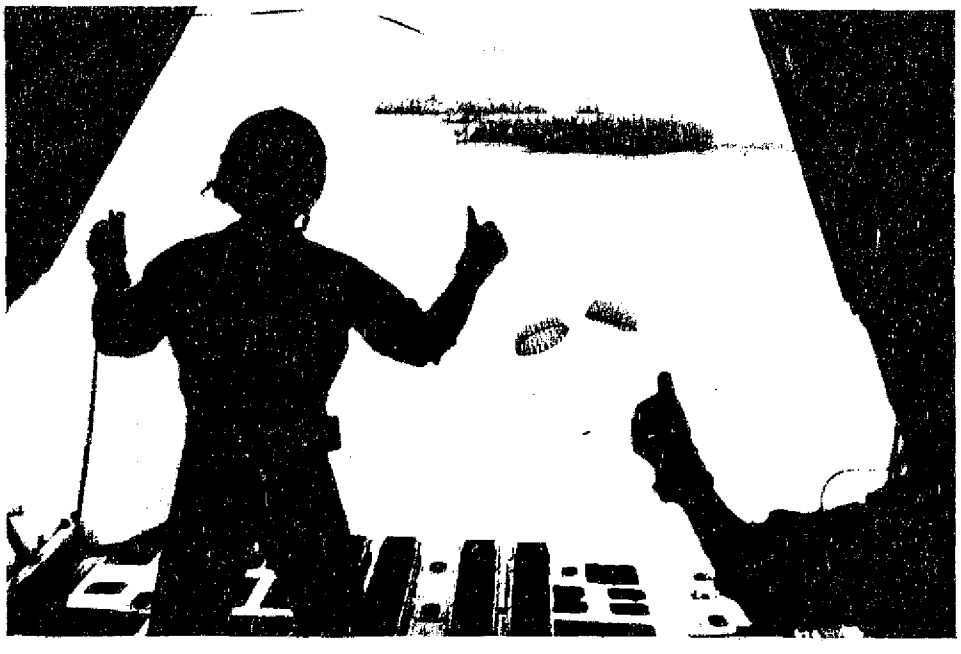
4) Recognizing that the new plywood used to contruct the above box may contain preservatives toxic to trochus, one tray of trochus (identical to those above) was kept on deck separately.

5) Because of the long ship transit period, (five and half days from Suva to Fakaofo,) three plastic trays of trochus were sent by aircraft to Apia. These trochus were collected 3 to 4 days after those which departed Suva aboard the "Wairua". Upon arrival in Apia they were placed in the flooded skiff of the "Wairua" with the other trochus. One hour thereafter the "Wairua" departed Apia for Fakaofo.

6) Aquarium fish are routinely shipped from Fiji to North America and Europe, after being placed in plastic bags (33 x 22 cm) containing seawater and oxygen. Using the same technology, one group of trochus was airfreighted along with No.5 above to the Wairua in Apia and was liberated from the plastic bags just prior to placement on the reef at Fakaofo.

During the above operations personnel familiar with trochus biology selected the precise reef areas most appropriate for the placement of these trochus, and of any future loads. It was therefore possible to take advantage in June of an offer by the New Zealand High Commission and the Royal New Zealand Air Force to airdrop trochus at Fakaofo. Late in May the author was notified that a C130-Hercules aircraft would be made available to fly trochus directly from Suva to Tokelau. Trochus, both on "dry" racks and in aquarium bags, were packed into a padded crate (90 x 90 x 90 cm) which fully loaded weighed 200 kg. The load was dropped using two T7-Alpha parachutes at an altitude of 100 metres while flying at an airspeed of 125 knots. Twenty three men in three boats were awaiting the crate at the drop site.

Both the air and surface shipments were accompanied by the author and other personnel involved in the project. All containers were covered to reduce the detrimental effect of sunshine, rain, and dust contamination. The trochus were regularly inspected. Dead trochus were removed upon detection and measured before being discarded. Salinity was monitored using two hand-held refractometers. In the event of a large decrease in salinity, common in both Apia and Suva harbours after rainstorms, contingency plans were formulated which involved carrying large amounts of oceanic seawater aboard the "Wairua" in plastic bins.



(Photo: R.D. Gillett 1986 Tokelau)

Figure 2: Dropping trochus onto reef by air (NZ Air Force) to waiting group below.

Figure 3: The transport scheme from Fiji to Samoa and Tokelau.

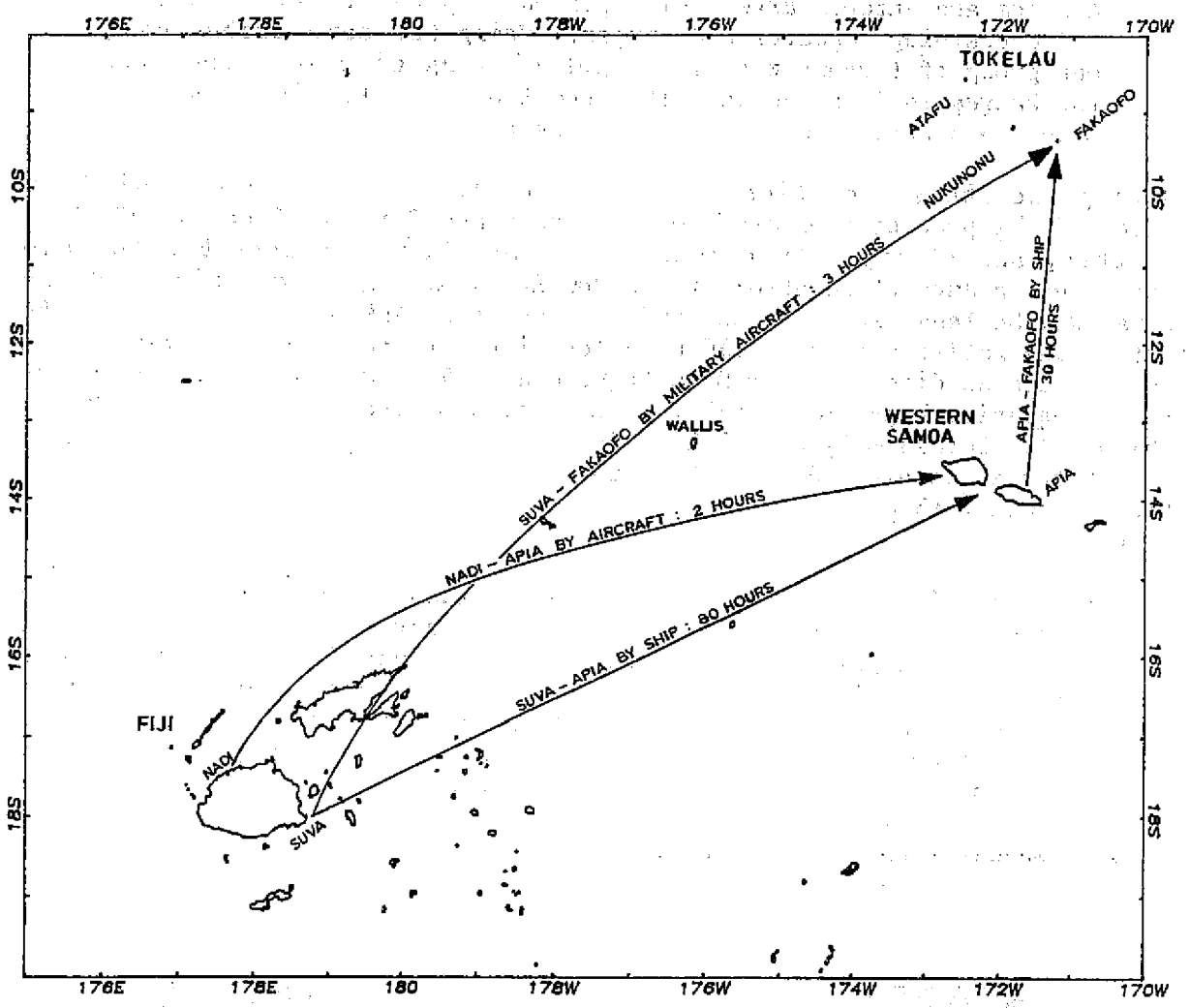


Table 2: Mortality of trochus during transport to Tokelau.

Method		Approximate number of shells	Time held 'dry'	Total time from capture to release	Number dead	Mortality in percentage
Shipboard:	Flooded skiff (1)	153	6 hrs	134 to 164 hrs	3*	1.9
	Flooded boxes (4)	285	6 hrs	134 to 164 hrs	7*	2.4
	'Dry' tray in box (3)	108	133 hrs	None released alive	108	100
	'Dry' tray on deck (1)	38	133 hrs	None released alive	38	100
Air/Ship:	'Dry' tray/ flooded skiff (3)	140	13 hrs	66 to 69 hrs	0	0
	Plastic bags (water & oxygen) (21)	21	4 hrs	66 to 69 hrs	0	0
Air:	'Dry' tray (2)	204	28 hrs	50 to 80 hrs	1	0.4
	Plastic bags (water & oxygen) (80)	80	3 hrs	50 to 80 hrs	0	0
	Total	1 029			159	15.4

* Some additional mortality may have occured due to escape and/or poaching.

Figure 3 depicts Tokelau in relation to Western Samoa and Fiji and shows details of the transport utilized between these areas. Table 2 gives details on the trochus mortality during transport to Tokelau. In summary, methods which involved carrying trochus in flowing water were very successful. Only 10 of these animals died and this was possibly due to escape onto lead-based paintwork. The 21 trochus transported "aquarium fish style" survived the 35 hours in the plastic bags without mortality. 93 per cent of the trochus held "dry" in trays survived 72 hours out of water. The remainder of these animals died between 72 and 96 hours.

The site for trochus implantation in Fakaofo, known as Tulua Fatu, was selected considering the presence of typical trochus habitat, distance from the population centre, reef and currents. Trochus were placed on smooth coral areas both on top of the reef flat and deeper in the surf zone in approximately two to three metres of water.

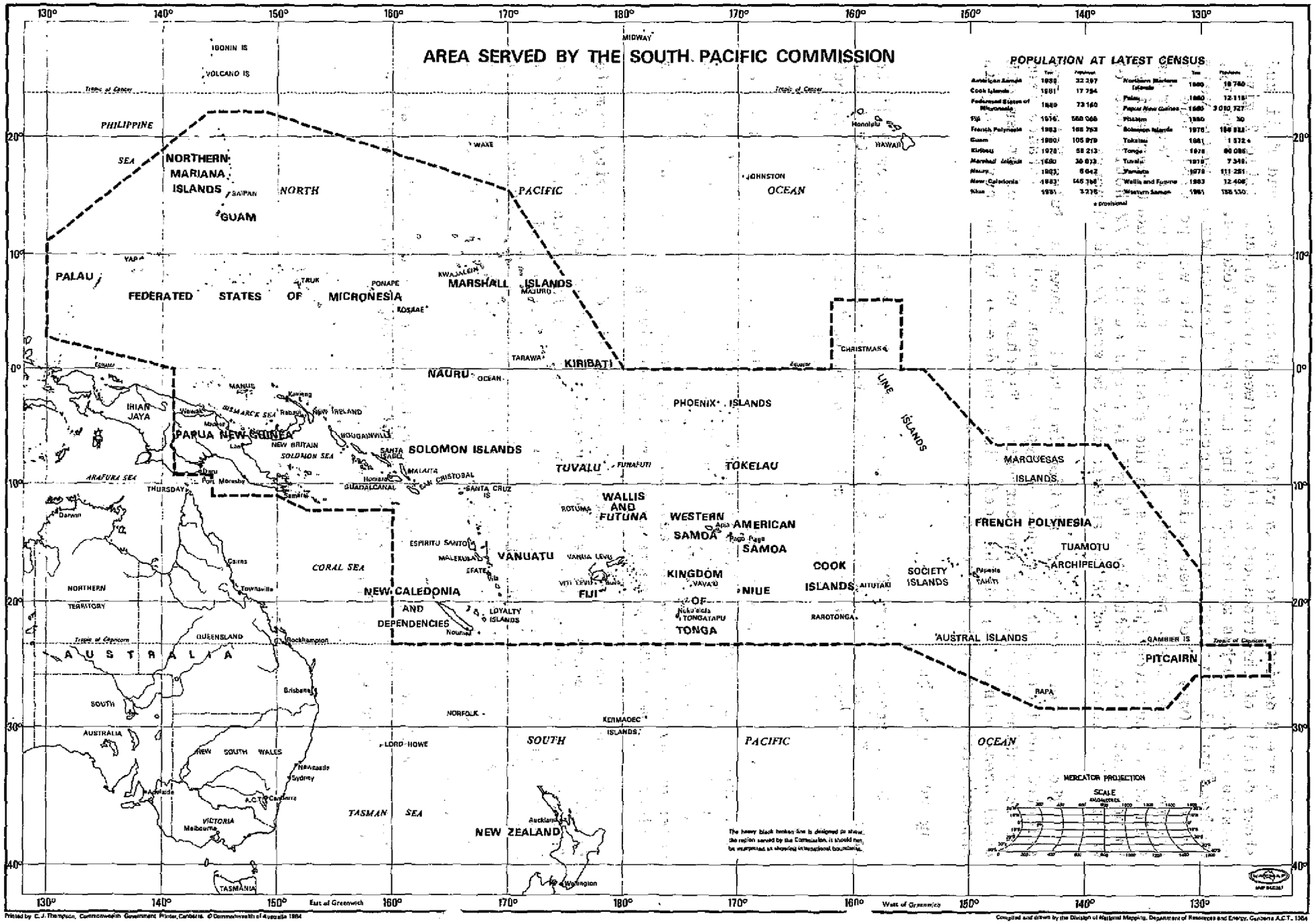
Concluding Remarks

In the project over 800 live trochus were transplanted from Fiji to Fakaofo. The number to survive the journey was in excess of twenty times the amount to survive previous transfers to the Cook Islands and to French Polynesia, both of which resulted in the establishment of trochus fisheries.

Fisheries officals in other Pacific Island countries who are contemplating a similar transplantation should make an independent assessment of the desirability and impact of such a project. They should also be careful not to underestimate the amount of work involved. Several weeks of advance preparation were necessary and for the actual trochus collection, over 195 man hours were expended on diving.

Transportation of trochus aboard non-specialized vessels using simple flooded tanks appears practical for future voyages of less than 6 days. Trochus transport on "dry" trays is not recommended for trips in excess of 2 days. The use of plastic bags and oxygen is promising and has advantages with respect to quarantine regulations when transiting other countries. If the placement site can be selected beforehand, if reliable ground crew are available, and if transport is provided free of charge, parachute dropping is ideal.

A complete report of the transplantation with bibliographic information is available from: South Pacific Regional Fisheries Development Programme, UNDP Private Mail Bag, Suva, Fiji.



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