

DIVISION OF MARINE RESOURCES

ANNUAL REPORT

1992

**BUREAU OF RESOURCES AND DEVELOPMENT
MINISTRY OF RESOURCES AND DEVELOPMENT
PALAU**



PREFACE

This is the third annual report produced by the Marine Resources Division (MRD). The objectives of this report are to facilitate the dissemination of information on activities of MRD to other government departments in Palau, and to provide information to the general public, particularly those active in the fisheries sector, on current issues in marine resource development and management in Palau and the role of MRD in these matters.

In order to satisfactorily address these objectives the report has been written in largely non-technical terms. Readers are encouraged to provide feedback on the suitability of this style of presentation.

If you require additional information on topics summarized in this report, the staff of MRD will be pleased to provide needed information. The Division has established close ties with organizations involved in fisheries development and management elsewhere in the Pacific, through which MRD may access information related to fisheries worldwide.

I look forward to develop this service as a practical means of keeping Palau informed about fisheries affairs.

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Introduction Introduction Introduction

In 1990, the population in Palau was 15,122, comprising 12,321 Palauans and 2,801 foreigners. About 69% of the population was concentrated in Koror (1990 Census, Appendix II). In 1992, there were 3,193 foreign laborers resident and 32,885 visitors came to Palau from January to November, of which 73% were tourists. Over 50,000 people were dependent upon our fishery to some extent in 1992.

Coastal fisheries in the Republic are concentrated between the barrier reef and the shore (Figure 1). The reef stretches approximately 400 kilometers around the islands enclosing a lagoon approximately 1,500 square kilometers in area. (The estimated area of fish habitats by State is shown in Appendix I). The largest fishing habitats are located in Koror (621 km²) and Ngerchelong (431 km²). Extensive reef systems are also present on the islands of Peleliu, Southwest, and Angaur, where significant fisheries targeting reef resources have developed. The offshore fisheries operate more than 12 miles from shore within Palau's 200 mile Exclusive Economic Zone and on the adjacent high seas.

The administration of marine resource management and development in the Republic of Palau reflects the different nature of the inshore and offshore fisheries. MRD is primarily concerned with inshore resource development and management. However, we also compile information on the offshore fishery. This **MRD Annual Report** summarizes the activities of the inshore fishery, targeting the top commercial finfish and invertebrates, and the activities of the offshore fishery, targeting tuna and billfish.

The strategy for marine resource management and development in the Republic recognizes the ocean as the nation's most valuable natural resource, and that the ocean offers the best opportunities for long term economic development and attainment of economic self-sufficiency. The informal strategy includes:

- initiatives to increase private sector employment and income generating opportunities;
- development of socially and environmentally sensitive resource management policies;
- diversion of fishing effort from inshore to offshore activities;
- resource survey and product development to expand the export base;
- development of marine conservation awareness programs;
- improved methods of product handling and processing;

- encourage active participation by State governments in marine resource development, management and conservation;
- encourage rationalization of shore-based infrastructure;
- increase local manpower training opportunities.

1992 was a year of consolidation for the Division of Marine Resources. The Marine Aquaculture Research Section (MMDC) continued to develop production culture methods for giant clams and export and economic opportunities in giant clam farming. MMDC has pioneered this field and can justifiably claim to be the world's most successful giant clam culture operation.

In the capture fishery, 1992 saw the opening of a 4-week trochus harvesting season after a three-year moratorium to allow stocks to recover from the previous harvest. Trochus shell is a major source of export revenue for Palau, but the resource has to be carefully managed if this revenue is to be maximised.

Private sector involvement in local fish marketing is diversifying, and fishermen are being given a bigger choice of outlets to sell their fish. Whilst this is likely to complicate the monitoring work of the Division, it is a welcome development for the economy.

Offshore, Palau continues to be an important part of the Pacific tuna fishery, which is said to be the only remaining major global fishery with potential for significantly increasing catches. Palau's geographic position makes it easier for Palau-based fishing companies to access major tuna markets in Japan and Asia:- a factor that is particularly important for the longline fishery targeting sashimi-quality fish. Palau is also situated in an area of high skipjack tuna abundance and thus derives revenue from the licensing of distant-water fishing vessels.

The attractiveness of Palau's offshore fishing grounds dictates a considerable law-enforcement effort, but Palau is greatly assisted by its membership of the Forum Fisheries Agency (FFA):- a consortium of Pacific Island nations which works together in helping to regulate the regional tuna fishery. For example, a vessel found poaching in Palauan waters can be "blacklisted" on the FFA Regional Register of Foreign Fishing Vessels and will not be allowed to fish in any other FFA member country until the grievance has been settled to Palau's satisfaction.

Summary of available information on Palau fish production, 1990-1992

	1992		1991		1990	
	Weight kg	US\$	Weight kg	US\$	Weight kg	US\$
Local purchase						
Reef finfish	289,133	695,921	307,788	747,715	?	?
Mangrove Crab	10,417	90,659	6,151	53,967	?	?
Lobster	4,007	34,874	3,245	27,971	?	?
Other	779	2,012	?	?	?	?
TOTAL local purchase	(304,336)	(823,466)	(317,184)	(829,653)	(209,863)	?
Subsistence (estimate)	750,000	N/A	750,000	N/A	750,000	N/A
Export						
Reef-fish by markets	2,600	?	?	?	?	?
Reef-fish other exporters	203,000	?	?	?	?	?
Dried Sea cucumber	0	0	1,855	?	0	0
Trochus	229,000	1,100,000	0	0	0	0
PITI/PMIC sashimi export	2,581,000	?	2,835,000	?	1,816,000	?
PITI/PMIC Total tuna export (inc sashimi)	4,133,000	27,564,819	6,443,000	?	?	?
Distant-water tuna catch						
US purse-seine	?		12,735,000		?	
Japan purse-seine	?		?		1,810,000	
Japan longline	?		?		1,296,000	

Source: MRD Annual Reports

(Figure 1. Map of Palau Islands of Palau Islands Palau Islands (the Southwest Islands are shown on the inside cover)).

**Organization Organization
Organization**

The responsibility for marine resource development and administration is shared among several

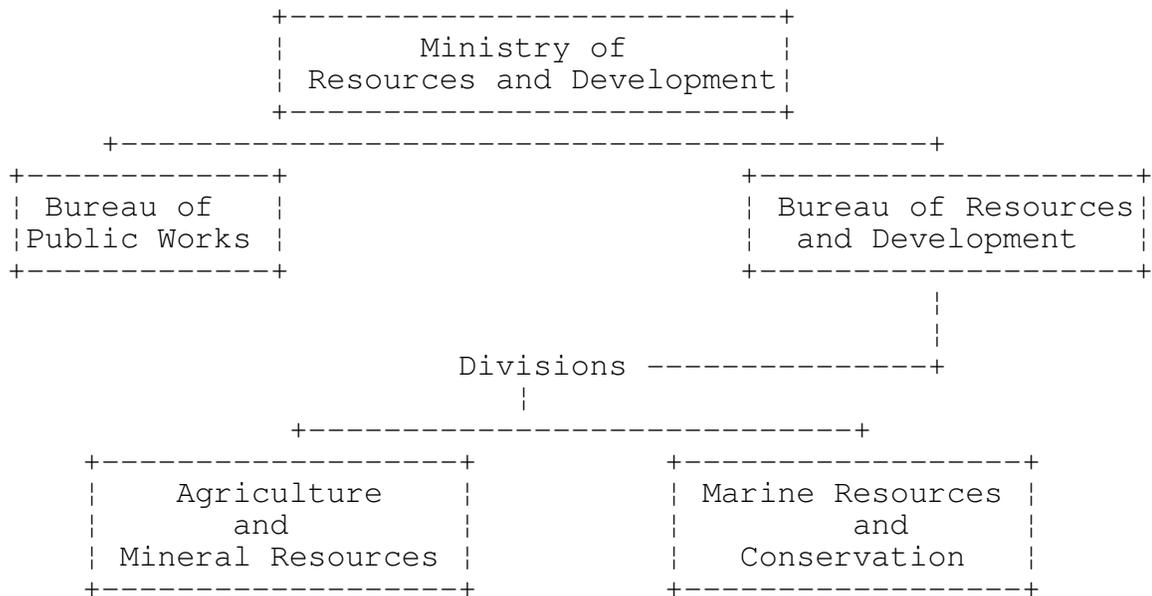
government departments and statutory authorities based in Koror. Marine Resources Division (MRD) is a division of the Bureau of Resources and Development. MRD shares a coastal site on the south coast of Malakal with the Office of the Director of the Bureau.

The Palau Maritime Authority (PMA) is responsible for licensing and management of fisheries occurring between the 12 mile territorial limit and the 200 mile Exclusive Economic Zone.

The Palau Fishing Authority (PFA) is the commercial arm of government activities in the fisheries sector and is involved mainly in marketing and development. PMA and PFA have boards, including government and private sector representatives, appointed by the President with the advice and consent of the Senate.

The Attorney-General's Office is responsible for marine surveillance. A national patrol boat has confiscated several illegal fishing boats in the Southwest Islands.

The existing relationship between the various national agencies involved with fisheries administration, development and management in Palau is depicted in the diagram below.

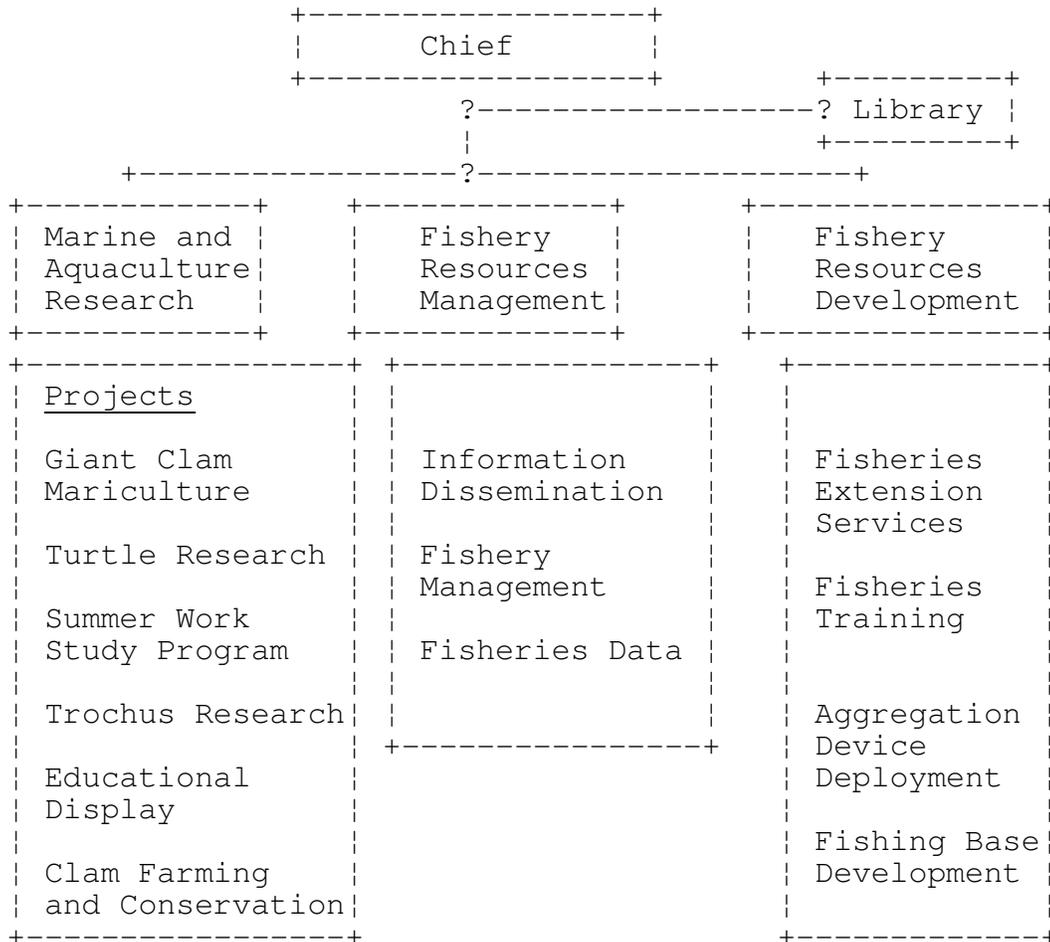


The Marine Resources Division The Marine Resources Division The Marine Resources Division

The main functions of MRD include exploration and surveying of marine resources, development and transfer of fisheries technology, resource management and conservation advisory services

promoting the cost-effective cultivation of aquatic species of potential economic importance, statistical monitoring and technical support to fishermen.

The division's work program is divided into three areas: Fisheries Resources Management, Fisheries Resources Development, and Marine and Aquaculture Research, as shown in the diagram below. This latter function is primarily executed by the Micronesian Mariculture Demonstration Center (MMDC), under the direction of the Chief of MRD.



FunctionsFunctionsFunctions

The Function of each branch is summarized below:

Fishery Resources Management:

1. To assess and evaluate the commercial potential of reef, pelagic and deep water

fishes, baitfish, mollusks, turtles and crustaceans from catch records, census and quantitative field measurements.

2. To develop and recommend regulations for the scientific management of these resources on a sustained yield basis.
3. To recommend establishment, by legislation, of regulatory measures such as size limits, fishing seasons and sanctuary areas, where appropriate.
4. To advise and inform the public of any measures and other important matters concerning marine conservation in the Republic.

Fishery Resources Development:

1. To continue efforts to develop off-shore and inshore fisheries by providing modern fishing techniques and gears for Palauan fishermen and established fishing businesses.
2. To promote and developing commercialization of fisheries and fishery products.
3. To provide technical assistance and advisory services to local fishing cooperatives in the purchasing, handling, marketing and processing of fish and other marine products both locally and externally.
4. To provide staff support and administrative assistance to the Board of Directors and management of Palau Federation of Fishing Associations, upon request and on the basis of staff availability.
5. To assist in the development of fisheries infra-structure and programs at the state level.

Marine and Aquaculture Research:

1. To maintain and operate the Micronesian Mariculture Demonstration Center as a site for research, education and experimentation on Palau's living marine resources.
2. To conduct hatchery rearing and mass production of commercially important marine species for the dual purpose of conservation and economic development. To produce giant clams and trochus for either farming or release in Palau's natural environment. To conduct turtle research for management and conservation

programs.

3. To serve as a center for education and training of Palauan students in principles of marine biology, conservation and mariculture. To conduct intensive summer education programs for Palauan students and provide educational tours of the facility for school classes of all grade levels.
4. To provide laboratory and dormitory space, on a short term cost-effective basis, to international scientists wishing to conduct research on Palau's marine species.
5. To stimulate economic development by attracting private investment in commercially profitable mariculture enterprises.

StaffingStaffingStaffing

MRD has a total of 26 staff positions shared between the three major work program areas. The present staff consists of fourteen civil service employees, three expatriate project oriented contract biologists supported by extra-budgetary sources and four short-term contract workers. Four civil service positions are currently under recruitment. The Chief of the Division reports to the Director, Bureau of Resources and Development. The leader of each branch reports to the Chief. The civil service employees are supported by an annual allocation to MRD by the government of Palau.

Name	Position
Civil Service	
Noah Idechong	Chief, Division of Marine Resources
Teruko Baiei	Clerk-Typist
Theofanes Isamu	Fisheries Officer
Becky Madraisau	Fisheries Specialist I
Pablo Siangeldeb	Fisheries Development Officer
Evelyn Oiterong	Fisheries Technician I
Steven Patris	Fisheries Technician
Marcus Ngiramengior	Fisheries Technician
Lorenzo Katosang	Fisheries Technician
Uro Ikesakes	Trades Technician II
Kangich Madris	Trades Technician I
McCarthy Kotaro	Extension Officer
Teruo Remoket	Extension Officer
Germance Taro	Tradesman

Non-Civil Service

Asap Bukurrou	Information Officer
Gerald Heslinga	Manager, MMDC and Clam Project Leader
Don Hanser	Clam Hatchery Foreman
Setts Mongami	Mariculture Technician
Ann Kitalong	Fisheries Biologist
Laurence Sumor	Mariculture Technician
Herman Kunihiro	Mariculture Technician

Operating Budget

The MRD receives an annual grant from the Palau government that covers the salaries of locally employed staff, utilities and fuel costs. Limited support from the government is received for operating costs. The majority of funding is from outside sources, which includes support for salaries for expatriates, construction costs for buildings and tanks, equipment costs, and travel costs for technical training and meetings. The sources include: the Economic Development Fund and the Technical Assistance Fund under the multilateral Treaty on Fisheries between the US and certain Pacific Island States; the Department of Interior, either directly or through the Sea Grant Program; the Japanese Government; the Japanese International Cooperation Agency (JICA); the Pacific Fisheries Development Foundation (PFDF); the Overseas Fishery Cooperation Foundation (OFCF); and the International Center for Ocean Development (ICOD). The South Pacific Commission (SPC) and the UNFAO Regional Fisheries Support Program have also provided technical assistance and training for our staff.

Summary of MRD Grants, 1992

- 1). Palau Government
 - Staff salaries and maintenance costs* \$ 232,481
- 2). U.S. Department of Interior
 - Biologist to develop a Fisheries Management Program* \$ 37,500
- 3). Multi-lateral Treaty on Fisheries
 - a) Economic Development Fund
 - Budget support for meetings* \$ 20,000
 - FAD materials* \$ 50,000
 - Fisheries Training and Support Facilities* \$ 50,000
 - Manpower Development Project* \$ 40,059
 - b) Technical Assistance
 - Library Assistance* \$ 10,000
- 4). Pacific Islands Network

Fish Poster \$ 17,000

Summary of MMDC Grants, 1992

- 1). U.S. Department of the Interior/University of Hawaii Sea Grant
 - Operations and Maintenance* \$ 110,000
- 2). Pacific Aquaculture Association
 - MMDC Mariculture Internship* \$ 8,500
 - Re-introduction of Tridacna gigas to Yap* \$ 34,450
- 3). PFDF Regional Yield Trials for Two Commercially
 - Important Giant Clam Species* \$ 62,000

FacilitiesFacilitiesFacilities

There is ample, air-conditioned office space spread through four buildings that are utilized by MRD staff. The buildings are of prefabricated design and were relocated to the Malakal site in 1973 when MMDC was established. In 1981, when the constitutional government was established, MRD and MMDC merged. However, it was not until 1988 that MRD moved from its original site close to the Micronesian Industrial Corporation (MIC) to the Malakal site.

The offices have gradually deteriorated during the last two decades and are rapidly approaching a condition where a decision concerning their suitability for continued occupancy will be required. The original MMDC office and library facility, constructed in concrete before the War, was condemned in 1985 and is scheduled to be demolished.

The site at Malakal has 5 air-conditioned dormitory rooms capable of accommodating 10 visitors. The dormitory is self-contained with cooking and other facilities. Two self-contained apartments are also available for longer term researchers. Approximately 15 visitors were hosted in these facilities in 1992, for periods ranging from 1 week to 3 months. In addition to living quarters, MMDC maintained an administrative office, six project offices and an extensive system of mariculture tanks with flowing seawater and aeration. The giant clam hatchery consists of 64 concrete tanks of 5-10 tons volume and a 1660-ft, state-of-the-art intensive hatchery. Laboratory equipment consists of compound and dissecting microscopes, balances, centrifuges, dissolved oxygen meters, air pumps, Ph meters, seawater chemistry analysis equipment, and 20 cu.ft. freezer. The giant clam hatchery has facilities for processing clam meat and shells and for packing clam meat in heat-sealed, stretch-wrapped containers. A substantial grant from JICA (Japan) this year resulted in an upgrading of the MMDC Trochus Hatchery to include state-of-the-art fiberglass larval culture vessels, spat settling tanks, UV-sterilization equipment and a 9-meter Yamaha workboat. The hatchery equipments were installed by Mr. Kikutani with assistance from the Trochus Project staff.

Three MacIntosh computers are on line with accessories including dot matrix and laser printers, floppy and hard disc drives, mass data storage backup system, backup power supply and a full complement of software for word processing, statistical analyses, financial analyses and database management. MRD has three EPSON computers, one IBM and one Toshiba laptop with accessories including two dot matrix printers and one HP laser printer.

The giant clam hatchery operated a small gift shop/visitor center to provide souvenirs, shellcraft and information to tourists. The shop marketed MMDC T-shirts, literature, shellcraft and shell jewelry on a daily basis. Construction of an office and training complex for fisheries resources development-related activities was completed by the end of 1992.

A separate building to be occupied by the Palau Maritime Authority has also been planned for the Malakal site. Construction on this building, with financial support provided under the goods and services component of a fisheries access agreement between Palau and Japan, commenced in 1992.

Boats include a 12 meter Yamaha diesel in-board and an assortment of small open deck work boats powered with outboard engines. At present, six scuba sets are maintained by various projects and some of the staff have undergone training to service and maintain equipment.

LibraryLibraryLibrary

A Marine Resources Division Technical (MRD) Library has been developed. The library's goals are to build and maintain a working collection of marine resources information/publications for the staff of the Division, as well as to provide information for other government agencies, local users, students, and visiting researchers, and the facility has already proved its worth.

The MRD Technical Library has continued to develop its collection of general information regarding both living and non-living marine resources, tridacna research, fisheries, aquaculture and marine conservation, with emphasis on the Pacific region. The library's holdings now include approximately 1,300 monograph titles, 30 active journal and newsletter subscriptions, as well as a unique collection of unpublished reports on Palau's marine environment.

As a member of the PIMRIS (Pacific Islands Marine Resources Information System) network, coordinated through the University of the South Pacific with the South Pacific Commission and the Forum Fisheries Agency, the MRD Technical Library is developing an online catalog using the UNESCO CDS-ISIS software. In the future, this development will allow the MRD Technical Library to link electronically with the PIMRIS Moana database based in Suva. As a member of the PIMRIS network, the MRD Technical Library benefits from a gratis Current Awareness Service, enabling MRD staff to obtain technical articles from journals which the MRD Library does not subscribe to.

Additional library development support has been obtained through the University of Oregon Micronesia Program. Funded by the U.S. Department of the Interior, technical assistance was provided to the MRD Library for three months, beginning January, 1992, by Jane Barnwell, Pacific Islands Studies Subject Specialist at the University of Oregon Library. Ms. Barnwell will be providing similar technical assistance during this time to two other agencies, the Belau National Museum Research Library and the Conservation/Entomology Division, creating numerous opportunities for the library staff at each site to benefit from joint training sessions.

During 1992, the MRD Technical Library received technical assistance through the University of Oregon Micronesia Program. During both an initial three-month period, and an additional three-month follow-up, the MRD Technical Library Information Officer was trained in the ongoing management of the library's collections, including bibliographic control, preservation and binding techniques.

Project goals at the MRD Library include: organization and planning for the space currently being renovated to accommodate the growing resource materials collection, involving a logical spatial layout as well as equipment, furniture, and supplies needs; assessment of the present collection and evaluation of future needs, especially for appropriate journals and reference materials; training for effective operation of the MRD library system, including future coordination of internal publications and information services as well as maintenance of the computerized cataloging system.

MRD produced eleven technical reports during 1992 (Appendix III). The topics of these reports ranged from field surveys to long term planning. Bound reports are available at the MRD library.

A comprehensive bibliography listing articles on all aspects of sea farming, fisheries and the Palau marine environment was published in early 1990 by Mr. M. Izumi, from the Regional Fisheries Support Programme, as a collaborative project between MRD, MMDC and the UNDP/FAO South Pacific Regional Fisheries Support Programme in Suva. MRD receives requests from Palauan residents, international visitors and overseas organizations for information about Palauan fisheries and marine resources. Overseas organizations have a close working relationship with MRD and are a source of valuable publications.

As Palau is a member of both the South Pacific Commission (SPC) and the South Pacific Forum Fisheries Agency (FFA), MRD benefits from information disseminated by them. In addition, the International Center for Ocean Development (ICOD), based in Canada, has provided funds to various South Pacific regional organizations to promote information storage, retrieval and dissemination. The program in which FFA, the University of the South Pacific (USP), SPC, FFA and the South Pacific Applied Geo-sciences Commission (SOPAC) are participating is called the

Pacific Islands Marine Resources Information System (PIMRIS). Through this system, MRD can quickly access publications related to South Pacific fisheries held at these various regional libraries. Professional visitors from these agencies and other research facilities are listed in Appendix IV.

WORK PROGRAM WORK PROGRAM WORK PROGRAM

Fisheries Resources Development Resources Development Development

Fisheries Extension Services Fisheries Extension Services Fisheries Extension Services

The Marine Resources Division and MMDC extend technical advice and services to interested individuals, fishermen, cooperatives and State governments on various issues which relate to the catch fishery, marine resources and mariculture management. Services are provided upon request and where resources are available either from within MRD or from other donor agencies with whom cooperative relation have been developed. Major activities in 1992 included resource assessment on various projects, evaluation of potential mariculture farms and sanctuary surveys.

Fisheries Training Fisheries Training Fisheries Training

MRD receives annual support from international agencies (listed in the Operating Budget section) to enable staff and Palauans involved in fisheries to obtain training. This training enables trainees to upgrade their skills, learn the latest technology in their fields as well as share knowledge within the region.

Name	Type of Training	Duration	Venue
McCarthy Kotaro Pablo Siangeldeb Steven Patris Teruo Remoket	FAD workshop	1-day	MRD
Pablo Siangeldeb Steven Patris	Global Positioning System (GPS) workshop	1 day	MRD
Theo Isamu	Fisheries Officer	6-months	Fiji
Asap Bukurrou	Library skills	3-months	
Moses Blesam Lawrence Sumor	Giant clam mariculture	3-months	

Fish Aggregation Device (FAD) and Vertical Longline Project
Fish Aggregation Device (FAD) and Vertical Longline Project

The South Pacific Commission's Deep Sea Fisheries Development Project (DSFDP) visited Palau from November 14, 1991 to October 31, 1992. The Marine Resources Division requested that an extensive project be initiated to conduct vertical dropline trials and expand the existing FAD program. The project was under the supervision of SPC Master fisherman, Peter Watt (MRD Tech.Rept 92.2).

Priority activities for the project included the following:

- adapt vertical longline gear, developed in Western Samoa, to suit various vessel designs in Palau;
- demonstration and training in vertical longlining techniques;
- demonstration and training in handling procedures for higher quality catch;
- bait fishing trials with the aim of supplying bait for the vertical dropline fishery
- bottom contour surveys to locate suitable sites for FADs
- determine alternative FAD designs for future deployments
- deploy FADs of various designs at surveyed sites.

Two vertical dropline systems were designed for the Marine Resources Division vessels:-- a vertical dropline drum, similar to the Western Samoan design, for fishing vessels 10-m in length. and a smaller vertical dropline drum designed for fiberglass boats 6-8 meters in length. A total of 12 vertical dropline fishing trips yielded 15 fish, 1 total weight of 755.5 kg for 12 sets; an average of 62.3 kg per trip and 23.8 kg per dropline. The majority of fish caught on the vertical droplines were sharks which are of no commercial value in Palau. A total of 18 troll fishing trips yielded 1017.5 kg; an average of 56.5 per trip. Results from the vertical dropline trials were unsuccessful for catching *Thunnus albacares* and *Thunnus obesus*. Possible reasons for this were that the FAD's were not deployed long enough to establish a migratory link between the large tunas and the FADs and that El Nino currents changed the migratory patterns of the pelagic species in 1992.

A total of 8 bait fishing trips yielded 43.5 kg; an average of 5.5 kg per trip. Bait fishing trials for terekrik (*Selar crumenophthalmus*) were marginally productive using multiple hook jigs. Contracting baitfishing out to net fishermen targeting terekrik would be more productive.

Bottom contour surveys on the east and west coasts indicated that there were few suitable locations to safely deploy FADs offshore. Three sites were located near a bank approximately 8 miles offshore from Ngeremlengui Passage, 3.5 miles off shore from Ngemelis Island and 3.5 miles offshore from Ngaraard village. Development of inshore FADs was recommended as a natural "stepping stone" to offshore FADs. Hawaiian Sphere buoy FAD systems were used in

1991, yet the expense of refurbishment, shipping and the bulky size were considered disadvantages of this system. Two alternative systems were chosen, the sub-merged McIntosh monofilament design and the semi-submerged Seychelles design. A monitoring program, comparing the fishing success of the three systems is recommended.

Table 1. Location, deployment dates, fishing trips, catch, and longevity of MRD FADs.

LOCATION	LAT/LONG	DATE DEPLOYED	NO. OF fishing TRIPS	TOTAL CATCH (Kgs)	CPUE	DAYS ON STATION
NGEREMLENGUI	07 37 625 134 22 525	04/17/92	18	963.0	12.3	196 ACTIVE
NGEMELIS	07 06 943 134 22 525	05/11/92	0	0	0	169 ACTIVE
NGIWAL	07 31 25 134 39 41	09/03/92	0	0	0	58 ACTIVE
UDEL	07 07 00 134 26 60	07/17/91	0	0	0	310 LOST
MUTREMDIU	07 13 20 134 33 60	07/17/91	0	0	0	230 LOST
NGEBARD	07 24 80 134 40 70	07/17/91	0	0	0	325 LOST
NGIPTAL	07 32 50 134 41 20	07/17/91	0	0	0	80 LOST
GALAP	07 37 90 134 41 90	07/17/91	0	0	0	130 LOST
ULONG	07 20 20 134 08 60	10/10/90	0	0	0	125 LOST
OLLEI	07 42 00 134 26 00	10/10/90	0	0	0	4 LOST

Palau Fishing Community Development Project Fishing Community Development Project Community Development Project

The Fishing Community Development Project was proposed to provide basic fisheries infrastructure at strategic locations in rural fishing communities around Palau. A study mission to Palau by a team from Japan International Cooperation Agency (JICA) confirmed the merit for such a project. Funding was subsequently approved by the government of Japan under its grant aid program. Four sites were identified for port and facilities development. These included the north [Ngerchelong], south [Angaur], east [Melekeok], and west [Ngatpang] coasts of Palau. The ports have all been completed and are now being utilized by fishermen.

Fishery Resources Management

Fisheries Regulations

An Act that delineates the responsibilities of MRD and other government fisheries agencies and a set of fisheries regulations, passed the first reading in the Palau's National Congress in 1992. Legislation (RPPL No. 3-61), that prohibits the commercial export of fish, lobster and mangrove crab from March through July, effective October 3, 1991 was repealed in 1992.

Trochus Fishery Management

MRD has two activities focussing on trochus. The first activity assesses the status of trochus stocks on the reefs and monitors the fishery. The second activity, coordinated through the Marine and Aquaculture Research Project, concentrates on culturing trochus for reef seeding trials.

Monitoring trochus population involves visual observation of the trochus on the reefs and keeping track of the level of annual export. MRD is thus able to advise States on the appropriate levels of harvesting that their reefs might sustain. Each State has at least one trochus sanctuary and Koror State has five. MRD offers advice on the suitability of the sites selected for sanctuaries and monitors trochus populations established there. Information on import tonnage, destinations, and unit cost of trochus shells needs to be more accessible to MRD. Export data has often been unavailable or fragmented and inconsistent between sources. Accurate export data would enable local governments to negotiate on firmer ground with foreign and local businessmen on prices for the tonnage that is sold.

In 1981, responsibility for management and regulation of the trochus fishery was given to the States. During this period, it was difficult to obtain information concerning the total trochus harvest. Concerns about the ability of the resource to sustain itself arose as the fishing pressure increased throughout the 1980's. In 1989, the Palau National Government passed legislation placing a moratorium on the harvesting of trochus for a period of three years from all States except Hatohobei and Sonsorol. In May 6, 1992, the Third Olbiil era Kelulua adopted House Joint Resolution No.3-84-14 designated an open season for the harvest of trochus on June 1992

throughout the Republic of Palau, except Tobi State. A summary of the 1992 harvest (MRD Tech Rept 92.3) is given below.

Trochus shell was the single most valuable inshore marine resource for Palau in 1992. Historically, the trochus fishery is exceptional in that after 77 years of known commercial exploitation it continues to produce sustainable yields for a lucrative foreign market. Local buying prices have escalated from \$.05 a pound in the 1923 to \$1.40 lb in 1992; a rate of 2 cents/year. Harvests peaked at 332 metric tonnes (mt) in 1923 but have averaged 116 mt for the past six decades (1910, 1920, 1930, 1950, 1980, 1990). Using a rule-of-thumb procedure developed for the Australian trochus fishery, based on historical records, an annual harvest quota of 100 metric tonnes is recommended for the maximisation of revenue.

A total weight of 535,506 lbs (241 metric tonnes) of clean (24%) and uncleaned (76%) trochus shell were sold by fishermen to local buyers in the 1992 harvest season, generating \$645,398 in revenues for the harvesters. Fifteen containers totalling 229 mt of dried clean shells were exported to foreign buyers, valued at 1.1 million dollars to local buyers and at 1.3 million dollars to foreign buyers. The top States harvesting trochus were Koror, Kayangel, Ngardmau and Ngeremlengui. Kayangel had the highest landings per sale at (400 lbs/sale) and Koror had the lowest (142 lbs/sale). A total of 1400 people sold trochus on 2,914 occasions to the two local buyers. This represents 10% of Palau's population that actively participated in the trochus harvest. Males made 88% of the sales, generating 92% of the revenues and females made 12% of the sales generating 8% (@\$50,000) of the revenues. At least 48 mt of trochus meat valued at \$100,000 is not being marketed and development of the trochus meat market is needed.

The catch rate of trochus has quadrupled since the 1930's. Average catch per unit of effort from 1936-41 was @5-lbs/man/hr compared to 20-lbs/man/hr in 1992. A fishermen in 1992 can potentially collect as much trochus in one week as he collected in one month in the mid-1930's. Increased numbers and sizes of boats and boat engines has made trochus collecting more efficient reaching even the most remote reefs.

During the 1992 season, 86% of the harvestable shells were between 3-4 inches in shell diameter. There has been a dramatic shift to the lower shell sizes since the 1950's. If an upper size limit is set it would have to be at 4.5 inches as larger shells are seldom found. This skewed shell distribution indicates that the trochus fishery is dependent upon first year recruits (3-inch diameter shells) into the fishery. During the 1990 and 1992 MRD surveys, field sampling showed that harvestable shells represented 70% of the adult population and undersized shells represented 30% of the population. Trochus shell grows @1-inch/year during the first three years. Growth after 3 years is 10x slower (0.1 inch/year). At this growth rate, the 2-year old age-class could recruit into the fishery as a legally-sized 3-yr old within one year. Approximately 10% (@20 mt) of the trochus shell inspected for export were under-sized, and this is a large percentage of wasted shell that could have been part of a future harvest.

Comparisons between the actual commercial landings of *Trochus* and estimated landings from field surveys conducted before and after the harvest show that the field surveys underestimated landings in especially Kayangel and Ngardmau by 69 mt. This discrepancy resulted mainly because field surveys were not conducted on Kayangel's Northern reef (Ngeruangel Reef) or on Ngardmau's outer reef. Very high densities of trochus occurred in both these areas. Future estimates on standing stocks must account for areas where major harvesting activities occurs and correct for reefs with exceptionally high trochus densities.

Table 2. *Trochus niloticus* exports, Palau: 1985 to 1992

Year	Local Value US\$	Metric Tonnes	Change from Previous Year	
			Number	Percent
Average	660,942	110
1992	645,398	229	-28	-10.9
1991	MORATORIUM			
1990	MORATORIUM			
1989	676,487	257	89	53.0
1988	n/a	168	81	93.1
1987	n/a	87	55	171.9
1986	n/a	32	-72	-69.2
1985	n/a	104

(Export data from two shipping companies based in Palau)

Table 3. Total Commercial Landings of clean (24%) and unclean (76%) trochus shells purchased by Belau Transfer and Mr.Akiwo during the 1992 harvest season (Taken from MRD Tech.Rpt 92.2).

State	Number of Sales	Number of People Selling	Weight (lbs)	CPUE(lbs per Sale)	Value (US\$)
Total	2,943	1,438	535,506	182(ave)	645,398

Koror	798	383	113,701	142	139,454
Kayangel	184	70	73,442	399	86,534
Ngardmau	256	114	51,299	200	61,680
Ngeremlengui	247	110	45,933	186	55,450
Peleliu	251	135	40,518	161	49,417
Ngerchelong	239	120	40,187	168	46,628
Airai	200	93	39,466	145	48,774
Ngaraard	194	107	37,566	193	44,943
Aimeliik	154	77	28,588	154	33,996
Ngatpang	93	38	16,628	179	19,898
Ngiwal	55	39	14,906	271	17,661
Ngchesar	73	35	13,957	191	17,151
Melekeok	40	29	10,620	266	12,633
Angaur	11	10	2,721	247	3,264
Unknown	39		3,669		4,394
Tobi	5	3	2,240	448**	3,447
Sonsorol	1	1	65	65	75

Tobi's landings/sale are not accurate because a buyer purchased shells from Tobi without obtaining individual purchase receipts for each harvester.

Inshore Fisheries Data Collection

The objective of this activity is to assess the current levels of commercial exploitation of marine inshore resources in Palau. Two staff are assigned to this activity. It involves close liaison with Palau Federation of Fishing Associations (PFFA) and major local markets to monitor landings and to estimate the current catch of all marine resources harvested. These statistics do not include the quantity of fish harvested for subsistence requirements. Preliminary estimates suggest that the subsistence production lies between 500 to 1100-t per year (MRD Tech. Rept.91.12), although household surveys that have been carried out suggest that subsistence consumption may be much higher.

There is currently limited information available on the harvest levels of marine resources in

Palau. Some landing and biological data for a range of species have been collected by MRD from PFFA through the last decade and PFFA commercial records alone are not adequate to document all developments that have taken place in Palauan reef fisheries throughout that period.

Fishermen may sell their catch to several fish markets or cooperatives that are currently operational in each State. It is hoped that under the Palau Fishing Community Project, the currently fragmented nature of fish handling and distribution at the State level will be streamlined. The State markets either retail locally to individuals, 16 hotels, and 26 restaurants or ship their catch to Koror for distribution there. In addition to PFFA, nine fish marketing operations of varying sizes were active in Koror in 1982. This expanded to 17 in 1986; 9 were operational in 1991. MRD has adopted a collaborative approach in developing its relations with local markets by providing summaries of information collected to the collaborating markets on a monthly basis. The resulting summaries provide MRD with useful information and at the same time provide the markets with a review of their recent operations.

Field trips to State fishing cooperatives in Ngeremlengui (March 25), Peleliu (April 13) and Kayangel (April 16) were organized by PMA to meet with the fishermen interested in starting up COOP. MRD staff were invited to meet the fishermen and discuss the need for more accurate accounting of the catch. MRD provided the COOPs with a list for each COOP showing the names of the fishermen with their total landings and dollar value. In Peleliu, many fishermen are selling directly to private buyers and MRD records do not account for most of their sales. In Kayangel, the fishermen are selling to the Ollei COOP and all their sales are being lumped together with Ngerchelong. The need for them to keep their own records to justify the need for equipment and loan applications was stressed. The fishermen in Kayangel filled out an interview form after the meeting. This interview form will be filled by the other fishermen on a follow-up visit.

Melekeok Fisheries Melekeok Fisheries Melekeok Fisheries

Melekeok Fisheries, based at Melekeok's fishing port, became operative in July 1991. Table 4a shows the annual landings during 1991-92. Their fish are sold primarily to local restaurants and PFFA (Table 4b). A species breakdown is given in Table 4c. Their 1991 landings were under-reported in the MRD 1991 Annual Report (11,814 lbs). Forty-five Melekeok fishermen and fifteen fishermen from other States, sold to the Cooperative. Melekeok has two State boats; a 12 meter Yamaha diesel in-board boat and a speed boat, that are crewed by 4-6 Melekeok fishermen. During 1992, 87% of the landings were from Melekeok State (38,916 lbs, 15 fishermen), and the remaining 13% came from Ngchesar (3,238 lbs, 5 fishermen), Ngerchelong (1,555 lbs, 5 fishermen), Ngaraard (259 lbs, 1 fisherman), Koror (477 lbs, 3 fishermen), and Ngiwal (90 lbs, 1 fisherman). These values have been incorporated into total landings on Tables 6-9.

Table 4a. Annual commercial landings for Melekeok Fishing Cooperative, 1991-92.

	1991 Jul-Dec (6-mo)	1992 Jan-Dec (12-mo)	Total	Monthly Average
Melekeok State Boat	5,770	17,677	23,448	1,302
Individual fishermen	15,521	27,037	43,019	2,868
Total	21,291	44,714	66,467	4,170

Table 4b. Distribution of sales for Melekeok Fisheries outside the Cooperative (November 1991-May 1992).

Buyer	Weight	Amount
Palau Pacific Resort	14110	18157
Yano and Sons	8204	10147
Blue By You	22	22
PFFA	2673	3004
Unknown	422	491
Total:	25,431	31,821

Table 4c. Species breakdown of fish purchased by Melekeok Fisheries Cooperative, 1992.

Species	Weight	Amount
Aii	848	639
Amberjack	107	107
Bottomfish	5098	5131
Crab	71	246
Desui	22	18
Deepwater Fish	243	243
Dudul	440	441
Dukl	25	18
Emang	335	1285

Erobk	22	22
Fish	29378	30425
Jack	401	390
Karangab	134	133
Kelat	52	57
Keremlal	72	72
Keskas	16	16
Klsebuul	1548	1646
Lobster	242	835
Lolou	27	23
Mekeem	62	62
Mellemau	46	46
Metengui	661	668
Meyas	140	140
Ngelngal	19	19
Orwidel	33	33
Sebus	32	32
Skipjack	376	214
Soda	556	229
Temekai	2944	2476
Tuna	91	70
Udech	336	336
Udel	152	152
Um	130	150
Wahoo	447	442
Wii	33	33
Yellowfin	3120	1679

Ngerchelong Fisheries Ngerchelong Fisheries Ngerchelong Fisheries

The Ngerchelong Fisheries, based at Ollei's fishing port, has been operative since the early 1980's . Their fish is sold strictly to the Palau Federation of Fishing Associations (PFFA). At least 31 Ngerchelong fishermen are active in the Cooperative. The Ngerchelong State boat is crewed by 10-12 men. The annual landings for the past five years is shown on Table 5. Since their fish has primarily been sold to the PFFA, further breakdown of their landings has been incorporated into all tables referring to the commercial landings by PFFA.

Table 5. Annual commercial landings for Ngerchelong Fishing Coop, 1988-92.

Year	1988	1989	1990	1991	1992

Total Landing (lbs)	50,126	59,936	39,360	36,397	50,021
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Inshore SubsistenceInshore SubsistenceInshore Subsistence

During 1988, MRD conducted a household subsistence survey in Palau. Unfortunately, estimates for the subsistence fishery were 3 times higher than our current estimates (MRD Tech Rept 91.12) and commercial landings were estimated to be four times higher than the documented 1991 commercial landings (MRD Tech.Rept 92.1). We hope to provide a better estimate in a future study. We would like to provide you with a summary of some of the descriptive data obtained during this survey. This includes the number and sizes of boats, the methods used by the fishermen, and concerns of the fishermen. This baseline information can be used to study future changes or trends in our fishery.

Boats

The number of boats and size of boats and engines were estimated for 1992 and compared with a boat survey in 1988 (Appendix V). The results of this survey show that the number of boats increased by 33% over the four-year period. The average boat size in 1992 is 20 ft with a 103 hp engine. This represents a 11% (1.5 ft) increase in average boat length and a 45% (22hp) increase in horsepower since 1988.

Fishing Methods

The types of fishing methods include spearfishing, hook and line, trolling, set nets (cotton and nylon gillnets), cast nets and harpoon, fish traps and gleaning. Appendix VI presents the only available data on fishing methods by State collected in 1988 by MRD staff. This data represents 13% of all households in Palau (except the Southwest Islands). Approximately 64% of the fishermen use spearguns and 50% use hook and line. Ngerchelongs State used a traditional net made of leaves (ruul) up until 1991, when the ruul was replaced with nylon nets.

Fishermen's Concerns

During the 1988 subsistence survey, a comment section in which the fishermen could state their concerns about Palau's fishery was included. Of 154 records of fishermen with boats, 96 provided a statement. A summary of their comments is given in Appendix VII. The majority of the statements refer to conservation, law enforcement, and protection of the resources that their livelihoods depend upon.

Total Inshore Landings

At least 554 metric tons of reef fish, mangrove crab and lobster and other invertebrates were landed for commercial use in Palau in 1992 compared to 450 mt in 1991. This is an estimated US\$1.5 million in income to Palau's local fishermen, based on the average local purchase price. Of the 554 mt landed, approximately 325 mt were sold locally and 229 mt were exported direct by the markets. We do not know how much of this locally sold fish is re-sold abroad by other traders since full statistics are only supplied by the markets. Thus, our total commercial landings of 554 mt may be overestimated due to the possible double-entry of fish that is sold more than once.

The four major commercial fish outlets are Palau Modekngai Company Inc (PMCI), Palau Federation of Fishing Associations (PFFA), Oh's Market and Melekeok Fishing Cooperative. PFFA and Melekeok Fishing Cooperative are subsidized by National and State funds, whereas PMCI and Oh's are private markets. These four markets purchased a total of 325 mt of inshore fish and invertebrates of which PFFA and Oh's exported 26mt; this represents 61% of the total reported commercial purchase and export on inshore fish and invertebrates. The top landings are from Koror, Ngerchelong, Ngaraard and Ngeremlengui.

Table 6 shows the distribution of the total landings from these markets for each State. PMCI and Oh's markets are easily accessible to most States and their landings are more representative of the Ngeremlengui, Ngaraard, Ngardmau, Ngiwal and Kayangel. Melekeok Cooperative represents primarily Melekeok State. Table 7 shows the total landings of these markets for each State by month. Landings are highest in March which coincides with the Lenten Season in Guam and Saipan. The demand and therefore the price is highest during this time. It should be noted that private markets refers to a resale of fish from PMCI and Oh's to PFFA when they are overloaded. The landings from Peleliu are underestimated. Several commercial exporters buy directly from the fishermen, so they are not landing their fish at the markets.

Courier;

Table 6. Reef Fish, Tuna, Crab and Lobster by State, Palau: 1992

State	Trips	State Boats	Fisher-men	Weight (Pounds)	Average (lbs/trip)	Amount (US\$)
Grand Total...	5,314	4	821	722,529	137	861,844
Total-excluding tuna and resale	5,283	4	814	669,217	127	821,481
Koror.....	1,259	1	241	165,106	131	188,765
Ngerchelong...	740	1	96	129,901	176	164,638
Ngaraard.....	503	0	54	80,192	159	105,822
Ngeremlengui..	750	0	75	74,910	100	100,979
Melekeok.....	569	1	44	41,781	73	42,680
Ngatpang.....	302	0	22	37,989	126	46,457
Ngardmau.....	192	0	27	26,488	138	33,007

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Airai.....	264	0	75	26,053	99	32,934
Ngchesar.....	162	0	27	21,453	132	25,638
Ngiwal.....	130	0	15	15,547	120	21,059
Aimeliik.....	203	0	47	13,938	69	18,890
Kayangel.....	43	0	18	12,521	291	13,922
Angaur.....	71	0	14	11,304	159	12,126
Peleliu.....	39	1	9	7,919	203	8,916
Unknown.....	56		49	4,115	73	5,647
Pole and Line (tuna)	31	0	7	39,573	1276	22,501
Private Markets (resold)				13,739		17,863

Source: PFFA, PMCI (excluding May 1992), Oh's (excluding January, October, and November 1992) and Melekeok Cooperative.

Table 7. Summary of purchases of fish, lobster, crab and other marine invertebrates for each State, by month for 1992 from PFFA, PMCI (excluding May), Oh's (excluding January, October and November) and Melekeok Cooperative. Unknown refers to purchases from fishermen that we do not know the State that they reside or fish. Pole and line (tuna) landings and private markets or resale are not included in this table.

Month:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Total
State:													
Koror	11,776	14,266	12,329	14,668	10,866	7,788	18,152	12,574	18,634	13,455	16,870	13,726	165,104
Ngerchelongs	8,622	12,596	16,102	16,490	8,062	8,376	18,264	8,554	9,673	4,211	10,469	8,479	129,898
Ngeremlengui	2,354	11,202	6,655	4,744	4,791	5,292	10,706	5,748	8,380	3,421	5,938	5,679	74,910
Ngaraard	5,372	8,887	10,975	10,391	836	2,175	8,536	6,853	8,817	7,490	5,051	4,808	80,191
Ngatpang	4,341	3,320	2,686	3,597	2,831	4,131	6,760	1,971	2,558	1,593	1,920	2,281	37,989
Airai	1,803	1,372	3,303	4,590	2,092	2,907	2,491	1,044	2,245	945	2,245	1,018	26,055
Peleliu	1,314	763	334	330		64	1,253	1,373	345	1,051	783	309	7,919
Ngardmau	2,974	1,264	356	1,892	171	17	1,272	3,938	2,558	2,909	5,224	3,913	26,488
Ngiwal	309	2,244	2,977	1,724	43	862	1,456	2,680	1,538	988	630	98	15,549
Kayangel	1,505	2,883	256	365		113	849		1,078	1,245	1,010	3,217	12,521
Aimeliik	399	367	1,259	872	570	1,051	677	193	791	592	2,886	4,280	13,937
Ngchesar	3,466	3,801	2,322	2,624	444	988	1,240	2,419	478	522	1,737	1,411	21,452
Melekeok	363	1,221	1,252	4,700	4,274	1,641	4,700	9,351	8,247	3,182	1,848	1,001	41,780
Angaur	1,843	614	803	2,199	1,242	1,487	1,539	426	636	428	87		11,304
Unknown	372	538	22	551	52	15	465	136	424	52	146	1,342	4,115
GRAND TOTAL	46,813	65,338	61,631	69,737	36,274	36,907	78,360	57,260	66,402	42,084	56,844	51,562	669,212

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Reef Finfish Fishery Reef Finfish Fishery Reef Finfish Fishery

The reef finfish fishery is second only to tuna, generating three quarter of a million dollars for Palau's local fishermen (Table 8). The top landings and effort are in Koror, Ngerchelong and Ngaraard. Species composition is only available for PFFA market and can be found in Appendix VIII. Appendix IX lists the Palauan, scientific and common names of commercial marine species. Appendices X-XIV present historical data on Palau's inshore fishery. The information for the finfish and subsequent information on lobster and mangrove crab fisheries provide a rough indication of the States where most of the fishing effort and landings originate. Appendix Xb shows a family breakdown of total commercial landings for PFFA, Ohs, PMCI, and Melekeok Cooperative. Many fishermen are not fishing in strictly one State. In most States there is at least one fishing operation that involves at least 6 men fishing and landing their catch together. A more detailed analysis of fishing effort is required, addressing boat size, crew size, time spent fishing and specific areas most frequently fished.

Table 8. The total reported commercial landings of finfish by State, for 1992. Finfish includes the reef fish, oceanic fish and bottom fish landed at PFFA, PMCI (excluding May), Oh's (excluding January, October and November) and Melekeok Cooperative. The offshore tuna operations and invertebrates are excluded from this table.

State	Trips	Men	Weight (lbs)	Average (lbs/trip)	Landed Value (US\$)
Total	4,404	695	637,419	144	695,921
Koror	1,216	232	163,558	134	182,553
Ngerchelong	569	81	121,735	214	132,757
Ngeremlengui	567	63	68,110	120	74,388
Ngaraard	329	39	73,453	223	78,971
Ngatpang	260	20	36,989	142	42,488
Airai	200	57	24,716	124	27,618
Peleliu	36	8	7,834	218	8,586
Ngardmau	172	26	25,096	146	27,287
Ngiwal	96	11	14,144	147	15,459
Kayangel	43	19	12,270	285	13,009
Ngchesar	137	18	20,919	153	23,525
Aimeliik	137	36	12,908	94	14,398
Melekeok	540	42	40,762	75	38,813
Angaur	71	13	11,281	159	12,034
Unknown	31	29	3,644	117	4,035

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Source: MRD Database

Invertebrate Fisheries

Mangrove Crab Fishery

Mangrove Crab Fishery

Mangrove crab purchases have increased considerably in the past decade. In 1980, 1.1 mt of mangrove crabs were sold and in 1992 at least 10.4 mt were sold; this represents a 10-fold increase in twelve years (Table 9). Recorded sales of crab increased by 70% between 1991 and 1992 alone. Further studies are needed to determine the density, distribution and standing stocks of mangrove crabs in each State of Palau.

Table 9. Total reported commercial landings of mangrove crab, by State, from PFFA, PMCI (excluding May) and Oh's (excluding January, October and November) and Melekeok Coop for Palau: 1992.

State	Trips	Men	Weight(lbs)	Average (lbs/trip)	Value (US\$)
Total	848	219	22,966	26	90,659
Ngeremlengui	230	32	6,063	26	23,880
Ngerchelong	189	40	6,442	34	25,150
Ngaraard	178	31	5,213	29	20,773
Ngiwal	4	8	1,021	255	4,072
Ngatpang	47	14	985	21	3,911
Aimeliik	64	20	882	14	3,391
Melekeok	31	8	779	25	3,035
Airai	33	16	605	18	2,412
Ngchesar	26	13	350	13	1,386
Koror	19	12	218	11	880
Peleliu	4	3	70	17	277
Ngardmau	4	3	34	9	284
Angaur	0	0	0	0	0
Kayangel	0	0	0	0	0

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Unknown	19	19	304	16	1,208
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Source: MRD Database.

Lobster Fishery

The lobster fishery is the second largest crustacean fishery, generating revenue of at least \$34,000. Often lobster are caught while fishing for reef fish. However, when fishermen target only lobster, they catch over 100 lbs a trip. Ngerchelong, Ngaraard, Ngardmau, and Koror have the highest lobster production in Palau (Table 10).

Table 10. Total reported commercial landings of lobster by State, from PFFA, PMCI (excluding May), Oh's (excluding January, October and November) and Melekeok Cooperative for Palau: 1992.

State	Trips	Men	Weight (lbs)	Average (lbs/trip)	Value (US\$)
Total	623	225	8,834	14	34,874
Ngerchelong	80	26	1,739	22	6,746
Ngaraard	94	17	1,525	16	6,078
Ngardmau	73	17	1,359	19	5,435
Koror	103	46	1,307	13	5,243
Airai	41	27	732	18	2,905
Ngeremlengui	86	27	671	8	2,680
Ngiwal	21	5	383	18	1,527
Aimeliik	28	15	322	12	1,277
Melekeok	54	20	258	5	899
Kayangel	14	7	252	18	913
Ngchesar	15	6	172	11	722
Anguar	2	2	23	12	92
Peleliu	1	1	15	15	52
Ngatpang	2	2	14	7	58

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Unknown	8	7	61	8	243
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Source: MRD Database.

Sea Cucumber Fishery

During 1992, no commercial sales of sea cucumber were reported. During 1991, a survey of the commercially important sea cucumbers was undertaken (MRD Tech.Rept.91.9). Approximately 23,000 m² of reef in Koror were surveyed for the 5 species considered to be of export value and 97 sea cucumbers counted (59 prickly fish, 35 black teat fish, 6 white teat fish and 1 sand fish). Ngerumekaol Channel, one of Koror's actively protected sanctuaries, had the highest densities of prickly fish sea cucumber (temtamel). During 1991, two shipments of dried smoked sea cucumber were reported; one shipment of 1620 kg from primarily Kayangel and another for 235 kg from the Southwest Islands, totalling 1855 kg or 1.855 tons of dried sea cucumber. A species breakdown of the 1620 kg shipment is given in Table 11. Species breakdown of a 1991 shipment of smoked sea cucumber. No commercial sales of dried sea cucumber were reported for 1992.

Table 11. Species breakdown of one shipment of dried sea cucumber, 1991.

Species	Common name	Palauan name	Number	Weight (kg)
Holothuria (M.) nobilis	black teatfish	bakelungal	6,706	991
Holothuria (M.) nobilis	white teatfish	bakelungal	822	184
Thelenota ananas	prickly redfish	temtamel	1,042	227
Stichopus variegatus	curryfish	ngimes	1,948	141
Holothuria (M.) scabra	sandfish	molch	130	21
Actinopyga sp.	blackfish	eremrum	263	35
Actinopyga mauritiana	surf redfish	bad el eled	81	5
unidentified		eremrum-like	93	13
Total:			11,085	1,617

Other invertebrates, molluscs and stingray purchased at PFFA, Oh's, PMCI or Melekeok Cooperative are listed below for reference:

Other invertebrates, molluscs and stingray purchased at PFFA, Oh's, PMCI or Melekeok Cooperative are listed below for reference:

Type	Weight (lb)	\$ Amount
Kim	91	158
Ketat	75	305
Kmai	14	28

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Milngoll (cuttlefish)	149	187
Octopus	274	341
Rrull(stingray)	670	517
Semum(trochus)	323	323
Squid	122	153

Local Distribution

An overall breakdown of local sales of fish, lobster and mangrove crab by PFFA to 16 restaurants, four fish outlets, food service (which distributes fish to public schools in Koror) and the hospital is shown in Table 12. This is 1991 data, as 1992 data was unavailable. Tuna sales data to local outlets has not been obtained. A more in-depth market study is needed to fully assess local distribution of inshore fish landings. Local sales information was only available from PFFA.

Table 12. Distribution of fish and crustaceans in Koror, Palau for PFFA only. Weight is in pounds, 1991 only.

Buyer	Reef fish	Tuna	Mangrove Crab	Lobster	Fillet fish	Fish steak
Restaurants (16)	12,250	1,871	15	104		
MOC	6,651	1,429		23	5,444	6,179
Local outlets	1,172	482	24	33		
Food Service	18,000					
Hospital	301	3,000				
Old age Program	3,560					
Export Companies	27,516					
Individuals	47,078	6,065		109		
Others	1,467	36				
Total lbs	118,000	12,883	39	269	5,444	6,179
Metric tonnes	53	6				

Local Pole and Line

The oceanic fish purchased by PFFA, were bought primarily from PITI longliners and one pole and line tuna boat. The pole and line tuna boat, operated by Mr. Masanori Kuniyoshi, is the only tuna boat operated locally. Mr. Kuniyoshi has provided MRD with a monthly breakdown of his catch in 1990 (Table 13). A total of 193,310 lbs or 87 mt were landed, of which 25,803 lbs (11.6 mt) were sold to PFFA. Thus 13% of the landings were sold to PFFA and the remaining 87% were sold at Mr. Kuniyoshi's market. We do not have the total landings for Mr. Kuniyoshi for 1991. However, he sold 26,353 lbs (11.8 mt) to PFFA in 1991, which is 8.8% of PFFA's total

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landings. He sold 37,431 lbs(16.8mt) which is 14% of PFFA's total landings in 1992. Several fish outlets and restaurants purchase tuna on a regular basis, because there is a consistent supply and lower price.

Table 13. Summary of Monthly Landings by Species for Masanori Kuniyoshi's Local Pole and Line Operation, Palau: 1990 (Numbers in hundreds of pounds)

Month	Type							
	Total	Katsuo	Soda	Agie	Tekuu	Ersuuch	Desui	Tere-krik
Total.	1,924	1,496	280	74	55	1	16	2
Jan.....	15	0	15	0	0	0	0	0
Feb.....	71	39	16	14	0	0	0	2
March...	79	48	17	14	0	0	0	0
April...	186	152	27	7	0	0	0	0
May.....	146	131	13	2	0	0	0	0
June....	205	162	30	4	0	1	8	0
July....	240	225	6	9	0	0	0	0
August..	216	212	4	0	0	0	0	0
Sept....	180	151	20	9	0	0	0	0
Oct.....	217	121	72	4	20	0	0	0
Nov.....	162	75	50	4	25	0	8	0
Dec.....	207	180	10	7	10	0	0	0

Note: Landing data for 1991 and 1992 was not available at the time of publication.

ExportExportExport

Continental Air Micronesia Airlines provides MRD with monthly summaries for all marine product exports. The destinations of the total amount of fish, crustaceans, molluscs, and other aquatic and terrestrial animals exported by air from Palau during 1991-92 are presented in Table 14. Total landings increased by 500,000 lbs and 4,000 shipments in 1992 compared to 1991. This increase resulted from a doubling of shipments of live aquarium fish to the USA and increased tuna shipments to Japan and Okinawa. Domestic shipments (Guam and Saipan) of inshore fish for 1992 are similar to 1991. An estimated 203 metric tonnes of edible fish was exported by individual fishermen or companies that did not land their fish at PFFA, PMCI, Oh's or Melekeok Cooperative. This estimate does not include containers with mixed contents (e.g. fish and taro) as we still need to determine how to quantify these more accurately. Appendix XV lists all types of marine product declared, including mixed containers. Appendix XVI lists the species of marine organisms shipped for the aquarium trade for three months only (February, June, July). Over 220,000 organisms valued locally at over \$220,000 were shipped during 1992, mainly cultured giant clams.

Table 14. The total weight and count and primary type of cargo sent to each destination for

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1991-92 for Continental Air Micronesia. The fresh sashimi tuna represents only the tuna air freighted by Continental Air Micronesia. Refer to Table 24 for the total sashimi tuna exported from Palau. A conservative approximation of the weight of inshore fish packaging (containers and ice) is @35%. The gross weight of tuna includes @9% packaging weight. Packaging of aquarium fish (containers and seawater) is @96.5% of the total weight.

YEAR Destination	1991 lbs/ct	1992 lbs/ct	Primary Type Sent
California	91952/2280	51423/1399	Aquarium Fish
Colorado	152/2	1174/16	Inshore Fish/Crab/Lobster
Guam	398706/3933	382667/3916	Inshore Fish/Crab/Lobster
Hawaii	2001/27	4258/101	Aquarium Fish Inshore Fish/Crab/Lobst
Hong Kong		538/2	Dried Sea cucumber/trochus shell
Japan	626174/3029	773629/3303	Fresh Sashimi Tuna
Japan		125041/749	Fish/crab
Los Angeles	15466/371	125797/3238	Aquarium Fish
Marshall Islands	191/1		Inshore Fish/Crab/Lobster
Majuro	43/1	283/5	Inshore Fish/Crab/Lobster
Manila		5/1	Live Parrot
Missouri		158/4	Live Fish
New York		525/14	Live Fish
Okinawa		94066/401	Fresh Tuna
Okinawa	354/5	8902/57	Inshore Fish/Crab/Lobster/Nautilus
Oregon	20/1		Inshore Fish/Crab/Lobster
Pohnpei	467/7	231/4	Inshore Fish/Crab/Lobster
Rota		837/8	Frozen Fish/Sardines
San Francisco	1831/45	44640/982	Aquarium Fish
Singapore		8/2	Dried Seacucumber
Saipan	369449/2826	383797/3375	Inshore Fish/Crab/Lobster
Tinian		358/4	Fish/Crab/Bat
Chuuk	49/1	51/1	Inshore Fish/Crab/Lobster
Taiwan	5064/69	3392/4	Non-cultured Clam)/Seacucumber
Texas		3269/95	Live fish
USA	33129/1066		Aquarium Fish/Swordfish
Washington		51/2	Crab/Bat/Smoked Fish
Yap	4826/4	1799/27	Inshore Fish/Crab/Lobster
Total:	1,549,874/13,748	2,010,679/17,767	

Catch RateRate

During 1992, catch per unit effort (CPUE) data collection was expanded and now includes three sources: 1) In-house CPUE data, collected directly by MRD staff during their fishing trips, 2) PFFA CPUE data, collected by PFFA staff as fishermen unload their fish and 3) Sports Fishing Tournament CPUE data, collected by MRD staff during tournaments. The data is used to assess fishing pressure using different fishing methods and time frames. MRD has a larger set of CPUE data for trolling and handline than spearfishing. A spearfishing tournament is recommended.

In-house CPUE data is primarily trolling to and from the FAD's. Table 15 shows the CPUE including the time to and from the FAD's (3.4) and trolling ONLY around the FAD's (12.3). This represents a three-fold increase in catch around the FAD's. Insufficient hand-line and speargun data is available in-house for 1992.

Table 15. In-house 1991 catch per unit effort (CPUE).

Method	Trips	Species caught	Catch per unit effort
Trolling	18	ngelngal, wahoo, aii	3.4 lbs/line/hr
FAD's			12.3 lbs/line/hr

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PFFA CPUE data is obtained from the purchase receipts, PFFA staff request CPUE information from fishermen on a volunteer basis. There is no standard sized set net used, so data for the different sized nets is given for each net used.

Table 16. Catch effort data from Palau Federation of Fishing Associations purchase receipt forms.

METHOD	HANDLINE (LBS/HK/HR)	TROLLING (LBS/HK/HR)	NET (LBS/NET/MAN/HR)	SPEARGUN (LBS/GUN/HR)
MAY	6.0(14)	2.8(5)	OTEI 5.1(3) EBERDONG 7.5(2) OLEWACHL 16.0(1)	n/a
JUNE	4.9(16)	6.9(4)	OTEI 14.3(4) EBERDONG 7.7(3)	0.4(1)
JULY	9.4(14)	4.6(7)	OTEI 10.2(2) EBERDONG 5.3(1) OLEWACHL 21.4(2)	n/a
AUGUST	3.1(3)	n/a	OTEI 7.8(4) EBERDONG 24.5(1) OLEWACHEL 14.7(2) MODED 7.9(1) BENHART 9.4(1)	12.8(4)
SEPTEMBER	8.0(12)	n/a	OTEI 6.4(1)	n/a
average	6.3(59)	4.8(16)	11.3(28)	not enough data

Method Categorizations:

- 1) Handline 1-3 man operation with 1-4 lines with 1-12 hooks catch keremlal, tiau, temekai, metengui, klsebuul,kedesau
- 2) Trolling 1-2 man operation with 1-2 lines catch wahoo/ngelngal,metengui
- 3) NET divided by net owners, since net dimensions differ
 - Owens Otei -3 man operation in 3-6 hrs catch smach and terekrik
 - Eberdong -8-10 man operation in 2-4 hrs catch beduut,um, melangmud
 - Olewachel -2 man operation in 5 hrs catch terekrik
- 4) Speargun not enough data to categorize

2nd Annual Sports Fishing Tournament

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Three MRD staff monitored and recorded the results of the 2nd Annual Palau Sports Fishing Tournament held during April 24-26, 1992. Data including basic profiles on the boat owners, and daily catch effort during the derby. A total of 32 boats with @120 people (captain and crew) participated in the tournament.

Six categories were available for entry:

- a. Billfish (Marlin, Sailfish, Broadbill, Swordfish)
- b. Tuna (Yellowfin, Bigeye, Dogtooth)
- c. Wahoo d. Mahi mahi e. Barracuda f. Giant Trevally

The derby results on Appendix 17 show that the highest landings and highest CPUE were made on Friday (3.93 CPUE) followed by Sunday (CPUE = 2.07), and Saturday (CPUE = 2.50). Many fishermen commented on the rough weather throughout the three days, especially on Saturday. Approximately 60% of the boats reported no catch. No marlin were brought in, however those fishing for marlin had most of the bites on Friday morning. Two boats reported that each had a marlin on the line but it broke the line in the fight. Mahi mahi were caught more frequently and represented the highest total weight, followed by wahoo and tuna (Appendix 18).

A rough estimate of the overall CPUE for the tournament was made as follows: the 32 trips reported in Table 9 were used to calculate an average time spent on the water of 9 hrs and an average number of hooks of 2.68 hrs. If we assume that all no catch were no catch trips then at total of 76 trips multiplied by the average hours and hooks are 684 hours and 203 hooks. An overall average CPUE for all boats then can be calculated as follows: $2,117.5 \text{ lbs} / 204 \text{ hooks} / 684 \text{ hrs} = 0.015 \text{ CPUE}$. We do caution that this estimate assumes that a boat reporting no catch had no catch.

School sizesize

Underwater, daytime, visual assessments of the population of the more commercially important marine species has been initiated. These species include the fin fish meyas, tiau and temekai, kemedukl, maml, keremlal, melangmud, mechur, kedesau, dech and others. An important component of this activity is for MRD staff to locate and describe breeding grounds utilized by reef fish of commercial importance in Palau. Table 17 presents the species and areas where the largest school sizes have been reported. Four sites in Koror were visited (Ngerumekaol Channel, Denges Pass, Ucheliuns- Tkebuu area, and Llebuchel Chnl, Ngerbeched). One channel in Ngeremlengui (Towachel Mlengui) and two sites along the inner reefs of Airai were surveyed; North of Ngkesill Island toward Ngederrar Island and South of Ngkesill Island toward Ongelungel channel.

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Species	Date	Area	Number of fish	Number of schools
Otkang	May27	Denges Pass	1	
	May28	Ngerumekaol Chnl	1	
	Jul24	Denges Pass	1	
Temtamel	May27	Denges Pass	1	
	May28	Ngerumekaol Chnl	6	
	Jul09	Ngeremlengui Chnl	6	
	Jul24	Denges Pass	1	
Black teatfish	Apr07	Ucheliuns-Tkebuu	7	
	May27	Denges Pass	2	
	May28	Ngerumekaol Chnl	0	
	Jul09	Ngeremlengui Chnl	8	
	Jul24	Denges Pass	5	
White teatfish	Feb08	Airai Bay-North	2	
Zanclus cornutus	Feb08	Airai Bay-North	220	1
	Feb10	Airai Bay-South	220	1
Plotosus lineatus	Feb08	Airai Bay-North	200	1
Black tip shark	Apr07	Ucheliuns-Tkebuu	1	
White tip shark	May28	Ngerumekaol Chnl	2	
Bechol	May27	Denges Pass	60	
Budech	Sept14	Llebuchel Chnl	24	
Dech	Apr07	Ucheliuns-Tkebuu	50	1
Desebiil	Feb10	Airai Bay-South	20	
Dukl	May27	Denges Pass	10	
	May28	Ngerumekaol Chnl	30	
Itotech	May07	Airai Bay-South		
Kelalk	May27	Denges Pass	70(1)	
Kemedukl	May27	Denges Pass	13(1)	1
	May28	Ngerumekaol Chnl	1	
	Sept14	Llebuchel Chnl	1	
Berdebed	Feb08	Airai Bay-North	20	
	Feb10	Airai Bay-South	35	
	May07	Airai Bay-North	6	
	Sept14	Llebuchel Chnl	1	
Keremlal	Feb10	Airai Bay-South	10 juveniles	
Klsebuul	Feb08	Airai Bay-North	20(1),30(1)	2
	Feb10	Airai Bay-South	200(1)	1
	May07	Airai Bay-North	30(1)	
	Sep14	Llebuchel Chnl-Koror	100	1

Table 17 continued. Quantification of school size for top commercial species in 1992.

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Species	Date	Area	Number of fish	Number of schools
Maml	May27	Denges Pass	1	
	May28	Ngerumekaol Chnl	2	
Maml	Jul09	Ngeremlengui Chnl	1	
Ngimer	Feb08	Airai Bay-North	20	
Maml-juv	Feb10	Airai Bay-South	75	
	May07	Airai Bay-South	12	
	Sept14	Liebichel Chnl-Koror	1	
Meyas	Feb08	Airai Bay-North	300(1),100(7),50(2)	10
	Feb10	Airai Bay-South	15(1),30(2),50(2)	5
	Apr07	Ucheliuns-Tkebuu	400(2),300(1),100(1)	4
	May07	Airai Bay-North	30,100	2
	May07	Airai Bay-South	16(2)	2
Ngyaoch	Feb10	Airai Bay-South	35	
	Sept14	Liebichel Chnl-Koror	6	
Temekai				
<i>E. microdon</i>	May27	Denges Pass	0	
	May28	Ngerumekaol Chnl	0	
	Jun24	Ngerumekaol Chnl	361	
	Jul1	Ngerumekaol Chnl	30	
	Jul24	Denges Pass	40	
<i>E. fuscoguttatus</i>	May27	Denges Pass	4	
	May28	Ngerumekaol Chnl	147	
	Jun24	Ngerumekaol Chnl	46	
	Jul1	Ngerumekaol Chnl	10	
	Jul24	Denges Pass	4	
Tiau				
<i>P. aerolatus</i>	May27	Denges Pass	1	
	May28	Ngerumekaol Chnl	118	
	Jun24	Ngerumekaol Chnl	48	
	Jul24	Denges Pass	1	
<i>P. leopardus</i>	May27	Denges Pass	3	
	May28	Ngerumekaol Chnl	3	
	Sept14	Liebichel Chnl	1	
	Jul09	Ngeremlengui Chnl	3	
Udech	Feb10	Airai Bay-South	30	
Um	Jul09	Ngeremlengui Chnl	10	
Hawksbill	May07	Airai Bay-North	1	
	Jul24	Denges Pass	1	

Offshore Fishery Offshore Fishery Offshore Fishery

Tuna

Palau Maritime Authority is a semi-autonomous government agency mandated under Title 27 of the Palau National Code to negotiate foreign fishing agreements to allow tuna fishing within the Republic's 200 mile Exclusive Economic Zone (EEZ), and to manage as well as regulate living marine resources within the zone. Log sheets for each fishing vessel are submitted to PMA. PMA is responsible for issuing permits to the fishing vessels and monitor developments in offshore fisheries. The agreements negotiated by the Authority require approval by the Palau National Congress before they become effective.

During 1992, four foreign fishing agreements were in effect; a total of 205 longliners and 45 purse seiners and associated vessels were registered in Palau. These agreements are with the 1) Fisheries Associations of Japan; 2) Multi-Lateral Fisheries Treaty with United States; 3) Palau International Traders Incorporated (PITI) and 4) Palau Marine Industries Corporation (PMIC).

- 1) The Fisheries Associations of Japan (Kitamaki, Kaimaki, Japan Tuna and Kinkatsukyo) were issued a total of 35 permits for single purse seiners during Feb 1,1991 to Jan 31,1992. These permits were issued to 32 Single Purse Seinners and 3 Group Purse Seinners consisting of 4 catch vessels, 3 anchor vessels and 6 carrier vessels. The Fisheries Associations of Japan were issued 76 permits for longliners; 63 under 20 G/T and 13 over 20 G/T.
- 2) US purse seiners are permitted through the Multi-lateral Fisheries Treaty between the US and 16 Pacific Island countries. Palau does not directly issue licenses to the US.
- 3) PITI registered 54 vessels during November 1991 to November 1992; 4 Taiwanese and 50 Chinese tuna longline vessels ranging between 20 GRT and 50 GRT, with their base operations in Palau.
- 4) PMIC registered 75 vessels during June 1991 to June 1992; 74 Taiwanese and 1 Chinese tuna longliner vessels.

The total landings and number of trips for the Japanese longliners and purse seiners in 1989 and 1990 are presented in Appendices XIX-XXI. The landings for PITI for 1987-1989 and the first half of 1990 (Jan-Jun) are presented in Appendix XXII. The landings for PMIC for 1989 and the first half of 1990 (Jan-Jun) are presented in Appendix XXIII. The US purse seiners landed a total of 12,735 metric tons (8,811 mt skipjack, 3,910.5 mt yellowfin tuna, and 13.5 mt of big eye tuna) during 1991.

Tuna Observer Program

A tuna tagging and sampling program has been initiated in Palau as part of a regional study conducted and funded by the South Pacific Commission. Mr. Kevin Williams, a tuna sampling

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expert, assessed the tuna operations in Palau and set up the sampling program (MRD Tech. Rept.91.13). The two tuna transshipping companies PITI and PMIC and several government agencies are cooperating with MRD in order to retrieve tags for the SPC regional tuna tagging program, obtain length and weight data, and other data on transshipment. Mr. Masubed Tkel is MRD's tuna observer and data collector. During July 1991 to July 1992, bigeye and yellowfin tuna were measured and weighed. The results are shown below:

Species	Sample Size	Mean Length in cm (STD)	Mean Weight in kgs (STD)
Bigeye Tuna	1,493	130(15)	45(16)
Yellowfin Tuna	1,283	127(10)	36(9.0)

The total amount of 4,133 mt of tuna (valued locally at \$27,564,819) was exported by PITI and PMCI during 1992 (Source: Division of Revenue and Taxation). Approximately 2,600 mt (63%) of the catch is air-freighted fresh to Japanese markets where it is sold for "sashimi" (Table 18). Lack of data from PMIC during June-Sept and the significant drop in landings during May resulted in a decrease of 250mt in 1992 compared to 1991. The remainder is frozen and stockpiled in Palau prior to shipment to Taiwan for canning. Of special interest in the available statistics for these operations is the presence of northern bluefin tuna in the catch.

Table 18a. Export to Sashimi Market only in Japan for PITI and PMIC, Palau: 1990-1992 (Weight in metric tons).

Month	1990	1991	1992
Total.....	1,816.3	2,835.2	2,581.4
January.....	15.3	25.0	19.6
February.....	20.4	4.8 ¹	36.7
March.....	23.4	41.8	37.3
April.....	91.9	247.7	89.11
May.....	233.3	1,067.5	269.5
June.....	438.0	162.0	201.5 ²
July.....	403.1	380.0	122.5 ²
August.....	177.3	274.0	102.28 ²
September.....	226.0	325.4	340.0 ²
October.....	89.8	156.0	610.0
November.....	71.6	81.8 ²	603.9
December.....	26.2	96.2 ²	149.9

1 - only PMIC data
2 - only PITI data

Marine and Aquaculture Research and Aquaculture Research

MMDC, the Micronesian Mariculture Demonstration Center, was founded in 1973. The facility serves the Republic of Palau and the U.S. affiliated Pacific islands by developing, demonstrating and promoting appropriate sea farming technology. MMDC also serves as a regional sea farming training center, a marine science research laboratory and a popular tourist attraction. The MMDC's five core programs have each been in operation for at least five years. These include:

- giant clam hatchery, sea farming, export and technical training
- hawksbill turtle research and conservation
- trochus shell resource assessment and resource management
- visiting scientist program
- tourist exhibits

Educational Programs and Training

This year, as in previous years, MMDC offered on a continuous basis a practical, 3-week training course entitled "Introduction to Giant Clam Mariculture". The course has been completed to date by about 85 Pacific Islanders, including more than 35 Palau residents.

Summary of MMDC Hatchery Production, 1991 of MMDC Hatchery Production, 1991

Clam Hatchery (Project Leader: G. Heslinga)

No. of 5-mos. old seed clams produced.....	467,300
No. of international deliveries.....	76
No. of domestic deliveries.....	122
No. of students trained in 30-day clam course.....	9
No. of concrete tanks of 5-10 tons volume in production...	64
Revenues from clam hatchery sales.....	\$157,460

Hawksbill Turtle Hatchery (Project Leader: B. Madraisau)

No. of eggs incubated.....	0
No. of eggs hatched.....	0
No. of baby turtles released.....	123
Total number of baby turtles released to date.....	3,139

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Revenues from gate fees..... \$6,931

Trochus Hatchery (Project Leader: K. Kikutani)

No. of 2-day old larvae produced..... 1,600,000
No. of 4-month old seed produced..... 401

Cooperative Programs

MMDC is presently collaborating with each of the coastal states of Palau in establishing small giant clam demonstration farms and sanctuaries. This work is being funded by ICOD through the Forum Fisheries Agency. MMDC assists the U.S.-affiliated Pacific Islands with experimental sea farming by providing seed clams on a fee basis through, for example, contractual arrangements with agencies such as the US National Marine Fisheries Service (NMFS) and the Center for Tropical and Subtropical Aquaculture (CTSA). MMDC also makes seed clams available at low cost or no cost to private sector individuals in Palau for commercial farming. In 1992, MMDC provided technical assistance and extension services to three local entities involved in mariculture: Palau Aquaventures, Inc., Home Improvement Center Aquatics Division, and the Melekeok Economic Development Authority.

Technical Reports and Publications (1992)

In 1992 the MMDC Clam, Trochus and Turtle Projects each produced monthly progress reports for submission to the Director of the Bureau of Resources and Development. These reports should be consulted for a detailed, quantitative description of project activities, maricultural production, research, training fieldwork and sales. One technical report and four original research articles were published in 1992 (Appendix I).

House Joint Resolution

On 20 July 1992 the Third Olbil Era Kelulau (Palau National Congress) passed a Joint House Resolution Number 3-92-15 "Commending and congratulating the Micronesian Mariculture Demonstration Center for their sea farming methods established during the last ten years which are now widely used in the Pacific islands for food production, conservation and economic development."

Meetings, Workshops and Conferences Attended (1992)

MMDC Manager Mr. Gerald Heslinga and former project technician, Mr. Theofanes Isamu, presented a paper on MMDC's clam breeding program at the ICLARM-sponsored "Workshop on Giant Clam Genetics" in Manila, Philippines in June, 1992. Mr. Heslinga served for the fourth

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year as Palau's representative on the CTSA (Center for Tropical and Subtropical Aquaculture) Technical Committee (as its Vice Chairman), and for the second year as Technical Committee Chairman of PAA, the Pacific Aquaculture Association. Mr. Heslinga attended meetings of both organizations in Honolulu in April, 1992, and attended a PAA Board of Directors meeting in Honolulu in September 1992. Mr. Heslinga also presented a paper on giant clam mariculture at the Seventh International Coral Reef Symposium in Guam in June, 1992.

Staff Movements in 1992

Mr. Thomas Watson resigned his position as Research Associate on the Giant Clam Project effective 31 December, 1992, after six years with the program. On January 1, 1993, Mr. Don Hanser replaced Tom, with a new position title of Hatchery Foreman.

Summary of MMDC's Progress and Constraints in 1991

Giant Clam Project Clam Project Project

The MMDC Giant Clam Hatchery reported that revenues generated by hatchery sales reached a provisional total of over \$157,000 in the year ending December 30, 1992. The year also saw full utilization of the clam hatchery's 64 production tanks, with emphasis placed on cultivation of small clams for the seafood, aquarium and conservation markets. MMDC's consistent hatchery production, and marketing success this year once again reinforced its position as the world's top-producing, top-selling giant clam hatchery. Efforts in local and regional technology transfer and information dissemination also continued in 1992, with clam mariculture training courses conducted throughout the year. In addition to disseminating monthly reports, MMDC staff published four original research articles for publication in scientific journals.

MMDC made a significant number of capital improvements on the giant clam hatchery this year including the following: new administrative wing, including manager's office and reception area; new aquarium research wing; new seawater analysis laboratory; completely renovated gift shop; a new shellcraft fabrication shop; two new power poles; complete rewiring of the facility; a new roof on the original visitor's center; a 150-ft planter box; a 2,000 sq ft canopy on the aquarium research wing; a new dock side winch; and resurfacing of the stairway leading from the top of the seawall to the ocean.

MMDC embarked on a program to investigate the feasibility of cultivating corals for the international aquarium trade. The intent is to undertake a three-year investigation, concentrating in the first year on soft corals, in the second year on hard corals, and in the third year zooanthid corals. It is felt that commercial scale coral farming will reduce harvesting pressure on wild stocks while creating a new source of export revenue, in much the same manner as giant clam

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mariculture. Near the end of December 1992, word was received from the National Oceanic and Atmospheric Administration (NMFS/NOAA) of approval of funding for a research project on this topic at MMDC to commence in 1993.

Despite solid performance in research, production and marketing, 1992 brought a number of problems to MMDC. These related primarily to three areas: unreliable and expensive communications, the high cost of exporting freight by air, and the uncertain climate regulating the international movement of cultivated giant clam products. MMDC experienced serious frustration maintaining contact with customers and colleagues in 1992 and received a high number of complaints about this. High air freight rates continued to be perhaps our greatest constraint to expansion. Finally, compliance with permitting requirements of the US Fish and Wildlife Service (which is responsible for enforcing CITES restrictions on trade in threatened and endangered species) occupied a significant portion of MMDC's time and effort this year. This problem underscored the need to establish a locally-based wildlife inspector in the Republic of Palau. The agent should have the authority to inspect and certify Palau's wildlife shipments covered by the CITES agreement. **Trochus Project**

Trochus Project

An important objective of MMDC's Trochus Project since its inception some ten years ago has been to determine the feasibility and cost-effectiveness of trochus mariculture as one of several potential management options for the local trochus fishery. Any assessment of trochus mariculture will depend first on the reliable hatchery production of seed.

The achievement of consistent spawning and seed production in the MMDC Trochus Hatchery in 1991, under the direction of Project Leader Ken Kikutani, represented a milestone in the development of trochus mariculture in Palau, and appeared to pave the way for assessment of the impact of artificial stock enhancement or "reef reseeding" with hatchery-cultured juvenile trochus in Palau. However, Mr. Kikutani, a JICA-funded biologist, went home leave to Japan during the first quarter of calendar 1992. His anticipated return to the project in April 1992 was delayed several times and finally failed to materialize, due to factors beyond MMDC's control. Consistency in trochus seed production was not achieved in the MMDC hatchery during the latter half of 1992. Attempts by Mr. Kikutani to undertake a field based seed release program were not carried forward by the trochus project staff after his departure.

At the end of 1992, the MMDC manager recommended a discontinuation of the MMDC trochus hatchery and a shift in emphasis from mariculture to conventional management methods such as size limits, closed seasons and sanctuaries. It was felt that the latter methods would constitute a more cost-effective approach to managing Palau's commercial trochus fishery than artificial stock enhancement through mariculture.

Turtle Project

A consensus was reached in late 1991 between representatives of the U.S. Fish and Wildlife Service and the Palau Marine Resources Division, MMDC and the Bureau of Resources and Development regarding the future of the MMDC Turtle Headstarting Program. It was agreed by all parties that in view of the endangered status of the hawksbill turtle and the inconclusive nature of marine turtle headstarting programs in Palau and elsewhere, hatchery culture of wild-caught hawksbill turtle eggs would be gradually phased out in Palau in favor of alternative conservation measures. These measures would include public display of wild turtles at MMDC with professionally prepared graphic display boards (for public awareness-building), implementation of a village-based public education program, and renewed efforts to protect Palau's known turtle nesting sites from illegal poaching. These activities were planned to be undertaken with collaboration between the Bureau of Resources and Development, the Waikiki Aquarium and the Nature Conservancy.

Tourists

Over 4,000 tourists, residents and students visited the facility in 1992, generating US\$6,931.00 in gate fees (Table 19). The number of visitors in 1992 is similar to 1991 (3,854 visitors). The outside visitors to our facility represents @10% of all outside visitors to Palau in 1992.

Table 19. Visitors to Marine Resources Facility, Palau: 1992

Month	Total	Outside Visitors	Local Residents	Local Students
Total	4,121	3,305	273	543
January	294	271	23	0
February	587	374	27	186
March	485	329	15	141
April	309	244	16	49
May	160	130	17	13
June	361	335	26	0
July	457	335	42	80
August	394	355	27	12
September	277	224	27	26
October	246	221	25	0
November	303	254	13	36
December	248	233	15	0

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APPENDICES

Appendix I. Estimated Area of Fishing Habitats by State, Palau: 1990
(Area is square kilometers)

State	Total	Mangrove	Inner Reef	Outer Reef	Lagoon
Total...	1529.8	45.0	186.6	264.7	1033.5
Angaur.....	2.6	0	2.6	0.0	0.0
Peleliu.....	40.4	4.9	35.5	0.0	0.0
Koror.....	620.8	1.6	19.2	100.0	500.0
Airai.....	64.6	7.9	22.7	4.0	30.0
Aimeliik.....	93.0	2.8	8.2	27.0	55.0
Ngatpang.....	31.1	6.3	2.7	7.1	15.0
Ngeremlengui.	38.8	4.0	7.5	12.3	15.0
Ngardmau.....	54.5	7.2	13.8	11.0	22.5
Ngaraard.....	67.7	3.4	23.2	17.3	23.8
Ngerchelong..	431.4	2.1	23.0	81.3	325.0
Ngiwal.....	19.2	1.3	5.8	0.0	12.1
Melekeok.....	10.1	1.7	8.4	0.0	0.0
Ngchesar.....	36.4	1.8	6.9	4.7	23.0
Kayangel.....	19.2	0.0	7.1	0.0	12.1

Appendix II. The 1990 Census for Palau (provided by the Office of Planning and Statistics).

State	Total	> 5 yrs	5-14	15-59	60+	Unemployed
Koror	10,501	1,048	2,009	6,738	706	958
Airai	1,234	138	238	752	106	109
Ngchesar	287	24	78	134	51	30
Melekeok	244	22	63	117	42	37
Ngiwal	234	17	63	112	42	5
Ngaraard	310	34	77	150	49	55
Ngerchelong	354	46	80	167	61	68
Kayangel	137	13	37	68	19	34
Ngardmau	149	21	32	83	13	29
Ngeremlengui	281	28	81	141	31	36
Ngatpang	62	10	8	36	8	24
Aimeliik	439	46	100	256	37	42
Peleliu	601	44	133	328	96	139
Angaur	206	17	45	111	33	43
Sonsorol	61	6	15	35	5	0
Tobi	22	1	5	13	3	1
Total	15,122	1,515	3,064	9,241	1,302	1,610

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Appendix III. LIST OF PUBLICATIONS FOR MARINE RESOURCES DIVISION (MRD) AND MICRONESIAN MARICULTURE DEMONSTRATION CENTER. (MMDC)

MRD PUBLICATIONS for 1992.

- 1) Division of Marine Resources 1991 Annual Report
MRD Tech.Rpt. No. 92.1. 66 pp.
- 2) Report on FAD Development and Vertical Dropline Fishing
Palau. P.G.Watt. MRD Tech.Rpt.92.2.
- 3) The 1992 *Trochus (Trochus niloticus)* harvest in Palau.
A. Kitalong. MRD Tech.Rpt.92.3
- 4) Quantification of Spawning Aggregations of three grouper species:
Plectropomus aerolatus(tiau), *Epinephelus fuscoguttatus*(temekai), and *Epinephelus microdon*(ksau) at Ngerumekaol and Denges Passes, 1990-1992. A. Kitalong and E. Oiterong. MRD Tech.Rpt. 92.4 9 pp.
- 5) Quantification of Spawning Aggregations of *Siganus fuscescens*(meyas) in Airai Bay 1990-1992. A. Kitalong and E. Oiterong MRD Tech.Rpt. 92.5 14 pp.
- 6) Reef Utilization in Airai and Koror. A. Kitalong. MRD Tech.Rpt.92.6 10 pp.

MMDC Publications for 1992.

- 1). History and Status of the MMDC Giant Clam Project. 1992. G.A.Heslinga
- 2). Fitt, W.K., G.A. Heslinga and T.C. Watson. 1991. Use of antibiotics in the Mariculture of giant clams (F.Tridacnidae). *Aquaculture* 104:1-10.
- 3). Hastie, L.C., T.C. Watson, T.Isamu, and G.A. Heslinga. 1992. Effect of nutrient enrichment on *Tridacna derasa* seed:dissolved inorganic nitrogen increases growth rate. *Aquaculture* 106:41-49.
- 4). Fitt, W.K.,G.A. Heslinga and T.C.Watson. 1992. Utilization of dissolved inorganic nutrients in the growth and mariculture of the tridacnid clam, *Tridacna derasa*. *Aquaculture*.
- 5). Shang, Y.C., P.S. Leung, K. Wanitprapha and G. Heslinga. Production cost comparisons of giant clam (*Tridacna*) culture systems in the U.S. affiliated Pacific Islands. Proceedings of the Third Asian Fisheries Forum, Singapore.

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Appendix IV. Professional Visitors, 1992

Month:	Name:	Purpose:
JAN	Jane Barnwell Micronesia Studies Program University of Oregon	Library Technical Assistance
FEB	Dr. Masataru Anraku OFCF advisor, Fiji	Discuss small scale fisheries project
	Shunichi Hozumi Shigeru Kuramochi Munehiro Simada Masashi Satoh	FACT FINDING MISSION 1992 Fisheries Grant-Aid
MAR	Andrew Wright FFA Deputy Director	Discuss 1993 FFC meeting
	Joe Reti, Project Director Peter Thomas P. Johnston Peter Hunnan	Global Environmental Facility
	Neva Wendt, SPREP Adrienne	National Conservation Strategy Plan
	Masataru Anraku	Cost Analysis of FDAPIN projects
APR	Peter Cusack, SPC Fisheries Development Officer	Site Visit
MAY	no professional visitors	
JUN	Southwest Islands Expedition Scientific Team Jim Maragos-team leader Terry Donaldson-fish Carla McDermitt- algae, seagrass Robert Smith -US Fish and Wildlife	Rapid Ecological Assessment of SW Islands
	Lt.Col Barnes FFA Representative	Installation of satellite dish
	Yutaka Yokoi Deputy Director, Grant Aid Division	OFCF Mission Site visit and discussion for further projects

Appendix IV. Professional Visitors, 1992

Month:	Name:	Purpose:
JUN	Futoshi Takahashi Grant Aid Division Mikio Toyonaga Manager Fisheries & Overseas Dev. Dept. DeKohsuke Shimazu Assistant Manager Fisheries & Overseas Dev. Dept. Noboru Tazoe-OFCF staff	
JUL	Jean Kenyan Univ of Hawaii	Coral reproduction Coral monitoring
	Jane Barnwell	Library Assistance
AUG	Elizabeth Matthews Kim DesRochers Sea Grant, Hawaii	Resource use survey
SEP	Rapid Ecological Assessment Northern Babelthuap Scientific Team:	Assess biodiversity

Appendix V. Number and size(ft) of boats and boat engines in 1988 and 1992. Data taken from MRD database.

STATE	1988 TOTAL BOATS	1992 TOTAL BOATS	1988 AVERAGE BOAT SIZE (ft)	1992 AVERAGE BOAT SIZE (ft)	PERCENT CHANGE IN SIZE	1988 AVERAGE ENGINE (HSP)	1992 AVERAGE ENGINE (HSP)	PERCENT CHANGE IN (HSP)
KOROR	229	417	18	20	38	86	115	34
AIRAI	33	34	16	17	6	36	52	44
PELELIU	31	28	18	21	18	80	105	31
NGCHESAR	23	15	20	20	0	58	88	52
MELEKEOK	13	16	17	20	18	53	78	47
NGERMLENGUI	28	41	0	18	0	66	67	2
NGERCHELONG	25	22	18	20	12	54	71	31
AIMELIIK	8	9	17	17	0	67	56	-16
NGARAARD	10	14	19	19	0	84	86	2
NGATPANG	12	10	15	19	27	31	54	74
NGARDMAU	10	7	16	19	18	44	105	139
NGIWAL	6	10	21	18	-18	41	82	100
KAYANGEL	11	5	19	23	26	69	99	43
OVERALL AVERAGE			17.7	20	11	59	103	45
TOTAL	439	628						

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Appendix VI. Summary of 1988 household survey of non-boat(nbt) fishing methods by State representing 13% of all households except the Southwest Islands. Source: Marine Resources Division database.

STATE	#nbt fisher intrvd	spear gun	hook& line inside reef	hook& line outside reef	kesokes	ruul	surr net	bskng	cast net	other
Aimeliik	24	12	10	0	2	0	1	5	1	4
Airai	29	19	10	0	0	0	2	2	9	4
Angaur	15	7	7	4	0	0	0	0	2	0
Kayangel	7	7	2	0	0	0	0	0	0	0
Koror	118	66	75	1	2	0	7	14	21	15
Melekeok	15	12	7	2	0	0	5	0	3	1
Ngaraard	22	12	12	0	1	0	7	1	3	1
Ngardmau	11	8	7	0	0	0	2	6	3	1
Ngatpang	8	5	2	0	0	0	0	1	2	3
Ngchesar	16	13	10	2	0	0	1	1	5	1
Ngerchelong	18	16	8	0	0	1	6	4	3	2
Ngeremlengui	9	5	1	0	0	0	3	0	4	2
Ngiwal	13	11	6	2	0	0	3	2	0	1
Peleliu	21	17	2	0	0	0	5	2	1	0
Total	326	210	159	11	5	0	42	38	57	35

#nbt fisher intrvd = number of non-bot fishermen interviewed

bskng = biskang

surr net = surround net

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Appendix VII. Comments of boat owners from 1988 subsistence survey. Source: MRD database.

Comments regarding:	Frequency (number of comments)
Conservation and Law Enforcement	21
Poison	19
Dynamite	14
Size of net and net mesh size	13
Protect meyas during breeding	11
Foreign fishing	10
Pollution	9
Stop seining inside reef	9
Undersized fish	8
Financial support from the USA	7
Ban SCUBA fishing	5
No commercial fishing within the lagoon	4
Too many fishermen	4
Marketing	3
Sanctuaries	3
Dredging	3
Educate youth	3
Conserve inshore fishing grounds	3
Conserve species with eggs	2
Price stabilization	2
Too many boats	2
Provide fishing gears	2
Make gleaning seasonal	1
Stop foreigners from collecting seaweed	1
Protect breeding grounds	1
Study Koror's fish scarcity	1

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Appendix VIII. Total monthly landings (pounds) of reef and oceanic fish, by species, taken from purchase receipts at Palau Federation of Fishing Associations. Source MRD database.

SPECIES	Scientific Name	TOTAL	JAN	FEB	MAR	APR	MAY	JUN E	JULY	AUG	SEP T	OCT	NOV	DEC
KEREMLAL	Lutjanus gibbus	39,420	5736	2918	4327	4335	4905	1401	4907	2445	3039	1767	2275	1365
UM	Naso unicornis	13,412	412	708		511	716		1372	1951	3757	574	2443	968
TIAU	Plectropomus spp.	9,324	62	2520	1458	1651	731	173	609		649		1366	105
KLSEBUUL	Siganus lineatus	17,836	1227	1313	1724	1010	674	18	88	331	1365	2046	5935	2105
MEYAS	Siganus canaliculatus	13,025	3240	3313	1342	1312	630	410	746	1008	577	250	169	28
UDECH	Lethrinus ramak	9,215	950	455	419	624	478	87	255	148	1072	1219	1557	1951
METENGUI	See appendix.	5,717	355	276	214	7	897	308	597	654	1198	711	347	153
KEDESAU	Lutjanus bohar	8,107	1427	1397	345	1191	395	83	504	742	616	231	421	755
MELANGMUD	Lethrinus elongatus	9,599		35	1190	1535	1189	430	1703	748	1324	512	816	117
MELLEMAU	Scarus spp.	3,032		55		447	825	47	469	318	146		378	347
ASSO FISH	Assorted Fish	11,217		803	5606	1567	2364	87	83		34		673	
NGYAOCH	Hipposcarus longiceps	9,931	649	406	1096	219	1323		2619	935	433		400	1851
TEMEKAI	Epinephelus spp.	4,263	150			159	134	1146	2205		317		80	72
ORUIDEL	Caranx melampygus	3,256	45		612	101	698	151	828	222	325	274		
BERDEBED	juvenile Bolbometopon muricatum	14										14		
KEMEDUKL	Bolbometopon		129	737	221	208	723		243	695	178			211

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SPECIES	Scientific Name	TOTAL	JAN	FEB	MAR	APR	MAY	JUN E	JULY	AUG	SEP T	OCT	NOV	DEC
	muricatum	8,380	9		2	2								
MECHUR	Lethrinus xanthochilus	1,793	370			548			104	138	434	20	44	135
BEDUUT	Siganus argenteus	2,973				104	402	203 6	431					
ERANGEL	Naso lituratus	1,097				228	222		122	8		59	169	289
SEBUS	See Appendix	1,544					116	61	363	277	222	157	211	137
TEREKRIK	Selar crumenophthalmus	7,052	342	528	239	418	112 7	312	305	437	286	352		2706
KOMUD	Kyphosus spp.	2,687	880	250		291	40		629	509				88
DUDUL	Pristipomoides spp.	828		9		324				59		436		

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Appendix VIII. - continued. Total monthly landings (in lbs.) of reef and oceanic fish, by species, taken from purchase receipts at Palau Federation of Fishing Associations.

Fish Name	Scientific Name	Total	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ITOTECH	Lethrinus harak	434				64	108		76	134				52
KOTIGO	Gerres filamentous	1,508		675					177	36		614	6	
MAML	Cheilinus undulatus	494	15	41		58			143	83	80			74
NGIMER	juvenile Cheilinus undulatus	434					257		97	17			63	
DECH	Mulloidides flavolineatus	284								102	182			
ULUU	Liza vaigensis	1,284					52		355		113	248	468	48
KELAT	Crenimugil crenilabis	180							135	45				
BANG	Parupeneus barberinus	1,153	555				261		149	87	18		83	
OMEKTUTAU	Caranx lugubris	307					42			265				
BSUKL	Myripristis melanostictus	454			98		318	38						
MESEKELAT	Chanos chanos	165							165					
MESEKUUK	Acanthurus xanthopterus	270								244				26
REKRUK	Lethrinus amboinensis	1,246					346			51	652	101		96
MEKEEM	Seriola spp.	0												
KSAU	Epinephelus spp.	0												
BUDECH	Choerodon spp.	0												
YAUS	Plectorhinchus goldmanni	58												58

BESECHAMEL	Monotaxis grandoculis	100					100								
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Appendix VIII. - continued. Total monthly landings (in lbs.) of reef and oceanic fish, by species, taken from purchase receipts at Palau Federation of Fishing Associations.

Fish name	Scientific Name	TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TEKUU	Thunnus albacares	1,884	1265							539			80	
SMACH	Rastrelliger kanagurta	22,489	1646	2609	2146	721	518	851	1519	1886	2036	2270	1221	5066
ERSUUCH	Coryphaena hippurus	637	72	87	472							6		
SODA	Euthynnus affinis	5,249			200		2261			1319				1469
KERENGAB	Gymnosarda unicolor	884	35		768					81				
TUNA	Katsuwonus pelamis	23,160	4417	447	3821	1208	928	4241	2682	2524	547		2310	35
KESKAS	Acanthocybium solandri	6,797	439	250	1662	2592	287	390				224	439	75
NGELNGAL	Scomberomorus commerson	6,305	299	163	358	1704		40	82	382	901	1360	654	362
AII	Sphyraena spp.	1,413	68	135	176	253		95	136	80	105	276	89	
LOLOU	Sphyraena genie	340							98			172	70	
UDEL	Aprion virscens	682			44		74		21	83	147	14	196	103
ESUCH	Caranx sexfasciatus	239	94			27						75		43
WII	Gnathanodon speciosus	557					427					130		
EROPK	Caranx ignobilis	359					85			35	208		31	
MELUIS	Makaira nigricans	165		165										
TEKRAR	Istiophorus platypterus	58			58									
MEAI	Sphyraena pinguis	113		113										
SULD	Albula glossodonata	116					116							
DESUI	Elagatis bipinnulatus	1,091			600	251			61	106	73			

SEMUM	Trochus niloticus meat	309						309						
EMANG	Scylla serrata	127	8	49			8			62				
ERABRUKL	Panulirus spp.	637		1	68	181	196	4	31	21	114		21	

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APPENDIX IX. Palauan and scientific names of some edible and commercial marine species collected in Palau. Scientific names of reef fish have been revised from Micronesian Reef Fishes (Myers 1989) and Fishes of the Great Barrier Reef and Coral Sea (J.E.Randall, G.R. Allen and R.C. Steene 1990). Invertebrate names and identifications were taken from MRD Tech. Rept. 91.1.

Palauan	Scientific Name	Common name
SEA ANEMONES		
bung	sea anemones	
eteremall	Stoichactis japonicus	sea anemone
	Stoichactis haddoni	sea anemone
olaumeas	Actiinodendron plumosum	sea anemone
SIPUNCULID WORMS		
chiull		sipunculid worms
ngimr		long sandworm
SEA CUCUMBERS		
bakelungal	Holothuria (Microthele) nobilis	black teatfish
bakelungal	Holothuria (Microthele) fuscogilva	white teatfish
temetamel	Thelenota ananas	prickly redfish
bad el elid	Actinopyga mauritiana	surf redfish
molech	Holothuria (Metriatyla) scabra	sandfish
eremrum	Actinopyga miliaris	
eremrum	Actinopyga echinites	
ngimes	Stichopus variegatus	curryfish
ederngor	Holothuria difficilis	
irimd	Stichopus sp.	
meremarech	Bohadschia argus	
sekesaker	Holothuria spp.	
sengil	Holothuria flavomaculata	
SEA URCHINS		
oalech	Diadema setosum	
duduomel	Toxopneustes pileolus	
ibuchel	Tripneustes gratilla	
	Hemicentrotus pulcherrimus	
	Strongylocentrotus pileolus	
MOLLUSKS		
Polyplacophora		
echui	Acanthopleura or Chiton sp.	chiton

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Appendix IX. continued.

Palauan	Scientific Name	Common name
GASTROPODS		
bsungel	<i>Terebralia semestriata</i>	mangrove snail
buich	<i>Cypraea tiger</i>	tiger cowerie
debusech	<i>Charonia tritonis</i>	trumpet triton
delsangel	<i>Nerita (Amphinerita) maxima</i>	snail
	<i>Nerita undata</i>	
ibusech	<i>Chicoreus ramosus</i>	giant murex
murech	<i>Nerita (Vittina)</i>	
	<i>turrita cumingiana</i>	turreted nerite
omuu	<i>Cassis cornuta</i>	horned helmet
ototel	<i>Conus spp.</i>	cone shell
rechull	<i>Strombus gibberulus</i>	small white conch
sang	<i>Lambis lambis</i>	spider shell
sang ra roech	<i>Lambis chiragra</i>	spider shell
semachel	<i>Strombus luhuanus</i>	blood-mouthed conch
semal or itol	<i>Dolabella sp.</i>	sea hare
semum or ekoek	<i>Trochus niloticus</i>	trochus
BIVALVES		
ebau	<i>Tapes literata</i>	lettered venus
edalngobel	<i>Pitar citrina</i>	yellow pitar venus
esechol	<i>Atactodea striata</i>	
esechol	<i>Atactodea f. glabrata</i>	
esechur	<i>Trachycardium flavum</i>	
esiuch	<i>Pinctada margaritifera</i>	
dekmus	<i>Haliotis asinina</i>	donkey's ear abalone
dekmus	<i>Haliotis ovina</i>	sheep's ear abalone
delal a ngduul	<i>Anodonita alba</i>	large mangrove clam
ngduul	<i>Anodonita philippina</i>	
delebekai	<i>Nucula rugosa</i>	
delebekai	<i>Gafrarium tumidum?</i>	nut clam
eduib or	<i>Polymededa luhuana</i>	mangrove clam
debuongel		
iud	<i>Ostrea glomerata</i>	rock oyster
iud	<i>Crassostrea echinata</i>	rock oyster
ilekum	<i>Codakia interrupta</i>	
kdor	<i>Tellina virgata</i>	
kerdaob	<i>Periglypta (Venus) puerpera</i>	
kikoi	<i>Andara sp.</i>	
kikoi	<i>Barbatia reeveana</i>	ark shell

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Appendix IX. continued.

Palauan	Scientific Name	Common name
kim		giant clams
duadeb	<i>Hippopus hippopus</i>	
otkang	<i>Tridacna gigas</i>	giant clam
kism	<i>Tridacna derasa</i>	southern clam
oruer	<i>Tridacna crocea</i>	boring clam
ribkungel	<i>Tridacna squamosa</i>	fluted clam
melibes	<i>Tridacna maxima</i>	small giant clam
olichel a sechou	<i>Pinna sp.</i>	pen shells
rudel	<i>Ptereria penguin</i>	oyster
sebuis	<i>Atrina vexillum</i>	pen shell
tiuach	<i>Malleus malleus</i>	black hammer oyster
uteuetech	<i>Chama buddiana</i>	
	<i>Chama sinuosa</i>	
CRUSTACEANS		
elauesachel	<i>Lysiosquilla maculata</i>	mantis shrimp
eleched	<i>Thalamitoides tridens</i>	
eleched	<i>Thalamitoides spinimana</i>	
eleched	<i>Thalamitoides danae</i>	
emang	<i>Scylla serrata</i>	mangrove crab
erabrukl	<i>Panulirus spp.</i>	lobsters
melech	<i>Panulirus longipes</i>	spiny lobster
	<i>femoristriga</i>	
bleyached	<i>Panulirus versicolor</i>	spiny lobster
raiklius	<i>Panulirus penicillatus</i>	spiny lobster
eramrou	<i>Laemedia astacina</i>	crayfish
eramrou	<i>Thalassina anomala</i>	mangrove crab
erechur		freshwater shrimp
erechur		saltwater shrimp
esechuul		sand crab
kesuar	<i>Gecarcoidea lalandii</i>	land crab
ketat	<i>Birgus latro</i>	coconut crab
kidel	<i>Carpilius maculatus</i>	crab
kmai	<i>Portunus pelagicus</i>	crab
ksull	<i>Paraxanthia elegans</i>	
ksull	<i>Xanthias lividus(?)</i>	
rekung or kakum		land crab
rekung el beab	<i>Cardisoma hirtipes</i>	land crab
rekung el daob	<i>Cardisoma carnifex</i>	land crab
rereek	<i>Grapsus tenuicrustatus</i>	black rock crab
senges	<i>Neopisesarma lafondi</i>	gray crab

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name
bukitang		octopus
erechur	Macrobrachium rosenbergii	freshwater prawn
STINGRAY		
rrull	Taeniura melanospilos	black spotted stingray
rrull	Dasyatus kuhlii	blue spotted stingray
rrull	Dasyatus bennetti	
FISH		
suld	Albula glossodonata	Indo-Pacific bonefish
mesekelet	Chanos chanos	milkfish
mekebud	Herklotsichthys quadrimaculatus	gold spot herring
sekos	Tylosurus crocodilus crocodilus	crocodile needlefish
bolobel	Hemiramphus far	halfbeak
SQUIRRELFISH		
bsukel	Myripristis berndti	big scale soldierfish
bsukel	Myripristis melanostictus	soldierfish
desachel	Sargocentron caudimaculatum	tailspot squirrelfish
desachel	Sargocentron spiniferum	long-jawed squirrelfish
desachel	Sargocentron tiere	blue-lined squirrelfish
kedaol	Neoniphon sammara	bloodspot squirrelfish
GROUPERS		
baslokil	Variola louti	lyretail grouper
ksau	Epinephelus microdon	marbled grouper
mokas	Plectropomus maculatus	barred-cheek grouper
mengardecheluheb	Cephalopholis argus	peacock grouper
bekerkard 'l temekai	Cephalopholis igarashiensis	
temekai	Cephalopholis sonnerati	tomato grouper
temekai	Epinephelus morrhua	
temekai	Epinephelus fuscoguttatus	blotchy grouper
temekai	Epinephelus septemfasciatus	
temekai	Epinephelus chlorostigma	brown spotted grouper
temekai	Epinephelus fasciatus	black-tipped grouper
temekai	Epinephelus marcospilos	black spotted grouper

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name
temekai	<i>Epinephelus maculatus</i>	highfin grouper
tiau	<i>Plectropomus areolatus</i>	squaretail grouper
tiau	<i>Plectropomus laevis</i>	saddleback grouper
katuu tiau	saddleback phase	
mokas	red phase	
BIGEYE		
dechil a deel	<i>Priacanthus hamrur</i>	goggle eye
JACKS, TREVALLY		
terekrik	<i>Selar crumenophthalmus</i>	bigeye scad
mams (juvenile)	<i>Selar crumenophthalmus</i>	
iliuchbuil	<i>Trachinotus blochi</i>	snub-nosed dart
desui	<i>Elagatis bipinnulatus</i>	rainbow runner
yab	<i>Carangoides fulvoguttatus</i>	yellow-dotted trevally
eropk	<i>Caranx ignobilis</i>	giant trevally
esuch	<i>Caranx sexfasciatus</i>	bigeye trevally
omektutau	<i>Caranx lugubris</i>	black jack
orwidel	<i>Caranx melampygus</i>	bluefin trevally
mekeem	<i>Seriola dumerili</i>	greater amberjack
mekeem	<i>Seriola rivoliana</i>	almaco jack
wii	<i>Gnathanodon speciosus</i>	golden trevally
DOLPHINFISH		
ersuuch	<i>Coryphaena hippurus</i>	mahi mahi
SILVERFISH		
edoched	<i>Gerres abbreviatus</i>	deep-bodied mojarra
esall	<i>Gerres oyena</i>	oyena mojarra
kotikou	<i>Gerres filamentosus</i>	filamentous mojarra
	<i>Gerres macrosoma</i>	
SNAPPERS		
akamuro	<i>Paracaesio xanthurus</i>	
bekerkard 'l dudul	<i>Pristipomoides zonatus</i>	
dudul	<i>Pristipomoides argyrogrammicus</i>	
dudul	<i>Pristipomoides auricilla</i>	
derringel	<i>Lutjanus fulviflamma</i>	black-spot snapper
dodes	<i>Lutjanus kasmira</i>	bluelined snapper

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name
dodes	<i>Lutjanus vitta</i>	one-lined snapper
kedesau	<i>Lutjanus bohar</i>	red snapper
kedesau 'l yengel	<i>Lutjanus argentimaculatus</i>	river snapper
kelalk	<i>Macolor macularis</i>	black and white snapper
kelalk	<i>Macolor niger</i>	black snapper
keremlal	<i>Lutjanus gibbus</i>	humpback snapper
kesebii	<i>Lutjanus monostigma</i>	onespot snapper
kliklechol	<i>Terapon jarbua</i>	crescent grunter
kliklechol	<i>Terapon oxyrhynchus</i>	grunter
korrii	<i>Lutjanus rivulatus</i>	scribbled snapper
metengui	<i>Gymnocranius japonicus</i>	
metengui	<i>Pristipomoides sieboldii</i>	
metengui	<i>Pristipomoides filamentosus</i>	
	<i>roseus</i>	
metengui	<i>Pristipomoides filamentosus</i>	
metengui	<i>Pristipomoides flavipinnis</i>	pink opakapaka
metengui ra tmolech	<i>Aphareus rutilans</i>	
reall	<i>Lutjanus fulvus</i>	flametail snapper
sebus	<i>Lutjanus malabaricus</i>	malabar snapper
sebus	<i>Lutjanus sebae</i>	red emperor
sebus	<i>Lutjanus erythropterus</i>	
sebus	<i>Etelis carbunculus</i>	
sebus	<i>Etelis marshi</i>	
sebus	<i>Etelis coruscans</i>	onaga
udel	<i>Aprion virescens</i>	jobfish
edui	<i>Symphorus spilurus</i>	
SWEETLIPS		
bikl	<i>Plectorhinchus obscurus</i>	giant sweetlips
debeliich	<i>Plectorhinchus flavomaculatus</i>	netted sweetlips
merar	<i>Plectorhinchus celebecus</i>	Celebes sweetlips
yaus	<i>Plectorhinchus goldmanni</i>	Goldman's sweetlips
EMPERORS		
besechamel	<i>Monotaxis grandoculus</i>	bigeye emperor
eluikel	<i>Lethrinus reticulatus</i>	
esiur	<i>Gymnocranius lethrinoides</i>	stout emperor
itotech	<i>Lethrinus harak</i>	blackspot emperor
korrii	<i>Gymnocranius lethrinoides</i>	stout emperor

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name
mechur	<i>Lethrinus xanthochilus</i>	yellowlip emperor
melangmud	<i>Lethrinus elongatus</i>	longnose emperor
menges	<i>Lethrinus kallopterus</i>	orange-fin emperor
metengui	<i>Lethrinus haematopterus</i>	
metengui	<i>Lethrinus mahsenoides</i>	yellowbrow emperor
metengui	<i>Lethrinus rubrioperculatus</i>	redgill emperor
rekruk	<i>Lethrinus amboinensis</i>	ambon emperor
udech	<i>Lethrinus obsoletus</i>	yellowstripe emperor
GOATFISH		
bang	<i>Parupeneus barberinus</i>	half and half goatfish
dech	<i>Mulloides flavolineatus</i>	yellowstripe goatfish
eldebsungel	<i>Parupeneus indicus</i>	Indian goatfish
emisech	<i>Mulloidichthys vanicolensis</i>	
RUDDERFISH		
komud	<i>Kyphosus cinerascens</i>	highfin rudderfish
komud	<i>Kyphosus vaigiensis</i>	lowfin rudderfish
WRASSE		
budech	<i>Choerodon anchorago</i>	
maml (adult)	<i>Cheilinus undulatus</i>	humphead or napoleon wrasse
ngimer (juv)	<i>Cheilinus undulatus</i>	
PARROTFISH		
beyadel (fem)	<i>Cetoscarus bicolor</i>	bicolor parrotfish
ngesngis (mal)	<i>Cetoscarus bicolor</i>	
butiliang	<i>Scarus spinus</i>	pygmy parrotfish
butiliang	<i>Scarus globiceps</i>	roundhead parrotfish
elebdechukl	<i>Scarus ghobban</i>	blue-barred parrotfish
kemedukl	<i>Bolbometopon muricatum</i> (adult)	humphead parrotfish
berdebed	<i>Bolbometopon muricatum</i> (juv)	humphead parrotfish
mellemau	<i>Scarus oviceps</i>	dark-capped parrotfish
mellemau	<i>Scarus bleekeri</i>	Bleeker's parrotfish
mellemau	<i>Scarus flaviplectoralis</i>	yellowfin parrotfish

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name
mellemau	<i>Scarus sordidus</i>	bullethead parrotfish
ngyaoch	<i>Hipposcarus longiceps</i>	Pacific longnose
otord	<i>Scarus frontalis</i>	tan-faced parrotfish
otord	<i>Scarus rubroviolaceus</i>	redlip parrotfish
udoudungelel	<i>Scarus gibbus</i>	gibbus parrotfish
MULLET		
blilch	<i>Liza macrolepis</i>	
kelat	<i>Crenimugil crenilabis</i>	fringelip mullet
kelat	<i>Valamugil seheli</i>	bluespot mullet
uluu	<i>Liza vaigiensis</i>	yellowtail mullet
BARRACUDA		
aii	<i>Sphyraena barracuda</i>	great barracuda
lolou	<i>Sphyraena genie</i>	blackfin barracuda
meai	<i>Sphyraena pinguis</i>	pygmy barracuda
SURGEON FISH		
belai	<i>Acanthurus lineatus</i>	bluebanded surgeonfish
borch	<i>Naso vlamingii</i>	bignose unicornfish
elas	<i>Acanthurus sandvicensis</i>	
erangel	<i>Naso lituratus</i>	orangespine unicornfish
eremuuch	<i>Acanthurus nigrofuscus</i>	brown surgeonfish
esengel	<i>Acanthurus olivaceus</i>	orangeband surgeonfish
esengel	<i>Acanthurus thompsoni</i>	Thompson's surgeonfish
mesekuuk	<i>Acanthurus xanthopterus</i>	yellowfin surgeonfish
mesekuuk bad	<i>Acanthurus mata</i>	elongate surgeonfish
ongchutel	<i>Naso tuberosus</i>	humpnose unicornfish
sechou	<i>Naso annulatus</i>	whitemargin unicornfish
um	<i>Naso unicornis</i>	bluespine unicornfish
RABBITFISH		
meyas	<i>Siganus fuscescens</i>	seagrass rabbitfish
klsebuul	<i>Siganus lineatus</i>	lined rabbitfish
beduut	<i>Siganus argenteus</i>	forktail rabbitfish
bebael	<i>Siganus punctatus</i>	peppered rabbitfish
reked	<i>Siganus doliatus</i>	pencil-streaked rabbitfish

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name
TUNA and MACKEREL		
bigeye tuna	<i>Thunnus obesus</i>	bigeye tuna
dogtooth tuna	<i>Gymnosarda unicolor</i>	dogtooth tuna
ngelngal	<i>Scomberomorus commerson</i>	narrow-barred king mackerel
keskas	<i>Acanthocybium solandri</i>	wahoo
katsuo	<i>Katsuwonis pelamis</i>	skipjack tuna
soda	<i>Euthynnus affinis</i>	kawakawa
tekuu	<i>Thunnus albacares</i>	yellowfin tuna
agie	<i>Decapterus spp.</i>	scads
terekrik	<i>Selar crumenophthalmus</i>	bigeye scad
terekrik	<i>Selar boops</i>	yellowband scad
smach	<i>Rastrelliger kanagurta</i>	striped mackerel
MARLINS		
meluis	<i>Makaira mazara</i>	Indo-Pacific blue marlin
tekrar	<i>Istiophorus platypterus</i>	Indo-Pacific sailfish
TRIGGERFISH		
duk1	<i>Pseudobalistes flavimarginatus</i>	yellowmargin triggerfish
duk1	<i>Balistoides viridescens</i>	mustache triggerfish
BOXFISH		
riaml	<i>Ostracion cubicus</i>	cube trunkfish
PUFFERFISH		
Telbudel	<i>Arothon mappa</i>	map puffer
PORCUPINEFISH		
drutm	<i>Diodon hystrix</i>	porcupinefish

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name
AQUARIUM FISH		
	<i>Alectis ciliaris</i>	threadfin
	<i>Plotosus lineatus</i>	coral catfish
	<i>Antennarius maculatus</i>	frogfish
	<i>Aeoliscus strigatus</i>	shrimpfish
	<i>Pterois radiata</i>	lionfish
	<i>Pterois volitans</i>	lionfish
	<i>Pseudanthias pleurotaenia</i>	bartlets
	<i>Pseudanthias pascalus</i>	purple queen
	<i>Callopleysiops altivelis</i>	marine betta
	<i>Pseudochromis porphyreus</i>	purple basslets
	<i>Oxycirrhitus typus</i>	longnose hawkfish
	<i>Paracirrhitus arcatus</i>	arc eye hawkfish
	<i>Sphaeramia nematoptera</i>	spotted cardinalfish
	<i>Hoplolatilus starcki</i>	blueface goby
	<i>Pogonochilus zebra</i>	bar/zebra goby
	<i>Caesio teres</i>	yellowback fusiler
	<i>Platax pinnatus</i> (juvenile)	pinnatus batfish
	<i>Heniochus acuminatus</i>	long-fin bannerfish
	<i>Chaetodon auriga</i>	auriga butterfly
	<i>Chaetodon ephippium</i>	saddleback butterfly
	<i>Chaetodon lunula</i>	raccoon butterfly
	<i>Chaetodon melannotus</i>	black-back butterfly
	<i>Chaetodon punctatofasciatus</i>	dot-dash butterfly
	<i>Chaetodon rafflesii</i>	latticed butterfly
	<i>Chaetodon semeion</i>	semeion butterfly
	<i>Chaetodon vagabundus</i>	vagabond butterfly
	<i>Hemitaurichthys polylepis</i>	diamond butterfly
	<i>Forcipiger flavissimus</i>	longnose butterfly
	<i>Forcipiger longirostris</i>	longnose butterfly
	<i>Pomacanthus sextriatus</i>	six-banded angel
	<i>Pygoplites diacanthus</i>	regal angel
	<i>Apolemichthys trimaculatus</i>	flagfin angel
	<i>Centropyge bicolor</i>	bicolor angel
	<i>Centropyge bispinosus</i>	coral beauty angel
	<i>Centropyge heraldi</i>	yellow angel
	<i>Centropyge loriculus</i>	flame angel
	<i>Centropyge aurantium</i>	golden angel

DIVISION OF MARINE RESOURCES

Appendix IX. continued.

Palauan	Scientific Name	Common name	Pomacanthus
navarchus(adult)	majestic angel		
	Pomacanthus imperator(adult)	imperator angel	
	Amphiprion melanopus	cinnamon clownfish	
	Amphiprion peridaeraion	pink skunk clownfish	
	Amphiprion clarkii	Clarke's anemonefish	
	Sphaeramia orbicularis	orbic cardinal	
	Chrysiptera cyanea(male)	blue damsel	
	Dascyllus aruanus	3-stripe damsel	
	Pomacentrus coelestis	electric blue damsel	
	Chromis atripectoralis	green chromis	
	Bodianus anthioides	lyretail hogfish	
	Pseudocheilinus hexataenia	sixline wrasse	
	Coris gaimardi(juvenile)	red wrasse	
	Novaculichthys taeniourus	dragon wrasse	
Gomphosus varius(male)		greenbird wrasse	
	Coris aygula(juvenile)	twin spot wrasse	
	Thalassoma hardwickii	six bar wrasse	
	Thalassoma lunare	lunare wrasse	
	Thalassoma lutescens(adult)	lime green wrasse	
	Zanclus cornutus	moorish idol	
	Scarus spinus	pygmy parrot	
	Synchiropus splendidus	mandarin dragonet	
	Nemateleotris helfrichi	helfrich dartfish	
	Ctenochaetus tominiensis	bristletooth surgeon	
	Acanthurus lineatus	clown tang	
	Paracanthurus hepatus	blue tang	
	Zebrasoma veliferum	sailfin tang	
	Ostracion meleagris	blue boxfish	
	Arothron meleagris	dogface puffer	
	Odonus niger	redtooth niger trigger	
	Balistoides conspicillum	clown trigger	
	Balistapus undulatus	golden trigger	
	Hemigymnus melapterus	half black wrasse	

Appendix X. Composition of commercial reef fish landings at PFFA between 1976 to 1989.

Family	Annual landings (in lbs) of reef fish to PFFA														
	1976	1977	1978	1979	1980	1981	1983	1984	1985	1986	1987	1988	1989	TOTAL	%Wt
SCARIDAE	25095	25667	12070	54117	68600	46510	47977	92426	95942	11354 9	55718	42137	62127	741,93 5	17.9 5
ACANTHURIDAE	18912	19696	17391	32156	79569	33917	44357	32905	87924	74567	23727	37150	61138	563,40 9	13.6 3
LETHRINIDAE	25005	13461	4104	37569	72886	23817	42259	56669	94491	61859	19070	44895	48091	544,17 6	13.5 2
LUTJANIDAE	18327	10044	3898	18830	40840	18321	41446	41960	98951	82479	15570	62682	50810	504,15 8	12.2 0
SIGANIDAE	25371	19062	26206	36513	46260	17069	15893	36618	49864	33446	15659	25790	43217	390,96 8	10.3 5
SERRANIDAE	3391	20152	15319	28335	27796	21102	34082	42315	48364	46005	36351	35352	22497	381,06 1	9.46
CARANGIDAE	6619	2815	2146	10240	9944	3502	10609	19682	28552	20015	11180	10201	11491	146,99 6	3.56
MULLIDAE	2225	1631	943	2273	5110	2667	2441	4352	5692	5889	2572	5266	1464	42,525	1.03
MUGILIDAE	7123	4434	1756	5833	6944	4349	1332	1308	5545	2017	643	1355	3062	45,701	1.11
LABRIDAE	1255	918	957	3836	3366	2578	4645	3712	7604	6048	1742	1994	910	39,565	0.96
GERRIDAE	4430	1935	208	2673	1585	950	213	639	3835	853	170	463	1008	18,962	0.46
HOLOCENTRIDAE	70	257	20	584	287	3470	863	1454	1169	848	48	0	71	9,141	0.22
HAEMULIDAE	0	95	335	903	1307	325	1224	1214	3236	132	0	0	0	8,771	0.21
OTHERS	65288	13744 1	50114	30842	12327	1370	14359	8071	100417	17933	188013	36173	33145	695,49 3	16.8 2
Total	203,1 11	257,6 08	135,4 67	264,7 04	376,8 21	179,9 47	261,7 00	343,32 5	631,58 6	465,6 40	370,46 3	303,45 8	339,03 1	4,132, 861	100. 00

DIVISION OF MARINE RESOURCES

Appendix X - continued. Composition of commercial reef fish landings at PFFA between 1990-92.

Family	1990	1991	1992	Total	%Wt
SCARIDAE	53186	13368	21380	87,934	10.32
ACANTHURIDAE	43810	25000	14779	83,589	9.81
LETHRINIDAE	57099	25939	22357	105,395	12.37
LUTJANIDAE	29123	74405	56456	159,984	18.78
SIGANIDAE	69331	37814	33599	140,744	16.52
SERRANIDAE	21361	25408	13586	60,355	7.09
CARANGIDAE	11711	3801	12861	28,373	3.33
MULLIDAE	5746	875	1436	8,057	0.95
MUGILIDAE	1647	841	1463	3,951	0.46
LABRIDAE	1397	608	928	2,933	0.34
GERRIDAE	648	2407	1508	4,563	0.54
HOLOCENTRIDAE	280	343	454	1,077	0.13
HAEMULIDAE	0	0	58	58	0.01
OTHERS	17904	61733	85078	164,715	19.34
Total	313,243	272,542	265,943	851,728	99.9900

DIVISION OF MARINE RESOURCES

Appendix Xb. Composition of commercial reef fish for ALL markets (PFFA, Oh's, PMCI, and Melekeok Cooperative) during 1992.

Family	Weight (lbs)
SCARIDAE	61,820
ACANTHURIDAE	33,811
LETHRINIDAE	29,011
LUTJANIDAE	71,032
SIGANIDAE	44,542
SERRANIDAE	38,134
CARANGIDAE	16,254
MULLIDAE	2,788
MUGILIDAE	2,003
LABRIDAE	2,712
GERRIDAE	1,551
HOLOCENTRIDAE	514
HAEMULIDAE	58
OTHERS	418,301
Total	722,531

DIVISION OF MARINE RESOURCES

Appendix XI. Composition of commercial reef fish landings at PFFA between 1976 to 1990.

Family	Percent composition		
	1976 - 1983	1984 - 1990	1976 - 1990
Scaridae	16.29	18.68	17.88
Acanthuridae	14.12	12.88	13.66
Lethrinidae	11.93	13.87	13.52
Lutjanidae	8.54	13.53	11.99
Siganidae	11.55	10.48	10.35
Serranidae	9.09	9.25	9.05
Carangidae	2.63	4.01	3.57
Mullidae	1.01	1.16	1.09
Mugilidae	1.93	0.53	1.06
Labridae	1.03	0.78	0.92
Gerridae	0.73	0.24	0.44
Holocentridae	0.39	0.13	0.21
Haemulidae	0.23	0.13	0.20
Others	20.52	14.32	16.05

Source: MRD Tech.Rept.91.12

DIVISION OF MARINE RESOURCES

Appendix XII. The ten most common species in the total commercial reef fish landings in Palau between 1976 and 1990.

Species	Percent of total landings between 1976 - 1990
<i>N.unicornis</i>	11.3
<i>B.muricatum</i>	10.4
<i>L.gibbus</i>	8.5
<i>Epinephelus spp.</i>	7.6
<i>L.ramak</i>	6.7
<i>H.longiceps</i>	6.1
<i>S.canaliculatus</i>	5.1
<i>S.lineatus</i>	5.1
<i>L.xanthochila</i>	3.4
<i>L.bohar</i>	2.7

Source: MRD Tech.Rept.91.12

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Appendix XIII. Fisheries Statistics 1922 to 1938. Source: South Sea Bureau(1937) South Sea Fisheries(1940) translated by Masanami Izumi, South Pacific Commission.

Year	Unit	Saipan	Yap	Palau	Chuuk	Ponape	Jaluit	Total
1922	Yen	4,961	410	35,234	23,046	41,165	8,780	113,596
1923	Yen	10,202	8,098	100,124	17,526	30,879	8,780	175,609
1924	Yen	15,192	13,355	37,171	32,914	7,142	9,404	115,178
1925	Yen	18,740	21,298	108,840	34,500	10,624	10,450	204,452
1926	Yen	27,817	22,599	146,568	28,070	18,379	10,939	254,372
1927	Yen	19,417	21,205	111,224	44,914	13,213	22,752	232,725
1928	Yen	24,490	24,157	169,170	26,202	14,760	19,154	277,933
1929	Yen	19,627	26,265	194,008	91,857	8,792	2,110	342,659
1930	Yen	70,296	23,569	116,329	269,134	17,739	13,700	510,767
1931	Yen	141,013	16,952	186,980	316,381	176,884	33,280	871,490
1932	Yen	374,564	9,410	226,985	366,497	163,580	125,830	1,266,866
1933	Yen	406,964	16,348	316,110	690,214	304,015	56,671	1,790,322
1934	Yen	570,130	38,921	1,249,782	454,948	267,587	63,435	2,644,803
1935	Yen	456,781	14,568	749,053	227,333	133,184	60,438	1,641,357
1936	Yen	309,676	14,424	2,337,360	604,751	287,273	31,537	3,585,021
	Kgs	1,997,080	35,783	6,200,858	6,215,750	2,801,439	189,174	17,440,084
	Shells					4,935	5,018	9,953
	Turtles		70	139		90		299
1937	Yen	463,998	17,988	4,970,784	950,778	431,710	27,330	6,862,588
	Kgs	3,998,198	33,556	18,357,054	12,950,846	4,187,398	106,334	39,633,386
	Shells	395		13,642		7,360		21,397
	Turtles	12		36	6	93		147
1938	Yen	394,902	34,771	2,861,406	506,635	220,308	8,262	4,026,284
	Kgs	2,828,624	202,468	9,229,848	5,572,582	1,716,582	29,406	19,579,510
	Shells			18,427		7,170		25,597
	Turtles			19	103	115		237

Appendix XIV., Micronesian Fisheries Statistics 1922 to 1938. Source: South Sea Bureau (1937) South Sea Fisheries (1940) translated by Masanami Izumi, South Pacific Commission.

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Appendix XV. Summary of air freight cargo declared on manifest forms for Continental Air Micronesia, 1991-92. "Other" refers to taro, tapioca, betelnut and other goods. The weight, given in pounds(lbs), is the gross weight, including containers, ice, and packaging. Count = number of containers sent.

TYPE	1991 count	1991 weight	1992 count	1992 weight
BATS	38	1519	22	913
BATS/OTHER	23	1283	19	960
BATS/PIGEON	0	0	1	32
CLAM	2	166	10	390
CLAM(DRIED)/OTHER	0	0	1	16
CLAM(GIANT CLAM MEAT)	2	111	14	593
CLAM(GIANT CLAM SHELL)	27	3129	5	496
CLAM(GIANT CLAM SHELL)/BLACK CORAL	1	82	0	0
CLAM(LIVE)	3	158	209	7304
CLAM/BATS	0	0	1	20
CLAM/BATS/OTHER	0	0	2	80
CLAM/OTHER	0	0	14	644
CLAM/TROCHUS MEAT	0	0	1	39
CRAB	6	295	13	538
CRAB(COCONUT)	0	0	2	139
CRAB(COCONUT)/OTHER	2	125	0	0
CRAB(LAND)	4	212	0	0
CRAB(LAND)/OTHER	3	257	6	684
CRAB(LIVE COCONUT)	0	0	4	177
CRAB(LIVE MANGROVE, COCONUT)	0	0	1	12
CRAB(LIVE)	3	77	2	66
CRAB(LIVE)/BATS	0	0	2	81
CRAB(LIVE)/OTHER	9	770	2	76
CRAB(LIVE)/SEACUCUMBER	0	0	3	315
CRAB(LIVE)/SMOKED FISH	0	0	2	124
CRAB(MANGROVE)	2	41	0	0
CRAB(MANGROVE, LAND)/BATS/OTHER	4	156	3	330
CRAB(STUFFED)	0	0	1	36
CRAB(STUFFED)/BATS/OTHER	0	0	3	308
CRAB/BATS	1	34	8	581
CRAB/BATS/OTHER	1	57	2	201
CRAB/CLAM/OTHER	0	0	3	263
CRAB/CLAM/SEACUCUMBER	0	0	1	45
CRAB/LOBSTER	1	45	9	518
CRAB/LOBSTER/CLAM/OTHER	2	89	0	0
CRAB/LOBSTER/OTHER	3	100	2	130
CRAB/OTHER	9	812	0	0
CRAB/SEACUCUMBER/OTHER	0	0	1	66
CRAB/SEAFOOD/OTHER	1	45	4	182
EEL(LIVE FRESHWATER)	1	30	0	0

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FISH	1408	185387	353	57343
FISH (DRIED) /OTHER	3	55	0	0
FISH (FILLET)	0	0	10	1036
FISH (FRESH FILLET)	0	0	4	220
FISH (FRESH)	1380	207517	830	131781
FISH (FRESH) /BATS	7	850	5	642
FISH (FRESH) /BATS/OTHER	0	0	4	211
FISH (FRESH) /CLAM	3	644	0	0
FISH (FRESH) /CRAB	4	753	9	744
FISH (FRESH) /CRAB (LAND) /OTHER	2	209	0	0
FISH (FRESH) /CRAB/BATS	0	0	3	245
FISH (FRESH) /CRAB/LOBSTER	3	308	1	65
FISH (FRESH) /CRAB/LOBSTER/OTHER	0	0	1	76
FISH (FRESH) /CRAB/OTHER	1	50	2	232
FISH (FRESH) /LOBSTER	19	1667	0	0
FISH (FRESH) /OTHER	25	2672	94	9329
FISH (FRESH) /SARDINES	1	41	0	0
FISH (FRESH) /SEACUCUMBER/OTHER	0	0	1	58
FISH (FRESH) /TUNA/OTHER	0	0	7	1400
FISH (FRIED) /OTHER	0	0	1	43
FISH (FROZEN)	1573	158431	3023	313718
FISH (FROZEN) /BATS	78	8083	77	6597
FISH (FROZEN) /BATS/OTHER	4	207	31	2515
FISH (FROZEN) /CLAM	3	196	5	530
FISH (FROZEN) /CLAM/OTHER	5	225	5	325
FISH (FROZEN) /CRAB	36	2992	54	6028
FISH (FROZEN) /CRAB (COCONUT)	5	685	0	0
FISH (FROZEN) /CRAB (COCONUT) /OTHER	0	0	4	332
FISH (FROZEN) /CRAB (MANGROVE, COCONUT)	0	0	5	640
FISH (FROZEN) /CRAB/BATS	1	100	3	339
FISH (FROZEN) /CRAB/BATS/OTHER	14	1771	9	722
FISH (FROZEN) /CRAB/CLAM	0	0	1	31
FISH (FROZEN) /CRAB/LOBSTER	0	0	21	1612
FISH (FROZEN) /CRAB/LOBSTER/BATS	0	0	8	907
FISH (FROZEN) /CRAB/LOBSTER/OTHER	0	0	23	1950
FISH (FROZEN) /CRAB/OTHER	46	4143	38	3005
FISH (FROZEN) /CRAB/TROCHUS MEAT	0	0	1	50
FISH (FROZEN) /FISH (DRIED)	0	0	1	86
FISH (FROZEN) /FISH (SMOKED)	4	1185	3	138
FISH (FROZEN) /FISH (SMOKED) /BATS	0	0	2	149
FISH (FROZEN) /FISH (SMOKED) /LOBSTER	0	0	1	45
FISH (FROZEN) /FISH (SMOKED) /OTHER	4	300	19	1431
FISH (FROZEN) /LOBSTER	19	1936	26	2055

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FISH (FROZEN) /LOBSTER/BATS	5	302	1	72
FISH (FROZEN) /LOBSTER/OTHER	6	526	18	1194
FISH (FROZEN) /LOBSTER/SQUID/OTHER	0	0	1	82
FISH (FROZEN) /LOBSTER/TROCHUS MEAT	0	0	1	84
FISH (FROZEN) /OCTOPUS	0	0	1	111
FISH (FROZEN) /OTHER	561	44413	1488	118082
FISH (FROZEN) /SARDINES	0	0	8	570
FISH (FROZEN) /SARDINES/OTHER	0	0	3	120
FISH (FROZEN) /SEACUCUMBER	1	85	0	0
FISH (FROZEN) /SEACUCUMBER/OTHER	0	0	11	867
FISH (FROZEN) /SEAFOOD	55	4026	27	2732
FISH (FROZEN) /SEAFOOD/OTHER	5	275	14	958
FISH (FROZEN) /SQUID	0	0	1	152
FISH (FROZEN) /TROCHUS MEAT	0	0	18	1352
FISH (FROZEN) /TROCHUS MEAT/OTHER	0	0	6	401
FISH (GROUPER)	6	847	0	0
FISH (LIVE AQUARIUM)	3894	147408	5738	230328
FISH (LIVE) /FISH (EGGS)	2	66	0	0
FISH (SMOKED)	2	28	5	80
FISH (SMOKED) /BAT	0	0	3	124
FISH (SMOKED) /CRAB/CLAM/OTHER	0	0	1	34
FISH (SMOKED) /OTHER	31	1538	36	1332
FISH (SMOKED) /SEAFOOD	1	20	0	0
FISH (SMOKED) /SEAFOOD/OTHER	6	279	4	132
FISH (SMOKED) /TROCHUS MEAT	0	0	1	65
FISH (SWORDFISH)	8	1713	0	0
FISH/BATS	8	9742	10	744
FISH/BATS/OTHER	54	4678	24	2075
FISH/BATS/PIGEON	18	1553	0	0
FISH/CLAM	4	691	4	280
FISH/CLAM(GIANT CLAM SHELLS) /OTHER	6	240	0	0
FISH/CLAM(LIVE)	0	0	2	177
FISH/CLAM/BATS	4	731	0	0
FISH/CLAM/OTHER	15	1752	17	917
FISH/CLAM/SEAFOOD/OTHER	0	0	4	211
FISH/CRAB	47	5730	12	1393
FISH/CRAB (COCONUT)	6	1103	0	0
FISH/CRAB (COCONUT) /BATS	5	667	0	0
FISH/CRAB (LAND) /OTHER	5	376	5	442
FISH/CRAB (LIVE COCONUT)	5	638	0	0
FISH/CRAB (LIVE MANGROVE)	5	816	0	0
FISH/CRAB (LIVE MANGROVE) /OTHER	7	762	20	2048
FISH/CRAB (LIVE)	15	2103	0	0

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FISH/CRAB (MANGROVE)	10	1561	0	0
FISH/CRAB (MANGROVE) /BATS	6	647	0	0
FISH/CRAB (MANGROVE) /OTHER	4	485	0	0
FISH/CRAB (MANGROVE, COCONUT) /OTHER	0	0	1	125
FISH/CRAB (MANGROVE, LAND)	8	728	0	0
FISH/CRAB (MANGROVE, LAND) /CLAM	20	1823	0	0
FISH/CRAB (MANGROVE, LAND, COCONUT)	0	0	5	440
FISH/CRAB (STUFFED) /LOBSTER/OTHER	0	0	4	205
FISH/CRAB/BATS	35	3720	9	521
FISH/CRAB/BATS/OTHER	7	629	3	467
FISH/CRAB/CLAM	5	331	2	329
FISH/CRAB/CLAM/BATS	0	0	19	1591
FISH/CRAB/CLAM/OTHER	0	0	1	181
FISH/CRAB/FISH (SMOKED) OTHER	0	0	3	219
FISH/CRAB/LOBSTER	8	888	3	298
FISH/CRAB/LOBSTER/BATS	0	0	1	109
FISH/CRAB/LOBSTER/CLAM	2	212	10	1152
FISH/CRAB/LOBSTER/CLAM/BATS	10	894	0	0
FISH/CRAB/LOBSTER/OTHER	3	208	12	1074
FISH/CRAB/LOBSTER/SEAFOOD	0	0	5	477
FISH/CRAB/OTHER	36	3456	34	2678
FISH/CRAB/SEAFOOD	9	880	0	0
FISH/CRAB/SEAFOOD/OTHER	0	0	1	106
FISH/FISH (SMOKED) /OTHER	0	0	2	81
FISH/LOBSTER	5	1299	5	420
FISH/LOBSTER/BATS	3	315	1	44
FISH/LOBSTER/CLAM/BATS	25	3567	0	0
FISH/LOBSTER/CLAM/OTHER	6	747	0	0
FISH/LOBSTER/OTHER	14	1469	17	2015
FISH/LOBSTER/TROCHUS MEAT	0	0	1	103
FISH/OTHER	808	67199	338	26288
FISH/SARDINES/BATS/OTHER	0	0	4	310
FISH/SARDINES/CRAB/CLAM	5	375	0	0
FISH/SARDINES/LOBSTER	0	0	2	262
FISH/SARDINES/LOBSTER/OTHER	0	0	3	213
FISH/SEACUCUMBER	4	258	0	0
FISH/SEACUCUMBER/OTHER	5	348	3	223
FISH/SEAFOOD	0	0	1	99
FISH/SEAFOOD/BATS	0	0	3	349
FISH/SEAFOOD/BATS/OTHER	0	0	4	335
FISH/SEAFOOD/OTHER	0	0	40	3311
FISH/SQUID/OTHER	2	220	1	45
FISH/TROCHUS MEAT/OTHER	0	0	3	72

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LOBSTER	2	62	6	195
LOBSTER/BATS/OTHER	7	333	0	0
LOBSTER/OTHER	10	744	0	0
LOBSTERS	0	0	5	150
LOBSTER/BATS/OTHER	0	0	1	46
LOBSTER/TROCHUS MEAT/OTHER	0	0	1	66
NAUTILUS (LIVE)	0	0	9	303
OCTOPUS	0	0	1	42
OCTOPUS/BATS	0	0	1	34
PARROT (LIVE BIRD)	2	21	1	5
SARDINES	4	210	5	189
SARDINES (FROZEN)	2	135	3	227
SARDINES/OTHER	10	500	0	0
SEA URCHINS (FROZEN) /OTHER	1	49	0	0
SEA URCHINS/OTHER	8	506	0	0
SEACUCUMBER	1	18	0	0
SEACUCUMBER (DRIED)	0	0	3	63
SEACUCM. (DRIED) /TROCH. MEAT (DRIED)	0	0	2	10
SEACUCUMBER/OTHER	6	405	2	112
SEAFOOD	18	1399	49	3603
SEAFOOD (FROZEN)	55	4026	0	0
SEAFOOD (FROZEN) /OTHER	5	275	0	0
SEAFOOD/BATS	1	45	0	0
SEAFOOD/OTHER	10	460	32	1813
SHELLS/OTHER	1	4	0	0
SQUID/OTHER	0	0	1	90
TROCHUS MEAT	0	0	7	301
TROCHUS MEAT/OTHER	0	0	11	525
TROCHUS MEAT/SEACUCUMBER	0	0	1	32
TUNA	0	0	620	134590
TUNA (FRESH FILLET)	55	3203	0	0
TUNA (FRESH)	2769	615252	3733	872572
TUNA (FRESH) /CRAB/OTHER	1	115	0	0
TUNA (FRESH) /OTHER	0	0	43	4004
TUNA (FROZEN)	40	7511	71	8011
TUNA (FROZEN) /OTHER	0	0	8	1390
TUNA (SODA FRESH)	0	0	8	929
TUNA (SODA FROZEN)	0	0	11	2566
TUNA (SODA) /OTHER	0	0	2	377
TUNA (YELLOWFIN FROZEN)	1	90	0	0
TUNA/BATS	1	23	0	0
TUNA/BATS/OTHER	0	0	11	626
TUNA/CLAM/TROCHUS MEAT/BATS	0	0	7	1312

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TUNA/OTHER	0	0	9	1222
Grand Total	13633	1550753	17747	2009695

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Appendix XVI. Listing of species exported for the aquarium trade during February, June, and July of 1992.

Common Name	Species Name	Count	Unit Price	Amount
White Tail Trigger	Abalistes stellaris	1	1.00	1.00
Clown Tang	Acanthurus lineatus	220	1.00	220.00
Powder Gray Tang	Acanthurus nigricans	136	3.50	476.00
Orange Shoulder Tang	Acanthurus pyroferus	34	2.00	68.00
Thompson's Surgeonfish	Acanthurus thompsoni	38	2.00	76.00
African Clown	Amphiprion clarki	37	0.75	27.75
Cinnamon's Clown	Amphiprion melanopus	285	1.50	427.50
Pink Skunk Clown	Amphiprion peridaeraion	36	0.75	27.00
Yellow Wrasse	Anampsis twisti	1	1.50	1.50
Colored Angler	Antenarius sp.	2	1.50	3.00
Angler fish	Antenarius sp.	4	1.00	4.00
Flagfin Angler	Apolemichthys trimaculatus	5	5.00	25.00
Lined Dogface Puffer	Arothron manilensis	8	1.50	12.00
Tiger Dogface	Arothron mappa	1	1.00	1.00
Dogface (Yellowface)	Arothron nigropunctatus	39	1.50	58.50
Yellow Trumpetfish	Aulostomus chinensis	11	6.00	66.00
Undulated Trigger	Balistadus undulatus	4	1.20	4.80
Clown Trigger (M/L)	Balistoides conspicillum	1	22.00	22.00
Titan Trigger	Balistoides viridescens	1	1.20	1.20
Coral Hogfish	Bodianus axillaris	46	2.00	92.00
Diana Hogfish	Bodianus diana	1	2.00	2.00
Yellowback Fusilier	Caesio teres	75	2.00	150.00
Spotted Sharpnose Puffer	Canthigaster janthinoptera	1	1.00	1.00
Assorted Puffer	Canthigaster spp.	3	0.60	1.80
Valentini Puffer	Canthigaster valentini	16	1.00	16.00
Melas Angel	Centropyge tibicen	92	1.50	138.00
Bicolor Angel	Centropyge bicolor	356	1.50	534.00
Coral Beauty	Centropyge bispinosus	94	1.00	94.00
Herald Angel	Centropyge heraldi	15	2.25	33.75
Flame Angel	Centropyge loriculus	27	7.00	189.00
Halfbeak Angel	Centropyge vrolicki	30	1.25	37.50
False Miniatus Grouper	Cephalopholis spiloparaea	2	0.50	1.00
V-tail Grouper	Cephalopholis urodeta	2	1.00	2.00
Bicolor Parrot	Cetoscarus bicolor (S/M)	13	3.00-4.00	38.00
Auriga Butterfly (small)	Chaetodon auriga	600	1.50	900.00
Bennet's Butterfly (med/lar)	Chaetodon bennetti	21	2.00-3.50	57.50
Lemon Butterfly	Chaetodon citrinellus	33	1.00	33.00
Saddleback Butterfly	Chaetodon ephippium	328	2.00	656.00
Subtotal:		2,619		4,498.80

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Appendix XVI. Listing of species exported for the aquarium trade during February, June, and July of 1992.

Common Name	Scientific Name	Count	Unit Price	Amount
Klein's Butterfly	<i>Chaetodon kleinii</i>	29	1.00	29.00
Lined Butterfly	<i>Chaetodon lineolatus</i>	65	3.00	195.00
Lunula Butterfly	<i>Chaetodon lunula</i>	15	2.00	30.00
Black-Back Butterfly	<i>Chaetodon mellanotus</i>	322	1.00	322.00
Eight Banded Butterfly	<i>Chaetodon octofasciatus</i>	1	1.00	1.00
Punctato Butterfly	<i>Chaetodon punctatofasciatus</i>	250	1.50	375.00
Latticed Butterfly	<i>Chaetodon rafflesii</i>	286	1.20	343.20
Semeion Butterfly	<i>Chaetodon semeion</i>	138	5.00	690.00
One Spot Butterfly	<i>Chaetodon speculum</i>	30	1.00	30.00
Four Spot Butterfly	<i>Chaetodon sp.</i>	1	5.50	5.50
False Falculz Butterfly	<i>Chaetodon ulientensis</i>	187	2.00	374.00
Tear Drop Butterfly	<i>Chaetodon unimaculatus</i>	41	2.00	82.00
Vagabond Butterfly	<i>Chaetodon vagabondus</i>	318	1.00	318.00
Singapore Angel	<i>Chaetodontoplus mesoleucus</i>	12	1.25	15.00
Red Breasted Tusk	<i>Cheilinus fasciatus</i>	33	2.00	66.00
Green Chromis	<i>Chromis atripectoralis</i>	7,840	0.23	1,803.20
Deep Reef Chromis	<i>Chromis delta</i>	9	0.60	5.40
Metallic Green Chromis	<i>Chromis viridis</i>	35	0.23	8.05
Blue Chromis (female)	<i>Chrysiptera cyanea</i>	17,154	0.23	3,945.42
Blue Chromis (male)	<i>Chrysiptera cyanea</i>	7,226	0.33	2,384.58
Spotted Hawkfish	<i>Cirrhitichthys oxycephalus</i>	4	0.50	2.00
Stocky Hawkfish	<i>Cirrhitus pinnulatus</i>	7	1.00	7.00
Twin Spot Wrasse	<i>Coris aygula</i>	3	2.25	7.00
Red Wrasse	<i>Coris gaimard</i>	26	2.25	61.00
Sailback Scorpion	<i>Corpaenopsis oxycephala</i>	3	1.00	3.00
Tomini Bristletooth	<i>Ctenchaetus tominiensis</i>	2	25.00	50.00
Zebra Sole	<i>Cymbacephalus sp.</i>	2	3.00	6.00
3-Stripe Damsel	<i>Dascyllus aruanus</i>	2,245	0.18	404.10
4-Stripe Damsel	<i>Dascyllus melanurus</i>	208	0.23	47.84
Domino Damsel	<i>Dascyllus trimaculatus</i>	101	0.23	23.23
Dwarflion fish	<i>Dendrochirus zebra</i>	16	0.75	12.00
Porcupine Puffer	<i>Diodon hystrix</i>	6	1.00	6.00
Wandering Cleaner Wrasse	<i>Diprotacanthus xanthurus</i>	9	1.20	10.80
Yellow Long Jaw Wrasse	<i>Epirulus insidiator</i>	1	2.00	2.00
Longnose Butterfly	<i>Forcipiger flavissimus</i>	390	1.00	390.00
Japanese Swallow	<i>Genicanthus melanospilus</i>	13	4.00	52.00
Blue Edge Swallow	<i>Genicanthus watanabei</i>	5	2.00	10.00
Subtotal:		37,004		12,087.32

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Appendix XVI. Listing of species exported for the aquarium trade during February, June, and July of 1992.

Common Name	Scientific Name	Count	Unit Price	Amount
Clam Goby	Gobiodon citrinellus	1	1.00	1.00
Green Bird Fish(male)	Gomphosus varius(male)	132	3.50	462.00
Green Bird Fish(female)	Gomphosus varius(female)	41	1.00	42.00
Marble Wrasse	Halichoeres centroquadrus	44	0.60	26.40
Weedy Surge Wrasse	Halichoeres margaritaceus	6	1.00	6.00
Pinstripe Wrasse	Halichoeres richmondi	64	1.20	70.80
Half Beak Wrasse	Hemigymnus melapterus	77	0.60	77.00
Diamond Butterfly	Hemitaurichthys polylepsis	119	2.00	238.00
Br/Wh Heniochus (M\L)	Heniochus chrysostomus	4	2.00	8.00
Horned heniochus	Heniochus monoceros	50	1.50	75.00
Brown Heniochus (M\L)	Heniochus varius	1	1.50	1.50
Purple Goby	Homolatinus purpureus	5	5.00	25.00
Blue Face Goby	Hoplolatinus starcki	30	4.00	120.00
Emperor Angel(adult)	Imperator	3	20.00	60.00
Emperor Angel(juv)	Imperator	2	10.00	20.00
Cleaner Wrasse	Labroides pectorales	22	0.60	13.20
Assorted Wrasse	Labroides species	47	0.80	37.60
Comet Wrasse	Labrosis xanthonota	5	1.50	7.50
Longhorn Cowfish	Lactoria cornuta	1	1.00	1.00
Fox Face	Lo vulpinos	8	2.00	16.00
Macolor Snapper	Macolor niger	9	4.00	36.00
Leopard Wrasse	Macropharyngodon meleagris	29	1.00	29.00
Black Trigger	Melichthys niger	1	3.00	3.00
Pink Tail Trigger	Melichthys vidua	5	2.00	10.00
Lipstick Tang	Naso lituratus	41	1.00	41.00
Bignose Unicorn Tang	Naso vlamingii	2	4.75	9.50
Dragon Wrasse	Novaculichthys taeniurus	52	1.60	83.20
Niger Trigger(small)	Odonos niger	40	1.75	70.00
Niger Trigger(medium)	Odonos niger	431	2.75	1,185.25
Niger Trigger(large)	Odonos niger	237	4.25	1,007.25
Yellow Boxfish	Ostracion cubicus	6	1.50	7.50
Orange Spot Filefish	Oxymonacanthus longirostis	32	0.80	25.60
Blue Tang	Paracanthurus hepatus	21	2.00	42.00
Blue Tang(S)	Paracanthurus hepatus	76	4.00	304.00
Blue Tang(M/L)	Paracanthurus hepatus	148	5.50	814.00
Arc Eye Hawk	Paracirrhites arctus	103	0.60	54.60
Freckled Hawkfish	Paracirrhites forsteri	22	1.00	22.00
Bluefin Damsel	Paraglyphidodon melas	3	0.28	0.84
Subtotal:		1,746		4,547.74

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Appendix XVI. Listing of species exported for the aquarium trade during February, June, and July of 1992.

Common Name	Scientific Name	Count	Unit Price	Amount
Latticed Sand Perch	<i>Parapercis clathrata</i>	4	1.00	4.00
Bicolor Goatfish	<i>Parupeneus barbarinonoides</i>	4	1.20	4.80
Yellow Goatfish	<i>Parupeneus cyclostomus</i>	9	1.00	9.00
Psychodelic Goatfish	<i>Parupeneus multifasciatus</i>	1	1.50	1.50
Goatfish	<i>Parupeneus sp.</i>	9	0.60	5.40
Assorted Filefish	<i>Pervagor spp.</i>	5	0.50	2.50
Orbic Batfish	<i>Platax orbicularis</i>	4	0.80	3.20
Spotted Grunts	<i>Plectorhinchus chaetodonoides</i>	1	2.00	2.00
Striped Sweetlips	<i>Plectorhinchus goldmannioides</i>	2	1.00	2.00
Oriental Sweetlips	<i>Plectorhinchus orientalis</i>	1	2.00	2.00
Coral Catfish	<i>Plotosus lineatus</i>	290	0.15	43.50
Zebra Goby	<i>Pogonochromis zebra</i>	633	0.70	443.10
Majestic Angel	<i>Pomacanthus narchus</i>	1	1.00	1.00
Blueface Angel (adult)	<i>Pomacanthus xanthurus</i>	3	15.00	45.00
Yellow Mollucan Damsel	<i>Pomacentrus moluccensis</i>	148	0.18	26.64
Purple Anthias (female)	<i>Pseudanthias bartlettorum</i>	25	2.00	50.00
Dispar Anthias	<i>Pseudoanthias dispar</i>	87	0.75	65.25
Purple Queen	<i>Pseudoanthias fasciatus</i>	402	2.00	804.00
Yellow Anthias	<i>Pseudoanthias pleurotaenia</i>	95	2.00	190.00
Six-line Wrasse	<i>Pseudocheilinus hexataenia</i>	3	1.00	3.00
Eight-line Wrasse	<i>Pseudocheilinus octotaenia</i>	29	1.50	43.50
Purple Basslet	<i>Pseudochromis porphyreus</i>	3	1.10	3.30
Long Jaw Wrasse	<i>Ptelagopus flagellifera</i>	12	0.75	9.00
Scissortail Goby	<i>Ptereleotris evides</i>	47	0.70	32.90
Whitefin Lion	<i>Pterois antennata</i>	7	1.50	10.50
Brown Peacock	<i>Pterois lunulata</i>	1	1.50	1.50
Radiata Lionfish	<i>Pterois radiata</i>	8	3.25	26.00
Black Peacock Lion	<i>Pterois volitans</i>	21	2.25	47.25
Regal Angel	<i>Pygoplites diacanthus</i>	86		
Humu Humu	<i>Rhinecanthus aculeatus</i>	350	1.20	420.00
Rectangle Trigger	<i>Rhinecanthus rectangulus</i>	14	1.50	21.00
Bursa Trigger	<i>Rhinecanthus verrucosa</i>	15	1.00	15.00
Assorted Blenny	<i>Salarias spp.</i>	374	1.00	374.00
Blenny	<i>Salarias fasciatus</i>	27	1.00	27.00
Red Squirrel Fish	<i>Sargocentron diadema</i>	14	1.00	14.00
Princess Parrot	<i>Scarus sp.</i>	2	3.00	6.00
Pygmy Parrot	<i>Scarus spinus</i>	175	5.00	875.00
Two-Line Spine Cheek	<i>Scolopsis bilineatus</i>	1	1.00	1.00
Subtotal:		2,913		3,634.84

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Appendix XVI. Listing of species exported for the aquarium trade during February, June, and July of 1992.

Common Name	Scientific Name	Count	Unit Price	Amount
Groupers	Serranidea sp.	2	1.00	2.00
Assorted Pipefish	Snagthus sp.	1	0.50	0.50
Orbic Cardinal	Sphaeramia orbicularis	278	0.50	139.00
Red Shoulder Wrasse	Stethojulis bandanensis	80	1.50	120.00
Jansen Wrasse	Stethojules janseni	7	1.00	7.00
Threadfin Snapper	Symphoricthys sp.	1	6.00	6.00
Stonefish	Synanceia verrucosa	8	0.60	4.80
Mandarin Dragonet	Synchiropus splendidus	88	2.50	220.00
Pacific Blue Head Wrasse	Thalassoma amblycephalum	25	1.00	25.00
Six Bar Wrasse	Thalassoma hardwickii	599	1.00	599.00
Jansen Wrasse	Thalassoma janseni	26	3.00	78.00
Lunare Wrasse	Thalassoma lunare	215	1.00	215.00
Sunset Wrasse	Thalassoma lutescens	66	2.00	132.00
Rainbow Parrot Wrasse	Thalassoma quinquevittatum	806	2.00	1,612.00
Pilot Fish	Trachinotus spp.	6	3.00	18.00
Goldenhead Sleeper	Valenciennesa strigatus	1	1.50	1.50
Lyretail grouper	Variola louti	1	4.00	4.00
Moorish Idol	Zanclus cornutus	157	1.20	188.40
Yellow scopas Tang	Zebrasoma flavescens	4	1.00	4.00
Scopas Tang(Brown)	Zebrasoma scopas	52	1.00	52.00
Sailfin Tang(small)	Zebrasoma veliferum	97	1.50	145.50
Sailfin Tang(med-large)	Zebrasoma veliferum	468	2.50	1,170.00
Stingray	Amphotistius trimaculatus	1	10.00	10.00
White tip shark	Carcharchinus sp.	2	50.00	100.00
Remora	Malacanthus latovittatus	2	1.50	3.00
Banded eel	Opicthus sp.	2	5.00	10.00
Snowflake eel	Echidnz nebulosa	5	5.00	25.00
Palauan sea hare	Aplysia sp.	12	1.50	18.00
Nudibranches	Chromodoris specie	32	1.50	48.00
Colored sea slug	Fryeria riippelli	23	1.50	34.50
Abalone shell	Haliotis asinina	206	1.50	309.00
Spanish Dancer	Hexabranhus imperialis	7	1.00	7.00
Hippopus clam cultured	Hippopus hippopus(9cm)	172	6.00	1,032.00
Assorted Knobby Sea Slug	Phyllidia spp.	166	1.30	215.80
Red Blood Sea Hare	Phyllidia spp.	161	1.50	241.50
Jewelled Knobby Sea Slug	Phyllidia varicosa	45	1.50	67.50
Subtotal:		838		2,211.30

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Appendix XVI. Listing of species exported for the aquarium trade during February, June, and July of 1992.

Common Name	Scientific Name	Count	Unit Price	Amount
Jellyfish	<i>Mastigas papua</i>	125	1.00	125.00
White Flat Anemone	<i>Radianthus simplex</i>	3	1.50	4.50
Green Carpet Anemone	<i>Stoichactis gigas</i>	6	5.75	35.00
Hairy Anemone	<i>Heteractis</i> sp.	6	3.00	18.00
Red Hairy Anemone	<i>Heteractis</i> sp.	1	10.00	10.00
Assorted Flatworms	<i>Pseudoceros</i> sp.	39	1.00	39.00
Medusa Worm	<i>Synapta medusa</i>	125	0.50	62.50
Assorted Sea Snail	<i>Pleuroploca</i> spp.	1	0.80	0.80
Rare Sea Snail	<i>Semicassis</i> spp.	4	1.50	6.00
Derasa Clam(9cm)	<i>Tridacna derasa</i>	1,325	1.50- 12.00	6,199.50
Gigas Clam(7cm)	<i>Tridacna gigas</i>	326	4.25	1,384.00
Crinoid Crab	<i>Allogalatea elegans</i>	8	6.50	52.00
Hairy Hermit Crab	<i>Aniculus aniculus</i>	1	3.00	3.00
Box Crab	<i>Calappa hepatica</i>	94	1.00	94.00
Blue Stripe Hermit Crab	<i>Calcinus elegans</i>	132	2.00	132.00
Assorted Hermit Crab	<i>Calcinus laevimanus</i>	358	0.50	179.00
Red Hermit Crab	<i>Dardanus megistos</i>	83	1.00	83.00
Rare Crab	<i>Dardanus</i> spp.	23	1.15	26.50
Spider Crab	<i>Maja spinigera</i>	90	1.00	90.00
Selly-like Foot Crab	<i>Micropipus</i> spp.	14	1.00	14.00
Anemone Crab	<i>Neopetrolisthes ohsimai</i>	2	1.00	2.00
Hermit Crab with Anemone	<i>Pardanus pedunculatus</i>	148	1.50	222.00
Rock Island Crab	<i>Platylambrus validus</i>	1	3.00	3.00
Decorator Crab	<i>Xenocarcinus</i> spp.	135	1.00	135.00
Halloween Hermit Crab	<i>Trizopagurus strigatus</i>	1	1.50	1.50
Oyster Shrimp	<i>Meleagrinae</i> spp.	1	10.00	10.00
Anemone Shrimp	<i>Periclimenes brevicapalis</i>	10	1.20	12.00
Orange Skunk Shrimp	<i>Periclimenes</i> spp.	5	3.00	15.00
Glass Anemone Shrimp	<i>Periclimenes holthuisi</i>	1	2.50	2.50
Crinoid Shrimp	<i>Pontoniopsis</i> spp.	4	3.00	12.00
Violet Urchin Shrimp(pair)	<i>Stegoponia commensalis</i>	1	8.00	8.00
Violet Urchin Shrimp	<i>Stegoponia commensalis</i>	1	3.00	3.00
Banded Coral Shrimp(pair)	<i>Stenopus hispidus</i>	126	1.75	220.00
Rare Shrimp	<i>Stenopus</i> spp.	7	2.60	18.50
Sexy Shrimp	<i>Thor amboinensis</i>	6	1.70	10.00
Zebra Shrimp	<i>Gnathophyllum americanus</i>	2	1.00	2.00
Subtotal:		142		253.50

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Appendix XVI. Listing of species exported for the aquarium trade during February, June, and July of 1992.

Common Name	Scientific Name	Count	Unit Price	Amount
Urchin with shrimp	Diadema sp.	1	2.00	2.00
Royal Sea Urchin	Diadema sp.	244	0.75	190.95
Toxedo Sea Urchin	Parasenia gratiosa	71	1.00	71.00
Flower Sea Urchin	Toxopneustes pileous	4	6.00	24.00
Ordinary Pencil Urchin	Heterocentrotus spp.	10	0.60	6.00
Crown of Thorns Starfish	Acanthaster planci	10	1.00	10.00
Kenya Star	Chroriaster granulata	8	1.00	8.00
Feather Starfish	Colobometra perspinosa	16	1.50	24.00
Pillow Star	Culcita novaeguinea	46	1.00	46.00
Red Starfish	Fromiz elegans	18	1.00	18.00
Marble Starfish	Nardoa sp.	21	1.00	21.00
Rare Deepwater Starfish	Nardoa sp.	44	2.00	88.00
Choc Chip Starfish	Protoreaster sp.	20	0.40	8.00
Assorted Star	Protoreaster sp.	19	0.40	7.60
Colored Sea Cucumber	Holothuria edulis	54	1.50	81.00
Turbo Grazer	Marmarostoma argyostoma	399	0.60	241.20
Brittle Star	Ophirachna incrassata	51	0.75	38.25
Sea Squirts	Pseudochordata sp.	3	0.50	1.50
Cuttlefish (cultured)	Sepia plangon	42	1.75	74.00
Subtotal:		1,081		960.50

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Appendix XVII. 1992 Fishing Derby. Source: MRD database.

Day	Area fished	TOTAL MEN	TOTAL HOOKS	TOTAL HOURS	TOTAL WEIGHT	CPUE (LBS/HK/HR)
FRI	Ngerael	5	4	9	239.5	6.65
FRI	Ngebard	3	3	9.5	220	7.72
FRI	Northwest	3	2	10.5	203.5	9.69
FRI	Southeast-Peleliu	4	4	10	200.5	5.01
FRI	Southwest-Ngerumkaol	3	4	11	92	2.09
FRI		4	2	10.5	84	4.00
FRI	NW	2	2	7	50	3.57
FRI	SW-Peleliu	5	3	12	39	1.08
FRI		3	2	11	37	1.68
FRI	East-Lighthouse	3	2	10	29	1.45
FRI	Anqaur	4	4	9.5	14	0.37
SAI		3	2	11	92	4.18
SAI		3	2	8	77	4.81
SAI		4	2	9	47	2.61
SAI		4	3	11	28	0.85
SAI		3	2	9	20.5	1.14
SAI	Northwest	4	2	7	19	1.36
SAI	Northwest	5	2	9	15.5	0.86
SAI		3	2	10	15	0.75
SUN	west	2	2	7	147	10.50
SUN	Ngeremlenqui Chl	4	4	8	69.5	2.17
SUN		4	2	9	62	3.44
SUN		2	2	12.5	56.8	2.27
SUN		4	3	7	54.8	2.61
SUN		4	2	5	50	5.00
SUN	Ngeremlenqui Chl	4	4	9	42.5	1.18
SUN	East-Lighthouse	2	2	5	29	2.90
SUN		4	2	9	23.5	1.31
SUN		4	4	9	20	0.56
SUN	west	3	4	9	15	0.42
SUN		4	4	6.5	15	0.58
SUN	Peleliu	4	2	10	10	0.50
TOTAL:		113.00	86.00	290.00	2,117.60	2.90

Appendix XVIII. Species breakdown for the landing of the 2nd Annual Palau Sports Fishing Tournament, 1992.

Type	Total wt(count)	Friday wt(ct)	Saturday wt(ct)	Sunday wt(ct)
Number of Boats	76	27	27	22
Number of Boats with no catch reported:	44	16	19	9
WAHOO	540(34)	396(21)	54(5)	90(8)
NGELNGAL	6(1)			6(1)
All	287(28)	125.5(15)	95(8)	66.8(5)
EROPK	42(3)	24(1)	10(1)	8(1)
IIAU	4(1)		4(1)	
MAHI MAHI	581.5(54)	258(23)	44(6)	279.5(25)
DOGIUUIH IUNA	211.5(6)	162.5(5)		49(1)
UDEL	16(2)	16(2)		
YELLOWFIN	171.5(3)	171.5(3)		
WII	23.5(2)	23.5(2)		

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Appendix XIX. Total landings (mt) by Japanese longliners operating under foreign access arrangements, 1985-1990.

Type of fish	Total	1991	1990	1989	1988	1987	1986	1985	Average
Total	3,915.26	n/a	1,296.75	1,386.24	74.82	55.06	157.35	945.04	652.54
Albacore	14.20		1.16	5.24	5.39	0.05	0.69	1.67	2.37
Bigeye tuna	1,725.34		580.49	772.86	19.82	27.31	54.84	270.02	287.56
Yellowfin tuna	1,933.27		660.90	547.89	46.96	25.94	92.49	559.09	322.21
Marlin	5.28		0.30	1.00	0.04	0.04	1.37	2.53	0.88
Blue marlin	112.27		31.00	41.70	1.81	0.77	4.33	32.66	18.71
Black marlin	9.98		2.57	2.38	0.09	0.16	0.84	3.94	1.66
Swordfish	52.60		17.66	13.22	0.68	0.73	2.71	17.60	0.00
Sailfish	0.72		0.23	0.25	0.00	0.06	0.08	0.10	0.12
Others	61.60		2.44	1.70	0.03	0.00	0.00	57.43	10.27

Appendix XX. Total landings (mt) by Japanese purse-seiners operating under foreign access arrangements, 1985-1990.

Type of fish	Total	1991	1990	1989	1988	1987	1986	1985	Average
Total	16,978		1,810	13,358	4,065	2,964	1,841.00	8,955.00	2,829.67
Bigeye tuna	62		6	50	9	0	11.00	42.00	10.33
Yellowfin tuna	5,220		1,058	3,104	809	979	428.00	3,136.00	870.00
Skipjack tuna	11,696		746	10,204	3,247	1,985	1,402.00	5,777.00	1,949.33

Appendix XXI. Fishery parameters for Japanese access longliners and purse-seiners, 1985-1990.

Fishery parameters	Total	1991	1990	1989	1988	1987	1986	1985	Average
Longliners:									
No. of vessels	148		47	54	8	4	20	51	25
Logsheet Days	5,097		1,609	1,879	145	98	291	1,450	850
EEZ Days	5,097		1,609	1,879	145	98	291	1,450	850
Fishing Days	4,140		1,308	1,524	115	84	230	1,220	690
Purse seiners:									
No. of vessels	52		12	28	14	17	14	27	9
Logsheet Days	0								0
EEZ Days	750		75	600	141	161	78	277	125
Fishing Days	750		75	600	141	161	78	277	125

Source: FFA database.

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Appendix XXII. Fish landed (metric tons) from PITI, Palau: 1987 to 1990. The 1992 data represents only the fish that was exported to the fresh sashimi market, not rejected or low grade fish.

Type of fish	Total	1992	1990	1989	1988	1987
Total	4,847.3	1,484.4	1,779.0	1,284.8	175.5	
Bigeye tuna	3,167.5	757.8	1,233.6	1,284.8	590.6	
Yellowfin tuna		30.5	48.5	42.0	99.6	39.4
Blue marlin	10.7	2.5	0.0	0.0	5.7	2.5
Black marlin	23.1	0.0	0.0	1.5	19.1	2.5
Broadbill Swordfish	23.1	0.0	23.1	0.0	0.0	0.0
Swordfish		45.8	0.4	18.4	2.3	15.0
Sailfish		2.8	0.0	0.0	0.0	0.5
Shark	43.8	0.0	0.8	27.0	0.0	16.0

Notes: For 1990, January to June ONLY. During January to June, 1990, 49 boats fished for 685 days for PITI.

Appendix XXIII. Total metric tons of fish landed by longliners from PMIC for 1989 and the first six months of 1990 (Jan-Jun). The 1992 data does not include June-Sept, and represents only air-freighted tuna. BE = bigeye tuna, YF = yellowfin tuna.

Year	#Boats	#Trip	BE	YF	other	Total
1989	5	9	400 14.29	307 10.92	735 25.11	1442 pcs 50.32 mt
1990	18	3	1034 42.57	2510 86.8	1830 76.25	5374 pcs 205.62 mt
1991	n/a					
1992			10251 566.68	13745 529.39	44 3.23	24040 pcs 1099.2 mt