

Tuna

A Key Economic Resource in the Pacific Islands

A Report Prepared for the
Asian Development Bank and the
Forum Fisheries Agency

Robert Gillett, Mike McCoy, Len Rodwell, and Josie Tamate

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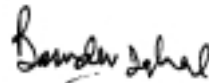
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Foreword

In this report, appropriately titled *Tuna, A Key Economic Resource of the Pacific*, the authors highlight the importance of tuna in the economy of Pacific Islands countries. Considering the limited exploitable resources of these island countries, it may be argued that for people of the Pacific, tuna is not only *a* key resource but often *the* key resource.

To the world, tuna represents a multibillion-dollar-a-year industry. To the Pacific Islands countries that contribute a third of the world's supply each year, it provides essential direct and indirect employment (5 percent to 8 percent of national employment), subsistence, and a valuable source of income for governments in the form of access fees and other benefits. In addition, through commercial sport fishing, tuna represents an important link to the countries' important tourism industry.

The future food security and economic development of the Pacific region will undoubtedly be linked to the responsible and sustainable management of its tuna resources. This report provides us with valuable insights into how such resource management can be achieved.



Basudev Dahal

Director

Office of Pacific Operations

Abbreviations

ADB	Asian Development Bank
AusAID	Australian Agency for International Development
DVA	domestic value added
DWFN	distant water fishing nation
EEZ	exclusive economic zone
FAO	Food and Agriculture Organization of the United Nations
FFA	Forum Fisheries Agency
FFC	Forum Fisheries Committee
FSM	Federated States of Micronesia
MHLC	Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Central and Western Pacific
MMA	Micronesian Maritime Authority
MSY	maximum sustainable yield
NFA	National Fisheries Authority
NGO	nongovernment organization
PAFCO	Pacific Fishing Company
PCS	Palau Conservation Society
PNG	Papua New Guinea
SOPAC	South Pacific Applied Geoscience Commission
SPARTECA	South Pacific Regional Area Regional Trade and Economic Cooperation
SPC	Secretariat of the Pacific Community (formerly South Pacific Commission)
SPREP	South Pacific Regional Environment Programme
STL	Solomon Taiyo Limited
UN	United Nations
UNCLOS	United Nations Conference on the Law of the Sea
UNDP	United Nations Development Programme
US	United States
WCPO	west-central Pacific Ocean
WTO	World Trade Organization

Executive Summary

Global Significance of the Region's Tuna

The Pacific Islands region is now the most important tuna fishing area of the world. It supplies about a third of all tuna in the world and its tuna fisheries dwarf those of the other three major tuna fishing areas both in volume and in value.

Value to the Region

The value of the catch has increased remarkably in the last few years, from about \$375 million in 1982 to \$1.2 billion in 1993, \$1.6 billion in 1994, \$1.7 billion in 1995, and \$1.9 billion in 1998.

The annual tuna catch in the Pacific Islands appears to have a current value of about:

- 11 percent of the combined GDP of *all* the countries in the region
- Half of the value of all exports from the region

It is well known that fish and fishing are tremendously important to the people of the Pacific Islands. Much of the nutrition, welfare, culture, recreation, government revenue, and employment in the region are based on its living marine resources. What is less appreciated is that, besides being the most important of the fisheries in the region, tuna fisheries produce about ten times the amount of fish produced by all the other fisheries of the region combined. Their value is over seven times that of all the other Pacific Islands fisheries combined.

Access Fees

The region received about \$60.3 million in access fees for foreign fishing activity in 1999—402 percent more than the \$15 million it received in 1982.

Access fees are a crucial component of government revenue in many countries, and are important even in the larger resource-rich countries of the region.

Access fees received by many Pacific Islands countries exceed the total value of all exports of those countries.

Employment

Considering only those jobs on tuna vessels and in tuna processing plants, about 10,000 Pacific Islanders are formally employed.

Total direct and indirect tuna-related employment is estimated to be between 21,000 and 31,000 or between 5 percent and 8 percent of all wage employment in the region.

Tuna-related employment provides support to government policies related to decentralization, women's activities, and private-sector development.

The five tuna canneries alone employ 5 percent of all formally employed women in the region.

Benefits from Locally Based Tuna Vessels

There are about 303 industrial-scale tuna vessels based in the region, including 26 purse seiners, 32 pole/line vessel, and about 203 longliners. The annual expenditures by these locally based vessels approach \$150 million.

Transshipment Benefits

Like locally based vessels, transshipping vessels have substantial local expenditures and associated benefits are expected to grow as local businesses expand to cater to vessel and related trade. The 507 transshipments known to have been made by Korean and Taiwanese seiners in 1996 have resulted in about \$3.8 million in local expenditures.

Tuna Exports

Although tuna may be expected to be a major export from some of the smaller countries in the region, tuna products are also an important component of the two most diversified economies of the region.

Commercial Sport Fishing

Tourism is a major part of the economy of the Pacific Islands and the economic plans of many of the countries in the region are predicated on an expansion of tourism. Commercial sport fishing for tuna is a specialized form of tuna fishing that is closely related to tourism. There is a large amount of commercial sport fishing activity in the Pacific Islands and considerable potential for additional benefits.

Small-Scale Tuna Fisheries

Tuna forms a substantial component of the catch of both the subsistence and artisanal fisheries in the Pacific Islands. With respect to volume, tuna appears to be the *most* important family of fish for small-scale fisheries.

Nutrition

Although it is often thought that the tuna caught by the industrial fishing fleets does not enter the food supply of the Pacific Islands, there have always been important exceptions and the situation is now changing.

Tuna makes up a substantial portion of all fish consumed, especially in the most economically vulnerable countries of the region.

Tuna is an important component of the diet of several countries categorized as low-income food-deficit countries. Without tuna, food security would be even more precarious.

Cultural Aspect

The greater respect and status accorded skilled tuna fisherman in his own culture encourage many other members of the community to emulate his success. The ready availability of such role models has a positive effect on daily life.

Future Importance of Tuna

In the future Pacific Islands climate of continued economic stagnation, very high population growth, fully exploited inshore and coastal fisheries, severe economic shocks, and massive unemployment, the currently underexploited tuna resources of the region will inevitably assume a much greater importance than they now have. The future food security of the region will depend heavily on its tuna resources, highlighting the need for effective conservation and management of the region's tuna.

Background of the Report

This report highlights the dependence of the Pacific Islands countries¹ on their tuna in order to show the importance of this resource and possibly to help justify allocation arrangements and assistance related to its management.

Several recent fisheries treaties have dealt with the dependence of Pacific Islands countries on tuna. The Multilateral High-Level Conference, in a series of sessions from December 1994 to September 2000, drew up and eventually adopted a convention providing for the conservation and management of highly migratory fish stocks in the western and central Pacific. The convention states:

In developing criteria for allocation of the total allowable catch or the total level of fishing effort the Commission shall take into account, *inter alia*,...the needs of small island developing States, and territories and possessions, in the Convention Area whose economies, food supplies and livelihoods are overwhelmingly dependent on the exploitation of marine living resources;...[and] the needs of coastal communities which are dependent mainly on fishing for the stocks.

Dependence on tuna resources was also brought out at the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, which adopted in August 1995 an agreement implementing the relevant provisions of the UN Convention on the Law of the Sea of 1982. That agreement clearly binds developed nations to provide management assistance to developing countries, particularly small island developing states that depend on the exploitation of living marine resources. Under the terms of the agreement, countries of the Pacific Islands that depend on the exploitation of their tuna resources would qualify for assistance in developing tuna conservation mechanisms and participating in tuna fisheries. This assistance could take the form of regional management arrangements, direct financial assistance, technical assistance, transfer of technology, and consultative services.

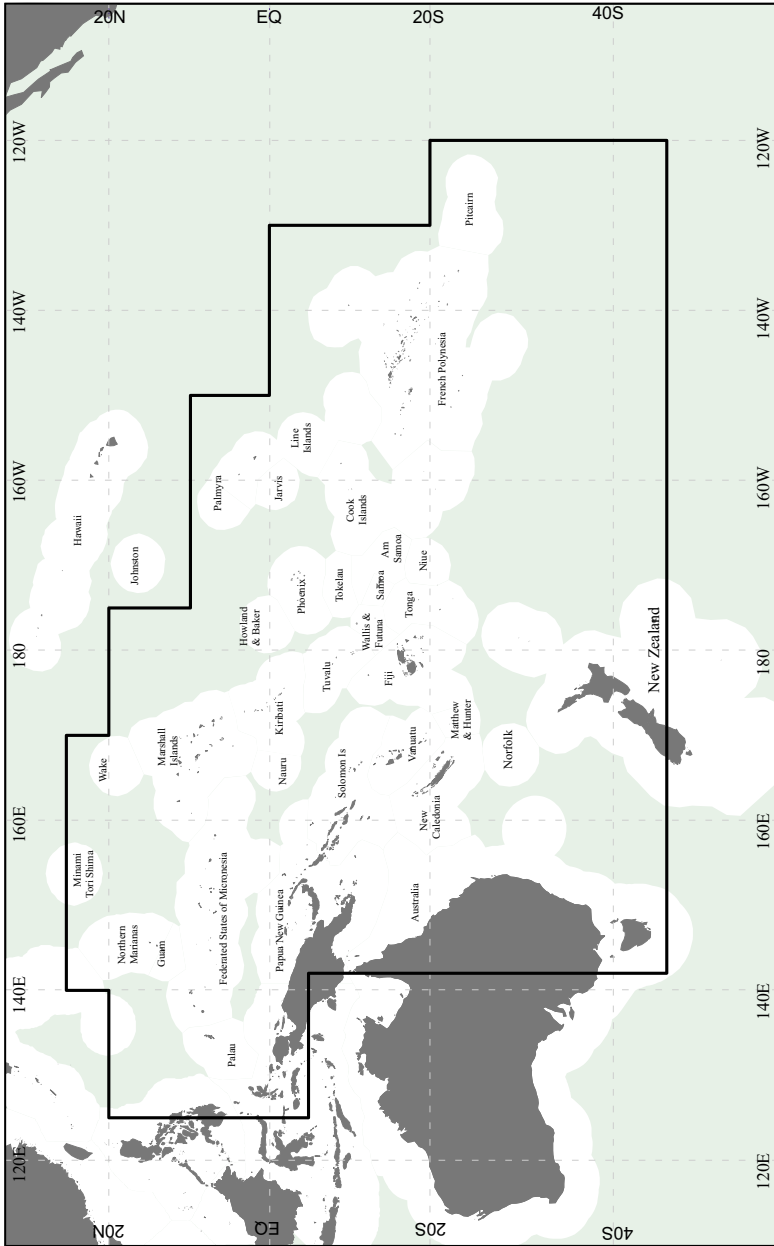
¹ Cook Islands, Fiji, Federated States of Micronesia (FSM), Kiribati, Marshall, Nauru, Niue, Palau, Papua New Guinea (PNG), Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

The present study relies on published information, reports from fisheries organizations representing the region, the regional tuna database of the Secretariat for the Pacific Community, and relevant unpublished data. Interviews were held with fisheries officials from the various Pacific Islands countries and with staff of the Forum Fisheries Agency, Secretariat of the Pacific Community, Asian Development Bank, World Bank, and Inter-American Tropical Tuna Commission, as well as other knowledgeable individuals. The main part of the report gives generalized information and examples of the importance of tuna to the Pacific Islands region. The appendixes provide more detailed information for three countries: Federated States of Micronesia (Micronesia region), Samoa (Polynesia region), and Papua New Guinea (Melanesia region).

The discussion in this report of the benefits that Pacific Islands countries derive from their tuna resources excludes associated development assistance and all comments on the value or merit of this type of aid. As Van Santen and Muller (2000) suggest, the real value of aid and payments in kind for access is often substantially less than the total amounts may seem to indicate.

Mention must be made here, though, of the ill-defined geographical boundaries of the area in question. The fishery area is variously taken to be the following, more or less in descending order of size: the western and central Pacific Ocean, the US South Pacific Tuna Treaty area, the statistical area of the Secretariat of the Pacific Community (SPC), statistical area 71 of the Food and Agriculture Organization, the SPC area, and the exclusive economic zones (EEZs) of Pacific Islands member countries of the Forum Fisheries Agency (FFA). The fishery area is also sometimes interpreted as the zone(s) of concentration of surface and longline tuna fishing, which can change considerably from season to season and from year to year. In this report, unless otherwise stated, the Pacific Islands tuna fishery area referred to is the SPC fisheries statistical area, which consists of the EEZs of SPC member countries and territories and the adjacent high seas (Figure 1).

Figure 1: SPC Statistical Area



Source: SPC

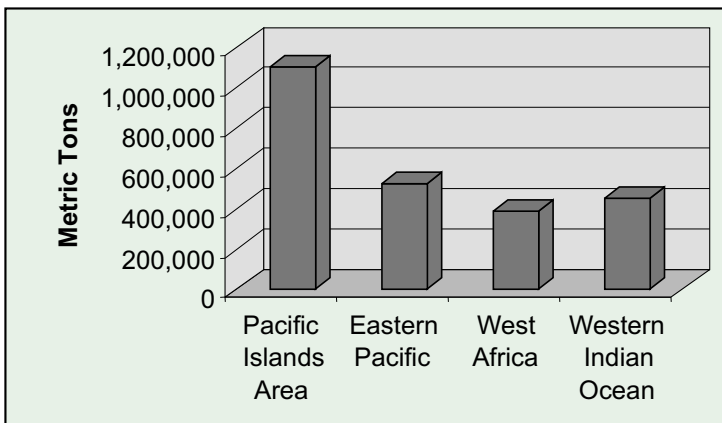
This report, funded by the Asian Development Bank, updates and expands on a study done in May 1997 (Gillett 1997a). The authors acknowledge the support of Thomas Gloerfelt-Tarp and Ian Cartwright and the assistance of the following in information gathering: Peter Cusack, Garry Preston, Kelvin Passfield, Peter Watt, Sofia Bettencourt, Simon Tiller, Tim Lawson, Peter Williams, and fisheries officers from all the FFA member countries. Drew Wright and Steve Beverly reviewed the draft and offered useful suggestions.

Global Significance of Tuna

Worldwide the catch of tuna (albacore, bigeye, skipjack, and yellowfin) has averaged about 3.6 million metric tons (MT) a year in recent years (J. Joseph 2000). In the Pacific Islands area, an average of 1 million MT was landed each year between 1997 and 1999. Hence, almost one-third of all the tuna landed in the world comes from the Pacific Islands region. This region supplies 60 percent of all canned tuna and about 30 percent of the tuna for the Japanese sashimi market.

There are four major tuna fishing areas in the world: the Pacific Islands, the eastern Pacific (average annual tuna catch of about 525,000 MT), west Africa (385,000 MT), and the western Indian Ocean (450,000 MT). The Pacific Islands fishery clearly dwarfs the other three in volume (Figure 2) and even more so in value because a large component of the Pacific Islands catch is for the high-value sashimi market. Quite simply, the Pacific Islands region is the most important tuna fishing area in the world.

Figure 2: Average Yearly Tuna Catch in the Major Tuna Fishing Areas, Later 1990s



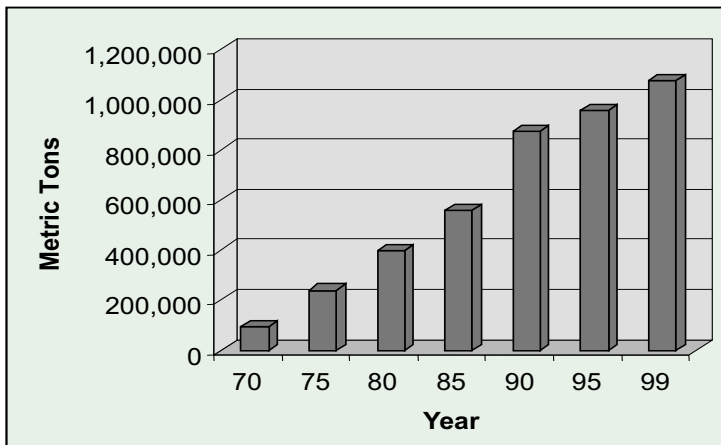
Sources: Inter-American Tropical Tuna Commission; SPC

The Tuna Fishery in the Pacific Islands

Regional Tuna Catch

The total volume and value of the catch from the tuna fishery in the Pacific Islands is large and growing larger. Although there is considerable annual variation, the volume of the catch has increased about elevenfold in the last 30 years (Figure 3).

Figure 3: Annual Tuna Catch in the Pacific Islands Area, 1970 to 1999



Sources: SPC (1996); T. Lawson personal communication (2000)

The value of the catch has also increased remarkably. From about \$375 million² in 1982 (Clark 1983), the value increased to \$1.2 billion in 1993 (World Bank 1995), \$1.6 billion in 1994 (FFA 1995), \$1.7 billion in 1995 (FFA 1996), and \$1.9 billion in 1998 (Van Santen and Muller 2000).

² Unless otherwise specified, all dollar amounts in this report refer to United States dollars.

Tuna Landings in FFA Island Member Countries

Table 1 gives the estimated tuna catch of the FFA member countries, using information from the SPC Catch and Effort Logsheet Database, SPC (2000), and other sources. Since the figures are based on vessel logsheets (with some adjustment), both their coverage and their accuracy can be assumed to vary between fleets. In general, the catch figures given are deemed reasonable for the major purse seine fleets (US, Japan, Korea, Taipei,China) and for the Japanese pole/line fleet. For domestic longliners and those from Korea and Taipei,China, however, the data may greatly underrepresent the true catch.

**Table 1: Estimated Tuna Catch of FFA Member Countries in the Pacific Islands,
by Nationality of Fishing Vessel, 1999 (metric tons)**

Country	Nationality of Fishing Vessel												TOTAL		
	China	Fiji	FSM	Japan	Kiribati	Korea	PNG	Phil. Samoa	Sol. Is.	Tonga	Taipei,China	US		Vanuatu	
Cook Is.	0	0	0	0	0	19	0	0	0	0	0	197	0	216	
Fiji	0	2,144	0	23	0	0	0	0	0	1	98	795	0	3,061	
FSM	1,031	0	2,499	59,708	250	55,885	54	0	0	0	63,103	599	4,900	188,029	
Kiribati	0	0	960	10,199	0	10,512	183	0	484	0	38,826	56,167	15,060	132,391	
Marshall	0	0	38	17,884	0	9,525	0	0	0	0	4,675	45	1,050	33,217	
Nauru	0	0	1,009	6,712	140	10,465	0	0	18	0	15,212	6,407	1,435	41,398	
Niue	0	0	0	0	0	0	0	0	0	2	0	0	0	2	
PNG	0	0	3,148	20	4,928	887	49,666	15,178	90	0	38,660	21,475	3,730	137,783	
Palau	995	0	0	46	65	0	13	0	0	0	1,249	0	0	2,368	
Solomon Is.	0	1	49	4	85	909	18	0	69,092	0	2,228	1,107	0	73,493	
Samoa	0	0	0	0	0	0	0	0	5,300	0	0	308	0	5,608	
Tokelau	0	0	0	0	0	0	0	0	0	0	0	2,123	0	2,123	
Tonga	0	14	0	0	0	0	0	0	0	265	2	29	0	310	
Tuvalu	0	0	109	4,338	0	5	0	0	90	0	1	35,989	0	40,532	
Vanuatu	0	65	0	0	0	0	0	0	0	0	53	0	0	118	
Total	2,026	2,224	7,812	98,934	5,468	88,207	49,934	15,178	5,300	69,774	268	164,107	125,241	26,175	660,649

Source: SPC Catch and Effort Logsheet Database, with adjustments

The Role of Tuna Fisheries in the National Economies

General

The Pacific Islands countries, in many cases, do not have the necessary statistics for gauging the importance of tuna to their national economies. Moreover, aggregate indicators for all the countries are too few and inconsistent to allow a comparison across the region. And even if such information were available, the rudimentary conceptual framework for quantifying fishery benefits could lead to widely divergent estimates. Studies that attempted to put a value on the ocean-related GDP of the United States, for example, produced estimates ranging from 2.6 percent to 35 percent of the total economy (Kildow et al. 2000). Yet, the importance of tuna to the Pacific Islands economies is undeniable.

Currently valued at \$1.9 billion, the annual tuna harvest (see the section “Regional Tuna Catch” above) indeed looms large in the Pacific Islands economies. According to SPC (1998b), the countries and territories in the region have a combined gross domestic product of about \$17 billion. The annual tuna catch is therefore about 11 percent of the region’s GDP.

The value of tuna exports relative to total exports would provide another gross indicator of the economic importance of the tuna resource to the region. Since most of the tuna catch is exported, tuna exports make up almost half of the roughly \$4.0 billion in annual exports (including mining exports) from the Pacific Islands countries (SPC 1998b).

The tuna resources of the area are enormous in relation to the national economies. A purse seine vessel, in a single haul, can capture enough tuna to match the value of a year’s exports from one of the smaller countries.

Fish in general are very significant in the Pacific Islands. FAO (1995b) states:

Fish and fishing are tremendously important to the people of the Pacific Islands. Much of the nutrition, welfare, culture, recreation, government revenue, and employment are based on the region’s living marine resources.

Table 2 compares the annual tuna catch with the other fish catch of the region in terms of volume and value.

Table 2: Annual Volume and Value of Catch of Pacific Islands Fisheries

Type	Volume (MT)	Value (US\$)
Industrial tuna fishery ^a	1,074,113	1,900,000,000
Industrial prawn fishery ^b	946	9,043,618
Subsistence fishery ^c	83,914	179,914,623
Small-scale commercial fishery ^d	24,327	81,800,664
Total	1,183,300	2,170,758,905

^a SPC (2000, unpublished data); Van Santen and Muller (2000)

^b NFA (1988)

^c Dalzell et al. (1996)

^d Dalzell et al. (1996)

As the table shows, not only is tuna fishery the most important of the four categories, it produces almost ten times the total amount of fish produced by all the other types of fisheries in the region and over seven times the value of all other fish catch.

FAO (1996) underlines the overall importance of tuna to the region:

For many South Pacific Island states and territories their social and economic development is closely tied to the fortunes of the region's fisheries sector. Indeed, in this connection, the importance of fish, and in particular tuna, in the South Pacific, has been likened to the importance of petroleum for the States in the Near East. This situation is especially true for those South Pacific States and territories that are composed largely of clusters of atolls and which, as a result, are severely limited in terms of land-based development.

Access Fees

A major financial benefit from these extensive tuna resources comes in the form of access fees paid by foreign fishing vessels that fish for tuna in the EEZs of FFA member countries. With very few

exceptions (e.g., for live-fish collection), all licenses issued to foreign fishing vessels plying the territorial waters of the Pacific Islands are for tuna fishing.

To qualify for such a license, a foreign vessel must be listed in the FFA Regional Register. Table 3 lists the numbers of vessels that were registered in 1999/2000.

Table 3: Tuna Fishing Vessels in the FFA Regional Register, as of August 2000

Country	Type of Vessel			Total
	Longline	Purse Seine	Pole/Line	
China	97	0	0	97
Japan	255	36	39	330
Korea	144	26	0	170
Pacific Island countries	9	21	0	30
Philippines	0	15	0	15
Taipei, China	184	42	0	226
US	1	35	0	36
Other	26	19	0	45
Total	716	194	39	949

The table shows that 949 longliners, purse seiners, and pole/line vessels were eligible for licensing in the region as of August 2000. The license fees paid by foreign fishing vessels arise mostly from bilateral licensing arrangements, the details of which are not always readily available. Therefore, information from FFA staff and direct contacts with FFA member countries were used to construct Table 4, which gives estimates of the access fees paid to Pacific Islands FFA member countries in 1999.

The \$60.3 million received for fishing licenses in 1999 marked a significant increase over the access fee revenues of earlier years.³ Compared with the \$15 million in fees reported by Clark (1983), the 1999 fees represented a 402 percent increase.

³ Gillett (1997) estimates \$66.3 million in access fees for 1996. But the Project Development fund contributions under the US tuna treaty were considered part of US purse seine fees in the estimation.

**Table 4: Access Fees Paid to Pacific Islands
FFA Member Countries, 1999 (US\$)**

Country	Type of Vessel			Total
	Longline	Purse Seine	Pole/Line	
Japan	5,128,000	9,199,000	1,405,000	15,732,000
US	0	16,693,026	0	16,693,026
Korea	3,492,000	6,250,000	0	9,742,000
Taipei, China	2,099,000	10,642,000	0	12,741,000
China, People's Republic of	500,000	0	0	500,000
FSM arrangement ^a	0	579,357	0	579,357
Others	90,000	4,200,000	0	4,290,000
Total	11,309,000	47,563,383	1,405,000	60,277,383

^a Preferential access to purse seine vessels of Pacific Islands countries that are parties to the arrangement

This revenue is substantial considering the small size of most of the economies in the region. The countries, however, differ substantially in the amount of licensing money they receive, with FSM, PNG, Kiribati, Tuvalu, and the Marshall Islands receiving the most.

For many countries in the region access fees make up a sizable portion of government revenue. Because of confidentiality and other reasons, this type of information is often difficult to obtain. Moreover, even where such information is readily available, varying methods of revenue recognition between countries hinder comparison. Available data show:

- Access fees in the Marshall Islands amounted to about 25 percent of Government revenue in fiscal year 1992/1993 (World Bank 1995) and are believed to have been partly responsible for the country's recovery in the late 1990s from three years of economic recession (ADB 2000).
- FSM has collected almost \$200 million in access fees since it declared its sovereignty over EEZ resources (MMA 2000b). In fiscal year 1999/2000 access fees composed about 39 percent of nontax revenue and 22 percent of the total domestic revenue of the national Government (FSM and MMA records).
- License fees contributed 45 percent of the total Government revenue of Kiribati in 1991 (Fairbairn 1992). A doubling of the fees in 1998 caused a 16 percent jump in GNP (ADB 2000).

- License fees in Tuvalu composed 10 percent of recurrent Government revenue in 1988, 7 percent in 1989, and 11 percent in 1990 (Fairbairn 1993). By 1999, the portion of license fees had grown to 40 percent (ADB 2000).
- In Palau in the mid-1990s, access fees accounted for about 10 percent of Government revenue, half of this from the locally based foreign fleet and the other half from the distant water fishing nation (DWFN) fleet (PCS 1999).
- Recent access fees in Tokelau have brought in almost twice the revenue from local duties, registrations, and taxes.
- In Vanuatu, the US tuna treaty alone generates over 62 percent of the revenue earned by the Government from fisheries.

The foregoing data show that licensing fees are an important revenue source for smaller countries with no abundant natural resources other than tuna. On the other hand, even Papua New Guinea, with its large mining, petroleum, and agriculture sectors, also derives a significant part of its income from license fees. According to the National Fisheries Authority and AusAID (2000):

- Access fees represent about 2 percent of total Government revenue and 33 percent of the nontax revenue of PNG.
- The PNG Government earns more from fishing access fees and charges than the amount it expected to spend in 2000 to maintain law and order (police and prisons).

Employment

A crucial benefit of tuna fisheries to Pacific Islands economies is the employment they provide. The labor-intensive nature of many tuna fishing and tuna processing operations, together with the scarcity of formal jobs in the region, heightens the relative importance of tuna-related employment.

The tuna resource generates employment in the following three categories:

- Direct employment on fishing vessels and in processing operations
- Employment connected to the tuna industry

- Indirect spinoff employment resulting from links to other sectors of the economy

Estimation of tuna-related employment

Direct employment on fishing vessels and in processing operations was estimated using a variety of sources: knowledge of the region, interviews with individuals having close contacts with industry, discussions with fisheries officers from the Pacific Islands countries, and published and unpublished reports. The results are given in Table 5.⁴

The table shows total direct employment of nearly 15,000 in the tuna industry of the Pacific Islands.

The second category of employment—jobs connected to the tuna industry—is less well defined and hence more difficult to quantify. In this category are jobs that contribute in some way to the tuna industry and for which the industry is either the sole or a major client. Office staff at the tuna fishing companies in Nuku'alofa, teachers at the Fisheries Training Centre in Tarawa, outboard mechanics in Fakaofu, roving fish vendors in Funafuti, and aluminum welders at the catamaran boatyard in Apia would fit into this category.⁵

The third category of employment in the tuna industry is indirect spinoff employment resulting from links to other sectors of the economy. Demand for canned mackerel, shoes, taxis, theater entertainment, and so forth, among the 8,000 or so who are directly employed on vessels and in processing plants in Fiji, Solomon Islands, and PNG, for example, will lead to the creation of more jobs in these other industries. Of the three employment categories, spinoff employment is the least obvious and the most difficult to quantify.

⁴For the Solomon Islands, this report considers only the period up to the civil disturbances in mid-2000, which forced at least the temporary closure of many tuna-related facilities.

⁵Other examples: the staff of the security company providing guards for Solomon Taiyo in Noro, secretaries in the offices of lawyers specializing in fisheries affairs in Kolonia, salesmen in the fishing gear store in Port Moresby, staff of the fish shop in Niue, refrigeration mechanics in Majuro, staff of the cargo department of the national airline in Fiji, sellers of the longline by-catch in Rarotonga, providers of food to the foreign fleets based in Koror, sales staff of the store that supplies outboard engines in Nauru, and the staff of the agency in Port Vila that services longline vessels.

Table 5: Direct Employment in Tuna Fishing and Processing in FFA Member Countries, 2000

Country	Total Jobs	Fishing							Smaller Commercial Vessels		Processing and Export
		Foreign Fishing Vessels	Transshipment	Longline	Purse Seine	Pole/Line	Artisanal	Others ^a			
Cook Islands	77			7			70				
Federated States of Micronesia	614	150		56	30		25 (Kosrae) 100 (Chuuk) 45 (Pohnpei) 30 (Yap)			178	
Fiji	1,407	340		462		25				400 (PAFCO cannery) 130 (sashimi) 35 (nat'l fisheries co.) 8 (tuna jerky) 410 (joining plant)	
Kiribati	1,193	350					800				
Marshall Islands	519	14	20				75				
Nauru	21			6				15			
Niue	47							12 (commercial skiffs) 35 (semicommercial skiffs)			
Palau	36	1				10	25				
Papua New Guinea	3,015		25	340	75					2,500 (cannery) 15 (joining) 60 (export processing) 1,450 (cannery) 40 (sashimi)	
Solomon Islands	2,853	138		240	135	750	100				
Tokelau	38						20	18 (commercial alia fishing)			
Tonga	403	3		140			30			150 (Pago Pago canneries) 80 (sashimi)	
Tuvalu	57	7					50				
Vanuatu	130	120					10				
Samoa	4,070	60		455						55 (Apia) 3,500 (Pago Pago canneries)	
Total	14,480	1,183	45	1,706	240	785	1,360	80		9,011	

^a Including unspecified smaller commercial vessels

Sources: Gillett and McCoy (1997); Gillett (1994); interviews with national fisheries officers, FFA staff, and regional experts

In-depth analysis would be required to gauge its magnitude. Some indication could be obtained by following the flow of income from the tuna fishery through the economy. Intuitively, the greater the amount of income retained within a country's economy, the greater the spinoff employment would be. This suggests that the labor-intensive tuna fisheries (e.g., the pole/line fleets of Fiji and the Solomon Islands) would produce proportionally greater spinoff employment than the capital-intensive purse seine fisheries, where much of the expenditure is for imported products.

Studies on various fisheries outside the Pacific Islands (Weber 1994, Swerdloff and Pooley 1979, and Meyer 1987, among them) have been made to estimate the direct and indirect employment associated with fisheries. Some of these reports have indicated a multiplier effect for employment, or a relationship between the number of direct jobs in fishing and processing and the number of jobs created indirectly. Fishing industry sources in New Zealand claim that eight jobs are created ashore for every one fisherman at sea (H. Walton and C. Huflett, personal communications). One longline company operator in Fiji feels that for every person working on one of his vessels or in his plant, five other jobs are created elsewhere in the economy (G. Southwick, personal communication). On the other hand, an economist with long experience in the region and with tuna fisheries believes that the ratio of direct to indirect employment would be between 1:1 and 1:2 (A. Hughes, personal communication). Detailed investigations to determine the multiplier effect of employment in the tuna industry of the Pacific Islands is far beyond the scope of the present study. Hypothetical calculations using a conservative ratio of two indirect jobs for every direct job in fishing and processing (14,480 in Table 5) gives a total tuna-related employment in the Pacific Islands of about 43,000. On a ratio of 1:1 the number of jobs would be about 29,000. This figure should, however, be used with caution: the ratio has little quantitative basis and could vary significantly between Pacific Islands countries. Nevertheless, a ratio of between 1:1 and 1:2 appears to be on the cautious side.

Arama (2000) expresses the impact of tuna employment somewhat differently. That study indicates that, for every employee at PAFCO, another four people (family members) are affected by the job.

Relative importance of employment to the Pacific Islands economies

According to UNDP (1994), there were about 370,000 wage-paying job opportunities in the Pacific region in 1991. Information on the number of formal jobs in the region at the end of the decade is not readily available, but there are indications that growth, if any, in the number of such jobs during the 1990s has been very slow. The number of jobs remained static in PNG (AusAID 2000), grew only very slightly in FSM (Bank of Hawaii 2000), and actually dropped in the Solomon Islands. Growth in wage-paying jobs in other Pacific Islands countries has also been sluggish (UNDP 1997e), as it has been in the private sector (1999a). A 5 percent increase in the number of wage-paying jobs during the decade would have resulted in 388,000 jobs by 2000. The 29,000 to 43,000 tuna-related jobs mentioned above would therefore represent between 8 percent and 11 percent of all wage-paying jobs in the Pacific Islands region.

The lack of reliable employment data makes it more difficult to assess the importance of such employment for specific countries. A rough comparison of available information on national employment with direct employment in fishing/processing (from Table 5) produced the results shown in Table 6.

The information in Table 6 should be interpreted with caution. The total employment information is in some cases several years older than the tuna industry employment data. The method of calculating the total employment may also vary between countries (Kiribati, for example, bases its calculation on provident fund contributions, while FSM uses census data). Nevertheless, it is apparent that the loss of direct employment on tuna fishing vessels and in tuna processing factories would severely damage the economies of Kiribati, Samoa, and the Solomon Islands, and would have a major impact on most of the other countries listed in Table 6. The subsequent reduction in spinoff employment would amplify the negative effects.

Table 6: Relative Economic Importance of Direct Employment in Tuna Fishing and Tuna Processing in the Pacific Islands

Country	Total Employment		Direct Employment in Tuna Fishing/ Processing	
	No.	Year	No.	% of Total Employment
Vanuatu ^a	18,500	1995	130	0.7%
Solomon Islands ^b	26,408	1997	2,853	10.8%
Kiribati ^c	11,142	1990	1,193	10.7%
Marshall Islands ^d	13,200	1992	120	0.9%
FSM ^e	18,669	1997	614	3.2%
Samoa ^{f,j}	23,009	1999	510	2.2%
Fiji ^g	93,400	1992	1,407	1.7%
Cook Islands ^h	7,113	1991	77	10.8%
PNG ⁱ	214,000	1998	3,105	1.4%

^a UNDP (1996)

^b Bank of Hawaii (1998)

^c Miles et al. (1992)

^d UNDP (1997a)

^e Bank of Hawaii (2000)

^f Central bank data

^g Bartsch (1992)

^h UNDP (1997d)

ⁱ SPC (1998), AusAID (2000)

^j If cannery employment were considered, the tuna industry employment figure would be 4,070, or 17.7% of total employment.

Other employment considerations

Tuna industry employment provides support for government policies related to decentralization, women's activities, and private-sector development. Many Pacific Islands governments favor policies that further decentralize employment, increase opportunities in rural areas, and stem the population drift to urban areas. Viable mechanisms for accomplishing these goals are unfortunately not common, but tuna industry employment contributes to the solution:

- The high employment at the canneries in relatively remote areas becomes especially important. The canneries at Levuka in Fiji and Noro in the Solomon Islands provide formal employment

in nonurban areas for about 2,000 people. Arama (2000) states that the PAFCO cannery in Levuka has become the lifeline of the island, providing income and employment, and spurring commercial activity.

- In Kiribati, people from the outer islands are given priority in filling jobs on Japanese tuna vessels.
- Most FSM men working on foreign tuna vessels are residents of remote villages or outer islands.
- Promising tuna jerky operations have started on the outer islands of Tuvalu and the Marshall Islands.
- In Samoa, a significant amount of tuna-related employment aboard the vessels is nonurban because about 40 percent of the longliners in the country are based outside Apia (including 20 percent on Savaii).

Similarly, many Pacific Islands governments wish to provide more employment opportunities for women. The canneries in Pago Pago, Levuka, Noro, and Madang employ over 6,500 Pacific Islands women. The tuna fishing and processing company Solomon Taiyo, note Barclay and Yoshikazu (2000), was the first to provide cash employment to women without tertiary education in the Solomon Islands and still is the only one providing significant opportunities of this kind. Women compose around 85 percent of the employees of the tuna cannery at Madang. Operators of the cannery say that loining and other processing operations now under development or negotiation will likely employ a similar proportion of women (P. Celso, personal communication).

If women are assumed to hold roughly one third⁶ of the estimated 388,000 jobs in the region mentioned in the section "Relative Importance of Employment to the Pacific Islands Economies," then these six tuna processing plants alone directly employ 5 percent of all job-holding women in the region. As women have a large portion of jobs in the growing number of sashimi export firms in the region, the importance of tuna-related employment for women is probably increasing.

In most Pacific Islands countries the public service sector is especially large. In the early 1990s public-sector employment

⁶ On the basis of familiarity with the region and a feel for the makeup of the workforce.

accounted for 70 percent of paid employees in Kiribati, 69 percent in Tuvalu, 48 percent in the Solomon Islands, and 46 percent in FSM (UNDP 1999a). Most governments of the region are actively scaling down the public sector and, at the same time, promoting private-sector growth. The Marshall Islands, for example, reduced the number of Government employees by 33 percent between late 1995 and March 1999, while Nauru retrenched about 30 percent of the public-sector workforce beginning in April 1999 (ADB 2000). The public sector in FSM has also been considerably downsized. (It should be noted in this context that all of the 15,000 people directly employed by the tuna industry and the 29,000 to 43,000 possible jobs alluded to in the section “Estimation of Tuna-Related Employment” are outside the public sector.) In addition, those private-sector jobs are based on creating wealth from natural resources and do not depend on public-sector spending.

Other Economic Benefits from Locally Based Tuna Industries

Some previous studies

Although job generation is often the most visible and appreciated benefit from basing operations locally, tuna resources bring many other types of gains to the local economies. But the matter of how to quantify the benefits from local fishing industries has stirred considerable debate among fisheries economists. Several techniques have recently been applied to the tuna fisheries of the region. Some studies using these techniques are given below.

- The total expenditures of locally based vessels could serve as a rough, surrogate indicator of the impact of an industry on a country. Kingston et al. (1993) studied two foreign tuna fishing companies that had local operations in Palau involving 173 Chinese and 52 Taiwanese longliners in 1993. For these two local longline companies, the sum of all local expenditures, referred to as “benefit to country,” was \$2,143,550 in 1992 and \$3,092,500 in 1993.
- The Palau Conservation Society (PCS 1999) used another method to quantify the benefits from the tuna industries. It estimated the total amount of expenditures or payments made in Palau.

Then, using a basic knowledge of the structure and dynamics of the Palau economy, it made a rough estimate of the proportion of expenditure that does not leave Palau, referred to as the “indirect benefit” to the country. The annual indirect benefits to Palau from the locally based longline industry were estimated to be \$671,000 over the period from 1993 to 1997.

- A similar technique was used by ADB (Lucas et al. 1996) to estimate the benefits retained by low-productivity longliners based in FSM. An estimate was made of vessel expenditures in 18 categories, as well as the amount in each category that does not immediately leave the country, referred to as “retained benefit.” The retained benefits per season from one FSM-based longliner amounted to \$148,003.
- FFA (1998), in studying the Majuro Fishbase in the Marshall Islands, defined “economic benefits” as the proportion of expenditure accruing to domestic factors of production. Assuming an annual catch of 2670 MT, economic benefits, including license fees, came to about \$0.27 million.
- Smith and Tamate (1999), studying the benefits of the Fiji pole/line fishery, examined the vessel expenditure categories and estimated the percentage of each category of expenditure that went to nonimported items. They added the dollar equivalent of the weighted average percentage (what they called the “domestic value added”) to the gross income of the fishery to estimate the “total value to the economy.” The pole/line fishery had a total value to the Fiji economy of F\$0.46 million to F\$5.52 million annually from 1988 to 1998.

Details of two studies

A study made by Palau Conservation Society (PCS) and the Forum Fisheries Agency (FFA) in Palau from 1993 to 1999 was the most comprehensive ever on the economic impact of tuna development on a Pacific Islands country. Another study, a recent one on Solomon Taiyo, was one of only a few that have traced the effects of a commercial tuna company on a country in the region. Some of the results of these two studies are summarized below, to illustrate facets of the tuna-related benefits.

The PCS and FFA study (PCS 1999) looked into the benefits generated by the locally based foreign tuna fleet in Palau. The report showed:

- *Gross economic value:* Palau's locally based longline fishery had an average annual gross (wholesale) value of about \$28 million from 1993 through 1997. Sashimi-grade bigeye and yellowfin accounted for about \$25 million of that total value.
- *Net economic value:* Of the fishery's \$28 million gross value, roughly \$9 million were net benefits, equivalent to the net economic rent generated by the fishery. The remaining \$19 million was used to defray the costs of capturing, transporting, handling, and marketing the catch, as well as managing the fishery and providing public services and infrastructure to the industry.
- *Distribution of net value:* About \$1 million (\$1.2 million in revenues less \$0.3 million in public services), or 10 percent of the available rent, accrued directly to Palau through various taxes on the industry. The remainder of the rent accrued to the transshipment companies and foreign fishing companies (together about \$7 million) and the Japanese marketing agents (about \$1 million). Assuming that the locally based companies had 40 percent local ownership, roughly \$1 million in private-sector profits were retained in Palau. Direct net benefits to Palau therefore totaled about \$2 million.
- *Indirect benefits:* The fishery generated indirect benefits for Palau through wages paid to Palauans and through local spending by foreign workers and vessels making port calls. Indirect benefits totaled about \$0.2 million per year in the public sector and about \$0.7 million in the private sector. The industry supported the equivalent of about 10 Government jobs filled by Palauans.
- *Significance of benefits:* The Palau economy appears to be capturing 20 percent to 30 percent of the fishery's available rent—about half to the public sector and half to the private sector. The \$1 million in Government revenues from the locally based fishery represented 5 percent of domestic Government revenue.
- *Distribution of benefits within Palau:* Palau's foreign fisheries provide an important source of revenue for the country's 16 states, among which 85 percent of the revenues from foreign fishing permits are distributed. Of the \$1.9 million in net

Government benefits from all foreign fisheries (1993–1997 annual average), about \$1.1 million, or 57 percent, went to the states. In 1997, foreign fishing revenues contributed 4 percent to 34 percent of the total revenues of each state.

Barclay and Yoshikazu (2000), on the other hand, sought to find out whether Solomon Taiyo Limited (STL) had been a development success. Their study yielded insights into the benefits provided by a tuna enterprise to a developing country. The Solomon Islands Government had four main goals for STL over the last three decades: it hoped that the company would create more jobs, localize staffing and procurement, generate revenue for the Government, and earn foreign exchange and contribute to a favorable balance of trade. The report on the study showed the following:

- *Employment:* In terms of job creation, STL has been an unqualified success, far exceeding the 100 to 200 jobs originally envisaged. As of June 1999, STL had 2,400 permanent employees and up to 700 casuals. As stated earlier, Solomon Taiyo was the first and still is the only significant source of cash employment opportunities for women without tertiary education in the Solomon Islands.
- *Local staffing:* Solomon Islanders fill nearly all low-level, junior supervisory, and middle management positions, but there has been limited localization of senior management and marketing personnel (only 2 out of 12 positions).
- *Local purchase of goods and services:* The company buys most of its fresh food from villages around Noro and pays royalties for baitfishing to customary reef owners. Domestic procurement amounted to S\$41 million in 1994.
- *Dividends and taxes paid to the Government:* Although STL has rarely paid dividends and income tax on profits, the company has generated substantial revenues for the Government in the form of other taxes such as import/export duties, withholding tax, PAYE (pay as you earn) tax, and licenses. The revenue produced by STL is of prime importance to a government that is chronically short of funds.
- *Foreign currency earnings and contributions to the balance of trade:* STL is one of the few successful exporting businesses in the Solomon Islands. It has succeeded in boosting exports and

earning foreign currency for the country. Without STL the Solomon Islands would be in dire economic straits.

- *Conclusion:* The study concluded that STL has been successful in providing employment, revenue, and overseas trade, and has had moderate success in localization.

Expenditures by locally based vessels

Locally based industrial tuna vessels, foreign as well as locally owned, are increasing in FFA member countries. Table 7 estimates the number of such vessels in the Pacific Islands, using knowledge of the region, interviews with fisheries officers from the various island countries, and discussions with key individuals.

Table 7: Locally Based Tuna Vessels in the Pacific Islands, as of Mid-2000

Country	Type of Vessel			Total Vessels
	Longline	Purse Seine	Pole/Line	
Cook Islands	1			1
FSM	47	5		52
Fiji	42		1	43
Kiribati	2	1		3
Marshall Islands				0
Nauru	1			1
Niue				0
Palau	80		1	81
PNG	34	15		49
Solomon Islands ^a	20	5	30	55
Tokelau				0
Tonga	12			12
Tuvalu				0
Vanuatu				0
Samoa	7			7
TOTAL	246	26	32	304

Note: The vessels in this table are those with a length greater than 15 meters.

^aCivil disturbances in mid-2000 halted, at least temporarily, the operation of many vessels.

The expenditures made on behalf of these 304 locally based vessels and by their crews may not be fully appreciated.

- Carter (1995) states that a tuna seiner spends \$300,000 to \$450,000 on each visit to the home port (four to five port calls are the norm). According to McCoy (1998), annual expenditures for a locally based purse seine vessel in PNG would be about \$1.5 million.
- Wilson (1995) contends that a locally based sashimi longliner doing short trips would spend \$13,000 each trip, and a fleet of 60 such vessels would generate \$8 million each year in home port expenditures. Lucas et al. (1996) estimate that a locally based longliner from Taipei, China would spend \$280,073 a year in FSM. A longliner based in PNG would spend about \$590,000 in the country each year (M. Brownjohn, personal communication). Philipson (1998), using three alternative country scenarios, estimates from \$650,000 to \$950,000 in yearly expenditures for a longline vessel.⁷
- A pole/line vessel based in the Pacific Islands would normally spend about \$300,000 to \$425,000 locally each year (Smith and Tamate 1999; R. Stone, personal communication).

Multiplying the number of locally based vessels in FFA member countries (Table 7) by these indicative expenditures per vessel would give a rough approximation of the magnitude of expenditures – about \$150 million. The portion of this figure that actually benefits Pacific Islands economies could be expected to increase as more local businesses develop to serve the needs of the tuna vessels and engage in associated activity. Maxwell and Owen (1994) revealed that for a given purse seine vessel in the region, net economic benefits to the local economy would be about 20 percent of gross expenditures.

Transshipment

In addition to the economic benefits from locally based tuna vessels, substantial gains accrue from vessels that occasionally visit ports in the region to transship fish. A ban on transshipment at sea introduced

⁷ Philipson's estimates include overseas marketing costs, which do not benefit local economies. These costs are excluded here.

by FFA member countries in June 1993 has caused a dramatic increase in port activity at transshipment points.

FFA states that in the first full year of transshipment operations(1994) the benefits were thought to be \$1.5 million in charges and \$10 million in local expenditure. As local businesses grow to cater to this trade, there is likely to be an increase not only in local expenditures but also in the proportion in benefits from those expenditures that will be retained in Pacific Islands countries.

Most purse seine transshipment in the 1990s took place in FSM, the Solomon Islands, PNG, and the Marshall Islands, although there was some transshipment in most FFA member countries. The most popular ports for tuna transshipping in the mid-1990s were (in descending order of preference) Chuuk, Guam, Honiara, Wewak, Manus, Kavieng, Tinian, Rabaul, and Yap.

Regionwide, port calls by purse seiners in Pacific Islands countries result in payments per visit of about \$3,000 to \$4,000 for government services and government levies, irrespective of port (McCoy and Gillett 1998). Payments to the private sector during port calls for transshipment total around \$4,000 per visit. The 507 transshipments known to have been made by the Korean and Taiwanese seiners in 1996 (SPC data) would therefore have resulted in \$3.8 million in local expenditures.

Country-specific information on transshipping shows substantial benefits:

- Heberer (1994) estimates that 294 purse seine transshipments occurred in Chuuk alone during the first six months that the ban on transshipment at sea was in place. "Each port call by a foreign flag purse seine vessel results in a \$5,000 to \$10,000 infusion of commerce to the local economy," he says, adding that 455 jobs can be directly attributed to tuna transshipment.
- Tong and Rodwell (1995) note that there were 1,057 recorded transshipments in FSM from June 1993 to August 1995. At \$7,500 local expenditure per transshipment, this would have resulted in \$7.9 million in local expenditure.
- In 1999 purse seiners transshipped about 90,500 MT of tuna through FSM ports (MMA 2000a). Besides Government taxes/charges, these vessels pay about \$2.2 million yearly to the private sector for services and supplies such as food, accommodation, rental cars, and minor repairs.

- The 238 purse seine transshipments made in the Marshall Islands in 1998 and 1999 (G. Joseph 2000) resulted in about \$1.8 million in expenditure in Majuro.
- Wright (1994) indicates that each purse seine transshipment in the Solomon Islands generates \$1,900 in fees for the Government of the Solomon Islands.
- Forau (1995) calculated that seiners spent \$299,658 in Honiara while transshipping in 1994.

Other Benefits to the Economies

Local expenditures by both locally based and transshipping vessels can be a rough indicator of benefits to the national economies. However, the level of total vessel expenditures does not indicate other financial benefits to the economies. These include foreign exchange earnings, revenue from fines, and sport fishing.

Foreign exchange earnings

Several Pacific Islands countries earn substantial foreign exchange from overseas sales of tuna.

Tuna is now the most important export of Samoa. Fish composed 71.8 percent of all Samoa exports in 1999, according to unpublished information from the Treasury Department, and 82 percent of all the fish exports were tuna or fish caught while fishing for tuna (Watt and Moala 2000). The tuna industry was therefore responsible for about 60 percent of all exports from the country in 1999. The growth of the Samoa economy in 1999, beyond expectations (World Bank 2000), was due in large measure to the export of tuna for canning.

Tuna is also the top export of the Federated States of Micronesia. The Government recorded \$10.4 million in total exports in 1996, the most recent year for which such data are available. Of this total, \$9.83 million, or 94.5 percent, came from fish exports (FSM 1998). Tuna accounted for about 95 percent of the fish exports (P. Sitan, personal communication) and, hence, for 90 percent of the value of all exports from FSM.

In the Solomon Islands tuna consistently contributes from 20 percent to 46 percent of the total value of exports (Solomon Islands Government 1999) while the export of most other commodities such as logs and gold is quite variable (Martin 2000).

In the Marshall Islands the new loining plant is likely to make semiprocessed tuna a leading export commodity.

Tuna products are also an important feature of the two most diversified economies of the region:

- The PAFCO cannery in Fiji exported \$13.9 million worth of tuna products in 1999 (Tuwai 2000) and a more or less equal amount of fresh tuna – about 5 percent of the value of all exports (SPC 1998b).
- PNG exported \$39.5 million worth of tuna in 1998 and \$29.3 million worth in 1999 (NFA export receipts). The tuna industry accounts for between 1 percent and 2 percent of all of the country's exports, including those from the major mining and petroleum industries.

Taxation

Apart from fees for access to tuna resources, many governments in the region earn substantial revenue from taxes on tuna-related activities. A few examples from the region illustrate the importance of these taxes:

- In PNG, domestic purse seine vessels pay from \$463,000 to \$595,000 in taxes and charges on entering the fishery and another \$237,000 to \$301,000 in taxes and charges annually. Longline fishery vessels pay \$41,464 in taxes and charges on entering the fishery and another \$62,224 annually (Lightfoot 1999).
- In the Solomon Islands, Solomon Taiyo pays little or no income tax but it has generated substantial revenues for the Government in other taxes such as import/export duties, withholding tax, PAYE tax, and licenses – a boon to a government plagued by chronic fund shortages (Barclay and Yoshikazu 2000).
- In FSM (Appendix A), national and state levies and charges on purse seine transshipments earned about \$1.11 million for the Government in 1999. The import duty on diesel fuel used by the

marine sector (mostly by the tuna fishing industry) came to about \$120,000 in 1999, one fourth of all import duties on diesel fuel. Significant national revenue also comes from the import duty on frozen longline bait. Estimates of expenditures by domestic vessels representative of fishing activities in FSM indicate that the 47 locally based longliners generate \$140,000 each year in tax revenue from bait purchases. Other national, state, and municipal taxes bring in around \$50,000.

- In Samoa (Appendix B), about \$1 million in direct import duties and other taxes for fuel, bait, and equipment was expected from the local longline fleet in 2000, a significant portion of all Government income for that year.

Revenue from fines

Some countries in the region earn significant income from fines following the successful prosecution of illegal fishing activity. Data on such fines are not readily available in most countries, and much of the information is hearsay. Nevertheless, there are indications that the amount involved is not paltry.

FFA is often (but not always) advised of such matters. It reports:

- In 1996, 25 cases involving illegal fishing activity were reported to FFA. Twelve of these cases were prosecuted successfully, and about \$3.9 million in fines and vessel forfeitures was collected.
- There were 38 cases of illegal fishing in the region from 1997 to 1999. Eight of these were settled by negotiation and four as a result of court cases. (The rest either remain unsettled or, if settled, have not been reported as such to the FFA Secretariat.) Fines and other compensation in the 12 settled cases amounted to \$635,733 (A. Richards, personal communication).

Information on individual countries came to light during the research for the present study:

- In FSM, more than 70 cases have been brought at the national level for illegal fishing or other violations since 1979. In total, more than \$3.65 million in fines or settlements has been

collected, and eight vessels have been forfeited to the Government. In 1999 two longliners were convicted of illegal fishing, and four more cases were pending (MMA 2000a).

- In PNG in 1997, 10 illegal boats were apprehended and prosecuted (NFA 1998).

Even some of the smaller countries of the region have earned some revenue from fines for illegal tuna-related activity. Niue obtained \$25,000 from a Taiwanese vessel prosecuted in 1999 (B. Pasisi, personal communication). Palau obtained about \$18,000 from a longliner fishing without a license (H. Francisco, personal communication). In 1994, Nauru received a settlement of \$1 million from Korean purse seiners that had been charged with illegal fishing; in late 2000 the country was prosecuting a US seiner for fishing within 12 miles offshore. In September 1998, the Government of Tuvalu reached an out-of-court settlement worth about \$40,000 with the owners of a US purse seiner that had been apprehended for allegedly fishing in a closed area.

It should also be mentioned that the arrest of the US seiners *Danica* (in PNG) and *Jeanette Dianne* (in the Solomon Islands) in the 1980s not only yielded substantial compensation but also helped catalyze regional solidarity in fisheries matters.

Commercial sport fishing

Tourism is a major part of the economy in the Pacific Islands, and the economic development of many of the countries is predicated on an expansion of tourism. Commercial sport fishing (sometimes referred to as game fishing) is a specialized form of tuna fishing that is closely related to tourism. At present there is a large amount of commercial sport fishing activity in the Pacific Islands. With the likely expansion of the tourist industry in the future, there is considerable potential for additional benefits from sport fishing.

Sport fishermen or tourists who are willing to spend considerable amounts of money can catch tropical oceanic game fish, mostly tuna and tuna-like species, from sport fishing vessels that operate mainly out of urban or tourist centers. Numerous analyses (e.g., Ditton et al. 1996), often sponsored by game fishing associations, have shown quite conclusively that local economies benefit from

sport fishing activities out of all proportion to the commercial value of the fish caught. Sport fishermen, especially tourists, spend money on vessel charters, accommodation, provisions, and shore recreation. Where a substantial commercial sport fishing fleet exists, the establishment of secondary industries providing gear, vessels, and general tourist services may follow. Bright (1996) suggests that in the Solomon Islands every dollar spent by sport fishermen has an economic impact of two dollars. It seems likely that commercial sport fishing will continue to develop in the region, and will be strongly influenced by the growth of the tourist industry.

Most Pacific Islands countries have sport fishing operations. The Tuna Management Plan of Vanuatu, for example, states that there are eight charter sport fishing vessels operating in Vanuatu, five different companies in Vila, and one vessel working out of Luganville. About 10 vessels participate in commercial sport fishing in Palau (Gillett 1999). Although sport fishing is often thought of as an activity confined to the major tourist centers of the region (such as the major resorts in Fiji), it benefits even more isolated locations. Niue, for example, has commercial charter operations to take tourists fishing (Leolahi 2000). A publication of the Solomon Islands Visitors' Bureau (SIVB 2000) touts the attractions of tuna game fishing at all four tourist accommodations listed for the relatively isolated Western Province.

The Pacific Islands also benefit from the international sport fishing tournaments held yearly in most countries in the region. Many of these attract significant numbers of overseas tourists and fishermen who spend, sometimes lavishly, for accommodation, food, entertainment, vessel charters and airfare during the competition. Samoa has hosted an international sport fishing competition each year for the past five years. The 2000 competition attracted 60 foreign competitors and an equal number of international spectators (P. Meredith, personal communication).⁸

⁸ Other well-known game fishing tournaments in the region are the Mobil All Micronesia Tournament held in Majuro each year, the Tonga International Game Fishing Tournament in Vava'u, the competition sponsored by the Port Moresby Game Fishing Club, Fiji's Vodaphone International Game Fishing Tournament, the fishing derby held annually by the Palau Sportfishing Association, the Cook Islands international tournament in Aitutaki, and the Pohnpei Tru Value Hardware Annual Gamefishing Tournament.

*Summary of Benefits to Pacific Islands Economies
from Industrial-Scale Tuna Fishing*

Industrial-scale tuna fishing provides large benefits to FFA Pacific Islands member economies: \$60 million in access fees, 25,000 jobs, close to \$130 million in expenditures by locally based vessels, and a host of other benefits. These represent a crucial economic contribution, especially considering the scarcity of other natural resources in many Pacific Islands countries, the generally poorly developed private sectors, stagnating economies, and rapidly increasing populations.

Small-Scale Tuna Fishing

Although a fair amount of information on the industrial-scale tuna fisheries of the Pacific Islands is available, data on the small-scale tuna fisheries and the benefits they produce are much less easy to obtain. The usual thinking has been that the offshore tuna resources are the domain of the industrial fleets, with little participation by small-scale fishermen. For example, World Bank (1995) states:

Exploitation of offshore resources—mainly tuna—is a modern phenomenon introduced into the region by foreign countries aiming to supply international markets. This is a technology and capital-intensive activity, employing modern methods and equipment in which few PMCs [Pacific member countries of the World Bank], with their scarce resources, are able to participate directly.

It is, however, important to note that tuna forms a substantial component of the catch of both the subsistence and artisanal fisheries in the Pacific Islands.

Dalzell et al. (1996) reviewed the catch composition of small-scale troll fisheries in 13 Pacific Islands countries. They showed that tuna and other scombrids make up a large portion of the catch (Table 8).

Table 8: Proportion of Tuna and Tuna-like Fish in Small-Scale Fishing in the Pacific Islands

Country	%
Fiji	29.7
PNG	84.6
American Samoa	86.0
Tokelau	100.0
Tuvalu	79.4
Nauru	88.5
Palau	45.9
Niue	85.9
Wallis/Futuna	52.9
Kiribati	77.8
Tonga	98.4
Vanuatu	92.9
Cook Islands	97.6

A study on the importance of small-scale tuna fishing (Gillett and Toloa 1987) gives the relative amounts of tuna in the artisanal catch of several Pacific Islands countries. Some results of that study are given in Table 9.

With regard to subsistence fisheries in the region, SPC (1994) states that of their annual fish catch of 80,000 MT about 30 percent is composed of pelagic species. Various tunas make up the vast majority of these pelagic species.

Table 9: Artisanal Catch of Tuna in the Pacific Islands

Country	Information
Cook Islands	A field survey showed that skipjack and other ocean fishes contributed the following amounts to the artisanal fishery in 1978: Rarotonga 7%, Aitutaki 0%, Mangaia 13%, Atiu 40%, Mauke 51% (Cook Islands Ministry of Agriculture and Fisheries 1979).
Kiribati	Household surveys determined the percentage of tuna in the predominantly subsistence fishery in the following islands: Abemama 5%, Aranuku 21%, Arorae 30%, Kuria 34%, North Tarawa 3%, Temana 62% (Mees, undated). Skipjack and yellowfin made up 81% of the total artisanal fish catch of 941 MT on South Tarawa in 1977–1978 (Crossland and Grandperrin 1979). Indigenous fishermen caught 12,304 kg of skipjack in the South Tarawa region in 1981 (Kiribati Ministry of Commerce and industry, undated).
Marshall Islands	Fish co-op data show that tuna composed about 23% of the 459 MT caught by small-scale fishermen on Majuro Atoll (R. Carpenter, personal communication, 1986).
New Caledonia	Skipjack and other tuna catches by the artisanal fleet in 1977 totaled 186 MT (Crossland and Grandperrin 1979).
Niue	About 35 MT of tuna and tuna-like species were caught in the 12-month period from Nov. 1985 to Oct. 1986 (B. Punu, personal communication, 1986).
Samoa	Skipjack and other tuna, mackerel, and barracuda made up 17.5% of the total annual fish catch of 1,089 MT in 1978 (Western Samoa Department of Statistics 1979). Tuna catches of the artisanal fleet increased from 413 MT in 1972 to 1,440 MT in 1982 (SPC 1984).
Solomon Islands	Tuna accounted for 12% of the total artisanal fish catches in 1977 (Crossland and Grandperrin 1979). Skipjack and yellowfin accounted for about 10% of the 6,000 MT to 10,000 MT caught by small-scale fishermen in 1986 (M. Batty, personal communication, 1986).
Tokelau	Tuna and tuna-like fish made up 19% of all fish, turtles, birds, and domestic animals taken for domestic consumption in a three-month period in 1986 (Gillett and Toloa 1987).
Tuvalu	Skipjack and yellowfin composed 50% of the total fish catch in 1978 (Crossland and Grandperrin 1979). Of the subsistence catch on Nanumea Atoll, 8.9% was made up of tuna and other pelagic species (Zann 1980).
Wallis/Futuna	Occasional fishing for tuna by only a few residents produced a catch of less than 2 MT per year (SPC 1984).

The above information on small-scale tuna fishing is somewhat dated, but there does not appear to be any more current compilation. The following more recent information is necessarily fragmented but serves to convey the significance of small-scale fishing for tuna in the region.

- In Kiribati, 14 islands were surveyed for fish catches in the period 1998 to 2000 (Tinga 2000). Weekly tuna landings averaged 8 MT per island. Tuna catches in South Tarawa, where fishing by 200 to 300 motorized skiffs takes place six days a week, amounted to about 33.8 MT in 1998 and 37.2 MT in 1999.
- In Samoa, most of the commercial catch of tuna (about 6,000 MT per year) is hauled in by longline vessels that could easily be considered “small scale.” In addition, small-scale trolling for tuna in the past years has produced about 100 MT of tuna yearly (Passfield, personal communication). This amount is likely to have increased recently with the deployment of two fish-aggregating devices (FADs) in 1999.
- In Nauru, Rodwell (1999) describes two of the most common fishing techniques: trolling around the ship mooring buoys (with an average tuna catch estimated at 20 kg per boat per day) and dropstone fishing (average tuna catch of 115 kg per boat per day).
- In FSM, 30 percent of the estimated subsistence fish catch of 6,243 MT is thought to be tuna. The small-scale commercial tuna catch is about 57 MT (Appendix A).

For the subsistence and artisanal fisheries of the Pacific Islands, the above information suggests that tunas and related species appear to have a considerably underappreciated role. Not only are these fish important, in terms of volume, tuna are the *most* important family of fish, as information on small-scale fisheries in the region suggests.

The tonnage data on the subsistence and artisanal fisheries given above do not reveal the human aspect of what may seem like meager quantities of fish. Gillett (1987) describes how some Pacific Islanders feel about the tuna from their small-scale fishery:

There is a strong heritage of tuna fishing at Satawal (central Caroline Islands). Although its soil is more fertile than that of most coral islands, the number of plants which can be cultivated is extremely limited. Taro and breadfruit make up most of the

diet. Fish produces a welcome change of food; however due to the lack of a lagoon, the reef resources are extremely small. It would indeed be a clever writer who could adequately express the jubilation caused by a sailing canoe arriving at Satawal fully laden with over a tonne [metric ton] of tuna. The crew of the canoe pound their paddles with joy while waiting offshore, old women dance and sing on the beach, and the entire population is in a state of delightful anticipation of bone-free protein. Tuna is very important to Satawal.

A beneficial aspect of small-scale tuna fishing was brought out by a recent study (World Bank 1999). At one sample site in Samoa (Manase, Savaii) alia tuna fishing was shown to be actually assisting in the management of small-scale inshore fisheries as the by-catch was sold in the village, reducing the need to fish in inshore fisheries.

A positive effect of tuna development on small-scale fisheries is becoming increasingly obvious in several Pacific Islands countries. Small-scale fisheries are able to “piggyback” on the infrastructure and economies of scale provided by industrial-scale tuna operations.

- In FSM, the existence of ice plants that serve the tuna industry allows small-scale fishermen to better preserve their catch and take advantage of export opportunities for reef or demersal fish and other marine products. Because these ice plants are usually operated, maintained, and serviced on a commercial basis, they tend to be more reliable than refrigeration or ice facilities built specifically for small-scale fishing, which rely on Government or other noncommercial means of operation.
- In PNG, commercial tuna longline fishery has been dispersed from Port Moresby to provincial bases on the New Guinea Islands region, and elsewhere. Related infrastructure developments and the establishment of marketing links at such centers are likely to provide new opportunities for small-scale fishermen to better handle and market their tuna catch. The economic opportunities created by the development of the domestic longline fleet are also thought likely to increase small-scale tuna fishing (ADB 1995b; Preston 1996; and Tutumarem Marine Consultancy Services 1999). At least one infrastructure development project—the construction of a longline vessel wharf at Kavieng in New Ireland—has taken this possibility into account in its design.

Nutrition

Nordhoff (1930) writes that skipjack

is and has been for many centuries a fish of great importance to the Society Islanders; it is no exaggeration to call it the herring of the South Seas. Its flesh is rich, palatable, and nourishing and one can eat it with relish every day.

In the outer islands of Yap in Micronesia, according to Bates and Abbott (1954), “the number one food fish in terms of importance to the island is identified as skipjack tuna.” Still referring to skipjack, Kennedy (1930) says that in Tuvalu “the flesh is highly relished, both cooked and raw, and an abundance of bonito⁹ is usually a signal for communal feasting.” Zann (1980), writing half a century later, notes that skipjack and other tunas are still very much an important food item in Tuvalu: “Tuvaluans greatly enjoy eating fish and have a word, *miti*, to describe their craving for fish. Individual tastes vary, but bonito is usually the stated favourite.” Even on large fertile islands, tuna is important. Hulo (1980) reports that in the North Solomons Province of PNG, “tuna is a highly regarded food fish which is caught in large numbers.”

The previous section showed that tuna is an important component of the small-scale fisheries in the region. Virtually all the tuna caught in those fisheries is consumed within the Pacific Islands. In general, tuna is most important in the diet of countries made up of small, resource-poor islands.

Although tuna caught by the industrial fishing fleets is often thought not to enter the food supply of the Pacific Islands, there have always been important exceptions and the situation is now changing. Solomon Taiyo (1998) sells about 1,000 MT of frozen tuna in local markets in the Solomon Islands; 20 percent of the company’s canned tuna production at Noro is consumed domestically. In Fiji, the PAFCO cannery in Levuka sells about 11 percent of its production (equivalent to about 6 percent of the country’s total consumption of canned fish, according to Gillett [1994]) on the local market (Fiji

⁹ In some Pacific Islands “bonito” refers to skipjack.

Fisheries Division 1996); such sales brought in \$2 million in 1998 (Fiji Fisheries Division 1999). In PNG, domestic sales of canned tuna have stood at 20 MT per day since January 2000 (P. Celso, personal communication). “Leakage” of frozen tuna from industrial operations into the domestic food system has always been significant at canneries and, more recently, transshipment points. The emergence of medium-scale tuna longline operations in most Pacific Islands countries has resulted in the sale of damaged tuna, undersized tuna, and by-catch on the domestic markets.

Although detailed fish marketing studies have not been made in most Pacific Islands countries, such studies that do exist bring out the prominence of tuna. Crossland and Philipson (1992), for example, in a study of fish marketing in the Solomon Islands show:

- Local sales of frozen tuna reached between 400 MT and 500 MT per year in the late 1980s and early 1990s.
- Frozen fish from the industrial fishery make up for a large portion of shortfalls in the supply of fresh fish.
- Local sales of canned tuna increased from 19,628 cases in 1976 to 163,863 cases in 1990 (equivalent to 329 MT to 2,873 MT of whole fish).
- Of all meals covered by the survey, 11.3 percent had frozen bonito and 3.5 percent had frozen by-catch from the tuna fishery.

Elsewhere in the region:

- In FSM, says Heberer (1997), while the tuna longline by-catch sold to the public in population centers is not a major component of vessel revenue, it can be an important contribution to available protein at affordable prices. One tuna company based in Pohnpei reports local sales of tuna and by-catch averaging 100 MT per year (G. Russo, personal communication). Local sales to restaurants, institutions, and the general public by another large processor based in Pohnpei averaged 24 MT per year, or 60 MT whole weight (Appendix A).
- In Samoa, tuna is important in the diet and this importance is growing, following the recent expansion in tuna longline fishing. The domestic markets sell more than 200 MT of tuna annually (Samoa Fisheries Division 1999), the equivalent of

1.18 kg per capita. Actual consumption is larger because of the tuna distributed informally and leakage from the longline fishery.

- An operator of a fleet of longliners in Fiji states that he often sells more than 10 MT of tuna and by-catch (G. Southwick, personal communication). Sales of tuna to institutions such as schools and hospitals in Fiji are also reportedly increasing.
- In Tuvalu, 50 percent of all fish sold in Funafuti is tuna (S. Maluofenua, personal communication).
- The entire catch of Palau's lone pole/line vessel in operation is sold for local consumption.

With the large importance of tuna in the diet, interruptions in supplies can understandably produce difficulties. In Pohnpei, the almost constant availability of tuna sashimi provides an important enticement to diners at restaurants. When a cholera epidemic in the state in 2000 forced the Government to ban sales of sashimi, restaurant operators, under pressure from customers, asked the Government to reconsider the ban and it was eventually lifted with new health safeguards in place (Y. Suzuki, personal communication).

It is difficult to obtain quantitative information on tuna consumption across the region. Population information from SPC (1993), fisheries information from Dalzell and Adams (1994), and nutrition information from FAO (1995a) and GPA (1997) were used to construct Table 10.

The regional per capita consumption of fish, about 55 kg per year, is substantially higher than the world average of 13.32 kg (FAO 1995b). In fact, the recorded fish consumption of some countries in the region – Kiribati, Tokelau, Tuvalu, Palau – is among the highest in the world. When Table 10 is viewed in the context of the information on small-scale fisheries in the previous section, certain features become apparent. The most notable is that fish is an extremely important part of the diet of the average Pacific Islander and that tuna makes up a substantial portion of all fish consumed, especially in the most vulnerable countries in the region.

PNG, Kiribati, Tuvalu, Solomon Islands, Vanuatu, and Samoa are categorized as low-income food-deficit countries by FAO (1995). The fact that tuna is an important part of the diet in many of these countries attests to the important role of tuna in the food security of the region.

Also relevant to food security is the fact that tuna is often landed in quantities that exceed immediate requirements. In many island communities, especially those that are remote and lack electricity, the excess catch is smoked, baked, or dried and stored for use during periods of food scarcity.

**Table 10: Per Capita Fish Consumption, Early 1990s
(kg/year)**

Country	Per Capita Fish Consumption
Cook Islands	67.8
FSM	73.4
Fiji	41.8
Kiribati	181.6
Marshall Islands	61.3
Nauru	50.0
Niue	62.3
Palau	107.7
Papua New Guinea	16.9
Solomon Islands	44.8
Tokelau	129.4
Tonga	34.5
Tuvalu	113.0
Vanuatu	27.0
Samoa	31.8

Culture

Many previous inquiries into the cultural significance of tuna focused narrowly on the contribution of tuna as food for cultural events. On islands where tuna fishing is important, its cultural influence extends into many other aspects of life including recreation, status in the community, and cultural heritage.

On many islands, fishing for tuna has been and still is a source of pleasure. While many subsistence societies have not, in the past, included a component that could be described as “leisure time,” activities that provided a large amount of excitement and pleasure while at the same time serving the more basic survival needs were looked upon with favor. The anthropological literature on the region contains many references to tuna fishing as a source of recreation, but of special interest is that fact that it is often referred to as the most important sport:

- Kennedy (1930) writes: “Easily the most exhilarating sport in the Ellice Group is the hunting of bonito.”
- In French Polynesia, according to Handy (1932), fishing for skipjack was the “most enjoyed pastime of chiefs.”
- MacGregor (1937) calls skipjack fishing “the greatest sport of Tokelau men.”
- In the Society Islands, offshore fishing “was and is their greatest sport,” says Nordhoff (1930).
- In Samoa, notes Hornell (1950), “the enthusiasm for this madly exciting sport remains as strong as ever. No blood runs so sluggish as not to course wildly with excitement as the fish are whirled aboard in a frenzied fight against time.”

In more modern times, the recreational aspects of tuna fishing have not been forgotten:

- Game fishing clubs exist in all but two FFA member countries, and most of the members and participants at the fishing competitions are local residents. More informal competitions are held in rural areas. Game fishing competitions are held yearly among villages in the northern Cook Islands and the

results are reported in the national newspapers (J. Dashwood, personal communication).

- Gillett (1987) writes: “Tuna fishing [on Satawal, Micronesia] is also fun. In a culture in which the use of the canoe is one of the most important aspects of daily life, tuna fishing is the most exhilarating use of the canoe. Even when catches are poor, hardly enough to justify a trip for the food value, there are no crew shortages. Loss of sleep, bone-chilling rain, baking sun, and hours of monotonous transit to the fishing ground aboard a pitching, rolling, jerking canoe are considered small sacrifices for the thrill of poling tuna.”
- According to SPREP (1985): “The recreational aspect of the tuna fishery [in Tokelau] is quite important – the fact that several men can hand-line tuna from one boat and that several boats can fish in the same vicinity, gives the activity a special social character. Joking and lighthearted insults, especially during the heated action of a big hookup and the accompanying fumbling, are much enjoyed.”

It is difficult to place a monetary value on the recreation provided by tuna fishing. In a study in Hawaii (Meyer 1987), the recreational and subsistence use of the catch was valued at \$30 million, but the “hedonic value” of fishing was estimated to be over \$335 million.

Fishing for tuna can be a very visible activity in small island communities, especially since the fruits of the labor can be quite impressive. In comparison to other types of fishery, tuna fishing is a relatively complex undertaking requiring considerable knowledge, fast thinking, long experience, dexterity, and physical stamina. The large amount of respect and status that a good tuna fisherman receives inspires other members of the community to emulate that success, and to some extent this has an effect on daily life. This applies not only to subsistence fishermen (e.g., Mau Pialug in the outer islands of Yap in FSM) and small-scale commercial fishermen (e.g., Tekake Williams in Rarotonga), but to industrial fishermen (e.g., Graham Southwick in Suva) as well.

In the age of satellites, computers, and skyscrapers, most Pacific Islands communities can never expect to be recognized for excellence in the more spectacular aspects of cosmopolitan life. The fact that many Pacific Islands culture groups can claim to be world-class tuna

fishermen or even the best in the world has real value to those communities and reinforces cultural pride. Although this is certainly true for residents of resource-poor islands east of the Pacific Islands region, it is also true for groups elsewhere. Ivens (1972) writes: "To the Melanesians of south-east Solomons, the catching of bonito is one of the things for which he exists."

Many ceremonies important to the cultures of the Pacific Islands involve tuna.

- A study on Solomon Taiyo (1998) reports: "Rituals surrounding the bonito [skipjack] are woven through the rich tapestry of Solomon Islands culture. Believed to have been sent by the gods, tuna presented a challenge to the skills and bravery of the Solomon Islands fishermen. In many parts of the Solomon Islands boys were initiated into adulthood by learning the mysteries and skills of bonito fishing through the ritual ceremony known as maraufu or malaohu. The importance of the bonito rites was reflected in the intricate artwork of the sacred bonito canoes and canoe houses. Carved with images of bonito, sharks, frigate birds, and fishermen, the canoes and canoe house posts represent the largest and most impressive examples of Solomon art."
- Gillett (1985) indicates that in Tokelau a thorough knowledge of tuna fishing is an important prerequisite for young men to undergo the ceremony of *kau kumete*, in which the highly esteemed title of *tautai*, or masterfisherman, is conferred. A *tautai* is considered the repository of tuna fishing information, which has been accumulating for hundreds of years.
- Buck (1930) describes the elaborate Samoan customs and ceremonies associated with tuna fishing gear manufacture, fishing nomenclature, and tuna catch distribution.
- Strict taboos and ceremonies surrounded tuna fishing activities and the consumption of tuna on many islands and atolls of the central Carolines, a strong indication of the reverence and importance attached to the resource. For example, on Satawal island, when skipjack tuna were brought ashore after a fishing expedition they were not treated carelessly and were butchered and divided only by respected senior members of the community (Hijikata 1987).

In the Pacific Islands, cultural importance is sometimes reflected in handicraft production. Close examination of a high-quality handicraft outlet can reveal a surprising number of artifacts related to tuna fishing. The women’s handicraft shop in Tuvalu, for example, regularly offers for sale tuna lures, gear boxes for tuna fishermen, and models of tuna fishing canoes complete with miniature poles/lures and carved wooden tuna. The beautiful pearl-shell tuna lure, considered by many to be the most characteristic fishing gear of the Pacific Islands (Anell 1955), is sold in handicraft shops in Honiara, Vila, Pohnpei, Tarawa, Funafuti, Apia, Yap, and Tongatapu, and is on display as well in many museums in the region and around the world.

Items such as coins, stamps, and flags often celebrate important aspects of a nation’s identity. The fifty-cent coin of the Cook Islands features a yellowfin. Pacific Islands countries have issued stamps depicting tuna, tuna fishing, tuna fishing gear, and even tuna research. The flag of the Tokelau interisland vessel features a tuna pearl-shell lure. This design was chosen after a nationwide competition.

Figure 4: Tuna, Tuna Fishing, and Tuna Fishing Gear on Pacific Islands Stamps



The Importance of Tuna in the Future

For various reasons, tuna will inevitably assume a much larger profile in the Pacific Islands in the medium- and long-term future. Tuna is likely to increase in significance in a number of sectors, two of which are especially crucial: (1) as a foundation for future economic development and (2) for food security. The resource must be able to provide for both of these sectors, to the detriment of neither one.

Foundation for Future Economic Development

Economic growth in the Pacific Islands area as a whole has been poor during the past decade (Forum Secretariat 2000; SPC 1998). Given this fact, plus the rate of population growth, the outlook is predictably gloomy. The population of the Pacific Islands is now growing at an annual rate of 2.2 percent, high relative to the world average of 1.8 percent. The population problem is arguably the most pressing for the Pacific Islands economies. The Pacific Human Development Report (UNDP 1994) states:

Throughout the decade of the 1990s most Pacific Island countries have experienced little economic growth.... Generally around the region population growth outstrips economic growth and fuels unemployment problems compounded by the declining viability of the semi-subsistence sector that has traditionally absorbed surplus labour.... Perhaps the most critical issue confronting Pacific Islands countries is how to provide all people with a secure, sustainable livelihood that meets their aspirations and counters the growth of poverty.

Consider:

- In FSM, from 1988 to 1997 the population increased at a rate 12 times the rate of employment growth (Bank of Hawaii 2000).

- In the Solomon Islands, 7,500 leave school each year (UNDP 1997), and there has been little, if any, growth in employment in the past decade.
- The labor force in PNG is growing at a rate of 3.2 percent per year (UNDP 1997e). In the decade between 1989 and 1997, according to AusAID (2000), there was no net growth in formal employment in the private sector.
- In Samoa, the economically active population and the potential labor pool far exceed the wage jobs available, and the gap will widen over time, given the slower rate of job creation (UNDP 1997e).
- UNDP (1999a) suggests that by the year 2010 the labor force in many of the countries will outnumber the wage-paying jobs by five to ten times.

In the past much of the growth in formal employment in the Pacific Islands was created by greatly expanding the public sector. Now with economic reform programs under way, public-sector employment is being cut back significantly, and this will add to unemployment.

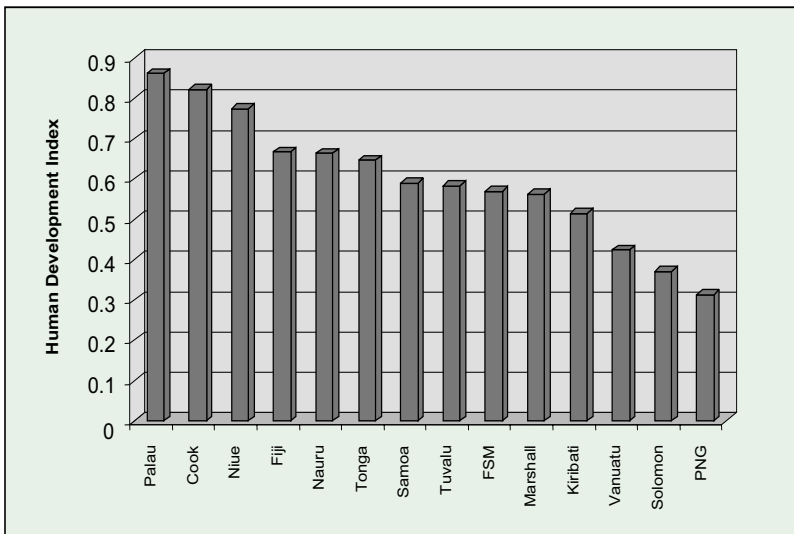
To make matters worse, the economies of the region stand to face additional difficulties. Many countries will lose or receive reduced benefits from preferential trade arrangements as a result of higher tariffs to European markets, lower prices for sugar approaching prices on the world market, and downscaled SPARTECA¹⁰ provisions. In addition, there is likely to be a winding down of development assistance to the region (currently a large \$1.2 billion), less remittance income from relatives overseas, fewer opportunities for emigration, a reduction in grant aid from the US or its outright termination (for US-affiliated Micronesia), depletion of forests (for Melanesia), economic disruption from land tenure difficulties (for Fiji), and loss of phosphate income (for Nauru). Forum Secretariat (2000) adds to this list: "vulnerability to the forces of nature, their geographic isolation from trading centers, political and social instability (in some member countries), and unsustainable levels of external and domestic debt levels."

¹⁰ For "South Pacific Regional Trade and Economic Arrangement," whereby certain commodities imported into Australia from participating Pacific Islands countries are eligible for duty reductions.

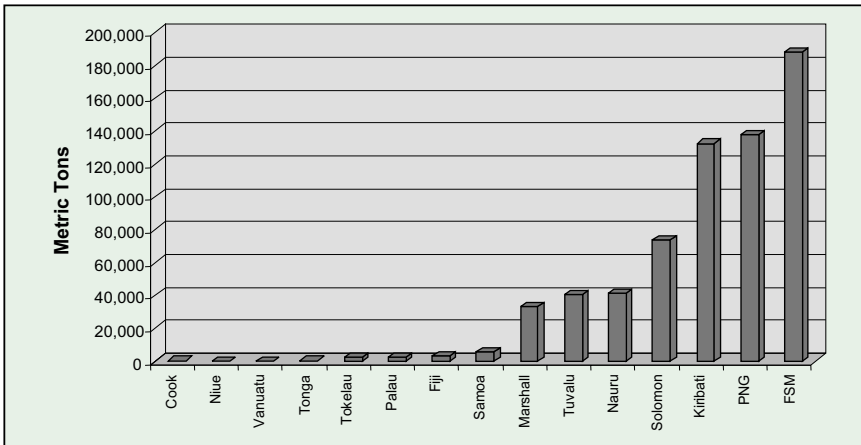
In the future Pacific Islands climate of economic stagnation, very high population growth, mounting unemployment, and severe shocks, it is inevitable that the currently underexploited tuna resources of the region will assume an importance very much greater than at present. Quite simply, most countries have few, if any, alternatives.

Fortunately, those Pacific Islands countries that are in the most desperate development situation appear to be the countries with the greatest tuna resources available for future development. UNDP (1999a) has applied its Human Development Index (HDI) – a measure of length of life, access to knowledge, income, and other factors – to Pacific Islands countries. The results are shown in Figure 5.

Figure 5: Human Development Index for the Pacific Islands Countries, 1999



With the exception of Vanuatu, all of the relatively poor Pacific Islands countries could be considered “tuna countries.” The 1999 tuna catches (Figure 6, from the information in the section “Tuna Landings in FFA Island Member Countries”) provide one indicator of endowment with tuna resources.

Figure 6: Tuna Catch of the Pacific Islands Countries, 1999

The poorest Pacific Islands countries have considerable tuna resources, which could be developed using technology available today.¹¹ This “capital for development” will undoubtedly become more important in the future – and even more valuable, considering the fully exploited nature of most of the world’s fishery resources. Hence, the need for effective conservation and management of the region’s tuna.

Future Food Security

Because the demand for fish in the Pacific Islands is strongly linked to population, changes in population should correspond to some extent to changes in demand. According to SPC (1993), between 1990 and 2010 the population of the region will increase from 6,068,000 to 8,871,060, or by 46 percent. SPC (1998a) points out that the present rate of population increase in the region, 2.2 percent, is equivalent to adding a population the size of Vanuatu’s to the region each year. Using per capita fish consumption information from Table 10, this would result in a demand for fish of 166,776 MT by 2010, or 58,535 MT more than in the early-1990s.

¹¹ From the calculations done for the “Access Fees” section above, the seven least developed countries of the region now receive 90 percent of the access fees.

Where will the extra 58,535 MT of fish come from? Many of the region's inshore and coastal fisheries are already fully exploited, especially in areas where the population increases are projected to occur, and major increases in fish from those areas are not expected. On the contrary, increased fishing, destructive fishing practices, and degradation of coastal zone environments are likely to reduce the amount of fish from inshore and coastal areas. The rapidly expanding economies of Asia and their huge markets for some inshore species may further aggravate the overfishing.

The most likely scenario is that per capita fish consumption from inshore and coastal areas will decrease. This could be compensated for by fish imports, but the future economic situation (see "Foundation for Future Economic Development" above) indicates decreased ability to pay for food imports. The inescapable conclusion is that, in order to maintain nutrition standards, Pacific Islands countries must make greater use of the region's tuna resources as food for their people.

FAO (1995a) comments on this situation:

To maintain per capita fish consumption levels, governments should consider greater utilization for local food of the catch from tuna fisheries. This could occur either by requiring retention of non-target species, encouraging local sales by the industrial fleet of a portion of the fish which are normally delivered to canneries for shipment out of the region, or encouraging tuna fishing activity by small and medium scale commercial operations.

Conclusions

The benefits to FFA Pacific Islands member economies from industrial-scale tuna fishing are large: \$60 million in access fees, 25,000 jobs, expenditures approaching \$130 million, and substantial miscellaneous benefits. Small-scale fisheries are critically important for their employment, nutritional, recreational, and cultural value.

Pacific Islands countries are certainly dependent on their tuna resources at present and it is inevitable that this importance will grow in the future, especially considering the scarcity of other natural resources in many Pacific Islands countries, stagnating economies, likely economic shocks, and rapidly increasing population. Because effective conservation and management of the tuna fishery is required to assure sustainability of the resource, these interventions will ultimately have a major effect on the quality of life in Pacific Islands countries.

Appendixes

Appendix A: The Importance of Tuna to the Federated States of Micronesia

Quantity of tuna caught in the country

- From 1991 to 1999, the FSM Exclusive Economic Zone (EEZ) yielded about 1,250,300 metric tons (MT) of tuna catch. Of this amount, 86.3 percent was caught by purse seine, 8.8 percent by longline, and 4.8 percent by pole-and-line vessels (MMA 2000).
- Provisional figures of the Micronesian Maritime Authority (MMA) for 1999 show a total of 188,028 MT caught in the EEZ – 92 percent by purse seine, 7.5 percent by longline, and the rest by pole-and-line vessels. In 1999, the total catch consisted of skipjack (74 percent), yellowfin (20.5 percent), and bigeye (4.6 percent) (T. Park, personal communication).
- From 1991 to 1999, longline vessels caught 38,836 MT of (sashimi-grade) tuna. Of this type of catch, 1,725 MT were exported in 1999 (Sitan 2000).
- Data on artisanal fishing activities are scanty; however, one survey in Pohnpei (OFCF 1995) estimated that 444 kg of pelagic fish, assumed to be mostly tuna, were caught and sold locally each week. Extrapolating this figure to artisanal activities and economic conditions in other states gives an average of 1,100 kg of tuna per week, or 57 MT per year, entering local commerce.
- Given the population distribution and the geography of the islands that also limits access to central markets, the subsistence catch is thought to be much larger. Citing earlier studies, FAO (1997) estimates the annual subsistence catch at 6,243 MT. Tuna is thought to compose around 30 percent of this catch (1,900 MT).
- The foreign catch makes up the bulk of the catch in the FSM tuna fishery. In 1999, foreign vessels accounted for all pole-and-line catch, 92 percent of the longline catch, and 91 percent of the purse seine catch (MMA 2000; T. Park, personal communication).

Value of tuna caught in the country

- Using the available figures cited above and an average price of \$2.75/kg¹ for tuna caught in artisanal fisheries, it is estimated that \$240,000 worth of tuna is sold in local markets annually.
- Although the subsistence catch does not enter commerce, the SPC Coastal Fisheries Program (cited in OFCF 1998) estimated its value at \$1.80 per kg, or \$3.42 million.
- About \$336 million worth of tuna caught by longline vessels was exported from 1991 to 1999. The total value of such exports from the country in 1999 was \$15.6 million (Sitan 2000).
- FSM-based purse seiners caught \$5.22 million worth of fish in 1999 (ADB 2000).
- Local sales and exports of tuna in 1999 fetched an estimated \$15.84 million.
- Sharks compose the largest portion of the by-catch of longline vessels in FSM. About 25 percent of sharks caught by foreign longliners are retained (Heberer 1997). All shark fins are retained for sale by the vessel crew, and such sales can result in bonus income above their regular salaries or shares. McCoy and Ishihara (1999) estimate that each member of the crew of a longline vessel fishing in the western Pacific can expect to receive from \$409 to \$827 per year from shark fin sales alone. At the higher value, this would represent over two months' wages.

Tuna exports

- Tuna is the top export of the country. In 1996, the last year for which total export data are available, the Government recorded total exports of \$10.4 million, of which fish exports were \$9.83 million, or 94.5 percent (FSM 1998). Tuna composed about 95 percent of fish exports (P. Sitan, personal communication) and, hence, accounted for about 90 percent of the value of all exports.
- In addition to exports of tuna landed in FSM, about 90,500 MT of tuna were transhipped through FSM ports by purse seiners in 1999 (MMA 2000). Payments to the private sector for services

¹ All dollar figures, unless otherwise specified, are in US dollars.

and supplies, such as food, accommodation, rental cars, and minor repairs, total an estimated \$4,000 per transshipment port call (McCoy and Gillett 1998). In 1999, transshipping purse seiners in FSM ports made \$2.23 million in such payments to the private sector.

Access fees

- MMA records show that, since 1979, FSM has received over \$170 million in EEZ access fees paid for tuna fishing rights.
- In fiscal year 1999, receipts from access fees totaled \$15.4 million (FSM 1999; MMA records)
- In January 2000, seven bilateral and one multilateral foreign fishing agreements were in place. In addition, there were nine agreements with locally based foreign vessels.
- Besides the revenue from bilateral arrangements, a multilateral treaty with the United States, which is administered by the Forum Fisheries Agency, gives FSM about \$110,000 more annually. This amount is tied to fisheries development projects.
- Japanese associations make an annual payment of goods and services as part of the access agreement. The payment in 1999 was valued by MMA at \$550,000 (E. Pangelinan, personal communication).
- In FY 1999, access fees represented about 39 percent of the nontax revenue and 22 percent of the total domestic revenue of the national Government.

Tuna vessel fines

- Fines levied for illegal fishing and other infractions in the FSM zone have been substantial. According to Department of Justice records, more than 70 cases have been brought at the national level for illegal fishing or other transgressions since 1979. In all, fines or settlements amounting to more than \$3.65 million have been collected, and eight vessels have been forfeited to the Government.
- In 1999, two longliners were convicted of illegal fishing, and four more cases were pending (MMA 2000).

Direct employment in the tuna industry

- Using the most recent estimates of the number of local longliners and purse seiners, about 254 people from FSM, 86 of them FSM citizens, are believed to be working on locally based tuna vessels.
- More recent estimates from Gillett and McCoy (1997) show that 150 FSM citizens are employed aboard foreign tuna vessels.
- Tuna enterprises, including processors and exporters, employ 178 FSM citizens.
- Artisanal tuna fishing provides about 200 jobs.
- It therefore appears that about 614 people from FSM are directly employed in the tuna industry.
- Wage-paying jobs in FSM totaled 18,669 in 1997, including 8,752 jobs in the private sector (FSM Social Security Administration, quoted in Bank of Hawaii 2000). The more than 614 jobs held by those directly employed by the tuna industry represent a substantial portion of the wage-paying jobs in the country.
- Private-sector jobs in FSM account for about \$24 million in wages (Bank of Hawaii 2000). The amount of the tuna industry payroll is not known, but assuming that the average wage in the industry reflects the average wage in the private sector as a whole, direct employment in the tuna industry would account for \$1.14 million in wages, or about 7 percent of all wages in the private sector. The proportion would be significantly larger if indirect employment in tuna-related industries and employment generated by spinoffs were considered.

Indirect and spinoff employment

- A variety of different types of jobs are closely connected to the tuna industry in FSM. Machine shop employees, welders, and others that provide minor vessel and machinery repair hold these types of jobs.
- Professional fees such as those paid for legal and accounting services are also associated with the tuna industry. One fleet

operator based in Pohnpei spends about \$2,500 annually per vessel for such services provided in the country.

- Others whose jobs indirectly relate to the tuna industry are fiberglass boat repairers and outboard engine mechanics who service the artisanal vessels, as well as fishing gear store salesmen, workers in the ice plants, refrigeration specialists, sellers of the tuna by-catch, fuel suppliers, staff of the shipping and air cargo agencies, and providers of groceries and supplies for the tuna vessels. Such jobs are significant in number but are difficult to quantify.
- The 600-plus people directly employed in the tuna industry and the people working in jobs closely associated with the tuna industry create greater demand for consumer goods and services, resulting in greater total employment in the economy.

Other employment considerations

- MMA, the government fisheries management agency, is responsible solely for the management of tuna fisheries. Its staff of 28 comprises 10 full-time office staff, 12 observers, and 6 port samplers.
- About 10 percent of those directly employed in the tuna industry are women.
- A significant amount of nonurban tuna-related employment aboard vessels is due to the outer islanders' reputation as seamen. Given the relatively small population of the outer islands relative to the urban areas, the employment of these outer islanders tends to have a greater impact.
- The availability of air freight services allows the cost-effective export of agricultural and fisheries commodities to Guam and elsewhere.
- Given the Government's stated policy of downsizing the public service, it is recognized that there will be fewer public-sector employees in the future. Jobs directly or indirectly related to the tuna industry (the vast majority of which are in the private sector) will become more important as this transition progresses.

Expenditures of locally based vessels

- The 47 locally based longline vessels in FSM spend about \$6 million per year on supplies, consumables, and services.
- Wages represent about 20 percent to 25 percent of the expenditures of longline vessels; FSM citizens, who make up 22 percent of the crew of longline vessels, earn \$440,000 in personal income from those wages.
- The locally based purse seine fleet appears to be spending about \$970,000 locally.

Government revenue from direct taxation of the tuna industry

- Figures provided in McCoy and Gillett (1998) indicate that Government revenue from both national and state levies and charges placed on purse seine transshipments amounted to \$1.11 million in 1999.
- In 1999, the national revenue from the import duty on diesel fuel used by the marine sector was about \$120,000; almost all of the fuel was used by the tuna fishing industry. This amount was 25 percent of all import duties on diesel fuel in the country (FSM Dept. of Economic Affairs, unpublished data.)
- Significant national revenue is also derived from the import duty on frozen longline bait. From estimates of expenditures by domestic vessels representative of fishing activities in FSM, it is calculated that the 47 locally based longliners generate \$140,000 in tax revenue per year from bait purchases.
- Other national, state, and municipal taxes generate around \$50,000.

Small-scale fishing

- Each year, trolling for tuna produces about 57 MT of tuna, which enters the local market.
- Subsistence fishing yields about 1900 MT per year.
- The ice plants serving the tuna industry allow small-scale fishermen to better preserve their catch and take advantage of export opportunities for reef or demersal fish and other marine products. Because these ice plants are usually operated, maintained, and serviced on a commercial basis, they tend to

be more reliable than refrigeration or ice facilities for small-scale fishing that rely on government or other noncommercial means of operation.

- Subsistence catches of tuna, mainly in the outer islands, are taken by handline and by trolling with outboard-powered motorboats or by canoe. In some islands of the central Carolines, fishing with pole and line by canoe can result in significant catches of over 1 MT per canoe per day during periods of high tuna abundance. This important food source is smoked or preserved in other ways for use later on when the weather inhibits fishing activity and access to tuna or other protein sources (Gillett 1987; Lieber 1994).
- Some atolls are able to close off lagoon passages with large nets to trap large schools of tuna within the lagoons. Such activities can result in substantial quantities of tuna for subsistence use, which are able to feed the entire island for weeks at a time (Bates and Abbott 1954). These and other activities focused on capturing tuna also serve to reduce inshore fishing on some coral reefs.

Nutritional value

- Tuna is important in the diet. Government figures (cited in Bank of Hawaii 2000) show the population of FSM to be 116,268. Annual per capita consumption of tuna is about 18.5 kg.
- No data on locally sold fish, including tuna or by-catch, have been collected. However, one company based in Pohnpei reports local sales averaging 100 MT per year (G. Russo, personal communication). Local sales to restaurants, institutions, and the general public by a large processor based in Pohnpei average 24 MT per year, or 60 MT whole weight. Lesser amounts are sold in the other three states, but the total for the country as a whole is estimated to be 200 MT.
- Thus, more than 257 MT of tuna are sold through domestic markets annually.
- The by-catch landed by locally based longline vessels is offloaded in FSM for local consumption or for processing and export. Among the major by-catch species landed are billfish, barracuda, dolphin fish, and wahoo. For processing and export, the most important species is swordfish. Heberer (1997)

estimates the swordfish catch as 33 percent of all billfish by-catch of longline vessels in FSM. While not producing a major component of vessel revenue, the sale of this by-catch to the public in population centers can be an important contribution to available protein at affordable prices.

- The almost constant availability of tuna sashimi provides an important enticement to diners at restaurants in FSM. When a cholera epidemic in Pohnpei forced the Government to ban sales of sashimi, unhappy customers put pressure on restaurant operators to seek a reconsideration of the ban, which was eventually lifted with new health safeguards in place (Y. Suzuki, personal communication).

Cultural and recreational value

- The Pohnpei Fishing Club has about 60 members. Each year the club conducts eight or nine fishing competitions in which tuna figure prominently. The opportunity to advertise products in FSM draws outside sponsors.
- Hotels in both Pohnpei and Yap offer tuna fishing as a recreational activity for their guests.
- The current and historical importance of tuna fishing activities in the local culture has been documented by ethnographers and is reflected in daily life in Micronesia.
 - Gillett (1987) says: "It would indeed be a clever writer who could adequately express the jubilation caused by a sailing canoe arriving at Satawal [outer islands of Yap] fully laden with over a tonne of tuna. The crew of the canoe pound their paddles with joy while waiting offshore, old women dance and sing on the beach, and the entire population is in a state of delightful anticipation...."
 - According to Lieber (1994), "Ritually and economically, tuna fishing was the single most important fishing activity in the community."
 - Bates and Abbott (1954), on the other hand, write: "The number one food fish in terms of importance to the island is identified as skipjack tuna."
 - Strict taboos surrounded tuna fishing activities and the consumption of tuna on many islands and atolls of the central Carolines, a strong indication of the reverence and

importance attached to the resource. For example, on Satawal island, skipjack tuna brought ashore after a fishing expedition were not treated carelessly and were butchered and divided only by respected senior members of the community (Hijikata 1997).

- The importance of tuna and tuna fishing is evident in the availability of handicraft items available in some stores in Micronesia, especially in the western areas. Traditional tuna fishing lures, tackle boxes, and associated fishing gear are offered for sale to tourists and others as examples of implements important to the culture of the islands.
- Various tuna species have been featured on FSM postage stamps.

Future importance

- Recognizing the importance of tuna to the country, the Plan for the Management of Tuna in the Federated States of Micronesia emphasizes the need for proper management of the country's tuna resources to protect its economic security. The plan identifies these major goals of tuna fisheries management:
 - Obtaining national revenue from fees paid for access to FSM tuna resources
 - Encouraging investment in enterprises related to tuna fisheries that will support development and provide economic and social benefit
 - Promoting employment opportunities that will contribute to the national economy
 - Developing international relationships beneficial to FSM
- FSM has made a large amount of capital available in the form of grants for tuna fisheries infrastructure and development, in recognition of the future importance of tuna. Direct foreign aid grants to the fisheries sector from one donor were valued by FSM Foreign Affairs at \$40 million over the past two decades (Raigutel, personal communication). Of that amount, about 10 percent, or \$4 million, directly supported the acquisition of tuna fishing equipment and supplies, while the remaining \$36 million supported tuna fisheries and other activities at the commercial and artisanal levels.

- The more than \$110 million invested directly in the sector (FFA 1994) is an indication of the importance given by the FSM national and state governments to tuna fishing and related projects.
- The national income from foreign tuna fishing vessels forms a large part of the income of the national Government, and the importance of this contribution is likely to grow as grant aid funds from the US lessen.

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Appendix B: The Importance of Tuna to Samoa

Quantity of tuna caught in the country

- The alia catamaran longline fleet caught 5,747 metric tons (MT) of tuna in 1997, 6,072 MT in 1998, and 5,156 MT in 1999 (Watt and Moala, 2000b). Of the yearly catch, about 70 percent was albacore, 12 percent yellowfin, 5 percent bigeye, and 4.5 percent skipjack (Passfield and Mulipola 1999). Tuna caught through other means added another 100 MT or so to these quantities. Samoa Fisheries Division (1999) reports a total catch of 4,971 MT for the financial year 1998/99, including 4,757 MT of tuna exports and 214 MT sold in the domestic market.
- According to Cusack and Stanley (1999), foreign longline vessels have fished in Samoa's waters since the 1960s. Their total catch has averaged between 200 MT and 500 MT, of which 75 percent has been albacore, 15 percent yellowfin, and 7 percent bigeye tuna. The Samoa area has attracted low to moderate longline vessel fishing relative to other parts of the region. The highest catch by foreign vessels was recorded in 1994 (1,050 MT). Data in Passfield and Mulipola (1999) show that Japanese, Korean, and Taiwanese longliners caught about 11,000 MT of tuna and other pelagic species between 1962 and 1994 in the vicinity of Samoa.
- The annual tuna catch in recent years has been about 25 percent higher than the catch of inshore species in subsistence fisheries.

Value of tuna caught in the country

- An estimated S\$600,000 worth of tuna is sold in the domestic market (Samoa Fisheries Division 1999).
- Tuna exports fetched an estimated S\$33 million for the 1998/99 financial year (Samoa Fisheries Division 1999) and S\$27.5 million for the 1999 calendar year (Watt and Moala 2000b). Boyle (1999) places the tuna exports for 1998 at S\$22.4 million.
- Shark fins valued at about S\$250,000 annually are also taken while tuna fishing.

- Recent local sales and exports of tuna appear to have reached a combined annual value of about \$10 million.¹

Tuna exports

- Tuna is now the most important export of Samoa. Unpublished information from the Samoa Treasury Department shows that fish made up 71.8 percent of the country's exports in 1999, and information in Watt and Moala (2000b) suggests that tuna or fish caught while fishing for tuna made up 82 percent of all fish exports. Hence, the tuna industry was responsible for about 60 percent of all exports from the country in 1999.
- World Bank (2000) reports that the growth of the Samoa economy in 1999 exceeded expectations and that the export of tuna for canning was a key contributor to that growth.

Access fees

- The US purse seine fleet and a foreign longliner based in Pago Pago are the only foreign vessels that are currently licensed to fish in the Samoa Exclusive Economic Zone (EEZ).
- Under the multilateral treaty with the United States that is administered by the Forum Fisheries Agency, Samoa receives \$148,000 yearly as its share in access fees. A further \$110,000 annually is tied to fisheries development projects.
- The lone foreign longline vessel licensed to fish in the Samoa EEZ pays S\$6,000 in access fees.
- According to the fee schedule of the Samoa Fisheries Division, locally based longliners generate about S\$65,000 in fees.
- Access arrangements for foreign and domestic vessels generate about \$281,233 in revenues and associated benefits yearly.

¹ Although there was some variation in exchange rates during the period under consideration, a constant rate of S\$3 = US\$1 is used in this report. Dollar figures, unless otherwise specified, are in US dollars.

Tuna vessel fines

- Fines for illegal fishing in the Samoa zone have been substantial. In the 1980s, a US purse seiner was fined \$100,000 and a Taiwanese longliner, \$125,000 (Fa'asili, personal communication).

Direct employment in the tuna industry

- The most recent estimates of the number of local longliners (Passfield 2000) and the size of the crew on vessels of various size categories (P. Watt, personal communication) indicate that about 455 people work on locally based tuna longliners.
- The tuna processors and exporters in Apia now employ 55 Samoans.
- An indicator of the extent of formal employment in Samoa is the 23,009 people paying into the National Provident Fund in 1999. The more than 510 jobs in Samoa aboard tuna vessels or at the Apia-based processors and exporters therefore represent a substantial portion of the wage-paying employment in the country.
- Gillett and McCoy (1997) report that 53 Samoans were employed aboard US tuna vessels. The number of Samoans working in the US purse seine fleet is likely to have increased in the last few years, says an official of the US National Marine Fisheries Service based in Pago Pago (G. Yamasaki, personal communication).
- About 3,500 people from independent Samoa are employed at the two canneries in Pago Pago, according to ASG (1999) and officials of the canneries.
- Therefore, about 4,070 people in Samoa are directly employed in the tuna industry.

Indirect and spinoff employment

- Various types of jobs are closely connected to the tuna industry in Samoa. These include aluminum boatbuilders/repairers, outboard engine mechanics, fishing gear salesmen, workers in the ice plants, refrigeration specialists, sellers of the tuna by-catch, fuel suppliers, staff of the shipping and air cargo

agencies, and providers of groceries and supplies for the tuna vessels. Such jobs are significant in number but difficult to quantify.

- The third category of tuna-related employment is the indirect spinoff employment resulting from links to other sectors of the economy. The 4,020 people directly employed in the tuna industry and the people working in jobs closely associated with the tuna industry create greater demand for consumer goods and services, resulting in greater total employment in the economy. Although the increase in total employment attributable to the industry is difficult to quantify, Samoa Government (1999) states that the tuna industry has increased the cash earnings of a wide range of households throughout Samoa, creating a direct flow-on effect on the commerce sector and a significant impact on the rest of the economy.

Other employment considerations

- About 58 percent of the Samoans employed at the Pago Pago canneries (2,030 people) are women.
- Because about 40 percent of the longliners in the country are based outside Apia (including 20 percent on Savaii), there is a significant amount of nonurban tuna-related employment aboard the vessels.
- World Bank (2000) indicates that a key issue for the Samoa Government is downsizing the public service. In the future environment of less public-sector employment, jobs directly or indirectly related to the tuna industry (the vast majority of which are in the private sector) will become more important.

Expenditures of locally based vessels

- Stanley and Toloa (1998) report that between 600 and 800 fishing trips are made by the alia fleet in an average week, each trip requiring between S\$200 and S\$500 in expenditures for fuel, bait, food, and crew wages. This information suggests that the annual expenditures of the alia fleet are in the order of S\$10 million.
- More recent analyses (Passfield and King 2000) show that an alia fleet of 121 active vessels, doing 65 trips per year, would

have local expenditures of S\$8.4 million for fuel, bait, ice, food, gear, and wages.

- The 20 locally based tuna longline vessels larger than 10 meters spend about S\$8 million locally per year.
- The entire locally based tuna longline fleet appears to be spending about \$5.5 locally each year.
- Wages paid (about \$2.2 million) represent about 40 percent of the expenditures by the vessels.

Government revenue from direct taxes on the tuna industry

- Most of the direct taxes on the industry take the form of levies on the fuel used by the longline vessels. According to the schedule of tax rates from the Samoa Treasury Department, the 121-vessel alia fleet pays about S\$1.8 million in taxes on fuel each year, including import duties and the value-added goods and services tax (VAGST). The 20 larger vessels in the longline fleet pay about S\$.7 million.
- Expenditures for bait and gear by the entire local longline fleet result in about S\$.6 million in taxes.
- The local longline fleet pays about \$1 million annually in direct import duties and VAGST for fuel, bait, and equipment.

Small-scale fishing

- Trolling for tuna produces about 100 MT of tuna annually (K. Passfield, personal communication). This amount is likely to have increased recently with the deployment of the two fish-aggregating devices (FADs) in 1999.
- A World Bank study (World Bank 1999) showed that at one site sampled in Samoa (Manase, Savaii) alia tuna fishing was actually assisting in the management of small-scale inshore fisheries as the sale of the by-catch in the village reduced the need for inshore fishing.

Nutritional value

- Tuna is important in the diet of Samoans and, with the recent expansion of tuna longline fishing, this importance is growing.

- More than 200 MT of tuna, or about 1.18 kg per capita, is sold in the domestic market (Samoa Fisheries Division 1999). This actual figure is larger because of the informally distributed tuna and leakage from the longline fishery. The 1.18 kg per capita consumption is significant compared with the 19 kg per capita fish consumption estimated by FAO (1993) for urban households.

Cultural and recreational value

- There are three commercial sport fishing operators in Samoa. One of these has about two charters per week and charges \$300 per half-day trip (P. Meredith, personal communication).
- Each year for the past five years an international sport fishing competition has been held in Samoa. The 2000 competition attracted 60 foreign competitors and an equal number of international spectators, who spent about S\$200,000, plus vessel charters and airfare.
- Activities revolving around tuna fishing are quite important in Samoan culture. Hornell (1950), describing traditional tuna fishing in Samoa, states: "The enthusiasm for this madly exciting sport remains as strong as ever. No blood runs so sluggish as not to course wildly with excitement as the fish are whirled aboard in a frenzied fight against time." Buck (1930) describes the elaborate customs associated with the manufacture of tuna fishing gear, the naming of fish, and the distribution of the tuna catch. In their classic reference on Pacific Island canoes, Haddon and Hornell (1936) call the bonito [skipjack] canoe of Samoa "the most graceful of all Polynesian canoes."
- Replicas of traditional Samoan tuna lures sold in handicraft stores in Apia reflect the importance of tuna in Samoan culture. Post Office officials also point out that various tuna species have been featured on postage stamps.

Future importance

- UNDP (1997) examines the employment situation in Samoa from 1986 to 2011 and shows that both the potential labor pool and the economically active population are much larger and

are increasing at a faster rate than the number of wage jobs. Jobs in the tuna industry (almost all of which are wage-paying) will therefore assume greater importance.

- According to officials of Star-Kist Samoa Incorporated, a tuna loining plant might be established at Asau on the western side of Savaii. The plant would provide more than a hundred jobs to start with and about 1,600 jobs eventually (Pacific Magazine 2000).
- Tuna fishing appears to have successfully reversed the fisheries sector's "state of continuous decline over the last decade" (AIDAB 1994), and there are indications that it will continue to do so in the future.

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Appendix C: The Importance of Tuna to Papua New Guinea

Quantity of tuna caught in the country

- Kumoru and Polon (2000) estimate the total annual PNG tuna catch to be 155,188 metric tons (MT) in 1997, 128,765 MT in 1998, and 72,647 MT in 1999. Using provisional 1999 logsheet data, it is estimated that about 138,000 MT were caught in 1999.
- Sanders (1999) states that the average purse seine tuna catch for the five years since 1993 was 296,000 MT, and the average for the longline fishery since 1991 was 534 MT.
- The Information Register of the PNG National Fisheries Authority (NFA) shows that in the five years from 1995 to 1999, 609,075 MT of tuna were caught in the PNG Exclusive Economic Zone (EEZ). Almost all of this catch (99.8 percent) came from purse seine vessels. Domestic longline vessels accounted for most of the balance.
- In 1998, the purse seine catch comprised skipjack (77.2 percent), yellowfin (22.1 percent), and other species. The longline catch that same year was made up of yellowfin (77.4 percent), albacore (11.7 percent), bigeye (5.7 percent), and other species (NFA Information Register)
- In recent years the nominal annual purse seine catch from the EEZ has exceeded 200,000 MT on three occasions (1989, 1991, and 1995). Allowing for underreporting by some fleets, the annual catch is believed to have reached more than 200,000 MT in 1989–1992 and 1995, and more than 350,000 MT in 1991 (South Pacific Commission 1997).
- Data on the tuna catch in subsistence and artisanal fisheries are scanty.

Value of tuna caught in the country

- According to unpublished NFA data, the total landed value of the tuna catch in 1998 was about \$140 million.¹

¹ Unless otherwise specified, dollar amounts are in US dollars.

Tuna exports

- Tuna exports amounted to \$39.5 million in 1998 and \$29.3 million in 1999 (NFA export receipts). In 1999:
 - The lone tuna cannery operating in PNG (RD Tuna Cannery) exported 5,587 MT of canned tuna to the US, Philippines, and Europe in 1999. This export was valued at \$12.3 million (NFA export receipts).
 - Other tuna products exported in 1999 were frozen tuna (\$14.3 million), fresh chilled tuna (\$2.6 million), and dried tuna (\$0.08 million) (NFA export receipts).
- The tuna fisheries also exported shark fins valued at about \$500,000.
- The tuna industry accounts for between 1 percent and 2 percent of all exports from the country including exports from the major mining and petroleum industries.

Access fees

- For 2000, access arrangements resulted in the payment of \$10,534,495 in fees plus \$706,125 for training levies, observer fees, and technical assistance (NFA and Forum Fisheries Agency data).
- Access fees paid in late 1999 and early 2000 included \$2,808,000 for Korean vessels and \$4,104,000 for vessels from Taipei, China (NFA 2000b). NFA (2000a) shows that these vessels paid an additional \$682,000 for observers, training levies, and fisheries development projects.
- Sanders (1999) states that \$3,067,012 was paid in the 9th (1996–1997) and \$1,382,194 was paid in the 10th (1997–1998) licensing period of the US multilateral treaty, for an average annual payment of \$3.8 million over the 10 periods. In the 11th licensing period PNG received \$1,688,855 (FFA 2000).
- In 1998, \$16.4 million in access fees was collected from vessels of Korean, Philippine, Vanuatu, Taipei, China, and US registry (McCoy 1998).
- PNG has collected about 45 percent of the access fees paid by purse seine fleets of the US, Korea, and Taipei, China in the region (McCoy 1998).

- As of 1 September 2000 (NFA Information Registry), fishing licenses for the EEZ had been granted to 78 purse seine vessels (under foreign access agreements), 19 purse seine vessels (under domestic or charter arrangements), 44 domestic longline vessels, and 120 support, tanker/reefer, or carrier vessels.
- To put the \$11.2 million 2000 access fees/charges into perspective, information from AusAID (2000) shows:
 - The amount represents about 2 percent of all government revenue, or 33 percent of nontax revenue.
 - The income from fees and charges is greater than the amount the Government was expected to spend in 2000 on services relating to law and order (police and prisons).

Tuna vessel fines

- Data on Government income from tuna-related fines and vessel confiscations are not readily available, but the amounts involved are substantial. In 1997, for example, 10 illegal boats were apprehended and prosecuted (NFA 1998).

Direct employment in the tuna industry

- The tuna cannery at Madang employs about 2,500 people (S. Tiller, personal communication).
- The PNG Fishing Industry Association and NFA have jointly estimated that there are a further 515 jobs in the tuna industry, with domestic longline vessel crews making up the largest component (340). Other subsectors providing employment are the local purse seine fishery (75), a loining plant (15), processing and exporting establishments (60), and transshipment operations (25).
- The total number of PNG nationals directly employed in tuna catching, processing, and exporting is about 3,000.

Indirect and spinoff employment

- PNG's growing domestic tuna fishery and onshore processing developments by domestic and foreign interests generate indirect jobs in a wide variety of sectors, including: mechanical engineering and maintenance; vessel maintenance, repair, and

dockyard services; refrigeration installation and repair; land, sea, and air transport services; vessel provisioning; packaging manufacture; accounting, legal, and other business services; insurance services; and fresh and processed fish products wholesale and retail marketing.

- The 3,000 people directly employed in the tuna industry and the people working in jobs associated with the tuna industry create greater demand for consumer goods and services, resulting in increased overall employment and economic activity in the country.

Other employment considerations

- The restructuring of the National Fisheries Authority has reduced the NFA staff from around 136 to 44. Under its new structure NFA expects to contract some tuna fishery monitoring functions to provincial governments and the private sector. Significant employment is expected to result, as exemplified by an anticipated need for 300 trained observers to monitor fishing and transshipping activities.
- Around 85 percent of the employees of the tuna cannery at Madang are women. It is likely that loining and other processing operations now under development or negotiation will employ similar proportions of women (P. Celso, personal communication).
- A current initiative to develop industry-oriented training courses at the National Fisheries College at Kavieng would provide 200 graduates annually for the seagoing and processing sectors in response to anticipated growth in the tuna fishery (National Fisheries College Strengthening Project, 2000).
- On the basis of information in SPC (1998) and AusAID (2000), the 3,000 people directly employed by the tuna industry can be said to represent about 1.5 percent of the total formal employment in the country. This proportion would become significantly larger if the difficult-to-quantify indirect employment in tuna-related industries and employment generated by spinoffs were considered.

Expenditures of locally based vessels

- Each longline vessel spends more than \$590,000 on the average on wages, supplies, and services annually. Of this total amount, airfreight is the single largest cost component, at around 25 percent, although some airfreight costs are paid directly to foreign carriers. The next most important cost component is fuel, which accounts for around 16 percent of the total, while wages and bait account for about 6 percent each. These figures indicate that the 30 or so vessels active in the domestic longline fishery spend \$17.7 million annually (M. Brownjohn, personal communication).
- The annual expenditures of onshore operations maintained by the various domestic tuna longlining companies, including receiving, grading, packing, and refrigerated storage services, are said to amount to at least around \$400,000, inclusive of wages and salaries, irrespective of whether the company operates only a few vessels or 8 to 10 vessels (M. Brownjohn, personal communication).
- McCoy (1998) estimates that the company operating the onshore cannery had direct local expenditures of \$4.8 million during the construction and startup year and currently spends around \$2.5 million annually.
- Purse seine vessels licensed to fish or transship in PNG are required to make minimum levels of local expenditure under the terms of access agreements (vessels operated by the company that has established an onshore cannery are exempted from this requirement). McCoy (1998) points out a distinction between the *payao* (fish aggregating device) – based fishery and the distant water fishery.
 - The minimum required local expenditure of *payao*-based fishing companies during the 1997/98 licensing period was \$1.95 million. Overall, fuel purchases accounted for 86 percent to 95 percent of local expenditure.
 - In the case of the distant water fishery, vessels from Taipei, China and Korea transship in PNG ports and allow PNG to derive benefit through local expenditure. In examining the local expenditure of such vessels in Wewak during 1996, McCoy (1998) estimates that each port call resulted in expenditure of about \$7,400.

- In 1996 there were about 311 transshipments from PNG ports (SPC data), which would have resulted in \$2.3 million in expenditure, very little of which was for fuel.

Government revenue from direct taxation of tuna industry

- An analysis of the value of the tuna fishery to PNG (Lightfoot 1999) indicates that foreign purse seine vessels entering the fishery generate an initial contribution of \$500 in taxes and charges and a further \$53,000 to \$70,000 in taxes and government charges annually (the taxes include the tax on fuel).
- Locally based purse seine vessels, in contrast, are estimated to generate contributions of \$463,000 to \$595,000 in taxes and charges on entering the fishery and a further \$237,000 to \$301,000 in taxes and charges annually.
- A similar analysis of the longline fishery in PNG waters (all domestic) indicates that vessels generate contributions of \$41,464 in taxes and charges on entering the fishery and \$62,224 annually (Lightfoot 1999).

Small-scale fishing

- There are few data on subsistence catches of tuna, but 10 percent of the estimated annual subsistence production of 26,000 MT is thought to comprise pelagic species, including tuna (FAO 1997).
- Troll fishing, which is conducted in only a few areas of PNG, typically includes a much higher proportion of tuna. Dalzell et al. (1996) estimate that more than 84 percent of troll catches in PNG is made up of tunas and other scombrids.
- Trials with fish-aggregating devices (FADs) indicate that the production and productivity of small-scale tuna fisheries can be increased by deploying FADs. A FAD deployed off Daugo Island near Port Moresby in 1992 is reported to have resulted in better than 27 kg per hour of catches of tuna and other species by small-scale fishermen trolling with multiple lines (Beverly and Cusack 1993).
- With the development of the domestic tuna longline fishery to provincial bases and its dispersal from Port Moresby to provincial bases in the New Guinea Islands region and

elsewhere, related infrastructure developments and the establishment of marketing links at such centers is likely to provide new opportunities for small-scale fishermen to better handle and market their tuna catch.

- The economic opportunities created by the development of the domestic longline fleet are also thought likely to increase tuna production by small-scale fishermen (ADB 1995b; Preston 1996; Tutumarem Marine Consultancy Services 1999). At least one infrastructure development project—the construction of a longline vessel wharf at Kavieng in New Ireland—has taken this possibility into account in its design (P. Cusack, NFA Fisheries Development Project, personal communication).

Nutritional value

- The consumption of all fish products in PNG is estimated at 78,000 MT annually, or about 18.0 kg per person per year (FAO 1997). Although tuna is thought to make up only a small portion of this amount at present, the proportion is increasing, primarily because of increased availability from the by-catch of industrial tuna fishing operations.
- Little reliable data are available on the local sale of tuna produced by either small-scale or industrial producers, but retail and wholesale availability of non-export-grade fresh tuna and tuna by-catch through retail outlets, restaurants, and hotels in Port Moresby is increasingly common.
- Canned tuna produced by the lone established tuna cannery at Madang is marketed throughout the country. Daily production and domestic sale of canned tuna has stood at 20 MT per day since January 2000 (P. Celso, pers. comm.).
- In the North Solomons Province, Hulo (1980) reports that “tuna is a highly regarded food fish which is caught in large numbers.”

Cultural and recreational value

- Regular sport fishing activity targeting tunas and other oceanic fish is found in the larger population centers of Lae, Port Moresby, and Madang. Less regular, tourism-associated sport fishing occurs in some resort centers, such as Kavieng and

Rabaul, most often in resorts offering diving and other water sports. Regular sport fishing competitions include an international competition organized by the Port Moresby Game Fishing Club.

- FADs have been deployed by some recreational sportfishing associations off Port Moresby and Lae to increase productivity (M. Penney, personal communication).

Future importance

- Considerable effort was invested in the National Tuna Management Plan, which came into legal force in March 1999. The plan's underlying strategy is to manage the level of fishing at a sustainable level that has been determined scientifically. Where such information is limited, the precautionary approach applies. The plan has two overall objectives:
 - To manage and conserve the tuna stock on a sustainable basis
 - To assist in the growth of the domestic tuna industry
- In 2000, several major tuna fishing or tuna processing projects were under consideration; some of these would provide several thousand job opportunities for PNG citizens. These projects included:
 - An economic cooperation agreement for fisheries with New Caledonia, which might result in the granting of fishing access to French purse seine vessels. Such access, if granted, suggests the possibility of onshore processing operations with market access to countries in the European Union.
 - Spanish interest in a cooperative arrangement with an established onshore processor, which would see Spanish purse seine vessels landing tuna for loining and export to Europe.
 - Discussions with Korean interests regarding the establishment of loining facilities producing products that could enter the Korean market under domestic production duty concessions.
 - Discussions with Taipei, China interests that might result in up to 48 purse seine vessels being based in PNG. The interest of Taipei, China in local basing is thought to stem

- in part from the recent establishment of a large-capacity dockyard and slipway at Port Moresby.
 - Applications for a further 25 longline vessel licenses (S. Tiller, personal communication).
- A PNG Government policy decision in 2000 that offers both local and foreign operators wider access to domestic and international air routes is considered likely to result in increased airfreight services for fresh chilled tuna shipments.
- The opportunities provided by tuna-related activities become even more important given the scarcity of jobs for an expanding population:
 - UNDP (1997) indicates that the PNG labor force is growing at a rate of 3.2 percent per year.
 - AusAID (2000) shows that there was no net growth in formal employment in the PNG private sector in the decade between 1989 and 1997.

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About the Authors

Robert Gillett

Robert Gillett, a director of Gillett, Preston and Associates (www.gillettpreston.com), has been involved in marine resources development in the Pacific Islands over the past three decades. He has also worked for several regional and international organizations active in the marine sector, including the South Pacific Commission, the Forum Fisheries Agency, and the Food and Agriculture Organization of the United Nations. Mr. Gillett has authored over 150 publications and technical reports on fisheries in the region.

Mike A. McCoy

Having lived and worked in Micronesia, Melanesia, and Polynesia since 1968, Mike McCoy has extensive experience in the use and management of marine resources at all levels of Pacific Islands life, from subsistence and artisanal fisheries to the development of industrial tuna fisheries. He has advised several Pacific Islands governments and authored numerous papers and technical reports on fisheries. Now based in Hawaii, Mr. McCoy is affiliated with Gillett, Preston and Associates.

E-mail: mmc@aloha.net

Josie Tamate

Josie Tamate was born and educated in Niue. After graduating from the Australian National University with a master's degree in the economics of development in 1998, she worked for two years as an agricultural economist with the Department of Agriculture, Forestry and Fisheries of Niue and later as a policy analyst with the Economic, Planning and Development, and Statistics Unit of the Premier's Department. As project economist with the Forum Fisheries Agency since 1999, Ms. Tamate has specialized in the analysis of fisheries access agreements.

E-mail: josie.tamate@ffa.int

Len Rodwell

Len Rodwell has an honors degree in economics from the University of Tasmania and 13 years' experience in fisheries policy in Papua New Guinea. He joined the Forum Fisheries Agency in December 1994 as market adviser and was promoted to the position of manager for economics and marketing in January 1999.

E-mail: len.rodwell@ffa.int