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**The Capture of National and Local Sustainable Benefits
from Pacific Marine Resources**

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Industrial fisheries

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I. Industrial Fisheries

This first section of the paper concentrates on tuna given that it is by far the most important of the industrial fisheries in the Pacific. Catching, processing and marketing of tuna are on a global scale; the fleets of the distant water nations dominate the catching of tuna in all the world's oceans. While half of the global supply of tuna is caught in the Pacific, only a relatively small proportion of the catch is processed in the region. The harvesting of tuna for fresh consumption is as important economically to the region as the canning industry (the fresh market is dominated by Japan, and includes the U.S., Hawaii and Korea) Pacific Island involvement in processing for the fresh markets is increasing from a low base.

Fisheries in Pacific Island economies

The contribution to the economy of fishing and fish processing to Pacific Island (PI) countries varies greatly depending on comparative advantage. The Solomon Islands has a large tuna resource, exploited by distant water and local fleets and, until recently, a large cannery – the sector contributing 26% of foreign exchange receipts from merchandise exports in 1999. However, the industry was affected severely by low tuna prices and social upheaval in 2000, and formal employment and income generation by the sector will probably take some time to recover. Papua New Guinea also has significant oceanic fish resources – lying as it does in the path of tuna migrations from the north. However, its economy is more diversified and marine product exports amount to less than 1% of the value of merchandise exports. In addition PNG receives significant access fees paid by distant water fishing nations, the extent of which is hidden in the accounts but which would amount to several million US\$. The Federated States of Micronesia (FSM) to the north of PNG also has a very large exclusive economic zone and rich tuna resources, yielding significant exports and access fees. Kiribati and Tuvalu further west have rich tuna grounds and once again fishing mainly through access fees contributes heavily to the economy. The fishing for canning tuna requires considerable capital resources beyond the scope of local investors, so attention has turned to trying to domesticate foreign vessels to capture economic benefits, but with limited success.

In the case of fishing and processing for the fresh markets for tuna, there are several ways in which PIs capture benefits. For example, in the Marshall Islands, air freight was the main contributor to value added, while in the Palau licence fees were most important (Hunt, 1999). The island states at higher latitudes possess smaller tuna resources. However, Fiji is an example of successful local investment and value adding and employment generation in catching and processing. The main exporters of fresh tuna are Guam, FSM, Palau, Fiji, PNG and the Solomons.

The world supply of tuna for canning has grown steadily with the advent of more powerful purse seine fishing vessels with larger nets and in greater numbers. Table 1 shows the increase in global catch and the relative importance of the Western Central Pacific (see Figure 1) and other oceans in production

Table 1: Tuna catch by ocean area, tonnes

	global catch	WCPO	EPO	Atlantic	Indian
1985	2117791	1007206	370750	429526	310309
1986	2392020	1136795	477208	422654	355363
1987	2392799	1138661	468546	397706	387886
1988	2615849	1236210	466948	409025	503666
1989	2705245	1286809	473298	418847	526291
1990	2948711	1417482	479944	482617	569058
1991	3190283	1654152	436316	534925	564890
1992	3128473	1566229	435709	483231	643304
1993	3176480	1455096	431588	536696	753100
1994	3244215	1561229	428109	547577	707300
1995	3313644	1613032	475381	509018	716213
1996	3202981	1533646	474916	492065	702354
1997	3350065	1630812	537844	447785	733624
1998	3601100	1900290	509967	457219	733624
1999	3571114	1718776	661495	457219	733624

Note to Table 1: In 1999 the WCPO tuna catch was the source of 48% of the global catch, and the EPO was the source of 19%.

Source: SPC (2000).

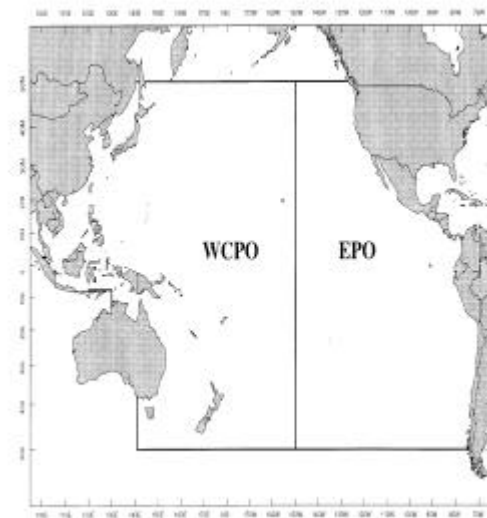
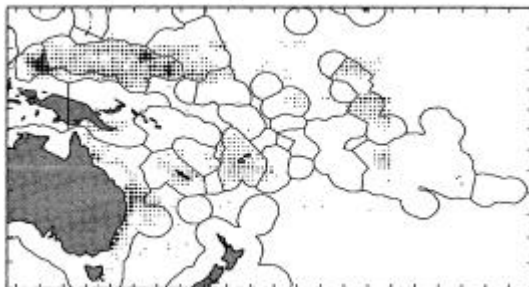
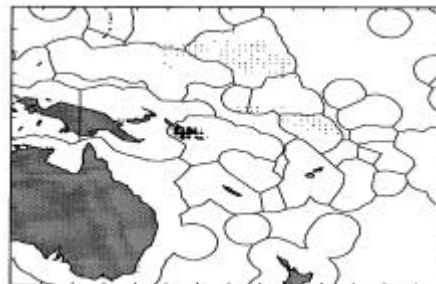
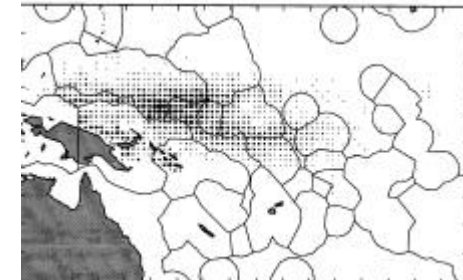
Figure 1: Western Central Pacific Ocean and Eastern Pacific Ocean

Table 2: Number of vessels by type and by location, and tuna catch (tonnes), WCPO

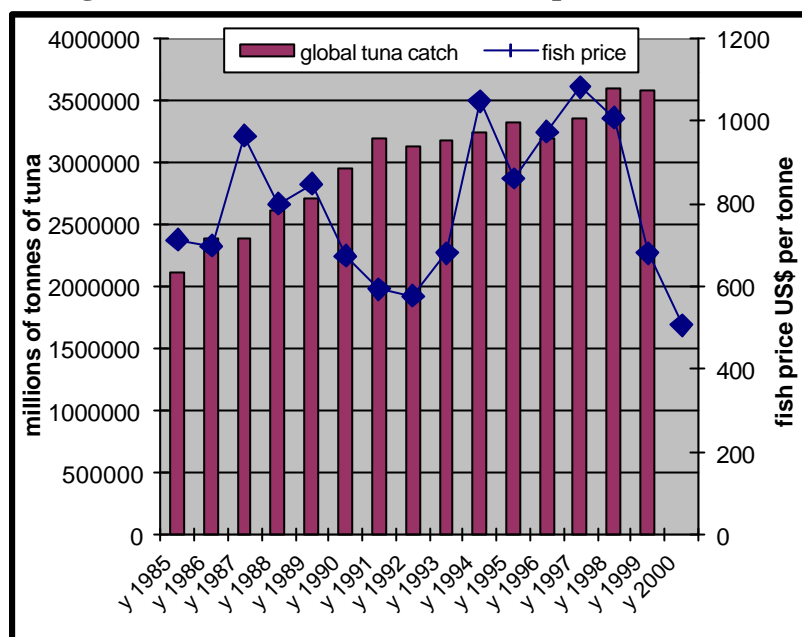
year	long line				pole and line				purse seine			
	distant water		PI		distant water		PI		distant water		PI	
	vessels	catch	vessels	catch	vessels	catch	vessels	catch	vessels	catch	vessels	catch
1990	2682	151883	16	2498	255	153123	169	27680	136	566781	4	9293
1991	2270	127024	26	3092	242	67944	157	44634	142	864316	9	13720
1992	3410	145940	57	3428	216	144867	148	28723	144	852091	10	15956
1993	3914	143433	113	6060	203	183400	110	25062	142	737564	10	15421
1994	3857	166321	155	8385	185	146592	113	28531	140	822269	15	21837
1995	3577	145630	221	9490	181	161215	127	41492	130	766403	15	52356
1996	3099	123323	277	19223	172	123698	116	28065	126	709899	14	46393
1997	3576	135550	357	21779	170	154723	108	24206	128	740481	24	76852
1998	3381	113742	394	22051	169	157568	118	25996	128	966020	26	113442
1999	3157	111314 ^E	417	20506	165	157560 ^E	112	31913	125	620720 ^E	31	122240

^E = author's estimate

Source: SPC (2000).

Figure 2: Long line catch intensity**Figure 3: Pole and line catch intensity****Figure 4: Purse seine catch intensity**

Source: Figures 2,3 and 4: SPC (2000).

Figure 6: Global tuna catch and fish price

Sources: SPC (2000); Thai market prices.

Table 2 breaks down distant water and local vessels and catch for the three major types of fishing in the WCPO, and the associated Figures 2, 3 and 4 show the location and intensity of types of fishing in the WCPO. Figure 2 shows that long lining was concentrated in the countries that issued licences to DWFNs, Figure 3 shows the concentration of pole and line fishing for the cannery in the Solomons, while Figure 4 shows that purse seine fishing was widely distributed in the equatorial zone. Figure 5 shows the area from which the data in Table 2 is collected by the Secretariat of the Pacific Community (SPC). The increasing long line participation by PIs is in catching for local processing and chilled fish export. The distant water long line vessels, on the other hand, are mainly relatively large vessels, fishing in EEZs under licence or in the high seas areas, that freeze their catch for sashimi or canning. The pole and line vessels mainly deliver to the canneries in the region, while the purse seine vessels, mainly in distant water fleets, deliver frozen tuna to canneries mainly outside the region.

Production, consumption and price - overcapacity and its implications

The increasing global catch of tuna (a large proportion of the increase being sourced from the WCPO) contributed to a slump in fish prices that made catching uneconomic in 2000. The world's tuna fleets combined to reduce production in the second half of that year, with the result that prices seem to have recovered – but just how long this price rise will last, given the necessity for fleets to fish to cover costs, is an interesting question. The PIs will experience a fall in access fees in 2002, which are negotiated annually, as a result of lower prices and lower fee rates. The overcapacity in the fishing fleets is of concern not only because it is affecting the incomes of PIs, but also because it has implications for the status of WCPO fish stocks – there is more discussion of issue of sustainability below. A study that needs to be done is the extent of subsidisation by governments of fishing fleets that leads to overcapacity in the region.

The Western and Central Pacific Ocean (WCPO) contains the Pacific Forum nations, which have joined together to form the Forum Fisheries Agency (FFA).¹ The FFA will continue to be the body that will determine to a large extent how successful the Pacific island states are in capturing benefits from the industrial tuna fishery.

The adoption of exclusive economic zones (EEZs), under the United Nations Convention on the Law of the Sea (UNCLOS) (United Nations, 1994) has greatly strengthened the property rights of PI countries, and indeed of all coastal states, over their oceanic resources. The conferred sovereignty over an area of ocean determined by a 200 mile limit from land has, in effect, transferred the management of the capital inherent in the oceanic resources to the coastal states. The archipelagic nature of many FFA nations means that their EEZs are often vast. In the case of the smaller archipelagic states the area is often beyond their capacity to monitor. In this respect, the introduction of vessel monitoring by satellite (VMS) by the distant water fleets is a major advance. However, it is expected that illegal, unreported and unregulated fishing vessels will still continue to fish undetected in parts of the WCPO and the high seas areas outside EEZs, threatening to undermine emerging efforts to manage the fishery (FFA, 2000).

Given that approaching half of the world's canning tuna comes from the EEZs of FFA member nations it should be possible for them to join together to collectively manage fishing effort and the supply of tuna. However, traditionally, the island nations have jealously defended their rights to enter into bilateral deals with the distant water nations who have been in a position to offer attractive side benefits as well as the fishing fees. Fisheries Ministers look forward to making public announcements that roads, hospitals and even hotels will be an outcome of the latest fishing deal, to supplement the good news that fishing access fees have been negotiated amounting to many millions of dollars. A summary of the positive and negative aspects of bilateral versus multilateral access fee policies for PIs on the one hand, and distant water fishing fleets on the other, is in Hunt (1989: Table 3.5).

The Palau arrangement² ostensibly puts a cap on the number of vessels fishing in the region's EEZs that constitute the main canning tuna areas. The cap of 205 has no clear market or conservation goal and has been continually undermined by allowing concessional increases in the number of vessels in certain EEZs.³ Moreover, the limitation of vessel numbers is bound to fail as a method of fishing effort control when the efficiency and size of vessels is continuously increasing. There is a proposal presently on the Table with the Palau group to limit the fishing effort by 'vessel days', a unit of effort more precise and more flexible than vessel numbers. The regional vessel days will somehow be allocated to member nations. The idea is that the supply of total regional fishing days will be reduced to a level that creates scarcity, forcing up the fee to the

¹ The FFA member countries are Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

² The arrangement is between FSM, the Marshall Islands, Kiribati, Nauru, Palau, PNG and the Solomon Islands.

³ In 2000, 14 Spanish purse seiners were added to the fleet, being licensed to fish in the Kiribati EEZ.

fishing company, thus generating more money for the PI countries. However, preconditions for this arrangement are firstly that scarcity can be induced, and secondly that scarce fishing days can be allocated to PIs who will then allocate days to fishing vessels only up their total quota. However, fishing fleets and companies may be able to substitute cheaper access fees elsewhere for higher priced fishing days in the WCPO, and they may also intensify their effort in the high seas areas, that are not subject to fishing day quotas, to reduce the overall cost of fishing. Moreover, some PIs with large tuna resources could break ranks and sell more fishing days than they were allocated in the face of lucrative offers from the distant water fishers. In these ways the fishing day concept could easily be undermined as a means of managing fishing effort and increasing the price of tuna. Moreover, a complicated formula will be needed to determine a standard 'fishing day', which would then need to be modified for just about every vessel applying to fish, according to its net size, the type of gear on board to find tuna schools (advanced sonar or helicopter), whether fishing on fish aggregating devices (FADS), and whether the vessel has attendant ranger and light boats.

An associated problem with the idea of limiting effort to affect price is that little is as yet known about the relationship between the two. Before launching into this scheme the research should be done to determine the elasticity of revenue from tuna day fees with respect to a change in the quantity of fishing days. Even if the fishing day fee could be forced up, would this, times the reduced amount caught, generate more or less revenue than allowing more to be caught at a lower fee? The substitution factor mentioned above, where fleets faced with higher access fees fish elsewhere, would be a vital determinant of the level of price rise in the face of a limitation of fishing days by the Palau group.

The downturn in the price of canning tuna would have affected the profitability of the distant water purse seine fleets. As a consequence they can be expected to negotiate access fees lower than 5% of value of catch under bilateral arrangements with PIs. There is a general lack of satisfaction among PIs with the level of access fees paid on the grounds that it is an inequitably small share of the resource rents available. The fact that the licence fee makes up only a small proportion of gross costs of purse seine fleets is cited as an ability to pay more on the part of the fleets. However, higher fuel cost and lower prices have squeezed the net profits of purse seine operators and access fees can make up a large proportion of net profits.

Domestication benefits and disbenefits

In an attempt to capture greater benefits from canning tuna fleets there have been major attention paid to the domestication of tuna vessels. This involves providing inducements for the vessels to base in ports in the region instead of in foreign ports. The rationale is that the locally based purse seine vessels will source their goods and services locally, generating large economic benefits in so doing. There is also a scheme in place where regional licence can be obtained for a concessional access fee of 5% of value of catch if the vessels employ nationals, make local purchases to a certain value and invest onshore. However, it appears that the cost of such an arrangement is perceived to be greater than the benefits and only a handful of vessels have taken up this option. The reality is that there are significant extra costs to fleets being based locally (Hunt, 1998). For example fuel may be dearer and the range of goods and services readily accessible in the home ports in Asia or elsewhere may not be available in the local ports. Moreover, the mainly

foreign crews will want R and R in their ports of origin. As a consequence, only 31 vessels were in 1999 based locally while 135 foreign vessels operated (see Table 2).⁴

The access fee charged, which is a percentage of the value of catch, is really a ‘royalty’ unaffected by the profitability of the industry. A more efficient and equitable means of distributing the benefits obtained by the distant water fleets is to directly allocate the ‘resource rents’ generated between the fleets and the resource owners. (Defining resource rent as revenue from catch less operating and fixed costs of the vessel.) However, resource rent sharing cannot be adopted because of the impossibility of obtaining operating costs from fleets in order to calculate rents. Meanwhile, access fees seem to be the best way of tapping resource rents. When negotiating access fees the PIs are at a disadvantage, not only because of their lack of information on the cost structure of the distant water fleets of the nations on the other side of the table, but also by the fact that the fleets can always threaten to go unmanaged areas if the fees are too high.

As mentioned above, domesticated vessels may generate more benefits for the PI than distant water vessels paying access fees. However, a dilemma for the negotiating country is the level of benefits it can expect from access fee remissions. The method that needs to be employed in determining the size of access fee remissions and the consequential domestication benefits is to regard the fee remission as an investment by the PI on which a reasonable return should be generated. For example, suppose the access fee is presently 5% but will fall to 2.5% if the fleet complies with certain conditions of domestication. Let’s say the remission in fees is worth in the order of US\$10 million in one year to the fishing fleet. For the deal to be beneficial the benefits generated should include not only the interest on the US\$10 million worth of capital outlaid by the PI, but also an allowance for risk. If benefits are generated in future years as well as in the present year then the present value of those benefits need to be calculated. The economic benefit to the PI is best assessed by calculating the domestic value added (DVA) of the proposal. The DVA is the actual value accruing to the country allowing for the fact that many goods and services are imported and do not benefit the country except by way of import duties. Take fuel for example. Fuel is imported at a cost to the country. The domestic value added to the fuel consumed by a domesticated fleet is that added in excise, storing, handling and transport to the site, which is only a small component of the delivered price. Gillette and Preston (2000:30) estimate that in PNG fuel and oil has a DVA of total expenditure of 8% made up of labour to supply, market and manage the fuel, plus the profits made by oil companies. Wages paid to shore-based workers are almost all spent locally but a proportion will be spent on imports, reducing their overall economic benefit. The importance of trying to establish DVA is emphasised in an exposition on the financial and economic benefits of the tuna industry in Papua New Guinea which points out that “Quite often high access fees paid by foreign fishing fleets deliver a higher level of DVA at less risk to an economy than costly attempts to establish a local fleet” (Gillette and Preston, 2000:17).

While the local ownership of purse seine vessels is out of the question for Pacific islanders on the grounds of capital cost, the same constraint is not as strong in the case of long line fishing for tuna for the fresh market. Nevertheless, capital and operating costs are still substantial – a second hand long line vessel in good condition could cost at least

⁴ 36 United States, 42 Taiwan, 35 Japan, 26 Korea, 10 Philippines 14 Spain.

US\$200,000 and substantial operating capital is required given that annual operating costs can be up to US\$1 million per annum and that returns in the first years of operations may be disappointing, depending on experience (Preston, 1996; FFA, 1998). The South Pacific Project Facility has, however, been active in funding localised ventures. Because the processing and packing is onshore and the vessels are based in local ports, often crewed by locals, the domestic value added by these vessels can be impressive. A major constraint to development of localised long lining is most likely to be presented by the ability to market the product in the U.S. and Japan – typically transport and ports are limiting factors. In the case of Fiji, the relatively large long line industry has been complementary with the tourism – the Air Pacific 747s bringing in tourists from Japan and elsewhere and taking back container loads of fresh tuna. The regularity of air services, the handling at airports of the fresh product by the airlines and being able to drive the unit cost of freight down with volume, are also key marketing issues. Also operating in the WCPO under licence with the PIs are large, long lining freezer vessels that stay at sea for longer periods and supply the canning or frozen sashimi markets. Like the purse seiners these vessels these pay access fees but make no contribution to domestic value adding.

Canning developments in the region

No discussion of the industrial fisheries would be complete without reference to developments in canning in the region and how these might benefit PIs. The central issue with regional canneries has been their economic sustainability and that question persists, despite the recent radical changes that have taken place in management and ownership.

The EEZ of American Samoa does not lie across the migratory routes of tuna but the excellent harbour at Pago Pago, as well as special provisions under U.S. law, have given the territory a natural advantage in harbouring the U.S tuna fleet and landing fish for processing, hence tuna canning is the nation's largest industry, employing some 4,000 workers. The industry depends on duty free status, tax exemptions and a viable wage scale. However, the preferential treatment of processed to the U.S is under question. Moreover, low cost competition from Mexican and Thai canneries could be severe (Bank of Hawaii, 1991).

Pafco, a mainly government-owned cannery on Levuka Island, Fiji, employed about 1,200 cannery workers plus 400 local people in the catching sector and another 150 in port and transport operations (ESCAP, 1996:92). However, it was for some time beset with problems of supply and performance, and it has discontinued canning, becoming instead loin producer for Bumble Bee Seafoods of the United States, which company also oversees quality. While canned tuna imports to the U.S. are subject to duty, loins – being partly processed tuna – can gain duty free entry. The loining operation is less labour intensive than canning, and employment has fallen to 450, but it could expand to 750 (SPC Coastal Fisheries Programme, 2000:2).⁵

Solomon Taiyo at Noro in the Solomon Islands has undergone an even more traumatic period of very low tuna prices combined with a poor security situation. The Japanese

⁵ Loining is also considered to be a potentially profitable development in PNG by the country's National Fisheries Authority.

partner exited and in its place has emerged the Soltai Fishing and Processing Limited, 51% owned by government through the Investment Corporation of the Solomon Islands and 49% by the Western Province government (the provincial government is likely to include resource owners in the share ownership). A redundancy exercise in February 2001 by the cannery that was once the largest single employer in the country affected both the small remaining active workforce (170) and the inactive workforce (1730). The cannery was always a disappointment to the Solomon Islands government in that it generated very little tax income. Despite tax relief, and the waiving of import and export duties, there was a steady accumulation of losses, made worse by the heavy debt burden that was denominated in yen and which therefore grew as the SI\$ depreciated. It was also the case that large management fees and sales commissions absorbed a significant proportion of revenues. In the case of Solomon Taiyo Limited, as with the loss making Pafco, the economic benefits were mainly through the purchase of goods and services and wages. For example the Solomon Taiyo cannery spent about SI 40 million per year on purchases from Solomon Islands registered companies, in baitfish requirements and on property rents. The cannery's net contribution to the balance of payments was some SI\$32 million or about 16 % of all current account receipts (ESCAP, 1996:150). The very large question that hangs over the operation is whether it can regain the initiative in exporting profitably the very high quality 'dolphin free' tuna for which it was renowned,⁶ or whether it will become an ill-afforded burden for government.

The RD company cannery in Madang, PNG, producing 'Diana' tuna is another example where the generation of domestic value added rests on employment and local purchases given that the company pays no import or export duties, can make a double deduction for its export market development expenditures, and is favoured with a five-year company tax holiday. The fishing licence agreement is a long term one, with fishing licences being renewed for 5 yearly periods up to 20 years, thus reducing the risk in the heavy on-shore investment made by the company. The government also gives protection to RD from imports of canned tuna into PNG (personal communication Rodrigo Rivera, Chairman and President, RD Tuna Cannery).⁷ The withdrawal by Pafco from canning and the reduction in production from the Noro plant appear to give RD an opportunity to increase its sales in PI countries. Canned tuna is covered under the Melanesian Spearhead Group Preferential Trade Agreement between PNG, the Solomon Islands and Vanuatu. There is also an opportunity for Pacific canneries to export to Europe, as did Pafco and Solomon Taiyo Limited previously, under the Contonou Agreement that replaced the Lomé Convention in 2000; at the same time, canned tuna can be exported free of duty to Australia and new Zealand under the SPARTECA agreement.

Sustainability issues in the WCPO

We now turn to the challenge of managing the tuna fishery of the WCPO. There are two key issues: first, how to deal with the emerging problem of overfishing and second controlling the catch of non-target species.

⁶ The pole and line fishing method of Solomon Taiyo, and of Pafco, guaranteed 'dolphin free' tuna demanded in overseas markets, and also delivered a better quality of fish for canning than purse seining.

⁷ This protection is presumably applies to imports outside the free trade agreement area.

Stocks of big eye, a tuna of high value in Japanese fresh markets, have been depleted worldwide, and depletion in the Pacific has now received official recognition. Hampton, Lewis and Williams (2000:17) had this to say: “Preliminary estimates of relative stock abundance from standardised long line catch per unit effort indicate a decline in abundance since the late 1970s in the WCPO and since 1990 in the EPO. Although the estimates require further study, the preliminary results raise a concern of overfishing and decline in adult biomass”.

Fonteneau and Hallier (1992, cited in SPC, (1996:28)) summarised the problems associated with fish aggregating device (FAD) fishing as follows: “Catching large quantities of juvenile yellowfin and big eye may have negative consequences for the rational exploitation of these species. Also this type of fishing cannot avoid catching the many species occurring close to the floating objects, which are then discarded; this may in the future raise as yet inaccurately appraised ecological, problems, especially if this fishing technique develops without control”; these two potential problems of FADS, one of catching juvenile yellowfin and big eye tuna and the other of by catch, “are currently a source of concern for the scientific community, without any estimation of their present and future severity being possible. International control over this type of fishing is envisionsable through tuna fishing commissions, but was deemed premature by the experts at La Jolla”.

The mortality of Atlantic big eye is calculated at being above the optimum level: there is overexploitation of the reproducing stock as well as the overfishing of juveniles at 2 to 3 kg, and accordingly it will be necessary to reduce the use of FADs (SPC, 1998). “If no measures are taken catch will drop to low levels and a total decline of the stock could result. ICCAT wants catches reduced to the level of 20 years ago, which is a drastic reductions... The high value of the catch justifies this research programme into big eye” (Dr. Joao Pereira, cited in SPC (1998:37,38). Dr Pereira (SPC, 1998) went on to criticise ICCAT Commissioners for ignoring the research proposed by scientists and their failure to adopt the necessary management measures.

The Inter-American Tropical Tuna Commission (IATTC, 1999) noted that the use of FADS has grown substantially in the last 5 years, increasing the catch of juvenile tunas, in particular yellowfin and big eye, in the purse seine fishery in the EPO. The IATTC reaffirmed its commitment to the application of the precautionary approach, which establishes that the lack of scientific evidence should not be used as a reason for not taking management measures for fisheries resources. The IATTC recalled that resolutions adopted by the IATTC at its 61st and 62nd meetings contained recommendations that the parties prohibit transshipment of tuna at sea and prohibit the use of tender vessels whose role it is to deploy, repair, pick up or maintain FADs at sea. A resolution of the IATTC was to establish a scientific working group to estimate among other things the impact of permanent or temporary closure of areas to use of FADs.

The International Commission for the Conservation of Atlantic Tuna (ICCAT, 1998) adopted a resolution for the establishment of closed areas or seasonal closures for the use of FADs; the resolution entered into force on June 21 1999. The Indian Ocean Tuna Commission (IOTC) (1999a:26) referred to a scientific committee the issue of a moratorium on the use of floating objects to bring about a reduction in catch of juvenile big-eye and reported as follows: The purse seine catch [in the Indian Ocean] of big eye has doubled since 1993 mainly due to the development of the fishery on FADs; currently

70% by number of the total catch is by purse seine fleets and consist of age 0 to 1 fish, and this could have an adverse effect in future on long line catches (IOTC,1999b:32).The IOTC concluded that “Area or season closures appeared to be the best option for management actions on big eye tuna”(IOTC,1999b:28).

Most purse seine fleets are reportedly making extensive use of FADS in the WCPO (FFA, 2000) and it is expected that some action will need to be taken in the future to curb such fishing on account of its deleterious impact on big eye stocks.

What is apparent is that the Total Allowable Catches (TACs) that the SPC calculates for individual PIs in the WCPO, and which the Pacific Islands use as a guide to set their limit to fishing licences, is based on the sustainable catches of skipjack and yellowfin – species that are more abundant and fecund than big eye. Given that the tuna fishery is a multi-species one, great difficulties are presented in the implementation of catch quotas for any one species, explaining why area closures have been adopted in other oceans. While these management methods may be some assistance in relieving the pressure on big eye it would appear that TACs being promoted need to be reduced to levels that would allow the recovery of big eye stocks.⁸ Such TAC reductions will of course have implications for the level of access fees that PIs receive. And any consideration of a reduction in catch level immediately raises the issue of how the reductions are to be shared between PIs – some of the likely difficulties of implementation were dealt with above.

Another issues that has not been satisfactorily addressed is the interaction of the purse seine and long line fisheries: specifically, what are the opportunity costs to the more lucrative long line fisheries of the increasing catches of yellowfin by purse seine for low value canning? A study by Campbell, Mentz and Owen (1994) suggested that a reduction in the purse seine yellowfin catch was justified on economic grounds. The present value of the net benefit of reducing the purse seine yellowfin catch in PNG waters by 1% was estimated to be around US\$3 million.

Major international agreements have set the groundwork for management regimes to be implemented in the WCPO. The UN Fish Stocks Agreement is important because it establishes a regime to control fishing in the high seas as well as in waters under national jurisdiction, moreover it requires states to cooperate on a regional basis in tuna management. In concert, the PI states and other invited parties have convened a Multilateral High-level Conference (MHLC) and have adopted in September 2000 a Convention on the Conservation and Management of Highly Migratory Fish Stocks in the WCPO. The convention establishes measures to achieve compatibility of measures between EEZs and the high seas and, just as importantly, it anticipates limits to TACs or fishing effort and the allocation of catch or effort quotas.⁹ Additional difficulties for management are posed by the fact that the waters of South-east Asia and the South China Sea are outside the ambit of the MHLC, and nations adjacent – including Indonesia and the Philippines – whose catches of tuna outside the EEZs of SPC countries are

⁸ Tuna catch quotas are already being applied in other oceans, for example a total tuna quota of 600,000 tonnes applies in the Atlantic (FFA, 2001:3).

⁹ The difficulties of designing and adopting quotas by tuna species as a management tool in the WCPO has been discussed by Hunt (1997), and a workable quota system has yet to emerge for the region.

substantial¹⁰ and influence stocks in the WCPO, are not members of the FFA or SPC and are not part of the MHLC.

A court decision in Hawaii that virtually closed the swordfish long line fishery of that country – pending an environmental impact study – as a result of a case brought by the NGO Earthjustice that concerns the frequency of hooking and tangling with turtles and the catching and killing of albatross in that fishery (SPC, 2001), has spotlighted the sustainability issue in long lining – a type of fishing being promoted in the region by SPC and FFA. Sharks are heavily represented in the by catch of the long line fishery in the WCPO. It is known that sharks are vulnerable to fishing pressure because of their low fecundity, but very little seems to be known about the status of the most vulnerable reef and deep water sharks (Chapman 2000). The U.S Congress has banned shark finning – the practice of slicing off the valuable fins and nations are being encouraged to develop regional and state shark plans. In Papua New Guinea, long liners have been catching large quantities of sharks, in fact, in 1999 over 400 tonnes of sharks were caught by PNG-based long liners, greatly exceeding the catch of tuna (for which vessels were licensed) (SPC, 2000: Figure 26). Given the likelihood that sharks will continue to be targeted for their very valuable fins, and the lack of any stock assessment or management plan for sharks, it would seem that the wisest policy in PNG would be for the National Fisheries Authority to adopt a precautionary approach and to institute a moratorium on shark fishing *per se*, along with measures to reduce shark by catch, until much more is known about stocks. The species of turtle being caught in the WCPO will be better monitored by SPC but again management methods should be promoted that limit turtle catch, for example by setting lines deeper, and that enhance turtle survival after catch. In the higher latitudes of the South Pacific albatross have been common casualties of long line fishing but steps are being taken to avert further depredations (Chapman, 2000).

¹⁰ The SPC (2000:145,146) reported for 1999 a total Indonesian catch of 235,487 tonnes of tuna and a total for the Philippines of 221,293 tonnes. About 400,000 tonnes of this (equivalent to 25% of the total SPC recorded WCPO catch) was taken outside the EEZs of SPC member countries. In addition 70,000 tonnes of tuna was taken in those countries in 1989-1999 by “unclassified gears” (SPC, 2001:1).

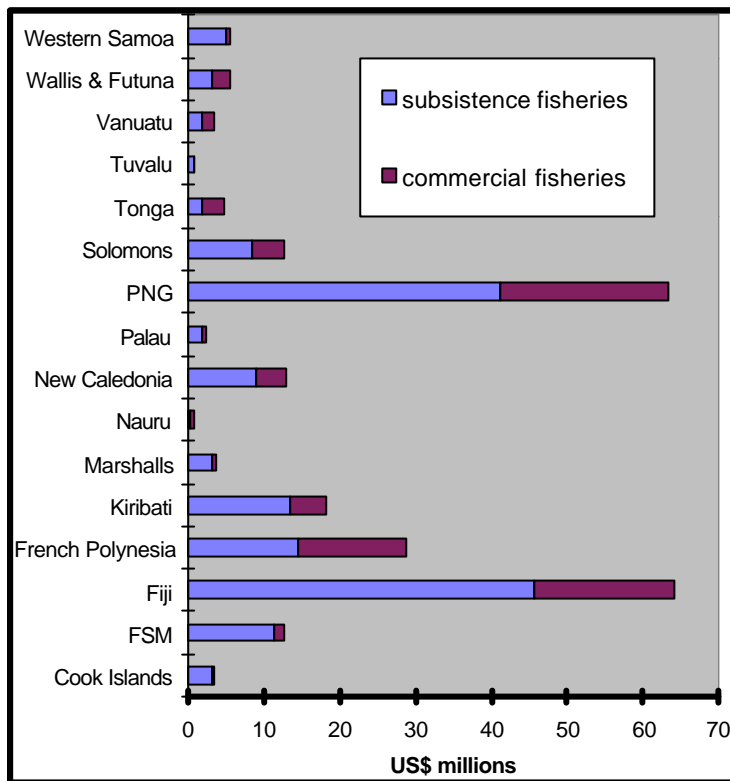
II. Inshore Marine Resources and Artisanal and Subsistence Fishing

The inshore fisheries are often within a kilometre of high water mark, shelf areas being limited except in PNG. Typically men do the fishing involving boats while women do reef-gleaning for invertebrates and shore fishing. There are a variety of products in the inshore besides fin fish – marine invertebrates may be the main targets, for example trochus shell is Wallis and Futuna's only significant visible export, and black pearls are valuable exports from French Polynesia and the Cook Islands. In other cases, ornamental coral and aquarium fish for export may be main artisanal targets. Commercial fishing in the inshore waters includes prawns (in Papua New Guinea), reef and deep slope fish, as well as bêche-de-mer and molluscs such as trochus and greensnail. A substantial bait fishery in Solomon Islands coastal waters supplies the pole-and-line tuna fleet of the Soltai cannery. An artisanal fishery in Siassi Island PNG supplies the mining settlements of the PNG highlands (the Lutheran shipping transporting the fish to Lae, the start of the highlands highway), while crocodile skins are exported from the Sepik. The contribution to household income of inshore fishing is estimated in some detail for Fiji in Box 1.

The value of subsistence and artisanal fishing

Local reef fish for consumption can be classed as an urban luxury, much cheaper protein is available in cans of mackerel or tuna from the store. However, in the rural areas where a large proportion of the population in most PICs - and an overwhelming majority in some - are still in a subsistence economy, a large proportion of the fin fish catch is still consumed by the fishers, or shared, and does not enter markets. The fact that subsistence fishing is important, or even dominant, means that the true importance to Pacific island states of their marine resources is not reflected in budget estimates or national accounts. Estimates of the value of fish taken in the coastal waters of selected Pacific countries provide an appreciation of the importance of subsistence, *vis a vis* commercial fishing, and also of the relative size of the coastal fisheries by country (Dalzell *et al*, 1995). It is clear that the value of subsistence fishing is significant in most PICs, very large in Papua New Guinea, the Solomon Islands and Fiji and that in several it has a replacement value of many millions of dollars. The importance of subsistence and commercial fishing for the inshore waters of PICs is illustrated by Figure 7, and is quantified for Fiji in Box 1.

Figure 7: Coastal fisheries value (mean of 1989-1994)



Source: Hunt (1997b, Figure 10.1, p. 147, based on data in Dalzell Adams and Polunin, 1995).

Note: 1. While the source of data for this figure does not provide a definition of “coastal waters” the term is assumed to be synonymous with territorial seas, i.e. within 12 nautical miles of the coast.

2. Details of the method of imputation of the value of subsistence fishing are not given by the source therefore the actual and relative values of subsistence fishing shown in Figure 11 should be used only as guides.

Box 1: Household income and subsistence and artisanal fishing, Fiji

Half the households in the coastal villages of the main island, Viti Levu, have at least one member who goes fishing. Of these fishing households, two thirds are subsistence and a third artisanal; the numbers engaged in larger commercial-scale fishing from villages is very small. As well as supplying villages, artisanal fishers also supply the fish markets of Suva and other urban centres.

The estimated weekly income to artisanal fishing households is F\$34 (Rawlinson, 1995:3). However, to obtain a more comprehensive picture of the economic importance of coastal fishing, a value is attributed to subsistence and artisanal fishing on Viti Levu. The application of a value of F\$3.75 per kg to the total annual catch of fish for subsistence (3,500 tonnes) and sale by village households (6,200 tonnes) in Viti Levu suggests a total value of subsistence and artisanal catch of some F\$37.5 million.

To obtain a countrywide valuation of household fishing, estimates need to be made of total national catch. The Fiji Fisheries Division estimated domestic supply for the whole country at some 23,000 tonnes. At an average price of F\$3.75 a total value of domestic fishing amounts to F\$86 million. This valuation shows that fishing has a much greater importance than the narrow official statistics and official analyses of the Fiji economy suggest; see for example Economic Insights (1995:Table 1.3:11) where subsistence fishing for 1994 is valued at only F\$30 million.

Source: Hunt (1999).

Sustainability issues

However, there are substantial problems of depletion and environmental damage associated with the commercial exploitation of inshore species. Problems relate mainly to fisheries that are not significant to the traditional livelihoods of the coastal communities. Bêche-de-mer and the other sedentary species greensnail, trochus and giant clam, are most easily overexploited and have suffered depletion in large inshore areas of the Pacific. Adams and Dalzell (1994:4) remind us that coastal villagers need income to educate their children and that marine resources are the main sources of cash: “Artisanal bêche-de-mer fishers have been known to become exasperated with the exhortation ‘to conserve these resources for the benefit of your children’ when the main reason they are harvesting is to pay for the children’s school fees and their children will not be around the island [in the future] to harvest these conserved resources anyway”. The demands in Asian markets for aquarium products and for live fish have encouraged unsustainable methods of fishing that involve fishstunning and poisoning and cause extensive coral reef damage and depletion of stocks (Richards, 1993; World Bank, 1995). The policing of such operations is often non-existent because fishing administrations tend to be weak and underfunded. Gillett (SPC, 2001d) reports that only one fourth of the staff of national fisheries agencies is spent on coastal management matters, and that in a survey of 31 sites throughout the Pacific only about 40% of the villages had been visited by government officials to discuss coastal resource management during the previous ten years. The enhancement of the authority of local communities enabling them to reject destructive fishing is an alternative to the reliance on central administrative controls. Adams and Dalzell (1994) asserted that the supply from artisanal fisheries was equal to supply, the threats to marine resources coming not so much from the fishing itself but from damage to habitats caused by terrestrial development, a conclusion supported in a recent study (SPC, 2001d). Clear ownership of inshore resources is seen as a key to the sustainability of the benefits from inshore marine resources.

There is also an issue of economic sustainability in the artisanal fishing projects that have received donor support in the region. For example the village of Ika, visited by the author in 1995, with 1000 people on Isabelle in the Solomons, hosted an E.U. fisheries project that targeted deep slope snapper for export to the capital Honiara, via a fortnightly passenger vessel. The assistance package included five vessels, a marketing centre, cold store, ice plant and scales, training in deep slope fishing, and a resident expatriate acting as trainer and operations and marketing manager. The failure rate of fishing projects in the Pacific is already notoriously high and in the Solomon Islands, in year 2000, only three rural fishing centres established with the financial assistance of the E.U. were operative out of the 32 established. Yet there is third development phase with another 7 centres planned for the three years 200-2003 (Central Bank of Solomon Islands, 2000:20). While a visit to the E.U.’s web site does not throw light on the reasons for failure, it is suspected that a major cause is the fact that market prices were not sufficient to cover costs, and since the political upheaval in that country spending power in Honiara and other urban centres would have been seriously undermined, suggesting further difficulties ahead for such projects.

Property rights and inshore resources

Legal authority in inshore waters rests at government level as a result of colonial rule. (But even in Tonga, a country never colonised, the government assumed ownership of marine resources.) In the past, however, the most widespread and important measure for the conservation of marine resources was the control of access through customary marine tenure (CMT) arrangements. The rights to fish were controlled by a clan, chief or family. In CMT, there was no 'ownership' by one group of all rights in the Western sense but rather a system of allocation of access and use rights. In CMT social boundaries are as important as physical boundaries but harder for Westerners to define (Crocombe, 1994). Change and erosion of traditional CMT have occurred largely because of population increases (about 3.5 million people now live on the coast in the South Pacific), adoption of technology (fishing power and mobility), the intrusion of the cash economy – the process is sometimes characterised by narrow groups or spokespersons, not fully representative of the traditional descent groups, being able to appropriate rents for their own use (SPC, 2001d) and a breakdown of chiefly authority (Johannes, 1978; Crocombe, 1994).

In the face of increased fishing pressure one solution is to adopt western fisheries management methods. Scientific methods require knowledge of the biology of target species and the availability of catch and effort data. But, except in a few cases, the data required for scientific fisheries management for inshore waters in the Pacific is not available. Much time-consuming and expensive research is required before Western-style management can be effected widely: indeed, from a management perspective it is unlikely that the Pacific island reef fisheries recruitment processes will ever be sufficiently understood to be incorporated into management initiatives. The task is exacerbated by the archipelagic nature of many PICs with islands scattered over great distances. Moreover, centrally imposed scientific management for inshore fisheries increases the monitoring and regulatory responsibilities of understaffed and underfunded fisheries departments and it was shown above that there are only minimal resources devoted to these tasks.

Given the pressing need for management of inshore fisheries and the scarcity of resources, alternative management models have been proposed by fisheries experts that strengthen, rather than weaken, CMT (Hunt, 1997b). Local knowledge substitutes for, or complements, scientific data; while local planning substitutes for, or complements, fisheries department planning. Legislative support for local tenure arrangements allows the reintroduction of effective traditional methods, such as temporary closures. However there is also a role for national regulations. While Gillett (1989:5) found that 40% of respondents in a coastal survey were not familiar with national rules for management of coastal resources, they could be effective if they were made simple and were seen to be relevant to the community.

The need for inshore management plans is most pressing in some of the smaller islands and atolls where greatly increased fishing effort on fish stocks is jeopardising the supply of essential protein to rapidly growing populations (Dalzell *et al*, 1995). The harvesting of commercial invertebrates such as trochus and bêche-de-mer (which in many cases have been severely depleted) can also come under local management arrangements. At the local (inshore) level, just as in the case of EEZs, tenure and access rights to marine

resources should be clearly defined to be effective (Hunt, 1997b).¹¹ A powerful incentive for local groups to restore and enhance CMT is the acknowledgment of their jurisdiction by local and central government, and the endorsement of their plans. In some Pacific Island nations much of the responsibility for coastal fisheries has already been devolved to the provincial or state level, for example FSM, PNG and Solomon Islands (the national government retain responsibility for the oceanic fisheries such as tuna fishing). In some PICs, CMT is already being reinforced by central governments. For example, local rights are recognised by the Fiji Fisheries Commission, and in the Solomon Islands (over both land and fisheries) through the Provincial Government Act of 1971.

CMT may present impediments to governments in undertaking industrial fisheries development - bait fishing for tuna pole-and-line fishing caused problems in Papua New Guinea.¹² It is argued, nevertheless, that strengthening CMT, rather than weakening it, should be the preferred policy in inshore areas that are beyond the practical jurisdiction of fisheries departments. The reasons are threefold.

- ◇ First, in many countries subsistence fishing dominates and the local communities that are dependent on the resources for their livelihoods should be in a position to manage those resources.
- ◇ Second, the resilience of management and conservation plans is enhanced by the clear access rights that should be a feature of strengthened CMT.
- ◇ Third, where commercial exploitation of local resources is a possibility, for example in the cases of trochus or bêche-de-mer, strengthened CMT puts the local communities in a more advantageous position in negotiating with traders.

Pacific governments have been prone to avoid the difficult process of clarifying CMT and instead carry out development or conservation through 'top down' approaches. However, the resilience of any development or conservation arrangements in inshore waters is often heavily dependent on local people being involved in decision processes and receiving rents. The potential for reintroduction of CMT is illustrated in the case of Kiribati.

Kiribati and CMT

In Kiribati, the ownership of all marine resources is vested in the state. This means, in practice, that effort in inshore fisheries of the islands is uncontrolled - a situation in contrast with the strict regimes exercised under traditional management. The transition from careful management under strongly held traditional property rights, to open access fisheries, is described by Teiwaki (1988, p. 41).

In the case of the reef and lagoon fisheries of outer atolls and islands, the logical entity for the vesting of fishing rights is the local community, which exploits the resource. It is argued that, even though there are collective action problems associated with community management, this arrangement would be superior to the holding of rights by a central government, which faces prohibitive costs of enforcement. The island council could exercise its control over marine resources using a variety of methods. It could limit the numbers of fishers, or restrict access or methods. In the latter case it could, for example, restrict the use of outboard motors on fishing vessels. Fish nursery areas and other areas

¹¹For examples of self-government of common property resources elsewhere, see Ostrom (1990).

¹²In the PNG bait fishery the allocation of part of the rents to a trust fund and to the provincial government, rather than to local groups, also became very contentious (Turner, 1994).

of great significance for the maintenance of fish stocks would come under the purview of the groups holding the rights to the inshore fisheries. In practice, the management system adopted by councils would be influenced by internal considerations of culture, equity and pragmatism.

Islands are developing their commercial fishing to supply the urban areas. There is bound to be competition between subsistence fishers and commercial fishers. The risk of resource depletion and potential conflict can only be resolved, realistically, by Councils exercising their rights to control total fishing effort in their waters (Hunt, 1997b).

In 1995 no effort restrictions or management plans were being applied anywhere to any fishery by the Fisheries Department of Kiribati, except through size of nets used on Tarawa lagoon. The inshore conservation regimes that strengthen customary tenure described are most applicable in rural areas, where traditional authority is still strong. On the urbanised atolls, such as Tarawa, and in peri-urban areas generally the fishing effort is high. Here central governments are able to ensure the enforcement of controls within their inshore management strategies.

Vanuatu and CMT

A very significant step in biodiversity conservation in Vanuatu is the development of provincial legislation, enabling local groups to strengthen their property rights and hence their ability to protect and to manage their natural resources. This step was the direct result of actions of Tacconi in negotiating with the Attorney General's department and using a draft by-law (obtained from Isabel province, Solomon Islands) as a model.¹³ Such legislation has been adopted in principle by the local government councils of Santo and Malekula, and has been enacted in Efate (Bennett, 1996).

In 1994 the local government region of MALAPA which includes Malekula was empowered to create protected areas by the passage through the Vanuatu Parliament of the *Bill for Decentralisation and Local Government Regions, Act No. 1, of 1994*. MALAPA was now able to introduce by-laws that "outline create and draw up regulations governing the environmental protection zones (natural parks, natural reserves or tourist-attraction areas in the national interest" (Act 1, Section 20 (9)). Tacconi subsequently assisted MALAPA in drawing up a by-law that facilitates planning by local ni-Vanuatu (Tacconi, 1995).

Other conservation arrangements of note that depend on local jurisdictions exercising their customary rights include that of a Cook Island Council enforcing limited trochus harvesting. The arrangement features individual transferable quotas and inspections upon landing (World Bank, 1995).

In Fiji the government has recognised the potential for CMT in management by granting property titles to coastal areas to custodian communities. In preparation for this, all customary marine areas are being mapped and registered prior to and titles being issued

¹³ Awareness of the potential for local management of marine resources had already been raised through an education programme conducted by the Vanuatu Fisheries Department and the Environment Unit of the Vanuatu government.

(World Bank, 1995). In investigating a commercial live reef fish development in Fiji, it was concluded that customary fishing rights law provides an effective local control of activities in the fishing area and for enforcing regulations put in place. A small council is made up of all the different parties involved for the protection of the resource owners' interest (SPC, 2001b).

Property rights access fees and scuba diving

In the Solomon Islands, the central government recognises customary tenure and hence compensates villages for the extraction of bait fish used in pole and line tuna fishing by the joint venture canning company STL. The way in which the inhabitants of Marovo Lagoon have protected their environment and confronted such commercial ventures is described in Hviding (1996).

Westerners find the concept of CMT difficult to grasp. In their own countries customary tenure has long since ceased to exist - the state invariably claims jurisdiction over territorial waters to the high water mark while much of the land area is held under freehold tenure. In contrast, as has been emphasised, customary tenure is still the dominant form of land tenure in the Pacific and CMT is still strong in some countries and regions despite colonisation.

Customary tenure is now also recognised by dive companies that gain access to the fabulous biodiversity of Solomon Island reefs and lagoons. Box 5 provides an example of how the customary owners have gained recompense for access to their marine resources.

Box 2: Customary marine tenure and scuba diving fees

The Uepi Island Resort, in the Marovo Lagoon, Solomon Islands, is surrounded by great biodiversity, both oceanic and coral reef. Spectacular drop-offs are a feature of the reefs, the clarity of the water is exceptional and the water temperature is usually between 28 and 32 degrees Celsius.

The resort began dive tours to reefs adjacent to the island resort in the early 1980s. At that time no customary fee arrangements were negotiated with the villagers who held the customary rights. As a result of failure to pay access fees disputes broke out between the resort and local communities resulting in some reefs being declared off limits to diving by the customary owners. However, by 1996, the payment of fees had regularised; A\$20 to A\$30 per diver was payable by the resort for access to dive sites (Uepi Island Resort, 1996).

The dive fees are the result of very detailed negotiations, in Melanesian pidgin, between the resort staff and the customary owners. In each case, negotiations conclude with the drawing up of a written agreement in both pidgin and English that covers access arrangements.

Note: The author is indebted to Ms Sabine Rodda of the Uepi Island Resort for information on negotiation procedures between the resort and the customary marine tenure holders.

Source: Hunt (1998).

Quotas and trochus - traditional and modern management combined

We now turn to case study of the adoption of an advanced management system – individual catch quotas (ITQs) in a trochus fishery, in Aitutaki Island, in the Cook Islands that is devolved to the local administration (Adams, undated). A system of catch quotas is common in the fisheries of industrialised countries, where the TAC is allocated between resource users, and where the transfer of the individual quotas between quota holders is allowed to increase efficiency (ITQs).

Mother of pearl production started in the Cook Islands in 1980 after the introduced *Trochus niloticus* had multiplied to such that it posed a threat to a traditionally-consumed gastropod and after it had become one of the few sources of export income for the country. A reserve area was delineated, minimum size limits imposed and an annual stocks assessment made that formed the basis for the limit to the annual harvest by weight of shell. The TAC was at first taken in a rush in one or two days by the competing villagers, but it was an unfair system because those living nearest the stocks took the biggest harvest and it was also an inefficient system in that there was no time to observe size limits closely. To overcome these problems, every household on the island was allocated a tradable quota worth around US\$250 per household. As well as improving the equity of the harvest, the system of ITQs allowed a more leisurely harvest of the best shells and more time for careful stock monitoring. The Cook Island Marine Resources Act formalises the principles developed in this plan (and other fishing plans), and has devolved much of the responsibility to the island council.

Emerging markets – extraction versus conservation

This section discusses the values of relatively new types of exploitation of inshore marine resources, namely live fish export and tourism. The first case is that of a development in Fiji for the live reef fish trade, in the Bua Province of Vanua Levu. The exporter to be supplied by local fishermen is a joint venture between an Australian and a Fijian company. A preliminary survey by SPC found that the only fish in abundance in demand for the trade was coral trout, and this stock was estimated to be worth US\$56 million using values in the Hong Kong Market. It was estimated, however, that the sustainable yield was much less than had been planned (SPC, 2001b). The danger of this type of project is that it is very difficult to make proper stocks assessments. Even though customary fishing rights law is said to be effective in locally enforcing regulations put in place, it must be said that, given the difficulty of stock assessment and the high returns, overexploitation, poses a substantial risk to economic sustainability.

While the contrasting tourism case comes from the Maldives in the Indian Ocean, it nevertheless has connotations for the Pacific. The marine life of the Maldives is diverse but the greatest attractions to divers are sharks, manta rays and turtles. A study by a scientist at the Marine Research Centre in the Maldives estimated that the viewing value of shark is US\$6 million per annum, of manta rays US\$7 million and of turtles US\$4 million. These estimates were derived by asking divers what they were willing to pay to see more of these creatures. The annual viewing value of the sharks is ten times the annual value of all shark products. There are, however, significant threats posed to the protected areas in the form of illegal fishing and coral mining. It is proposed in the study that a dollar a dive be charged to generate US\$0.9 million a year for the development of alternative options for fishermen whose lives are affected by the protection of the areas (SPC, 2001c).

Conclusions

The paper has addressed the prospects for marine resources to contribute to development in the Pacific region. In the first instance, the prospects for the industrial or oceanic fisheries were assessed. The WCPO contributes about half of the world's canning tuna. It was found that in the countries with the large canning tuna resources that the fishery already contributes considerable income mainly in the form of access fees from the distant water fleets that deliver their catches to canneries elsewhere. In the case of chilled tuna for export, long line fishing is also dominated by distant water nations but vessels based in the PIs now catch about 20% of the total for processing locally. There are a variety of ways in which PIs can capture benefits from long line fleets based domestically. Long line fishing has more growth potential in the region because it is less capital intensive but it tends to be limited by shortages of infrastructure and trained personnel, both of which can be addressed by governments.

It was emphasised that deals involving the waiving of licence fees in exchange for onshore investment and domestication of fleets should be subject to the test of domestic value added to answer the question: Will the country be better off collecting licence fees, or by encouraging domestication to tap a range of benefits associated with the purchase of goods and services and the employment of nationals? The canneries of the region face

fierce competition from efficient canneries of Asia Europe and the U.S. and profitability may be elusive.

The overcapitalisation in the world's tuna fleets has been highlighted by the recent fall in the price of tuna. However, the development of mechanisms for cohesively addressing a limitation of fishing effort, in the WCPO, is still some way off. Moreover, there is as yet no general recognition among PIs that there are limits to tuna catches in the Pacific. If big eye stocks are to be conserved then there will need to be reductions in the fishing on FADs, as there have been in other oceans, and in TACs. An overall tuna quota for the WCPO will probably need to form the base on which the TACs of individual PIs are formulated. A major difficulty is the fact that Indonesia and Philippines, major players in the WCPO, are not specifically included in the Pacific forums that will be formulating such management plans. A research programme that should be carried out is the role of subsidies in the overcapitalisation of tuna fleets.

Another major issue that will affect particularly the long line industry is that of by catch. The state of shark and other species commonly caught along with tuna are expected to receive intensive attention from environmental NGOs. It would be wise for PI governments to be very cautious about the issue of licences for shark fishing, and to act now to minimise the by catch of long liners.

The conclusions concerning the capture of benefits from the inshore fisheries tend to hinge on sustainability issues. It was shown that the inshore resources confer massive benefits on coastal populations, both in terms of food sources and in terms of cash, and that these benefits are typically underreported. Efforts to commercialise the rather fragile reef and deep bottom resources would seem to be suspect in many instances – in terms of the probability of resource depletion without proper management. It was emphasised that local communities in rural areas are in the best position to manage local marine resources, and that their powers should be strengthened and supported by provincial and central governments. However, the threats to the coastal resources often emanate from terrestrial sources. In those cases governments have the difficult task of coordinating more than one ministry in recognising and addressing the threats.

In the long run, the maintenance of the continuous benefits presently enjoyed by coastal populations will be determined by the people's ability to manage their resources sustainably, as well as their ability to limit internal and external threats to inshore and coastal eco-systems.

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