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SOME PROBLEMS OF DEVELOPING AND MANAGING FISHERIES
IN SMALL ISLAND STATES

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1. Introduction

Small island countries face many of the problems of all developing nations. They also need to contend with numerous special difficulties as a result of their small size, restricted populations, and isolation. The general problems have been discussed in numerous reports and publications and will be considered by other authors in this seminar series. In an attempt to minimize repetition of discussion I will, in so far as possible, restrict my comments to only those problems which relate specifically to the development of fisheries in small island states. Of course, some of the problems which hinder fisheries also hinder development in many other spheres and hence, some overlap with problems not related to fisheries is unavoidable.

Fish and fisheries play a very significant part in the culture, sustenance, and recreation of all small island communities. Even though western style development has diversified life styles in most island communities and has created new alternatives to fish and fishing as a way of life, it is doubtful if the significance of fisheries to island people has decreased in recent years. Furthermore, in the last few years the international acceptance of the principles of extended zones of fisheries or economic jurisdiction has brought the fisheries potential of small island states into the international political arena for the first time and has begun to influence government policy at the highest levels. The increased potential which this new 200 mile regime brings to small island states is being regarded by many as a bonanza, particularly for those states which have relatively few terrestrial natural resources. However, the complications and difficulties involved in developing the resources of these extended zones, or even in managing fisheries already harvesting the resource, pose their own new problems. Extended jurisdiction also brings responsibilities which many smaller states have inadequate facilities to cope with.

2. The Resources of Small Island States of the Pacific

The small developing states of the western and central Pacific are, in general, comparatively isolated islands or archipelagoes. In most cases, there is little, if any, continental shelf and the smallness of the land mass means that there is very little nutrient run-off to enrich the adjacent waters. The waters surrounding them are typically clear, blue and oceanic, and support comparatively low total productivity compared to continental coastal areas. As a result of the lack of large continental shelf areas or extensive coastal enrichment, small island states do not often have extensive inshore fisheries resources. However, the 200 fold increase in the combined areas of jurisdiction of Pacific coastal states, resulting from the acceptance of 200 mile zones (Table 1), means that the prospects for fisheries development are not restricted to the coastal fisheries which have historically provided livelihood. The coastal resources have, however, traditionally been of greater significance and it is appropriate to discuss their potential development and management first.

TABLE 1. Population, land and sea area (200 mile zones) of the small island countries and territories in the area of the South Pacific Commission

(from Sevele and Bollard 1979)

Country or Territory	Population (mid 1978)	Land Area (sq. km)	Sea Area (sq. km)	<u>Sea Area</u> Land Area
American Samoa	31,500	197	390,000	1,980
Cook Islands	18,500	240	1,830,000	7,625
Fiji	607,000	18,272	1,290,000	71
French Polynesia	141,000	3,265	5,030,000	1,541
Guam	90,000	541	Included in TTPI	N.A.
Kiribati	56,000	684	3,550,000	5,190
Nauru	7,000	21	320,000	15,238
New Caledonia	138,000	19,103	1,740,000	91
New Hebrides	101,500	11,880	680,000	57
Niue	3,700	259	390,000	1,506
Norfolk Island	1,900	36	400,000	11,111
Pitcairn Island	100	5	800,000	160,000
Solomon Islands	214,000	28,530	1,340,000	47
Tokelau	1,600	10	290,000	29,000
Tonga	93,000	699	700,000	1,001
Trust Territory of the Pacific Islands	133,000	1,832	6,200,000	3,384
Tuvalu	7,400	26	900,000	34,615
Wallis and Futuna	10,000	255	300,000	1,176
Western Samoa	153,000	2,935	120,000	41
South Pacific Commission area (excl. Papua New Guinea)	1,808,200	88,790	26,270,000	296

2.1. Coastal Resources

2.1.1. The problems of development

It has already been suggested that the coastal resources of the small island states are restricted because of the limited total area of habitat; however, these inshore stocks have traditionally been of unequalled significance to island peoples. Their role in the future of island societies should not be underestimated, even if they are not developed beyond their present levels.

The coastal resources of the small island states of the Pacific are mostly those of tropical reef or lagoon environments. These environments harbour a great diversity of marine organisms and many families of fish, crustaceans and molluscs are represented. However, the relative productivity of marketable fish and other sea foods from such reef areas is not great. Furthermore tropical reef areas are not suitable for trawling and they seldom harbour extensive resources of pelagic species vulnerable to seining. As a result large catches are not regularly taken and infrastructures for handling even moderate quantities of fisheries products are normally not established. Development is therefore severely hampered by the lack of a major single fishery which could provide the backbone of commercial catching and processing enterprises. This lack of a major fishery, coupled with the restricted market outlets as a direct function of smallness, means that fishing vessels tend to be small and fishermen are required to diversify their gear and techniques to make best use of the variety of species available. This necessity to depend on small vessels often results in fishing activities being completely disrupted by periods of even moderate weather. Small communities are therefore frequently faced with the problem of fishing vessels being unable to work for long periods. When they can work, glut conditions can often result from abnormally good catches by only one or two vessels.

It is therefore not surprising that even though there is great diversity in the coastal fisheries resources in small island states, the total harvest from them is not great. This is substantiated by the relatively small catches made in the coastal fisheries of the island states of the Pacific (Table 2).

Improvements in fishing gear and technology will undoubtedly increase the effective fishing effort brought to bear on the inshore resources of island states. In many cases this can be anticipated to result in an increase in total catch which could, by most definitions, constitute development. However, total catches can only be increased if the incentive to the fishermen is maintained and this can only be done if sufficient market demand exists to ensure that increased financial returns will result from increased catches. In small island communities this is often not possible because of the small number of consumers and the ease with which local markets can be glutted. This normally necessitates export to urban areas, neighbouring islands or possibly distant metropolitan centres. For the small scale coastal fishermen there are many processing and marketing problems which hinder this type of development. The most notable are:

TABLE 2

Local catches and catches by distant-water fleets in the waters of the countries and territories of the South Pacific Commission

Country or Territory	Local Total Fish Catch (tonnes)	Local Tuna Catch (tonnes)	Longline Catch ⁽⁸⁾ in 200 Mile Zone by Foreign Fleets in 1976 (tonnes)	Pole-and-line ⁽⁸⁾ Catch by Japanese Fleet in 200 Mile Zone in 1976 (tonnes)
American Samoa	220 ('78) (1) (2)	20 ('78) (2)	387	29
Cook Islands	-	-	2,866	10
Fiji	11,594 ('77) (1) (3)	7,262 ('77) (1) (3)	1,553	233
French Polynesia	2,386 ('74) (4)	1,293 ('74) (5)	7,264	0
Guam	-	-	-(6)	-(6)
Kiribati	1,344 ('77) (1)	786 ('77) (1)	11,349	16,570
Nauru	0	0	1,845	8,224
New Caledonia	499 ('77) (1) (3)	186 ('77) (1) (3)	1,800	58
New Hebrides	10,500 ('76) (7)	10,000 ('76) (7)	1,012	93
Niue	20 ('78) (1)	10 ('78) (5)	289	4
Norfolk Island	-	-	700	2
Pitcairn	-	-	1,090	0
Solomon Islands	17,444 ('76) (5)	15,787 ('76) (8)	2,709	17,248
Tokelau	-	-	450	1,645
Tonga	1,117 ('77) (1)	300 ('77) (5)	816	18
Trust Territory of the Pacific Islands	10,000 ('76) (5)	5,284 ('76) (8)	20,601	38,360
Tuvalu	80 ('78) (1)	40 ('78) (1)	1,886	7,611
Wallis and Futuna	-	-	386	155
Western Samoa	1,700 ('76) (1)	850 ('76) (1)	160	24
<u>TOTAL</u>	56,904	41,818	57,163	90,284

(1) Figures from Crossland and Grandperrin 1979.

(2) Excluding unloadings to the Pago Pago canneries.

(3) This includes only the catches which passed through markets.

(4) From Kearney 1977.

(5) Estimated by the author.

(6) Catches included under Trust Territory of the Pacific Islands.

(7) Mainly longline catches transhipped at Santo.

(8) From Kearney 1979.

- (i) There is great species diversity in tropical marine environments and seldom is it possible to develop a fishery solely on one species. Processors and customers alike can therefore not become accustomed to dealing regularly with a single species.
- (ii) The species diversity requires versatility in the handling and processing techniques used in order to maintain quality.
- (iii) The remoteness of many island areas normally results in abnormally high fuel and maintenance costs for all processing and refrigeration equipment.
- (iv) The ambient temperature in tropical environments strains the limited refrigeration which is available in most cases.
- (v) Ciguatera poisoning is a common phenomenon in most island areas. This not only prevents the sale of certain species of fish to local knowledgeable consumers, but in many cases it completely prohibits the export of fish because of the uncertainty on the part of foreign buyers.
- (vi) Export of produce is difficult if refrigeration is required, and is expensive because of high freight costs resulting from remoteness.

2.1.2. The problems of management

The development of fisheries resources unavoidably raises questions of management. Firstly it is necessary to define if management is required for the protection of a species, a population, or a stock, or if it is necessary for more political or economic motives. In some cases where the resources are large and effort minimal, the only management decision necessary is to increase the catch by increasing the total effective effort; in such situations there are fewer problems. However, when resources are limited, as is the case in many islands, an increase in the total effective effort will result in a decrease in the catch per unit of effort and hence in the average economic return. In some cases it could even result in a decrease in the total catch, as, for example, has been experienced in the turtle fisheries of several Pacific countries. Largely because of the restricted area of the inshore resources, many of them are highly susceptible to over-exploitation to the point where total yield is decreased. Therefore, any development of these resources must be done within the basic guidelines of sound fisheries management and resource conservation.

Management of coastal resources for economic gain will need to be aligned with the general political and socio-economic goals of the country, and will probably involve optimizing effort in accordance with the state of the harvestable resource and available markets and processing facilities.

Management decisions from a conservation viewpoint will need to take account of many complex variables affecting the harvestable adult stocks, and the maintenance of breeding and nursery grounds such as mangroves, reef flats and inter-tidal zones. The complexity of these issues will be magnified in tropical reef environments because of the diversity of the species being exploited. It is impractical at this time to try and predict what management issues will assume general importance, or how individual problems could best be solved.

2.2. Aquaculture Potential

While it would be foolish to disregard the potential of aquaculture as a fisheries development medium for any developing state, I feel that in small island states aquaculture development projects should be regarded with caution. Closed system aquaculture has, in the main, only been successful in the very large developing countries, where incomes are very low, population densities are high and natural protein resources are restricted. In many cases when coastal mangrove or inter-tidal zones are converted for aquaculture, their original value as breeding or nursery grounds for species harvested in existing commercial fisheries is overlooked. In general, continuous access to a relatively high priced luxury market is required for most aquaculture products and these conditions do not often exist in small island countries. Development planners would be well advised to examine the problems of the numerous aquaculture projects which have been undertaken in similar areas before committing funds or manpower.

The economic implications of developing aquaculture schemes in the island states of the South Pacific were considered in depth by the South Pacific Commission's Eighth Regional Technical Meeting on Fisheries, which concluded that in this region very few previous projects such as this had been successful; it "recommended that detailed economic surveys should be carried out before any commercial scale aquaculture projects are initiated, and pointed out that such surveys should include the economics of alternative use of both the land to be developed and the investment capital" (Anon 1975).

2.3. Offshore Resources

2.3.1. The problems of development

The known offshore fisheries resources of the central and western Pacific are dominated by highly migratory species, predominantly tunas. The significance of these species is clearly shown in Table 2, where the approximate total fish catches, and those of tunas and billfishes by the longline and surface fisheries, in the respective 200 mile zones of the small coastal states in the area of the South Pacific Commission are given. From the figures given in Table 2 it can be shown that tuna account for 189,265 tonnes (93 percent) of a total recorded fish catch of 204,351 tonnes from the 200 mile zones of the small island states in the area considered.

Even though "local tuna catches" in Table 2 amount to 41,818 tonnes, it must be noted that the greater part of this total is taken by foreign vessels fishing independently of, or in joint venture with, the coastal state; the catch is recorded as local by the individual countries because it is landed or transhipped in the respective country.

The tuna catches in Table 2 are particularly significant for two major reasons: firstly the totals show the unequalled economic potential of tunas for many of the individual states; secondly the present low level of participation by coastal states indicates considerable potential for development. The real problem then is how to increase the involvement of the island states in these fisheries. A whole range of possibilities exists, from the development of wholly owned, operated and controlled local fisheries, through numerous joint venture alternatives, to the generation of revenue from totally foreign fleets. Of course, no one of these possibilities need be pursued exclusively and some balance of local and foreign enterprises could be the most rewarding.

If the island states choose to generate revenue from the licensing of foreign boats, then the problem is largely one of management; however if the coastal states pursue the option of developing their own fisheries for the offshore resources, then some of the major problems they will need to overcome include:

- (i) Seasonal fluctuations in the abundance of the resource
Even though the area of ocean under the control of individual coastal states has increased dramatically as a result of the acceptance of 200 mile zones of extended jurisdiction, these areas represent only a fraction of the habitat of the highly migratory species. The abundance of these resources in any one 200 mile zone fluctuates markedly with season, particularly in the higher latitudes. It may, therefore, be impossible for most small island states to maintain a fleet year-round, particularly as most of them have no other suitable fisheries in which to employ vessels and crew during off-peak seasons. Co-operation with neighbouring states, preferably on a broad regional basis, could help to alleviate this problem.

Highly migratory resources often show marked year to year variations in abundance in addition to seasonal variability. Companies or countries with limited financial resources find it very difficult to withstand successive poor seasons, or even a single very bad one.

- (ii) The requirement for large expensive vessels
An average (300 tonne) pole-and-line or longline vessel used in the distant-water fisheries of the central and western Pacific now has a replacement value which substantially exceeds A\$1,000,000, and even in 1976 cost almost A\$1,000,000 per year to operate (Tables 3 and 4). An average U.S. tuna purse seiner of 1,000 tons costs approximately A\$6,000,000 to build and A\$2,000,000 per annum to run (Table 5).

Small states mostly do not have suitable slipping and docking facilities for larger fishing vessels, nor do they carry extensive stocks of spare parts and ancillary equipment.

TABLE 3

Declared income and expenditure for Japanese skipjack pole-and-line vessels
of 50-100, 100-200 and 200-500 gross tonnes
 All costs are in units of 1,000 Yen

Year Tonnage Class	1971			1972			1973			1974			1975			1976		
	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500
Sample size	N/a	13	14	N/a	11	20	1	8	29	2	2	35	N/a	3	38	N/a	N/a	40
Average Tonnage	N/a	186.79	288.84	N/a	183.57	296.07	59.96	190.34	306.35	59.65	192.63	306.05	N/a	191.90	325.59	N/a	N/a	350.35
No. of Crew	N/a	38.5	38.8	N/a	37.8	37.3	27	30.4	34.7	24	35.0	32.5	N/a	22.0	29.7	N/a	N/a	30.2
Total income	N/a	124565	145064	N/a	161742	154954	76075	103129	186872	75281	115862	175278	N/a	90023	146493	N/a	N/a	239154
Total operating costs	N/a	109310	136175	N/a	156867	148509	71327	95503	179635	75934	116930	175630	N/a	88496	167188	N/a	N/a	226228
Profit	N/a	15255	8889	N/a	4875	6449	4748	7626	7237	-653	-1068	-352	N/a	1527	-20695	N/a	N/a	12926
Cost of Labour	N/a	56421	65236	N/a	71706	68661	37623	46223	79322	28260	51038	68316	N/a	32574	56501	N/a	N/a	91307
Labour as % of total cost	N/a	51.6%	47.9%	N/a	45.7%	45.7%	52.7%	48.4%	44.2%	37.2%	43.6%	38.9%	N/a	36.8%	33.8%	N/a	N/a	40.4%
Cost of Fuel/Oil	N/a	7432	9491	N/a	12518	12246	5419	8492	16165	11008	17572	32311	N/a	19796	39854	N/a	N/a	48909
Fuel as % of total cost	N/a	6.8%	7.0%	N/a	8.0%	8.2%	7.6%	8.9%	9.0%	14.5%	15.0%	18.4%	N/a	22.4%	23.8%	N/a	N/a	21.6%
Cost of Bait	N/a	9413	15970	N/a	13379	12574	7744	9653	14453	8045	9775	15191	N/a	13262	16909	N/a	N/a	18378
Bait as % of total cost	N/a	8.6%	11.7%	N/a	8.5%	8.5%	10.9%	10.1%	8.0%	10.6%	8.4%	8.6%	N/a	15.0%	10.1%	N/a	N/a	8.1%
Fuel cost/ tonne tuna caught	N/a	10.81	10.91	N/a	12.08	12.08	11.99	14.32	15.10	32.48	30.61	35.01	N/a	N/a	N/a	N/a	N/a	N/a
Bait cost/tonne tuna caught	N/a	13.69	24.76	N/a	12.91	12.91	17.13	16.28	13.85	23.74	17.02	16.62	N/a	N/a	N/a	N/a	N/a	N/a

¹ All figures are modified or calculated from statistics published in the 1978 Annual Fisheries Statistical Report of the Japanese Ministry of Agriculture Forestry and Fisheries. Translations of relevant tables were kindly made available to the author by the Micronesian Maritime Authority, Ponape, Eastern Caroline Islands.

TABLE 4

Declared income and expenditure for Japanese longline vessels
of 50-100, 100-200 and 200-500 gross tonnes
 All costings are in units of 1,000 Yen

Year Tonnage Class	1971			1972			1973			1974			1975			1976		
	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500	50/ 100	100/ 200	200/ 500
Sample size	22	4	N/a	22	6	1	27	10	1	32	13	1	32	11	N/a	29	5	2
Average tonnage	75.85	164.36	N/a	72.94	169.50	371.02	75.09	162.72	299.35	79.06	168.35	299.35	76.91	168.39	N/a	75.06	152.13	276.27
No. of crew	17.1	19.5	N/a	16.5	19.2	26	16.1	17.8	22	16.1	18.3	21	15.2	18.0	N/a	14.6	17.6	20
Total income	46350	85590	N/a	48102	92411	55504	66178	96541	78625	66365	106594	83262	80246	118556	N/a	104401	142134	174577
Total operating costs	44722	68732	N/a	46129	81108	53203	65457	90096	93501	77799	108778	87381	85945	122076	N/a	104150	132391	179131
Profit	1628	16858	N/a	1973	11303	2301	721	6445	-14876	-11434	-2184	-4119	-5699	-3520	N/a	251	9743	-4554
Cost of labour	18514	29628	N/a	19200	37039	25199	26223	36071	35066	28857	40456	32210	30911	45827	N/a	41357	52816	78211
Labour as % of total cost	41.4%	43.1%	N/a	41.6%	45.7%	47.4%	40.1%	40.0%	37.5%	37.1%	37.2%	36.9%	36.0%	37.5%	N/a	39.7%	39.9%	43.7%
Cost of fuel/oil	3747	7722	N/a	3332	8733	8815	5039	10504	7939	9574	20650	13160	12991	24114	N/a	16309	27969	35005
Fuel as % of total cost	8.4%	11.2%	N/a	7.2%	10.8%	16.6%	7.7%	11.7%	8.5%	12.3%	19.0%	15.1%	15.1%	19.8%	N/a	15.7%	21.1%	19.5%
Cost of Bait	3776	3590	N/a	2963	3854	4600	3419	3997	3312	4355	5878	4250	5210	6394	N/a	6625	7597	7129
Bait as % of total cost	8.4%	5.2%	N/a	6.4%	4.8%	8.6%	5.2%	4.4%	3.5%	5.6%	5.4%	4.9%	6.1%	5.2%	N/a	6.4%	5.7%	4.0%
Fuel cost/tonne tuna caught	27.05	31.86	N/a	24.41	34.82	44.84	31.12	43.40	37.70	71.66	96.81	65.77	N/a	N/a	N/a	N/a	N/a	N/a
Bait cost/tonne tuna caught	27.26	14.81	N/a	21.71	15.37	23.40	21.12	16.52	15.73	32.60	27.56	21.24	N/a	N/a	N/a	N/a	N/a	N/a

¹ All figures are modified or calculated from statistics published in the 1978 Annual Fisheries Statistical Report of the Japanese Ministry of Agriculture Forestry and Fisheries. Translations of relevant tables were kindly made available to the author by the Micronesian Maritime Authority, Ponape, Eastern Caroline Islands.

TABLE 5

Estimated operating expenses for U.S. purse seine vessels of
1,100 ton class

All figures are in U.S. Dollars

(Kearney 1979)

	1976	1977	1978
Total Income	2,200,000	1,700,000	2,200,000
Total Operating Costs	2,100,000	1,700,000	1,980,000
Profit	100,000	0	220,000
Cost of Labour	900,000	480,000	610,000
Labour as % of Total Cost	42.9%	28.2%	32.1%
Cost of Fuel/Oil	270,000	160,000	160,000
Fuel as % of Total Cost	12.9%	9.4%	8.4%
Fuel Cost/Ton Tuna Caught	100	80	63

(iii) Cost and availability of fuel

From Tables 3, 4 and 5 it can be seen that in 1976 it cost A\$141,765 per annum (¥48,909,000 at a rate of A\$1.00 = ¥345) for fuel for a 350 tonne pole-and-line vessel, A\$101,464 (¥35,005,000) for a 276 tonne longliner and A\$239,000 (US\$270,000 at A\$1.00 = US\$1.13) for a 1,100 ton purse seiner. The fuel costs for any one of these vessels exceed the entire national fuel bill for 1977 for each of two of the island states of the South Pacific (Tuvalu and Niue) and represent a substantial fraction of the fuel consumption of several others (Table 6).

Fishing fleets throughout the world are facing serious economic problems as a result of the world's worsening oil situation and small island states are no exception. They may even be more disadvantaged, for should they undertake a major fisheries development scheme their fuel purchasing policy would need major review. Fuel is not only becoming more expensive (Table 7), but is also becoming increasingly difficult to obtain, making it difficult for any non-oil producing country to plan the development of fisheries which will necessitate substantial increases in fuel consumption.

Fuel is also far more expensive in remote areas (Table 8). This makes it disadvantageous for foreign flag vessels to bunker there and hence difficult for small states to encourage these vessels to call and unload their catch. It also means that small island states have an extra economic disadvantage to contend with when catching fish to sell on an internationally competitive market.

TABLE 6

Imports of fuel and minerals by some small island countries and territories in the area of the South Pacific Commission in 1977

(From Sevele and Bollard 1979)

Country or Territory	Value of Fuel and Mineral Imports \$A'000
American Samoa	17,719
Cook Islands	734
Fiji	53,072
French Polynesia (1976)	21,943
Kiribati	2,111
Nauru	1,307
New Caledonia	63,312
New Hebrides (1975)	3,065
Niue	164
Norfolk Island	546
Solomon Islands	3,542
Tonga	1,798
Trust Territory of the Pacific Islands (1976-77)	4,429
Tuvalu	67
Western Samoa	3,337

TABLE 7

Changes in marine diesel prices at two United States ports

Year	Los Angeles Price US\$ per barrel	New York Price US\$ per barrel
1970	4.40	3.51
1973	11.55	10.96
1974	16.88	16.96
1975	N.A.	15.25
1976	16.02	15.25
1977	16.13	15.67
1978	16.13	15.85
1979	21.89	21.87

TABLE 8

Diesel fuel prices in July 1979 at selected ports

Port	Country	Price US\$ per gallon
Pago Pago	American Samoa	0.62
Los Angeles	United States of America	0.56
Cape Town	South Africa	1.59
Suva	Fiji	1.05
Noumea	New Caledonia	1.10
Port Louis	Mauritius	0.95
Las Palmas	Canary Islands	1.02
Panama	Panama	1.20

(iv) Problems of smallness and economies of scale

Problems of smallness and economies of scale are not peculiar to fisheries and most of them have been covered in other papers for this conference. Enumeration of these problems is unnecessary; however, one example relevant to the specific problems of developing a major fishing facility is probably warranted.

In a previous study based on data from the Papua New Guinea skipjack fishery, I estimated that approximately 8,000 tonnes of tuna per annum were required to maintain the economic viability of the catching sector (Figure 1); this would require at least ten catcher boats (Kearney 1975). In addition to the problems of funding a venture of this size, most small island states do not have sufficient skilled fishermen, or other technical or management personnel, available to facilitate this scale of development. If a live-bait and pole fishery, capable of catching 8,000 tonnes of tuna per annum, is to be developed, then live-bait resources sufficient to support bait catches well in excess of 240 tonnes would be required (Kearney 1975). Most small island states do not have bait-fish resources of this magnitude and even for some which do, a catch of 240 tonnes per annum would be several times their present total commercial fish catch.

Furthermore, experience suggests that the development of tuna fishing industries in the western Pacific is suspect unless there is some processing associated with it. If the fish are not processed but merely exported frozen, then the remoteness of most small states means that freight costs may be as high as A\$200 per tonne and may severely jeopardise the entire

operation. The minimum annual requirement for a viable tuna cannery is around 5,000 tonnes, depending on the locality, and 15,000 tonnes is probably closer to the optimum size in most areas. Not only does this type of processing facility pose additional financial and manpower problems, but it requires water and power resources which are beyond most very small island countries.

2.3.2. The problems of management

Even though few small island states are at present actively involved in the management of fisheries resources, there is no doubt that most, if not all, of them have a strong desire to increase their involvement in the fisheries which go on in the waters surrounding them. The international acceptance of extended jurisdiction has undoubtedly given the coastal states new rights and powers in this field. They have rather suddenly become responsible for the management of resources exploited by fisheries in which the coastal states have not been involved (Table 2).

The articles in the law of the sea texts most relevant to discussions on increased involvement by coastal states in the management of the fisheries resources in their 200 mile zones are Articles 56, 61 and 62 of the Informal Composite Negotiating Text (ICNT 1977). Throughout those sections of the ICNT relevant to fisheries management, four main themes have been stressed.

- (i) Increased rights of coastal states
The increased rights of coastal states in the exclusive economic zone are clearly defined in Article 56, "(a) Sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the bed and subsoil and the super-adjacent waters". Additionally (Article 61.1) "The coastal state shall determine the allowable catch of the living resource in its exclusive economic zone", and (Article 62.3) "The coastal state shall determine its capacity to harvest the living resources of the exclusive economic zone".
- (ii) Obligations of coastal states
Considering the obligations of coastal states, Article 62.1 states "The coastal state shall promote the objective of optimum utilization of the living resources in the exclusive economic zone", and Article 62.2 adds "Where the coastal state does not have the capacity to harvest the entire allowable catch, it shall ... give other states access to the surplus of the allowable catch".
- (iii) Obligations of nationals fishing in an exclusive economic zone other than their own
The obligations of nationals or other states fishing in the exclusive economic zone are numerous but most importantly include compliance "with the conservation measures and with the other terms and conditions established in the regulations of the coastal state. These regulations shall be consistent with the present Convention and may relate, *inter alia*, to the following:

- (a) Licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration ...
 - (b) Determining the species which may be caught, and fixing quotas of catch, ...
 - (e) Specify information required of fishing vessels, including catch and effort statistics and vessel position reports ...
 - (h) The landing of all or part of the catch by such vessels in the ports of the coastal states; ...
 - (k) Enforcement procedures" (Article 62.4).
- (iv) The need to conserve the resource base
Article 61.3 endorses the need "to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yields, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishery communities and the special requirements of developing countries".

These four points clearly indicate the increased rights of coastal states, and their responsibility to protect the resource for the benefit of mankind and to actively promote attainment of maximum sustainable yields. What has happened in practice is that foreign fishing nations have accepted the principles of increased coastal states' rights, but the attainment of benefits by the coastal states has been solely determined by the ability of the states to negotiate agreements to their advantage. In effect the responsibility to maintain maximum yields has been ignored. This is not surprising in the light of Articles 56, 61.1 and 62.2.

It could have been predicted that the coastal states would have, by their increased rights, assumed the primary role in the management of the fisheries in their respective 200 mile zones. However, in reality the small coastal states of the central and western Pacific have found that the distant-water fishing nations have not rushed to buy licences from the whole region, but rather they have negotiated on a bilateral basis with a few selected states. In many cases, coastal nations have not been able to obtain "buyers" for access to their waters, and their anticipated participation in the management of their offshore resources has therefore not eventuated. While at first glance this result would suggest that the introduction of licence fees has in itself caused a withdrawal of at least some of the foreign fishing fleets, it is probable that economic problems other than those associated with licences have at least equally contributed.

The offshore tuna fisheries of the central and western Pacific are at present extremely unstable. Japan has traditionally been the dominant distant-water fishing nation in this region and for an accumulation of reasons it is becoming increasingly less attractive for Japanese vessels to operate there. The Japanese skipjack market is at present very depressed, largely as a result of the marked drop in the value of the

U.S. Dollar against the Yen, making it uneconomic for Japan to export its excess catches to the United States. Further, labour (Tables 3 and 4) and fuel (Table 7) costs are constantly rising while catch per unit effort remains static or tends to decrease. When the additional potential burden of licence or access fees is considered, the short-term financial future for the catching sector of the tuna fishing industry in the western Pacific is not good. Owners of foreign fishing vessels are therefore keen to minimize the licence or access fees they are forced to pay and one way to do this is to concentrate the fishing effort near those countries which have not as yet declared 200 mile zones, or which charge minimal licence fees. For further discussion see Kearney 1979.

The lack of uniformity in fisheries policies by the coastal states has therefore jeopardised the chances of several states of becoming involved in the management of the fisheries and the generation of revenue from them. Furthermore, as the major resources are highly migratory, the few countries which now have fisheries agreements cover only a fraction of the area of the distribution of the resource and they cannot effect a sound management regime for conservation purposes. The need for regional co-operation on management of the highly migratory resources, whether for the generation of revenue or for conservation, is therefore stressed. This issue has been dealt with in greater detail in a previous report (Kearney 1977).

3. Summary and Conclusions

3.1. The Present State of Fisheries Development

Table 9 summarizes the extent of commercial fisheries in the small states of the South Pacific Commission area. The recorded catches for local consumption represent less than 10 percent of the total catch from the 200 mile zones, while the locally registered catches account for little more than 25 percent of this total. The present domination of the catches from this region by the distant-water fishing nations exploiting exclusively highly migratory species is immediately apparent.

3.2. Some Available Options

In the preceding sections, I have, as indicated in the title of this paper, concentrated on the problems which small island states face in developing or managing fisheries resources; the general tone of the comments is therefore not particularly constructive or optimistic. However, the very fact that the coastal states do have substantial resources in their 200 mile zones, and that the accepted principles of the law of the sea undoubtedly give them responsibility for management, is reason enough to increase the involvement of coastal states. Furthermore, there are resources, such as the deep water snappers, and other species of the reef slopes, which have only just begun to be exploited and which offer exciting new potentials. The fact that many small island states import fish and fisheries products means that there is a need for import replacement, and confirms that local markets could absorb increased quantities of local product. The generally restricted nature of the known resources and the tendency in tropical reef fisheries for catch per unit of effort to drop quickly with increased effort suggest that development of inshore fisheries should be gradual and cautiously carried out.

TABLE 9. Commercial, local and foreign fish catches, and fish imports and exports for some countries and territories in the area of the South Pacific Commission

Country or Territory	Commercial fish catch ⁽¹⁾ for domestic consumption (tonnes)	Total locally ⁽²⁾ registered fish catches (tonnes)	Total fish ⁽³⁾ catch from 200 mile zone (tonnes)	Total fish ⁽⁴⁾ imports (1976) (\$A'000)	Total fish ⁽⁵⁾ exports (1977) (\$A'000)
American Samoa	220	220	636	496	67,979
Cook Islands	N.A.	N.A.	2,876+	N.A.	-
Fiji	4,332	11,594	13,380	7,000	4,705
French Polynesia	2,386	2,386	9,650	2,200	-
Kiribati	1,344	1,344	29,263	76	-
Nauru	0	0	10,069	N.A.	-
New Caledonia	499	499	2,357	1,100	121
New Hebrides	500	10,500	11,605	930	12,011
Niue	20	20	313	50	-
Norfolk Island	N.A.	N.A.	702+	-	2
Solomon Islands	1,657	17,444	37,401	150	7,895
Tokelau	N.A.	N.A.	2,095+	N.A.	-
Tonga	1,117	1,117	1,951	96	5
Trust Territory of the Pacific Islands	4,716	10,000	68,961	N.A.	3,265
Tuvalu	80	80	9,577	N.A.	-
Western Samoa	1,700	1,700	1,884	700	-
<u>TOTAL</u>	18,571+	56,904+	202,720+	12,798+	95,983

(1) From Crossland and Grandperrin, 1979

(2) From Table 2

(3) From Kearney, 1979

(4) From George Kent, 1979 (manuscript)

(5) From Sevele and Bollard, 1979

Increased involvement in the offshore fisheries is a different issue. It is difficult to generalize because, while successful skipjack pole-and-line fisheries have been developed in Solomon Islands and Fiji, the lack of baitfish resources in countries such as Nauru appears to preclude the development of such a fishery. Nonetheless I feel confident that there is potential for more successful pole-and-line fisheries to be developed in the small island states of the western Pacific. Even for those countries without the baitfish or skipjack resources to develop a local pole-and-line fishery, there is obviously potential to license foreign purse seiners or distant-water pole-and-line or longline vessels, particularly if development and licensing policies can be co-ordinated amongst the small island states with common resources and interests.

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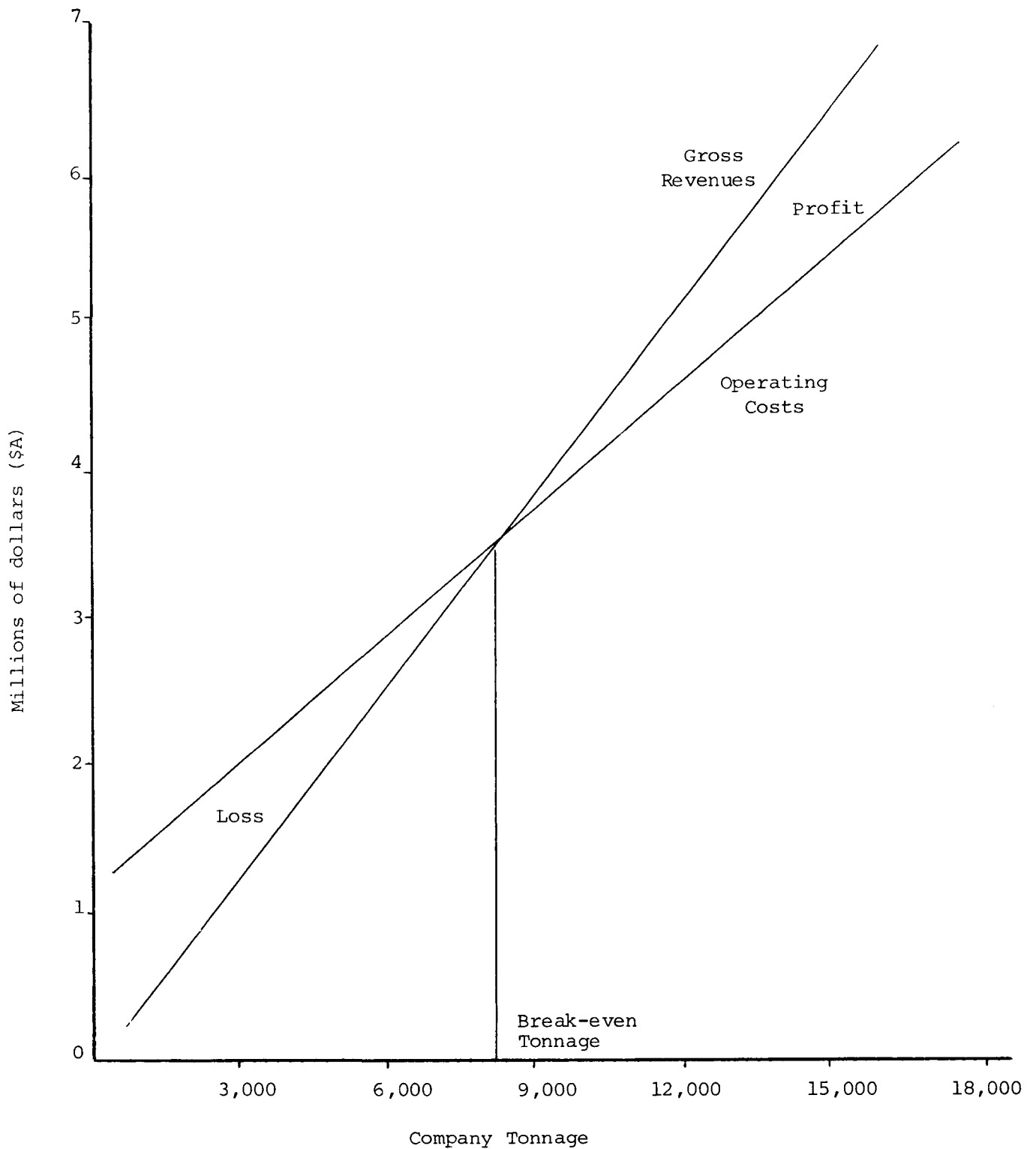


Figure 1. Estimated break-even point for Papua New Guinea fishing companies fishing companies, 1974. Source: Kearney, 1975.