

The exclusive economic zone and economic development in the Pacific island countries[☆]

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Abstract

The exclusive economic zone (EEZ) became accepted internationally in the 1970s. This transferred resource wealth to the coastal states establishing such zones. The history of the EEZ is reviewed, and its impact on the economic development of the Pacific island states considered. The growth performance and the tuna fishery development of these states are reviewed and possible causes of limited success discussed. The use of trust funds to increase the resource wealth of the Pacific island states is briefly considered.

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1. Introduction

The so-called exclusive economic zones (EEZs) that became accepted in the 1970s were a major institutional development and fundamentally changed the jurisdictional framework for fisheries worldwide. Access to fish stocks, which used to be free to anyone outside of a narrow belt of territorial sea, became the prerogative of the nearest state, usually called the coastal state. This enabled coastal states to control access to fish stocks off their shores for their own benefit, either individually or in cooperation where stocks are shared among two or more states. This arrangement has made possible institutional innovations such as limits on total catches and individual transferable quotas, which have become widespread even if often controversial.

The establishment of the EEZs meant that some countries were excluded from their traditional fishing grounds. The EEZs thus amounted to a transfer of wealth from distant water fishing nations to the coastal states. But they also provide incentives to generate wealth by a better

management of fish stocks. Either way we look at it, we would expect to see positive effects by the EEZs on the economic growth and development of coastal states, especially those whose fish resources are a large part of their resource wealth.

The Pacific island states certainly belong to that category. Many of them are tiny and have little resource wealth apart from the fish in the immense EEZs around them. Traditionally these nations hardly utilized these resources at all, but the EEZs empowered them to control the access to these resources within their zones, at least in principle. That does not mean that they have to utilize these resources themselves; it is indeed still the case that most of the fish is taken by fleets from distant water nations, but the formal jurisdiction of the coastal states makes them entitled to compensation for granting access, just as a landowner can charge a fee for allowing someone else to use his land.

Not only are most of the Pacific island countries tiny and with a small population, they are also among the poorest countries in the world. What effect has the EEZ had on their economic development and growth? Several authors have looked at this and generally reached rather pessimistic conclusions; recent contributions are Petersen [1] and Parris and Grafton [2]. The Asian Development Bank has over the years commissioned several reports on the

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development of the Pacific island nations and how it could be promoted by the resources of the EEZ ([3,4], see also [19]). About 10 years ago Schurman [5] investigated how successful the EEZs had been in redistributing incomes from the fishing industry in favour of the Pacific island nations, concluding that little had happened, neither by developing tuna industries in the countries concerned nor by licence fees paid by distant water fishing nations to the Pacific island states.

Ten years later there is little reason to overturn Schurman's conclusion, except perhaps that some of the Pacific island states have increased their share of the tuna catches. Some of this is, however, just the effect of distant water fishing nations reflagging their vessels and not due to the development of an indigenous tuna fishery (see Ref. [6], p. 15).

The absence of an income redistribution effect of the EEZs for the Pacific island countries may, however, have more to do with the specific conditions of these states than with the redistribution mechanisms inherent in the EEZ as an institution. They are not necessarily "an excellent 'test case' for analysing the redistributive effects of the [new] Law of the Sea" (cf. [5], p. 108). In contrast to the Pacific island states, many coastal states had already developed their own, often export-oriented fishing industries in the 1970s, and the EEZs further promoted that development.

We begin by discussing the historical background for the EEZs and the effect of these on fish resource wealth. This is followed by a short description of the Pacific island countries. We then look at the growth of their GDP and tuna fisheries since 1970, well before the EEZs arrived on the scene. Thereafter, the options of the Pacific island states are discussed. Their lack of success in developing their own tuna fisheries, despite proximity to the fishing areas, indicates that they may not have a comparative advantage in this. That leaves the option of renting out fishing rights to distant water fleets. We briefly discuss the role of trust funds in that connection. Finally, the prospects of the tuna fisheries in the west central Pacific are reviewed.

2. The historical background

A little over a hundred years ago even the experts could argue that fishing had no appreciable effect on the fecundity of fish stocks. This view was famously put forward by Thomas Huxley, an eminent British biologist, in the late 19th Century. He did not do so without a reason. The growth and especially the recruitment of fish are influenced by environmental factors that vary so enormously that the effect of fishing, up to a point, drowns in the noise. Fishing technology was not advanced enough to have a discernable effect until late in the 1800s, and then only in those areas of the world which were most heavily fished, such as the North Sea.

Gradually fishing pressure increased worldwide, partly because of advances in fishing technology and partly because of a rising demand from a growing and increasingly

affluent world population. The signs of overfishing became clearer in an increasing number of places. The increasing fishing pressure coming from fleets from various nations ultimately led to deteriorating profits and declining fish stocks. This generated a scramble for exclusive fishing rights, so that the demands of fleets of certain nationalities could be satisfied by excluding others. The coastal states took the lead in this development and claimed exclusive fishing rights within a certain area off their shores. In the beginning these claims were rather moderate, at least compared to what happened later. In the 1930s, Norway claimed a right to a 4-mile fisheries zone from lines that closed off fiords and bays, against the then prevailing 3-mile territorial limit measured from the coastline. The United Kingdom, whose fleet at the time fished in distant waters, objected to this, and the case went to the international court of justice in the Haag where it was resolved in 1951 in favour of Norway. This prompted Iceland to raise a similar claim, which also landed her in trouble with the British.

It was perhaps unavoidable that exclusive rights to fish stocks would be based on some kind of a geographical proximity principle. It may seem natural, but was in any case given a tremendous boost by claims by the United States to mineral resources—in practice, oil—underneath the ocean bottom on the continental shelf. Countries with interests in fish drew the inevitable analogy; why should the fish swimming in the sea above the continental shelf not be subject to the same kind of regime as the minerals? The United States put forward her claim by a presidential proclamation in 1945, and it did not take long until some states with interests in fishing came forward with similar claims about fish. Iceland claimed the waters of the continental shelf, and so did some Latin American states like Mexico and Argentina with their concept of the "patrimonial sea." The states on the west coast of South America—Chile, Peru, and Ecuador—claimed 200 nautical miles. These states have a narrow continental shelf and exploit fish that live high up in the water column and are not restricted to the waters of the continental shelf (anchovies, sardines, tunas).

The claims by the coastal states were grounded in an ability to exploit the fish resources which they were claiming. More distant nations may have developed the fisheries—the English pioneered the trawl fisheries at Iceland, and the development of the Peruvian anchovy fishery took off after the collapse of the California sardine, with some equipment and boats moved from California to Peru—but over time the coastal nations came to master the technology themselves and created export-oriented fisheries, which in turn became engines of economic development.

The development towards extended exclusive coastal states rights occurred by leaps and bounds in the latter part of the 20th Century. In 1958, the United Nations held its first conference on the law of the sea. This conference codified the rights to minerals on and underneath the continental shelf and came close to establishing a 12-mile

fisheries zone, recognizing the rights of traditional distant water fishing nations within the zone. These rights were strongly resisted by certain coastal states, and this variant of the 12-mile fishing limit did not gain the necessary qualified majority of votes, neither at the 1958 conference nor at a second, follow-up conference in 1960. Nevertheless, the 12-mile limit increasingly came to be recognized internationally. Some countries, most notably the Soviet Union, had established a 12-mile territorial limit even before the Second World War. By the 1960s, the 12-mile fishing limit had become uncontroversial and widely applied.

The Latin American states established their 200-mile limit already in the 1950s. Initially, this was regarded as a wild claim and was not recognized by others, but came to be regarded with increasing sympathy as the pressure on fish stocks increased and it became clear that the 12-mile limit hardly mattered at all. In the 1960s, the Soviet Union and its satellites developed factory fleets which roamed all over the world oceans and caught an impressive amount of fish outside the 12-mile limit. The coastal states became worried that this would have repercussions for their own fisheries and began to think about a further extension of their fishing limits. This development also resonated well with the prevailing mood in the 1970s of giving developing countries, usually previous colonies, a greater say over their natural resource wealth. When the United Nations third conference on the law of the sea was convened in 1973, it quickly became clear that the 200-mile limit had widespread support, provided it only related to jurisdiction over natural resources and not over navigation. This then materialized in the 200-mile EEZ, in which nations have jurisdiction over natural resources, both living and minerals on and underneath the sea bottom. In the late 1970s, many nations established such zones, and from that time on it must be regarded as a part of international law.

The EEZ amounted to a substantial transfer of wealth to the coastal states. Resources which previously could be exploited by all were now reserved for the states off whose shores they were located. But it is important to note that this wealth transfer can only partly be said to be at the expense of the distant water fishing nations that used to exploit them. Exploitation of open access resources tends to result in break-even profits for the industry (cf. [7]). By limiting the fishing activity, it is possible to earn a profit over and above what is necessary to pay for the use of capital equipment, the so-called resource rent. Those who obtain this resource rent can use it to pay for consumption of goods and services or invest it in other activities and enhance economic growth. There is some controversy over who should be the recipient of the resource rent, the government or the fishing industry. Those who think the government should get the rent argue that fish stocks are public resources and that governments acting in trust of the public should ensure that the public gets its fair share of this resource wealth. Those who take the opposite point of view argue that the rent would enhance the private

sector's interests in resource conservation and that private companies would invest it more profitably than governments would do, thus enhancing economic growth.

However this may be the point is that this resource rent will not materialize unless the exploitation of the fish stocks is limited. For this to be possible there has to be some authority which can exclude some potential exploiters. The authority to do so was conferred on the coastal states by the 200-mile limit. This limitation of the exploitation activity means that there will be more manpower and capital available for other purposes, so increasing the total volume of goods and services produced rather than engaging in an unproductive competition for catching a limited amount of fish. The resource rent reflects the value of these additional goods and services, and this generation of additional wealth is the ultimate justification for the limitation of the fishing activity. But no additional wealth will be generated unless the coastal states in fact do limit the exploitation activity and then in an efficient way. All have not succeeded on this point. One reason is that fish stocks often migrate between the economic zones of more than one state, so that effective management requires the cooperation of two or more states. Such cooperation is often difficult to attain, the more so the more states that are involved. This also underlines the fact that the resource wealth given to the coastal states by the EEZs is largely the result of their own activities.

There is no doubt that the distant water fishing nations suffered losses of capital and human skills that no longer were useful after the EEZs were established and they were excluded from their traditional fishing grounds. In the long run they probably did not lose much, however, because skills can be acquired and capital invested in other activities, and it was not earning more than its opportunity cost in the fishery. And the coastal states did not gain much either, unless they limited their own fishing in a cost-effective way. It is possible to argue that the distant water fishing states will also reap some benefits from the coastal states managing their fish resources well. These benefits would come in the form of larger supplies of fish than would have been forthcoming with a greater overexploitation under a continued open access. In the limit continued open access could have resulted in a total collapse of fish stocks, which with the EEZs in place ought to be easier to avert.

This puts the coastal states in the role of the exploiters of the fish resources, but since the EEZ in effect establishes national ownership over resources the coastal states may decide to rent out the access to these resources to others. This is in fact what some coastal states have elected to do. How beneficial this arrangement will be for the coastal states depends on two things: (i) their ability to extract rents from the exploiters through appropriately setting the access fees, and (ii) their use of the access fee revenues. If the access fee is invested productively it could boost economic development, which is particularly important for poor countries. If not, it could perpetuate poverty and

Table 1
Some basic data on the Pacific island countries

Country	Land area (km ²)	Sea area (km ²)	Population (2004)	GDP per capita (US\$, 2005)
Cook Islands	237	1,830,000	18,000	10,201
Fiji	18,333	1,290,000	847,700	3536
Kiribati	811	3,550,000	99,350	721
Marshall Islands	181	2,131,000	62,000	1791
FS Micronesia	701 ^a	2,980,000 ^a	110,500	2168
Nauru	21	320,000	13,600	4068
Niue	259	390,000	1500 ^c	
Palau	488	629,000	20,000	6150
Papua New Guinea	462,243	3,120,000	5,887,000	905
Samoa	2935	120,000	185,000	2196
Solomon Islands	28,370	1,340,000	477,700	626
Tokelau	12	290,000	1400 ^b	
Tonga	649	700,000	102,000	2089
Tuvalu	26	900,000	10,400	2516
Vanuatu	12,190	680,000	211,400	1556

Sources: Forum Fisheries Agency (size) and UN Common Database (population, GDP).

^aFrom [20].

^bCIA Fact Sheet.

^cWeb page of Niue.

promote dependence on external sources of revenue, particularly if the government is corrupt and the access fee revenues accrue to a protected elite which uses them for consumption or salts them away in foreign bank accounts for their own benefit. In that case the resource wealth of the EEZs would turn into a resource curse, as so often has happened with oil and minerals.

3. The Pacific island countries

The Pacific island countries were among the main beneficiaries of the EEZ. Most of these are small and not well endowed with natural resources, except for the fish within their EEZs. The main resource wealth of the EEZs is the tuna stocks that are located there. The Pacific islands countries, unlike many of the coastal states of the world, did not traditionally exploit the fish stocks around their shores on any appreciable scale. The tuna fishery in the area was largely developed by Japan, which also was and still is the main, and certainly the most profitable, market for tuna. The EEZ thus conferred a sudden and, in relative terms, enormous resource wealth on the Pacific island states that the locals never had much direct use for themselves, not unlike the discovery of oil underneath the sands of Arabia or in the jungles of the Amazon. In this respect, the Pacific island states were somewhat special among coastal states.

Now that this resource wealth has been conferred on the Pacific island states, the question arises how can they take advantage of this? The need to do so is not in doubt; most of the Pacific island states are among the poorest in the world. There are two ways in which they can do so: (i) engage in the tuna fisheries and establish export industries and perhaps also processing industries geared towards exports; (ii) let other nations do the fishing, but charge fees

for access to their zones. Both avenues have in fact been taken, and different states have taken different approaches.

The Pacific island states are members of the Forum Fisheries Agency (FFA), founded in 1979, immediately after the EEZs were established.¹ The purpose of this agency is to coordinate the fisheries policies of the Pacific island states, not least in their dealings with the distant water fishing nations who do most of the tuna fishing in the area. The main distant water fishing nations are Japan, the United States, Taiwan, South Korea, and China. There are 15 members of the FFA, besides Australia and New Zealand. Table 1 lists these 15 members and some of their salient characteristics. Two of these, Niue and Tokelau, have a population of less than 2000 each and are not engaged in tuna fishing on any appreciable scale. Most of the 13 remaining members are tiny, with an EEZ a hundred to a thousand times their landmass, because they lie far away from other countries and sometimes consist of tiny islands spread out over a large area. Their populations are also small; the Cook Islands, Nauru, Palau and Tuvalu all have a population of 20,000 or less; Kiribati, the Marshall Islands, the Federated States of Micronesia, and Tonga have populations around 100,000; and Samoa and Vanuatu have a population of around 200,000. Fiji and the Solomon Islands have a much bigger landmass and are endowed with natural resources other than fish (agricultural land, minerals, timber), and their populations are just under a million and half a million, respectively. The main exception is Papua New Guinea, with a population of

¹The French Pacific territories, New Caledonia, French Polynesia, and Wallis and Futuna, are not members of the FFA, and neither are the US territories American Samoa, Guam, and Northern Mariana Islands, and the only remaining UK territory (Pitcairn). All of these are, however, members of the Secretariat of the Pacific Community.

almost 6 million and rich in minerals of various kinds (16% of its GDP in 2004 came from mining).

All of the Pacific island states must be characterized as poor, measured in terms of GDP per capita. The Cook islanders are the richest, with a GDP per capita of US \$10,000. This sets them apart from the rest and places them in a category of medium rich countries. The Cook Islands are associated with New Zealand, from where they get economic assistance, and their inhabitants have migrated on a large scale to New Zealand and send back remittances to relatives on the islands. The islands have a tiny population (10,000). Next in line is Palau, with about US \$6000. At the bottom, we find Kiribati, Papua New Guinea, and the Solomon Islands, with less than US \$1000 per capita and thus among the poorest countries in the world.

4. Economic growth in the Pacific island states

How well have the Pacific island states succeeded in taking advantage of the riches conferred upon them by the EEZs? To get an impression of this, we shall look at the growth in their GDP. Fishing access fees are monetary transfers and hence not a part of GDP, but to the extent they generate economic development they would lead to an enhanced rate of growth in GDP. Development of a domestic fishing industry, be it catching or processing, would raise GDP, provided it did not replace other activities. In the case of the Pacific island states this is unlikely; subsistence fishing or farming are the activities that most likely would be replaced, but these are only imperfectly recorded in GDP if at all. Development of a tuna fishing industry would also be manifested as an increase in domestic tuna catches. This will be looked at below.

The Pacific island nations began to collect licence fees for tuna fishing around 1980, after the EEZs had been established. Their success in doing so was limited in the beginning, but improved over time. The US government was for many years unwilling to recognize the jurisdiction of coastal states over tuna, and traces of that position can still be seen in the UN Law of the Sea Treaty and other documents as a reference to “highly migratory species.” The US was therefore initially unwilling to pay access fees to the Pacific island states, but changed its position in the mid-1980s as the Soviet Union was trying to get access to the EEZs of these countries [8,9]. Whereas Japan negotiated with the Pacific island countries individually and was able to play each off against the others, the United States negotiated with the members of the FFA as a group. That the US followed this strategy was apparently the result of her stand that highly migratory species such as tuna was the responsibility of international organizations, of which the FFA could be seen as an embryo. A presumably unintended side effect was a strengthening of this organization.

The position of the Pacific island nations was also strengthened by the entry of new distant water fishing

nations (Taiwan, Korea, and others) into the tuna fishery in the 1980s, as this increased the competition for licences [1,2]. Presumably the ability of the Pacific island states to collect licence fees has been hampered by their limited ability to police their vast EEZs. There are indications that this is the case; Petersen ([12], p. 207) quotes Gillett et al. [3] to the effect that in 1992 as much as 45% of the catch was not reported.

In any event, the flow of licence fees increased over the 1980s and was in the late 1990s reported to be about 3.5% of the total catch revenue.² Whether or not this is small depends on the level of costs in the fishery; licence fees come out of pure profits, and if pure profits are no more than 10% of revenue, then the licence fees would be substantial, or a third of pure profit. The rent potential in the tuna fisheries has been estimated at 30–40% of revenues [11], which would imply that the licence fees are only about 10% of potential rent, but potential rent is not the same as actual rent and may for institutional reasons not be achievable; some national fleets would gain from the restructuring of the fisheries involved while others would lose unless there were side payments. In addition, the distant water tuna fishing nations are engaged in various aid projects in the Pacific island countries, with the aid more or less explicitly tied to the allocation of fishing licences. Without the EEZs, the willingness of distant water fishing nations in the area, such as Japan, to provide aid would most likely have been a lot less. This aid can therefore be seen in part as an income from the EEZs.³

One reason why the collection of rents from distant water fishing nations could be characterized as only moderately successful is that access to fishing in the EEZs of the Pacific island nations was essentially open for many years after the establishment of the zones. No limits were imposed on the total catch or the number of boats; fishing licences were issued more or less on request by the Pacific island states, which got a certain share of the catch value in return. There probably was not at the time a need to be restrictive in the issuance of licences, as the tuna stocks probably were not overexploited in any sense; for many years the total catch continued to grow almost linearly (cf. Fig. 3). Over time, however, competition for licences developed with new entrants coming into the fishery, and the Pacific island states began to take steps to limit the number of licences. Essential in this regard was the Palau Arrangement, concluded in 1992, by which a limit was set for the number of purse seine vessels that could be licensed in the region.

²Estimate by Swan, quoted in Bertignac et al. [11]. Petersen [1] quotes numbers from 1993 that vary substantially among nations, from 10% of revenue for the United States, 5% for Japan, 3.7% for Taiwan, and 2.2% for Korea.

³The tuna fishing fleets of the distant water fishing nations involved (mainly Japan and the US) do not pay for the foreign aid. This can therefore be seen as subsidization of the fleets involved. According to figures published in Herrick et al. [8], 80% of the access payments made by the US to the FFA countries 1988–1993 was paid by the US government.

Table 2
Average (arithmetic) rates of growth in the Pacific island countries

	1971–1980	1981–1990	1991–2000	2001–2005	1971–2005
Cook Islands	3.6	9.9	3.0	4.0	5.3
Fiji	5.0	2.5	2.4	2.4	3.2
Kiribati	1.8	−0.5	1.0	2.2	1.0
Marshall Islands	5.6	7.9	−1.3	1.4	3.7
FS Micronesia	5.6	4.4	1.2	1.1	3.3
Palau	−0.4	1.5	0.5	2.2	0.8
Papua New Guinea	8.6	1.3	5.9	2.5	4.9
Samoa	2.7	0.0	2.4	3.4	1.9
Solomon Islands	7.9	2.9	1.4	0.8	3.6
Tuvalu	5.6	1.2	2.7	6.5	3.6
Vanuatu	6.3	5.1	3.9	0.1	4.4
Tonga	3.7	4.5	2.7	2.3	3.4

Source: UN Common Database.

Table 2 shows the average annual growth rate of GDP 1971–2005 for 12 of the 13 states identified above.⁴ The annual growth rate (not shown) has been highly variable, which presumably is due to one or both of the following. First, these countries are highly dependent on agricultural, fish, and mineral products, the price of which is highly variable and, for agriculture and fisheries, which output depends on variable weather and environmental factors. Second, these countries also depend on foreign aid, and for the tiniest of them even the construction of a road or the building of a hospital may have a significant impact on the GDP. But it is hard to find any case where the growth rate increased after 1980 or 1990 to a sustained higher level than what went before. For the entire period the growth rate has not been particularly high; it is highest, about 5%, for the Cook Islands and Papua New Guinea, and lowest, about 1%, for Kiribati and Palau. This is discouraging, given the poverty and the high population growth in these countries.

5. Development of tuna fishing in the Pacific island countries

Let us then turn to the question whether the Pacific island countries have succeeded in developing their own tuna fisheries. This has been a stated goal for many of them. Fig. 1 shows the share of the Pacific island countries in the tuna catches in the west central Pacific. This share was actually higher in the 1970s, before the EEZs took effect, than in the 1980s, but since the early 1990s it has been climbing rapidly.

Looking at the countries individually (Fig. 2), we see that in almost all of them the tuna catches have been increasing rapidly since the 1990s, and in some since the 1980s. The main exception is Palau, which caught substantial quantities

⁴The data for Nauru are worthless, with the reported annual rate of growth staying the same 1971–1985 and again 1992–1997, by which time it had turned into a decline. Nauru is otherwise a very special case; being extremely rich during the years of phosphate mining but poor after the phosphate deposits were exhausted in the 1990s.

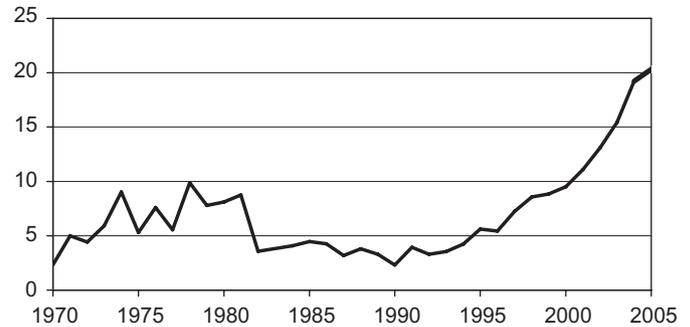


Fig. 1. Share of the tuna catches (percent) in the west central Pacific taken by the Pacific island nations. Source: Compiled from the WCPFC Tuna Fishery Yearbook, Secretariat of the Pacific Community.

of tuna in the 1970s, but after 1982 hardly any at all. This was due to the withdrawal of a foreign canning company from the country [13]. In Fiji, tuna catches began to rise already in the late 1970s and have continued to do so ever since, but with some variations. In Papua New Guinea, tuna catches virtually stopped in the 1980s but have increased rapidly since the mid-1990s. In the Solomon Islands, tuna catches had a strong upward trend until 2000, when a civil strife broke out. The expansion in Fiji and the Solomon Islands has taken place through joint ventures with foreign companies.

Papua New Guinea has built up a domestic tuna fleet by regulations banning foreign ownership of tuna boats and ending licensing of foreign boats in its EEZ. A regulation by the FFA banning transshipment of tuna at sea has attracted boats to harbours in the Pacific islands states for transshipment. None of this has, however, been enough to generate a higher and sustained growth. Fiji, Papua New Guinea, and the Solomon Islands have had a highly erratic rate of growth, and it has declined rather than increased. The economies of these countries are diversified enough that the fishing industry is far less important than it is in the other Pacific island states, so that a positive contribution from the fishing industry on GDP is of limited importance and perhaps cancelled by adverse effects from other industries.

One noteworthy feature of the catch profile of the individual countries is the variability over time. This is in large part due to the variability in the geographical distribution of the tuna stocks, caused by the climatic events known as the El Niño and La Niña. In some years, very little tuna may be available in any given country's EEZ even if it is quite extensive and the stocks in a good condition. Only the countries that have fleets of large boats with a wide range of action and access rights to the EEZs of other countries are able to avoid the fluctuations caused by the variability of the weather. Some variability over time is also due to shifting fortunes in the domestic fishery.

The increases in tuna catches shown in Fig. 2 may be worth less than meets the eye. Much of this development is due to joint ventures with foreign companies which

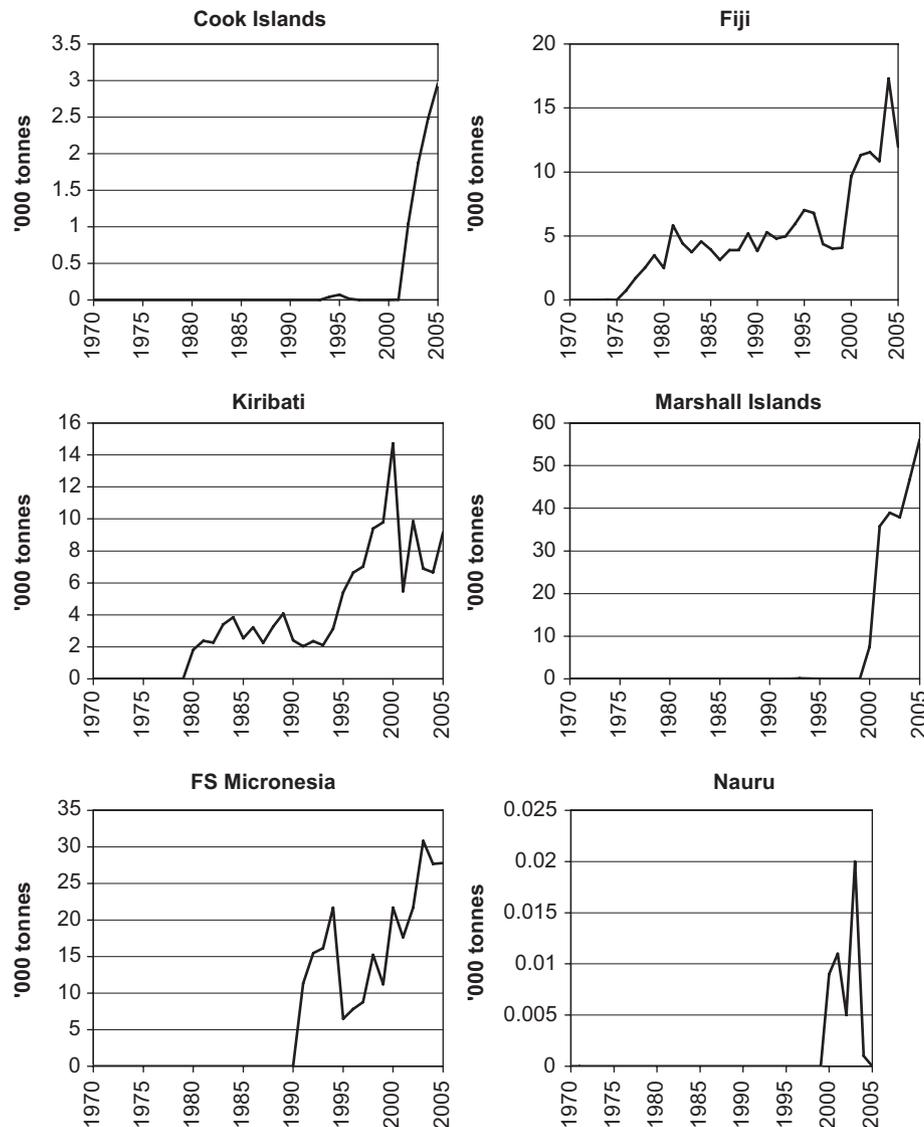


Fig. 2. Catches of tuna by the Pacific island states. *Source:* WCPFC Tuna Fishery Yearbook, Secretariat of the Pacific Community.

have a limited impact on the host country. Some foreign companies have in the past discontinued their operations and left, pulling the rug from underneath a fledgling domestic tuna industry. Then there are the government-initiated developments which have not borne fruit. Some have been abandoned after having been a drain on the national economy for many years. The government of Kiribati established a tuna fishing company in 1981, but it seldom made a profit, and after several rounds of foreign aid assistance and leasing of its vessels to fishing in other countries the company ceased operations in 2000. With foreign aid, the government of the Marshall Islands established a longline fishing base, which was leased out to foreign operators who chartered foreign longliners. At one point there were more than 150 Chinese longliners using this base, exporting their catch to Japan, which benefited the national airline flying the fish out. In the late 1990s, both climatic factors and disputes between the Chinese operators of the base and the government led to a

declining activity, and the base was closed in 1998. Government-owned fishing companies in Micronesia have not been successful and have operated at a loss. The Nauru government's operations of two purse seiners were unsuccessful.

It may be noted that many Pacific islanders, especially from Kiribati and Vanuatu, work as crew on foreign fishing vessels. This indicates that fishing skills are acquired and not beyond the reach of the Pacific islanders. The impediments to development of tuna fisheries in the Pacific islands must be sought elsewhere; in lack of entrepreneurship, distance from foreign markets, lack of infrastructure, and inadequate policies towards business. The impression one gets from the various reports and articles on the tuna fisheries in the Pacific islands is that most of the business failures have been in government-owned firms that have never earned a profit, or foreign-owned ones where the owners found it opportune for some reason to relocate. The latter is an indication that the Pacific island states do

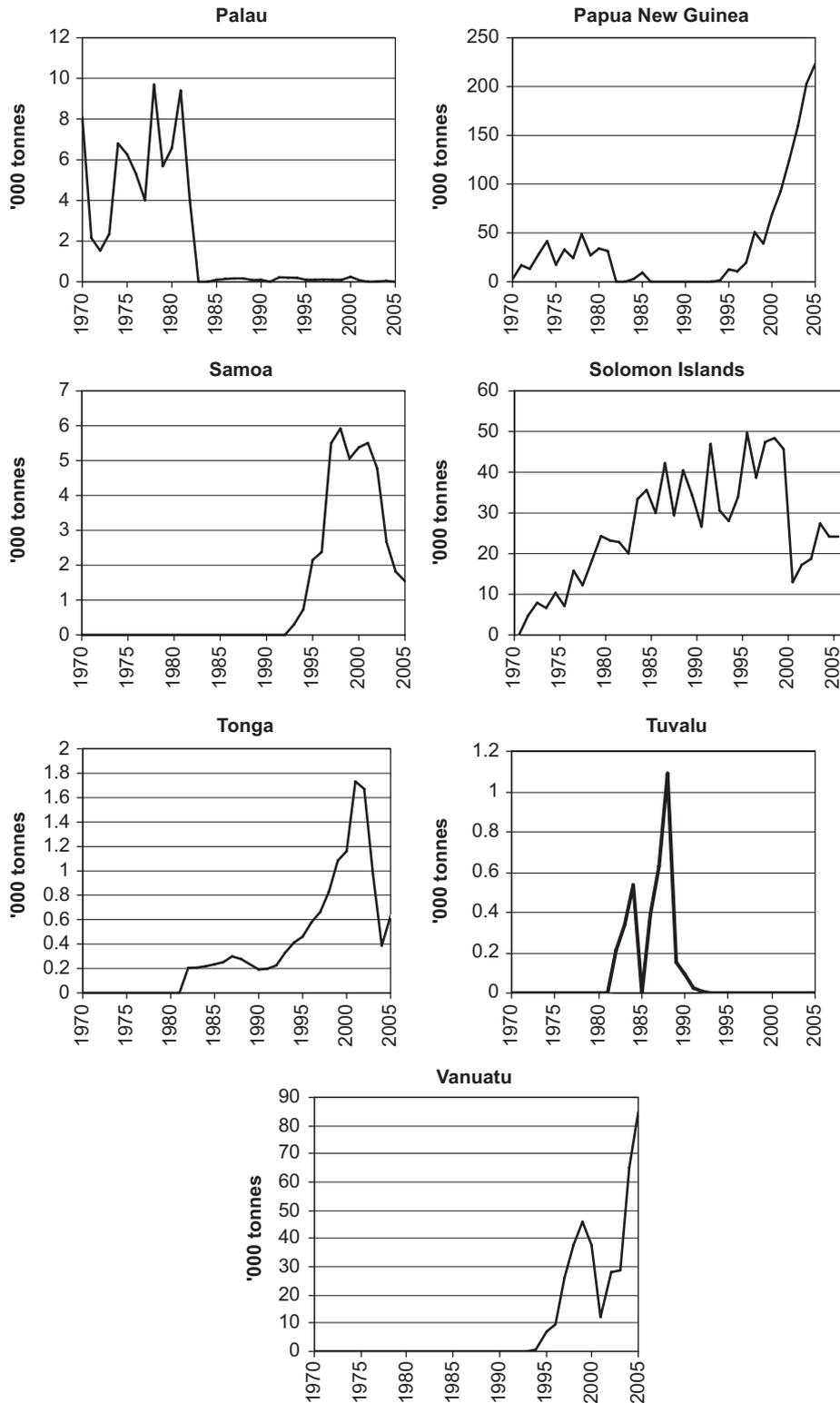


Fig. 2. (Continued)

not have any comparative advantage in tuna fishing, despite the proximity to the resources.

Tuna canneries have been established in some Pacific island states, with mixed success. It is noteworthy that much of the tuna caught in the region is shipped to canneries in

low labour cost countries such as the Philippines and Thailand.⁵ Lack of employment opportunities is often cited

⁵Barclay [14] discusses the shifting fortunes of the Soltai cannery in the Solomon Islands and its predecessor. She argues that high transportation

as a reason for establishing tuna processing industries in the Pacific islands, but nevertheless they do not compete easily against other low cost countries, for whatever reason. In some countries, tuna canneries have been accused of causing environmental and social problems [15].

Privately owned domestic firms might fare better than foreign- or government-owned ones, but there is as yet limited experience of this. Even if all is well with local entrepreneurs, the impediments on the side of logistics might be impossible to overcome. The Pacific islands are far away from the main tuna markets, which are located in Japan, the United States and other rich countries. Some of the Pacific island states have poor harbour facilities. It is noteworthy that a large part of the populations of the countries that are in association with either the United States⁶ or New Zealand⁷ and are able to migrate to these countries have done so on a large scale, even to an extent where the population is declining and remittances of emigrants are a significant part of the income of the home country. Perhaps the solution to the poverty of the small Pacific island states lies here, rather than in a development of a domestic fishing industry which would be fighting against strong odds.

The alternative to deriving wealth from the tuna resources through a domestic fishing industry is to rent out access to tuna fishing in the EEZs. As already mentioned, this has been done from early on and with increasing success, even if some analysts have concluded that it could be yet more successful. This puts the Pacific island states into the role of a rentier. This could in principle have as beneficial effect on the management of the tuna resources as if the states involved exploited the resources themselves; the ability of distant water fishing nations to pay access fees depends on how plentiful the fish stocks are. Two things are critical if the Pacific island states' role as rentiers is to lead to a good management of the tuna stocks. First, they must coordinate their actions and maximize the aggregate benefit; if each competes against all the others the result will go a long way towards dissipating all rents and hence access fees, as each country tries to capture as large a share as possible of the total rents by issuing more licences than consistent with maximizing the total rent. There has in the past been a strong element of such competition among the Pacific island states.

The second requirement is that the states take a long-term view and maximize the discounted value of the aggregate rent flow over a wide time horizon and at a reasonable rate of discount. One aspect of this is that the access fees should flow to the nation as a whole instead of ending up in the private accounts of the individuals who are responsible for the fisheries and could take their money

and run. There has in the past been a tendency to this through corrupt administration in some Pacific island states.⁸ Under those circumstances, the EEZs are unlikely to benefit either the Pacific islands or the management of the tuna stocks.

For the small Pacific island states a successful collection of access fees could be a major source of national wealth, especially as a domestic fishing industry is perhaps not likely to be particularly profitable. In some Pacific island states, the access fees are already substantial. In Kiribati, for example, access fees account for 40–50% of government revenue, corresponding to 22% of GDP [15]. Not only could this be a sustainable source of revenue but could even generate a growing national wealth through the use of trust funds, to which we now turn.

6. Trust funds

It has been suggested [10] that the licence fees the Pacific island nations get from the distant water fishing nations be deposited in a trust fund and the incomes from that fund used to develop the Pacific island economies. Parallels have been drawn with the Kiribati trust fund, built up from the phosphate revenues from Banaba. Phosphate extraction has long since ended in Banaba, but the fund still exists and has in fact grown over certain time periods in the past. The fund has only been used as a revenue equalization fund, and it has been used cautiously, as the growth of the fund despite the absence of other income than its own indicates (cf. [10]).

There are other and discouraging experiences from the Pacific islands in the use of trust funds. Nauru, which for many years enjoyed a high income per capita from its phosphate extraction, built up an investment fund from its phosphate revenues, but the fate of that fund was as disastrous as the Kiribati fund has been successful. Instead of preserving the phosphate wealth by turning it into a renewable, financial wealth by way of the trust fund, it is now all gone, and Nauru is essentially broke and dependent on foreign aid. How two similar funds established from similar sources and for similar purposes by countries with similar cultures came to meet so diametrically different fates is indeed surprising and worth a further study.

The main purpose of resource funds such as the Nauru phosphate fund and petroleum funds like the Alaska Permanent Fund and the Norwegian Petroleum Fund is to preserve non-renewable resource wealth by turning it into renewable financial wealth. As the Nauru story indicates, not all countries which have attempted this have been equally successful.⁹ As to the resource fees from the tuna fisheries, it is not immediately obvious why a trust fund would be needed. The tuna stocks are renewable resources, and given that they continue to be profitable, they will

(footnote continued)

costs, due to diseconomies of scale, are a significant disadvantage for the Pacific islands compared with Thailand.

⁶The Marshall Islands, the Federated States of Micronesia, and Palau.

⁷The Cook Islands and the tiny states of Niue and Tokelau.

⁸Some cases are mentioned in Ref. [15].

⁹Further on this, see Ref. [16].

sustain a flow of income indefinitely. No transformation of wealth by way of financial wealth is needed, since the wealth is not depleted as long as the fisheries are conducted in a sustainable manner.

Nevertheless, there could still be a case for a trust fund. That case derives not so much from a need to build up a fund to further investment in infrastructure, education, and profitable private enterprise—the continuous revenue flow can be used for that. But saving some of the revenue flow in a trust fund could make the Pacific island countries richer in the long term, in case they lack profitable investment opportunities at home. This pictures the Pacific island countries in the role of the rentier, but given their apparent disadvantage in tuna fishing and other activities, this might be the most promising role for the smaller among them.

Consider a revenue flow R , which can be used either for investment (I) or immediate consumption (C). Given the smallness of the Pacific island countries, it certainly is reasonable to assume that the return on their wealth is unaffected by how much they invest, so that their investment income would be rW , where r is the rate of return it is reasonable to expect in the financial markets abroad and W is their financial wealth. The optimal use of the revenue flow over time is a standard exercise in growth theory without diminishing returns to capital. With a utility function $U(C)$ and a pure rate of time preference ρ , the welfare maximization problem is

$$\text{maximize } \int_0^\infty U(C)e^{-\rho t} dt \tag{1}$$

subject to

$$\frac{dW}{dt} = R + rW - C \tag{2}$$

Using the constant elasticity utility function

$$U(C) = \frac{C^{1-\eta}}{1-\eta} \tag{3}$$

and applying the Maximum Principle results in the following differential equation for optimal consumption:

$$\frac{dC/dt}{C} = \frac{r-\rho}{\eta} = k \tag{4}$$

from which we find that consumption should grow at a constant rate k . It then remains to determine the initial consumption $C_0 < R$. This is a knife-edge problem such that the initial consumption must allow the capital stock to grow, and it will grow infinitely large over time, as will consumption. The financial wealth at any time t is given as

$$W_t = \int_0^t (R - C_0 e^{k\tau}) e^{r(t-\tau)} d\tau \tag{5}$$

from which we can retrieve Eq. (2).

Table 3 shows the outcome of this exercise for some constellations of parameters. For $\rho = 0.01$ and $\eta = 2$, we see that 40% of the fees ($R = 1$) should be saved. In 10 years, consumption would increase from 0.6 to 0.73, and in

Table 3

How optimal saving of resource fees depends on time preference and elasticity of marginal utility

Eta	rho	C (0)	C (10)	C (20)	C (40)	W (10)	W (20)
2	0.01	0.6	0.73	0.90	1.34	4.43	9.84
2	0.02	0.7	0.81	0.94	1.28	3.24	7.00
4	0.01	0.8	0.88	0.98	1.19	2.10	4.43
4	0.02	0.85	0.92	0.99	1.15	1.56	3.24

40 years about double, to 1.34 and thus exceed the annual resource fees. This is made possible by the accumulation of financial wealth, from nothing to 4.4 times the annual resource fees in year 10, and to almost 10 times the annual resource fees in year 20. Increasing the time preference increases consumption in the near term but slows down the accumulation of wealth and lowers consumption in the more distant future, as the future counts for less. Increasing the elasticity of marginal utility has a similar effect, not because of time discounting but because equality across generations is more important; to wit, why should the present, poor generation sacrifice so that the future generations, which are going to be richer anyway, can have a higher consumption? While too much should not be read into exercises like this, it serves to show how accumulation of wealth out of meagre revenues could improve future consumption. Needless to say, the numerical results are sensitive to the return in financial markets (r), but 5% is probably not far off the mark; the Ministry of Finance in Norway expects 4% over the long haul, but the Alaska Permanent Fund has done a bit better since it came into being in 1976.

7. Prospects of the tuna fisheries

What are the implications of a further growth in the tuna fisheries of the Pacific island states? If the tuna resources are already fully exploited, it would have to come at the expense of those who already are in this fishery. If the stocks are not yet fully exploited, it could come in addition to existing fisheries, until the stocks are fully exploited.

Fig. 3 shows the development of the tuna catches in the west central Pacific since 1970. Since that time, the fishery has expanded from less than half a million tonnes per year to more than 2 million in recent years. Before 1970 and until the 1980s, Japan was the dominant player in the tuna fisheries. The expansion has primarily been due to Indonesia, the Philippines, Taiwan, and Korea, all of which are or were developing countries which, perhaps with the exception of the Philippines, have succeeded in generating high and sustained growth. Tuna fishing has clearly been a part of this, albeit a minor one.

As Fig. 3 shows, the catches of tuna from the west central Pacific have increased almost linearly since 1970. That by itself indicates that the fishery has not yet run into a resource constraint. There are nevertheless signs that

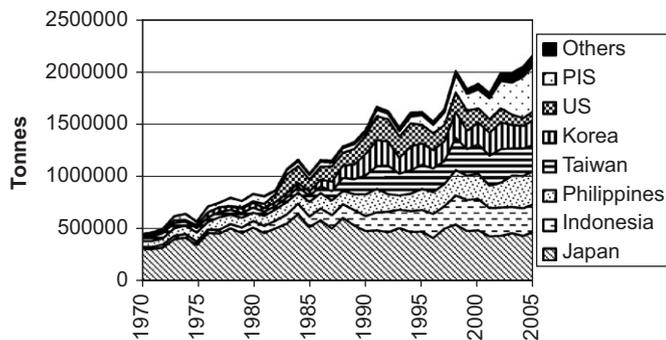


Fig. 3. Catches of tuna in the west central Pacific by country (PIS, Pacific islands states). *Source:* WCPFC Tuna Fishery Yearbook, Secretariat of the Pacific Community.

some tuna stocks are already fully exploited and perhaps overexploited [17,18]. One thing we may note from this figure is increased variability in catches from year to year. That could be a sign of intensive exploitation and perhaps overexploitation; as the fishing pressure increases the fishery depends more and more on one or just a few age groups.¹⁰ Since age groups vary greatly in size for environmental reasons, dependence on fewer age groups shows up as greater variability in catches over time.

There is reason to believe that a further growth of the tuna fisheries of the Pacific island states would lead to overfishing of the tuna stocks. Other developing countries like the Philippines, Indonesia, and China have been expanding into the tuna fisheries and are likely to continue doing so, even if rich countries like Japan, the US and perhaps even Korea and Taiwan contract their operations because their costs are too high. If the Pacific island states use the FFA to coordinate their expansion, they might be able to limit the expansion of the fishery in their own EEZs. In order to make room for their own fleets, they would ultimately have to cut down on licensing fleets from other countries to fish in their zone. On this point the interests of the members of the FFA might diverge; some members, finding it unrewarding to develop their own fishing fleet, would be interested in continuing to license foreign fleets to fish in their zone. Other FFA members would then have to pay licence fees to the members without their own fleets. Then there remains the problem of the high seas, the area outside the 200-mile zone. There is as yet no authority with jurisdiction over the high seas. Traditionally access to this area has been open for anyone, but there is now a UN agreement in effect on fisheries in this area. According to this agreement, fishing on the high seas is supposed to be controlled by regional fisheries management organizations. It is unclear, however, what these organizations can do about those who do not want to abide by their rules, such as those who want to enter the fishery and want no

restrictions on their activities. These regional organizations have no jurisdictional authority; this is still in the hands of the state which has jurisdiction over the offending boat. Countries which are trying to get established in the fishery or expand their activities by more than the organizations would allow will not be enthusiastic in taking measures against their own boats for violating regulations these countries do not recognize as legitimate.

8. Conclusion

Despite having acquired jurisdiction over vast ocean areas rich in fish, the Pacific island states have not been successful in using this as an engine of economic development. Development of their own fishing activities has in many cases been unsuccessful. The largest ones (Fiji, the Solomon Islands, Papua New Guinea) have developed their own fisheries, but in cooperation with foreign owners and with doubtful success. So far the impact on their overall economic development has been limited, and whatever positive impact it may have had has been dwarfed by adverse developments in other areas, as the overall growth rate has not increased over time.

There are two possible reasons for this discouraging development. One is inadequate policy. The governments of many Pacific island states have been directly and unsuccessfully engaged in the fishery. The Pacific island states are not alone in having negative experiences with government run businesses. The regulatory and political framework may also be unattractive for private interests who might want to get involved in the fishery. The other reason is that the Pacific island states simply do not have any comparative advantage in fishing, despite being in close proximity to the resources. Turning fish into a saleable product for choosy markets like the ones found in the rich countries of the world requires good logistics—the fish must be landed in a good condition, handled adequately and, if it is to be sold fresh, transported to the final destination by air without any delay. Distant water fleets whose owners and crew have a direct experience of the demands of the final markets may be better at meeting their requirements and may also be a part of an integrated logistics operation that minimizes any friction and delays in handling the product. The skills at pulling the fish out of the sea are only a part of this, and other links in the chain from the ocean to the market are just as critical if not more so.

If the solution to the poverty of the Pacific island states does not lie in tuna fishing, where does it lie then? Papua New Guinea, Fiji, and the Solomon islands are rich in other resources, which it may be more rewarding to develop. For the small island states, the picture is bleak if the future does not lie in tuna. There are hardly any other resources, and development of light industry or services for export is likely to be hindered by a small home market, long distances from external markets, and poor infrastructure. Then two options remain, emigration, which has

¹⁰Tropical tuna spawn several times each year, so the age groups would not be year classes as in fisheries in colder waters. Nevertheless, the recruitment of young fish to the stock is believed to be highly variable.

already been chosen by many, and a rentier existence financed by fishing fees and also perhaps by foreign aid and remittances. In that case, it would be advisable to invest some of the fishing fees in financial wealth overseas. This would in due course contribute to raising consumption and living standards.

References

- [1] Petersen EH. Economic policy, institutions and fisheries development in the Pacific. *Marine Policy* 2002;26:315–24.
- [2] Parris H, Grafton RQ. Can tuna promote sustainable development in the Pacific? *The Journal of Environment and Development* 2006;15:269–96.
- [3] Gillett R, McCoy M, Rodwell L, Tamate J. Tuna. A key resource in the Pacific islands. Manila: Asian Development Bank; 2001.
- [4] Gillett R, Lightfoot C. The contribution of fisheries to the economics of Pacific island countries. Manila: Asian Development Bank; 2002.
- [5] Schurman RA. Tuna dreams: resource nationalism and the Pacific islands' tuna industry. *Development and Change* 1998;29:107–36.
- [6] Willock A, Cartwright I. Conservation implications of allocation under the Western and Central Pacific Fisheries Commission. WWF and Traffic Oceania; 2006.
- [7] Gordon SH. The economic theory of a common-property resource: the fishery. *The Journal of Political Economy* 1954;62:124–42.
- [8] Herrick Jr. SF, Rader B, Squires D. Access fees and economic benefits in the western Pacific United States purse seine tuna fishery. *Marine Policy* 1997;21:83–96.
- [9] Waugh G. The politics and economics of fisheries in the South Pacific. In: Henningham S, May RJ, editors. Resource development and politics in the Pacific islands. Bathurst: Crawford House Press; 1992. p. 171–8.
- [10] Petersen EH. Institutional economics and fisheries management. Cheltenham, UK: Edward Elgar; 2006.
- [11] Bertignac M, Campbell HF, Hampton J, Hand AJ. Maximizing resource rent from the western and central Pacific tuna industry. *Marine Resource Economics* 2001;15:151–77.
- [12] Petersen EH. Institutional structures of fishery management: the Fortuna in the South Pacific. In: Garnaut R, editor. Resource management in Asia Pacific developing countries. Canberra: Asia Pacific Press; 2002. p. 187–220.
- [13] Doullman DJ, Kearney RE. The domestic tuna industry in the Pacific islands region. Honolulu: East-West Center; 1986.
- [14] Barclay K. Tuna dreams revisited: economic contributions from a tuna enterprise in Solomon Islands. *Pacific Economic Bulletin* 2005;20(3):78–93.
- [15] Barclay K, Cartwright I. Governance of tuna industries: the key to economic viability and sustainability in the western and central Pacific Ocean. *Marine Policy* 2007;31:348–58.
- [16] Hannesson R. Investing for sustainability: the management of mineral wealth. Boston: Kluwer Academic Publishers; 2001.
- [17] Hampton J, Langley A, Kleiber P. Stock assessment of yellowfin tuna in the western and central Pacific Ocean, including analysis of management options. Western and Central Pacific Fisheries Commission; 2006 SA-WP1.
- [18] Hampton J, Langley A, Kleiber P. Stock assessment of bigeye tuna in the western and central Pacific Ocean, including analysis of management options. Western and Central Pacific Fisheries Commission; 2006 SA-WP2.
- [19] Asian Development Bank. Asian Development Outlook, 2006.
- [20] FAO: Fisheries Country Profiles <www.fao.org>.