Inshore Fisheries Research Project
Meeting Report

THE PRESENT STATUS OF COASTAL
FISHERIES PRODUCTION IN THE
SOUTH PACIFIC ISLANDS

South Pacific Commission
Noumea, New Caledonia
SOUTH PACIFIC COMMISSION

TWENTY-FIFTH REGIONAL TECHNICAL MEETING ON FISHERIES
(Noumea, New Caledonia, 14–18 March 1994)

THE PRESENT STATUS OF COASTAL FISHERIES PRODUCTION
IN THE SOUTH PACIFIC ISLANDS

by

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South Pacific Commission
Fisheries Programme
Introduction

The objectives of this paper are to provide a first overview of the volume and value of coastal fisheries production in the Pacific Island countries and territories and to briefly summarise some highlights and trends in the various coastal fisheries in the region. Such an overview is timely given that this is the South Pacific Commission's historic 25th Regional Technical Meeting on Fisheries. However, it is still only an interim summary - a "best estimate" - and we would welcome all comments and criticisms, particularly those which will update or improve the accuracy of these estimates for the 26th RTMF.

At the first SPC fisheries meeting, over 40 years ago, one of the main problems highlighted for attention in the SPC work programme was to address the lack of quantifiable information on South Pacific island fisheries. But, because of the complexity and diffuse artisanal nature of coastal fisheries, together with the gradual development of national fishery administrations, developments in fisheries production from the coastal zone have not yet been comprehensively documented at the regional level. Several individual countries have produced annual catch statistics of varying degrees of comprehensiveness, but no concerted attempt has been made to compile these and other data to estimate total regional inshore fisheries production, the value of landings and discuss trends in these fisheries. The estimates of regional production that have been made have necessarily either been informed guesses (e.g. Van Pei 1961) or derived from incomplete statistics (e.g. Crossland & Candeperrin 1977). The Food & Agriculture Organisation of the United Nations (FAO) includes annual summaries of total fisheries production by most of the Pacific Island nations but these are clearly of varying accuracy and, for example, may group tuna catches with coastal fisheries landings, or some countries may include subsistence catch estimates and some not.

By contrast, for oceanic fisheries, mechanisms for data provision from tuna fleets and national administrations are by now well developed. Statistical information on catches and developments of industrial-scale tuna fisheries in the South Pacific is well documented and reported in the South Pacific Commission's Tuna and Billfish Assessment Programme's (TBAP) quarterly Regional Tuna Bulletins and the Tuna Fishery Yearbook (e.g. TBAP 1993).

One of the objectives of the SPC Inshore Fisheries Research Project (IFRP) has been to assist with the improvement of statistical data collection and reporting by SPC member countries, for the primary purpose of improving the availability of information necessary for national fisheries planning and management. The recent review of Pacific Islands fishery resources published by the Forum Fisheries Agency (Wright & Hill, 1993) again highlighted the lack of information on the scale of harvests of fish and marine organisms from the coastal zone. The offshore tuna landings from the western and central Pacific amount to over 1,000,000 t/year (TBAP 1993) with a nominal landed value of a billion dollars, but less than 3% of this tuna is caught by Pacific Island vessels and an even lower percentage of the value is retained in the Islands. Landings from the coastal zone are more modest, but they have a far greater social and economic impact on the residents of the Pacific Islands. Moreover, there is a more immediate risk of over-exploiting the resources in the narrow coastal zones of many Pacific island countries as populations increase and technology improves the fishing power of artisanal fishermen and women. Management of coastal fisheries is an increasingly important priority, but for this to have any hope of success, mechanisms of information and feedback about the status and trends in coastal fisheries must first be acquired by fisheries managers and administrators.
Although the data sources are still very much ad hoc, this summary is intended to be a step towards the regular comprehensive compilation of regional coastal fisheries statistics, and this work is particularly aimed at the identification of gaps and weaknesses. These estimates of fisheries production are also likely to be of interest to workers in a variety of disciplines such as nutrition, economics, planning and coastal zone management.

Data Sources

As far as possible, estimates of landings have been taken from annual reports, technical reports or other papers published between 1989 and 1992, and provided to the SPC Fisheries Programme. Most countries have some estimate of commercial fisheries production and these are usually published in some form of technical document. Information on landings prior to 1989 was used in some instances where recent landings data were not available. Accurate estimates of subsistence fisheries production were usually not available. In some cases subsistence fisheries production had to be estimated from nutritional data as the product of per capita food consumption and population size. In the few instances where no estimate as all of national subsistence fisheries production was available (Northern Marianas, Papua New Guinea, Tuvalu, Wallis & Futuna, Western Samoa), then the FAO figure was used (FAO 1991) as a nominal total and subsistence production estimated as the difference when known commercial landings were subtracted.

Status of Fisheries

General

A summary of the catch and landings in each of the countries and territories of the region is attached in Appendix 1. These data have been used to estimate the mean annual catch volumes and values from the different sectors of the inshore fisheries in the South Pacific between 1989 and 1992 (Table 1), and the subsistence and commercial catches by country summarised in Table 2. The total coastal fisheries production in the South Pacific during the early 1990s was estimated to be about 104,000 t/yr, worth US $243,700,000 (Table 1). The population of the South Pacific region is about 2,500,000 people giving an annual per capita coastal production of 16.0 kg. If the large inland populations of 2,700,000 in Papua New Guinea is discounted then the annual per-capita production is about 27.4 kg. (Note that this coastal fisheries production estimate is not equivalent to fish consumption, and does not take account of canned fish imports, tuna consumption, or exports).

Eighty per cent of the catch from inshore fisheries in the South Pacific, whether from reefs, estuaries or freshwater is taken for subsistence purposes with the remainder (20%) being directed to commercial markets: most of the commercial fish used for domestic markets, and most of the commercial invertebrates for export markets. Subsistence fisheries production was estimated to be about 80,000 t/yr, and would have been worth $160,000,000 if sold in domestic markets. In most instances, the value of the subsistence catch is based on the average figure for commercial fish landings. Commercial fisheries landings amount to about 24,600 t/yr, worth $83,100,000. Not included in this total is the production from aquaculture which, amongst other items, would add another $42,000,000 from the production of L1 of pearls in French Polynesia and $7,570,000 from shrimp farming in New Caledonia. The disparity between the total
commercial catch and the sum of the individual components from commercial fishing is due to omission of details about landings of miscellaneous organism (such as octopus, chiton etc.).

### Table 1: Mean annual coastal fisheries production in the South Pacific: 1989-92

<table>
<thead>
<tr>
<th>Catch</th>
<th>Weight (t)</th>
<th>Value (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial reef and deep slope fish</td>
<td>10,476</td>
<td>26,034,723</td>
</tr>
<tr>
<td>Commercial coastal pelagics</td>
<td>4,419</td>
<td>14,708,216</td>
</tr>
<tr>
<td>Commercial estuarine fish</td>
<td>1,586</td>
<td>4,280,170</td>
</tr>
<tr>
<td>Commercial crustaceans</td>
<td>1,903</td>
<td>15,343,502</td>
</tr>
<tr>
<td>Commercial beche-de-mer (processed to 10% fresh wt)</td>
<td>1,717</td>
<td>12,371,240</td>
</tr>
<tr>
<td>Commercial trochus-, greensnail-, pearl- shell</td>
<td>2,147</td>
<td>8,688,586</td>
</tr>
<tr>
<td>Total commercial catch</td>
<td>24,609</td>
<td>83,353,790</td>
</tr>
<tr>
<td>Total subsistence catch</td>
<td>88,049</td>
<td>160,322,747</td>
</tr>
<tr>
<td>Total coastal fisheries catch</td>
<td>104,658</td>
<td>243,677,346</td>
</tr>
</tbody>
</table>

**Status of specific resources**

**Shallow water reef fisheries**

For the most part, shallow water fisheries in the region are associated with coral reef ecosystems although there are important estuarine and freshwater fisheries in the larger islands. Just under half the nearshore commercial landings (Table 1) are made up of reef fish, which would form a similar proportion of subsistence landings (Dalzel 1993). As most of the fish caught in shallow water are for subsistence consumption, the two main factors driving exploitation of the reef fishery resource are population growth, and the relative cost of fishing against the cost of other sources of protein such as meat and tinned fish.

Most catches from nearshore reef fisheries are consumed at or close to the landing site but as rational economies develop and urbanisation increases, there is a greater dispersal of landings from their point of origin to other domestic and international markets. Several SPC member countries (e.g. Cook Islands, Fiji, Palau; Tonga) have also developed ornamental reef fisheries for export thus creating a value for small previously non-target species which are in demand for the international aquarium trade (Pyle 1993). An unquantified but substantial volume of reef fish is also exported as passenger luggage, particularly where there are large populations of Pacific Islanders living overseas, e.g. Polynesians living in New Zealand, Tokelauans living in Samoa, and Micronesians in Guam and Hawaii.
### Table 2: Mean annual subsistence and commercial production from coastal fisheries for the countries and territories of the South Pacific between 1989 and 1992

<table>
<thead>
<tr>
<th>Country</th>
<th>Subsistence production (t)</th>
<th>Nominal Value (US$)</th>
<th>Commercial fisheries production (t)</th>
<th>Value (US$)</th>
<th>Total fisheries production (t)</th>
<th>Nominal Value (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Samoa</td>
<td>215</td>
<td>855,238</td>
<td>52</td>
<td>178,762</td>
<td>277</td>
<td>990,000</td>
</tr>
<tr>
<td>Cook Islands</td>
<td>858</td>
<td>3,047,563</td>
<td>124</td>
<td>314,491</td>
<td>982</td>
<td>3,360,174</td>
</tr>
<tr>
<td>Federated States of Micronesia</td>
<td>6,243</td>
<td>11,227,400</td>
<td>646</td>
<td>1,002,296</td>
<td>6,689</td>
<td>12,739,696</td>
</tr>
<tr>
<td>Fiji</td>
<td>10,200</td>
<td>40,117,924</td>
<td>5,056</td>
<td>18,799,040</td>
<td>22,706</td>
<td>59,097,804</td>
</tr>
<tr>
<td>French Polynesia</td>
<td>3,318</td>
<td>12,432,000</td>
<td>2,891</td>
<td>15,375,555</td>
<td>5,999</td>
<td>20,665,555</td>
</tr>
<tr>
<td>Guam</td>
<td>472</td>
<td>1,953,862</td>
<td>114</td>
<td>453,894</td>
<td>556</td>
<td>2,409,856</td>
</tr>
<tr>
<td>Kiribati</td>
<td>9,084</td>
<td>13,371,567</td>
<td>1,240</td>
<td>4,779,000</td>
<td>12,324</td>
<td>18,140,567</td>
</tr>
<tr>
<td>Marshall Islands</td>
<td>3,096</td>
<td>3,033,213</td>
<td>369</td>
<td>714,534</td>
<td>2,369</td>
<td>3,718,717</td>
</tr>
<tr>
<td>Nauru</td>
<td>98</td>
<td>219,606</td>
<td>279</td>
<td>628,606</td>
<td>777</td>
<td>848,205</td>
</tr>
<tr>
<td>New Caledonia</td>
<td>2,000</td>
<td>7,344,417</td>
<td>1,002</td>
<td>4,883,410</td>
<td>5,032</td>
<td>12,177,827</td>
</tr>
<tr>
<td>Niue</td>
<td>103</td>
<td>471,864</td>
<td>12</td>
<td>34,729</td>
<td>115</td>
<td>505,253</td>
</tr>
<tr>
<td>Northern Mariana Islands</td>
<td>302</td>
<td>836,885</td>
<td>120</td>
<td>493,601</td>
<td>322</td>
<td>1,320,285</td>
</tr>
<tr>
<td>Palau</td>
<td>750</td>
<td>1,205,192</td>
<td>756</td>
<td>2,412,071</td>
<td>1,486</td>
<td>4,217,603</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>20,588</td>
<td>411,176,000</td>
<td>4,966</td>
<td>22,096,908</td>
<td>25,934</td>
<td>63,272,908</td>
</tr>
<tr>
<td>Gilberts</td>
<td>8</td>
<td>16,000</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>16,000</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>10,000</td>
<td>8,405,669</td>
<td>1,250</td>
<td>3,493,911</td>
<td>11,350</td>
<td>12,794,571</td>
</tr>
<tr>
<td>Tokelau</td>
<td>191</td>
<td>564,309</td>
<td>0</td>
<td>0</td>
<td>191</td>
<td>564,309</td>
</tr>
<tr>
<td>Tonga</td>
<td>593</td>
<td>1,901,209</td>
<td>1,429</td>
<td>2,806,641</td>
<td>2,328</td>
<td>4,707,849</td>
</tr>
<tr>
<td>Tuvalu</td>
<td>807</td>
<td>657,861</td>
<td>120</td>
<td>981,871</td>
<td>927</td>
<td>1,755,892</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>2,045</td>
<td>1,953,360</td>
<td>467</td>
<td>1,516,364</td>
<td>2,521</td>
<td>3,467,724</td>
</tr>
<tr>
<td>Wallis &amp; Futuna</td>
<td>862</td>
<td>4,100,000</td>
<td>138</td>
<td>1,285,400</td>
<td>1,000</td>
<td>5,395,490</td>
</tr>
<tr>
<td>Western Samoa</td>
<td>756</td>
<td>5,090,000</td>
<td>219</td>
<td>319,096</td>
<td>2,300</td>
<td>5,399,196</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>80,048</strong></td>
<td><strong>160,322,927</strong></td>
<td><strong>24,610</strong></td>
<td><strong>83,535,790</strong></td>
<td><strong>104,638</strong></td>
<td><strong>244,877,716</strong></td>
</tr>
</tbody>
</table>

**Improvements in shallow water reef fishing include more widespread use of outboard motors, the introduction of monofilament nets and lines and better facilities for the fishermen to dispose of their catches. However, improvements in fishing power and population growth have in many locations been paralleled by declines in stocks, catch rates and in some cases landed volume. There are several examples of fish stock depletion in the Pacific. These include, decliner in reef and lagoon fish stocks in Palau (Johannes 1981, 1991), reef fish and lagoon fish in Kiribati (Yeeating & Wright 1991) bonetfish, milkfish and porortfish in the Cook Islands (Anon 1988, J. Dashwood SPC Fisheries Programme pers. comm.), some of the largest Serranids and Lutjanids at certain locations in Fiji due to commercial spearfishing (B. Carlsten, Waiaki Aqaurium, Hawaii pers commune), reef and small pelagic fishes in Western Samoa (Hem 1992). There has been a significant and continued decline in total domestic commercial fishery landings in Fiji over the past few years (Anon 1992b), but this is probably due to increasing restrictions on access to native fishing grounds since 1987.**

In the smaller Pacific Island countries where marine produce has always been a primary source of protein, population pressure may lead to relatively high levels of exploitation on nearshore
stocks. For example, the estimated annual fisheries yield from coral reefs and associated habitats in American Samoa ranges from 8.6 to 44.0 t/km² with a mean of 27 t/km². Approximately 36% of this total consists of shellfish gleaned from the reef flat at low tide (Munro 1984). Small islands such as Niue and Nauru, with limited reef and shelf area and extensive fishing activity, have estimated yields of 3.3 (Dallzell et al. 1993) and 10.2 t/km² (IFPR pubsp, data) respectively from the reef and shelf areas combined. By contrast locations in Melanesia, where agricultural land is generally more abundant and population densities much lower, tend to have much lower yields from nearshore fisheries. In Papua New Guinea the annual total reef fisheries yield for the whole country was estimated to be 0.21 t/km² (Dallzell & Wright 1986). Much higher annual yields (~ 5.0 t/km²) have been recorded in Manus (Chapau & Lokaio 1986) and at the capital city Port Moresby (Lock 1986) but these are still relatively modest when compared with islands in Polynesia and Micronesia.

In many locations in the Pacific exploitation of reef resources is regulated by communities, particularly via traditional concepts of marine tenure. In some locations, customary ownership of fishery resources has almost disappeared, resulting in open access to nearshore reef resources. Fisheries management and development must account for traditional ownership where it exists, and this may be formalised in legislation as in Fiji (Adams 1994). Contemporary approaches to managing reef fisheries in some locations in the region may include very detailed fisheries regulations and ordinances that specify closed seasons, areas closed to fishing, size limits of the certain species and mesh size limits for fishing gear. Such approaches are likely to more enforceable on the commercial sector than at the community or village level.

One major new commercial finfish trend has been the export of live food fish (as opposed to aquarium fish) to Southeast Asia (Richards 1984). Such operations tend to be carried out by foreign fishermen and can have a high profile. For example, several serranid spawning aggregations were apparently severely depleted as a result of an unmanaged operation in Palau several years ago. Live food fish exports are currently occurring from Papua New Guinea, where this is a lucrative fishery in certain areas, and apparently a similar enterprise may be starting up on the Great Barrier Reef (G. Macpherson, Northern Fisheries Research Centre, Cairns, pers. comm.) As far as we are aware, no other SPC country is currently exporting live fish for food, although proposals may have been made.

Coastal reef finfish catches will continue to be the main source of subsistence protein for most Pacific Island countries for the foreseeable future, but there is likely to be an increasing volume of high value species being transported to domestic urban and tourist centres and exported to overseas markets. Problems are likely to occur in countries where yields from coral reef fisheries cannot keep pace with population growth and where there are no major developments in targeting offshore fish stocks or aquaculture. Those islands most at risk from future ‘Malthusian overfishing’ of reef fish will be those with a high human population in comparison to the available reef and lagoon area. There is not yet any comprehensive quantification of coastal fisheries habitat areas for the Pacific Islands, so this ranking cannot yet be made, but islands such as Upolu, Ratongota and Tarawa (for example) would definitely appear to be in the high risk category.

Deep slope fisheries

The deep reef slope community comprises large carnivorous species of snappers (Lutjanidae), groupers (Serranidae), emperors (Leubiniidae) and jacks (Carangidae) found in waters between
100 and 300 m. During the mid 1970s, the South Pacific Commission commenced surveying the deep reef slope stocks of the Pacific Islands and demonstrating the techniques to exploit these stocks (Dalzell & Preston 1992). Catches of snappers from the deep reef slope are dominated by members of the genera *Priacanthus* and *Et Tis* (referred to here collectively as eteline snappers) which are high quality fish with a high demand from overseas markets in Japan and Hawaii. The fishing gear that was promoted for exploiting the deep slope stocks was a wooden hand reel based on a design used in Western Samoa. This hand reel could be readily assembled and fitted to most kinds of small scale fishing craft, but was usually replaced with hydraulic gear as commercial deep slope fisheries developed.

The initial reason for SPC becoming involved in developing deep reef slope fisheries was to provide alternative avenues for fishing effort hitherto concentrated on shallow reef fish stocks, and also to catch fish that could be exported guaranteed free from ciguatera. Commercial fisheries for deep reef slope species became established in Tonga, Fiji, Vanuatu, Papua New Guinea and American Samoa. Later, it was known by fishermen in Fiji and Tonga that extra profits could be realised through air-frightening fresh, iced eteline snappers to markets in Hawaii, and occasionally Japan. The fishery in Tonga has a significant export component as well as a high demand for fish on local markets. Deep slope catches in Vanuatu are absorbed through domestic markets which includes a large restaurant and hotel trade on the main island of Efate. Landings are relatively modest ranging from about 100 t/yr in Vanuatu (Anon 1992d) to between 300 and 500 t/yr in Tonga (King 1993).

Following the peak years of the Fiji deepwater snapper fishery between 1987 and 1990, when up to 200 t/yr were landed, commercial vessels gradually switched to fishing for large pelagic fishes as this was more consistently profitable, particularly with bottomfish catch rates declining from their formerly 'virgin stock' levels (Adams 1991). In PNG a small commercial fishery in the north of the country landing 20 t/yr went into decline went government support for the fishery was removed (Chaput & Dalzell 1991). A combination of factors contributed to the decline of the American Samoan fishery, which was comparable in scale to the fishery in northern PNG but where landings were exported to Hawaii to realise greater profits. Amongst the factors responsible for the downturn in the fishery were declines in catch rates of deep slope stocks, volatility of the prices on the Hawaiian market, delays in payment for export catches and competition from purse seine by-catch on the domestic market (Itano 1991).

Information from commercial deep slope fisheries suggests that with persistent fishing, catch rates will decline to between half and two-thirds of those of virgin stocks (see contributions in Polovina & Shiomura 1989). This was particularly serious in Tonga where the fishery was based mainly on seamounts where, due to the limited habitat area (and stock sizes), catch rates became uneconomic relatively quickly. The fishery in Tonga survives due to the reduction of the fishing fleet from 40 to about 20 vessels which can rotate between the various seamounts giving depleted grounds the chance to recover. To cope with deep slope stock decline in Vanuatu, fishermen were encouraged to target shallow reef fish stocks instead of deep slope fishes and this has led to increase in shallow reef species in domestic markets (Dalzell 1992a).

Fishing deep slope stocks may commence again in countries such as PNG and Fiji where resources are larger and where fishing pressure has dropped over the last two or three years. There are indications that deep slope fishing in the Solomon Islands may offer excellent prospects for domestic and international markets (P. Wellington pers. comm.). However, it is unlikely that there will be another major expansion of fishing for deep slope stocks comparable
to the increase in effort during the 1980s, particularly where there is the possibility of fishing profitably for large pelagic fishes (see below).

Large pelagic fishes, including coastal and offshore species, have always been important in the subsistence diet of Pacific Islanders. Tuna from the basis of artisanal fisheries in Kiribati, PNG and French Polynesia, and other large pelagic species, such as Spanish mackerel, form substantial commercial fisheries in many countries. Domestic landings of both large and small pelagic species amount about 20 per cent of the total domestic commercial catch from near shore areas in the Pacific (Table 1). The data sources used to compile the country summaries in the appendices show that subsistence catches are composed of 10 to 75 per cent pelagic species, with a regional average of about 30 per cent.

One of the most notable developments of the last five years in the tropical western Pacific has been the development of domestic longline fisheries for fresh, chilled yellowfin and bigeye tuna. It was the introduction of monofilament longlines in the Hawaiian longline fishery in the early 1980’s that led to improved catches of these species (Cook 1989). Deployment of monofilament line can be automated with a line thrower, allowing deeper, continuous longline curves that let this gear fish deeper than kualoa longlines, and this longlining method spread rapidly to other parts of the Pacific. Improved airline connections between the Pacific Islands and Japan, Hawaii and the continental United States has meant that domestic commercial longline fisheries have developed (or are developing) in American Samoa, Fiji, Palau FSM, Marshall Islands, Guam, French Polynesia and New Caledonia and Tonga. A major limiting factor for such fisheries is access to markets, which is dictated mainly by airline schedules and the space available for cargo on commercial aircraft. Catches by these small-scale domestic longline tuna fisheries are classified by the TBAP in the Regional Tuna Bulletin, and are thus not included in the summaries in Table 1 and 2, but this fishery overlaps significantly with coastal fisheries, particularly where vessels are multipurpose.

In parallel with the development of the small scale longline fishery has been experimental fishing for small pelagic stocks to supply bait for longlining operations. Longlining in the tropical Pacific has relied for the most part on imported bait from Japan. Partial or total replacement of imported bait could decrease operating costs and possibly increase the spread of economic benefits from longline fishing. Small pelagic stocks (scads, sardines and herrings) have traditionally featured in the subsistence diet of many Pacific Islands and are caught for sale in domestic markets. Experimental bait fisheries using purse seines and lift nets have been established in Tonga (König 1993) and the Federated States of Micronesia, (Anon. 1992a) while the potential for local bait supply was investigated in Papua New Guinea (Duell 1992b). Locally available small pelagic species have been briefly tested as longline bait by commercial boats in Fiji, but were too seasonal and reliable supplies were difficult to obtain (G. Southwick pers. comm.).

A further development has been the adoption of a technique first pioneered in Indonesia where live milkfish are used to bait longlines and hence markedly improve catches. Plans have been made to develop milkfish culture in Chuuk by a FSM-based longline fishing company (Lindsay 1994). Milkhish culture is a tradition in Micronesia and may offer further potential for fishermen to share in the economic benefits of longline fishing. Longline fishermen are notoriously
conservative in their choice of bait. Experimentation is expensive, and local substitutes are likely only to be accepted if good catch rates can be consistently demonstrated.

Another form of pelagic fisheries technology adapted from commercial fisheries to the needs of Pacific Islands fishermen is the Fish Aggregating Device (FAD) or "payao". Purse-seiners and pole-and-line fishing vessels in the Pacific used FADs to maximize catches of tuna. Normally FADs were deployed considerable distances from shore and sometimes in depths of over 2000 metres but, during the mid 1980s, technology was adapted for deployment of FADs for the benefit of Pacific Islands fishermen operating near to the coast. Concurrent with the progress with near-shore FADs was the development of vertical longlining for tunas and other larger pelagic fishes to supplant or augment catches made by trolling. FAD technology is coming of age. Reasonable (ie) times can now be expected from these devices and studies are showing that their use can be fully justified at the national economic level, with national rates of return on investment of over 2,000% (J.Amosson, Marine Resources Assessment Group, Suva, pers. comm.)

Greater emphasis is now given to developing near-shore pelagic fisheries to improve fishermen incomes, relieve fishing pressure on reef and deep slope stocks and to improve supply of fresh fish on domestic markets. Artisanal fishermen may also receive further economic benefit if they are able to catch high value sashimi-grade tuna and have a local buyer with access to overseas markets, as in Suva. In urban areas where there is a substantial demand for fish, such as Port Moresby in Papua New Guinea, and Apia Western Samoa, the deployment of coastal FADs has been shown to be very successful with fishermen able to make substantial earnings from large pelagic catches (Beverly & Casack 1995, Watt in press). In a few cases there are now some commercial fishing communities that are entirely dependent on FADs for their livelihood.

Beche-de-mer

Harvesting holothurians (sea-cucumbers) for processing into beche-de-mer (trepang) is among the oldest of the commercial fisheries in the South Pacific and dates back to the early 1800s (e.g. Ward 1972). The major producers of beche-de-mer were, and still are, Papua New Guinea, Solomon Islands, New Caledonia, Vanuatu and Fiji. Current export production ranges between 1500 and 2000 t annually of dried product, although figures for some locations such as Kiribati and Tonga are unavailable. The main consumers of beche-de-mer are a cople of Chinese origin and the majority of beche-de-mer is exported to Hong Kong, Singapore and Taiwan. Small volumes of beche-de-mer are also sent to markets in Canada, USA, New Zealand and UK.

Beche-de-mer fisheries in the South Pacific have been characterised by cycles of heavy exploitation followed by "fallow" periods during which the resource has had the chance to recover. Exploitation declined in the latter half of the 19th century probably because of sheep overfishing, whilst the slump in trade after 1930 was due to the embargo in trade into China caused by the Sino-Japanese war, followed by the continued restrictions on external trade under the Chinese communist government. The present expansion of harvesting effort for beche-de-mer in the South Pacific began in the late 1980s, partly due to declines in production from other beche-de-mer producers in Southeast Asia and due to the easing of restrictions on trade with China (Preston 1991). Beche-de-mer is much sought after in China and has apparently been useful recently as a buffer item in circumvent currency transfer restrictions.
The need for management of beche-de-mer harvesting usually only becomes evident as stocks become scarce following a rapid increase in effort. Banning SCUBA gear may help maintain a stock of the larger individuals in deeper water and provide a reservoir for recruitment following harvest depletion. Other management options are described in Adams (1993), but the most common measure currently being considered in the Pacific Islands is the minimum size limit.

Whilst statistics on total exports of beche-de-mer are usually good, making the ones of the most easily quantifiable of fisheries, this information is not necessarily very useful for management. Up to 20 different species are now commercially traded in western Melanesia (the number of species declines towards the east) and whilst these all occupy different habitats they are usually classified only as 'beche-de-mer' on export. An export licensing system that requires exporters to quantify their trade in each species is very useful. Also, it is often very difficult to find out where these beche-de-mer were harvested - exploitation may appear to be low when averaged over the whole country, but harvesting is often actually confined to fairly limited areas, moving from reef to reef as each becomes depleted.

The current boom in beche-de-mer export began around 1985 and was first evident in Fiji, followed by Solomon Islands and Papua New Guinea. Suddenly there appeared to be a demand for lower-value, easy to collect species as well as the higher-value 'traditional' species (black and white leaffish, sandfish). Even though export volumes boomed (the increase in Fiji was over 1000% in the three years to 1988) prices did not fall, and this has been one of the main characteristics of the beche-de-mer trade - demand is insatiable. The volume of beche-de-mer export sustained by most islands was definitely unsustainable in the short term, and supplies are now becoming scarce, even in the remoter areas. Malaysians, often of Chinese origin, are now branching out from their bases in Melanesia and looking to Polynesia and Micronesia as higher prices start to balance the higher cost of trade in these areas.

**Trochus**

The top shell *Trochus niloticus* was originally found in the South Pacific in Melanesia, Fiji, Wallis and the Western Caroline Islands (Falea and Yap). Due to the demand for mother of pearl for button manufacture, trochus has been harvested extensively in the South Pacific since the start of the 20th century (Nash 1993). Further, there have been over 50 separate transplantations of trochus in the South Pacific to islands beyond its natural range in an attempt to extend the economic benefits of trochus harvesting (Gillett 1993). Most of these transplants have generated successful fisheries in locations such as Atuataki, Tahiti, Pohnpei, Eniwetok, Guam, Rota and it is estimated that between 6,500 and 12,000 metric tonnes of extra trochus have been harvested over the past 50 years as a result of these transplantations (Adams, in prep. SPC Trochus SIG Bulletin).

Management initiatives for trochus fisheries in the South Pacific include minimum and maximum size limits for harvesting, establishing trochus sanctuaries where harvesting is forbidden, limiting the fishing season or even banning harvests in some years. The lower size limit is designed to exclude immature trochus from harvests and allow animals to become sexually mature, while the primary role of the upper size limit is to protect shell quality for the market since old shells are usually unsuitable for button manufacture.

In small islands, the trochus season is often limited to only a few days duration. Estimates of stock size for setting of harvest quotas are usually made through a pre-harvest survey of the trochus population making counts in transects. The transect densities are then extrapolated to
the entire population and the quota based on this estimate. Recent comparative studies at Aitutaki have shown, however, that the most accurate method of estimating trochoth populations and hence setting quotas is by mark and recapture methods, by tagging. The disadvantage of this method is that the trochoth population is determined during harvesting, as tags are returned by harvesters and thus a quota is not set before trochoth collection begins. This methodology could also be extended to countries in Melanesia which have extensive trochoth resources and no harvest season.

Over the past ten years, hatchery methods or trochoth aquaculture have been optimised. No commercial quantities of trochoth have been produced but the potential to re-stock depleted reef areas with cultured juvenile trochoths and enhance recruitment is being tested. Experiments have been carried out in Palau, Vanuatu, Fiji and New Caledonia, and we await a review of all these different experiments (some of them still going on) with interest.

Between 1,500 and 2,000 t of trochoth is harvested annually from the Pacific Islands, although this may vary considerably from year to year. Depending on demand, stock sizes and the occasional molatoria, which are a feature of trochoth fisheries management in many islands. Trochoth markets are greatly dependent on the demand for mother-of-pearl buttons for the fashion industry in Europe and Asia, and trends in the garment (particularly shirt) manufacturing industry will probably dictate the future of trochoth fisheries in the region. The switch from shell to plastic buttons in the 1950s caused a decline in the demand for trochoth that did not recover for two decades. It is also possible that demand (and prices), could plummet virtually overnight if trochoth is ever promoted as an endangered species by the "green" movement. Unlike as it sounds (since trochoth is undoubtedly the best managed commodity fishery in the Pacific) trochoth has apparently found its way onto one endangered species list already by being lumped together with other mother-of-pearl producing shells, such as greenmali and gold-lip pearl shell.

Pearl oysters

Like beche-de-mer, there is a long history of harvesting the black-lip pearl oyster, Pinctada margaritifera, and the search for the elusive pearl brought many outsiders to the Pacific in the last century, particularly to eastern Polynesia (Sims 1993). Most of the production in the South Pacific region is black-lip pearl oyster which is most abundant in the clear shallow waters of lagoons, bays and sheltered bays to a depth of about 40 m. The gold-lip oyster is much more restricted in distribution, confined to the deeper waters of shelf areas of continents and the large islands of western Melanesia. At present the most productive areas are the lagoons of the Tuamotu and Gambier Archipelagos in French Polynesia, the northern Cook Islands and, to a lesser extent the Solomon Islands, Fiji and Papua New Guinea. As an example of the relative productivity of these areas, the harvest of black-lip pearl shell from French Polynesia has averaged over 450 tonnes per year for the 10 years before 1980 (Intes 1986), whilst the average export of pearl-shell from Fiji has been around 20 tonnes per year for the past 15 years.

Shell production from black lip oysters in French Polynesia and the Cook Islands is no longer from wild stocks, but mostly from oysters cultured for pearl production. Pearl cultivation is still a developing industry in the Cook Islands and at present only a small amount of pearls are produced each year. In French Polynesia pearl production amounts to about 1,100 kg/yr, worth over $42,000,000 (Appendix 1). Total black lip oyster shell production from the South Pacific region currently amounts to about 400 t/yr with about two thirds of this volume being produced by French Polynesia.
Management of pearl oyster stocks in the Cook Islands and French Polynesia is presently focused on preserving wild stocks to produce spat for pearl culture. Consequently very little harvesting of wild populations occurs in either location. Management initiatives in French Polynesia and the Cook Islands have also included setting harvest seasons, quotas and size limits.

The South Pacific Commission has surveyed blacklip pearl oyster stocks in Tuvalul Kiribati and the Marshall Islands but has not found wild stocks large enough to support the spat-collection needs of commercial pearl farms. A survey of Kirimati Island in the Line Archipelago provided a useful example of the consequences of over-fishing a black-lip oyster population. Kirimati was a major producer of pearl oysters in the late 19th century, however, the survey revealed only a residual population, still recovering from this over-exploitation almost a hundred years later. Similar lack of recovery from earlier exploitation has also been noted in Penrhyn and Suwarrow Atolls in the Cook Islands (Sims 1992).

Crustaceans

Crustaceans such as spiny lobsters and mangrove crabs form part of the subsistence catch in the South Pacific and form the basis of limited commercial fisheries. The spiny lobster species commonly found on coral reefs in the South Pacific include Panulirus penicillatus, Panulirus ornatus, Panulirus versicolor and Panulirus longipes. P. penicillatus is the most widespread spiny lobster in the South Pacific and lobster fisheries in the region are for the most part based on this species (Pitcher 1993). The exception is in Papua New Guinea where P. ornatus is caught in considerable quantities in the Torres Strait to the west of the Gulf of Papua and at Yule Island at the eastern edge of the Gulf.

Traditional basket traps, baited with chitons or sea-urchins are said to catch P. penicillatus and P. longipes, but the lagoon species P. versicolor and P. ornatus rarely enter traps (Pitcher 1993). Fishing for lobsters with traps in the South Pacific is now rarely practised and most catches are made by divers spearing lobsters and by fishermen catching them by hand from shallow reefs at night. Trials in Fiji (and undoubtedly many other places) with commercial lobster pots from Hawaii and New Zealand have not been successful. A nominal estimate of the total commercial production of lobsters in the region (excluding the Australian Torres Strait catch of P. ornatus) is in the vicinity 200 to 350 t/yr.

$P.\ penicillatus$ is restricted to the windward surf zones of oceanic reefs in depths to about 10 m. Abundances of unexploited stocks of $P.\ penicillatus$ in this reef edge habitat tend to be quite high and lead to over-optimistic expectations of the productivity of reef lobster stocks. Estimates of stock abundance are 111-128 lobsters per kilometre of reef edge in the Solomon Islands (Prescott 1980) and 35-164 lobsters/km of reef in Eniwetok Atoll in the Marshall Islands (Ebert & Ford 1986). No other abundance estimates appear to have been published. Estimates of sustainable yield suggest that about 20 kg of lobster can be harvested per kilometre of reef edge each year. This is a very modest production compared to shelf and temperate lobster fisheries on the Pacific rim, particularly when those lobsters can be caught relatively efficiently in traps, or during mass migrations. Pacific Island lobster fisheries are a continual magnet for foreign investment, despite their proven poor export prospects.

The portunid crab, Scylla serrata is found throughout most of the tropical Pacific wherever there areas of muddy substrate with stands of mangrove trees (Brown 1993). Like spiny lobster it has been caught by Pacific Islanders for subsistence purposes and forms the basis of limited
commercial fisheries in some countries of the region. Mangrove crabs are cau that in the South Pacific in traps or, more commonly, by carefully pulling crabs from their burrows with a metal or wooden hook. If crabs can be extracted carefully without damage to the burrow then the vacated burrow will soon be re-occupied and crabs can continue to be captured at the same site for many years.

Densities of mangrove crab populations in north and south PNG range from about 10 to 23 crabs/ha (Frusher 1983, Chapau 1991). Similar densities have been reported from eastern Australia (Brown 1993). The size of the mangrove crab resource will be rather small for most Pacific Islands, given the limited habitat size and only limited production will be possible from crab stocks. Further, reclamation of mangrove swamps will decrease crab populations through habitat loss. Management measures for mangrove crabs include size limits and closed seasons in some of the countries of the region. The actual production of mangrove crab in the region is difficult to estimate accurately since there are very few published statistics. In Fiji, commercial sales of mangrove crab on the domestic market (not counting subsistence consumption) have averaged 116 tonnes per year for the past 10 years, and other countries with similar proportions of mangrove forest might possibly expect a similar productivity. Fiji has around 42,000 hectares of mangrove forest, and thus has an average national commercial mangrove crab production of 2.75 kg (around 5 adults) per hectare (per 10,000 square metres) of mangrove.

Papua New Guinea has the only commercial penaeid shrimp trawl fishery in the region (it is the only Pacific Island nation with an extensive continent-shelf and with substantial estuarine habitat) and lands over 1,100 t annually (Anon 1994). Mariculture of penaeid shrimp has been successfully developed in New Caledonia, with annual production of over 600 t. A smaller amount of maricultured shrimp (~60 t/yr) is produced in French Polynesia, where chrevette or seampi is also cultured with an annual production of between 15 to 20 t (Dauphin & Cheung 1992). Fiji has several small-scale penaeid shrimp farms with a total annual production of around 10 tonnes. These were based until recently on postlarvae imported from Australia but there are now increasing quantities of postlarvae coming from a local hatchery.

Discussion

In this text, we have focused on some of the fish fisheries that are common to most of the countries of the South Pacific. The total fisheries production estimates in Tables 1 and 2 include estuarine fisheries and freshwater fisheries figures where available, but they have not been particularly discussed because they are important only in the large Melanesian islands and in Fiji. Freshwater fisheries are particularly important in Papua New Guinea with its large inland population. Fisheries yield for the Sepik River system alone is estimated to be about 6,000 t/yr, half of which comprises feral exotic tilapia, Oreochromis mossambicus (Coates 1993). Quite a large proportion of the fish biomass of the Rewa river in Fiji now consists of exotic species, particularly O.mossambicus (Fiji Fisheries Division, unpublished data), and attempts are being made to improve yields from the Sepik River through selective introductions of other exotic species (Coates 1993, Anon 1994).

Present fin-fishery development initiatives in the region are likely to continue to turn towards pelagic rather than demersal fisheries due to the larger unexploited resource base, and more and more attention is going to be devoted to the consolidation and management of reef fisheries. Trials in PNG and elsewhere in the region are proving the viability of adapting monofilament longline gear to small and medium sized fishing vessels and there does not appear to be any
indication of decline in the market demands for high quality fresh sashimi quality tunas from Japan and the USA. The main limiting factor is transporting the catch by air from the Pacific Islands to overseas markets. Some countries such as Palau, French Polynesia, New Caledonia, Fiji, FSM and Tonga have direct air links with Japan and Hawaii. Other countries where pelagic fisheries are developing will have to try to find some way of accessing these overseas markets and take advantage of the better returns on landings.

For the smaller resource-poor countries of the Pacific, beche-de-mer and mother-of-pearl shell fisheries offer the potential for increased income but shallow-water invertebrate fisheries are easily over-exploited and any such income must be considered mainly as "windfall" cash for village fishmen rather than as a basis for permanent investment. These fisheries are also strongly influenced by external market forces beyond the control of national economies and could easily go into decline through decreased demand. Management of sessile invertebrate harvests, particularly in smaller countries will have to be severely limited to maintain sustainable yields.

Present management strategies for trochus in the the former US Trust Territories of Micronesia and the Cook Islands are based on very short harvest seasons with quotas dictated by pre-season stock assessments. If a large part of the population expects to share in the revenues from resources such as trochus then limited seasons with short pulses of intensive effort may be the only way to effectively manage these stocks. It has also been suggested for beche-de-mer (R.Richmond, University of Guam, pers.comm.) that producers form a cartel and rotate harvests between islands each year, giving depleted stocks the chance to recover in those islands not participating in an annual harvest, or even that trochus and beche-de-mer harvest periods be opened alternately to provide a similar recovery period (P.Lokani, DFMR, Papua New Guinea, pers.comm.).

Advances have been made in the culture of commercial sessile invertebrates but other than the deployment of spat collectors for pearl oysters in the Cook Islands and French Polynesia, there are no demonstrable examples of successful replenishment of depleted populations by maricultured stocks. This does not necessarily mean that experiments have failed, but that the stock assessments used to date have not been sensitive enough to detect differences between natural and "enhanced" recruitment, and this was the main reason why Palau has discontinued trochus reseeding experiments (N.Idechong, Marine Resources Division, Palau, pers.comm.). Further research and development is required to determine if reseeding is feasible and cost-effective, especially for those species that do not have particularly low or erratic recruitment. Such pure research may be outside the financial and manpower resources priorities of most Pacific Island fisheries departments and be more appropriately carried out by Universities. Hatchery reseed experiments may even contribute to unsustainable harvesting by suggesting that any current damage to stocks can be quickly repaired in the future. It should be recognised that, at present, there is no 'magic cure' for overfishing. Management and stock conservation research in the Pacific Islands perhaps should continue to be focussed on mechanisms of limiting total harvest volume in socially and economically feasible ways.

The estimates of fisheries production in Tables 1 and 2 are the most accurate that can be obtained at present in desktop study, and are a 'snap-shot' of fisheries production in the early 1990s. Some countries, such as Fiji and the American territories, have very well developed monitoring and survey programmes for estimating commercial fish production. However, in almost all countries, the estimates of subsistence fisheries production must be computed empirically. This has been accomplished from dietary data where information has been recorded
directly on per capita consumption of fish or, more commonly, on the frequency of fish and shellfish consumption. Such information is collected during national nutritional surveys and epidemiological surveys periodically carried out by government health departments. Such approaches are likely to be the only practical and cost-effective method of determining subsistence catches.

There is a great deal of information that has not yet been incorporated into our summary. Unpublished work kept in forgotten filing cabinets, and information 'expatriated' by external researchers will continue to come to light and will contribute towards making these estimates more accurate. Information arising both from SPC fisheries staff making visits to national fisheries administrations, and from national reports and publications sent to SPC will continue to be translated into digital format. The Resource Assessment Section will continue to assist with the improvement of national inshore fishery data-collection and analysis, but there is still a great deal of work that can be done just gathering together the existing historical data.

As a regional organisation, SPC suffers by being one step removed from what is happening in the national fishery. There is no regional agreement whereby SPC member fisheries administration are encouraged to let us know what is happening in their fisheries, or to pass on copies of relevant publications and reports so, very often, the information we are able to collect comes from occasional in-country visits. If some of the 'latest developments' highlighted in this paper seem out of date, it is because of this information lag. One of the reasons for publishing this Status Paper is to RTMF is to give national representatives the chance to correct any mistaken impressions we may have about developments in their fisheries, and to let us know about any developments or information sources that we may be unaware of.

John Munro and Semisi Fakahau (1993, p22) suggest that 'One of the simplest and most overlooked methods for estimating the potential of a fishery is simply to compare the current harvests per unit area with those taken by similar fisheries operating in similar habitats. For example, if an established fishery is yielding 4 tonnes per square km per year, then it is reasonable to assume that a fishery operating in a similar habitat elsewhere will be able to produce a similar amount.' We feel that it can be extremely beneficial for the countries of the region to have some sort of central depository for inshore fisheries catch, effort and status information, particularly for those export fisheries which tend to 'migrate' across the region (and where one country can learn a great deal from the experiences of another), but also to enable the sort of information sharing that can lead to an improvement of stock assessments across the region.

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APPENDIX I
COUNTRY SUMMARIES
American Samoa

Geographic profile

Land area [sq. km] 200
Population 46,773
Area of EEZ [sq. km] 390,000
Length of 200 m isobath [n.mi] 143.3
Reef area [sq. km]

Fisheries statistics

Nominal domestic fisheries production [t] 267
Commercial fisheries production [t] 51.6
Nominal value of commercial production [$] 178,762
Number of motorised vessels 50

Nominal value of domestic fisheries production [$] 993,000
Subsistence fisheries production [t] 215.4
Nominal value of subsistence production [$] 814,238
Number of non-motorised vessels 50

Details of commercial fisheries production

Finfish

Reef & deep slope fish [t] 8.2
Reef & deep slope fish [$] 32,800
Pelagic species [t] 43.1
Pelagic species [$] 144,200
Estuarine species [t] 0.3
Estuarine species [$] 0.3

Crustaceans [t] 1,762
Crustaceans [$] 1,762
Beche-de-mer [t] 32,800
Beche-de-mer [$] 32,800
Mother-of-pearl [t] 32,800
Mother-of-pearl [$] 32,800


Cook Islands

Geographic profile

Land area [sq. km] 237
Population 18,617
Area of EEZ [sq. km] 1,830,000
Length of 200 m Isobath [nm] 222.7
Reef area [sq. km]

Fisheries statistics

Nominal domestic fisheries production [t] 942
Commercial fisheries production [t] 124
Nominal value of commercial production [S] 314,491
Number of motorised vessels 200
Nominal value of domestic fisheries production [S] 3,362,174
Nominal value of subsistence fisheries production [t] 858
Nominal value of subsistence production [S] 3,047,683
Number of non-motorised vessels 120

Details of commercial fisheries production

Invertebrates

Reef & deep slope fish [t] 1
Reef & deep slope fish [S] 3,552
Pelagic species [t] 24
Pelagic species [S] 85,524
Estuarine species [t] 99
Estuarine species [S] 225,683

Federated States of Micronesia

Geographic profile

Land area (sq. km) 701
Population 100,749
Area of EEZ (sq. km) 2,78,000
Length of 200 m isobath (nmi) 1,332.7
Reef area (sq. km)

Fisheries statistics

Nominal domestic fisheries production [t] 6,839
Commercial fisheries production [t] 646
Nominal value of commercial production [$] 1,402,296
Number of motorised vessels 2000

Nominal value of domestic fisheries production [$] 17,739,696
Subsistence fisheries production [t] 6,243
Nominal value of subsistence production [$] 11,237,400
Number of non-motorised vessels 600

Details of commercial fisheries production

Finfish

Reef & deep slope fish [t] 321
Reef & deep slope fish [$] 577,800
Pelagic species [t] 198.5
Pelagic species [$] 357,300
Estuarine species [t] 97
Estuarine species [$] 352,000

Invertebrates

Crustaceans [t] 20.5
Crustaceans [$] 196,444
Beche-de-mer [t] 97
Beche-de-mer [$] 352,000

Notes: All figures on volume and prices of commercial landings adapted from FFA Marine Resource Profile of FSM (1999), Commercial landings indicator 6.7 (12,312 US $) of edible and dried, and 244 of dried (5000 US $). Vessel numbers from McCoy (1999). Subsistence production based on annual per capita fish consumption for the four states of the FSM compiled from dietary information in Elymore et al (1989).
Fiji

Geographic profile

- Land area [sq. km]: 18,272
- Population: 715,375
- Area of EEZ [sq. km]: 1,290,000
- Length of 200 m isobath [n.m]: 3,000
- Reef area [sq. km]

Fisheries statistics

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Details of commercial fisheries production

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Invertebrates

- Crustaceans
- Seiche-de-mer
- Mother-of-pearl

Notes: Catch returns and value figures from Fijian Fisheries Division Annual Report (Amen 1992). Commercial harvests of shellfish (mainly Patinopecten, arcticodoris and other marine organisms for domestic consumption in Fiji amount to about $20,000; live aquarium fish worth $25,000 were exported from Fiji in 1991. Boat numbers from McCoy (1993).
French Polynesia

Geographic profile
Land area [sq. km] 3,521
Population 188,814
Area of EEZ [sq. km] 5,030,060
Length of 200 m isobath [n.mi] 2,975.9
Reef area [sq. km]

Fisheries statistics
Nominal domestic fisheries production [t] 5,998.5
Commercial fisheries production [t] 2,898.5
Nominal value of commercial production [$] 15,573,555
Number of motorised vessels 120
Nominal value of domestic fishery production [$] 28,005,555
Subsistence fisheries production [t] 3,108
Nominal value of subsistence production [$] 12,432,000
Number of non-motorised vessels

Details of commercial fisheries production

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<td>Mother-of-pearl [t]</td>
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Guam

**Geographic profile**
- Land area (sq. km): 541
- Population: 133,152
- Area of EEZ (sq. km): 218,000
- Length of 200 m Isobath [n.mi]: 85.2
- Reef area [sq. km]

**Fisheries statistics**

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**Details of commercial fisheries production**

### Invertebrates

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<td>83,894</td>
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<tr>
<td>Pelagic species (t)</td>
<td>103.9</td>
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<td>Pelagic species ($)</td>
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<tr>
<td>Estuarine species (t)</td>
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<tr>
<td>Estuarine species ($)</td>
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</tr>
</tbody>
</table>

#### Data sources
- Crustaceans (t) 0.02
- Crustaceans ($) 268
- Beche-de-mer (t) 1.00
- Beche-de-mer ($) 1.00
- Mother-of-pearl (t) 0.00
- Mother-of-pearl ($) 2.00

**Notes**: Data is based on species and values of 1995 commercial and subsistence landings from Fishery Statistics of the Western Pacific Vol III (Hansen et al, 1995). For further details, see data from 1990 in Volume VII (Hansen et al, 1992b). Gross commercial landings revenue 84.3 t of imported fish worth US$ 174,900.
Kiribati

Geographic profile

<table>
<thead>
<tr>
<th>Land area [sq. km]</th>
<th>811</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>72,398</td>
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<tr>
<td>Area of EEZ [sq. km]</td>
<td>3,550,000</td>
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<tr>
<td>Length of 200 m isobath [n.mi]</td>
<td>708.7</td>
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<tr>
<td>Reef area [sq. km]</td>
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Fisheries statistics

<table>
<thead>
<tr>
<th>Nominal domestic fisheries production [t]</th>
<th>12,324</th>
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<tr>
<td>Commercial fisheries production [t]</td>
<td>3,240</td>
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<tr>
<td>Nominal value of commercial production [$]</td>
<td>4,770,000</td>
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<tr>
<td>Number of motorised vessels</td>
<td>600</td>
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<tr>
<td>Nominal value of domestic fisheries production [$]</td>
<td>18,143,667</td>
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<tr>
<td>Subsistence fisheries production [t]</td>
<td>9,064</td>
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<tr>
<td>Nominal value of subsistence production [$]</td>
<td>13,373,667</td>
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<tr>
<td>Number of non-motorised vessels</td>
<td>5000</td>
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</table>

Details of commercial fisheries production

<table>
<thead>
<tr>
<th>Finfish</th>
<th>Invertebrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reef &amp; deep slope fish [t]</td>
<td>Crustaceans [t]</td>
</tr>
<tr>
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<td>1746</td>
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<tr>
<td>Reef &amp; deep slope fish [$]</td>
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<tr>
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<td>2,570,000</td>
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<td>Beche-de-mer [t]</td>
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<td>Pelagic species [$]</td>
<td>Beche-de-mer [$]</td>
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<tr>
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<td>1,015,833</td>
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<td>Estuarine species [t]</td>
<td>Mother-of-pearl [t]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Estuarine species [$]</td>
<td>Mother-of-pearl [$]</td>
</tr>
</tbody>
</table>

Marshall Islands

Geographic profile

Land area [sq. km] 181
Population 43,380
Area of EEZ [sq. km] 2,131,000
Length of 200 m isobath [n.mi] 1420.0
Reef area [sq. km] 

Fisheries statistics

Nominal domestic fisheries production [t] 2,369
Commercial fisheries production [t] 369
Nominal value of commercial production [$] 714,504
Number of motorised vessels 500

Nominal value of domestic fisheries production [$] 3,817,717
Subsistence fisheries production [t] 2,000
Nominal value of subsistence production [$] 3,103,213
Number of non-motorised vessels 250

Details of commercial fisheries production

Invertebrates

Finfish

Reef & deep slope fish [t] 173
Crustaceans [t] 10.9
Reef & deep slope fish [$] 275,784
Crustaceans [$] 3.3
Pelagic species [t] 34,836
Beche-de-mer [t] 183
Estuarine species [t] 34,836
Mother-of-pearl [t] 403,884

Nauru

Geographic profile

Land area [sq. km] 21
Population 9,919
Area of EEZ [sq. km] 320,000
Length of 200 m isobath [n.mi] 10.6
Reef area [sq. km] 3.5

Fisheries statistics

Nominal domestic fisheries production [t] 376.46
Commercial fisheries production [t] 278.60
Nominal value of commercial production [$] 628,605
Number of motorised vessels 218

Nominal value of domestic fisheries production [$] 848,205
Subsistence fisheries production [t] 97.86
Nominal value of subsistence production [$] 219,600
Number of non-motorised vessels 128

Details of commercial fisheries production

Finfish

Reef & deep slope fish [t] 70.8
Reef & deep slope fish [$] 129,885
Pelagic species [t] 207.8
Pelagic species [$] 494,720
Estuarine species [t] 49
Estuarine species [$] 1

Invertebrates

Crustaceans [t] 70.8
Crustaceans [$] 129,885
Beche-de-mer [t] 207.8
Beche-de-mer [$] 494,720
Mother-of-pearl [t] 49
Mother-of-pearl [$] 1

Notes

New Caledonia

Geographic profile
- Land area [sq. km]: 19,103
- Population: 164,173
- Area of EEZ [sq. km]: 1,740,000
- Length of 200 m isobath [n.mi]: 1556.0
- Reef area [sq. km]:

Fisheries statistics
- Nominal domestic fisheries production [t]: 3,032.2
- Commercial fisheries production [t]: 1,932.7
- Nominal value of commercial production [$]: 4,832,410
- Number of motorised vessels: 263
- Nominal value of domestic fisheries production [$]: 12,177,827
- Subsistence fisheries production [t]: 2,000
- Nominal value of subsistence production [$]: 7,344,417
- Number of non-motorised vessels:

Details of commercial fisheries production

<table>
<thead>
<tr>
<th>Fishery</th>
<th>Nominal Domestic Production [t]</th>
<th>Nominal Domestic Production [$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reef &amp; deep rope fish</td>
<td>730.8</td>
<td>Crustaceans [t] 35.3</td>
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<tr>
<td>Reef &amp; deep slope fish</td>
<td>2,682,650</td>
<td>Crustaceans [$] 377,950</td>
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<tr>
<td>Pelagic species</td>
<td>7.5</td>
<td>Beche-de-mer [t] 123</td>
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<tr>
<td>Pelagic species [$]</td>
<td>45,055</td>
<td>Beche-de-mer [$] 1,333,560</td>
</tr>
<tr>
<td>Estuarine species [t]</td>
<td></td>
<td>Mother-of-pearl [t] 135.4</td>
</tr>
<tr>
<td>Estuarine species [$]</td>
<td></td>
<td>Mother-of-pearl [$] 393,200</td>
</tr>
</tbody>
</table>

Notes: Values and values of landings, and beam surveys from (Anon 1975c). A total of 15.3 t of other mussels were reported from New Caledonia, comprising mainly giant clams (10.6 t) and octopus and squid (5.1 t). Harvesting of skippers by New Caledonia amounts to about 644 t/a. Worth about 5,370,000. 
Niue

Geographic profile
Land area [sq. km] 259
Population 2,239
Area of EEZ [sq. km] 390,000
Length of 200 m isobath [n.mi] 53.1
Reef area [sq. km] 6.2

Fisheries statistics
Nominal domestic fisheries production [t] 115.4
Commercial fisheries production [t] 12
Nominal value of commercial production [$] 54,720
Number of motorised vessels 60
Nominal value of domestic fisheries production [$] 526,224
Subsistence fisheries production [t] 102.4
Nominal value of subsistence production [$] 471,504
Number of non-motorised vessels 240

Details of commercial fisheries production

<table>
<thead>
<tr>
<th>Fishes</th>
<th>Invertebrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reef &amp; deep slope fish [t]</td>
<td>Crustaceans [t]</td>
</tr>
<tr>
<td>Reef &amp; deep slope fish [$]</td>
<td>Crustaceans [$]</td>
</tr>
<tr>
<td>Pelagic species [t]</td>
<td>Beche-de-mer [t]</td>
</tr>
<tr>
<td>Pelagic species [$]</td>
<td>Beche-de-mer [$]</td>
</tr>
<tr>
<td>Estuarine species [t]</td>
<td>Mother-of-pearl [t]</td>
</tr>
<tr>
<td>Estuarine species [$]</td>
<td>Mother-of-pearl [$]</td>
</tr>
</tbody>
</table>

Northern Marianas

Geographic profile

- Land area (sq. km): 471
- Population: 43,345
- Area of EEZ (sq. km): 777,000
- Length of 200 m Isobath (n.mi): 405.2
- Reef area (sq. km)

Fisheries statistics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal domestic fisheries</td>
<td>322</td>
<td>1,320,595</td>
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<tr>
<td>production [t]</td>
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<tr>
<td>Commercial fisheries production [t]</td>
<td>120.4</td>
<td></td>
</tr>
<tr>
<td>Nominal value of commercial</td>
<td>493.601</td>
<td>824,685</td>
</tr>
<tr>
<td>production [$]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of motorised vessels</td>
<td>206</td>
<td>Number of non-motorised vessels</td>
</tr>
</tbody>
</table>

Details of commercial fisheries production

**Fish**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value 1</th>
<th>Value 2</th>
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</thead>
<tbody>
<tr>
<td>Reef &amp; deep slope fish [t]</td>
<td>50.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Reef &amp; deep slope fish [$]</td>
<td>206,295</td>
<td>15,915</td>
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<tr>
<td>Pelagic species [t]</td>
<td>68.6</td>
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</tr>
<tr>
<td>Pelagic species [$]</td>
<td>271,030</td>
<td></td>
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<tr>
<td>Estuarine species [t]</td>
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</tr>
<tr>
<td>Estuarine species [$]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Invertebrates**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crustaceans [t]</td>
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<td>1.4</td>
</tr>
<tr>
<td>Crustaceans [$]</td>
<td></td>
<td>15,915</td>
</tr>
<tr>
<td>Beche-de-mer [t]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beche-de-mer [$]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother-of-pearl [t]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother-of-pearl [$]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Palau

Geographic profile
Land area [sq. km] 488
Population 15,122
Area of EEZ [sq. km] 629,000
Length of 200 m isobath [n.mi] 232.0
Reef area [sq. km] 3

Fisheries statistics
Nominal domestic fisheries production [t] 1,486
Commercial fisheries production [t] 736
Nominal value of commercial production [$] 2,412,071
Number of motorised vessels 750
Nominal value of domestic fisherier production [$] 4,217,263
Subsistence fisheries production [t] 750
Nominal value of subsistence production [$] 1,805,192
Number of non-motorised vessels 40

Details of commercial fisheries production

Finfish
Reef & deep slope fish [t] 492.1
Reef & deep slope fish [$] 1,184,626
Pelagic species [t] Crustaceans [t] 14.4
Pelagic species [$] Crustaceans [$] 125,533
Estuarine species [t] Beche-de-mer [t] 229.0
Estuarine species [$] Beche-de-mer [$] 1,109,000

Invertebrates
Mother-of-pearl [t] 14.4
Mother-of-pearl [$] 125,533

Papua New Guinea

Geographic profile

Land area [sq. km] 462,243
Population 3,762,954
Area of EEZ [sq. km] 3,120,000
Length of 200 m isobath [n.mi] 7305.0
Reef area [sq. km] 39,940

Fisheries statistics

Nominal domestic fisheries production [t] 25,554
Commercial fisheries production [t] 4,966
Nominal value of commercial production [S$] 22,096,908
Number of motorised vessels 8,000

Nominal value of domestic fisheries production [S$] 63,272,908
Subsistence fisheries production [t] 20,588
Nominal value of subsistence production [S$] 44,176,000
Number of non-motorised vessels 10,000

Details of commercial fisheries production

Finfish

Reef & deep slope fish [t] 1,100
Reef & deep slope fish [S$] 2,200,200
Pelagic species [t] 630
Pelagic species [S$] 1,240,000
Estuarine species [t] 940
Estuarine species [S$] 1,960,400

Crustaceans [t] 1240
Crustaceans [S$] 10,500,000
Beche-de-mer [t] 546
Beche-de-mer [S$] 4,776,708
Mother-of-pearl [t] 470
Mother-of-pearl [S$] 1,400,000

Pitcairn Islands

Geographic profile

- Land area [sq. km]: 5
- Population: 66
- Area of EEZ [sq. km]: 800,000
- Length of 200 m isobath [nm]: 22.6
- Reef area [sq. km]

Fisheries statistics

- Nominal domestic fisheries production [t]: 8
- Commercial fisheries production [t]: 0
- Nominal value of commercial production [$]: 0
- Number of motorised vessels: 3
- Nominal value of domestic fisheries production [$]: 16,000
- Subsistence fisheries production [t]: 8
- Nominal value of subsistence production [$]: 16,000
- Number of non-motorised vessels

Details of commercial fisheries production

Finfish
- Reef & deep slope fish [t]:
- Reef & deep slope fish [$]:
- Pelagic species [t]:
- Pelagic species [$]:
- Estuarine species [t]:
- Estuarine species [$]:

Invertebrates
- Crustaceans [t]:
- Crustaceans [$]:
- Beche-de-mer [t]:
- Beche-de-mer [$]:
- Mother-of-pearl [t]:
- Mother-of-pearl [$]:

Notes
- Estimates of fish production taken from monthly reports of numbers of fish landings in Pitcairn Islands newsletter, the 'Pitcairn Logbook'. Value of catch computed from a nominal unit price of 22.00/kg.
Solomon Islands

Geographic profile

Land area [sq. km] 27,556  
Population 285,176  
Area of EEZ [sq. km] 1,340,000  
Length of 200 m isobath [n.mi] 2444.3  
Reef area [sq. km]  

Fisheries statistics

<table>
<thead>
<tr>
<th></th>
<th>Nominal domestic fishery production [t]</th>
<th>Nominal value of domestic fisheries production [$]</th>
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<tbody>
<tr>
<td></td>
<td>11,150</td>
<td>12,749,471</td>
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<tr>
<td></td>
<td>1,150</td>
<td>10,000</td>
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<td></td>
<td>Nominal value of commercial production [$]</td>
<td>Nominal value of subsistence production [$]</td>
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<tr>
<td></td>
<td>4,343,811</td>
<td>8,405,660</td>
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<tr>
<td>Number of motorised vessels</td>
<td>1800</td>
<td>Number of non-motorised vessels</td>
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<tr>
<td></td>
<td></td>
<td>5000</td>
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Details of commercial fisheries production

<table>
<thead>
<tr>
<th></th>
<th>Crustaceans [t]</th>
<th>Crustaceans [$]</th>
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</thead>
<tbody>
<tr>
<td>Reef &amp; deep slope fish</td>
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<tr>
<td>Reef &amp; deep slope fish</td>
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<td>Pelagic species [t]</td>
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<td>Pelagic species [$]</td>
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<td>Estuarine species [t]</td>
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<tr>
<td>Estuarine species [$]</td>
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<td>1,675,818</td>
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</tbody>
</table>

Notes: Substance and commercial catch figures taken from PAG Fisheries resource profile of Solomon Islands (Shayne 1990). A mean value of $0.05/kg (US$ 0.27/kg) was used for fish landings (The 1980s, SPC Fisheries Programme, pers. comm.). Vessel numbers taken from McCoy (1991). Note about 3,000 t of small pelagic hullfish (mainly Diplodus but also seahorses and sardines) are caught each year by domestic purse-and-line fleet (Nicholls &发展的在1990).
Tokelau

Geographic profile

Land area [sq. km] 10
Population 1,577
Area of EEZ [sq. km] 290,000
Length of 260 m isobath [n.mi] 56.4
Reef area [sq. km] 

Fisheries statistics

Nominal domestic fisheries production [t] 191
Commercial fisheries production [t] 0
Nominal value of commercial production [$] 0
Number of motorised vessels 140
Nominal value of domestic fisheries production [$] 104,509
Subsistence fisheries production [t] 19
Nominal value of subsistence production [$] 104,509
Number of non-motorised vessels 32

Details of commercial fisheries production

Finfish
Reef & deep slope fish [t] Crustacea [t]
Reef & deep slope fish [$] Crustacea [$]
Pelagic species [t] Beche-de-mer [t]
Pelagic species [$] Beche-de-mer [$]
Estuarine species [t] Mother-of-pearl [t]
Estuarine species [$] Mother-of-pearl [$]

Notes
Based on fish catch data recorded over an 8-week period on Fakaofo by Hooper (1985) and extrapolated to whole population. Most numbers from Mac-wy (1991). Nominal value of catch based on price of NZ$ 1.00/kg (US $0.65/kg) paid for yellowfin in maka ma'afy (S. Roberts, SPC pers. comm.).
Tonga

Geographic profile

Land area [sq. km] 747
Population 94,649
Area of EEZ [sq. km] 700,000
Length of 250 m isobath [n.mi] 893.0
Reef area [sq. km]

Fisheries statistics

Nominal domestic fisheries production [t] 2,362 Nominal value of domestic fisheries production ($) 4,707,849
Commercial fisheries production [t] 1,429 Subsistence fisheries production [t] 333
Nominal value of commercial production ($) 2,806,641 Nominal value of subsistence production ($) 1,901,208
Number of motorized vessels 809 Number of non-motorised vessels 200

Details of commercial fisheries production

Finfish

Reef & deep slope fish [t] 1,254
Reef & deep slope fish [S$] 2,799,094
Pelagic species [t] 150
Pelagic species [S$] 305,660
Estuarine species [t] 25
Estuarine species [S$] 101,887

Crustaceans [t] 25
Crustaceans [S$] 101,887
Beche-de-mer [t] 150
Beche-de-mer [S$] 305,660
Mother-of-pearl [t] 25
Mother-of-pearl [S$] 101,887

Tuvalu

Geographic profile

Land area [sq. km] 26
Population 9,043
Area of EEZ [sq. km] 900,000
Length of 200 m isobath [n.mi] 128.2
Reef area [sq. km] 150 km

Fisheries statistics

Nominal domestic fisheries production [t] 927
Commercial fisheries production [t] 120
Nominal value of commercial production [$] 97,811
Number of motorised vessels 208

Nominal value of domestic fishery production [$] 755,592
Subsistence fisheries production [t] 807
Nominal value of subsistence production [$] 657,781
Number of non-motorised vessels 500

Details of commercial fisheries production

Finfish

Reef & deep slope fish [t] 77
Reef & deep slope fish [$] 62,762
Pelagic species [t] 43
Pelagic species [$] 35,049
Estuarine species [t] 8
Estuarine species [$] 5

Crustaceans [t] 35
Crustaceans [$] 8

Beche-de-mer [t] 8
Beche-de-mer [$] 8

Mother-of-pearl [t] 8
Mother-of-pearl [$] 8

# Vanuatu

## Geographic profile
- **Land area [sq. km]**: 12,190
- **Population**: 142,419
- **Area of EEZ [sq. km]**: 680,000
- **Length of 200 m isobath [n.mi]**: 1400.0
- **Reef area [sq. km]**: 10,634

## Fisheries statistics
- **Nominal domestic fisheries production [t]**: 2,512
- **Commercial fisheries production [t]**: 467
- **Nominal value of commercial production [$]**: 1,514,364
- **Number of motorised vessels**: 250

## Nominal value of domestic fisheries production [$]
- 3,467,724

## Subsistence fisheries production [t]
- 2,045

## Nominal value of subsistence production [$]
- 1,953,360

## Number of non-motorised vessels
- 2000

## Details of commercial fisheries production

### Fish
- **Reef & deep slope fish [t]**
  - 274
- **Reef & deep slope fish [$]**
  - 453,396
- **Pelagic species [t]**
  - 127,358
- **Pelagic species [$]**
  - 24
- **Estuarine species [t]**
  - 86,268
- **Estuarine species [$]**
  - 143

### Crustaceans
- 26
- **Crustaceans [$]**
  - 127,358

### Beche-de-mer
- 24
- **Beche-de-mer [$]**
  - 86,268

### Mother-of-pearl
- 143
- **Mother-of-pearl [$]**
  - 847,342

### Notes
Wallis & Futuna

Geographic profile

Land area [sq. km]  255
Population  13,705
Area of EEZ [sq. km]  300,000
Length of 200 m isobath [n.mi]  69.9
Reef area [sq. km]  

Fisheries statistics

Nominal domestic fisheries production [t]  1,064
Commercial fisheries production [t]  138.1
Nominal value of commercial production [$]  1,285,400
Number of motorised vessels  361
Nominal value of domestic fisherier production [$]  5,595,400
Subsistence fisheries production [t]  861.9
Nominal value of subsistence production [$]  4,310,000
Number of non-motorised vessels  

Details of commercial fisheries production

Finfish

Reef & deep slope fish [t]  96.0
Reef & deep slope fish [$]  528,000
Pelagic species [t]  23.00
Pelagic species [$]  172,500
Estuarine species [t]  
Estuarine species [$]  

Invertebrates

Crustaceans [t]  2.1
Crustaceans [$]  23,100
Beche-de-mer [t]  
Beche-de-mer [$]  
Mother-of-pearl [t]  17
Mother-of-pearl [$]  560,000

Western Samoa

Geographic profile

Land area [sq. km] 2,935
Population 161,298
Area of EEZ [sq. km] 126,000
Length of 200 m isobath [n.m.] 307.8
Reef area [sq. km]

Fisheries statistics

Nominal domestic fisheries production [t] 3,550
Commercial fisheries production [t] 219
Nominal value of commercial production [$] 319,066
Number of motorised vessels 80

Nominal value of domestic fisheries production [$] 5,389,140
Subsistence fisheries production [t] 3,281
Nominal value of subsistence production [$] 5,070,674
Number of non-motorised vessels 100

Details of commercial fisheries production

Invertebrates

Reef & deep slope fish [t] 171.7
Beche-de-mer [t] 15.3
Beche-de-mer [$] 23,443
Mother-of-pearl [t] 20.5
Mother-of-pearl [$] 31,678

Crustaceans [t] 263,745
Crustaceans [$] 20

Petrel species [t]
Priglie species [t]
Estuarine species [t]
Estuarine species [$]