SPC/Inshore Fish. Mgmt./BP 36
7 June 1995

ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

Fisheries Programme

JOINT FFA/SPC WORKSHOP ON THE MANAGEMENT OF
SOUTH PACIFIC INSHORE FISHERIES
(Nouméa, New Caledonia, 26 June - 7 July 1995)

RESEARCH ON FISHERIES IN THE PACIFIC ISLANDS REGION

by

Tim Adams
South Pacific Commission

Andrew Richards,
Forum Fisheries Agency

Paul Dalzell,
South Pacific Commission

and

Lui Bell
Forum Fisheries Agency

1. Background

This review was compiled jointly by the Resource Assessment Section of the South Pacific Commission (SPC) Fisheries Programme and the Research Coordination Unit (RCU) of the South Pacific Forum Fisheries Agency (FFA). The intentions of the review are:-

- to update some aspects of previous regional research reviews—see Anon. (1962), Fakahau *et al*. (1986), Herr (1990)—as part of the summing-up process of the work of SPC's Inshore Fisheries Research Project (1988-1994) and the FFA's RCU (1988 -1995);
- to provide baseline information for possible development of a Pacific Island consensus regional coastal fisheries research strategy;
- to develop a working paper for discussion at the June, 1995 workshop on Inshore Fisheries Management, convened jointly by FFA and SPC in Nouméa;

1.1 Acknowledgments

The personnel costs of FFA's Research Coordination Unit (A. Richards and L. Bell) are funded by the Government of Canada, and the personnel costs of the Resource Assessment Section of the SPC's Fisheries Programme (T. Adams and P. Dalzell) are funded by the Government of the United Kingdom.

The production of this report was greatly assisted by the return of questionnaires by the Governments or Administrations of American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Northern Marianas, Palau, Papua New Guinea, Solomon Islands, Tonga, Tokelau, Tuvalu, Vanuatu and Western Samoa. The report also drew heavily on the experiences and opinions of other members of staff of the SPC Fisheries Programme and the FFA, particularly those who had recently visited relevant countries.

The costs of discussing, amending and publishing this review, as part of the proceedings of the FFA/SPC Workshop on the Management of South Pacific Inshore Fisheries, were borne in part by the United nations Development Programme's Regional Fisheries Support and National Capacity Building Programme (implemented by SPC and FFA), and in part by the United Kingdom Overseas Development Agency's Integrated Coastal Fisheries Management Project (implemented by SPC).

1.2 Glossary

Agenda 21 — an action plan which is one of the outputs of the United Nations Conference on the Environment and Development (UNCED). Chapter 10 concerns Marine Resources, and is reproduced in Annex I to this review.

EEZ — Used here as a generic acronym covering Exclusive Economic Zones, Fisheries Zones, and 200-mile limits: The extent over which most nations claim exclusive rights to harvest and manage resources, and to enforce those rights at the national level. For the purposes of Pacific Islands coastal fisheries management, EEZ's are not significant, since these fisheries occur entirely within Territorial or Archipelagic Waters.

Fisheries Department — is used here as a generic term for a branch of Government that is concerned with the administration of fishing. Depending on the country such services may variously be termed Fisheries Division, Ministry of Marine Resources, Fisheries Department, Section Pêche etc.

FFA — **Forum Fisheries Agency**, an agency of the South Pacific Forum, based in Honiara, Solomon Islands. Set up by the Forum Fisheries Convention in 1979 to "facilitate the collection, analysis, evaluation and dissemination of relevant statistical and economic information about the living marine resources of the region, and in particular the highly migratory species." Member countries are Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa. "Nearly everyone agrees the Forum Fisheries Agency ... is one of the South Pacific's regional triumphs. Nearly everyone also agrees that except for a few lucky gold or copper mining economies, fish is the only real big money resource most Pacific Island countries have." (Keith-Reid & Aiavao, 1994)

ICLARM — the **International Center for Living Aquatic Resources Management** is based in Manila. Set up originally with funding from the Rockefeller Foundation under an agreement with the

Philippines Government, it has aimed to accomplish strategic research of circum-tropical application into fisheries management and aquaculture. In 1992 ICLARM was recognised as an international organisation by the UN and acquired direction and financial sponsorship from CGIAR.

LOSC - Law of the Sea Convention (1982), arising out of the United Nations Law of the Sea Conferences (UNCLOS). A Pacific Island nation, Fiji, was the first nation in the world to ratify this convention in 1982 but the convention did not come into force until 1994 and several FFA and SPC members have still not yet ratified it..

Metropolitan country — In this sense, a "developed country" original signatory member of the South Pacific Commission. Currently including Australia, France, New Zealand, the United Kingdom and the United States of America, all of which (apart from Australia) still administer territories or dependencies within the SPC work-area. The Netherlands ceased to be a metropolitan member of SPC in 1962 when it withdrew from New Guinea (because it ceased to administer a non self-governing territory within the scope of the Commission, although the wording of the Canberra Agreement was subsequently altered to allow any country within the scope of the Commission to become (or remain) a member, on acceptance by all other members and on deposition of an instrument of accession). The United Kingdom notified the region in 1993 of its intention to withdraw from SPC membership but retains sovereignty over Pitcairn, Henderson, Oeno and Ducie (population: 52, EEZ area: 800,000 km^2) within the SPC work-area. Pitcairn remains an SPC member in its own right.

ORSTOM — The French scientific research institute for development through cooperation has three research centres in the Pacific (New Caledonia, French Polynesia and Vanuatu), and accomplishes a great deal of fisheries research, particularly basic research. A memorandum of understanding was signed between ORSTOM and SPC in 1994 to pool their skill and knowledge in joint research programmes, scientific and technical information and training, although the committee to propose and review joint actions has not yet met.

PIMRIS — **Pacific Islands Marine Resources Information System**. An information network linking USP, SPC, FFA and SOPAC libraries through the medium of shared bibliographic databases. The PIMRIS Coordinating Centre at USP library, and bibliographic functions at FFA and SOPAC, were funded by the Canadian Government through ICOD, whilst the SPC component is funded by the French Government and is responsible for the operation of several special interest groups and newsletters covering key inshore resources.

SOPAC **—South Pacific Applied Geosciences Commission**, formerly CCOP-SOPAC, based in Suva, Fiji, is an agency specializing in marine geosciences. Like its sister agency, FFA, SOPAC's mission is to assist Pacific Island nations to derive benefits from the marine resources opened up to them by the declaration of 200-mile EEZs a decade and a half ago, with FFA concentrating on the living, and SOPAC on the non-living, resources. Unlike FFA, SOPAC did not inherit a major resource-base already under active exploitation, since sea-bed mining is still some time away from commercial feasibility, and has diversified its activities, particularly into coastal protection and marine mapping.

SPC — **South Pacific Commission** (Commission du Pacifique Sud or *CPS* to Francophone members), set up by the Canberra Agreement in 1947 to "encourage and strengthen international cooperation in promoting the economic and social welfare and advancement of the peoples of the non self-governing territories in the South Pacific region" (SPC 1984). SPC's constituted powers or functions are "to study, formulate and recommend measures for the development of, and where necessary the coordination of services affecting ... fisheries ... (etc) ... To provide for and facilitate research in technical, scientific, economic and social fields in the territories within the scope of the Commission and to ensure the maximum co-operation and co-ordination of the activities of research bodies... (etc)". Member countries and territories: Australia, New Zealand, France, UK, USA, New Caledonia (Fr), French Polynesia (Fr), Wallis & Futuna (Fr), American Samoa (US), Guam (US), Commonwealth of the Northern Marianas (US), Pitcairn (UK), Tokelau (NZ), Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, Western Samoa. With the setting-up of partly overlapping regional development bodies under the South Pacific Forum (Forum Secretariat, FFA, SOPAC), the South Pacific Commission has felt it necessary to adapt its mission, though it still covers a much broader range, geographically, in respect of specialisations, and in the range of membership, than the Forum. In general, SPC plays a research and advisory rôle, leaving the more politically

homogeneous Forum agencies to pursue more applied and direct interventions (such as negotiation of fishing treaties) on behalf of member countries.

***SPOCC* - South Pacific Organisations Coordinating Committee**. An occasional committee consisting of the heads of regional organisations, meeting briefly to discuss institutional administrative matters, and to co-ordinate work programmes in order to avoid either overlaps or gaps in the service to member countries. Although not formally constituted, and not reporting directly to member countries, the committee consists of the heads of the Forum Secretariat, SOPAC, SPC, FFA, USP and others.

***SPREP* - South Pacific Regional Environment Programme** (Programme Régionale pour l'Environnement - PROE - to its Francophone members) is a regional organisation based in Western Samoa. Originally a programme of the South Pacific Commission, SPREP became separately constituted under the SPREP Convention and moved to Western Samoa in 1991. SPREP has the same membership as SPC.

1.3 Limitations of the scope of the review

This review does not explicitly incorporate consideration of *tuna* fisheries research. However, national tuna fisheries research capability is taken into account, since it is usually carried out by the same staff who undertake coastal fisheries research and utilises many of the same national resources. Regionally, tuna fishery research is much more specific and organised than coastal fisheries research and is subject to a different set of aims and constraints. The reader is referred to reviews such as

"The south-western Pacific is now the world's greatest tuna fishery. Last year, according to Forum Fisheries Agency and South Pacific Commission figures, it yielded 1,200,000 metric tonnes of fish with a commercial value of around $US1,500 million. That was 50 percent of the annual supply of canning grade tuna and 45 percent of all world tuna production." (Keith-Reed & Aiavao, 1994)

Adams *et al*. (1991) for more information.

Similarly, the explicit consideration of *aquacultural* research is also excluded. Previous reviews of aquaculture in the South Pacific have been prepared by Glude (1971), Villaluz (1972), Uwate et al. (1984) and Tanaka (1991). However, because such research, particularly that related to mariculture, has potential value in enhancement of depleted stocks of certain organisms, and because of the increasing requirement for fisheries administrators to have on their staff, officers with expertise in aquaculture, some attention is paid to the capability of South Pacific countries to effectively conduct research related to aquaculture.

This review concentrates primarily on the coastal fisheries research goals, needs, policies, capabilities and progress of SPC/FFA member Governments and Administrations, and is not intended to critically review the capabilities of *regional* and *international* organisations in this area. This is a subject that is currently under consideration by the "*Review of South Pacific Regional Institutional Arrangements in respect of Marine Resources*", commissioned by the South Pacific Organisations Coordinating Committee (SPOCC) and organised by FFA and SPC. To assist the reader however, a summary of the rôle of some extra-national organisations in coastal fisheries research is provided, as perceived by themselves or as specified in their constitutions.

This review is necessarily of narrower scope than the monumental work of Fakahau and Shepard (1986). We were unable to make specific visits to countries to gather information, but relied on previous personal experience combined with the limited information in questionnaire replies. Like Fakahau and Shepard (1986), we would warn readers "not to expect an erudite scientific treatise specifying methodology for study of South Pacific fish stocks, nor a crisply defined proposal for strategies to improve regional fisheries research capabilities." However, eight years down the track, we hope to be able to at least provide the beginnings of an outline for such a strategy, for discussion and finalisation by Pacific Island representatives at the SPC/FFA Inshore Fisheries Management Workshop planned for June 1995.

1.4 Definition of fisheries research

The term "fisheries research" often means "the population biology of useful fish and invertebrates." In

this review a somewhat more literal definition is used including fish biological, stock assessment, gear development, economic and sociological research in relation to inshore fisheries. In essence; investigating how human beings interact with living natural coastal marine resources, and developing ways of "improving" that interaction. "Improvement" here may mean increasing catches, increasing income, reducing by-catches, preventing depletion, or even reducing the tendency to urban drift, depending on the context.

1.5 General background to Pacific Islands coastal fisheries

The Pacific Islands region, for the purposes of this review, is most simply defined as the work area of the SPC. This area implicitly includes the entire FFA work area, since all FFA members are also SPC members. The SPC work area includes all of the islands in the Pacific Ocean that are south of Hawaii, west of Easter Island, east of Indonesia and north of Norfolk Island. It does not include any of the islands that are properly part of Australia (e.g. Norfolk Island), Japan (e.g. Bonin Islands), New Zealand (e.g. Kermadec Islands) or the Federal United States of America (e.g. Rose Atoll), although it does include territories and national affiliates of SPC metropolitan members.

Apart from the main island of Papua New Guinea, which sits on a continental shelf, the nearshore fisheries environments of the Pacific Islands are characterised by precipitously shelving slopes to abyssal depths. The comparatively meagre proportion of shallow water available to the islands, and the generally low primary productivity of this water sets Pacific Islands coastal fisheries apart from most other tropical reef fisheries. The extensive reef systems of Australia, Indonesia, the Philippines, and even the West Indies are set in comparatively nutrient-rich shelf waters, and only the tropical Indian Ocean archipelagos of Chagos, the Seychelles and the Maldives can really be considered equivalent to the Pacific Islands. The geographical area of the reefs, lagoons and slopes does not appear to have been calculated for most Pacific Island countries, at least not in sufficient detail to be useful in estimating potential coastal fisheries productivity.

Despite maintaining fishery rights, and thus management responsibilities, over 29,500,000 square kilometres of ocean - equivalent to the combined land areas of the USA, Canada and China - the total population of the Pacific Islands is only 6.7 million people - and only 2.6 million if the largely inland population of Papua New Guinea is excluded. There are at least 11 square kilometres of ocean for each and every (non-Papua New Guinea) Pacific Islander. Jurisdictionally, the sea is nearly 200 times more significant to the average Pacific Islander than it is to the average global citizen.

The people of the Pacific Islands are primarily rural dwellers and the majority still exist within a predominantly subsistence economy. At the same time, the significant scarcity of agricultural land in Polynesia and Micronesia, and the relative predominance of the ocean in all of the islands, means that this subsistence economy depends much more on fishery products than equivalent rural situations in, say, Africa. As a consequence of this economic dependence on inshore fisheries, despite the comparatively large area of coastal area per head of population, many of these inshore fisheries are considered to be, if not actually under stress, then approaching saturation. Thirty years ago the SPC Fisheries Technical Meeting tentatively stated that "several instances are known of reef and inland water stocks having been further depleted during the past decade and since these support the bulk of the subsistence operations of the area, this situation must cause the governments some concern" (SPC, 1962). The population of the Pacific Islands has doubled since that opinion was cited (SPC Demography Programme estimate, 1994), and pressure on the more heavily fished areas (Western Samoa, Guam and Rarotonga were cited as examples in 1950 SPC fisheries work) has inevitably increased.

In some Pacific Island atoll countries, the annual average consumption of fish and other marine products can be over 250 kg per person, most of which would be caught by that person or their family. By comparison, the average Briton eats 18kg of fish per year, most of which would be bought from a shop.

However, these pockets of high exploitation are balanced by other areas of lower exploitation, particularly around remote or uninhabited islands, and taken as a whole the inshore areas of the

Pacific Islands are not considered to be overfished. Most Pacific Island countries, within their borders, still have the resource capacity to sustain current national levels of inshore production. Expansion prospects however are limited, particularly commercial export expansion prospects, since this sustainable production is almost entirely absorbed by the Pacific Islands themselves. The quotation earlier that "...fish is the only real big money resource most Pacific Island countries have.." (Keith-Reid & Aiavao, 1994), applies only to the oceanic tuna fishery, which is already an order of magnitude larger than the total coastal fisheries and which can probably sustainably support a doubling of current catches (SPC Oceanic Fisheries Programme).

Tuna fisheries may be far larger in current scope than coastal fisheries, but 93 per cent of the tuna caught from Pacific Island EEZs is still landed by distant water fishing nations, whilst virtually all inshore fish and invertebrates are landed by Pacific Islanders themselves. Although tuna is the only real hope for major Pacific Islands economic expansion in fisheries, coastal fisheries are of far more immediate significance to Pacific Islanders, and of vital importance to domestic economies. The problem facing coastal fisheries in the region is not a development problem, but a maintenance problem. Fortunately, it is not yet (in most cases) an overfishing problem, and there is still the opportunity to tackle it.

The view from 1962

"The reef stocks support subsistence fishing throughout the South Pacific Commission area and are inevitably of limited potential; they cannot support industrial (processing) operations; only exceptionally do they support market fisheries; and for various reasons they are extremely vulnerable to exploitation, even of rational form, whilst if poison, dynamite and other indiscriminate and destructive forms of fishing are used, the stocks decline rapidly" (SPC, 1962).

A summary of the current status of Pacific Island coastal fisheries production is contained in Dalzell and Adams (1994). The total annual fishery production from the coastal zones of the 22 SPC island member countries and territories is estimated at 105,000 mt (at the point of consumption), and would be worth approximately US$250,000,000 if all were sold at average market prices. It is estimated that 80 per cent of these fishery products were consumed directly by the fishing community.

Government fisheries services are a relatively recent phenomenon in the Pacific Islands. Under colonial government, fisheries were not normally separately administered. There were no licensing schemes, and those fisheries regulations that were in place were passive (minimum size limits, and reservations on certain areas), able to be enforced with the minimum of effort and designed to prevent major damage to fisheries rather than to assist the maintenance of sustainable yield. Very few Pacific Island administrations had fisheries services forty years ago (SPC, 1952), and this had increased to only four by the time ten years had passed (SPC, 1962).

Key point

It is not immediately appreciated by outsiders, particularly those trying to develop exports of local products or substitute for imports, but fish, in general, is high priced in Pacific Island domestic cash markets. It is often cheaper to import fin-fish from temperate, developed countries than to buy local reef fish, and the differential is enormous when relative incomes are taken into account. This is a major reason why marine exports from the Pacific Islands concentrate on speciality products such as bêche-de-mer and pearl-shell. It is only economic to develop export markets for reef-fish where people, usually other Pacific Islanders, are prepared to pay extra for fish that are specifically reef-fish.

Today, fisheries services are in place in all South Pacific governments and administrations (with the exception of Pitcairn). Throughout most of their short existence the main departmental remit has been for economic development rather than fisheries management. In most cases, information gathering capacity has been severely limited and many of these departments have been "flying blind", their direction influenced heavily by the availability of external aid. It is relatively easy to obtain funding to install an iceplant, for example, but it is very difficult to obtain funding to support an information-gathering service that will help decide where to put that iceplant. It is therefore inevitable that departmental policy will tend to move in the direction from which it is easiest to obtain funding. Even so, most Pacific Island fisheries departments have been able to maintain relevance to the fishing community by virtue of Pacific Island lifestyles. Fishing is something done by almost everyone in the

Pacific, and there is not the schism between government fisheries officers and the fishing industry that is often experienced in developed countries.

A great deal of progress has also been made in describing Pacific Island fisheries in general since the first SPC Fishery Conference and, whilst a great deal more local detail is needed, the basic national infrastructure is now in place enabling Pacific Island Governments to actively manage domestic fisheries, and to aim for sustainability rather than simply the passive "prevention of major damage". Pacific Island governments have already demonstrated a considerable will to manage tuna fisheries. Indeed this will, manifested through the FFA and the SPC Oceanic Fisheries Programme, has led to the setting of several precedents in international law and to considerable progress in promoting the rôle of coastal states in global fisheries affairs. The pelagic tuna fishery is, of course, comparatively simple when set against the diverse interactions of coastal resources and communities, but coastal fisheries do at least offer the prospect for devolution of management responsibility.

Pacific Island government fisheries departments tend to have higher relative staffing levels than government fisheries departments in developed countries. For example, the United Kingdom maintains approximately one Division of Fisheries staff member per 15,000 head of population. By contrast, Fiji maintains 1 Fisheries Division staff member per 5,000 people, Vanuatu has one fisheries officer per 4,500 people, and Tonga one per 1,800. In Cook Islands, the Ministry of Marine Resources has one staff member for every 150 people in the country.

One of the major reasons why Pacific Island governments are relatively large is simply because islands are small, and governments are subject to irreducible minima, as well as the usually-quoted "social welfare" factors influencing civil sectoral size. Note that, for example, Kiribati has much the same obligations under the international law of the sea as the United States (including responsibility for its distant water fleet).

At the time of the Fakahau-Shepard (1986) review, there had just been a period of major restructuring of fisheries administrations in the region, characterised by the entry into the public service of increasing numbers of technically trained islanders. When fisheries divisions were being formed in the late 1960s and early 1970s, in almost every instance, the officers were expatriates. In 1980, only 2 national (not including territorial) fisheries services in the region were headed by local nationals. By 1986, only two were *not* headed by local nationals. By 1992, localisation appears to have been completed, and it is now rare to find expatriates working in any line position within independent national fisheries services. This trend has not necessarily been the result of national desires to replace expatriates with local staff, because in many cases equivalently-trained local staff do not yet exist, but has been strongly influenced by the need of metropolitan countries to reduce, or even abolish, their expatriate manpower assistance programmes. The rate of removal of skilled expatriate manpower has perhaps been too rapid for national staff training programmes to cope with and, whilst it is an arguable subjective judgement, it is likely that average skill and experience levels within national fisheries services are somewhat lower than they were in the early 1980s.

This shortage of appropriate expertise is most acutely felt in fisheries research units, since the level of academic training required is usually higher than for other fisheries administration. It is further exacerbated by the generally lower status of research within the public service hierarchy, meaning that skilled national researchers often choose, or have to, leave research for administration within a comparatively short time of entering the service. It was not attempted here, but it would be interesting to assess what proportion of fisheries service heads and principal officers were trained initially as researchers.

Research sections bear the same relationship to fisheries departments as fisheries departments bore to governments 25 years ago. Some places have them and some don't. Some countries feel that they are better off pooling their resources at the regional level and some, particularly the larger countries, are able to maintain their own, dedicated facilities. Only Papua New Guinea, which is by far the largest country in the region, which has its own university, and which is atypical with regard to coastal fisheries anyway, could be said to be approaching any of the metropolitan countries in terms of fishery research capability, and regularly mounts in-depth or strategic research projects using domestic resources.

Most fisheries research carried out by Pacific Island governments is extremely applied, and usually motivated by a crisis in one form or another. One government even refuses to apply the label "research" to its "information-gathering activities in support of fisheries development and management", both because the broad literal meaning of the word and in view of the ingrained reactions that it tends to elicit, particularly from economists (e.g. Lawson, 1993).

The ideal fisheries research unit for a typical Pacific nation consists of a core function devoted to the continuous monitoring of fisheries (providing feedback on how fisheries are performing and locating potential problems - commercial monitoring, catch-return analysis, dialogue with the community and perhaps routine stock assessment), and a problem-solving function (responding to administrative and parliamentary needs for information relating to specific crises - special projects to collate existing information and/or perform focussed stock assessments). Strategic, or long-term, research (e.g. the development of underwater visual census methodology) is usually implemented by outsiders, or its place is taken by a function which monitors research and development taking place elsewhere and makes relevant information accessible.

These functions are not necessarily carried out by dedicated staff, especially in the smaller services where staff may need to cover a multitude of different tasks. Small island countries face the problem of having to manage a relatively large coastal zone compared with some of the larger countries. Staff in small island countries therefore require wide-ranging skills and thus a higher level of training than those in the larger countries, where higher staff levels may allow specialisation of research tasks.

1.6 General needs for fisheries research

The justification for coastal fisheries research, as broadly defined previously, is obvious. One of the main functions of fisheries research is to seek out information, and there is no reason for a fisheries department to exist if it has no way of finding out what effects its decisions have on the fishing community and the fisheries resources on which it depends.

The most important type of fisheries research is thus the provision of feedback to the fisheries administration, including the highlighting of problems in need of attention. These are permanent and continuous objectives and not particularly suited to the definite-duration "projectised" type of activity that is sponsored by external aid. Such **monitoring** research is primarily a function of national agencies and is preferably sponsored, at least in part, by the national fishing community.

Another major need for coastal fisheries research is to suggest and test possible answers to the problems identified by monitoring, as prioritised by the administration. This type of **problem-solving** research is more sporadic in nature, and is more amenable to "projectisation" and thus to external aid. (Note that this distinction between monitoring versus problem-solving research, and national versus external implementability is applied here specifically to coastal fisheries research. Fisheries for highly migratory species, such as tuna, require a more international approach at all stages of the research process).

The Pacific Islands region has always provided fertile ground for **pure** (alternatively termed academic, or basic) research investigating, for example, the taxonomy and biology of species, or the implementation of fishing practices, that are not found in other parts of the world. This type of research is useful for the perspective that it provides on local fisheries, necessary for training the inquisitive personalities that will carry out all types of research, and essential for long-term advances in human knowledge, but it is probably the least effective in satisfying the operational and day-to-day needs of fisheries management in Pacific Island countries. However, being easily "projectised", and suiting general goals that benefit the sponsoring country, the more speculative end of the research spectrum is still a major target for research that is classified as aid to Pacific Islands.

Speculative research in the form of bio-prospecting (the search for organisms with potential pharmacological properties), is nowadays usually justified to third-world target (or "genetic resource"-owning) countries as being a primary vehicle for the conservation of biodiversity, via the "gene-banking" of potentially endangered species, and can be strongly supported by first-world governments. Yet these same first-world governments are among those which also regulate the primary markets driving the exploitation of third world marine resources:- one of the main factors behind the loss of biodiversity in the first place.

There have been various attempts over the years to downgrade the rôle of research (indeed this very

review tries to de-emphasise basic research in favour of applied research). To some, "research" is synonymous with "waste". From one development economist's point of view (Lawson, 1993) it is not more research that is needed to improve the success of fisheries projects, but more attention to information that is already in existence. What is meant, of course, is that further basic scientific research into the biology of these resources is not a priority at this stage, when there is a great deal such information still undigested. But research is still necessary to find, obtain and collate this information. This is why, in this review, we use the word "research" in the sense that it is used in Pacific Island fisheries departments, with its literal connotations of information collection and comprehension.

Johannes (1994) has called for fisheries researchers to "think the unthinkable" and consider data-less management as distinct from information-less management. Instead of trying to improve research performance to "...focus narrowly on designing more quantitatively rigorous, biological data-gathering programmes", Johannes (1994) encourages fisheries biologists and managers to heed the information provided by fishermen on resource depletions, and assist the fishermen in establishing village-based controls, before severe depletion or local extinction of these resources occurs.

The need for a change in development and management practices in relation to information on fisheries has been flagged by the World Bank *et al*. (1992). These authors consider that improvements in these areas can be made without having more or better information. "In most cases, the information presently available is sufficient to undertake the necessary changes in institutions and to increase the benefits from the resources." In the longer term, however, new and innovative research will be required to allow better use of existing data, and the development of cost-efficient strategies to collect the most pertinent data for understanding and managing major aquatic systems (World Bank *et al*., 1992).

The Research Syndicate of the FFA 10th Anniversary Conference (see Herr, 1990) followed the view provided by Fakahau and Shepard (1986) and characterised Pacific Islands fisheries development as passing through three major phases: exploration (where commercially-viable fisheries are identified), consolidation (where catches increase, catch rates inevitably decline from virgin fishery levels, and resource assessments undertaken) and maturation (where catches are carefully monitored, scientifically analysed and management regimes introduced). Much of the exploration and consolidation phases of inshore fisheries has already taken place and the Research Syndicate considered that, in general, Pacific Island inshore fisheries are now in the consolidation-maturation phase (Adams and Wata, 1991), and that the main goal of fisheries research should now be directed towards the assessment and management of fisheries that are already being exploited at levels close to, or exceeding, maximum productivity. Nauen (1993), paraphrasing the Study on International Fisheries Research (World Bank *et al*., 1992), and considering fisheries on the global scale, suggests that "... the era of expansion in fisheries is definitely over. A radical shift in paradigm is called for: no more public capital investment into the expansion of production, but efforts into sustainable management or rather governance."

The rôle of fisheries research in the Pacific Islands region has definitely evolved over the years. Much of the research carried out in the first half of this century was exploratory academic and taxonomic research, carried out by vessel-based expeditions, or centred on a few laboratories such as the South Seas Government Marine Research Laboratory in Palau, and aimed at providing research opportunities for developed country students and pure researchers. It was not until the 1950s and 1960s that there was an effort to develop island-based fisheries services and to carry out applied research aimed at the development and management of island inshore fisheries. Smith (1972) points out that "..(fishing was) either a subsistence activity or one which occupied a relatively small number of commercial fishermen. Unlike agriculture, it was not an activity in which governments took a close interest ...".

For example Fiji, which has one of the most developed coastal fisheries in the Pacific Islands, did not institute its Fisheries Division until 1966, and most of the early fisheries surveys and planning implemented in the now-independent Pacific Islands was carried out by the South Pacific Commission in the 1950s. Hubertus van Pel, the first SPC Fisheries Officer (1954-61) is probably to be considered the father of modern institutional fisheries in the Pacific.

The first SPC fisheries meeting (SPC, 1952) prepared a brief review of the fisheries of the area at the time. "This review was exceedingly sketchy because relatively little work in the sense of fisheries

science as it is now understood had been done and because few of the territories had fisheries services." At the second SPC fisheries meeting it was stated that "...statistics, of the kinds normally used by fishery departments, are virtually unavailable within the area..", that "...there is a major deficiency with respect to economic information concerning both subsistence and commercial fisheries..", and "...at this stage little can be said about the condition of the resources of the area.." (SPC, 1962).

This 1962 meeting also reviewed fishery resource research needs in the region, recognising 3 developmental categories: *applied* research (having early economic benefit), *humanitarian* research (directed towards "the maintenance in perpetuity of the essential material needs of the local population"), and *basic* research (wide-scope, knowledge gap-closing, towards long-range planning). It was of the opinion that research by individual Pacific Island countries or territories should be *applied* research directed on immediately local problems, that metropolitan governments should carry out research in all three categories, particularly *humanitarian* and *basic* research, and that international organisations confine themselves to *humanitarian* and *basic* research only.

With rapidly increasing populations (the number of people in the Pacific Islands doubled in the period 1964-1994) the pressure on coastal fisheries resources from subsistence fishing, and from commercial fishing to supply local urban markets, increased greatly. In addition, there was dramatically increased pressure on certain fishery resources to supply export markets, and this pace of change was too rapid for some Pacific Island fisheries services to assimilate. Since statistical feedback was so poor and short-term political priorities were so strong, many fisheries administrations were still putting all their effort into development at a time when the fisheries themselves should have been consolidating.

Key point
Eighty per cent of Pacific Islands coastal fisheries production is consumed directly by the producers and their communities. Only 20 per cent enters commercial markets for cash sale or export (Dalzell & Adams, 1994). Coastal fisheries are thus still vital to the nutrition of Pacific Island rural peoples, and a much larger percentage of the population will be affected by a fishery resource "crash" than in the average western fishery

The mid-1980s saw a growing awareness of this need for consolidation, at least at the international level, and the needs expressed by the reports of Fakahau and Shepard (1986) and Evans (1986) led directly to the implementation of the SPC Inshore Fisheries Research Project and the FFA Research Coordination Unit. Both programmes, whilst working from different directions, were designed to strengthen national coastal fisheries resource management capabilities, both by coordinating available research resources at the regional level, and by directly assisting in strengthening national research capabilities where appropriate.

The need for the effective management of national coastal fishery resources (whether that be by direct Government intervention or by strengthening community and industry self-policing mechanisms) has now become a major motivating factor behind most Pacific Island fisheries department's programmes of work (although the concept of trying to assure gradual long-term economic gain by limiting explosive industrial growth is still not accepted by many central government planning offices). For example, the introduction to the 1991 Annual Report of the Fiji Fisheries Division (Fiji Government, 1992) states that:-

> *"The aims of the Division are based firmly on objectives developed over the course of previous (National) Development Plans, which have been in support of increasing employment, developing exports and adding value, whilst promoting conservation. However, there have been developments in the fisheries sector which have necessitated a gradual change in the balance of emphasis put on these different objectives. For example:- as the sector becomes increasingly developed and commercialised, fishermen will become increasingly able to support their own infrastructural and capital development, whilst certain natural resources will come under greater stress. The Fisheries Division is still very much a development branch of Government, but must ensure that legislative and procedural mechanisms are in place to ensure that the maximum long term economic benefit can be gained from these resources."*

Thus, apart from the omnipresent and continuous need for monitoring and feedback from fisheries,

the main goal for strategic fisheries research is the development of appropriate ways of maximising long-term human benefits from the living coastal marine resources of the region - in short, making fisheries management work. Although this may appear to include a wide gamut of research possibilities, it is in contrast to the two main former national research goals:-of identifying exploitable resources, and of finding ways of obtaining the maximum catch in the shortest possible time.

Although it has only recently become widely accepted as a major aim by governments, the need for management-oriented fisheries research has long been recognised and promoted in the region. Whilst one of the initial aims of the SPC, as specified in an annex to the 1947 Canberra Agreement, was "Fisheries research, including surveys and the testing of methods of catching and processing fish and other marine products with the special aim of improving the nutrition of the local inhabitants", it was quickly realised that there was not a huge amount of potential for actually increasing coastal fishery catches. Consequently, the 1962 SPC fisheries meeting recommended that "special attention be given to forming (coastal fishery) management plans acceptable to local populations and to developing extension programmes to educate local populations in the advantages of these plans...". It considered that "Governments and administrations should place themselves in a position to manage the use of these resources so as to ensure that the local native populations would be able to draw the best possible yields from these stocks."

(The meeting also recognised that "local peoples have little interest in conservation schemes" - an opinion presumably based on observations of Pacific Islanders using destructive fishing practices, particularly war-surplus explosives, to catch fish for cash sale. Then, as now, the non-escalatory subsistence practices of the majority were inevitably overshadowed by the entrepreneurial actions of a few, and it is only recently that the concept of allowing communities a say in the management of fisheries has regained any credibility in government circles.)

Key point

Although the population of the Pacific Islands region has doubled in the past thirty years, with correspondingly increased pressure on coastal fishery resources, it must be remembered that Pacific Islanders suffered severe population declines following contact with the outside world, due mainly to lack of resistance to exotic (and erotic) diseases, but also as the inevitable consequence of colonialism. It is possible that today's island human populations are no larger than they were 200 years ago, and thus that inshore fisheries are no more heavily exploited than they were once before in the past.

Thus, in summary, the major aim of research on Pacific Islands nearshore fisheries is to develop the sustainable management of those fisheries. This is not exactly a new concept, and has been the main finding of most reviews over the past decade as well as the guiding concept behind the two regional projects that collaborated to produce this report. However, the piece-meal implementation of this aim is reflected in lack of a coherent blend of national and regional approaches to the sustainable management of nearshore fisheries in the region. The main aim of "yet another" review is to provide the raw material out of which a forthcoming workshop of national and regional fisheries staff, and experts, can build a coastal fishery strategic research plan for the Pacific Islands region.

Such a plan would be useful not only for the medium to long-term planning of national and regional fisheries research administrators, but would also signal these needs to the community at large and to the International Donor Community. Building on FFA's Fisheries Awareness Programme and USP's Public Marine Education Programme, the plan could be a useful reference for national and regional curriculum development officers in the design of science curricula at the primary and secondary levels.

1.6.1 Legal requirements for coastal fisheries research

A more explicit need for management-oriented coastal fisheries research is, or is being, expressed in the national legislation of many Pacific Island countries. For example, the Solomon Islands draft Fisheries Act states...

> "6. (2) Each Provincial Government shall prepare and keep under review a plan for the management and development of fisheries in its Provincial waters other than fisheries for highly migratory species in accordance with procedures (etc) ..."

The Fiji Fisheries Act (Amendment) Regulation 4B of 1990 provides the following, more restricted research need:-

> "The Minister shall, from time to time, determine on the basis of the best available information, the total allowable catch of every fishery category listed in the Seventh Schedule (including several reef-slope species) within Fiji fisheries waters and may allocate maximum allowable catch quotas accordingly (etc) ..."

In the Cook Islands, under the Marine Resources Act (1989) the minister may designate any fishery which, having regard to scientific, economic, environmental and other relevant considerations, is considered important to the national interest or which requires management and conservation measures for effective conservation and optimum utilisation. A fisheries plan is to be prepared and kept under review in respect of each designated fishery. The plan itself must identify each fishery, its characteristics and its current state of exploitation; specify the objectives to be achieved in the management of each fishery; specify the management and development strategies to be adopted for each fishery; specify, where appropriate the licensing programme to be followed and the limitations to be applied to local and foreign fishing vessels respectively and take into account any relevant traditional fishing methods or principles (Lodge, 1994), all of which requires research.

A basic need for fisheries research is built into most Pacific Island country fisheries legislation, and provides a measure of national priority and potential commitment. It was intended, when planning the structure of this review, to include a summary of all Pacific Islands legislation involving coastal fisheries management, but institutional constraints have made a comprehensive treatment impossible in the time available. One of the aims of the June 1995 SPC/FFA Workshop on Inshore Fisheries Management is to draw together all the latest coastal fisheries legislation and regulations from SPC member countries and territories, and these will be available with the FFA Legal Counsel in future, if no further summary is immediately carried out.

1.6.2 **International requirements for coastal fisheries research**

There is a requirement for fisheries stocks to be assessed within EEZs of all nations subscribing to LOSC. These LOSC provisions dealing with controls over marine scientific research in the EEZ and continental shelf (LOSC, articles 246-55) do not directly affect coastal fisheries research, since the definition of the EEZ normally excludes the territorial waters within which Pacific Islands coastal fisheries are situated. However, as illustrated by the Fiji example above, similar requirements may come to be incorporated into legislation affecting territorial waters.

Also, any national research capabilities set up to assess EEZ stocks will influence the assessment of coastal fisheries by increasing the pool of expertise available for such work. However, most South Pacific island nations have taken LOSC so seriously that they now rely almost entirely on regional organisations for the assessment of highly migratory stocks.

Other, subsequent United Nations member country agreements, particularly Agenda 21 from the UNCED Earth Summit in 1992, define the need for marine resources research inside territorial waters a little more explicitly. Programme Area D of Chapter 17 of Agenda 21 is reproduced in full in Annex **1** to this review, and is discussed further in the draft research strategy.

In summary, leaving actual *needs* aside, there is ample mandate for coastal fisheries research contained in legislation, international agreements and institutional directives. Indeed, there is an immediate, formal requirement for far more work than could possibly ever be accomplished under even the most optimistic of institutional enhancement scenarios. The task is thus not to justify the need for more information and understanding (i.e. "research") on Pacific Island inshore marine resources, but to prioritise the directives that have already been expressed into those that will usefully identify and mitigate the effects of overexploitation, and which are also achievable in an area which is said to be suffering from chronic "donor fatigue".

2. Country profiles

The following profiles are compiled mainly from questionnaires sent to SPC/FFA member country and territory fisheries administrations. Only two countries failed to eventually respond to the questionnaire although, as is always the case with questionnaires (particularly questionnaires which require a significant effort to answer in full), the interpretation of the answers may be a little inconsistent. The following figures should be treated as indicative only, and will hopefully be subject to checking and correction by national representatives at the SPC/FFA Inshore Fisheries Management Workshop.

2.1 Cook Islands

General Information

The Cook Islands were proclaimed a British protectorate in 1888, and on 11 June 1901 were annexed and proclaimed part of New Zealand. Under the Constitution of 1965, Cook Islands is a fully self-governing State in free association with New Zealand. The Cook Islands Parliament has exclusive power to make laws for Cook Islands. However, the government of New Zealand, in conjunction with the government of Cook Islands, has certain responsibilities with regard to foreign affairs and defence (Campbell and Lodge, 1993). Cook Islands is a member of the South Pacific Forum, a founder member of the FFA, a full member of the SPC (since 1973) and a member of FAO. Though not a member of the United Nations in its own right, Cook Islands is a signatory to LOSC. The country consists of 15 small scattered high islands and atolls spread across an EEZ area of approximately 1,830,000 square kilometres. The current population of 18,552 (1991) is mostly concentrated in the country's capital, Rarotonga.

The following statistics about Cook Islands are obtained from various sources, particularly Anon. (1993) and the SPC Statistics Programme:

Land area (square kilometres)		237
Coastline length (km at HWM)		unknown
Lagoon area		unknown
Length of 200 m isobath (nm)*		222.7
Population growth rate (annual) as a per cent		5.3
Population under 15 years old as a per cent		34.0
GDP per head in 1990 (USD)		3,339
Foreign Aid per head in 1990 (USD)		702
Total government spending per capita in 1991 (USD)		1,838
Value of imports in 1991 (USD)		40,366,154
Value of fisheries imports in 1991 (USD)		172,997
Value of exports in 1991 (USD)		5,453,077
Value of fisheries exports in 1991 (USD)**		4,321,582
FAO estimate fish consumption/head		
FAO estimate of catches (mt) in 1988		1,100
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)		
SPC estimate of coastal zone catches (mt)		982
SPC estimate of potential coastal catch value, if marketed	***	3,362,174

* (Dalzell & Preston, 1992)
** (mainly black pearls)
*** (not including pearl exports)

Fisheries Administration

The Cook Islands Ministry of Marine Resources (MMR) is responsible for the administration of fisheries in the country, with a staff of approximately 78 and a budget of NZD7.9 million (USD4.03) in 1993/4, however, the largest part of this is external in origin, and devoted the development of pearl culture, particularly on the island of Penrhyn. Cook Islands MMR maintains a distinct Research and Information Division, which has 16 staff and a budget of NZD167,559 (USD85,055) not including

salaries.

Cook Islands responses to 1994 questionnaire

Organisation	1993/4	1992/3	1991/2
Marine Resources budget (USD)	4,026,020	642,234	-
Marine Resources staff	78	?	-
Marine Resources research budget (USD)	85,055	43,147	-
Marine Resources research staff	16	15	10
No. trained to postgraduate level	3		
No. trained to bachelors level	4		
No. trained to diploma level	2		
No. trained to certificate level	0		
No. of field stations	2 (foreign-funded)		
No of specialised research establishments	2 (foreign-funded)		
No. of research vessels	0 (not counting small boats)		
Other assets	4 computers (foreign-funded)		

Present research activities

Aquaculture	Pearl Oyster, Giant clams, Trochus, Prawns, Milkfish
Monitoring	Local stores - fish supply and cost FAD catches Household surveys - currently at Pukapuka, Mangaia and Aitutaki
Other organisations currently carrying out fisheries-related research in Cook Islands	None except consultancies. A current consultancy study is concerned with the feasibility of farming dolphin fish (*Coryphaena hippurus*).
Collaborating organisations in fisheries research	USAID - Penrhyn pearl oyster research & training facility AIDAB - Araura giant clam hatchery
Annual Report	last produced in 1993

Lewis A. D. (1986) described Cook Islands fisheries research whilst recommending priorities for future activities, and Anon (1993) followed this up in some detail. The Cook Islands fisheries legislation has been comprehensively reviewed and revised by FFA (see Lodge, 1994) and stands fair to become model example of the way in which traditional and community management can work within a firm legal framework.

2.2 Fiji

General Information

Fiji was ceded to Great Britain in 1874 and was a British Colony between 1874 and 1970. The island of Rotuma at 12☜30'S, 178☜E was added to the colony of Fiji in 1881. Fiji is now an independent Republic, a member of the South Pacific Forum and an ACP state of the European Community. Fiji is also a member of the FFA, the SPC, SPREP, SOPAC and FAO. It was the first country to sign and ratify LOSC (Campbell and Lodge, 1993).

Fiji comprises about 844 islands and islets (approximately 106 inhabited) scattered over a 200 mile EEZ of 1.26 million square kilometres. The most recent population census was in August 1986, which recorded a total population of 715,000. It is estimated that the population at the end of 1989 totaled 726,000, comprising 352,000 Fijians (48 per cent), 338,000 Indians (47), 10,000 Part Europeans (1), 4,000 Chinese, 3,000 Europeans and 18,000 Others (2). It is estimated that the total population in the year 2000 will be 805,500.

The following statistics about Fiji were obtained from various sources:

Land area of main archipelago (square kilometres)	18,333
Coastline length (km at HWM)	unknown
Shelf area to 200 m (square kilometres)*	15,000
Length of 200 m isobath (nm)**	1,800 + 1,200
Population growth rate for total population (annual) as a per cent, for the period 1980-1990***	2.0
Population under 15 years old as a per cent	
GDP per head in mid-1991 (USD)***	1,830
Foreign Aid per head in 1991 (USD)***	62
Total government spending per capita in 1991 (USD)	
Value of imports in 1991 (USD)	
Value of fisheries sector imports in 1992 (USD)****	8.7 million
Value of exports in 1991 (USD)	
Value of fisheries sector exports in 1992 (USD)****	28.7 million
FAO estimate fish consumption/head	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Richards *et al*., 1994
**Dalzell and Preston, 1992
***Dowling, 1993
****Fiji Fisheries Division Annual Report for 1992

Fisheries Administration

Fiji Fisheries Division, part of the Department of Agriculture and Fisheries, Ministry of Agriculture, Fisheries and Forests, has its headquarters at Lami, on the western outskirts of the capital, Suva. Of the 117 established positions of the Division, 26 are allocated to Resource Assessment and Development. At the end of 1993, 112 of the established positions were occupied

Fiji Fisheries Division staff and budget details

Organisation	1993/4	1992/3	1991/2
Fiji Fisheries Division budget (USD)			
Fiji Fisheries Division staff		112	
Fisheries Division research budget (USD)			-
Fisheries Division research staff		26	
No. trained to postgraduate level		2	
No. trained to bachelors level		6	
No. trained to diploma level		5	
No. trained to certificate level		?	
No. of field stations		2	
No of specialised research establishments			
No. of research vessels		1	
Other assets		computers	

Present research activities

Aquaculture	Nile tilapia, Pearl Oyster, Giant clams, Grass carp
Monitoring	Municipal markets - fish and non-fish species weights and values Non-market outlets - fish and non-fish species weights and values FAD catches Household surveys - Report of ACIAR-supported survey of 2,553 households on Viti Levu was released in September 1994
Other organisations currently carrying out fisheries-related research in Cook Islands	
Collaborating organisations in fisheries research	ACIAR - Underwater Visual Census project, black pearl stock assessment project JICA - aquaculture feeds development project
Annual Report	last produced in 1993 (1992 Annual Report)

2.3 Solomon Islands

General Information

Solomon Islands is situated in the south-western Pacific Ocean between 5-12☜ S and 152-170☜ E. Its Main Group Archipelago consists of a double chain of six large islands (Choiseul, Santa Isabel, New Georgia, Malaita, Guadalcanal and San Cristobal [Makira]). There are also some 30 smaller islands, and approximately 962 islets, atolls and cays spread over 600,000 km□ of ocean. The country has a total land area of 28,369 km□ and jurisdiction over 1.34 million km□ of ocean within its 200 mile EEZ. The islands have little or no continental shelf and many of them support only limited areas of relatively depauperate coral reef (UNEP/IUCN, 1988). Other islands, however, have extensive fringing and barrier reefs, enclosing some of the world's largest lagoons. In 1991, Solomon Islands had a population of approximately 330,000, which is forecast to double in 20 years at the current population growth rate.

The southern and eastern Solomon Islands were progressively placed under British protection in the 1890s, and Santa Isabel and the other islands to the north were ceded by Germany in 1900. Full self-government was achieved in 1976 and independence in 1978. Solomon Islands is a constitutional monarchy, whose head of state, the Governor-General, represents the British Sovereign. Solomon Islands is a member of the South Pacific Forum and is an ACP state of the European Community. The country is also a member of the FFA, the SPC and the FAO (Campbell and Lodge, 1993).

The following statistics about Solomon Islands were obtained from various sources:

Land area of main archipelago (square kilometres)	28,396
Coastline length (km at HWM)	unknown
Shelf area to 200 m (square kilometres)	
Length of 200 m isobath (nm)*	2,444
Population growth rate (annual) as a per cent for the period 1980-1990**	3.5
Population under 15 years old as a per cent	unknown
GDP per head in mid-1989 (USD)**	560
Foreign Aid per head in 1991 (USD)**	117
Total government spending per capita in 1991 (USD)	
Value of imports in 1991 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1989 (USD)***	30.0 million
Value of fisheries sector exports (finfish and non finfish) in 1989 (USD)***	15.0 million
Value of fisheries sector exports (non finfish) in 1992 (USD)***	5.1 million
Estimate fish consumption (kg/head) in 1982***	25.7
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Preston, 1992
**Dowling, 1993
***Richards *et al*., 1994
****Cook, 1998

Fisheries Administration
The Solomon Islands Fisheries Division is part of the Ministry of Agriculture and Fisheries. There are 24 positions in the Divisional structure, including that of the Divisional head, the Fisheries Division Under Secretary. The Division has a Research and Management Section, which comprises 11 positions. There are also seven new positions for "Domestic Observation and Monitoring Activities". Solomon Islands is divided administratively into 9 provinces, each of which has a provincial fisheries administration headed by a Provincial Fisheries Officer.

Solomon Islands responses to 1994 questionnaire

Organisation	1993/4	1992/3	1991/2
S.I. Fisheries Division budget (USD)			
S.I. Fisheries Division staff	24		
S.I. Fisheries Division research budget (USD)			-
S.I. Fisheries Division research staff	11		
No. trained to postgraduate level	1 (in training)		
No. trained to bachelors level	3		
No. trained to diploma level	4		
No. trained to certificate level	-		
No. of field stations	0		
No of specialised research establishments	0		
No. of research vessels	1 (foreign- funded)	1 (foreign-funded)	
Other assets	Laboratory at HQ Computers	Laboratory at HQ Computers	

Present Research Activities

Aquaculture	Nil
Monitoring	Fisheries export statistics compilation
Other organisations currently carrying out fisheries-related research in Solomon Islands	The Nature Conservancy - Marine Protected Area, Arnarvon Islands
Collaborating organisations in fisheries research	ACIAR - Underwater Visual Census project ICLARM - pearl oyster survey, giant clam project, sea cucumber growth study
Annual Report	last produced in 1990 (1989 Annual Report)

2.4 Papua New Guinea

General Information

Papua New Guinea (PNG) is located in the western Pacific between the Equator and 12☜ S and 141☜ E to 160☜ E, and has a total land area of approximately 462,840 km□. Its estimated population in 1990 was 3.7 million, approximately two-thirds of whom reside in the interior of the main land mass of the country. Prior to achieving full independence in 1975, Papua (in the south) was an external territory of Australia while New Guinea (in the north) was administered by Australia as a United Nations Trust Territory.

The "Offshore Seas" of PNG combine the area equivalent to an exclusive economic zone (approximately 3.12 million km□) with the territorial sea. They comprise all waters between the territorial sea baseline and the defined outer limit. The whole of the offshore seas are declared to be the "declared fishing zone" under the Fisheries Act. The continental shelf definition is based upon the 1958 Continental Shelf Convention. PNG is a member of the South Pacific Forum and is an ACP state of the European Community. The country is also a member of the FFA, the SPC and FAO (Campbell and Lodge, 1993).

The following statistics about PNG were obtained from various sources:

Land area of main archipelago (square kilometres)	462,840
Coastline length (km at HWM)	10,000
Coral reef area to a depth of 30 m (square kilometres)*	40,000
Coralline shelf in depths less than 200 m (square kilometres)**	170,000
Length of 200 m isobath (nm)	7,305
Population growth rate (annual) as a per cent for the period 1980-1990	2.4
Population under 15 years old as a per cent	
GDP per head in mid-1992 (USD)***	1,098
Foreign Aid per head in 1991 (USD)***	106
Total government spending per capita in 1991 (USD)	
Value of imports in 1991 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1989 (USD)	
Value of marine products exports in 1989 (USD)	
Value of fisheries sector exports (non finfish) in 1993 (USD)***	18.7 million
Estimate fish consumption (kg/head) in 1982	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Wright, 1986 ** Munro, 1976 ***Dowling, 1993.

Fisheries Administration

Fisheries matters in PNG are a shared function between the national government and the 19 provincial governments. At the national level, the Department of Fisheries and Marine Resources (DFMR) has, since 1986, administered fisheries activities. At the provincial level, some Provinces have Fisheries Departments, while others have Fisheries Divisions within provincial Departments of Primary Industry.

National DFMR currently employs approximately 165 staff, under the DFMR Secretary who is responsible to the Minister for Fisheries and Marine Resources. DFMR's Research and Surveys Branch currently has a "Staff on Strength" of 12 Fisheries Scientists, 8 Technical Officers and 8 Seamen.

Papua New Guinea responses to 1994 questionnaire

Organisation	1993/4	1992/3	1991/2
DFMR budget (USD)	6,828,300	6,757,000	4,508,300
DFMR staff	165		
DFMR research budget (USD)	Stock Assessment - 634,400 Highlands fish stocking- 524,800 Highlands fish farming - 155,000	Stock Assessment - 667,200 Highlands fish stocking- 325,500 Highlands fish farming - 158,400	Stock Assessment - 527,700 Highlands fish stocking- 152,500 Highlands fish farming - 13,900
Research & Surveys Branch staff	Scientific Officers (local-9, overseas-3) Technical Officers-8	Scientific Officers (local-10, overseas-1) Technical Officers-5	Scientific Officers (local-12, overseas-0) Technical Officers- 5
No. trained to postgrad level	2		
No. trained to bach. level	9		
No. trained to diploma level	0		
No. trained to cert. level	10		
No. of field stations	6	6	6
No of specialised research establishments (aquaculture)	1 (included above) - Highlands aquaculture development centre	1 (included above) - Highlands aquaculture development centre	1 (included above) - Highlands aquaculture development centre
No. of research vessels	1 (18 m) plus part use of 1 other (25 m)	1 (18 m) plus part use of 1 other (25 m)	1 (18 m) plus part use of 1 other (25 m)
Other assets	Laboratory equipment, computers, dinghies, outboard motors	Laboratory equipment, computers, dinghys, outboard motors	Lab equipment, computers, dinghys, outboard motors

Present Research Activities

Aquaculture	Common carp (*Cyprinus carpio*) integrated farming
River stocking	Tilapia (*Tilapia rendalli*) , Java carp (*Puntius gonionotus*), snow trout (*Schizothorax* sp.)
Monitoring	Government fisheries centres Produce markets (limited monitoring) Subsistence fisheries (limited monitoring) Fishery logbook data for some commercial fisheries
Resource surveys	Fisheries resources surveys in maritime provinces
FADs	Planned for near future
Other organisations currently carrying out fisheries-related research in PAPUA NEW GUINEA	GTZ - Fisheries data collection in Morobe and Madang Provinces Christensen Research Institute, Madang (Marine biology) UPNG (within the Department of Biology) Environmental units of mining companies - monitoring of stocks
Collaborating organisations in fisheries research	SPC - tuna port sampling and data collection CSIRO/IOC - penaeid prawn recruitment
Annual Report	Most recently published in 1992 (covers 1985-1992). To be published again in 1994 to cover the period 1992-1994.
Other Reports (series)	Research Technical Reports & Research Bulletins Research & Survey Branch Reports

2.5 Republic of the Marshall Islands

General Information

The Republic of the Marshall Islands is an island nation in the western Pacific made up of a double chain of coral atolls comprising 34 islands and 870 reefs lying between 5° N and 15° N, and 162° E and 173° E. Its total land area is 181.3 km□ while the total area of the country's EEZ is 2.13 million km□. The total population was 45,000 in 1992, spread over 24 of the atolls.

Until 1986, Marshall Islands was a United Nations Trust Territory, administered by the United States. In October of that year, the two countries entered into a Compact of Free Association, under which the Marshall Islands formally took over responsibility for its affairs, including external relations. The US retains control over defence policy and provides financial support, (US$715 million) over a 15 year interim period. Marshall Islands is a member of the FFA and the SPC (Campbell and Lodge, 1993).

The following statistics about Marshall Islands were obtained from various sources:

Land area of main archipelago (square kilometres)	181.3
Coastline length (km at HWM)	
Coral reef area to a depth of 30 m (square kilometres)	
Coralline shelf in depths less than 200 m (square kilometres)	
Length of 200 m isobath (nm)*	1,420
Population growth rate (annual) as a per cent for the period 1980-1990**	3.8
Population under 15 years old in 1988, as a per cent***	51
GDP per head in mid-1988 (USD)**	1,583
Foreign Aid per head in 1991 (USD)	n.a.
Total government spending per capita in 1991 (USD)	
Value of imports in 1991 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1989 (USD)	
Value of marine products exports in 1989 (USD)	
Value of fisheries sector exports (non finfish) in 1993 (USD)	
Estimate fish consumption (kg/head) in 1982	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Preston, 1992
**Dowling, 1993
***Smith, 1992

Fisheries Administration

Created in 1988, the Marshall Islands Marine Resource Authority (MIMRA) is the administrative unit with responsibility for fisheries matters in Marshall Islands. As well as its comprehensive powers and duties in relation to management of fisheries, MIMRA is also responsible for other marine resource matters, such as the exploration and exploitation of non-living resources of the seabed (Campbell and Lodge, 1993). The National Environmental Protection Authority (EPA), Marshall Islands Development Authority (MIDA), Kwajalein Atoll Development Authority (KADA), and the local atoll governments also play significant roles in the exploitation and regulation of the marine resources sector (Smith, 1992).

Within MIMRA, the unit which conducts research is the Mariculture Division. This Division currently employs 6 staff , comprising 4 permanent staff and 2 casual staff.

Marshall Islands responses to 1994 questionnaire

Organisation	1993/4	1992/3	1991/2

MIMRA budget (USD)			
MIMRA staff			
MIMRA Mariculture Division budget (USD)	448,600 (local)	n.a.	n.a.
MIMRA Mariculture Division staff	Local 7 Overseas 1	Local 6 Overseas 1	Local 5 Overseas 0
No. trained to postgraduate level	0		
No. trained to bachelors level	0		
No. trained to diploma level	?		
No. trained to certificate level			
No. of field stations	2		
No of specialised research establishments	2		
No. of research vessels	3		
Other assets	Aquaculture equipment		

Present Research Activities

Aquaculture	Giant clams, trochus
Monitoring	Government fishing centres, produce markets, local stores, subsistence fisheries
Resource surveys	Trochus, seaweed and sponge
Other organisations currently carrying out fisheries-related research in Marshall Islands	Robert Reimers Enterprises Inc. - giant clams Marshall Island Aquatics - giant clams Black Pearls Inc. - setting spat in 2 locations within Majuro Lagoon, to compare growth and survival using different suspension and holding techniques.
Collaborating organisations in fisheries research	SPC?
Annual Report	Nil
Other Reports (series)	Nil

2.6 Tonga

General Information

The Kingdom of Tonga consists of approximately 150 islands and islets, with an area of 696.7 km□, of which 36 are inhabited. The islands are spread over a sea area of approximately 360,000 km□ between 15☜ S and 23☜ 30' S, and 173☜ W and 177☜ W, and divided into three main groups, Tongatapu, Ha'apai and Vava'u. It has been estimated that Tonga's 200 nm EEZ, if in place, would have encompass an area of approximately 700,000 km□. The approximate population in 1992 was 96,300.

The Kingdom became an independent monarchy in 1970, having been a British protected state from 1900 to 1970 under the provisions of the Anglo-German Agreement of 1899. The Head of State is the hereditary head of the royal family. Tonga is a member of the South Pacific Forum and is an ACP state of the European Community. The country is also a member of the FFA, the SPC and FAO (Campbell and Lodge, 1993).

The following statistics about Tonga were obtained from various sources:

Land area (square kilometres)	696.71
Coastline length (km at HWM)	
Inshore coral reef fishing area (square kilometres)*	106.1
Inshore mangrove fishing area (square kilometres)*	3.4
Shallow and deep lagoon area less than 160 m deep (square kilometres)*	837.5
Length of 200 m isobath (nm)**	294 + 599
Population growth rate (annual) as a per cent for the period 1976-1986***	0.5
Population under 15 years old in 1986, as a per cent*	40.6
GDP per head in mid-1992 (USD)***	1,437
Foreign Aid per head in 1991 (USD)***	201
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)***	66.10 million
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)***	13.40 million
Value of fish exports in 1993 (USD)***	1.12 million
Value of fisheries sector exports (non finfish) in 1993 (USD)	
Estimate fish consumption (kg/head) in 1982	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Bell *et al*., 1994
**Dalzell and Preston, 1992
***Dowling, 1993

Fisheries Administration

The Ministry of Fisheries is responsible for the control, development and management of Tonga's fisheries resources. The Fisheries Ministry headquarters are in Tongatapu, with fisheries offices located in the main centres in the other groups.

Budgetary and staffing details for the Ministry of Fisheries

Organisation	1993/4	1992/3	1991/2
Ministry of Fisheries budget (USD)			
Ministry of Fisheries staff			
Research and Aquaculture Section budget (USD)			
Research and Aquaculture Section staff	11?		
No. trained to postgraduate level	0		
No. trained to bachelors level	2		
No. trained to diploma level	2		
No. trained to school certificate level	7		
No. of field stations			
No of specialised research establishments			
No. of research vessels			
Other assets			

Present research activities

Aquaculture	Pearl oyster farming, mullet farming, trochus seed production, green snail seed production, giant clam stock enhancement,
Biology of particular organisms	mullet, ark shell (*Anadara*), Venus shell (*Gafrarium*)
Monitoring	
Resource surveys	Bottom-fish stock assessment, reef lobster survey, Shellfish (*Anadara* spp.) stock assessment, marine resources stock survey
Other organisations currently carrying out fisheries-related research in Tonga	RDA International - USAID funded consultancy company, concentrating on small-scale longline fishing in Vava'au (study now completed).
Collaborating organisations in fisheries research	JICA - Aquaculture of mullet, green snail, trochus, giant clams
Annual Report	Last published in 1993?
Other Reports (series)	Tonga Fisheries Research Bulletin (commenced in 1994)

2.7 Vanuatu

General Information

The 80 islands which make up the Republic of Vanuatu lie between 12☜ S and 21☜ S (or 22☜ 30' S including Matthew and Hunter Islands) and 166☜ E and 171☜ E. The land area of the islands is approximately 12,189 km□, excluding Matthew and Hunter Islands. These islands, originally part of the New Hebrides Condominium, are now claimed by both Vanuatu and France. The total size of Vanuatu's EEZ is 680,000 km□.

Vanuatu became an independent Republic in 1980, having previously been administered by Great Britain and France as the Condominium of the New Hebrides. The country is a member of the South Pacific Forum and is an ACP state of the European Community. Vanuatu is also a member of the FFA, the SPC and FAO (Campbell and Lodge, 1993).

The following statistics about Vanuatu were obtained from various sources:

Land area (square kilometres)	12,189
Coastline length (km at HWM)	
Inner reefs and lagoons area (square kilometres)*	448
Inshore mangrove area (square kilometres)*	25
Outer reef slope area from 100-400 m deep (square kilometres)*	7,360
Length of 200 m isobath (nm)**	1,400
Population growth rate (annual) as a per cent for the period 1980-1990***	2.5
Population under 15 years old in 1989, as a per cent*	51.5
GDP per head in mid-1990 (USD)***	1,120
Foreign Aid per head in 1991 (USD)***	357
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)***	58.2 million
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)***	17.8 million
Value of fish exports in 1993 (USD)***	
Value of fisheries sector exports (shells) in 1991 (USD)***	1.6 million
Estimate fish consumption (kg/head) in 1982	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Bell and Amos, 1993
**Dalzell and Preston, 1992
***Dowling, 1993

Fisheries Administration

The Fisheries Department, Ministry of Agriculture, Livestock, Forestry and Fisheries, administers fisheries matters in Vanuatu. The Fisheries Department, headed by the Director of Fisheries, has a Fisheries Research Unit of 4 permanent professionals.

Vanuatu responses to 1994 questionnaire

Organisation	1993/4	1992/3	1991/2
Fisheries Department budget (USD)	240,000	180,000	180,000
Fisheries Department staff			
Fisheries Research Unit budget (USD).	8,035	trochus - 22, 321	trochus - 22,321

[all funding from overseas]		green snail - 53,600	
Fisheries Research Unit staff	local - 3 overseas - 0	local - 4 overseas - 0	local - 3 overseas - 1
No. trained to postgraduate level	0		
No. trained to bachelors level	2 (Marine Biology)		
No. trained to diploma level	3		
No. trained to certificate level	0		
No. of field stations	0		
No of specialised research establishments	1 (Trochus hatchery)		
No. of research vessels	0		
Other assets	Computers		

Present research activities

Aquaculture	Trochus (for reef re-stocking)
Biology of particular organisms	Nil
Monitoring	Government fish centres Produce markets Bêche-de-mer, trochus and green snail processors Aquarium fish traders
Resource surveys	Fisheries resources surveys Socio-economic studies, and traditional fisheries knowledge and management.
Other organisations currently carrying out fisheries-related research in Vanuatu	Nil
Collaborating organisations in fisheries research	James Cook University - Trochus stock enhancement with hatchery-reared juveniles
Annual Report	No
Other Reports (series)	Yes (titles?)

2.8 Palau

General Information

The Republic of Palau is situated between 6° 51' N and 8° 15' N, and 135° 50' E and 134° 45' E. There are approximately 340 islands with a total land area of approximately 500 km□. Palau's extended fishery zone covers some 600,900 km□.

Until declaring its independence in 1994, Palau was the last remaining Trust Territory of a trusteeship arrangement between the United States of America and the United Nations over former German possessions north of the Equator, which had been mandated to Japan in 1919. Palau is now essentially a Federal Republic. It is the only member of the FFA which is not also a member of the South Pacific Forum, and is a member of the SPC (Campbell and Lodge, 1993).

The following statistics about Palau were obtained from various sources:

Land area (square kilometres)	500
Coastline length (km at HWM)	
Inner reef area (square kilometres)*	187
Mangrove area (square kilometres)*	45
Outer reef area (square kilometres)*	265
Lagoon area (square kilometres)*	1,034
Length of 200 m isobath (nm)	
Population growth rate (annual) as a per cent for the period 1980-1990***	1.4
Population under 15 years old in 1990, as a per cent***	30
GDP per head in mid-1990 (USD)	5,084
Foreign Aid per head in 1991 (USD)	
Total government spending per capita in 1991 (USD)	
Value of total imports in 1992 (USD)***	45.0 million
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1992 (USD)***	42.4 million
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988**	0.23
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Nichols, 1991
**Preston, 1988
***Palau Economic Development Plan (1995-1999)

Fisheries Administration

There are 2 distinct authorities for the administration of Palau's fisheries. The Palau Maritime Authority is basically responsible for the control and regulation of foreign fishing in the fisheries zones of Palau. The Palau Fishing Authority is required to advise and make recommendations to the national government in establishing marine resources development policy in the internal waters of Palau. Also, the Authority is mandated to establish programmes for the development of fisheries in the internal waters and act as a conduit for public funds for commercial fisheries development.

The Division of Marine Resources of the Bureau of Resources and Development under the Ministry of Resources and Development oversees the management and development of Palau's inshore marine resources. The Division does not have a separate fisheries research unit.

Palau responses to 1994 questionnaire

Organisation	1993/4	1992/3	1991/2
Fisheries Department budget (USD)	227,000	205,000	197,000
Fisheries Department staff			
Fisheries Research budget (USD). [all funding from overseas]	80,000 (salaries)	80,000 (salaries)	80,000 (salaries)
Fisheries Research staff	Local - 3 Overseas - 2	Local - 0 Overseas - 2	Local - 0 Overseas - 2
No. trained to postgraduate level	overseas - 2	overseas - 2	overseas - 2
No. trained to bachelors level	0	0	0
No. trained to diploma level	4	0	0
No. trained to certificate level	0	0	0
No. of field stations	0	0	0
No of specialised research establishments	*1	*1	*1
No. of research vessels	0	0	0
Other assets	Visiting researchers accommodation	Visiting researchers accommodation	Visiting researchers accommodation

*Micronesian Mariculture Demonstration Centre

Present research activities

Aquaculture	Giant clams
Biology of particular organisms	Nil
Monitoring	Produce markets - fish landing statistics
Resource surveys	General resource surveys
Other organisations currently carrying out fisheries-related research in Palau	Nil
Collaborating organisations in fisheries research	SPREP - coral health monitoring, turtles FFA - grouper spawning aggregation monitoring
Annual Report	Last published in 1992
Other Reports (series)	Yes, Divisional Reports.

2.9 Tokelau

General Information

Tokelau is situated between 8☜ S and 10☜ S, and 171☜ W and 173☜ W. It comprises the three atoll islands of Atafu, Nukunonu and Fakaofo, together with the small islands, islets, rocks and reefs depending from them. The land area of Tokelau is 10.1 km□ and in 1992 its population was 1,800. The approximate size of the EEZ is 290,000 km□.

Formerly part of the Gilbert and Ellice Islands Colony, the group was transferred to the jurisdiction of New Zealand in 1926. By legislation enacted in 1948, Tokelau was declared to be part of New Zealand as from 1 January 1949. The obligations of New Zealand under regional and international arrangements extend to Tokelau. New Zealand is a member of the South Pacific Forum, the FFA, the SPC and FAO (Campbell and Lodge, 1993).

The following statistics about Tokelau were obtained from various sources:

Land area (square kilometres)	10.1
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	56
Population growth rate (annual) as a per cent for the period 1980-1990	
Population under 15 years old in 1989, as a per cent	
GDP per head in mid-1990 (USD)	
Foreign Aid per head in 1991 (USD)	
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Preston, 1992

Fisheries Administration

The Department of Agriculture and Fisheries, Office for Tokelau Affairs administers fisheries in Tokelau. There is no separate fisheries research unit.

Tokelau responses to 1994 questionnaire

Organisation	1993/4	1992/3	1991/2
Fisheries Section (USD)	23,000	143,000	n.a.
Fisheries Section staff			
Fisheries Research budget (USD)	overseas - 6,000	government-3,000	
Fisheries Research staff	local - 1 overseas - 2 (short-term consultant	local - 1 overseas - 2 (short-term consultant)	local - 1 overseas - 2 (short-term consultant)
No. trained to postgraduate level	0		
No. trained to bachelors level	0		
No. trained to diploma level	1		
No. trained to certificate level	0		
No. of field stations	0		
No of specialised research establishments	0		
No. of research vessels	0		
Other assets	0		

Present Research Activities

Aquaculture	finfish, trochus
Biology of particular organisms	Nil
Monitoring	government fish centres
Resource surveys	fisheries resources surveys, gear development and FADs
Other organisations currently carrying out fisheries-related research in Tokelau	Nil
Collaborating organisations in fisheries research	SPREP - resource assessment surveys
Annual Report	Nil
Other Reports (series)	Nil

2.10 Kiribati

General Information

The Republic of Kiribati consists of 32 coral atolls in 3 main groups, and one isolated phosphate island (Banaba), spread over more than 5 million km□ of the Central Pacific Ocean. The total land area of Kiribati is 690 km□, and the total area of the EEZ is 3.6 million km□. The estimated population in 1992 was 69,000.

The Gilbert and Ellice Islands were proclaimed a British Protectorate in 1892 and annexed as the Gilbert and Ellice Islands Colony in 1916. In 1975, the Ellice Islands severed its constitutional links with the Gilbert Islands, first as the Colony of Tuvalu and later as Tuvalu. The Gilbert Islands Colony achieved full independence as the Republic of Kiribati in 1979.

Kiribati is a member of the South Pacific Forum and is an ACP state of the European Community. It is also a member of the FFA and the SPC (Campbell and Lodge, 1993).

The following statistics about Kiribati were obtained from various sources:

Land area (square kilometres)	690
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	709
Population growth rate (annual) as a per cent for the period 1980-1990**	2.4
Population under 15 years old in 1989, as a per cent	
GDP per head in mid-1991 (USD)**	750
Foreign Aid per head in 1990 (USD)**	278
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Preston, 1992
**Dowling, 1993

Fisheries Administration

Kiribati Fisheries Division is part of the Ministry of Environment and Natural Resource Development, with its headquarters at Bikenibeu, Tarawa. It is headed by a Chief Fisheries Officer, appointed by the Minister.

Budgetary and staffing details for the Kiribati Fisheries Division

Organisation	1993/4	1992/3	1991/2
Fisheries Department budget (USD)			
Fisheries Department staff			
Fisheries Research budget (USD)			
Fisheries Research staff			
No. trained to postgraduate level	0		
No. trained to bachelors level	1?		
No. trained to diploma level	1?		
No. trained to certificate level			
No. of field stations			
No of specialised research establishments			
No. of research vessels	0		
Other assets			

Present Research Activities

Aquaculture	black pearl, seaweed
Biology of particular organisms	
Monitoring	
Resource surveys	
Other organisations currently carrying out fisheries-related research in Kiribati	Black Pearls Inc. - comparative growth of black pearl spat Biosystems Research - Tarawa Lagoon study
Collaborating organisations in fisheries research	ACIAR - black pearl collaborative study (with Fiji and Solomon Is.)
Annual Report	Yes?
Other Reports (series)	Nil?

2.11 Federated States of Micronesia

General Information

The Federated States of Micronesia (FSM) is a group of 607 islands located between the Equator and 14☜ N, and 136☜ E and 166☜ E. The total land area covered by the islands is approximately 700 km□. In 1992, FSM had a population of 110,000. It has a 200 nautical mile EEZ of 2.98 million km□.

FSM is a federation consisting of 4 States: Kosrae, Yap, Chuuk and Pohnpei. It entered into a Compact of Free Association with the United States in 1986, which marked the end of the US trusteeship. FSM is a member of the FFA and the SPC (Campbell and Lodge, 1993).

The following statistics about FSM were obtained from various sources:

Land area (square kilometres)	700
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)	
Population growth rate (annual) as a per cent for the period 1980-1990*	3.5
Population under 15 years old in 1990, as a per cent**	47
GDP per head in mid-1989 (USD)**	1,385
Foreign Aid per head in 1991 (USD)**	277
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dowling, 1993
**Smith, 1992

Fisheries Administration

There are several government and semi-government agencies involved with marine resources exploitation and management at the national, as well as state levels. The national government's Marine Resources Division (NMRD) of the Department of Resources and Development, is responsible for providing the national and state governments with technical information, coordinating training, advisory services and support for development and management activities in marine resources including fisheries, aquaculture and coastal resource management. NMRD administers the National Aquaculture Centre (NAC), based in Kosrae.

Other agencies involved with marine resources exploitation and management include the Micronesian Maritime Authority, Division of Marine Surveillance, National Fisheries Corporation, Kosrae Marine Resources Division, Pohnpei Marine Resources Division, Economic Development Authority, Chuuk Department of Marine Resources, Yap Marine Resources Management Division and Yap Fishing Authority. The states, for all intents and purposes, operate independently in fisheries matters (Smith, 1992).

Budgetary and staffing details for the NMRD

Organisation	1993/4	1992/3	1991/2
NMRD budget (USD)			
NMRD staff			
NAC budget (USD)			
NAC staff			
No. trained to postgraduate level			
No. trained to bachelors level			
No. trained to diploma level			
No. trained to certificate level			
No. of field stations			
No of specialised research establishments			
No. of research vessels	0		
Other assets			

Present Research Activities

Aquaculture	giant clams
Biology of particular organisms	
Monitoring	
Resource surveys	
Other organisations currently carrying out fisheries-related research in FSM	Richard Croft - wool sponge aquaculture
Collaborating organisations in fisheries research	
Annual Report	
Other Reports (series)	

2.12 Nauru

General Information

Nauru, a solitary upraised atoll, is situated at 0☜ 30' S and 166☜ 56' E. It has a land area of approximately 21.2 km□ and is some 19 km in circumference. The population of Nauru in 1992 was approximately 8,400, of which a large proportion is made up of overseas workers, principally from Kiribati and Tuvalu. The total area of Nauru's Exclusive Fisheries Zone (EFZ) is 436,490 km□.

Nauru became an independent Republic in 1968. Prior to that Nauru had been annexed by Germany in 1888 and surrendered to Australian forces in 1914. It was administered under a mandate conferred on the British Empire and approved by the League of Nations from 1920 to 1947, when the UN General Assembly approved a trusteeship agreement with the governments of the United Kingdom, Australia and New Zealand as joint administering authority. Nauru is a member of the South Pacific Forum, the FFA and the SPC (Campbell and Lodge, 1993).

The following statistics about Nauru were obtained from various sources:

Land area (square kilometres)	21.2
Coastline length (km at HWM)*	19
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	10.3
Population growth rate (annual) as a per cent for the period 1980-1990	n.a.
Population under 15 years old in 1989, as a per cent	
GDP per head in mid-1980 (USD)**	9,091
Foreign Aid per head in 1990 (USD)**	43
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Preston, 1992
**Dowling, 1993

Fisheries Administration

Fisheries functions in Nauru are implemented and coordinated by the Fisheries Section of the Department of Island Development and Industry. The Fisheries Section has 3 staff members, two of which are permanently attached to the Department, while the other staff member is on general duties. The Section is headed by a Senior Project Officer, with assistance from a Fisheries Development Officer. There is no separate Research Section (Fisheries Development Sub-Programme, FFA).

Budgetary and staffing details for the Department of Island Development and Industry

Organisation	1993/4	1992/3	1991/2
Departmental budget (USD)			
Departmental staff			
Fisheries Section budget (USD)			
Fisheries Section staff	3		
No. trained to postgraduate level	0		
No. trained to bachelors level	0		
No. trained to diploma level	2		
No. trained to certificate level	1		
No. of field stations	0		
No of specialised research establishments	0		
No. of research vessels	0		
Other assets			

Present Research Activities

Aquaculture	Milkfish (Buada Lagoon)
Biology of particular organisms	Nil
Monitoring	Fish landing surveys
Resource surveys	Nil
Other organisations currently carrying out fisheries-related research in Nauru	Nil
Collaborating organisations in fisheries research	Nil
Annual Report	Nil
Other Reports (series)	Nil

2.13 Tuvalu

General Information

Tuvalu, a group of 9 atolls with a total land area of approximately 26 km□, lies between 5☜ 30' S and 11☜ S, and 176☜ E and 180☜ E. In 1992 the total population of Tuvalu was approximately 9,000. Its EEZ has an approximate area of 757,000 km□.

Formerly known as the Ellice Islands, Tuvalu was administered by Great Britain as part of the Gilbert and Ellice Islands from 1892, initially as a Protectorate and later as a British Colony. The Ellice Islands separated from the Gilbert and Ellice Islands Colony in 1975 and became the Colony of Tuvalu. In 1978, Tuvalu became an independent state. Tuvalu is a member of the South Pacific Forum and is an ACP state of the European Community. Tuvalu is also a member of the FFA and the SPC (Campbell and Lodge, 1993).

The following statistics about Tuvalu were obtained from various sources:

Land area (square kilometres)	26
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	
Population growth rate (annual) as a per cent for the period 1980-1990**	1.7
Population under 15 years old in 1989, as a per cent	
GDP per head in mid-1990 (USD)**	1,212
Foreign Aid per head in 1990 (USD)**	600
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Preston, 1992
**Dowling, 1993

Fisheries Administration

Tuvalu Fisheries Division, part of the Ministry of Natural Resources Development, administers fisheries matters in Tuvalu. The Director of Fisheries heads the Fisheries Division.

Budgetary and staffing details for the Tuvalu Fisheries Division

Organisation	1993/4	1992/3	1991/2
Fisheries Division budget (USD)			
Fisheries Division staff			
Research Section budget (USD)			
Research Section staff			
No. trained to postgraduate level			
No. trained to bachelors level			
No. trained to diploma level			
No. trained to certificate level			
No. of field stations			
No of specialised research establishments			
No. of research vessels			
Other assets			

Present Research Activities

Aquaculture	
Biology of particular organisms	
Monitoring	
Resource surveys	
Other organisations currently carrying out fisheries-related research in Tuvalu	
Collaborating organisations in fisheries research	
Annual Report	
Other Reports (series)	

2.14 Western Samoa

General Information

Western Samoa is situated between latitude 13☜ and 15☜ S, and longitude 168☜ and 173☜ W. It consists of two large islands, Savai'i and Upolu, together with several adjacent smaller islands. The total land area is approximately 2,857 km□. In 1992, the population of Western Samoa was approximately 159,000. Western Samoa's EEZ has an area of approximately 120,000 km□.

Western Samoa achieved its independence from New Zealand in 1962. It is a member of the South Pacific Forum and is an ACP state of the European Community. It is also a member of the FFA, the SPC and FAO (Campbell and Lodge, 1993).

The following statistics about Western Samoa were obtained from various sources:

Land area (square kilometres)	2,857
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	243
Population growth rate (annual) as a per cent for the period 1980-1990**	0.1
Population under 15 years old in 1989, as a per cent	
GDP per head in mid-1992 (USD)**	930
Foreign Aid per head in 1990 (USD)**	356
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	
SPC estimate of potential coastal catch value, if marketed	

*Dalzell and Preston, 1992
**Dowling, 1993

Fisheries Administration

Administration of fisheries matters in Western Samoa is through the Fisheries Division of the Department of Agriculture, Forests and Fisheries. Head of the Division is the Chief Fisheries Officer. There is a Research Section in the Fisheries Division, consisting of 3 Fisheries Officers.

Budgetary and staffing details for the Western Samoa Fisheries Division

Organisation	1993/4	1992/3	1991/2
Fisheries Division budget (USD)			
Fisheries Division staff			
Research Section budget (USD)			
Research Section staff	5	6	
No. trained to postgraduate level	1	1	
No. trained to bachelors level	2	3	
No. trained to diploma level	1	1	
No. trained to form 5 certificate level	1	1	
No. of field stations	0	0	
No of specialised research establishments	0	0	
No. of research vessels	0	0	
Other assets			

Present Research Activities

Aquaculture	giant clam, seaweed, mullet, tilapia
Biology of particular organisms	Nil
Monitoring	coastal fishery data collection and analysis
Resource surveys	bottomfish stock assessment, bêche-de-mer resource assessment
Other organisations currently carrying out fisheries-related research in Western Samoa	?
Collaborating organisations in fisheries research	?
Annual Report	Most recent in 1993
Other Reports (series)	Nil

2.15 Commonwealth of the Northern Marianas (CNMI)

General Information

The Commonwealth of the Northern Marianas consists 14 of the 15 Marianas Islands, an archipelago in Micronesia situated between latitudes 14°10' and 20°31'N. The five southernmost islands are geologically the oldest and primarily consist of uplifted limestone. The remaining nine northern islands are entirely volcanic and some exhibit sporadic volcanic activity. The total land area consists of 478 km^2 , about two thirds of which is formed from the three main islands, Saipan, Tinian and Rota.

The CNMI is self governing, in association with the United States under a Covenant signed in 1975. Apart from federal funding from the USA, the main income of the Marianas is earned from tourism and taxes on garment factories established by Asian businesses. Tinian is a transhipment point for US, Korean and Taiwanese tuna purse seine vessels, from which the CNMI derives a significant income. The CNMI is a member state of the South Pacific Commission

Land area (square kilometres)	478
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	405.2
Population growth rate (annual) as a per cent for the period 1980-1990	9.6
Population under 15 years old in 1989, as a per cent	23.8
GDP per head in mid-1992 (USD)	9,895
Foreign Aid per head in 1990 (USD)	
Total government spending per capita in 1991 (USD)	2,849
Value of total imports in 1993 (USD)	382,319,000
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	256,365,000
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	322
SPC estimate of potential coastal catch value, if marketed	1,320,095

*Dalzell and Preston, 1992

Fisheries Administration

Administration of fisheries matters in CNMI is through the Division of Fish and Wildlife of the Department of Natural Resources. There are Divisions of Fish and Wildlife on both Saipan and Tinian. The senior administrator in the Division on Saipan is the Chief and on Tinian, the Resident Director. Fisheries research activities are administered by the Fisheries Resources Management Unit (FRMU), currently comprising 1professional officer but with a further two officers to arrive in late 1994. A number of technicians are also employed within the FRMU

Budgetary and staffing details for the CNMI Division of Fish and Wildlife

Organisation	1993/4	1992/3	1991/2
Fisheries Division budget (USD)	500,000	600,000	1,100,000
Fisheries Division staff			
Research Section budget (USD)			
Research Section staff	2	2	8
No. trained to postgraduate level			1
No. trained to bachelors level			1
No. trained to diploma level			
No. trained to form 5 certificate level			
No. of field stations			
No of specialised research establishments			
No. of research vessels			1 paid for by federal funds
Other assets			

Present Research Activities

Aquaculture	Extension work and grant applications
Biology of particular organisms	
Monitoring	Produce markets Local stores Subsistence fisheries Tuna transhipment facility
Resource surveys	Sampling of two commercial inshore fisheries
Other organisations currently carrying out fisheries-related research in CNMI	None
Collaborating organisations in fisheries research	Seafood market analysis (economic study) Trochus stock assessment with SPC
Annual Report	Most recent annual report published in 1993
Other Reports (series)	Fishery Statistics of the Western Pacific (Section on Marianas)

2.16 Guam

General Information

Located at 13°28' N, Guam is the southernmost and largest island of the Marianas chain. The island has two distinct zones, the north is characterised by a large uplifted limestone plateau fringed near the ocean by tall cliffs and steep hillsides that descend to narrow terraces or directly into the sea. The southern portion of the island is volcanic in origin, with tall ridges dissected by deeply eroded ravines along the southwestern coast. The total area of the island is 540 km^2.

Guam is a permanent unincorporated territory of the Unites States with a locally elected legislature and governor. Guam's income comes from the large US military presence on the island, from US federal funds and from the large tourist industry most of which caters for the Japanese market. Guam is also a major transhipment point for Japanese and other Asian tuna longline vessels, from which the territory derives a considerable income. Guam is a member of the South Pacific Commission.

Land area (square kilometres)	540
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	0.7
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	85.2
Population growth rate (annual) as a per cent for the period 1980-1990	2.5
Population under 15 years old in 1989, as a per cent	30
GDP per head in mid-1992 (USD)	9,527
Foreign Aid per head in 1990 (USD)	676
Total government spending per capita in 1991 (USD)	5,103
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	82,402,320
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	586.2
SPC estimate of potential coastal catch value, if marketed	2,369,526

*Dalzell and Preston, 1992

Fisheries Administration

Administration of fisheries matters in Guam is the responsibility of the Division of Aquatic and Wildlife Resources, part of the Department of Agriculture. The Chief of the Division is the senior administrative officer.

Budgetary and staffing details for the Guam Division of Aquatic and Wildlife Resources

Organisation	1993/4	1992/3	1991/2
Fisheries Division budget (USD)	750,000	690,000	700,000
Fisheries Division staff			
Research Section budget (USD)	520,000	485,000	475,000
Research Section staff	1	2	3
No. trained to postgraduate level			3
No. trained to bachelors level			3
No. trained to diploma level			
No. trained to form 5 certificate level			
No. of field stations			
No of specialised research establishments			
No. of research vessels			
Other assets			

Present Research Activities

Aquaculture	Finfish and giant clams
Biology of particular organisms	Yes but species not specified
Monitoring	Government fisheries centres, subsistence fisheries
Resource surveys	Yes but resource not specified
Gear development & FADs	Yes but gear or FAD not specified
Other organisations currently carrying out fisheries-related research in Guam	Yes, Dept of Commerce gathers tuna transhipment data from locally based longline fleet fishing outside Guam EEZ, Natl Marine Fisheries Service (NMFS) commercial sales receipts
Collaborating organisations in fisheries research	NMFS collects and analyses offshore fisheries data and commercial receipts data to generate annual fisheries statistics
Annual Report	Yes
Other Reports (series)	Yes

2.17 French Polynesia

General Information

French Polynesia comprises five archipelagos of islands, atolls and islets distributed over 4.2 million km^2 of ocean and with a total land area of 3,521 km^2. The Society Islands include nine volcanic high islands and five atolls. The Marquesas consists of seven volcanic high islands and six islets rocks and banks. The Austral Islands, including Rapa are all volcanic high islands apart from one atoll. Similarly all of the Gambier Islands are high volcanic islands apart from one atoll. All of the Tuamotu Islands are atolls, with one exception, Makatea, which is raised atoll with an elevation of 113 m. These five archipelagos all lie south of the equator between latitudes 750' and 2736' S and longitudes 13428' and 15440'W.

The largest island, Tahiti (1,042 km2), in the Society Islands is the centre of government and commerce. As a French Overseas Territory, with a French Government appointed High Commissioner. The territory also has an elected assembly as well as being represented in the French Parliament by to deputies and a senator. The economy of the territory is based on funds from the French Government, Tourism, cultured pearls and a small but developing fishing industry.

Land area (square kilometres)	3,521
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	2,971
Population growth rate (annual) as a per cent for the period 1980-1990	2.5
Population under 15 years old in 1989, as a per cent	36
GDP per head in mid-1992 (USD)	15,203
Foreign Aid per head in 1990 (USD)	1,275
Total government spending per capita in 1991 (USD)	3,014
Value of total imports in 1993 (USD)	860,465,760
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	5,999
SPC estimate of potential coastal catch value, if marketed	28,005,555

*Dalzell and Preston, 1992

Fisheries Research Administration (EVAAM)

Organisation	1993/4	1992/3	1991/2
Fisheries Division budget (USD)			
Fisheries Division staff			
Research Section budget (USD)	5,566,000	4,977,200	4,443,600
Research Section staff	79	83	84
No. trained to postgraduate level	14		
No. trained to bachelors level	1		
No. trained to diploma level			
No. trained to form 5 certificate level			
No. of field stations	1		
No of specialised research establishments	2		
No. of research vessels			
Other assets			

Present Research Activities

Aquaculture	Mariculture of giant clams, trochus, shrimps. green snail, turtles and fish
Biology of particular organisms	Yes, but not specified
Monitoring	Monitoring activities conducted in government fisheries centres, produce markets, subsistence fisheries and fishermen's cooperatives
Resource surveys	Socio-economic studies and surveys of traditional fisheries knowledge and management
Gear development and FADs	Yes
Other organisations currently carrying out fisheries-related research in French Polynesia	IFREMER (research on pearl oyster culture and aquaculture of tropical marine species); ORSTOM (tuna research), UFP (doctoral thesis research on marine species); EPHE (coral reef research); SMA (research on aquaculture, corals and turtles)
Collaborating organisations in fisheries research	IFREMER (pearl culture and aquaculture); ORSTOM (tuna research) SMA (aquaculture, corals, turtles, fisheries statistics)
Annual Report	Yes (1993)
Other Reports (series)	Yes, technical reports series published by EVAAM. SMA publishes and annual summary of commercial fisheries statistics

2.18 American Samoa

General Information

The US territory of American Samoa comprises 5 inhabited high islands and one inhabited atoll and one uninhabited atoll in the central South Pacific. The largest island Tutuila (14˚18'S, 170˚41'W) is the center of government and contains about 95 per cent of the territories population. Tuituila, Anuu and Manu'a group are high volcanic islands of non continental origin, rising precipitously from the ocean and with narrow coastal strips of flat land. Swains Island is a raised atoll with a large enclosed lagoon and has a population of between 10 and 20 people. Rose Atoll is uninhabited and is a typical atoll with two small islets, a large lagoon and extensive fringing reefs.

American Samoa, like Guam, remains an unincorporated territory of the United States. There is a locally elected assembly, the Fono, composed of 20 publicly elected representatives and 18 senators appointed by traditional chiefs. The territory also has an elected Governor and lieutenant Governor, who can veto legislation passed in the Fono. The economy of American Samoa is dependant on the US Government employment, subsidies and grants from the US Government and on two tuna canneries operating in Pago Pago.

General Information

Land area (square kilometres)	200
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	0.52
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	143.3
Population growth rate (annual) as a per cent for the period 1980-1990	3.7
Population under 15 years old in 1989, as a per cent	38.1
GDP per head in mid-1992 (USD)	5,128
Foreign Aid per head in 1990 (USD)	1,630
Total government spending per capita in 1991 (USD)	2,596
Value of total imports in 1993 (USD)	368,917,780
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	267
SPC estimate of potential coastal catch value, if marketed	993,000

*Dalzell and Preston, 1992

Fisheries Administration

Administration of fisheries matters in American Samoa is the responsibility of the Department of Marine and Wildlife Resources. The Director of the Division is the senior administrative officer.

Organisation	1993/4	1992/3	1991/2
Fisheries Division budget (USD)	450,000	450,000	450,000
Fisheries Division staff			
Research Section budget (USD)			
Research Section staff	15	14	14
No. trained to postgraduate level	4		
No. trained to bachelors level			
No. trained to diploma level	4		
No. trained to form 5 certificate level			
No. of field stations	2		
No of specialised research establishments	1		
No. of research vessels	2		
Other assets			

Present Research Activities

Aquaculture	Mariculture of giant clams
Biology of particular organisms	Biology of blue lined surgeon fish, *Acanthurus lineatus.* Other species but not specified
Monitoring	Monitoring of fish throughput in local stores, monitoring of subsistence fisheries
Resource surveys	Survey of status of coral reefs and fish biomass, socio-economic surveys and collection of information on traditional fisheries knowledge and management
Gear development and FADs	Ongoing research on effectiveness of FADs for local fishermen
Other organisations currently carrying out fisheries-related research in American Samoa	NMFS collects information from purse-seine and longline vessels landing catches at Pago Pago Pago Pago canneries
Collaborating organisations in fisheries research	NMFS collaborates in fisheries statistics data collection from coastal fisheries. Other collaborative research activities include tagging of sea-turtles and research on corals.
Annual Report	Yes, latest report 1993
Other Reports (series)	Yes internal technical reports

2.19 Pitcairn Islands

General Information

The Pitcairn Islands are a sub -tropical group of four small islands situated between latitudes 23✍ and 26✍ S and longitudes 124✍ and 131✍ W, about 2000 km to the southeast of Tahiti. Pitcairn itself is a high volcanic island while Ducie and Oeno are atolls, and Henderson is a raised limestone atoll or Makatea. The total land area of the Pitcairn Islands is 4.3 km^2, but most of this comprises Henderson Island (3.7 km^2)

Only Pitcairn is inhabited, mostly with the descendants of the Bounty mutineers. The Pitcairn Islands are a British Crown Colony, with the British High Commissioner to New Zealand holding the position of Governor. The local economy is supported mainly from UK Government funds, but Pitcairn Islanders also sell handicrafts, fish and lobsters to passing ships in exchange for cash and bartered items. Pitcairn is a member of the South Pacific Commission

Land area (Pitcairn only) (square kilometres)	4.5
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	
Population growth rate (annual) as a per cent for the period 1980-1990	-11
Population under 15 years old in 1989, as a per cent	30.5
GDP per head in mid-1992 (USD)	
Foreign Aid per head in 1990 (USD)	
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	8
SPC estimate of potential coastal catch value, if marketed	16,000

*Dalzell and Preston, 1992

Fisheries Administration

There is no fisheries department or fisheries division on Pitcairn. Local fishing is for recreational and subsistence purposes. Catches are usually reported to one of the islanders for inclusion in the monthly newsletter, the Pitcairn Miscellany. Administration of the coastal waters and the EEZ is the responsibility of the Office of the Governor of Pitcairn, in consultation with the wishes of the Island Council.

Funds for fisheries initiatives such as mounting an observer programme on foreign fishing vessels operating inside Pitcairn coastal waters may be provided through UK Government funding.

2.20 Niue

Niue comprises a single uplifted tropical atoll, witth a former reef and lagoon raised to about 60 m above sea level and is the largest upraised coral island in the world. Like the Cook Islands Niue has a compact of free association with New Zealand and there has been an extensive history of migrations of Niueans, mostly to New Zealand. About 2000 Niueans presently reside on the island with the balance of the population comprised of other Pacific Islanders and New Zealand citizens.Due to its small size Niue has limited natural resources , but unlike non-emergent atolls the land will support a wide variety of crops such as citrus fruits, root crops, vanilla and coconuts. There is no surface fresh water on the island which is drawn from artesian wells.

Land area (square kilometres)	258 km2
Coastline length (km at HWM)	64.8
Inner reef area (square kilometres)	6.2
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	35
Population growth rate (annual) as a per cent for the period 1980-1990	-2.4
Population under 15 years old in 1989, as a per cent	36.7
GDP per head in mid-1992 (USD)	6417000
Foreign Aid per head in 1990 (USD)	2311100
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	3885063
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	40.8
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	115
SPC estimate of potential coastal catch value, if marketed	561300

*Dalzell and Preston, 1992

Fisheries Administration

Fisheries on Niue are administered by the Director of the Department of Agriculture Forestry and Fisheries. Responsibility for fisheries matters are handled by the Fisheries Officers. In the past there was only one Fisheries Officer who was responsible for research, extension and development. More recently, the Department has recruited a second Fisheries Officer to be responsible for research activities.

2.21 Wallis and Futuna

General Information

Wallis and Futuna is a French Overseas Territory comprising two island groups, the Wallis Islands (159 km^2) and Hoorne Islands (115km^2). The two island groups lie 230 km apart and are situated about 600 km north of Fiji. Wallis has a central island of Uvea, surrounded by a barrier reef 3-4 km offshore, with 19 low coral or small volcanic islets. Uvea is relatively low rising to a maximum elevation of 149 m, whereas the smaller Hoorne Islands, comprising, Futuna (80 km^2) and Alofi (35 km^2), reach elevations of 524 and 416 m respectively They have no barrier reef and are surrounded by narrow fringing reefs

Wallis and Futuna is the responsibility of the French High Commissioner to New Caledonia, who selects a Senior Administrator to control the local bureaucracy. An elected Territorial Assembly has limited powers over local matters. A Territorial Council is comprised of the King of Wallis, two Kings of Futuna and three members appointed by the French administrator. The territory also elects a deputy and senator to the French Parliament. The economy of Wallis is entirely dependant on French Government funds and remittances from relations in New Caledonia. The only export is trochus amounting to between 5 and 50t/yr.

Land area (square kilometres)	255
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	69.9
Population growth rate (annual) as a per cent for the period 1980-1990	1.3
Population under 15 years old in 1989, as a per cent	41.9
GDP per head in mid-1992 (USD)	
Foreign Aid per head in 1990 (USD)	
Total government spending per capita in 1991 (USD)	
Value of total imports in 1993 (USD)	
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	1,000
SPC estimate of potential coastal catch value, if marketed	5,595,400

*Dalzell and Preston, 1992

Fisheries Administration

Fisheries in Wallis is the responsibility of the Service de l'Economie et de la Pêche. The senior administrator is the Chef du Service

2.22 New Caledonia

General Information

New Caledonia and the associated Loyalty islands together comprise a French territory situated between 19 30' and 23 S, and stretching between 163 and 168 E. The main island of New Caledonia, or Grande Terre' is one of the larger Pacific Islands and is about 400 km in length and about 50 km wide. New Caledonia is part of a great fold in the earth's surface that runs south from Papua New Guinea to New Zealand., and comprises a mixture of metamorphic, sedimentary and volcanic rock. The Loyalty Islands to the east of the Grande Terre comprise three raised coral islands, Ouvéa, Lifou and Mare, and a number of other small islands and islets. The total area of the territory is 19,100 km^2, of which the Grande terre occupies 16, 890 km^2. The main island is surrounded by a large barrier reef, the second largest in the world after the Australian Great Barrier Reef. Also within the New Caledonia EEZ are the Chesterfield Islands, a group of small coral islets and reefs half way between the territory and the east coast of Australia

New Caledonia is a French overseas territory administered by a High Commissioner but with three provinces which each elect their own political assemblies. As a overseas territory, New Caledonia elects two members of the French National Assembly and one member of the Senate. Further, as France is a member of the European Union, the people of New Caledonia participate in the selection of French European Members of Parliament. New Caledonia's economy is based mainly on Nickel mining which accounts for about 93 % of territorial exports, with tourism now the second largest industry catering to an annual 87,000 visitors, one third of whom come from Japan. New Caledonia is a member of the South Pacific Commission.

Land area (square kilometres)	19,100
Coastline length (km at HWM)	
Inner reef area (square kilometres)	
Mangrove area (square kilometres)	20,250
Outer reef area (square kilometres)	
Lagoon area (square kilometres)	
Length of 200 m isobath (nm)*	1,556
Population growth rate (annual) as a per cent for the period 1980-1990	2.0
Population under 15 years old in 1989, as a per cent	32.6
GDP per head in mid-1992 (USD)	12,589
Foreign Aid per head in 1990 (USD)	
Total government spending per capita in 1991 (USD)	2,950
Value of total imports in 1993 (USD)	420,905,870
Value of fisheries sector imports in 1992 (USD)	
Value of foreign exchange earnings (exports) in 1993 (USD)	
Value of fish exports in 1993 (USD)	
Value of fisheries sector exports (shells) in 1991 (USD)	
Estimate fish consumption (kg/head/day) in 1988	
FAO estimate of catches (mt) in 1988	
SPC estimate of tuna catches in EEZ (DWFN + national) (mt)	
SPC estimate of coastal zone catches (mt)	3,032
SPC estimate of potential coastal catch value, if marketed	12,177,827

*Dalzell and Preston, 1992

Fisheries Administration

Fisheries in New Caledonia are administered at both the national and provincial level. At the national level, fisheries are the responsibility of the Service Territorial de la Marine Marchand et de Pêches Maritimes, which is administered by a Chef du Service. At the provincial level, each of the three Provinces has a Service de Pêches or Service de la Mer. Marine Marchand ie responsible for licensing commercial fishing operations, surveillance and compilation of fisheries statistics. The provincial fisheries offices regulate fisheries within their respective provinces and conduct extension work with local fishermen.

Budgetary and staffing details for New Caledonia's Marine Marchande

Organisation	1993/4	1992/3	1991/2
Fisheries Division budget (USD)			
Fisheries Division staff	5	5	5
Research Section budget (USD)	75,000	2,075,000	75,000
Research Section staff			
No. trained to postgraduate level			1
No. trained to bachelors level			
No. trained to diploma level			
No. trained to form 5 certificate level			
No. of field stations			
No of specialised research establishments			
No. of research vessels			1
Other assets			

Present Research Activities

Aquaculture	
Biology of particular organisms	
Monitoring	Monitoring of local fish markets
Resource surveys	Yes but no information given on which resources are surveyed
Gear development and FADs	Deployment of FADs
Other organisations currently carrying out fisheries-related research in CNMI	IFREMER (Nouméa) ORSTOM (Nouméa) Université Fran□ais du Pacifique (Nouméa)
Collaborating organisations in fisheries research	South Pacific Commission, sampling of longline catches
Annual Report	Yes
Other Reports (series)	Statistical reports on fish landings

3. Regional organisations

3.1 The University of the South Pacific (USP)

South (1991) classifies research into two major categories: "basic" and "applied" and, whilst pointing out that it might seem that only applied research should be pursued at USP, taking that the mandate of the university is to serve its member countries, recognises that there are over 25 institutions in the region that offer support and advisory services in fisheries research. He recommends that USP recognises the "importance of basic and applied research as a foundation to the Marine Studies Programme (MSP), and will continue to find ways of improving opportunities and funding for its conduct." He further recommends that at USP, "..research in marine studies will focus on two broad programmes, one on Coral Reefs and the other on Atolls" in the period 1991-1996.

This follows from the report of Shepard and Onorio (1987), which recommended that USP's Institute of Marine Resources should "not strengthen its capabilities in conducting applied research and offering advice in the fisheries field" but should "strengthen its capability to conduct basic research in support of its academic programme." South (1991) further recommends that "USP's rôle as a regional advisory body in fisheries will be through its collaboration with regional agencies only, and will specifically focus on post-graduate training and basic research."

USP through its MSP also houses the South Pacific Operations Centre of the International Ocean Institute (IOI). The Centre's primary responsibility is coordination, marketing and servicing of the IOI objective:- to improve the management of oceans. In the South Pacific region, the focus is on the development of a possible alumni and regional leader network, instituting of short courses, joint research projects with the MSP, and collaborating with USP on deepening of IOI's experience in distance learning (Bulai *et al*., 1993)

3.2 ICLARM

Although the International Center for Living Aquatic Resources Management is an international rather than a regional organisation, it has a very active South Pacific Office based in Solomon Islands at the ICLARM Coastal Aquaculture Centre.

ICLARM's strategy is to decrease the expected global supply gap between rate of increase in fish supply and projected demand for fish, is based on concentrated strategic research. "The research must help improve the management and sustainability of current fisheries, and establish the biological and social basis for increased aquaculture and enhanced fisheries potential" (ICLARM, 1992). The seven priority issues for ICLARM's international research are: sustainability of coastal fisheries systems, improved management of coral reef fisheries, improved fish productivity through genetics and husbandry, removal of socio-economic and environmental constraints to aquaculture growth, development of farming systems, assessing and developing the potential for enhanced fisheries and strengthening of national research systems.

To respond to these seven international research issues, there will be three research programmes; inland aquatic systems (focusing on ponds), coastal resource systems (focusing on estuaries and lagoons) and coral reef resources (focusing on coral reefs). A fourth programme, national research support, will provide a strong institutional building rôle for ICLARM (ICLARM, 1992).

3.3 SPC

The South Pacific Commission has been involved in regional fisheries research, either in a coordinative policy rôle, or an applied rôle, since the first SPC Fisheries Conference in 1952. Adams (1993) provides a historical overview of SPC's research activities in coastal fisheries, recently exemplified by the Inshore Fisheries Research Project (1988-1994) and the Integrated Coastal Fisheries Management Project (1994-7). The Fisheries Programme's Information Section provides much of the backup needed for research activities, and has a particularly strong networking role, publishing a general quarterly fisheries newsletter and 6 monthly bulletins of research-focussed special interest groups covering different inshore resources.

The current focus of SPC coastal fisheries research is assisting member countries in the production of inshore fishery management plans, through the Integrated Coastal Fisheries Management Project in the period 1995-7. This will involve the full time of both the Resource Assessment Section and the Post-Harvest Section, both to perform basic resource surveys, and to develop ways of improving the

utilisation of catches that may have to be reduced under a management regime. SPC's future input to nearshore marine resource issues very much depends on the outcome of the current "Review of South Pacific Regional Institutional Arrangements in respect of Marine Resources."

3.4 FFA

Since 1988, FFA has maintained a Research Coordination Unit (RCU), in support of nearshore issues relating to the FFA mission statement "To contribute to the economic and social well-being of member countries by promoting the sustainable development and management of their fisheries resources." The RCU is a Sub-Programme of FFA's Fisheries Research, Development and Management Programme, the objective of which is "To improve the management and sustainable development of fisheries resources and to facilitate applied research within member countries for the generation of long-term socio-economic benefits" (FFA, 1993).

The second phase of the RCU (RCU II) commenced on 1 April 1992 and will cease on 31 March 1995. It offers a variety of services to FFA member countries, with the overall goal of "improving the capacity of FFA to coordinate research in its member countries, which will facilitate rational and sustainable assessment, development, management and conservation of inshore living resources in the region" (FFA, 1992).

The primary thrust of the work of RCU II has been the production of national fisheries resources profiles for member countries. The main purpose of the profiles is to provide the basic information required to assess the current levels of exploitation of nearshore marine resources, and to identify the research and management requirements for future developments. RCU II has provided advice to member countries with respect to the development of management guidelines for several nearshore resources, and has continued to research and develop opportunities for the application of a community-based approach to nearshore resource management (FFA, 1994). FFA's future input to nearshore marine resource issues very much depends on the outcome of the current "Review of South Pacific Regional Institutional Arrangements in respect of Marine Resources."

3.5 SPREP

The South Pacific Regional Environment Programme has, until recently, concentrated most of its efforts on terrestrial issues, and occasional high-profile marine conservation issues like turtles and marine mammals. Latterly, SPREP has instituted an Integrated Coastal Management programme that includes fisheries and fisheries management issues as part of the broader coastal area planning process, and is in the process of implementing a marine component to its Biodiversity Programme, funded by the Global Environment Facility. SPREP's future input to nearshore marine resource issues very much depends on the outcome of the current "Review of South Pacific Regional Institutional Arrangements in respect of Marine Resources."

3.6 Western Pacific Fisheries Management Council

WesPac is not an international organisation, but its responsibility covers the waters of 3 different SPC members within the SPC work area. It is one of eight United States national area fisheries bodies set up under the US Magnuson Fishery Conservation and Management Act of 1978 to manage the fish in the federal waters of the US Fishery Conservation Zone, extending 200 nautical miles outward from the territorial sea. WesPac covers the federal waters of American Samoa, Commonwealth of the Northern Marianas, Guam, and Hawaii as well as the other US Pacific possessions of Johnson, Kingman, Palmyra, Jarvis, Howland, Baker and Wake. The Council has been particularly active in the development, implementation and review of management plans for large pelagic and crustacean fisheries, but its role in coastal fisheries may be limited by its mandate to cover federal (non-territorial) waters. WesPac council was instrumental in securing a recent amendment to the Magnuson Act that recognised tuna as a species falling under the national management purview.

4. A strategy for Pacific Islands coastal fisheries research

It is not the intention of this review to present a finished strategy for endorsement, but having provided some background information, to add a few suggestions for principles on which such a strategy might be developed. These are contained in Annex **2** to this document. The intention is to provide a forum for discussion at the SPC/FFA Workshop on Inshore Fisheries Management to be held in Nouméa in June 1995 during which these principles can be refined and, perhaps, the outline of a regionally-acceptable consensus produced.

5. References

Adams T. J. H. (1993) *Research in the Pacific Islands on coastal fisheries: An SPC Perspective*. Inshore Fisheries Research Project Meeting Papers Series, South Pacific Commission, Nouméa, New Caledonia

Adams T. J. H. & A. Wata (1991). *Review of the FFA/ICOD Research Coordination Unit*. FFA Technical Paper 2/91. Forum Fisheries Agency, Honiara.

Adams, T. J. H., A. D. Lewis and J. Hampton, (1991). *The South Pacific Commission's Tuna and Billfish Assessment Programme Draft Strategic Plan (1992-1996)*. Working Paper 5, 4th SPC Tuna and Billfish Standing Committee, Port Vila, Vanuatu, June 1991. 35pp.

Bell, L. A. J. and M. J. Amos (1993). *Republic of Vanuatu Fisheries Resources Profiles*. FFA Report #93/49. Forum Fisheries Agency, Honiara, Solomon Islands. 137p.

Caddy, J. F. and S. Garcia (1986) Fisheries Thematic Mapping - a prerequisite for intelligent management and development of fisheries. *Océanogr. Trop*. 21 (1): 31-52 (Paper presented by FAO to the Colloquium on Marine Resources Atlases, London, 3-4 October 1985.)

Campbell, B. and M. Lodge (1993) *Regional Compendium of Fisheries Legislation (Western Pacific Region): Report to the Governments of the South Pacific Forum Fisheries Agency*. Volumes I-III. GCP/INT/466/NOR, Field Report 93/31, FL/WPSCS/93/19. South Pacific Forum Fisheries Agency & Food and Agriculture Organisation of the United Nations, Rome, Italy.

Dalzell, P. J. and G. Preston (1992) *Deep reef slope fishery resources of the South Pacific*. Inshore Fisheries Research Project Technical Document 2. South Pacific Commission, Nouméa, New Caledonia.

Dalzell, P. J. and T. J. H. Adams (1994) *The present status of coastal fisheries production in the South Pacific islands*. SPC Regional Technical Meeting on Fisheries Working Paper 8. South Pacific Commission, Nouméa, New Caledonia.

Dowling, E. (1993). Statistical Annex. **In** *Pacific Economic Bulletin*, Volume 8, Number 2. December 1993. National Centre for Development Studies, The Australian National University. 75-111.

Evans D. (1986) *Fisheries research needs in the South Pacific: Information requirements for the effective management and development of the fisheries of Island States of the South Pacific.* Volume II: Federated States of Micronesia, Marshall Islands, Nauru and Palau. Forum Fisheries Agency, Honiara, Solomon Islands.

Fakahau S. T. & M. P. Shepard (1986) *Fisheries research needs in the South Pacific: Information requirements for the effective management and development of the fisheries of Island States of the South Pacific*. Volume I: Cook Islands. Kiribati, Niue, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa. 91pp + 200pp appendices. Working paper 21, 18th Regional Technical Meeting on Fisheries, South Pacific Commission, Nouméa, New Caledonia.

Fisheries Act (Cap.158) Ed. 1985. *Laws of Fiji*. Government Printer, Suva, Fiji.

Forum Fisheries Agency (1990) *Current fisheries development research activities in South Pacific Forum countries*. Compiler: A. Wright. In Herr (1990) (op. cit. 88-156)

Forum Fisheries Agency. (1992). *Management Plan - Research Coordination Unit, Phase II: June 1992 - March 1995.* Forum Fisheries Agency, Honiara, Solomon Islands. pag. var.

Forum Fisheries Agency. (1993). *South Pacific Forum Fisheries Agency Corporate Plan, 1993-1995*. Forum Fisheries Agency, Honiara, Solomon Islands. 34p.

Forum Fisheries Agency. (1994). *Director's Annual Report 1993/94.* Forum Fisheries Agency, Honiara, Solomon Islands. 23p.

Glude, J. B. (1971) *Report on the potential for shellfish aquaculture in Palau Islands, Yap Islands, Guam, Truk, Ponape, Ellice Islands, American Samoa, Cook Islands, Fiji Islands, New Caledonia and French Polynesia*. South Pacific Islands Fisheries Development Agency.

South Pacific Commission, Nouméa, New Caledonia.

Grant, C. D. (1978) *A review of the state of fisheries statistics and training courses in Fishery Statistics in the South Pacific Region*: A report prepared for the Improvement in Fisheries Statistics Project. FI: TF/RAS/53(AUL). Food and Agriculture Organisation of the United Nations, Rome, Italy.

Herr R. (1990) Editor: *The Forum Fisheries Agency: achievements, challenges and prospects*. University of the South Pacific, Suva, Fiji.

ICLARM (1991) *A Strategic Plan for International Fisheries Research*. May 1991 Board-Approved Draft for TAC Evaluation. International Center for Living Aquatic Resources Management, Manila, Philippines. 89pp

IPFC (1990) *Elements for a strategy for development of management-oriented fisheries research*. In: Papers presented at the sixth session of the standing committee on resources research and development of the Indo-Pacific Fishery Commission. FAO Fisheries Report No. 463 Supplement. Food and Agriculture Organisation of the United Nations, Rome, Italy.

IPFC (1993) *Follow-up to the study on international fisheries research needs of the coastal states in the region*. In: Papers presented at the seventh session of the standing committee on resources research and development of the Indo-Pacific Fishery Commission. IPFC: RRD/93/8. Food and Agriculture Organisation of the United Nations, Rome, Italy.

Johannes, R. (1994) Government-supported, village-based management of marine resources in Vanuatu. FFA Report 94/2. Forum Fisheries Agency, Honiara.

Johannes, R. (1994) Design of tropical nearshore fisheries extension work beyond the 1990's. **In** *Traditional Marine Tenure and sustainable management of marine resources in Asia and the Pacific.* Proceedings of the International Workshop, pp162-174. International Ocean Institute, Suva.

Keith-Reid, R. & U. Aiavao (1994). Fishing: Agency of success. *Islands Business Pacific*, August, 1994, p70.

Lawson, R. (1993) Research provides bottomless pit for UN millions. (Review of: A Study of International Fisheries Research (World Bank et al., 1992, ibid)). *Marine Policy* July 1993.

Lewis A. D. (1985) Ed: *Fishery Resource Profiles: Information for Development Planning*. Fiji Fisheries Division, Government Printers, Suva.

Lewis A. D. (1986) *A review of fisheries research activities and plans*: Ministry of Marine Resources, Cook Islands. MMR Technical Bulletin No.1. MMR, Rarotonga.

Lewis A. D. (1990) *Fisheries Research in the South Pacific: an Overview*. In Herr (1990) (69-87)

Lodge, M. (1994) *Review of the Fisheries Legislation of the Cook Islands*. Report prepared for the Ministry of Marine Resources, Cook Islands. Forum Fisheries Agency.

Munro, J. L. (1976). Potential productivity of coral reef fisheries. In *Ecology and Conservation in Papua New Guinea*. (K. P. Lamb and J. L. Gressit eds.) pp 90-97, Wau Ecology Institute Publication Number 2.

Munro, J. L., and Fakahau, S. T. (1993) Appraisal, Assessment and Monitoring of Small-Scale Coastal Fisheries in the South Pacific, in *Nearshore Marine Resources of the South Pacific*, (eds A. Wright and L. Hill), pp 15-53, Forum Fisheries Agency, Honiara, Solomon Islands.

Nauen, C. E. (1993) Why is aquatic resource systems research needed? (Rejoinder to: Lawson, 1993, ibid). *Marine Policy* July 1993.

Richards, A (1993). *Cook Islands Fisheries Resources Profiles*. FFA Report #93/25. Forum Fisheries Agency, Honiara, Solomon Islands and Cook Islands Ministry of Marine Resources, Rarotonga, Cook Islands. 121pp.

Richards, A. H., L. J. Bell and J. D. Bell. (1994). *Inshore Fisheries Resources of Solomon Islands*. FFA Report #94/1 (ICLARM Contribution #1023). South Pacific Forum Fisheries Agency, Honiara, Solomon Islands. pag. var.

Shepard M. P. (undated c.1989-90) *Fisheries Research Needs of Small Island Countries*. International Center for Ocean Development, Halifax, Canada

Shepard, M. P. and B. R. Onorio (1988) *A review of fisheries research and associated training activities at the University of the South Pacific*. 27 pp. Unpublished report. USP, Suva, Fiji.

Sivasubramaniam K. (1993) The Research Needs: for present and future development and management of marine fisheries in the Bay of Bengal region. *Bay of Bengal News*, June, 1993. Bay of Bengal Programme, Madras, India.

South, G. R. (1991) *University of the South Pacific Marine Studies Programme 5-year Plan: Marine Studies for the Twenty-First Century in the South Pacific*. University of the South Pacific, Suva, Fiji.

SPC (1952) *South Pacific Commission Fisheries Conference Report*. South Pacific Commission, Nouméa, New Caledonia.

SPC (1962) *South Pacific Commission Fisheries Technical Meeting Report*, February 1962. South Pacific Commission, Nouméa, New Caledonia.

SPC (1984) *Consolidation of agreed provisions and practices relating to the establishment and operation of the South Pacific Commission, including the Canberra Agreement as amended*. South Pacific Commission, Nouméa, New Caledonia.

Tanaka, H. (1991) *Aquaculture development in the South Pacific: strategy, status and future approach*. Information paper 31, 23rd Regional Technical Meeting on Fisheries, South Pacific Commission, Nouméa, New Caledonia.

UNEP/IUCN. (1988). *Coral Reefs of the World Volume 3: Central and Western Pacific.* UNEP Regional Seas Directories and Bibliographies. IUCN, Gland, Switzerland and Cambridge, U.K./UNEP, Nairobi, Kenya. xlix + 329 pp., 30 maps.

Uwate, R., P. Kunatuba, B. Roberti, and C. Tenakanai (1984). *A review of aquaculture activities in the Pacific Island region*. Pacific Islands Development Program, East-West Center, Honolulu, USA.

van Pel, H. (1961) *A guide to South Pacific Fisheries*. 72 pp. South Pacific Commission, Nouméa, New Caledonia.

Villaluz, D. K. (1972) *Aquaculture possibilities in some islands of the South Pacific*. South Pacific Islands Fisheries Development Agency. South Pacific Commission and the Food and Agriculture Organisation of the United Nations. DP/RAS/69/102/12. FAO, Rome, Italy.

World Bank (1991) *Small-Scale Fisheries Research Needs*. World Bank Technical Paper Number 152. Fisheries Series. World Bank, Washington DC, USA.

World Bank, United Nations Development Programme, Commission of the European Communities and the Food and Agriculture Organisation of the United Nations (1992) *A study of International Fisheries Research*. Policy and Research Series 19. World Bank, Washington DC, USA.

World Bank (1995) *Fisheries*. Chapter 4 **in** *Pacific Island Economies: Building a resilient economic base for the twenty-first century*. Country Department III, East Asia and Pacific Region, The World Bank Report No 13803-EAP. Washington DC, USA.

Annex 1 - Excerpts from Agenda 21

UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT

Rio de Janeiro, 3-14 June 1992

AGENDA 21

Chapter 17: Protection of the Oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources

INTRODUCTION

17.1 The marine environment, including the oceans and all seas and adjacent coastal areas - forms an integrated whole that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development. International law, as reflected in the provisions of the United Nations Convention on the Law of the Sea referred to in this chapter of Agenda 21, sets forth rights and obligations of States and provides the international basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources. This requires new approaches to marine and coastal area management and development, at the national, regional and global levels, approaches that are integrated in content and are precautionary and anticipatory in ambit, as reflected in the following programme areas:

(a) Integrated Management and sustainable development of coastal areas, including exclusive economic zones;

(b) Marine environmental protection;

(c) Sustainable use and conservation of marine living resources of the high seas;

(d) Sustainable use and conservation of living marine resources under national jurisdiction;

(e) Addressing critical uncertainties for the management of the marine environment and climate change;

(f) Strengthening international, including regional, cooperation and coordination;

(g) Sustainable development of small islands.

17.2 The implementation by developing countries of the activities set forth below shall be commensurate with their individual technological and financial capacities and priorities in allocating resources for development needs and ultimately depends on the technology transfer and financial resources required and made available to them.

(... programme areas A—Integrated Coastal Management, B—Marine Pollution, and C—High Seas issues, are not reproduced here)

Programme area D: **Sustainable use and conservation of marine living resources under national jurisdiction.**

Basis for action

17.70 Marine fisheries yield 80 to 90 million tons of fish and shellfish per year, 95 per cent of which is taken from waters under national jurisdiction. Yields have increased nearly fivefold over the past four decades. The provisions of the United Nations Convention on the Law of the Sea on marine living resources of the exclusive economic zone and other areas under national jurisdiction set forth rights and obligations of States with request to conservation and utilization of those resources.

17.71 Marine living resources provide an important source of protein in many countries and their use is often of major importance to local communities and indigenous people. Such resources provide food and livelihoods to millions of people, and if sustainably utilized, offer increased potential to meet nutritional and social needs, particularly in developing countries. To realize this potential requires improved knowledge and identification of marine living resource stocks, particularly of underutilized and unutilized stocks and species, use of new technologies, better handling and processing facilities to avoid wastage, and improved quality and training of skilled personnel to

manage and conserve effectively the marine living resources of the exclusive economic zone and other areas under national jurisdiction. Emphasis should also be on multi-species management and other approaches that take into account the relationships among species.

17.72 Fisheries in many areas under national jurisdiction face mounting problems, including local over-fishing , unauthorized incursions by foreign fleets, ecosystem degradation, overcapitalization and excessive fleet sizes, undervaluation of catch, insufficiently selective gear, unreliable databases, and increasing competition between artisanal and large-scale fishing, and between fishing and other types of activities.

17.73 Problems extend beyond fisheries. Coral reefs and other marine and coastal habitats, such as mangroves and estuaries, are among the most highly diverse, integrated and productive of the Earth's ecosystems. They often serve important ecological functions, provide coastal protection, and are critical resources for food energy, tourism and economic development. In many parts of the world, such marine and coastal systems are under stress or are threatened from a variety of sources, both human and natural.

Objectives

17.74 Coastal States, particularly developing countries and States whose economics are overwhelmingly dependent on the exploitation of the marine living resources of their exclusive economic zones, should obtain the full social and economic benefits from sustainable utilization of marine living resources within their exclusive economic zones and other areas under national jurisdiction.

17.75 States commit themselves to the conservation and sustainable use of marine living resources under national jurisdiction. To this end, it is necessary to:

(a) Develop and increase the potential of marine living resources to meet human nutritional needs, as well as social, economic and development goals;

(b) Take into account traditional knowledge and interests of local communities. small-scale artisanal fisheries and indigenous people in development and management programmes;

(c) Maintain or restore populations of marine species at levels that can produce the maximum sustainable yield as qualified by relevant environmental and economic factors, taking into consideration relationships among species;

(d) Promote the development and use of selective fishing gear and practices that minimize waste in the catch of target species and minimize by-catch of non-target species;

(e) Protect and restore endangered marine species;

(f) Preserve rare or fragile ecosystems, as well as habitats and other ecologically sensitive areas.

17.76 Nothing in paragraph 17.75 above restricts the right of a coastal state or the competence of an international organization, as appropriate, to prohibit, limit or regulate the exploitation of marine mammals more strictly than provided for in that paragraph. States shall cooperate with a view to the conservation of marine mammals and in the case of cetaceans shall in particular work through the appropriate international organisations for their conservation, management and study.

17.77 The ability of developing countries to fulfil the above objectives is dependent upon their capabilities, including the financial, scientific and technological means at their disposal. Adequate financial, scientific and technological cooperation should be provided to support action by them to implement these objectives.

Activities

(a) Management-related activities

17.78 States should ensure that marine living resources of the exclusive economic zone and other areas under national jurisdiction are conserved and managed in accordance with the provisions of the United Convention on the Law of the Sea.

17.79 Coastal States, individually or through bilateral and/or multilateral cooperation and with the support, as appropriate, of international organisations, whether subregional, regional or global, should *inter alia:*

(a) Assess the potential of marine living resources, including underutilized or unutilized stocks and species, by developing inventories, where necessary , for their sustainable use;

(b) Implement strategies for the sustainable use of marine living resources, taking into account the special needs and interests of small-scale artisanal fisheries, local communities and indigenous peoples to meet human nutritional and other development needs;

(c) Implement, in particular in developing countries, mechanisms to develop mariculture. aquaculture and small-scale, deep-sea and oceanic fisheries within areas under national jurisdiction where assessments show that marine living resources are potentially available;

(d) Strengthen their legal and regulatory frameworks, where appropriate, including management, enforcement and surveillance capabilities, to regulate activities related to the above strategies;

(e) Take measures to increase the availability of living marine resources as human food by reducing wastage, post-harvest losses and discards, and improving techniques of processing, distribution and transportation;

(f) Develop and promote the use of environmentally sound technology under criteria compatible with the sustainable use of marine living resources, including assessment of the environmental impact of major new fishery practices;

(g) Enhance the productivity and utilization of their marine living resources for food and income.

17.80 States, in implementing the provisions of the United Nations Convention on the Law of the Sea, should address the issues of straddling stocks and highly migratory species, and taking fully into account the objective set out in paragraph 17.74, access to the surplus of allowable catches.

17.81 Coastal States should explore the scope for expanding recreational and tourist activities based on living marine resources, including those for providing alternative sources of income. Such activities should be compatible with conservation and sustainable development policies and plans.

17.82 Coastal States should support the sustainability of small-scale artisanal fisheries. To this end, they should, as appropriate:

(a) Integrate small-scale artisanal fisheries development in marine and coastal planning, taking into account the interests and, where appropriate, encouraging representation of fishermen, small-scale fisher-workers, women, local communities and indigenous peoples;

(b) Recognize the rights of small-scale fish-workers (*sic)* and the special situation of indigenous people and local communities, including their rights to utilization and protection of their habitats on a sustainable basis;

(c) Develop systems for the acquisition and recording of traditional knowledge concerning marine living resources and environment and promote the incorporation of such knowledge into management systems.

17.83 Coastal States should ensure that, in the negotiation and implementation of international agreements on the development or conservation of living marine resources, the interests of local communities and indigenous people are taken into account, in particular their right to subsistence.

17.84 Coastal States, with the support, as appropriate, of international organisations should conduct analyses of the potential for aquaculture in marine and coastal areas under national jurisdiction and apply appropriate safeguards as to the introduction of new species.

17.85 States should prohibit dynamiting, poisoning and other comparable destructive fishing practices.

17.86 States should identify marine ecosystems exhibiting high levels of biodiversity and productivity and other critical habitat areas and provide necessary limitations on use in these areas, through, *inter alia*, designation of protected areas. Priority should be accorded, as appropriate, to:

(a) Coral reef ecosystems;

(b) Estuaries;

(c) Temperate and tropical wetlands, including mangroves;

(d) Sea grass beds;

(e) Other spawning and nursery areas.

(b) Data and Information

17.87 States, individually, or through bilateral and multilateral cooperation and with the support, as appropriate, of international organisations, whether subregional, regional aor global, should:

(a) Promote enhanced collection and exchange of data necessary for the conservation and sustainable use of the marine living resources under national jurisdiction;

(b) Exchange on a regular basis up-to-date data and information necessary for fisheries assessment;

(c) Develop and share analytical and predictive tools, such as stock assessment and bioeconomic models;

(d) Establish or expand appropriate monitoring and assessment programmes;

(e) Complete/update marine biodiversity, marine living resource and critical habitat profiles of exclusive economic zones and other areas under national jurisdiction, taking account of changes in the environment brought about by natural causes as well as human activities.

(c) International and regional cooperation and coordination.

17.88 States, through bilateral and multilateral cooperation, and with the support of relevant United Nations and other international organisations, should cooperate to:

(a) Develop financial and technical cooperation to enhance the capacities of developing countries in small-scale and oceanic fisheries, as well as in coastal aquaculture and mariculture;

(b) Promote the contribution of marine living resources to eliminate malnutrition and to achieve food self-sufficiency in developing countries, *inter alia*, by minimizing post-harvest losses and managing stocks for guaranteed sustainable yields;

(c) Develop agreed criteria for the use of selective fishing gear and practices to minimize waste in the catch of target species and minimize by-catch of non-target species;

(d) Promote seafood quality, including through national quality assurance systems for seafood, in order to promote access to markets, improve consumer confidence and maximize economic returns.

17.89 States should, where and as appropriate, ensure adequate coordination and cooperation in enclosed and semi-enclosed seas and between subregional, regional and global intergovernmental fisheries bodies.

17.90 States recognize:

(a) The responsibility of the International Whaling Commission for the conservation and management of whale stocks and the regulation of whaling pursuant to the 1946 International Convention for the Regulation of Whaling;

(b) The work of the International Whaling Commission Scientific Committee in carrying out studies of large whales in particular, as well as of other cetaceans;

(c) The work of other organisations, such as the Inter-American Tropical Tuna Commission and the Agreement on Small Cetaceans in the Baltic and North Sea under the Bonn Convention, int eh conservation, management and study of cetaceans

and other marine mammals.

17.91 States should cooperate for the conservation, management and study of cetaceans.

Means of implementation

(a) Financing and cost evaluation

17.92 The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $6 billion including about $60 million from the international community on grant or concessional (*sic*) terms. These are indicative and order of magnitude estimates only and have not been reviewed by governments. Actual costs will depend upon, *inter alia*, the specific strategies and programmes governments decide upon for implementation.

(b) Scientific and Technological means

17.93 States, with the support of relevant intergovernmental organisations, as appropriate, should:

(a) Provide for the transfer of environmentally sound technologies to develop fisheries, aquaculture and mariculture, particularly to developing countries;

(b) Accord special attention to mechanisms for transferring resource information and improved fishing and aquaculture technologies to fishing communities at the local level;

(c) Promote the study, scientific assessment and use of appropriate traditional management systems;

(d) Consider observing, as appropriate, the FAO/ICES Code of Practice for Consideration of Transfer and Introduction of Marine and Freshwater Organisms;

(e) Promote scientific research on marine areas of particular importance for marine living resources, such as areas of high diversity, endemism and productivity and migratory stopover points.

(c) Human Resource Development

17.94 States individually, or through bilateral and multilateral cooperation and with the support of relevant international organisations, whether subregional, regional or global, as appropriate, should encourage and provide support for developing countries, *inter alia*, to:

(a) Expand multi-disciplinary education, training and research on marine living resources, particularly in the social and economic sciences;

(b) Create training opportunities at national and regional levels to support artisanal including subsistence fisheries, to develop small-scale use of marine living resources and to encourage equitable participation of local communities, small-scale fisher-workers, women and indigenous people;

(c) Introduce topics relating to the importance of marine living resources in educational curricula at all levels.

(d) Capacity-building

17.95 Coastal States, with the support of relevant subregional, regional and global agencies, where appropriate, should:

(a) Develop research capacities for assessment of marine living resource populations and monitoring;

(b) Provide support to local fishing communities, in particular those that rely on fishing for subsistence, indigenous people and women, including, as appropriate, the technical and financial assistance to organise, maintain, exchange and improve traditional knowledge of marine living resources and fishing techniques, and upgrade knowledge of marine ecosystems;

(c) Establish sustainable aquaculture development strategies, including environmental management in support of rural fish-farming communities;

(d) Develop and strengthen, where the need may arise, institutions capable of

implementing the objectives and activities related to the conservation and management of marine living resources.

17.96 Special support, including cooperation among States, will be needed to enhance the capacities of developing countries in the areas of data and information, scientific and technological means and human resource development in order to enable them to participate effectively in the conservation and sustainable use of marine living resources under national jurisdiction.

(... programme area E—climate change—is not reproduced here...)

(...the following programme areas F and G are only reproduced as they relate to the current discussion...)

Programme area F: **Strengthening international, including regional, cooperation and coordination**

Basis for action

17.116 It is recognised that the rôle of international cooperation is to support and supplement national efforts. Implementation of strategies and activities under the programme areas relative to marine and coastal areas and seas requires effective institutional arrangements at national, sub-regional, regional and global levels, as appropriate. There are numerous national and international, including regional, institutions, both within and outside the United Nations system, with competence in marine issues, and there is a need to improve coordination and strengthen links among them...

...**Activities**

(a) Management-related activities

Global

17.118 The General Assembly should ... request the Secretary-General and executive heads of United Nations agencies and organisations to:...

... (d) Promote, where necessary, greater collaboration between the United Nations agencies and subregional and regional coastal marine programmes;...

... Subregional and Regional

17.120 States should consider, as appropriate:

(a) Strengthening and extending where necessary, intergovernmental regional cooperation, the Regional Seas Programmes of UNEP, regional and subregional fisheries organisations and regional commissions;

(b) Introduce, where necessary, coordination among relevant United Nations and other multilateral organisations at the subregional and regional levels...

...(b) Data and Information

17.121 States should, where appropriate:

(a) Promote exchange of information on marine and coastal issues;

(b) Strengthen the capacity of international organisations to handle information and support the development of national, subregional and regional data and information systems, where appropriate. This could include networks linking countries...

...17.123 ...States should, through international cooperation, develop a comprehensive programme for meeting the core human resource needs in marine sciences at all levels.

Programme area G: **Sustainable development of small islands**

Basis for action

17.124 Small Island developing States, and islands supporting small communities, are a special case for both environment and development. They are ecologically fragile and vulnerable. Their small size, limited resources, geographic dispersion and isolation from markets, place them at a disadvantage economically and prevent economies of scale. For small island developing States the ocean and coastal environment is of strategic importance and constitutes a valuable development resource.

17.125 Their geographic isolation has resulted in their habitation of a comparatively large number of unique species of flora and fauna, giving them a very high share of global biodiversity. They also have rich and diverse cultures with special adaptations to island environments and knowledge of the sound management of island resources...

...17.127 Because small island development options are limited, there are special challenges to planning for and implementing sustainable development. Small island developing States will be constrained in meeting these challenges without the cooperation and assistance of the international community.

Objectives

17.128 States commit themselves to addressing the problems of sustainable development of small island developing States. To this end it is necessary:

(a) To adopt and implement plans and programmes to support the sustainable development and utilization of their marine and coastal resources, including meeting essential human needs, maintaining biodiversity and improving the quality of life for island people;...

...Activities

(a) Management-related activities

17.129 Small island developing States, with the assistance as appropriate of the international community and on the basis of existing work of national and international organisations, should:

(a) Study the special environmental and developmental characteristics of small islands, producing an environmental profile and inventory of their natural resources, critical marine habitats and biodiversity;

(b) Develop techniques for determining and monitoring the carrying capacity of small islands under different development assumptions and resource constraints;

(c) Prepare medium- and long-term plans for sustainable development...

...(c) International and regional cooperation and coordination

17.132 International organisations, whether subregional, regional or global, must recognize the special development requirements of small island developing States and give adequate priority in the provision of assistance, particularly with respect to the development and implementation of sustainable management plans...

...Means of implementation...

...(b) Scientific and technical means

17.134 Centres for the development and diffusion of scientific information and advice on technical means and technologies appropriate to small island developing States, especially with reference to the management of the coastal zone, the exclusive economic zone, and marine resources, should be established or strengthened, as appropriate, on a regional basis...

...(d) Capacity building

17.136 The total capacity of small island developing States will always be limited. Existing capacity must therefore be restructured to meet efficiently the immediate needs for sustainable development and integrated management. At the same time, adequate and appropriate assistance from the international community must be directed at strengthening the full range of human resources needed on a continuous basis to implement sustainable development plans.

17.137 New technologies that can increase the output and range of capability of the limited human resources should be employed to increase the capacity of very small populations to meet their needs. The development and application of traditional knowledge to improve the capacities of countries to implement sustainable development should be fostered.

Annex 2

Suggestions towards a strategy for Pacific Islands coastal fisheries research

The organisation(s) to implement the regional components of this strategy will depend very much on the outcome of the SPOCC "Review of South Pacific Regional Institutional Arrangements in respect of Marine Resources", which should be available by May 1995, but the current outline is written with FFA, SPC and SPREP in mind:— the regional organisations which currently have a "fire-fighting" role to play in their coastal living marine resource management advisory services to Pacific Island nations.

The national components of this strategy are more difficult to fit into a coherent framework, since each country and territory has its own, usually different, policies and capabilities. As is drawn out later, the UNCED Agenda 21 already contains a basic framework that provides for improvements in sustainable marine resource management at both the national and international levels, and this discussion will restrict itself to a few suggestions for specific principles for national research.

Definitions

strategy, *n.* generalship, or the art of conducting a campaign and manoeuvring and army: artifice or finesse generally.—*adj.* **strategic**, pertaining to, dictated by, of value for, strategy.

tactics, *n.* The science or art of manoeuvring in the presence of the enemy: purposeful procedure

(Chambers Twentieth Century Dictionary).

The basic divisions of a Strategy for Pacific Islands Coastal Fisheries Research are considered to be as follows:-

1. **International tactical research** - short term, applied, research, considered to be the main focus of action for international fisheries organisations at the regional level (i.e. "Regional organisations"), and the main focus of the following discussion;
2. **International strategic research** - long-term, basic, research, most effectively carried out by academic institutions (both regional and national, since most strategic research is of international relevance) and the more global of the international organisations (since, unless they have regional, or sub-regional branches, they can afford to focus on longer-term priorities separate from the short-term needs of nations and districts);
3. **National research** - in the Pacific Islands region, at the least the developing countries of the Pacific, concentrating on coastal fishery monitoring, tactical "emergency" research in response to problems identified by monitoring (particularly rapid resource assessments), and maintaining a strong input of information about research (both tactical and strategic) going on elsewhere;

This is not necessarily the best way of compartmentalising the overall strategy, but best fits existing institutional structures and reflects the main type of activity at existing institutions.

> **Suggested Goal of Tactical Inshore Fisheries Research**:- *To improve the quantity and quality of applied, practical research that is urgently necessary in order for Pacific Island Countries to identify and prevent over-fishing of living marine resources within their territorial waters:— to promote tactical research towards the development of appropriate, workable and effective maintenance (and, where necessary, rehabilitation) regimes for inshore fisheries which are subject to commercial exploitation or to excessive human population pressure.*

This is a limited *tactical* goal which is simply the most urgent part of the wider problem of ensuring the sustainable management and development of Pacific Island fisheries. The other important component of this wider effort:— *strategic research,* or longer-term, forward-looking research into ways of planning and ensuring the long-term sustainability of living marine resource exploitation within Pacific Island territorial waters — of identifying basic biological characteristics of living marine resources of the Pacific Islands, particularly their inter-relationships and interactions with the wider environment (including the fishing community), and of developing ways of predicting the

response of resources to exploitation, management, and other external effects — is deliberately separated from this part of this draft plan since it is already considered by the University of the South Pacific Marine Studies Programme 5-year Plan (South, 1991), the ICLARM Strategic Plan (ICLARM, 1991) and various other policy documents, and need not be discussed again here.

Rôle of international organisations in coastal fisheries:—An early regional fisheries research review (SPC, 1962) suggested that national institutions be responsible only for *tactical* fisheries research or the provision of applied solutions to immediate problems, whilst regional organisations concentrate on *strategic* research, and the development of long-term solutions through academic applications. Experience since then has shown that such a distinction, whilst logical, is not necessarily appropriate. Although Universities are usually able to maintain the appropriate detachment for strategic research, the main *raison d'être* for regional development agencies' involvement in inshore fisheries research has always been the need to directly assist member countries in the tactical solution of crises caused by exploitation.

Some other reviews, particularly those arising from consideration of LOSC and the management of tuna fisheries, have concluded that, since Pacific Island coastal fisheries fall within the limit of territorial waters and do not involve highly migratory species (apart from turtle, crayfish etc.), they are under the exclusive jurisdiction of governments and thus regional and international institutions need not bother about the management of inshore waters. Although it is obvious that regional and international organisations have no *jurisdiction* over territorial waters, it is equally obvious that regional organisations can be the coordinative medium whereby small countries can pool their resources (both external and internal) and derive a consistent source of expert advice on shared problems and on inshore resources held in common. Indeed, from the jurisdictional premise, it could equally well be argued that international organisations have no rôle in the EEZ either, since this zone is usually *exclusive,* economically, to the coastal State. Of course, when it comes to highly migratory species and straddling stocks, Article 64 of LOSC suggests that international organisations are necessary to coordinate the management of these specific fisheries in national EEZs (although there has been some debate over the meaning of the word *"appropriate*" in front of the phrase "*international organisations"* in Article 64), whilst other UN agreements, for example Agenda 21 (see Annex 1) additionally specify an advisory and supporting rôle for international organisations ("*whether subregional, regional or global*") in helping countries to assess and develop sustainable management of all marine living resources in EEZs and *other areas under national jurisdiction*.

Constraints and problems currently faced

Human resources

It has to be accepted that the human resources of most Pacific Island countries, however high in quality they may be, are low in quantity. It is difficult to take advantage of economies of scale in places where the scale is forever limited, and many Pacific Island countries have a smaller population than the average continental town (e.g. Fiji has a smaller population than El Giza, a suburb of Cairo (Egypt), and Palau has a third of the population of Casper (Wyoming, USA)). People with higher education are scarce and a significant number of highly-educated Pacific Islanders choose to devote the most productive years of their lives to higher-paying jobs outside their homelands. Pacific Island Governments have higher-priority tasks for their scarce graduate nationals than fisheries management, usually in economic development, and even those people who are trained specifically in fisheries science usually find themselves moving rapidly into higher-level administrative posts. There is usually no career path within research, and most fisheries research, whether for management or otherwise, is carried out by young people.

This does not mean that the Pacific Islands must necessarily continue to rely on expatriate expertise in line positions. Indeed, such line expertise is now almost unavailable from former colonial powers, despite a severe shortfall in skill and experience that will not be made up for many years (and despite the fact that staff integrated within the organisation can be far more effective than those working outside on special projects— the form that most manpower assistance takes nowadays). It does however mean that Pacific Island Nations must look to

sharing some of their available human resources at the regional level, or even perhaps agreeing on a certain level of specialisation by each nation. Although it may be difficult to "lose" staff to regional organisations for two or three years, that must be balanced against the assistance that the country will receive in turn from experts from other countries working for those organisations, and the experience gained by the seconded staff member.

A strategy that both FFA and SPC are pursuing to encourage the sharing of national expertise at the regional level is the concept of *attachment*, whereby national officers are seconded from their governments for periods of one month to one year, or longer, to work on projects implemented by regional organisations. As well as gradually developing self-sufficiency within the region, these attachments are valuable for on-the-job training and broadening experience. The SPC Resource Assessment Section also regularly performs fieldwork in one country with the assistance of fisheries officers from another country, again both to make use of the special expertise of those officers, and to broaden their experience—of definite and immediate benefit to both participating countries.

Formal academic training, and the promotion of formal academic training, is not considered as a strategy for improving *tactical* regional inshore fisheries research under this plan. Human resource development at this level is a longer-term approach, and is most appropriately handled by strategic research institutions, particularly the Universities.

To put the issue into the global (developing country) perspective, ICLARM (1991) considers that "In some countries or regions with rich fisheries resources (Myanmar, eastern Indonesia, Laos, Cambodia, Vietnam and the South Pacific) the national aquatic research systems are very weak or nonexistent. They will need considerable staff development and technical assistance in order to establish viable programs."

Financial Resources - who is to foot the bill for better (or indeed, any) tactical research?

The money to support regional research towards the development of appropriate, workable and effective ways of preventing fishery resource attrition currently comes entirely from extra-regional sources. For example, the SPC Resource Assessment and Management Unit is supported by the Government of the United Kingdom, the FFA Research Coordination Unit is supported by the Government of Canada, and the SPREP Biodiversity and Integrated Coastal Management programmes are supported by the Global Environment Facility and other sources. Pacific Island Countries pay subscriptions to regional organisations, which are classified as "core budget", but core budgets are used to fund the basic framework of the organisation:— the administrative and support services around which the work programmes are built and which external grant-awarding sources will not support— and rarely support full work programmes alone.

Because of their modular nature, and the immediate and tangible nature of their output, it is much easier for external donors to consider funding work-programme activities than administration, and there are always complaints that core budget should be funding more work-programme activities as well. The only way in which that could happen would be either for administration to be reduced, or for national subscriptions to be increased. Institutional administrations tend to gradually increase in size (if you want more accountability, you need more accountants), and to resist attempts at reduction, so the natural ceiling fixed by reserving a limited core budget for administration is fortuitous. If core and external funds were freely interchangeable in application, or if increased subscriptions were to boost the core budget, a much larger administration might result. Then again, if subscription funds were clearly earmarked for administration and work-programmes, it is likely that administration would suffer unduly.

Since the break-up of the Warsaw Pact many "traditional" sources of external assistance have been accelerating their withdrawal from the Pacific region, or making the terms of their assistance more difficult to achieve, and promoting the intention that the region, and its international organisations, must become financially self-supporting within as short a time as possible. The most usual synonym used for the unpalatable phrase "financially self-supporting" is "sustainable":— a word which is easy to associate with the more palatable concept of a "sustainable" environment and the "sustainable" management of natural resources. Ironically, at a time when international efforts towards the conservation of the

global environment are being heavily promoted, international resources for the management of an ocean that contains almost half of the world's area of seawater are being withdrawn. There is a natural tendency for international financial resource planners to concentrate on the fact that the region does not contain many people rather than the fact that it contains quite a large proportion of the earth's surface.

Unlike the situation in temperate countries and industrial fisheries in more developed countries, there is no immediate, or even medium-term prospect of Pacific Islands coastal fisheries ever paying for their own management, at least management to the degree expected in developed fisheries. Although New Zealand can now boast that fisheries research and management is now entirely paid for by revenue from the fishing industry it must be recalled that the fishing industry in New Zealand is fully commercial or recreational with a very small subsistence component, the vast part of the catch is generated by a relatively small number of species, and the overall productivity of the ecosystem is much higher than in the Pacific Islands. The sheer multitude of different species fished by Pacific Islanders alone defeats this hope, since each one of these would require fully as much research to conventionally manage as, for example, the herring, or cod, or orange roughy fisheries. When added to the fact that most of this fish is landed by rural villagers for the family table, and does not even enter the cash economy, the hope becomes tenuous indeed. Unless, of course, some totally different, low-cost, multispecies management paradigm is adopted, but such models do not come ready-made to apply to commercial export fisheries. Community marine tenure and co-management systems have promising potential for adaptation over wider areas but still require to be tested and adapted to externalities, with no guarantee of providing a universal panacea.

Another alternative is to use a few highly commercial fisheries pay for the management of all the others. For the Pacific Islands, the only potential candidate is the distant-water tuna fishery, but this only generates significant income for a minority of countries and none at all at the regional level. Pacific Island incomes from tuna fisheries do not even pay for *tuna* research and management at present, let alone regional inshore fisheries research, and it has already been formally agreed by FFA member countries that US treaty income should not be used to support other FFA work-programmes except the administration of the treaty itself. However national fisheries institutional income from the US Multilateral Treaty does sometimes go towards the support of inshore fisheries research and management at the national level, through the small portion that comes directly to the fisheries administration. Most other tuna fisheries licencing income goes directly to national treasuries and the resultant annual budgetary funding to the fisheries administration bears little relationship to the income it has generated (of course, when fisheries licencing revenue forms a major part of the economy in a country with few other sources of income, there is little reason why it should bear such a relationship, given the immediate need for better hospitals and schools).

When talking about (financial) sustainability, there is also a tendency to avoid the fact that quite a large proportion of the actual cash generated by Pacific Island commercial fisheries passes outside the region, and that the major proportion of the commercial fishing itself (93% in the case of tuna) is carried out by people from outside the region. Should Pacific Island nations be expected to pay for the comprehensive management of fisheries within their waters when most of the money generated by those fisheries does not circulate within their economies? Some agencies are trying to approach this problem by helping Pacific Island nations to assess fair rents for access to their resources, but this rental mechanism does not appear to work well in practice, even for virtually single-species, single-fleet fisheries like tuna, and has almost no current expression in coastal fisheries where it would be even more costly to impose, administer and enforce. The present system, whereby revenue from commercial fishing in the Pacific Islands enters the extra-regional community, and development (and fishery management) assistance enters to the Pacific Islands from the extra-regional community in return, holds a much better chance of addressing the immediate problems of the region before it is too late. This should not be seen as aid encouraging dependency, but as a form of indirect resource rental.

However, since most of the inshore fisheries management problems of the Pacific Islands arise, or have arisen, from export fisheries (such as bêche-de-mer, trochus, live groupers and snappers, black pearl shell, giant clam), mainly to a few countries in East and South-East

Asia, it is not completely outside the bounds of possibility for such fisheries to be managed by a regional licencing arrangement, in the same way as is being considered for tuna by the Parties to the Nauru Agreement, and revenue thereby raised to support research into management at the regional level. Since these fisheries are entirely within territorial waters and do not concern highly migratory species, there could be absolutely no argument by distant water fishing nations that LOSC requires the involvement of the fishing nation in their management. A regional licencing arrangement for live reef-fish for export as food, controlled entirely by Pacific Island nations, would set an interesting precedent. The reason such an arrangement is unlikely, apart from the low total value of these fisheries compared to tuna (see Dalzell & Adams, 1994), is that such export operators do not normally negotiate at the government-to-government level, but between the company representative and the local administrator, chief or businessman. Such negotiations can be locally lucrative and difficult to relinquish, particularly under non-governmental resource ownership systems.

For the present and immediate future it will be necessary for tactical fisheries management research in the region to rely on the sources of funding that most other research in the world still relies upon—governments and grants. The problem already mentioned is that many of the "traditional" grant-awarding bodies (e.g. the Governments of Canada, New Zealand, the United Kingdom, and United States) are withdrawing from the region (or from fisheries, or claim to have reduced resources to spend, or that subsidies to buy access for their fleets are really aid, or that they are applying their resources through different channels) and alternative sources will have to be explored.

Towards this end, fisheries management scientists need to do a better job of promoting their work in the areas to which the major donors are turning their attention. For example, it is not often made clear to outsiders that inshore fisheries management in the Pacific is one of the few disciplines that is actually promoting the sustainable utilisation of natural resources that is currently being talked about in theoretical terms by environmental agencies. It is rarely pointed out that the aims of Pacific fisheries institutions in this area are virtually identical to the aims of Chapter 17 of Agenda 21 of the United Nations Earth Summit of 1992, particularly Programme Area D (see Annex **1**).

In addition, with so much hand-wringing in the Northern Hemisphere press recently over the so-called failure of industrial fisheries management processes, more could be made of the positive examples, and the hope for the future of sustainable global fisheries management exemplified by the "Pacific Way".

Institutional development

Whilst consideration of institutions is essential to any consideration of strategy for inshore fisheries research in the region, the recommendations of the SPOCC "Review of South Pacific Regional Institutional Arrangements in respect of Marine Resources", and the scope of the acceptance by member countries of these recommendations, will have a great bearing on regional institutional development in the future.

Information inadequacy:— there needs to be much better linkage between international, regional and national institutions in order to efficiently share resources and knowledge to improve the maintenance of coastal fisheries.

A great deal happens at the national level that is not apparent at the regional, unless that nation is subject to frequent visits from regional organisation staff, and often one country is unaware of relevant work that may be happening in another country. This is not through any lack of goodwill, since communication is usually excellent during personal visits, but because the habit of communication at a distance is not yet ingrained into human nature. One of the jobs of a regional organisation is to foster a sense of *community* that encourages people in different countries and areas to think of themselves as colleagues, and thus to discuss ideas. One of the main ways in which this is accomplished is by the sponsorship of regional meetings and workshops where face-to-face contact can be made.

Another facet of the communication problem results mainly from the fact that the formal reporting of work accomplished is not a common art—most Pacific Island fisheries officers prefer to *do* things rather than *write* about them—and is exacerbated by the fact that formal

communications between countries and regional organisations must be passed via foreign affairs departments (or their equivalent). Although this does not normally lead to misinterpretations, it is a significant and discouraging overhead on communications. In addition, there is no formal requirement for information to be transmitted from the national to the regional level, or for regional institutions to communicate with each other except at the very apex through SPOCC (although the convention of annual colloquia between FFA and the SPC Fisheries Programme, starting in 1993, lowered this communication threshold in one case at least).

Whatever the causes, there is a definite and continuing communications problem between countries and regional organisations, and between countries and countries, that leads to the production of a substandard service by regional organisations to member countries, and the duplication of work and wastage of effort by countries. Possible solutions include:-

- A formal requirement for national fisheries, marine environmental and marine resources departments to automatically file any reports on work accomplished or carried out by third parties, and on any national fisheries statistics, with regional organisations in the same manner that tuna fisheries catch data is currently filed with the SPC/FFA Regional Tuna Database, and as regional institutional reports are currently (although informally) filed with the PIMRIS Coordinating Centre;
- An annual colloquium of staff of all regional organisations concerned with marine resources in the region, to discuss work, needs and ideas at the technical level, not just at the apex. (This is likely to be too expensive to be practical).
- A better telecommunications network. The current Peacesat installation has improved the potential for communications immeasurably, but requires both parties to be in a particular place at the same time and thus has a considerable coordinatory overhead, not to mention limited bandwidth, and the need for a full-time operator. Computer e-mail facilities in the Pacific Islands lag far behind the rest of the world, even Africa, because of the high cost of telecommunications between islands, yet e-mail has proven to be a very good research communication tool where it is available. E-mail has all the convenience of fax, but is cheaper for sending text, with the additional capability of communicating databases and computer-usable reports and images. One of the unquantified and imponderable benefits of e-mail is that it seems to foster the sense of *community* mentioned at the start of this section, and encourages users to communicate more freely than most other forms of communication-at-a-distance.
- In the longer term, a continuing emphasis on developing national skills in report writing and communications, particularly through the promotion of annual reports in each country and the "projectisation" of national work-programmes. Part of this improvement might arise from the secondment of more officers on attachment to regional organisations, where regular reporting is an inescapable requirement of life.

Strategies

Arising from the above discussion of problems and constraints, the following are suggested as principles towards the development of strategies to accomplish the goal outlined:— to promote tactical research towards the development of appropriate, workable and effective maintenance regimes for inshore fisheries:

(Note:— we fully accept the principle put forward by Johannes (1994) on the need to develop "data-less management methods", and the need for "management under uncertainty" techniques highlighted by IPFC (1990). For this reason, the research strategy that we are advocating here is not intended to develop a huge infrastructure to perform in-depth fisheries stock assessments and to enable Governments to take rigorous control of every facet of Pacific Island inshore fisheries (if such a thing were even possible). It is intended rather to gather together some basic essential information, to develop and apply "broad-brush" rapid (but quantitative) appraisal techniques, to develop local capabilities and understanding, and to generally provide the tools necessary for Pacific Island communities to make effective decisions about the disposition of the marine resources under their control. "Data-less" management does not mean "information-less." It also has to be accepted that the need for effective management of some Pacific Island export fisheries is immediate, or even

desperate, and that some areas just do not have community systems in place to control external fisheries. There is still a need for Governmental "fire-fighting" systems to be made effective)

Agenda 21 Chapter 17 Programme Area D (see Annex 1) already provides the basic context within which a Pacific Islands inshore fisheries research strategy can be developed, and has already been agreed by many Pacific Island countries, as well as providing a mandate for many national and international assistance agencies. At the same time, the focus is too broad in some areas (e.g. *"Promote the study, scientific assessment and use of appropriate traditional management systems"*) and too narrow in others (e.g. "*Consider observing, as appropriate, the FAO/ICES Code of Practice for Consideration of Transfer and Introduction of Marine and Freshwater Organisms"*) to be considered as a ready-made blueprint for the Pacific Islands region in coastal fisheries research.

It must also be borne in mind that programmes designed for ecological purposes may have slightly different aims from programmes designed for fisheries management purposes. One of the main departures is that ecological initiatives usually stress *qualitative* rather than *quantitative* descriptors of ecosystems. An "inventory of species" to the environmentalist usually means a list of the species present, whilst this is only the start for the marine resources scientist, who wishes to know *how many* of each species are present. A biodiversity survey may be a sufficient end in itself to the environmentalist, but may be of little use in the sustainable management of an active multispecies fishery, and the scope of work must be extended accordingly if both ecological and economic aims are to be addressed (and scarce resources shared) by projects such as marine surveys.

The following are some suggestions for items for discussion and possible inclusion in a "Strategy for Pacific Islands coastal fisheries research":-

Some priority areas for tactical research

Concentrate research on resources which are subject to commercial fishing, or around islands with a very high subsistence population density per unit of available fishing ground.

> A strategic plan that is trying to address urgent problems must narrow its focus. This strategy is based on the assumption that *subsistence* fisheries, at the level of fishing pressure experienced in most Pacific Islands, are not in trouble:— a generalisation that is borne out by the small number of requests received by regional organisations for assistance with assessing and managing such fisheries. *Commercial* fisheries, which are subject to the common economic imperative of continuous expansion (particularly fisheries for export), are a much more common source of concern, and are usually in need of definite external control if they are not to become overfished. (This generalisation sets the Pacific Islands region aside from much of the rest of the world, where high coastal population densities mean that subsistence fisheries *are* often in trouble).

Produce an inventory of Pacific Island fishing grounds, based on classified, remotely-sensed imagery, with the area estimated for each ecologically-useful habitat type;

> Good estimates of the area of "available habitat" for inshore species subject to heavy exploitation are hard to come by where they exist, and completely lacking for most Pacific Island countries. Such estimates are invaluable in extrapolating *rapid* but indicative stock assessments based on limited field surveys, and estimating maximum potential production for certain species. Most of the species urgently requiring a more intensive management approach are shallow-water invertebrates, which are more amenable to this sort of assessment than fish. The tools are definitely available, particularly with the increasing use of satellite imagery. Caddy and Garcia in 1986 made an eloquent case for the use of thematic mapping in fisheries research, but there is currently no sign of any comprehensive treatment of Pacific Island reefs and lagoons that is likely to be available within the decade, although a few pilot studies have been carried out

Continue development of a regional inshore fisheries database, based initially on existing and historical information about catches or usage by species by area, but later acting as a focal point for the development of national coastal fishery statistical systems;

> Fisheries specialists from outside the region are sometimes unaware that most Pacific Island governments only have a vague idea what their production of coastal resources is. This uncertainty is caused by the large size of the subsistence sector, and the difficulty of

quantifying it, but there is also a general feeling of hopelessness that inshore fisheries can ever be quantified without a huge expenditure of resources. However, a great deal can be done to improve the accuracy of estimates just by comparing one area with another, and there is a great deal of quantified information around, unpublished and all but forgotten, that could be of synergistic value when put together.

The first cut at such a database will be produced by the extrabudgetary SPC Integrated Coastal Fisheries Management Project, in collaboration with FFA, but this needs to develop into a "core" regional programme in the same way as the Regional Tuna Database. The US territories have for several years participated in the Western Pacific Fisheries Information Network (WPACFIN), but it will take some time for the independent countries of the Pacific to develop such data-collection systems at the national level, and a top-down approach is likely to be much more immediately useful.

One of the main initial priorities for this database would be the compilation of catch-effort and yield data from as many different areas and different fisheries as possible, for management-intensive species, particularly invertebrates. Munro & Fakahau's (1993) premise, that one of the most valuable fisheries stock assessment tools is the knowledge of how a particular species has reacted to exploitation in a different area, is sound common-sense. All too often, such information is difficult to come by, particularly in one country from another.

Mariculture research should not be considered a priority for tactical coastal fisheries management-oriented research:

This is not to belittle aquaculture, but to emphasise that research into aquaculture is qualitatively different from research into capture fisheries. Quite simply, aquaculture is not based on natural resources, but is, apart from the basic biology of the organisms under consideration and the markets in which they are sold, far more akin to agriculture than fishing. More relevantly to the present discussion, artificial fisheries enhancement ("reef-reseeding") research in the Pacific Islands region is currently *strategic* (i.e. long-term) research, not *tactical* research, although it holds promise of becoming a tactical fisheries rehabilitation tool in the near future. There is a need to separate aquaculture and fisheries research in the minds of administrators and accountants in case resources become diverted to one at the expense of the other. In the past decade or so, this diversion was in favour of fisheries, and aquaculture suffered, but there is now a noticeable shift in emphasis such that in more than one Pacific Island country, fisheries departmental research has become overwhelmingly dominated by mariculture.

It might be argued that maricultural improvement offers hope for the rehabilitation of overfished reefs as a management strategy, or the hope that diversion of commercial interest into aquaculture will relieve pressure on natural stocks, but these hopes can only address the problems of a few species at best. Prevention is always preferable to cure, and the two types of research activity should be balanced.

Building capacities for tactical research

Continue institutional support for a "task-force" at the regional level, able to perform ad-hoc fishery assessments and provide management advice to Pacific Island countries on request

Essentially a continuation of the role of the SPC Inshore Fisheries Research Project:- a need which is still very much outstanding given the high turnover of manpower at the national level. This task force would work alongside national staff and provide on-the-job training as well as make use of expert staff from one country to help address the problems of another. The trend for heavier and heavier pre-planning of projects to ensure greater control by, and accountability to, donors continues, and this has severely degraded the capacity of regional organisations to respond to fisheries management crises in member countries. Regional organisations *must* maintain some capacity for responding quickly to justified requests for assistance, and not implement purely long-term pre-planned projects.

Follow-up and expansion of national fishery resource profiles, to address the information deficiencies identified by those profiles;

The national fishery resource profiles initiated in Fiji (Lewis, 1985) and extended to each

independent country of the region by FFA, although they are reference documents in themselves, should also be used to identify information weaknesses that need to be addressed in each nation, and should be upgraded periodically through linkage to the Regional Inshore Fisheries Database, and national information sources. In countries whose fisheries administrations do not produce a comprehensive annual report, annual updating of the resource profiles by national staff could be an appropriate alternative way of focussing fisheries monitoring and research activities, and identifying future priorities.

Establish a pro-active regional unit dedicated solely to real-time inshore fisheries information acquisition and dissemination

This would regularly visit and poll countries and regional organisations on work accomplished or under way and reports written, or statistics gathered, on coastal fisheries, and make that available to the others as quickly as possible. This would be, in effect, an hybridisation of the concepts behind the PIMRIS coordinating centre at USP, the FFA Research Coordination Unit and the SPC Fisheries Information Section, but without the RCU's overhead of running a direct expert advisory service to countries, without PIMRIS's concentration on formally published information and library development and with more of a direct information acquisition and "news-gathering" mandate than the SPC information section. This Unit would not substitute for the information functions in any of these organisations, since information processing is an essential attribute of any organisation, but would rather add to one of them, and be constituted with a mandate to require and request information from all fisheries organisations in the region, whether national or international. FFA already has a suggestion of such powers within its constituting Convention.

Such a unit would also act as a general clearing house for non-formal information and first point of contact for scientists outside the region. For example, there is currently a need for up-to-date information on facilities available within the Pacific Islands for performing coastal fisheries research, and on the type of research which countries consider a priority. This could be of great benefit in persuading students and researchers from developed countries both to work within the region, and to perform work that is of immediate benefit to the host country. At the moment, much of this work is concentrated in Fiji and Guam since these countries have universities with academic linkages, but other opportunities exist elsewhere.

Develop other skills relating to coastal fisheries management at the regional level in addition to the current emphasis on biology, fisheries science and information specialists:

The following three major areas stand out:— FFA's Legal Counsel is required to concentrate on EEZ and highly migratory fisheries, but there is a need for a dedicated regional officer to advise South Pacific island nations also on coastal fishery management legislation and regulation. Similarly, the trade control (as opposed to the economic development) aspects of coastal fisheries are not currently addressed by a specialist at the regional level, yet trade plays a significant role in coastal fisheries management, notwithstanding GATT. The social scientific aspects of fisheries management have never been addressed by a dedicated officer at either FFA, SPC or SPREP, but are becoming more and more immediate concerns with the increasing acceptance of the importance of social factors in marine area management, and of the lessons (both positive and negative) that Pacific Island marine tenure systems might have for fisheries management in other areas.

Coastal Fisheries Research by national Governments

This topic is not considered in depth here as a component of the need for Tactical Inshore Fisheries Research, because it needs to be considered separately for each country taking into account their different capabilities and problems, and is thus most efficiently addressed at the FFA/SPC Workshop on the Management of South Pacific Inshore Fisheries Resources. However, the following general points are suggested:—

National coastal fishery monitoring systems are an essential prerequisite for government-mediated management and research:

This is not to say that a large part of national fisheries administration resources should be devoted to the development of formal databases, but that there must be some existing and continuous mechanism whereby fisheries staff can quickly assess what is happening in

national fisheries. There is no point in having a fisheries administration at all if it is not able to quickly assess the results of any actions or decisions that it takes. For small atolls, where the fisheries officer may be personally acquainted with every fisherman on the island, this is not a problem (presuming that this officer communicates his findings back to headquarters, or that he has the responsibility to make management decisions on his own). For large or densely populated islands, more formal systems are helpful, such as annual fishing boat registration (not necessarily "licencing" with its connotations of restrictive permission and fees) systems. As well as providing hard information on the scale of the fishery, such requirements bring all fishermen into the office at least once a year, where they can be asked about their problems or opinions.

Unfortunately, when institutional resources are being "rationalised" it is often the monitoring system that is the first to suffer (if it has not already been wiped out by a previous purge) because these officers do not appear to produce anything directly relevant to the central governmental aim of developing increasing national revenue from fisheries.

National coastal fishery research should be prioritised towards applied responses to problems identified by the national fishery monitoring programme:

As they develop, Pacific Island nations (and there are several SPC members already at this stage) can afford to devote resources to strategic, forward-looking fisheries research (such as the development of new stock assessment techniques, or the systematic development of a permanent cadre of postgraduate-level staff), but it is suggested that smaller countries concentrate their own resources on addressing immediate management problems and emergencies with whatever resources are available to hand. They should also make an effort to concentrate the activities of external researchers on these problems, although they may have to accept that the price of obtaining a measure of directly relevant external assistance is to have to endorse a considerable amount of academic research of more relevance to the external researcher's own goals. Too many Pacific Island fisheries research directions are driven by either the availability of external assistance in a particular field, or local political directives which may, or may not have real-world priority (or feasibility) but which HAVE to be answered. If research "task force" priorities can be defined by the problems identified in the monitoring programme, rather than political or collaborative influences, urgent problems have the hope of being solved much more quickly.

Maintain external information linkages:

In an organisation which has reduced strategic (basic) research activities to a minimum, it is essential to reduce the disadvantage by taking account of strategic research being carried out by others. For example, methodological advances made elsewhere may make it easier or quicker to accomplish the tactical research objectives of the local organisation. Fisheries management is a fairly non-commercial and non-controversial field, and there is not likely to be any lag in information dissemination caused by corporate secrecy or national interest. International personal contacts are usually the most productive, but are not usually comprehensive. A good "window" on relevant research is provided by the SPC Special Interest Group resource-specific newsletters, by ICLARM newsletters such as Naga and Clamlines, and by the bibliographic services available through PIMRIS. Since this is compiled by two regional agencies the following suggestion is perhaps not completely balanced, but it is worthwhile keeping in regular touch with regional fisheries agencies and describing problems and activities to them. Material assistance can not often be given, unless the activity is programmed some way down the track, but advice is freely provided and referrals will often be made to someone working on a similar problem in another country.

Use local communities to make decisions about local resources, where feasible

One constant factor in Pacific Island fisheries is that coastal communities make decisions about the disposition of coastal resources in their immediate neighbourhood. In some islands this community rôle has been eroded almost to invisibility, but it is still in existence. For example in Tonga — a country which is often cited as one where customary marine tenure has been completely superceded by the State — giant clam circles in the Vava'u group are only poached if they are distant from a village. In other words, the village community is exerting control—protection—over giant clams within its area of jurisdiction. This propensity

for local jurisdiction in rural areas can make the life of the Government fisheries manager considerably easier, provided the aims of community management and national management are the same. For example, in Fiji, controls were placed on the bêche-de-mer export industry in 1989 to try and halt runaway overexploitation of resources for export. A conditional ban was placed on the export of the one species (sandfish) that was used as a major local food-source. Initially, grave political problems were encountered in deciding which (if any) export operators would be allowed to export sandfish, and from which areas. Things became a lot easier for the Fisheries Division when later, the decision was devolved to the local level and operators were only allowed to export sandfish from areas where they had the written permission of the registered fishing rights owner to operate. Local action by communities (and government registered fish-wardens) could exclude operators from areas where permission had not been obtained. It became policy in Fiji to allow customary fishing rights owners to decide the disposition of the resources in their area. Some areas are subject to "income-generating influences" particularly in the exploitation of export resources that are not locally utilised, but other areas are more conservation-minded, and the net effect of community control is usually more effective overall management than if Government struggles alone to prevent overfishing.

Devolution of management responsibility to the community level will not remove entirely the need for institutional information gathering and problem-solving research, but it can reduce the scope of some of the management problems themselves. In most cases, there is a need to provide advice and information about resources, particularly non-traditional resources but also to make up for traditional feedback mechanisms and information that may have been forgotten.

Strategic Fisheries Research:-

To quote the ICLARM strategic plan for international fisheries research: "Much research and related activities are being carried out at the national level to deal with fisheries problems. Due to national research policies and scarcity of human and financial resources, most research is of a "fire-fighting" nature, providing short-term solutions and, as a consequence, much of the results are not useful in the long term. The strategic framework is missing." (ICLARM, 1991).

However, since the advent of this ICLARM plan, the Study on International Fisheries Research (World Bank et al., 1992) and the subsequent Strategy for International Fisheries Research coordinated by the International Development Research Centre (IDRC) of Canada, this strategic framework has definitely emerged and been pushed well to the fore. For that reason, we will not attempt even a brief treatment of strategic fisheries research, but would refer the reader to the organisations and documents above.

However, it should be kept in mind that these recent works, in the main, provide strategic plans for *strategic* research, and tend to ignore the continuing need to develop a framework for the ongoing plethora of "fire-fighting", problem-solving, *tactical* research. There has always been a need to focus and prioritise these problem-solving research activities, to prevent activity being wasted on the wrong problems, and to prevent high-priority problems being ignored, and the framework for this is still missing.