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**MAKING BETTER USE OF EXISTING KNOWLEDGE IN MANAGING PACIFIC
ISLAND REEF AND LAGOON ECOSYSTEMS**

by

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SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME

Noumea, New Caledonia

TOPIC REVIEW

MAKING BETTER USE OF EXISTING KNOWLEDGE IN MANAGING
PACIFIC ISLAND REEF AND LAGOON ECOSYSTEMS

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MAKING BETTER USE OF EXISTING KNOWLEDGE IN MANAGING PACIFIC ISLAND
REEF AND LAGOON ECOSYSTEMS

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(i)

ABSTRACT

Management of reef and lagoon resources in the South Pacific will have to continue to rely on less-than-adequate scientific information. Substantial improvements in the management of these resources are possible, however, if more effective use is made of existing scientific information and relevant traditional knowledge and customs. To achieve this the following actions are proposed: 1. The employment of individuals to gather indigenous knowledge of reef and lagoon resources and act as liaisons between government resource personnel and fishermen. 2. An Oceania-wide conference on indigenous knowledge concerning natural resources, plus related coursework in the region's schools. 3. The upgrading of library facilities. 4. The writing of review papers on environmental impact methodology and on mangrove management. 5. The systematic review and evaluation of past and present marine resource development programmes. 6. The greater involvement of land resource personnel in marine resource management.

INTRODUCTION

The nature and extent of marine environmental problems in the South Pacific have been discussed at previous meetings sponsored by the South Pacific Commission and other intergovernmental agencies. Thus there is no need to enumerate once again the numerous stresses imposed by man on Pacific island reef and lagoon environments. In the past heavy emphasis has been placed on the role of research in supplying solutions to these problems. But environmental research, as classically practiced, is a painfully slow and expensive process, and the cost of acquiring precise quantitative scientific solutions to some environmental problems in reef and lagoon ecosystems would be far greater than the benefits derived.

A case in point is the management of reef and lagoon finfisheries. Here we are faced with sets of biological, political, cultural and economic constraints of such complexity as to render the sound scientific management of most reef and lagoon finfish stocks unlikely in this century. If this statement sounds overly pessimistic, consider the shaky state of temperate zone marine fisheries management programs with many decades and many millions of dollars worth of research behind them. Larkin (1979, p. 104, 105) calls the Pacific salmon fishery "the most sophisticated fishery in the world," yet notes the need for "much more sophisticated management" and states that "the only realistic prognosis for salmon is a long and slow decline in abundance." Fisheries in the North Sea are, relatively speaking, exceptionally well-studied, but biologists are still far from able to predict yields satisfactorily and set catch quotas accordingly (e.g. Hempel 1978). Yet orders of magnitude more research has been done on these fisheries than on all reef and lagoon fisheries combined.

Another unmanageably complex problem is that of establishing accurate tolerances of reef and lagoon communities and their constituent organisms

to the wide range of pollutants to which they may be exposed. The number of potential pollutants (even if we restrict ourselves to the most important ones) - multiplied by all the important reef and lagoon habitats and organisms potentially affected by them - yields an array of interactions that would overtax the investigatory capacities of the world's richest nations.

Such considerations dictate that many years will pass before islanders can realistically expect to manage most of their marine resources with scientific rigor. Nevertheless, much scope remains for immediate improvement because economic and environmental management of reef and lagoon resources has not kept pace with available knowledge. (This was one of the main conclusions reached at a recent UNESCO seminar on ecological aspects of coastal zone management in Oceania.) Here I would like to suggest a number of actions that could help remove this major impediment to better management.

EVALUATING PREVIOUS FISHERIES PROGRAMMES

The history of reef and lagoon fisheries management in the South Pacific is a chronicle of disappointments. Although these fisheries are tiny by world standards the problems of managing them are not proportionally small (e.g. Johannes 1981 a,b). Understanding and orchestrating all the biological, political, cultural, economic and technological factors relating to sound management has proven to be a daunting task. Unfortunately there is little to motivate individual fisheries personnel to dwell upon failed programmes, so little has been written about them. A systematic Oceania-wide review and analysis of these projects should be carried out, for it would help prevent new fisheries managers from making old mistakes. In addition, the identification of the key ingredients in even partly successful programmes would help provide useful positive guidelines.

Such a review would probably reveal, for example, that it is easier to monitor and manage a fishery successfully in which the catch is used exclusively for export. This is because export catches usually go through a central market and often consist in Oceania of just one, or, at most, a few species. These factors greatly simplify the gathering of reliable catch statistics. In addition many export species are sedentary invertebrates (e.g. trochus, green snail, beche-de-mer, black coral, rock lobster) and thus easier to monitor in the field than most finfish populations.

The question follows as to just how much of the effort that has been put into the collection of finfish catch statistics has actually paid for itself in terms of improved management. I suspect the answer is "very little." Usually just a small (and often non-representative) portion of finfish catch from reefs and lagoons goes through readily monitored distribution channels and the data derived therefrom often seem to be of marginal value. The scope for cost-effective assessment is very limited in a multi-species, multi-method, multi-habitat, multi-island fishery annually worth only a few hundred thousand dollars (in some cases much less), particularly as this is only one of several expensive activities involved in management.* If a review of reef and lagoon fisheries management supported what I am suggesting here, fisheries managers might consider more productive deployment of some of the money and manpower presently used to gather finfish catch statistics.

EXPLOITING INDIGENOUS KNOWLEDGE AND CUSTOMS

It is not uncommon for island fishermen to reduce their fishing efforts because of stock depletion before the fisheries manager's statistics are seen to indicate that overfishing has occurred (e.g.

* A more optimistic view of what might be achieved in assessing small scale fisheries is presented by Welcomme and Gulland (1980). Anyone interested in the subject should read their thoughtful article. But many Pacific island fisheries seem too small for even these prescriptions to work well.

Johannes 1978a, 1980a). This is one of many examples of the fact that local knowledge is often superior to available research findings. It is also relatively cheap to obtain. The reef and lagoon resource manager is generally aware of this, but he and his staff are usually too busy with other duties to seek out this knowledge systematically. Casual conversations at the dock are not enough.

I believe that every island group should have at least one carefully chosen individual whose sole responsibility is to learn from fishermen and serve as liaison between them and government planners and resource managers. Often such work requires living in fishing villages for weeks or months at a time (see Johannes (1981c) for a discussion of some of the practical aspects of such work). It is important that such efforts begin soon. Pacific islanders' knowledge of the sea, although exceptionally rich, is fading fast. Allowing it to vanish amounts to throwing away the results of centuries of priceless research.

One country report prepared for this meeting contains the following statement concerning reef and lagoon management; "Traditional controls appear to be effective in areas away from the thrust of modernity, where local government is still effective." This assertion reflects a growing awareness of the value of traditional controls and traditional village authority in environmental management in the Pacific islands (see also Johannes 1978a, 1980a, 1981a). More effort seems desirable to record and evaluate these customs and to promote educational and political efforts to help shore them up where they are seen to be of continuing value. This could be one of the functions of the proposed liaison workers.

Elsewhere I have described a means by which fisheries managers could reduce pressure on overexploited stocks and increase pressure on underutilized stocks by making use of fishermen's knowledge of the times and

locations at which many reef food fish aggregate to spawn (Johannes 1981b). People in coastal villages are also valuable sources of information on pollution and other kinds of environmental degradation. But Pacific island fishermen who are concerned about a local pollution problem often do not know whom to alert, or feel that they would be ignored if they spoke up.

In one island, for example, a group of fishermen were upset about a planned causeway because it would block the spawning migrations of their most important lagoon food fish. Government causeway planners became aware of the problem only by accident and not until the causeway was already under construction (Johannes et al. 1979). Elsewhere, island fishermen became angry because dredging and filling interfered with important tidal migration routes and spawning aggregation sites of lagoon food fish (Johannes 1978b). Such important sites can rarely be discovered by means of conventional environmental impact studies, but are common knowledge to fishermen. These fishermen pointed out that if anyone had just asked them, they could have helped find alternative sites where construction activities on the reef would have done less damage. A person acting as liaison between fishermen and government could tap such presently wasted expertise.

Recently a conference was held in Port Moresby on traditional conservation practices in Papua New Guinea and their implications for today (Proceedings listed under Johannes 1981a). The value to resource managers of tapping the extensive specialized local knowledge of traditional hunters, farmers and fishermen was made abundantly clear at this excellent meeting. A similar Oceania-wide conference is desirable in order to focus attention on the value of gathering and recording of such information. A formal means of gathering such information should also be built into the curricula of the institutes of higher learning in the South Pacific (see Appendix A).

IMPROVING ACCESS TO RECORDED INFORMATION

A good resource management programme cannot exist in the absence of a functional library. Much of the essential literature relevant to management of local reef and lagoon ecosystems is obtainable in libraries in some Pacific island population centers. But in others library facilities are poor. In some instances even locally produced reports are unavailable in the government agencies that produced them because they have been lost or misplaced.

It is not difficult nor expensive to set up and manage a modest natural resource library. (At the institution where I work, which employs fifteen researchers, a secretary untrained in library work devotes about half a day per week to our library and keeps it running smoothly). Lack of appropriate literature is more often due to no one bothering to centralize and organize it than to lack of manpower or money for the purpose. Much relevant published literature is available free in the form of reprints of journal articles available upon request from the authors. Even the smallest countries should subscribe to Current Contents in order to keep up with this literature. The subscription cost could be shared by the government agencies that used it (e.g. fisheries, land resources management, agriculture). The South Pacific Commission might help by providing monthly mimeographed or microfiched listings of current relevant publications and reports.

Opportunities also exist for rendering existing information on island marine resource management more useful by means of published reviews. Several SPREP country reports mention, for example, the need for guidance in carrying out environmental impact studies (EIS's). EIS preparation has been the subject of a burgeoning literature recently. But no guidelines seem to be available in which the special ecological conditions characterizing Pacific island ecosystems nor the relevant local socioeconomic factors are taken into account. There is, however, a

growing volume of individual EIS reports for various South Pacific islands. These reports and the more general literature on EIS methodology could be used to help formulate a useful set of guidelines for preparing island EIS's.

Bibliographies of marine research literature pertaining to the local geographic area exist for some island countries but are still needed in others. Such compilations are of great value to librarians, resource managers, researchers and consultants.

A number of island countries have in their SPREP country reports expressed a wish to know more about how to manage mangrove communities. The need for a comprehensive review of the scattered, hard-to-locate literature on this subject is acute. Perhaps the SPC could support the writing of such an article by a mangrove expert.

ENLISTING THE SUPPORT OF NON-MARINE GOVERNMENT DEPARTMENTS

Land based activities often have major impacts on reef and lagoon resources. (This is why the State of Hawaii defines its coastal zone, for management purposes, as extending inland to the tops of its mountains). The understanding, expertise and cooperation of land resources and public works personnel is therefore essential to good marine resource management. In this connection I have already mentioned one problem that can arise when marine dredging and filling is carried out by public works people who are unaware of its potential marine ecological impact.

A pervasive problem around high islands is the smothering of reef communities by silt arising from terrestrial erosion brought about by man's activities. One activity that seems sure to exacerbate this problem is cassava farming. It is expanding rapidly on some Pacific islands because: 1. cassava grows in soils that are marginal for most other crops, 2. less labor is involved in growing it than in growing traditional root crops, 3. it is used as a substitute for taro in areas

hit by taro blight. In addition, cassava is being promoted as a source of alcohol to reduce island dependence upon imported fuels.

Unlike most traditional root crops, cassava thrives on steeply sloping land. Clearing such land poses severe erosion problems. The effects on fringing reefs of erosion and sedimentation due to cassava farming are already evident in some areas. Marine resource managers should consider enlisting the expertise of agricultural authorities in combatting the problem by promoting better erosion control.

CONCLUSION

Most of the proposals discussed here could be carried out effectively using skills and knowledge drawn from within the SPC region. This emphasis is intentional, not only because it is consistent with islanders' frequently expressed desire for greater self-determination, but also because the undervaluing of local expertise has clearly hindered Pacific island natural resource management.

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A P P E N D I X A

(The proposal outlined below for Papua New Guinea institutes of higher learning could also be applied to the University of the South Pacific and the University of Guam. It could also be used in island primary and secondary schools - as it has been already by a few enterprising island teachers).

EDUCATION FOR WISE USE OF NATURAL RESOURCES IN PAPUA NEW GUINEA

Much of what we know about the natural resources of developed countries can be found in libraries. In many developing countries, however, a large portion of this knowledge is found only in the heads of certain older men and women. Scientists are belatedly discovering that such information, concerning the bush, the garden and the sea, assumes encyclopedic proportions in countries like Papua New Guinea, and is superior in some important respects to that of western science. In many cases, however, it is no longer being transmitted effectively, often being lost as its owners die.

Among those citizens who know least about such things are the young members of the highly educated elite whose learning years are spent far from their villages. Ironically it is these very people who will be most responsible for determining patterns of natural resource use and conservation in their villages, the provinces and in the capital in years to come. Their technological and economic sophistication cannot possibly be put to best use in the absence of the vital knowledge of their natural resources possessed by their elders.

An example : modern fishing gear and sound business management cannot be used efficiently to upgrade fisheries if no one remembers where and when the fish can be found in abundance and which fishing methods are appropriate to which species and environmental conditions. Who knows as much about this as the village elders, the only custodians of centuries of accumulated experience and knowledge concerning the local reefs and lagoons, the movements of the currents and fish, the changes that come with the tides and the seasons ?

Institutes of higher learning in developing countries have a responsibility to help retain such knowledge. Its absence from their curricula amounts unintentionally to a tacit assertion that it is no longer worth learning. Yet its effective transmission cannot be achieved entirely in a typical classroom setting. So what can be done ?

I would like to suggest that a course on traditional and contemporary use of natural resources be made mandatory for all students in this country's institutes of higher learning. As one of the course requirements each student would be asked to submit a report describing some aspect of traditional resource use in his or her village. The necessary research might be carried out during Christmas break when many students return home. Copies of these reports would be kept on permanent file where, collectively, they would grow to become a large and unique source of traditional knowledge.

I stress the importance of such training for all students - not just biology, agriculture and fisheries students, but also students of law, business, political science, engineering, education. All of them need to understand the nature and limits of their natural resources, for within a few years they will be the ones who make the important decisions concerning the uses to which these resources are put.

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