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FISHERIES RESEARCH IN THE SOUTH WEST PACIFIC: A SUMMARY OF SOME OF THE PROBLEMS

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1. Problems associated with the design, implementation, analysis of results and the documentation of fisheries research programmes in the island countries of the south-west Pacific are presented.

2. Priority areas that require attention in the region include; an improvement in training facilities on a national and regional basis for personnel involved in all aspects of investigation, exploitation and administration of the fisheries sector, attempts made to identify, analyse and document in-country historical data that presently is inaccessible, promote regional dialogue and co-operation, promote the dissemination of relevant literature throughout the region and advertise and promote contacts between fisheries officers and experts in various aspects of fisheries exploitation in the region.

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INTRODUCTION

Fisheries research in the South Pacific should be easy for those so motivated to carry it out. There are not many areas outside the Indonesian/Philippine Archipelago that equals this region in terms of abundance and diversity of marine organisms. In most seasons the climate is amenable to field work and a marine resource investigator could satisfy himself for many years on almost any shore he chose to establish himself.

In terms of western science's knowledge of the marine organisms from this area, rapid expansion has only commenced in recent times. This is a reflection of changing attitudes of island country administrations to marine resource exploitation. An increasing presence of western technology introduced in order to efficiently harvest resources for competitive international markets, or merely to compete against imports of similar produce from outside the region, has put demands on local resources not experienced under traditional patterns of exploitation.

Present day resource managers have had access to an increasing amount of literature produced over the last decade detailing the wealth of knowledge island communities have of the marine resources in adjacent waters. This knowledge was reflected in the traditional activities of coastal communities who relied on the resources as a source of food or as a basis for commerce and spiritual contemplation.

It has been suggested that most island peoples recognised the finiteness of these resources and their harvesting activities were structured so as to ensure the long term resilience of the resource. However, there is evidence, that at least in some Pacific communities, such considerations did not always apply and resources were conserved as a consequence of the economic work practices of traditional societies, not as a result of formal policies with conservation in mind.

It is widely recognised that as an area of increasing interest for the commercial exploitation of marine resources, very little is understood about the biology of the resources and their responses to various harvesting strategies. This resulted in the May 1985 Forum Fisheries Committee Meeting directing the Forum Fisheries Agency (FFA) to commission a study of inshore fisheries research needs of the South Pacific. The Canadian International Development Agency (CIDA) Management for Change Programme and the International Centre for Ocean Development (ICOD) funded these studies, Fakahau and Shepard, (1986) and Evans, (1986). There are not many such large areas of the world's oceans, or as many countries within such a region, that will come under the influence of the deliberations of comprehensive reports such as these.

The reports concluded that most island states in the region have not identified current problems with the management of their fisheries clearly enough to indicate the type and scope of information required to improve their fisheries management capabilities. This is partly a consequence a policy of seeking to survey and develop potentially valuable resources and generate

a cash flow before considering management. As a result, in many instances, data requirements and fisheries analysis have not been a priority.

Limited financial resources and the relative scarcity of fisheries analytical capabilities have led to the development of "cart before the horse" policies with respect to the managed exploitation of marine resources in the region. Rarely has the development of a resource been sufficiently well documented to trace in fisheries science terms, the response of the resource to changing exploitation patterns. As a result present day management guidelines based on historical data are difficult to define.

However, partly as a result of the expansion of two fisheries in the region over the last fifteen years, this situation is changing. The development of commercial tuna fisheries was the first to make apparent the need for resource management policies based on the systematic collection of data from a fishery as it developed. The resources necessary to do this were first established in Papua New Guinea (PNG) where investigations were concerned with the tuna resources as well as the baitfish resources essential for the operation of the pole-and-line method of fishing.

The second fishery in the region that is starting to receive a similar amount of attention is based on the offshore reef slopes which are currently fished by handlines and vertical droplines. On an individual country basis, other resources have been the subject of quite detailed research. This is particularly the case in PNG where commercial fisheries for prawns, barramundi and spiny lobster have been monitored by biologists for a decade or more.

Some Obstacles to Fisheries Research

Generally speaking, fisheries research programmes anywhere involve four phases. They are:

i) identification of the objectives of the research;
ii) the formulation of a strategy to achieve those objectives;
iii) implementation of the programme; and
iv) documentation and dissemination of the results which may include a proposal to develop a sensitive monitoring programme.

No matter where a fisheries research programme is to be developed, there are bound to be problems associated with its implementation. However, we should be encouraged by the apparent recognition of the requirement for biological data for the management of fisheries resources of the region and be aware that the means for the development of effective and flexible management strategies will not occur rapidly.

Social, political, economic, bureaucratic and ethical constraints will often discourage biological research. Problems with the supply of equipment or unco-operative fishing communities contribute to a situation where training in fisheries assessment techniques at tertiary level is handy but by no means the only skill required by scientists. Some basic understanding of psychology, diplomacy and a large amount of patience are useful

attributes for fisheries researchers planning work in this region. Some problems that may be encountered in the region are discussed below.

Considerations in Project Design

An important consideration during the design of fisheries research programmes, is an understanding of the culture and social structure of the fishing community with which the research is involved. It is important to identify the user groups and be able to describe the interaction of different groups who share the resource. It would be useful to be able to quantify the effect of harvesting the resource by one group and the implications of this for other users.

In many traditional Melanesian communities at least, any individual is only sporadically engaged in fishing. When a clan, family, village group or an individual requires cash for school fees, the purchase of a new outboard motor or the like, fishing may be one of the activities they become involved in to accumulate the necessary cash.

Generally, it can be expected that cash earning effort will be directed towards the greatest return for least effort. In Pacific Island countries for example, when a greater return for effort can be obtained processing copra, fishing activity may be depressed and vice versa. Once the cash target is attained, the cash earning activity is reduced, and in the case of fishing, returns to subsistence levels. As different needs in a community arise, men, women and children continually enter and leave the pool of participants in the activity offering opportunities to accumulate cash while social, especially religious commitments in the village often dictate the time available for productive work effort.

One of the first tasks of any research or survey program is to establish what resources can realistically be assumed to be available for use for the duration of the programme. If only one outboard motor is available for a 1 - 2 year sampling programme, and as is often the case, maintenance services are unreliable, then it is pointless to design a sampling programme that would be adversely affected by motor breakdown. With experience, most researchers become familiar with basic mechanics, not only of outboards, but a whole range of mechanical tools that may be utilised by researchers, e.g. compressors, diesel engines, electric tools, dive and fishing equipment.

Unfortunately, limited financial resources preclude the luxury of establishing cashes of spare parts that may be required in the event of breakdown. Also unfortunately, many retailers of essential equipment in remote areas can not afford to carry large inventories of spare parts, resulting in long delays as necessary parts are ordered, in many cases, from the parent factory overseas.

Data Collection

In most cases it is unrealistic to expect reliable data to be collected by the fishermen themselves. For example, PNG's lagoon fishermen's perception of time is always a source of debate, as a "long taim liklik", in pidgin-English may range from 1 hour to 10 hours, and very few fishermen carry time pieces. Individual

fishing expeditions may involve 4 people at the start and they may be joined by 2 or 3 others half-way through the exercise. A handline fisherman can usually recall the depth he fished by the number of standard 40m lengths of fishing line he used. However, he may commence fishing with two hooks on a line, to have one lost midway through the fishing trip after which he continues fishing with one hook.

In addition, fishing expeditions may involve the use of a variety of gears. Spears, nets and handlines are common combinations used during any one fishing trip. In such situations, effort is very difficult to standardize and as a result, indices of abundance normally calculated from catch/effort statistics are difficult to derive.

Although the best site to monitor the catch of artisanal reef fishermen is at a central landing depot, problems also occur there. To begin with, it is not unusual for island fishermen to attempt to sell their catch at local produce markets, or elsewhere within urban centers, where prices are usually better than those offered at government or privately operated fish depots. In many cases, fishermen attempt to sell the unsold portion of their catch to the depot, where no indication of the size or composition of the original catch is possible. Even at the depot, some fishermen retain a portion of their catch for subsistence consumption, which unless specifically asked about, is overlooked.

One of the main problems identified by Fakahau and Shepard (1986) and Evans (1987) was the lack of suitably trained staff to direct, or even assist with data collection and analysis. It is important that people involved in the sampling programme have an appreciation for the objectives of the exercise and the requirement to maintain the defined procedure.

Species identification is always a problem and is not limited to national fisheries staff. Up-to-date keys to assist with identification are often difficult to obtain and, in any case, many staff find taxonomic keys difficult to use. To assist with species identification, fish charts have been produced for a number of countries in the region and should at least allow data recorders to assign a fish to a group or family. However, this is still not ideal. With many artisanal reef fishermen in the region harvesting 200 - 300 species over a one year period and with any one catch comprising 20 species or more, it is a problem that will not readily be solved.

Data Analysis

Many fisheries research units in the South Pacific now have access to desktop computing facilities. However, they are not always available close to the site of data collection and thus data entry to a suitable database is frequently carried out in job lots by people not familiar with the data. This is one reason why forms designed for data recording should be clear and amenable to the transfer of data to a computer screen. Data entry to a suitable database on a computer is a large source of error that can adversely effect results.

With many databases, errors can be reduced by clearly defining the range acceptable to any field on data entry, duplicates can be removed automatically and entry can be made in batches which

are checked for validity before they are appended to the main database. However, all this requires some computer literacy and it is in this field that this region needs some major impetus.

Training programmes dealing with micro-computing should be a priority for fisheries officers who have access to computers. It would also be beneficial if computer hardware and software compatibility throughout the region could be promoted and assistance sought to provide computing facilities to fisheries departments currently lacking them.

Analysis of data using micro-computers has been greatly assisted by recent software developments. There are now a number of packages available that utilise length-frequency, catch-effort, tag recapture and other information to assist with defining patterns in fisheries related data. There are also many packages available that assess data validity by various statistical techniques.

All such tools are extremely useful when used rationally. When used indiscriminately and without appreciation for the limitations for the programmes themselves, major flaws that may not be immediately apparent could be present in the results. Serious consideration should be given to the analysis of results using computers and when possible the results validated using more than one technique. The philosophy of being content with a result just because it is that, a 'result', and failing to query its accuracy as a reflection of the actual situation is condemned.

Traditional methods of length-frequency analysis to determine growth parameters relate to assigning relative ages to peaks in length-frequency distributions and linking these peaks arranged in time. Problems with applying both these techniques relate to identifying periods of recruitment and identifying related modal peaks.

Such problems are amplified in this region because of the variety of gears used to draw the catch sampled from the natural population. Also, recruitment of many reef fish occurs throughout the year with one, and not uncommonly two peak periods of recruitment, for which the influencing factors are poorly understood. Problems estimating growth parameters may be partially overcome as otolith reading techniques are refined or if tag/recapture programmes are implemented in an attempt to validate growth estimates from analysis of length frequency data.

The relationship between yield, effort and species composition at a number of locations using a variety of gears also requires assessment. It would be ideal, but is increasingly difficult, to experimentally fish virgin stocks to provide baseline information on gear selectivity and catchability and to compare them with the exploited situation. In the long term it is also necessary to determine how species interact in an attempt to explain fluctuations in species abundances. This would provide some indication of the likely effects of exploitation on species composition.

Once the major problem of data analysis is surmounted, (and it is a major problem as most national fisheries organisations have accumulated unanalysed data secreted away in storage), there are also problems associated with documenting the work.

Project Documentation

The unfortunate situation exists that besides poor literacy in data analysis, many fisheries staff face severe difficulties when trying to translate the history and conclusions of their investigations into a written form accessible to others.

This problem was identified by Fakahau and Shepard (1986), Evans (1986) and Shepard and Onorio (1987) and relates to the limited training and educational facilities available in the region. Many training institutions do not effectively liaise with government fisheries organisations or with personnel involved in the fishing sector. As a result they fail to critically assess how their training programmes can best meet the requirements of government and private interests in the efficient development of the fisheries resources of the countries in the region.

In addition, most people working in this area have come to expect documentation to occur in the English language and overlook the fact that throughout the South Pacific, English is only the second or third language used to communicate. If documentation in the mother tongue is encouraged there may be problems with the translation and dissemination of the material internationally, but the overall standard of recording may be improved. In fact, the PIMRIS proposal did incorporate a facility to provide translation services. However, it does not mean training in the English language should be neglected; on the contrary, it should be encouraged.

Applying the Results and Conclusions

Once manuscripts of the work are finalised, more often than not they are relegated to shelves or cupboards to gather dust. The dissemination of information in a written form to colleagues, fishermen and other interested parties is of paramount importance. Unless this is done the financial and other resources expended on data collection and analysis are wasted.

In some countries, the infrastructure is established to publish research results and other items of interest in a form readily understood by extension workers and others involved in the primary industry sector. Researchers in the employment of the government should also be encouraged to publish details of their work in more technical journals which are circulated within the country and internationally.

However, in the current climate of budgetary constraint, research that is not gauged to offer the potential for socio-economic benefit to countries will be one of the first areas of government activity to be trimmed. Resources dedicated to publishing the results of government sponsored research will suffer a similar fate.

Regional organisations can help fill the void that would result if this occurred by assisting to publish the results of in-country research and when possible, distributing relevant publications to countries who have similar research interests. In this way, some duplication of research effort could be avoided.

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In many situations it is difficult to apply the results of research projects because of non-existent or obsolete legislation necessary to implement the management practices suggested from the research.

The Fisheries Acts of many countries were drafted by colonial administrations and are now in most cases, out of context with the present situation of independent states with jurisdiction over 200 mile exclusive economic zones. Many countries are aware of this situation, and are currently revising their laws relating to marine resource use.

Another by-product of the colonial era, but of decreasing influence, is the short term contract employment situation offered to expatriates. Such people find they often enter a situation where the previous occupant of the position had also been on short term contract. He may have policies based on his education and experience that differ from his predecessor and unless the government has accurately defined guidelines, little forward progress becomes evident as contracts role over.

A three-year attachment period for counterpart staff is usually not sufficient for professions that justify the recruitment of expertise overseas and so effective localisation has been slow, although most countries in this region now have national staff in charge of government fisheries-related institutions. However, every country, developed or developing, requires some imported expertise. It is just unfortunate that those recruited to developing countries tend to stay for shorter periods than if they were moving between countries of similar situations to their own.

Despite such problems, which as mentioned above are not all confined to the south-west Pacific, this region offers enormous potential in the field of fisheries research. This research should be designed to provide some assistance with immediate requirements in the short term but should also recognise that sound management options can only be developed after exhaustive long term study. Provided in-country expertise can be developed to carry out systematic research, large advances in our knowledge of the marine resources of the region will occur. Coincidentally, the information base necessary for the efficient management of those resources as they are exploited by changing harvesting strategies can be improved.

A Summary Of Requirements

Generally:

i) Improve training facilities on a national and regional basis for;
   - fishermen,
   - extension officers,
   - administrators,
   - scientists and support staff, and
   - industry at all levels.

For example, run workshops for scientists to promote four phase development of research programmes promoting where possible uniformity and compatability of techniques;

ii) Document existing unanalysed data;

iii) Disseminate in-country work of regional interest;

iv) Promote between country dialogue and co-operation;

v) Promote dissemination of relevant literature through the region;

vi) Advertise and promote communications among regional and international expertise;

vii) Convene workshops to advise specific research programmes. The IFR Workshop is a useful precursor to this concept; and

viii) Promote dialogue between fishermen, extension workers, administrators and scientists.

With respect to priorities in the development of a fisheries research programme (not necessarily ranked):

Initially;

- develop a guide to data requirements/tools necessary list and then structure the programme,
- develop user-friendly taxonomic keys,
- promote records of species/effort data for indices of abundance,
- document gears and fishing methods in the fishery under study,
- promote the collection of species/length frequency data by gear type and habitat,
- promote age studies,
- promote the collection of socio-economic data relating to the resource users,
- research traditional use of the resources exploited by the fishery, and
- promote documentation of the programme as it progresses.

Intermediate to long term needs;

- assess present and develop new models that use length/frequency data,
- utilise different methods in an attempt to validate results from initial estimates,
- develop empirical models to relate yield, effort and species composition,
- determine spatial structure of exploited stocks,
- determine gear selectivity,
- study inter-specific relationships,
- study feeding ecology,
- study reproductive biology and recruitment patterns,
- develop trial, practical management plans, and
- document results and promote dialogue with fishermen, extension workers and administrators.

In the long term;

- establish a sensitive monitoring programme,
- develop management models that cater for changing conditions in the fishery, and
- maintain contact with fishermen, extension workers and administrators.

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