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Coastal Fisheries in Papua New Guinea

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Abstract

The subsistence fishing activities of the Labu Butu village south of the Markham River, Morobe Province were documented by recording the catches of 12,399 fishing trips for 26 months, representing over 82,000 hours of fishing. From these observations the annual catch was estimated at 15～34 tonnes of prawns, 41～75 tonnes of finfish and 10～15 tonnes of larval fish. The larval fish fishery had the highest catch rate at 5kg/hr/person versus 0.7kg/hr/person for finfish. Much of the lime used in the chewing betel nut is manufactured by Labu women from shells collected in the Labu estuary. Annual production was estimated at over 30 tonnes.

The Labu fishery uses a variety of equipment that are generally not species or size selective, in several locations to fish a diverse tropical fish assemblage. This is probably an important factor in maintaining a high catch per effort. This balanced approach to exploitation serves as an equilibrium between subsistence fishermen and their resource. Market incentives which influcence catch size or composition should be preceded by research on fish community structures and biological productivity of the system.

Marine resource development and management schemes in development countries need to be designed with consultation with local users of the resource and with an understanding of the biology of the resource. Tackling resource management problems at the village level is encouraged. Collaborating with villagers provides oppotunities and difficulties quite unlike those encountered in more conventional environmental studies.

Suggestions are given of how working with artisanal fishermen can yield otherwise inaccessible insights into such matters as: unappreciated resource areas and their vunerability to damage through coastal development, important aspects of the biology of target species, relevant local oceanographic phenomena, the local cultural palatability of proposed management schemes and local traditional conservation practices of continuing value.

Joint research efforts increase the knowledge available about the local conditions and help the development and management of Papua New Guinea resources.

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Coastal Fisheries

Along the coast of Papua New Guinea, many small fishing communities exist in a limbo somewhere between traditioal and modern society. It is easy to treat the continuity of traditional fishing as a mere ethnographic curiosity. Many tourists who have visited fishing villages no doubt remember them as being full of happy villagers enjoying the good, simple life. Admittedly, the natural beauty of some village settings helps to produce this kind of tropical beach fantasy.

However, a less excusable set of myths consistently appears in the work of economic specialists who have made fisheries development their primary concern. Their discipline is grounded on an *a priori* commitment to change, largely in the form of technical innovation. The justification for this approach is the familiar argument that because of competition with more advanced technologies, the disappearance of traditional fishing is a forgone conclusion.

Fishing traditionally supplied the bulk of the animal protein for human consumption in many coastal areas in the tropics, but in the past few decades this has changed. The introduction of new fishing technology has led, at least temporarily, to increased landings in many areas. But an increasing percentage of the catch is usually exported, while increasing quantities of lower quality processed foods are imported. In other countries this has contributed to a marked deterioration in local diets and has also led to the increasing impoverishment of many traditional fishermen (FORMAN, 1970; NIETZCHMANN, 1973; CORDELL, 1973; ALEXANDER, 1975; KENT, 1976; LAWSON, 1978; ANONYMOUS, 1978; SMITH, 1979; JOHANNES, 1978a; 1981).

One might guess that, under the circumstances, marine research and resource management in Papua New Guinea would focus on protecting traditional fisheries and putting more locally caught fish in villagers' mouths. This has not generally been the case. Traditional fisheries are usually part of a very localized system of exchange that often does not involve money. Even where it does, this rural cash flow rarely shows up in government economic statistics gathered in cities. And where there are not enough visible dollars to articulate a need, the economic system fails to identify that need (KENT, 1976).

The subsistence fishing activities of the Labu Butu village south of the Markham River were documented by recording the catches of 12,399 fishing trips for over two years, representing over 82,000 fishing hours. The annual catch of finish ranged from 41–75 tonnes. Four species, *Liza macrolepis, Lactarius lactarius, Pseudosciaena weberi and Otolithes argenteus* were most frequently caught representing 15.4%, 13.3%, 11.8% and 10.1% of the catch. Thirty–six taxa gruops were commonly caught, representing over 99% of the recorded catch. Most of the fish were caught at the mouth of the Markham River and in the open sea offshore. Owing to the use of small sailing canoes,

fishing in the open sea is seasonal and dominated by the winds. Most of the offshore fishing occurs from December to April/May.

Scoop nets are the most common method of fish in the day, handlines at night and gill nets during both periods.

Many of the fisheries are seasonal. Mullet were most abundant May/June although there was a large variation in catch rates between years. The value of the finfish catch is about K200,000 to K365,000.

The prawn catch dominated by *Metapeneaus demani* and *Macrobrachium* ranges from 15–34 tonnes per annum and worth K14,000 to K30,000 p.a. The larval fish fishery had the highest CPUE at 5kg/hr/person versus 0.7kg/hr for finfish and 2.0kg/hr for prawns. The larval fish fishery has the most distinct seasons. Over 8 tonnes of larval guedgons, *Ptereleotris*, are caught per annum using scoop nets. The fish are caught near the month of the Markham River for three days after the new moon from May to November. Larval gobies, *Sicyopterus*, are caught at the mouth of the Labu estuary after periods of very heavy rains. Larval eels such are *Anguilla obscura* and *A. bicolor* were less abundant and irregular in their occurrence. The total larval fish catch per annum is estimated at 10–15 tones with a local market value of K10,000～K15,000.

Finally, much of the lime used in chewing betelnut is manufactured by Labu women from gastropod shells collected in the Labu estuary. The shells are cooked in sago wood fires on the beach and processed into "edible" lime which is sold in the market. This lime is preferred as it weaker than lime made from coral. The annual production is over 30 tonnes and is valued at K120,000.

This study documented the subsistence fishing of only one village with a populations of 750 people. The mean annual local market value of their fisheries is K300,000 to K500,000 or about K400 to K650 per person in the village. Of course not all is sold at the market, as much is locally consumed. I suggest that this productivity is not unique. There are many fishing villages along the PNG coast and their contribution to the economy and their fisheries knowledge has been greatly underestimated in the past.

There are few examples of how to develop coastal marine resources in the tropics. There are many showing how not to develop the resources. Basically, the criteria between the two are: 1) fish stocks must not be depleted, 2) nationals should ultimately run fishery at all levels, and 3) adverse social effects and cultural erosion should not be a consequence.

The reasons why there are so many bad examples are many and complicated. Biologically, the fisheries are very different from those in the temperate waters where much of industrial fishing technology evolved. In temperate coastal waters and the open ocean, biological productivity is channeled into comparatively few edible species. Only a few different fishing techniques are needed to harvest this production. The productivity of shallow tropical marine communities is, in contrast, channeled into a myriad of different edible species. Over 100 species of marine animals are eaten by the local Labu Butu

people. Many different fishing methods are therefore required and the process is inevitably less efficient. There are greater number of species in the tropics and very little knowledge of the biology on many of them. It has been said that the Hawaiians of Captain James Cook's time knew more about the fishes of their islands than is known today (GOSLINE and BROCK, 1960). their islands than is known today (GOSLINE and BROCK, 1960). Traditional island fisherman can provide a wealth of valuable information on some aspects of the biology of the species they harvest (JOHANNES, 1978a). Obtaining this information requires less time and money than by conventional biological research methods. Here I will discuss, 1) some examples of the useful insights that can arise when biologists seek the knowledge and advice of fishermen or examine their traditional patterns of resource use, and 2) some methods and pitfalls peculiar to marine biological research involving human Intermediaries, i.e. fisherman.

1 Examples of what can be learned from traditional fishermen

1.1 Traditional Marine Conservation Methods

Most governments and fisheries agencies in the tropics have not fully recognized that traditioal coastal fishing systems have a demonstrated potential for sustained yield and employment that should be the envy of many temperate zone fisheries managers. Centuries ago Papua New Guineans developed almost all of the marine conservation measures that industrialized nations developed with in the past 80 years (JOHANNES, 1978a; 1981). The most important of these, reef and lagoon tenure, is a form of limited entry. Considered by many fisheries experts to be the cornerstone of sound fisheries management, limited entry systems have nonetheless been eroded or destroyed in many island groups by colonialists who did not understand their value.

1.2 Stock Assessments

ROEDEL (1979) has noted the need in small scale tropical fisheries for "a simple to apply quick–and–dirty way of getting first approximations" of stocks and their populations dynamics. Fishermen often possess information that could be useful in this context. They often know, for example, the seasonal migration paths taken by some important species, such as mullet and mackerel. They sometimes also know the spots and times at which a wide range of species aggregate to spawn.

1.3 The impact of coastal construction on migrations of fish

The disruption by dams of the migrations of spawning and juvenile salmon and other fish is common knowledge in the temperate zone. But it is not generally recognized that because many reef and lagoon fish also migrate that their movements are likewise vulnerable to disruption by dredging and filling in coastal waters. The pathways of some of these tropical species may be well known to local fishermen.

1.4 Local hydrography

Knowing local currents, their seasonal changes and their influences on navigation and fish movements, is second nature to the artisanal fisherman. Native fishermen on several small islands in the south western Pacific are intimately familiar with a particular island wake pattern that has never been described by physical oceanographers (JOHANNES, 1981). Such currents strongly influence the distribution of tuna and certain other species near these islands. Fisheries resource managers who do not avail themselves of this kind of information impose unnecessary difficulties on their work (ANON. 1978).

1.5 Fish Systematics and Biology

Time and time again, biologists have been excited with the capture of what was assumed to be a rare species, only to learn that local fishermen know the species well by vernacular names (BULLIS, 1978). The taxonomic expertise of tropical fishermen is sometimes formidable, but tapping it often requires learning their classification system. Asking fishermen to give the derivations of the local names of fish sometimes yields information concerning their biology; these names sometimes allude to their behaviour, diet, habitat or the means by which they are best caught (JOHANNES, 1981). Such information is often not found in any journal; our scientific knowledge of most tropical food fish is meager. Moreover, the costs of obtaining it using more conventional research methods would often be greater than the value of the fishery to which it were applied.

2 Some suggestions for working with artisanal fishermen

Working in Villages according to a neat timetable is often impossible. Fishermen are only available when they are not fishing or engaged in other essential village activities. The researcher must adjust his or her schedule to theirs. More time must therefore be allotted to such work than might at first seem necessary.

Traditionally, fishing has been a prestigious activity in Papua New Guinea and good fishermen are often proud of their knowledge and careful to transmit it accurately. It would be very misleading to give the impression that even under the most favorable conditions one can obtain valuable information from fishermen simply by sitting down with them and saying "tell me everything you know". In some areas where considerable knowledge about the sea exists, local customs may prevent its being readily discussed. Even in the absence of such cultural impediments, fishermen cannot be expected to volunteer much valuable information if the interviewer is not clear in his own mind about what he is searching for. Making the most of the knowledge and perceptions of villagers concerning their fish and fisheries requires living in their village for extended periods of time and gaining their acceptance by participating in village activities.

In summary, the Labu fishery uses a variety of equipment that are generally not

species or size selective, in several locations to fish a diverse tropical fish assemblage. This is probably an important factor in maintaining a high catch per effort. This balanced approach to exploitation serves as an equilibrium between subsistence fishermen and their resource. Market incentives which influence catch size or composition should be preceded by research on fish community structures and biological productivity of the system.

A prime requisite for any programme of fisheries development is comprehensive knowledge of the society which it is designed to serve as well as a systematic research programme on the fishery itself. Far too many fisheries development projects have been based on the view that technical skill can overcome the planner's lack of socio–economic knowledge of the village community and of biological knowledge of the catch.

When we talk about managing a resource we really mean managing the people who use that resource. In order to do so more effectively, studying and putting to use their knowledge and customs, with their collaboration and endorsement, does not seem unreasonable. Moreover the benefits to us, as gathers of knowledge, can be substantial.

The contribution of joint research efforts are a step towards increasing the knowledge of Papua New Guinea fishing resources and assists in the development of its fisheries.

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