

**FISHERS' KNOWLEDGE AND MANAGEMENT:
DIFFERING FUNDAMENTALS IN ARTISANAL
AND INDUSTRIAL FISHERIES**

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ABSTRACT

Differences in characteristics of industrial and artisanal fisheries should be better understood for improved communication between those who do research on local ecological knowledge in these different fisheries. Artisanal fisheries often differ from industrial fisheries in that:

1. Per unit of catch or of areas fished, the numbers of fishers, species caught, gear types used, landing sites and distribution channels are typically far greater, especially in the tropics. Local ecological knowledge is of particularly great value to biologists in such complex settings where conventional biological knowledge is poor.
2. In some areas limited entry (marine tenure) has been well established for centuries. In these areas ethical questions concerning the publication of local ecological knowledge, while by no means non-issues, are often less problematic because the exploitation of this knowledge by outsiders is much less likely.
3. These fisheries are often managed (or mismanaged) by the fishers; in cooperative management arrangements government fisheries personnel are usually the junior partners.
4. Among artisanal fisheries researchers there is an even greater need for closer collaboration between biologists and social scientists. Biologists are much better trained to ask useful questions about local ecological knowledge, put the answers into broader biological context and help restrain social scientists from framing management recommendations that ignore critical biological realities. Social scientists are better skilled in achieving good collaboration and rapport with local people, in interviewing, and in restraining biologists from drawing management conclusions that ignore equally critical cultural realities. The two types of researchers should be working more often in teams.

INTRODUCTION

Members of a group often share assumptions that are valid within that group, but

inappropriate when extended beyond it. Such over-generalizing is the bugbear of all trans-disciplinary communication. It is hard to avoid, but we need to try to minimise it.

In this connection some key assumptions of those whose research focuses on industrial fisheries may be inappropriate when extended to indigenous fisheries. Fisheries textbooks, which are often disproportionately concerned with temperate zone industrial fisheries, tend to foster this overgeneralizing.

Here I discuss some examples of this, in an attempt to help improve communication between researchers who study fishers' knowledge and its uses in management in industrial and indigenous fisheries. I, too, run the risk of overgeneralizing, since my perspective is influenced by my greater familiarity with the indigenous fisheries of the tropical Asia-Pacific region than elsewhere. This, at least, is where most of the world's indigenous marine fisheries are found.

Access

One of the most common generalizations is that the fundamental problem with fisheries lies in their open access nature. But in much of Oceania and parts of Northern Australia, Africa, Asia, and Latin America, limited access has long been a feature of indigenous fisheries management (reviewed in Cordell 1989; Ruddle 1994; McGoodwin 1990). Some such systems, like those of the native fishers of the Pacific coast of North America, have largely disappeared. But many others persist¹. This has several implications for how fishers' knowledge is obtained and employed in management. Who controls the management process is one of them.

Industrial fisheries researchers often make generalizations concerning the need to "empower" fishers, or to "let fishers in on the management process". But in indigenous fisheries, especially on tenured fishing grounds, management is already often largely in the hands of the fishers. Fishers have been thus empowered in the Pacific Islands, for example, for many centuries (Johannes 1979; Johannes *in press*).

¹ Also, some countries' governments are recognizing the need for indigenous fishers who operate under open access conditions to control their fishing grounds and are making appropriate laws. The Philippines, for example, enacted a government code in 1991 that makes coastal management a major responsibility of coastal municipalities.

All the basic marine conservation measures developed in the west only a century ago were used in the Pacific Islands hundred of years ago. Because of their geographic settings, some Pacific Island cultures discovered their marine resources were limited long before Europeans did; unlike Europeans, they had neither a continental shelf fishery nor a large source of terrestrial animals on which to depend for animal protein.

In addition, tropical nearshore fisheries are characterized by many more species, methods, fishers and landing sites per unit of catch than industrial fisheries. Centralized government management is generally quite impractical under such conditions (Johannes 1998).

In some Pacific Island countries, villagers make far more fisheries regulations than governments (e.g. Johannes and Hickey 2002). Governments may still pass some laws pertaining to indigenous fisheries. But government enforcement is typically low to non-existent. In the Solomon Islands for example, single fisheries officers with a small canoe and insufficient fuel, are responsible for government enforcement, among other jobs, in districts encompassing many dozens of small villages and hundreds of kilometres of coastline.

This is not an unusual situation. The cost of centralized government management in these numerous tiny fisheries is generally prohibitive, except in a few high-value export fisheries where the product may be adequately monitored at central collection sites prior to export. If most government fishing laws are to be enforced effectively, it must be done by villagers, and they will do so only if they perceive the benefits (e.g. Johannes and Hickey 2002).

Here, accordingly, it is not fishers who need to be "let in to the management process", but rather fisheries researchers and government fisheries managers. This can be accomplished, as in industrial fisheries, via co-management arrangements. But whereas fisheries researchers are inviting industrial fishers into the management process as they recognize their own limitations, the opposite trend is developing in indigenous fisheries.

In the Pacific Islands, for example, fishers are increasingly inviting government personnel to collaborate with them in devising management measures. This happens when they recognize that their traditional knowledge and management measures, while often still

valuable, are no longer adequate to enable them to cope with new problems brought by increasing populations, improved technologies, new export markets, cash economies and other consequences of westernization (e.g. Toloa *et al.* 1991; Johannes and Hickey 2001; see also Purnomo, this volume, for an Indonesian example).

Johannes (1979) foresaw the "demise" of traditional fisheries management in Oceania due to the various impacts of westernization on its cultures. Fortunately he was wrong. Fishers' knowledge of resource depletion and the increasing need for better management, plus a growing recognition that co-management offers a promising way to achieve it, has resulted in a renaissance in village-based fisheries management in the region in the past decade

For example, in 21 Vanuatu villages surveyed by Johannes (1998) and resurveyed by Johannes and Hickey (2002), village-based marine resource measures had more than doubled in eight years. A total of 40 of these measures were operating in 1993. Most had been initiated within the previous three years due to the encouragement of the Vanuatu Fisheries Department. By 2001 five of these measures had lapsed but 51 new ones had been implemented.

In Samoa in the mid 1990s, the Samoa Fisheries Division triggered an upsurge in village-based conservation by giving village regulations formal by-law status. Designed and enforced by the villagers, these bylaws are monitored more effectively than regular government fisheries laws. Within three and a half years of the program's introduction, 52 villages had established their own sets of bylaws (Fa'asili and Kelokolo 1999).

There is still a long way to go before the nearshore resources of Oceania are all well managed, but the current trend is promising.

Collaboration of Researchers

To usefully evaluate fishers' knowledge concerning the species they catch, one must first have a good grasp of what is already known scientifically about those species. For this, social scientists who study industrial fishers' ecological knowledge need only 'bone up' on the published information on one - or at most, a handful, of species and one, or few, methods used to catch them. Learning enough about the many species, methods and habitats that characterize tropical indigenous fishers is not so easy.

As Freire and Garcia-Allut (2000, p. 376) point out:

“Fishing strategies in artisanal fisheries are based on flexibility, with a diverse pattern of activity (with respect to the species exploited, location of fishing grounds, and gears used) throughout the yearly fishing cycle. Industrial fisheries present a strategy of intense and continuous exploitation of the same resources in similar habitats using one or a few gears”

Needless to say, collaboration with fisheries biologists can be especially valuable in studying indigenous fisheries.

Biologists who work with industrial fishers are often of the same general culture and speak the same language. This is seldom the case with those who study tropical indigenous fishers. Accordingly, understanding local culture and custom is more demanding and the input of social scientists is often vital in this connection. Social scientists also tend to be more adept in local languages than biologists.

In short, the need for collaboration between biologists and social scientists in studies of the ecological knowledge of indigenous fishers is even greater than it is in typical industrial fisheries.

Ethics

Security of indigenous tenure over fishing grounds means that dealing with local knowledge ethically is less often a burning issue than it is in industrial fisheries (Nor is it as important as in terrestrial settings where ethnobotanists seek traditional plant-based medicines²).

In areas where indigenous fishers hold secure tenure over their fishing grounds, there is less risk in their revealing their specialized knowledge. Indeed, they are sometimes proud to do so (e.g. Johannes 1981; Hviding 1996). This openness stems in part from the fact that these fishers can often exclude outside competitors

who might exploit this knowledge³ from their fishing grounds.

Also, for reasons discussed above, fisheries personnel have little opportunity to use this knowledge to support the imposition of unwanted regulations on indigenous fishers. Important exceptions to this, however, are fourth world fishers, that is, indigenous fishers in countries ruled by industrialized, usually western, powers. North American Native Peoples, American Samoans and Australian Aborigines, for example, may well have justifiable fears in this connection (e.g. Wavey 1993, p. 16).

Knowledge Characteristics

Indigenous fishers are physically closer to their prey than industrial fishers. They see them while gleaning or pursuing them with a spear or castnet on foot, from over the side of their canoes, and from underwater as they spearfish. Their knowledge of the behaviour of fish and invertebrates is thus more intimate than that gained in wheelhouses via echo sounders. But it is limited to shallower waters and smaller areas.

Economics

Indigenous fishers' knowledge is less often “commercial in confidence” than it is in industrial fisheries. For example, although fishing for profit is gradually increasing in Oceania, Dalzell *et al.* (1996) found that subsistence catches were more than twice as valuable as commercial catches in the nearshore fisheries of 22 Pacific island countries. Here in many fishing villages, only a few of the many species harvested are sent out for sale. These tend to be highly valued species that do not need refrigeration, such as various shells and shell products and beche-de-mer (dried sea cucumber). Otherwise, economic activities are often organized along kin-based lines with catches being distributed within extended families⁴.

McGoodwin (1990 p. 63) states, “*In traditional subsistence systems, where the main goal is to*

² Although tropical marine biota bristle with pharmacologically active compounds, there are surprisingly few examples of indigenous medicines being made from them. Here, therefore, the need to ensure appropriate recompense for information on locally-used, marine-based medicines seldom arises.

³ In certain circumstances, however, such knowledge could be used to the advantage of outsiders and the detriment of its possessors. I do not document such knowledge even in reports to the agencies that fund my research (e.g. Johannes and Kile 2001) because even in-house reports have a way of migrating eventually into the wrong hands.

⁴ Similar findings have been reported in connection with aboriginal fishers in Canada (e.g. Pinkerton 1987; Usher and Weinstein, 1991).

produce food, there is a finite and thus satisfiable demand for the product. But for people living in a market economythere is no upper limit on the demand for cash." In indigenous villages, then, profit does not always motivate, capital is not always the engine of production and subsistence economics do not compute in economic models based on assumptions more appropriate to industrial fisheries (Johannes 1989; McGoodwin 1990).

Like open access, overcapitalization is an enormous problem in industrial fisheries. But capital is usually scarce in indigenous societies. Indigenous fisheries involve orders of magnitude less capital per job than industrial fisheries (D. Thompson in Maclean 1988) and under-capitalization has often been said to be a problem.

Management

Industrial fisheries management has typically focused heavily on the population dynamics and physical dynamics of fish stocks and on the quantitative regulation of stock removal. Traditional indigenous fisheries management has focused almost entirely on qualitative controls such as closed seasons and closed areas. This is at least in part because obtaining the necessary information for quantitative management has been beyond reach in these fisheries. Indigenous knowledge tends to be qualitative. Biological management here is not about achieving optimum sustainable yields; it is about preventing serious declines.

Ironically, as we come to recognize that adequate quantitative knowledge for stock-based management is also quite beyond our reach in most industrial fisheries (Walters 1998), the older, more qualitative management approaches used in indigenous fisheries are gaining increasing support from social scientists, economists and fisheries biologists for use in industrial fisheries (e.g. McGoodwin 1990; Pinkerton 1994; Wilson *et al.* 1994; Sainsbury 1998). In addition, Pauly (1997) and others recommend the "rediscovery" in industrial fisheries of the virtues of the decentralized, "place-based management" of indigenous fishing communities.

Mobility

Industrialized fisheries are dominated by large, mobile, largely corporately owned fleets. Owners can move their fleets or their capital elsewhere when a fishery is no longer profitable. The

incentive to manage sustainably is thus relatively weak.

As discussed above, indigenous fishers can often exclude outsiders from their fishing grounds. (The 'sea nomads' of eastern Indonesia are a striking exception). The flip side of this practice is that they cannot easily move if their fishery becomes unprofitable. Their incentive to manage sustainably is thus stronger⁵.

Such localization of fishing also means that many generations of indigenous fishers have operated in the same limited area over centuries, refining and passing on their knowledge. In the process this knowledge has become encyclopedic in some of these cultures (Johannes 1981; Hviding 1996; Johannes and Hviding 2001).

This UBC meeting was an exceptional opportunity for a large number of researchers on industrial and artisanal fisheries to compare experiences and perspectives. During the meeting it became obvious that some fundamental differences in the nature of the fisheries that the two groups study result in important differences in their approaches to research on and use of fishers' ecological knowledge as well as to other subjects. It also became obvious that each group can learn much of value from the other. Communication between our two groups will proceed much faster, however, if we become more aware of some of the differing perspectives and assumptions that underlie our thinking and methods. This short paper, written after the meeting, is a preliminary attempt to improve that awareness by demonstrating how differences in such things as access rules, biodiversity, fishing methods, mobility, intellectual property issues, and co-management power relations influence the thinking of our two groups.

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⁵ This incentive can be overwhelmed, however, by the condition of Malthusian overfishing (too few fish to feed a desperately hungry population). The problem is concentrated in parts of Asia and Africa.

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QUESTIONS

Saudi Ramirez-Sanchez: You assume that the conservational ethics of indigenous people existed in the past and then decayed with contact, but that they can go back to those ethics. How do you go back? These cultures and ethics are no longer isolated from outside influences.

Bob Johannes: I didn't mean to suggest that at all. Times have changed. Traditional conservational efforts would not work in these altered circumstances that use a cash economy. However, the conservational ethic can be used as a foundation. That's what is happening in Somalia in a big way. There's still ownership of fishing grounds and that is an incentive to conserve, because no one else can come in and fish. I didn't mean to suggest that these cultures are frozen in time.