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Inside this issue

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Editor's note

In the first article, "Outriggers Lost in the Sea of Time", Thomas Malm suggests an interesting research topic focusing on perceptions about outrigger canoes to understand the relationship between social relations, biodiversity, and sustainable development under conditions of rapid cultural change on small islands and coastal areas in Oceania. The argument rests on the idea that outriggers can be seen as a "total social phenomenon" that enables understanding of various other aspects of the society to which they are connected.

Although I think this Information Bulletin should not be a vehicle for me to publish my own items, I hope that this one lapse will be forgiven. There have been several requests over the past year for copies of the "Introduction" that I wrote for a volume of Bob Johannes' collected works. However, since it is an integral part of an electronic and conventional book, it is not possible to pull it out for distribution separately. Happily, the publisher agreed to permit reformatting and republication of the "Introduction" here, as the second article in this edition. It was originally prepared as a guide to the literature in the book of collected works, so I am not too sure how well it will stand separately. Please keep that in mind as you read this article!

That leads to another point that I have been thinking about for a few years. Along with many others, I have been studying old-established systems of fisheries management that are still widely used throughout the Asia-Pacific region, particularly in the Pacific Islands. (In Asia I have studied them in Japan, Thailand and Vietnam, and others have examined them in Indonesia, Laos and Malaysia.) Such systems of property rights and associated regimes of rights and rules closely reflect local social organization and power structures. As a result, although some are very stable and enduring, others have eroded to varying degrees, and yet others have collapsed altogether. In the early-1990s we described the variety of pressures that act on such systems, and which trigger change. Given the success of basing new management on the pre-existing management in some Pacific Island nations, such as Samoa and Vanuatu, for example, it now seems an appropriate time to focus on the reasons for lack of success, and to examine particular local cases of erosion of systems, and what needs to be done to "repair" this damage as well as to modernize the system. Of course, there is a variety of issues that need to be looked at as we seek to use old systems for a modern purpose within radically changed economic and social environments. But there are also

many issues that are common throughout the region (such as migration overwhelming traditional rights areas, particularly nearer urban centres, to name but one).

This Special Interest Group can provide a useful focus for this topic. I would appreciate receiving emails, particularly from within the Pacific Islands region, with comments and suggestions for research. If you have any papers, notes, extended comments, or other items ready to publish, we would be especially delighted to hear from you, and to publish your materials in future editions of this Information Bulletin.

Kenneth Ruddle

PIMRIS is a joint project of five international organisations concerned with fisheries and marine resource development in the Pacific Islands region. The project is executed by the Secretariat of the Pacific Community (SPC), the Pacific Islands Forum Fisheries Agency (FFA), the University of the South Pacific (USP), the Pacific Islands Applied Geoscience Commission (SOPAC), and the Pacific Regional Environment Programme (SPREP). This bulletin is produced by SPC as part of its commitment to PIMRIS. The aim of PIMRIS is to improve the availability of information on marine resources to users in the region, so as to support their rational development and management. PIMRIS activities include: the active collection, cataloguing and archiving of technical documents, especially ephemera ("grey literature"); evaluation, repackaging and dissemination of information; provision of literature searches, question-and-answer services and bibliographic support; and assistance with the development of in-country reference collections and databases on marine resources.

PIMRIS

Pacific Islands Marine Resources Information System

Outriggers lost in the sea of time:
An overlooked aspect of cultural change and conditions for sustainable development in Oceania

Thomas Malm[1]

Abstract

A series of comparative studies is suggested, focused on perceptions of outrigger canoes, and aimed at an increased understanding of the relationship between social relations, biodiversity, and sustainable development in Oceanic societies on small islands and in coastal areas undergoing rapid cultural change. After a critique of the recent notion that canoe-building in Polynesia developed as a result of natural selection, and after discussing the declining local interest in outrigger canoes, it is argued that these canoes can be regarded as a "total social phenomenon" or "fact", in Marcel Mauss' sense of the term. By focusing on such a phenomenon/fact, it is possible to understand many other societal aspects to which it is connected, including gender relations, social structure, religion, perceptions of nature, economy, relationships between centre and periphery, and cultural change. With a focus on outrigger canoes, analyses should take into consideration the processes of imperialism, colonialism, acculturation, and modernisation.

Introduction

Canoes are often featured as icons of Oceania, from pre-historic voyages (Davis 1992; Howe 2007) to contemporary travel posters, hotel displays (Fig. 1) or even logotypes for universities and governments. As an example, Hviding (1996:174–176) notes that in New Georgia, in the Solomon Islands the plank-built war canoe survives only as a few museum specimens, it is still "an icon of ethnic pride". He writes that "the transmission of the skills of war-canoe building has become a powerful symbol of renewed ties with a maritime-based tradition that for seventy years has been suppressed by the steadily more indigenized missions, ostensibly because of its violent and 'heathen' aspects."

Figure 1.
A double canoe built for display at a hotel on Bora Bora, French Polynesia. (Photo by the author, 1983)

The large double-hulled and most of the single hulled canoes used for warfare or long-distance voyaging (Figs. 2 and 3) had already disappeared in the 19th century, together with almost all of the maritime knowledge associated with them (Dodd 1972). In recent decades they have experienced a renaissance, with experiments on traditional navigation, as manifestations of ethnic or national pride, and the recording of wisdom of the last remaining navigators (Finney 1979, 1991; Finney and Among 1994; Gladwin 1970; Lewis 1978; Thomas 1988). However, the same can hardly be said about the smaller and much simpler dugout or plank canoes to which a balancing outrigger float is attached (Fig. 4). To build such a canoe and make it seaworthy certainly requires expertise (cf. Dierking 2007). Nevertheless, in most contemporary Pacific Island societies these canoes are held in very low esteem. In fact, on many islands they are no longer used.

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Figure 2.
Polynesian voyaging canoe. Drawing by Sverre Holmsen. (Author's collection)

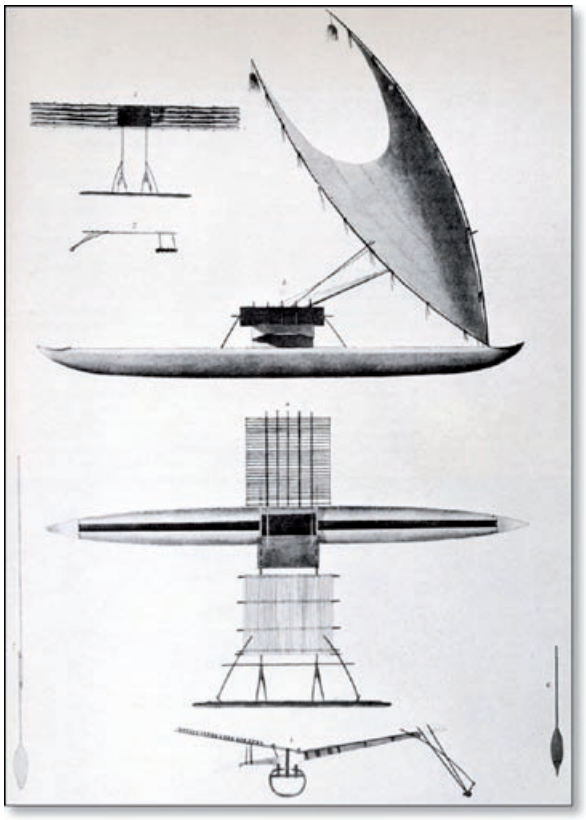

Figure 3.
Micronesian outrigger canoe with sail. (From J.S.C. Dumont d'Urville, *Voyage de L'Astrolabe*, 1830–1833)

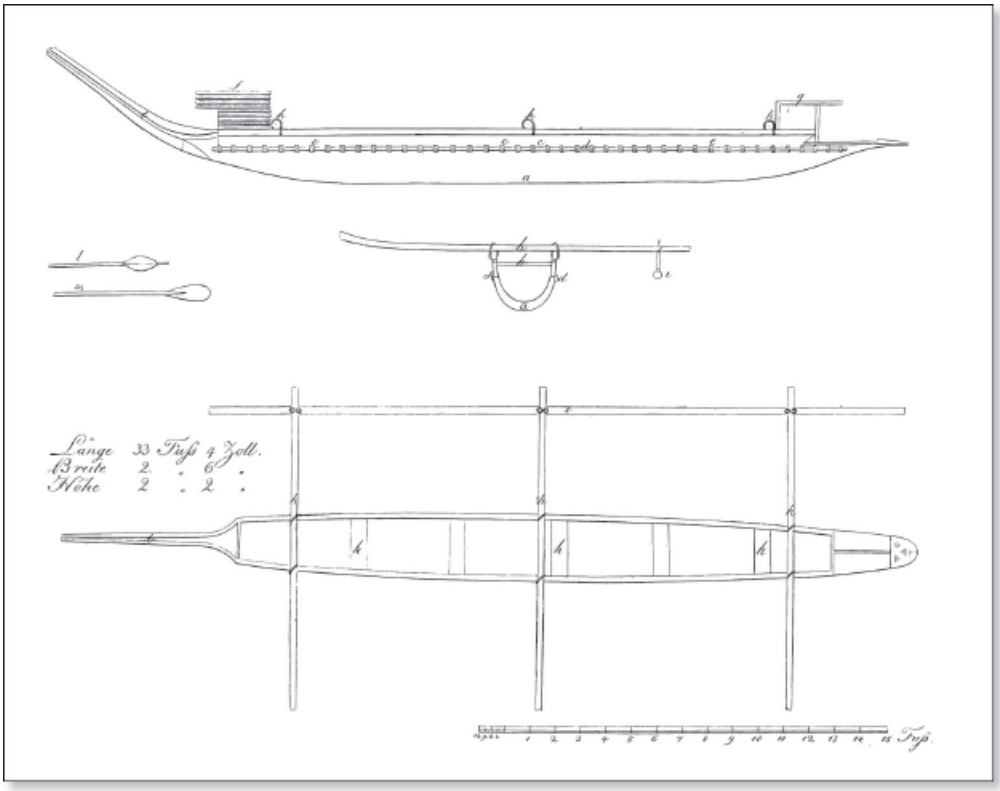

Figure 4.
Drawing of a Marquesan outrigger canoe from the beginning of the 19th century. (From G.H. Langsdorff, *Voyages and Travels*, 1813)

Figure 5.
Fishermen in the Society Islands, ca. 1935.
(Photo from Sverre Holmsen's collection,
reproduced by courtesy of Lena Reri Holmsen.)

Figure 6.
Traditional outrigger canoe on the beach at Vao, Vanuatu, with a prow decoration in the shape of a stylized frigate bird. This decoration was already documented by participants in Cook's second voyage (1774). The island in the background is Malekula.
(Photo by the author, 1990)

Figure 7.
Model of a *tafa'anga* canoe, made in 1891, partly by King George Tupou I of Tonga and partly under his direct supervision. It was brought by Sir Basil Thomson to England (where it was re-assembled erroneously so that the U-shaped connectives crossed under the boom instead of over it). The row of knobs where egg shells (*Ovula ovum*) were attached on a canoe of full size is seen on the decking. (Photo by Anita Herle, University of Cambridge Museum of Archaeology & Anthropology; courtesy of the museum; CUMAA Z32.319)

The literature on traditional use of outrigger canoes consists mainly of older studies (e.g. Buck 1930; Grimble 1924; Haddon and Hornell 1975 [1936–38]; Hornell 1930), some newer monographs (Dodd 1972; Neyret 1976; Smaalders and Kinch 2003), and usually brief articles (e.g. Brosi et al. 2007; Cole 1985; Geraghty 1994), or occasional data in works that emphasise other or more general matters (e.g. Oliver 2002; Whistler 2000). For example, in a 373-page anthology about Polynesian ethnology (Howard and Borofsky 1989), in which the chapters represent a blend of modernity, tradition, continuity, and change, canoes are mentioned only in a single sentence (stating, that a work on the subject was published in 1936 [p. 216]). Thus, until recently, life in Oceania has always been dependent on fishing (Fig. 5), and since the 1930s, one of the most well-known representations of material culture has become among the *least* documented and discussed. During the same period, Oceanic societies have undergone rapid and often destructive changes regarding health and relationships with nature (Bogadóttir 2008; Crocombe 2001; Danielsson 1965; Finau et al. 1987; Malm 2001, 2003, 2007a; Thaman 1982).

My purpose in this article is to explain why studies that have focused on outrigger canoes may provide clues to a better understanding of those processes and the conditions for sustainable development on islands and coastal zones of Oceania and, possibly for other tropical regions.

Canoes and survival of the fittest

Somewhat surprisingly, double- as well as single-hulled canoes have recently become a focus for studies on the processes of natural selection. Rogers and Ehrlich (2008) argue that functional aspects of Polynesian canoe construction can be seen as a result of selection mechanisms connected to survival. According to these authors, both of whom are biologists, unlike details in the construction that may be of practical consequence for canoe users, and which therefore tend to change slowly in design after having reached a level near perfection, decorations (Figs. 6 and 7) tend to change more slowly. Only those "memes", cultural equivalents to

genes (Dawkins 1976), that were of any positive consequence to adaptation with respect to paddling and voyaging would survive as "the fittest". Thus, natural selection would be possible to explain not only in organic evolution, but also cultural change. Implicit in this argument — especially considering what Ehrlich warned about decades ago in his book, The Population Bomb — is that a culture that develops according to ecologically bad decisions will risk becoming extinct.

Now, it is quite obvious why designs that appeared to be directly unsuitable did not evolve into traditions that survived. The most basic requirement for any canoe is, of course, that it be seaworthy; in other words, the sea filtered out un-seaworthy canoes, by causing them to sink, for example! What must be realized, however, is that the characteristics of the canoes did not vary randomly.

Every canoe builder, a master of his trade, must have striven to make canoes of a standard that would give him and his apprentices prestige by being manoeuvrable in the marine environment, admired for their beauty, having decorations that were believed to attract the benevolence of the gods and spirits, or in other ways that lived up to popular expectations. Would this be a parallel example to, say, why all species of small forest birds have the same basic construction but different patterns on their feathers? As I see it, the difference is that birds cannot choose their shape or pattern, whereas the mother-of-pearl ornamentation on a canoe is an entirely deliberate design that, in theory, can be changed as soon as someone gets a new idea about how canoes ought to be decorated. No embryo has ever been able to select its genes, but is simply hatched or born into this world with characteristics that will give the animal an advantage or disadvantage in survival and reproduction. A canoe builder, on the other hand, can make a selection at any time — at least, were it not for the power of local conventions — because of either a flash of genius or pure stupidity can make a successful or unsuccessful invention, and decide to pass on or not the knowledge, the "memes", and thereby intentionally influence the tradition. With respect to details of canoe construction, survival depends on a very deliberate striving for perfection — a *cultural* and not a natural selection.

Even if cultural change and genetic evolution follow parallel patterns and perhaps are possible to predict with a certain accuracy, because characteristics must function in relationship to environmental factors that Rogers and Ehrlich see as natural selection in canoe building, is nothing but yet another example of Lamarck's vision from the early-19th century of how acquired characteristics could be inherited. Most well-known is probably the case of giraffes that, for centuries, had been trying to reach high tree branches and therefore stretched out their necks — a classic textbook case of how natural selection does *not* work (see e.g. Solomon et al. 2005:334).

A major reason why on many islands outrigger canoes have become extinct or are very near that point is probably that they are no longer needed for survival. But that is not the whole story. As a matter of fact, on most islands it is not the fittest canoes that have survived — which is what would be expected from the processes of natural selection — but those that are easiest to make and by no means the best for maritime activities.

Contemporary interest in outrigger canoes

Now and then, during fieldwork in Polynesia, Melanesia and Micronesia over the past 25 years, I have suggested to fisheries experts, indigenous scholars and other local people that it would be a good idea to study perceptions about outrigger canoes and the art of building them. Mostly, I have then been told in response that this has either been documented a long time ago, or that no one is interested these days.

While talking to people in the islands I have expressed the opinion that these canoes are environmentally friendly — because they are entirely made of local materials and, because they are paddled or sailed, do not require any kind of fuel — and that they also are excellent for physical exercise and are connected to both knowledge and rituals that have changed considerably in recent times without having been fully documented. I also know from conversations with many tourists that they would enjoy renting an outrigger canoe for paddling on the lagoon — and these days tourism is a most important source of income in the islands — but that this is seldom possible. Instead, imported plastic kayaks are available for rent within the framework of "eco-tourism". Interestingly enough, the sporting aspect has made outrigger canoes, even if they are made of fibreglass or aluminium, popular for canoe racing in Hawai'i and Tahiti, the most modernised of all the islands (Figs. 8, 9 and 10), and where there are several clubs for this activity (see, for example, Caldwell 2006). (As a matter of fact, the first canoe club in Hawai'i was formed a century ago, in 1908.)

Outrigger canoes for fishing have disappeared entirely, or almost entirely, on a number of islands that, until recently, were known as "very traditional". In both contemporary Tonga and Samoa, for instance, it is doubtful if one could find an outrigger canoe built according to a standard that would have been regarded as high by an expert of the 19th century. Many or most of them are of a rather poor quality, even by contemporary standards, and many are already rotting. In both Samoa and Tonga,

Figure 8.
The author with modern outriggers, Kahului, Maui, Hawai'i. (Photo by the author, 2006)

Figure 9.
Modern outrigger canoe used for racing and for taking out tourists. Waikiki, Hawai'i. (Photo by the author, 1984)

Figure 10.
A Tahitian paddling his canoe. Mo'orea, French Polynesia. (Photo by the author, 2000)

Figure 11.
Dugout canoe, Sa'anapu, Samoa. (Photo by Ragnheiður Bogadóttir, 2007)

Figure 12.
An outrigger canoe with a flat stern to which an outboard motor can be attached. Mo'orea, French Polynesia. (Photo by the author, 1983)

skilled canoe builders were formerly members of a guild. Nowadays, however, it is common for household members to build their own simple dugout canoes (Fig. 11a-b), none of which is formed from wooden planks that would make them light and fast (Whistler 2000:95–97).

Of course, it is easy to understand why many islanders would prefer an outboard motor boat — in French Polynesia, outboard motors are often attached to the canoes (Fig. 12) — but, on the other hand, relatively few can afford such a boat. Thus, most people have no boat at all.

Those remaining in the islands largely use remittances to buy imported food, including canned fish, which according to several studies is of much lower value to health than locally produced food (e.g. Bogadóttir 2008; Finau et al. 1987; Thaman 1982). Cardiovascular diseases and obesity-related diabetes — caused by genetic disposition combined with new food habits and lack of physical exercise — have increased alarmingly, and become a tremendous problem in most of the island nations, particularly in Polynesia and Micronesia. People in the best health are often, if not mostly, found on the least modernised islands, simply because they have no choice but to eat locally available fish, shellfish, fruit, vegetables and root staples. And those food items are nutritionally superior to the imported food that they otherwise could afford. In order to go fishing, or to transport people, crops or other things, outrigger canoes are still used on some of those outer islands (Figs. 13 and 14), but even there they are now beginning to disappear. The physical exercise demanded by traditional food production and paddling canoes also undoubtedly contributes to the better health conditions on the more traditional islands.

Figure 13.
Children in a village on Malekula, Vanuatu, with the canoe that they use daily for getting to school. (Photo by the author, 1990)

Figure 14.
Women in an outrigger canoe. Paama, Vanuatu. (Photo by the author, 1990)

There is a risk that the knowledge about how these canoes are built and used, as well as rituals to which they are connected, will disappear before a thorough documentation has been made. There might also be a risk that certain indigenous trees — including endemic species — which have provided construction materials, will not be re-planted and, thus, become extinct. In fact, several species are already rare or acutely threatened (Whistler 2000:94–95). As noted recently for Pohnpei, in Micronesia, a heightened awareness of the value of local biodiversity is linked to traditional knowledge, including canoe-making, and could help support conservation measures (Brosi et al. 2007). It is also quite possible that islanders will not develop any strong attachment to the marine environment, its biodiversity and its need for protection simply because they rarely, if ever, have a chance to get out on the lagoons and barrier reefs where they can experience the wonders of nature first hand. For example, during my own work in Tonga on the documentation of vernacular names for plants and animals (Malm 1999, 2007b), including many marine taxa, it was quite obvious that much knowledge had become lost within just a couple of generations. There, as in so many other Pacific Islands where I have been, outrigger canoes were usually regarded as old-fashioned and more or less worthless.

Analytical perspectives

Especially in older studies, studies in material culture were important for reconstructing life in Oceania before or at the time of early European contact (Figs. 15, 16 and 17). There is also a rich literature about material culture in general from recent years (e.g. Buchli 2002; Glassie 1999; Schlereth 1999). However, although within my field of human ecology, material culture is something that appears to interest few researchers working in Oceania, a focus on material culture makes it possible to achieve a better understanding of several sociocultural aspects.

When I studied women's marine gathering of invertebrates and algae on coral reefs and in lagoons, especially in Tonga (Malm 1999, 2007c), I regarded this traditional chore as what sociologist Marcel Mauss (1968) called a "total social phenomenon" or "-fact". By focussing on such a seemingly simple activity, I argued that at the same time it was possible to understand many other aspects of society, in that gathering was connected to gender roles, social structures, religion, perceptions of nature, economy, the relationship between centre and periphery, and cultural change, among other things.

Outrigger canoes could also definitely be studied from such a perspective. Studies made on a number of islands across the Pacific might yield valuable

Figure 15.
A picture from Olivier van Noort's expedition to Guam in 1600. This is one of the first pictorial records of oceanic outrigger canoes. (From J. van Spilbergen, *Speculum orientalis occidentalisque Indiae navigationum*, 1619)

Figure 16.
Houses on stilts and canoes in a lagoon of New Guinea. (From W. Sievers, *Australien und Ozeanien*, 1895)

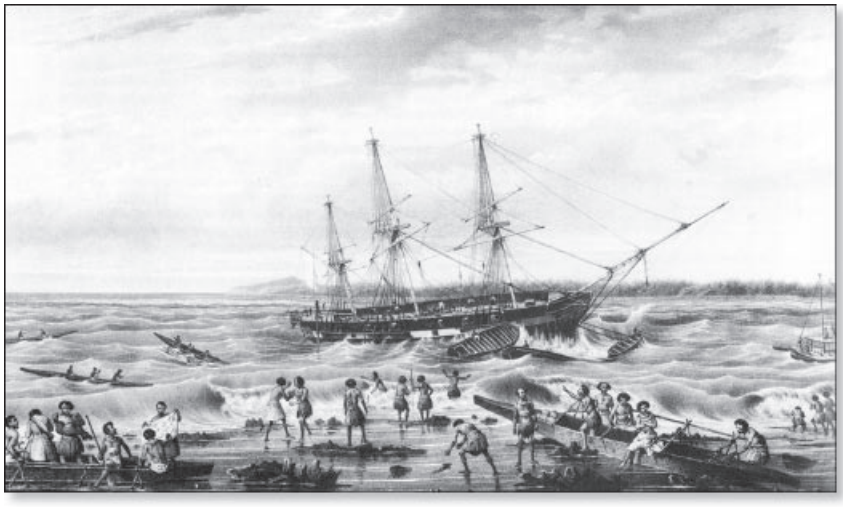

Figure 17.
Tongan outrigger canoes on a picture which shows Dumont d'Urville's ship L'Astrolabe on the reef at Tongatapu. (From J.S.C. Dumont d'Urville, *Voyage de…L'Astrolabe*, 1830–1833)

data for making comparisons, and offer a better understanding of processes of change and the conditions for sustainability in islands and coastal zone societies.

It is important to conduct these studies within a global framework. What has been regarded as original or traditional is often a result of global processes, and can be understood only in relation to the larger world with which island societies are connected (Friedman 1994). For studies of outrigger canoes, I suggest that a global systemic analysis be made within a framework whose four corners represent aspects of a historical process. (I have applied such an analytical approach in my work on centralisation in French Polynesia; Malm 2003.) These are: 1) *imperialism* and *colonialism*, which result in the islands becoming integrated into the modern world system; 2) *acculturation*, which means that Western (or Oriental) ideas are integrated into, changing or replacing local cultural aspects; 3) *modernisation*, which includes such structural changes as a successive transition from subsistence to a monetary economy and wage labour; and 4) *migration*, which leads to depopulation of outer islands as well as to aggregated populations on main islands, and to emigration to metropoles outside island nations (Fig. 18).

Research questions that I suggest are important to pose include:

- How are outrigger canoes perceived by older and younger people on modernised and more traditional islands, and what difference might there be with respect to gender?
- Which rituals are still connected to outrigger canoes, and which ones seem to have disappeared or been changed?
- How did the situation emerge that resulted in outrigger canoes becoming such a low status that they have become extinct or are close to that point?
- What are the consequences of their demise for environment, lifestyle and social relationships?
- What are the reasons for canoes still being used on certain islands?
- What possibilities are there for canoes still to be constructed and used in years to come, and how can they be expected to be used?

In order to obtain answers to these questions, it is important not only to interview experts on canoe building and document their skills, but also to communicate with other people in local societies, including fisheries experts as well as people who, for some reason, do not perceive canoes as interesting at all.

Concluding remarks

It is important to make studies according to what has been suggested here in Oceanic societies that are experiencing rapid cultural change. They would provide a valuable understanding of the relationship between social relations, biological diversity and sustainable development on islands and in coastal zones. Such projects would, for instance, be excellent for undergraduate students at universities in the region. Documenting and publishing on this subject could involve researchers from abroad as

Figure 18.
Outrigger canoes in the harbour of Apia, Samoa.
(Photo by Ragnheiður Bogadóttir, 2007)

well as local people interested in recording their cultural heritage.

A comparative perspective with a focus on outrigger canoes as a total social phenomenon could be interesting not only for analysing what has happened in the past, but also for providing new and important insights for sustainable living on islands where lifestyle has always been closely connected to the marine environment. After all, there would not have been a single human being in those islands at Captain Cook's arrival were it not for the canoes that carried people there across the world's largest ocean.

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Introduction to the collected works of R.E. Johannes, publications on marine traditional knowledge and management[1]

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Robert E. Johannes was a tropical marine ecologist who, from the mid-1970s, pioneered the idea of integrating for resource conservation the specialized ecological knowledge and traditional marine resource management systems of Pacific Island fishing communities with Western concepts of scientific management. In so doing he highlighted the importance of indigenous knowledge and community-based systems as key factors in marine conservation.

Although they are among the most biologically productive communities, coral reefs seem to be particularly vulnerable to overharvesting. Johannes sought to understand why. So he went to Palau in the mid-1970s to test an ecological hypothesis that might explain the upper limits on the harvest of fish in coral reef communities: "But after a few weeks I became aware of various political, cultural, and economic pressures impinging on fishing in such a way as to make my purely biological explanation seem quite simplistic." (Johannes 1981:x).

As a result of his 16 months experience in Palau and the South West Islands, Johannes became deeply involved in halting the erosion of what he considered invaluable traditional ecological knowledge in fishing communities, and applying it directly to improve marine resource management. At the same time he helped build local capacity to do this and to spread the word. Doing this, however, incurred major professional risks and invited the scorn of his marine biologist colleagues, a number of whom regarded him as a drop-out. But he felt more than compensated by the admiration of Palauan villagers, who commented that although fisheries researchers had visited them before and held forth about their knowledge, Johannes was "the first who ever asked us about *our* knowledge." That vital difference in attitude and approach opened wide doors throughout the Pacific Islands and beyond. Johannes described his Palauan research in the now classic "Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia", published by the University of California Press in 1981.

The essence of Johannes' approach can be summarized fairly simply. Coral reef fish resources present complex and unfamiliar challenges to fisheries management because, unlike temperate latitudes, there are far more species, and fisheries are not dominated by an overwhelming few. So it is almost impossible for managers to understand rapidly the biology of even the most important of the hundreds of species caught. However, a short-cut resides in the minds of small-scale nearshore fishermen, who are especially rich sources of unrecorded knowledge. Nevertheless, little effort had been made to record this information before the 1970s: anthropologists researching in the Pacific Islands focused largely on terrestrial ecosystems, whereas "natural scientists have routinely overlooked the practical knowledge possessed by artisans...It is one manifestation of the elitism and ethnocentrism that run deep in much of the Western scientific community" (Johannes 1981:ix).

As a consequence, marine resource development and management schemes often fail because they are designed with little understanding of resource users, the ecological settings in which they operate and their cultural milieux. Working with small-scale tropical fishermen can yield information on such usually "hidden" factors as unappreciated resource areas and their vulnerability to damage through coastal development, important aspects of the biology of target species, local oceanographic phenomena, the cultural acceptability of proposed management schemes, and valuable traditional conservation practices. Local knowledge is particularly important where formally recorded data are lacking (see, for example, Johannes 1981b). In particular, fishermen's knowledge of the seasonality of activities of marine fauna would likely be superior to that of consultants, since it would be based on year-round observation and therefore comprehensive. In contrast, consultants might turn up at the wrong season and so miss some critical activity. For example, knowledge of lunar cycles is invaluable for the protection of breeding grounds which

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would rarely be discovered without the knowledge of local fishermen. Johannes' pioneering research popularized awareness of spawning aggregations and explained in practical detail how the predictable spawning aggregations provide exceptional opportunities for fisheries management (Johannes 1978, 1980, 1989).

Aware that the rapid disappearance of traditional knowledge and the lack of interest of younger people in acquiring it was a serious constraint on implementing his approach, Johannes sought to create a widespread awareness of this often encyclopedic knowledge base. He advocated a reawakening of traditional environmental ethics among youth and hereditary chiefs related to their exclusive reef and lagoon tenure, an ancient form of marine protection which, he contended, provides a practical and time-tested model of "limited entry" that Western fisheries biologists and economists were only then hitting on as an innovative way to manage their own fisheries.

The relative success of indigenous management contrasted with western-style management

In the late-1970s Johannes introduced the concept of national indigenous marine resource rights, which then were accorded low priority by legislators and maritime legal specialists preoccupied with the international aspects of the Law of the Sea (Johannes 1977, 1978b). Indigenous law and Western legal and property concepts were at odds, with the Westerners assuming the universal validity of theirs and regarding others as primitive. A constant theme of Johannes is that in this instance traditional Western laws are primitive. He argued that this difference arose because Pacific Islanders knew their resources were finite and their traditional laws reflect this knowledge. In contrast, the continentally oriented Westerners were unaware of resource scarcity, and their laws and attitudes reflected an abundance characteristic of a continental situation.[3] Compared with Pacific Islanders, who long ago understood resource scarcity, Westerners have only relatively recently had to confront the now obvious impact of their own overfishing on continental shelves:

> In summary, Pacific Islanders discovered the cornerstone of sound fisheries management, in the form of reef and lagoon tenure, centuries before any form of marine fisheries management was seriously considered in the West. Difficulties arising from conflicts between traditional marine tenure systems and westernization and commercialization of island fisheries have resulted in its destruction in some areas and the threat of destruction in others. Where it still exists, it seems clear that the system must undergo some alterations in order to accommodate twentieth century pressures on it. However, the destruction of the system will ultimately create more numerous and fundamental fisheries management problems than its solves (Johannes 1977:126).

Nevertheless, a clear temptation to either weaken or invalidate traditional tenure in Pacific Island fisheries was apparent. To Johannes that was a serious mistake, and he asserted that reef and lagoon tenure and other traditional conservation measures were effective because "most Pacific Island marine conservation measures, when applied judiciously, serve the purposes for which they were designed" (Johannes 1978b: 356). However, where traditional conservation rules have been either weakened or forcibly abolished, marine resources have subsequently been over-exploited. Therefore Pacific Island governments need to support the best of these customs, because Western-style management is not sound for tropical nearshore fisheries. It is important that Pacific Island governments ensure traditional mechanisms of resource management and conservation, or at least some mutually agreed modification of them, become integrated within national fisheries policy and development projects (Johannes 1982a).

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3. Johannes addressed the question of whether or not Pacific Islanders possessed a traditional conservation ethic (1978a), by which he meant "an awareness that one can deplete or otherwise damage one's natural resources, coupled with a commitment to reduce or eliminate the problem" (Johannes 1994b, 2003:115). He also speculated on why Pacific Islanders developed sound methods of protecting marine resources, when their record of exterminating terrestrial species is so bad. Johannes suggested that the answer to the second part was because it is easy for islanders to unwittingly exterminate birds and other island megafauna "because of their very low reproductive output" (*Ibid*. 114). Extinctions of such creatures could have happened so fast that the islanders failed to comprehend the need for conservation until it was too late" (*Ibid*. 115). "But although it was possible to severely deplete nearshore marine stocks, it was nearly impossible to exterminate most marine species... even after severe overharvesting populations of fish and most edible invertebrates will often rebound within a few years when given adequate protection. In short, the time in which islanders could develop an awareness of the need for conservation before doing irreversible damage to their seafood stocks was much longer than it was for land animals." (*Ibid*.). Islanders may well see the limits more easily than Continental people do, and if this is true it would only be because islanders often exceeded the limits more easily than did Continental peoples. "Because of their very different geographical setting, many Pacific islanders simply bumped into their marine environmental limits much earlier than Europeans did, and the island residents did what common sense dictated under the circumstances: invented marine conservation." (*Ibid*.). But it is important to note that bad environmental practices were also commonplace in Pacific islands and that constructive and destructive practices coexisted.

Johannes contended that any Western type of fisheries management introduced as a replacement would be ineffective in Pacific Islands. The main reasons were:

(1) that the great number of species in tropical inshore fisheries would require very many more regulations and much greater enforcement to achieve the same goals as were already reached using traditional tenure;
(2) that fisheries management knows much less about tropical than temperate species and therefore is not equipped to handle tropical fisheries, and, because of its huge data requirements, would be infeasible (*vide infra*);
(3) that there are many more boats, gear types and fishermen in tropical inshore fisheries than in Western commercial fisheries;
(4) that government law enforcement is of notoriously limited capacity in many Pacific Island States, and would be evaded by resentful fishermen; and
(5) that Pacific Island governments lack the money and trained specialists to cope with a Western-style of fisheries management.

Beyond that, Johannes elaborated the additional complexities in Pacific Island nearshore fisheries that present Western and Western-trained economists with unusual conditions, some of which may preclude economically sound fisheries development (Johannes 1989a). Such impediments include the general impossibility of obtaining at reasonable cost the information on catch, effort and stocks required for sound management, in the conventional Western sense of the term. In addition, social barriers to capitalistic behavior are also widespread, and occupational pluralism the norm. However, in compensation the fisheries manager has unusual opportunities compared with other parts of the world to build on indigenous marine resource management systems and on rich indigenous knowledge bases. But the record of development projects in the Pacific islands is poor in terms of both economic performance and social and economic impacts. "Fisheries development," particularly if it implied development of large-scale external markets for reef and lagoon finfish, the most important traditional marine resource of Pacific Islanders, should be undertaken with caution. "The biological, social and economic stumbling blocks are too many and too complex to surmount collectively in the foreseeable future. Most private and government capital that has been sunk into reef and lagoon finfisheries development in the islands were indeed just that — sunk." (Johannes 1982b: 247).

> In short, westerners are quite unable to manage multi-species tropical demersal species on an efficient scientific basis and it will be many decades, it ever, before we are able to do so. Of necessity in the meantime, our prescriptions are based largely on intuition and good intentions. As a consequence our failures are legion, our successes rare. Traditional Pacific island management customs take on added appeal when we consider our own dismal record (Johannes 1977:125).

Constraints on that potential

Johannes identified six main constraints on the application of traditional knowledge and management to modern fisheries conditions. His concern with some is evident from the first works of the 1970s, but others became more explicitly stated as Johannes' frustrations emerged with an unwillingness to change. The main contraints identified are:

(1) The unwillingness of fisheries scientists to countenance the use of indigenous knowledge;
(2) The failure to appreciate differences between temperate zone industrial fisheries and tropical nearshore fisheries;
(3) The issue of empowerment and who really needs to be empowered;
(4) Ethical issues regarding indigenous knowledge; and
(5) Idealizing TEK, or intellectual dishonesty and uncritical acceptance of indigenous knowledge
(6) Problematical social scientists.

1. The unwillingness of fisheries scientists to countenance the use of indigenous knowledge

Johannes was quite simply frustrated by the stubborness of the scientific establishment. He observed, for example, that although 2,400 years ago fishermen on the island of Lesbos taught Aristotle about the lunar periodicity of roe development in sea urchins, it was only in the nineteenth century that researchers confirmed the same information to the "satisfaction of the scientific community" (Johannes 1994c:82). Further, while Johannes was in Palau in the mid-1970s local fishermen explained to him the lunar periodicity and location of spawning aggregations of some 55 species of food fish, or is it turned out, twice as many species of marine animals as biologists had then described for the entire world!

But his appreciation for fishermens' knowledge was not widely shared:

> Some of my biologist colleagues have little interest in traditional environmental knowledge such as that possessed by Pacific Islanders.

> They dismiss such knowledge, gained during centuries of practical experience, as anecdotal, although their own specialized knowledge is based largely on studies carried out over much shorter time periods under conditions where being wrong did not involve the risk that they and their families would go hungry (*Ibid*.:81).

The problem quite simply was that:

> Many biologists ... insist that true science must involve controlled experimentation and rigorous statistical testing of null hypotheses. According to these criteria, much of what is being discussed here, the Science of Pacific Island Peoples, is not really science at all. For we who value such knowledge there is no need to feel defensive. We are in good company. Conveniently overlooked by some who champion this falsificationist definition of science is the fact that it also excludes not only much social science, but also most of oceanography, geology, meteorology, and astronomy as well as large portions of ecological and evolutionary research (*Ibid*.).

A further frustration was that local scientists educated in the West have largely adopted the same attitudes: "colonial bodies are being replaced, but scientific colonialism lingers" (Johannes 2003a:119). So much so, Johannes lamented, that university educated local fisheries researchers do not even imagine the value of their elders' knowledge.

In contrast, Johannes' approach was straightforward and inclusive. "For my purposes .... anything that contributes to our knowledge of the physical world is part of science. This definition ignores distinctions based on how this knowledge is obtained. The important criterion is whether it provides us with understanding." (Johannes 1994b).

2. The failure to appreciate differences between temperate zone industrial fisheries and tropical nearshore fisheries

Westerners, both fisheries biologists and fisheries social scientists alike, are generally unaware of the fundamental differences between tropical small-scale nearshore fisheries and their own industrial fisheries. In part this accounts for the misguided development policies implemented in tropical nearshore fisheries. Further, Western fisheries textbooks deal almost exclusively with temperate zone fisheries, and so are inappropriate for training tropical fisheries managers. Nevertheless, they continue to be used to train them (Johannes 2003a).

There are major differences between tropical nearshore fisheries and temperate industrial fisheries. First, in the tropics nearshore fisheries are typically far more numerous in terms of per unit of fish catch or areas fished, numbers of fish species, gear types, number and location of landing sites, and distribution channels.

Second, in many tropical areas marine tenure with associated rights limiting entry has been customary for centuries. But an all too common generalization is that the problem with fisheries lies in their open access nature. This is simply not true for many parts of the world, although it often is the case in the temperate zones, where the writers of fisheries management textbooks received their formal training and fisheries experiences.

Third, most tropical small-scale fishermen, at least those in the Pacific Islands, operate in clear and shallow nearshore waters and so are physically closer to their prey than are industrial fishers. Based on visual sightings, they pursue fish closely with hand held gear, unlike industrial fishers who operate from wheelhouses based on information provided by echo sounders.

Fourth, tropical small-scale fishermen mostly seek to provision just their households or their community, except for very valuable items of their catch. Activities are generally operated on a kinship basis, as are distribution channels, and the fishery is usually under-capitalized. The profit motive is not overiding. In contrast, it dominates in industrial fisheries which are aimed at supplying national or international markets, and in which kin relationships usually mean little.

Fifth, traditional fisheries management in the tropics is based almost entirely on such qualitative controls as closed seasons and closed areas. Of course, this is probably because quantitative management has been infeasible in such fisheries. "Indigenous knowledge tends to be qualitative. Biological management here is not about achieving optimum sustainable yields; it is about preventing serious declines." (*Ibid*.:18). Although industrial fisheries management has focused almost entirely on population dynamics and physical dynamics of fish stocks and on the quantitative regulation of stock removal, it is now increasingly realized that this is infeasible, even in most industrial fisheries.

Finally, whereas industrial fisheries are dominated by large corporate fleets that traverse the world, local fishers invariably stick with local grounds,

from which outsiders are excluded. This means that they inherit a long and often encyclopedic history of local knowledge about the intimate details of their local area. This is not usually the case with industrial fisheries.

3. The issue of empowerment and who really needs to be empowered

Researchers in industrial fisheries often generalize about the need to "empower" fishers, or about the need to "let fishers in on the management process" (*Ibid*.:15). This is arrant nonsense when applied to many parts of the world where fisheries management has been in the hands of fishermen for centuries, and where they have been therefore empowered for a similar length of time.

Since tropical nearshore fisheries are characterized by vastly more fish species and their corresponding fishing methods than temperate fisheries, and because there are very many more small landing points and complex social distribution systems than in temperate fisheries, central government management would be basically infeasible, despite its advocacy by Western fisheries development advisers. As a consequence, villagers in some Pacific island countries commonly make more formal fisheries regulations than do governments. Although governments may still pass laws about local fisheries, these are commonly ignored in places like the Solomon Islands, where individual fisheries officers with a small canoe and an insufficient fuel budget cannot be expected to manage the large districts for which they are nominally responsible. So to press for central administration or even co-management under such conditions is laughable. The most that can be hoped is that villagers will enforce those government laws they see as beneficial to them. Thus, Johannes continued, rather than the fishermen it is the fisheries managers and fisheries researchers from government who need to be "let in on the management process" (*Ibid*.:16).

Johannes also noted that unlike some industrial fisheries in temperate regions under co-management arrangements, where, when fisheries researchers recognize their own limitations, they often invite fishermen into the management process, quite the opposite situation usually prevails in tropical small-scale fisheries. In many Pacific Island nations it is the fishermen who invite fisheries managers to participate with them in devising new management solutions for their own traditional fisheries. This occurs particularly when fishermen realize that their own traditional measures and knowledge, while still adequate for many purposes, are no longer applicable under increasing human population pressure, or for managing new technologies, or where new export markets have arisen and a cash economy developed, among other impacts resulting from Westernization.

4. Ethical issues regarding indigenous knowledge

Johannes was deeply concerned about the misappropriation of traditional ecological knowledge (TEK). The main issue is whether outside corporations would seek to exploit local knowledge for their profit and also, in certain situations, whether external managers would seek to use the knowledge to impose stricter regulation on local or indigenous people.[4]

However, this did not lead him to adopt an extreme position, since not all indigenous peoples were preserving their traditional ecological knowledge effectively. The optimal solution would be to ensure that young people record and retain their traditional knowledge within their culture. However, that takes time and revitalization of knowledge transmission mechanisms, and, because TEK is being lost at an alarming rate, it is important that an outsider performs that role when local people display no interest in safeguarding and ensuring its continuity.

Moreover, since it is now generally acknowledged by both indigenous people and outsiders alike that, in the context of modernized fisheries, TEK works best when it is blended with Western science, the issue becomes not one of limiting the circulation of traditional knowledge among members of the culture group, but of getting it as quickly as possible into the most practical situation to solve immediate problems. However, the formalized protection of TEK from expropriation would assist in engaging many more communities to openly discuss their knowledge, thereby making it available for use in fisheries management. This remains a critical challenge to be met in promoting the the widespread use of TEK in the Pacific and elsewhere.

5. Idealizing TEK, or intellectual dishonesty and uncritical acceptance of indigenous knowledge

In this risk-averse era, when political correctness frequently stifles intellectual sincerity, it is indeed refreshing to reread Johannes' clear and comprehensive condemnation of what he regarded as intellectual dishonesty. He was not afraid to confront its various forms.

In particular, Johannes was well aware of the dangers and dishonesty of the uncritical acceptance and

4. In other words it would allow non-indigenous managers to refine their science-based management based on local knowledge (Johannes 1994c).

romanticization of traditional ecological knowledge, and that "uncritical appreciation can be almost as bad as none at all" (Johannes 1994b:86), such that "(s)ome claims about the environmental wisdom of traditional peoples have been so overblown that they have provoked a backlash" (*Ibid*.:87). With respect to romanticization and the mythical golden age of TEK, he took the commonsensical middle course, and concluded that the "truth lies somewhere in between: valid and invalid environmental beliefs, wise and unwise environmental practices coexist in many if not most cultures. People learn from their excesses. To assume differently is to assume that indigenous peoples are, in general, either inherently superior, or inferior, to the cultures of the developed world" (*Ibid*.). He observed a serious deficiency in the literature on TEK in the absence of any effort to determine validity, with local people being little different from those in developed countries in the desire to get the facts right or to embellish them as pretended experts (Johannes 1993).

Johannes excoriated environmental and social activists who quickly recognized the powerful rhetorical tool that the concept of traditional resource management and TEK researchers provide, but then often selectively use only those facts that accord with their case. An egregious example is the shameless conflating of an imputed sacredness with profound ecological wisdom. Although nature and religion might be more intimately intertwined in a local culture than in Western societies, environmental activists have not shrunk from the "convenient but tenuous extrapolation from this by routinely referring to TEK and indigenous attitudes towards nature as 'sacred' ", or by employing such phrases and terms as "sacredness of ecological systems" or "sacred ecology" of indigenous peoples (Johannes 2003b: 120). Such deceitfulness is regrettable, for:

> Because of such ploys, the notion of indigenous peoples as environmental paragons living in preternatural harmony with nature has metastasized through the media, and indigenous peoples are now often presented to us as environmentalist role models (*Ibid*.).
>
> This urge to select and embellish the facts is not limited to Western environmental activists. Observing the resonance of such environmental rhetoric among Westerners, some indigenous people have adopted it. And this has brought the inevitable temptation to use it to influence the outcomes of resource management or development initiatives in favor of islanders. For example they may exaggerate the environmental significance of an area being considered for development to extract greater concessions from the government or developers (*Ibid*.:121).

6. Problematical social scientists

Although proud of his collaboration with social scientists, Johannes identified some of their activities as obstructionist or otherwise problematical. Regarding the recent florescence of village-based marine resource management in Vanuatu and other Pacific island nations (Johannes 1998a), he noted that this continued growth of community-based marine resource management further refutes the idea that traditional non-Western attitudes toward nature cannot provide a sound basis for the modern day management of natural resources, and enabled Johannes to take the stick to a:

> small but destructive group of anthopologists...(who)...maintain that building contemporary conservation on traditional natural resource management is bound to fail because of differences between Western and indigenous concepts of nature. This is an astonishing generalization, coming as it does from a profession that normally serves to restrain Western ethnocentrism, for it implies that only Westerners are capable of deducing the connection between harvesting pressure and natural resource availability. No one has been more outspoken on this issue than Dwyer (1994:91) who has claimed that, "to represent indigenous management systems as being well-suited to the needs of modern conservation, or is founded on the same ethic, is both facile and wrong". This opinion arises from generalizing too freely from experience gained in certain cultures for which the statement may well be true. (Johannes 2002:337).

He also noted a further problem related to the uncritical and naïve assumption by some anthropologists "that superstitions and myths concerning the environment embody functional environmental adaptations. Probably some do, but the generalized attribution of environmental utility to such beliefs does not deserve serious scrutiny. Moreover, locally prescribed methods for improving fishing or hunting that focused on propitiating spirits or counteracting the effects of sorcery can divert attention from real and sometimes correctable causes." (Johannes 2003b:122).

Worse than mere naïveté is that with its own taboos social science is replete with intellectual dishonesty.

In particular, he roundly condemned one such taboo that "... prohibits many from acknowledging that there are traditional maladaptations in non-Western cultures...Perhaps to minimize the exploitation of observations by racists--or to avoid being labeled as racist... many anthropologists, for example, maintain the fiction that all cultural practices are beyond censure..." (*Ibid*.:121).

He noted that this particular taboo raises the especially vexing ethical issue of whether or not important judgments concerning human behavior should be suppressed because they might inflate racism, and, if respect for the customs of others is a hallmark of a civilized society, whether unlimited, uncritical respect is also civilized. Johannes observed that although the "widespread public discussion of certain clearly maladaptive cultural practices, such as female genital mutilation, would seem to have made cultural relativism increasing less tenable in recent years...it seems to have retained its currency among many anthropologists, including some who address environmental issues." (*Ibid*.:122).

Such naïveté has led to some severe and perhaps unanticipated problems in Pacific Island nations. For example:

> some island elites have been quick to exploit the cultural relativist stance that they have picked up from anthropologists who have been ubiquitous in the Pacific islands for several decades. Elites use this position not only to warn off outside critics but also to justify their exploitation to their own people (Lawson 1996). Serious environmental harm is being done in Oceania, most visibly in Melanesia, by island leaders who take advantage of their traditional environmental stewardship responsibilities and allow multinationals in to rip off the people's natural resources. (Johannes 2003b).
>
> In the same general fashion, fisheries resources in some Pacific islands have been sacrificed to enrich leaders. For example, exporting live reef food fish to Southeast Asia has become a big industry in recent years. If allowed to proceed without proper controls, it results in severe fish stock depletion as well as other serious environmental and socioeconomic damage...Cultural relativism impedes efforts to address such practices (*Ibid*.:123).

And the final irony is that "emboldened indigenous politicians who despoil their islands' natural resources tell critics, 'stay out of this. You don't understand our culture. These actions are in accord with our traditional customs.' Yet, as Lawson (1996) points out, members of Pacific islands elites are often among those islanders most out of touch with their traditions." (*Ibid*.).

Requirements for the future

Since it is impossible to manage most marine fisheries to achieve optimum yields, the only practical option is to adopt a precautionary approach that aims to protect resources from serious depletion. Because manpower and funds are not available to produce scientific data for each managed fishery, it is necessary to go beyond precautionary management to data-less management. For example, Johannes made back-of-the-envelop calculations to demonstrate that, in countries like Indonesia, underwater censuses using transact surveys would be infeasible and that Rapid Rural Appraisal of fishing villages would be even less realistic. The recourse would be to use data-less management, which, of course, is the universal traditional system of management employed for centuries by indigenous fishermen all over the world (Johannes 1998b).

Similarly, his field research on traditional knowledge demonstrated that random sampling of interviewees and a rigorous statistical analysis of the data obtained was likely to yield inaccurate and misleading data. Rather than use randomly select informants, Johannes found it is more valuable to interview people with:

> ...high reputations in the villages for fishing expertise. For the most part these people were between 42 and 79 years of age. Some of them no longer fish because of physical infirmity, but all maintained an active interest in fishing and in the changes in fishing conditions occurring over the years. The attitudes and knowledge revealed by these interviews should not be assumed to be representative of Tarawa's fishing communities as a whole, but of their most experienced fishermen.
>
> Interviews were deliberately unstructured. When unanticipated but promising subjects came up we pursued them with further questions, thus following any potentially instructive pathways along which the interviewee's knowledge seem to be leading us. To minimize the constraints put on informants by the limitations of our own knowledge and preconceptions, we did not use questionnaires or a sur-

> vey-style format. The latter are useful in pursuing well-defined and circumscribed questions; they are inappropriate, however, in exploratory interviews concerning specialists' knowledge where the interviewer is uncertain concerning what types of useful information may be forthcoming (Johannes and Yeeting 2000:1–2).

To capture the vital information that would be missed otherwise, Johannes was adamant about the importance of including alternatives to complement random sampling of fishermen within the design of field surveys. However, he realized that this would require a major shift in the thinking and training for biological scientists to enable them to embrace data-less and data-poor management, as well as rewriting textbooks to acknowledge and include it together with conventional statistical approaches. That would not be easy, because "the brainwashing we have received from narrowly trained and dogmatic teachers, entranced by the theoretical appeal of statistical analysis of data generated by a random sampling, has tended to blind many of us to the virtues of other approaches" (Johannes 1994a).

A new kind of training and research is required to prevent serious overfishing under cooperative management situations. For this purpose Johannes proposed that the less theoretically elegant and less quantitatively rigorous prevention of serious overfishing should be subsitituted for OSY and MSY as the objective of fisheries management. To implement that, extension workers must learn how to obtain information needed to plan and sustain village management strategies based on the practical aspects of local knowledge. This is not normally part of a fisheries biologist's curriculum, *but it should now be* (*Ibid*.). However, to implement this approach would first demand that the ingrained mentality of fisheries researchers be changed, since biologists are not taught to seek knowledge from people, but first from books and then from nature. It is important to emphasize that Johannes did not regard data-less management as synonymous with "information-less" management; "one doesn't need data to protect a spawning aggregation or a giant clam population that fishermen agree is badly overfished" (Johannes 1994b).

Johannes was concerned that just paying lip-service to TEK had already become important by the 1990s to obtain lucrative consulting and other contracts, which then resulted in volumes of unread reports. He considered it important to publicize how information based on traditional ecological knowledge could be systematically obtained and organized to ensure that it was useful for environmental impact assessment, and that it could be tightly integrated with information obtained from other sources. He was convinced that local knowledge needs systematic collection, and that this should focus on schools and higher education institutes, using an interdisciplinary approach (Johannes 1984).

Johannes emphasized that research in support of village-based management is also urgently required. Such research requires the interactive and pragmatic testing of various management strategies on the fishing grounds, based on the fishermen's ideas. Subsequent management decisions are then based on the outcomes of those tests. In other words, this is an old trial-and-error management research approach, and it will replace the scientific hypothesis-testing approach to research. Seriously declining fisheries require immediate action, an idea guaranteed to make conventional fisheries biologists hesitant without the huge quantities of data required to fine tune management. There has very been little experimental management research, although there are excellent opportunities for it throughout the Pacific, where village tenured waters are available. The research design could be simple before-closure-and-after surveys, since many of the experiments now being performed by villagers are suitable for this, particularly in Vanuatu and other parts of Melanesia (*Ibid*.).

Johannes reported in detail on a striking renaissance in tradition-based marine resource management in fishing villages in Vanuatu since the early 1990s, which was catalyzed by the Fisheries Department (Johannes 1998a). It provides an excellent example of villagers on their own initiative extending government measures from trochus, for which they were designed, to cover other species of fish and invertebrates. In a follow-up survey of the same villages eight years later, the trend in village-based resource management initiatives was found to have continued, with the number of marine management measures more than doubling in response to continued population growth and commercialization of resources (Johannes and Hickey 2004). The experience of Vanuatu provides many lessons on how to initiate effective and inexpensive government assisted, village-based resources management. It also demonstrates admirably how a local, low-cost, "bottom up" operation that listens to fishermen can have much greater success than an international fisheries project costing tens of millions of dollars.

In one of his last articles Johannes revelled in contrasting his pessimism of a quarter century earlier with the renaissance of community-based marine resource management in parts of Oceania (Johannes 2002). Despite this welcome resurgence, however, he cautioned against complacency. During the intervening years the decline resulting from

the impact of Westernization that he decribed in 1978 had been reversed in many island nations, particularly Vanuatu, Samoa, Cook Islands, Fiji, Palau, Tuvalu, and the State of Hawai'i, USA. Despite the continuation and even intensification of all the conditions that led Johannes 24 years earlier to conclude that the demise of traditional systems was imminent, those traditional management methods are some of the techniques responsible for the renaissance.

Johannes observed that the resurgence of traditional community-based marine resource management can be attributed in large part to a growing perception of resource scarcity, the strengthening of traditional village based authority, to legal recognition of marine tenure, government support, and improved conservation education, among other things. Although undoubtedly he would be embarassed to read this, many believe that the resurgence of traditional management systems, particularly in the Pacific Islands, owes a great deal to the message, advocacy and tireless efforts of Robert E. Johannes to this most worthwhile of causes, so evocatively first set out in his seminal book, "Words of the Lagoon". His other publications reprinted here emanated from the ideas in that volume. Although traditional knowledge and management are inseperable in his work, his first love is quite evidently local or traditional knowledge and, above all, the fishermen of the Pacific Islands who are its custodians.

Table 1. Main topics of the reprinted publications.

Item	Date	Article title	Main topics addressed
1	1977	Traditional law of the sea in Micronesia	Traditional marine resource management Marine tenure Characteristics of tropical nearshore fisheries Resource scarcity and conservation – Pacific Islanders cf. Westerners Traditional cf. Western legal concepts Failure of Western management Potential usefulness of traditional resource management Consequences of destroying traditional systems
2	1978	Traditional marine conservation methods in Oceania and their demise	Traditional marine resource management Marine tenure Resource scarcity and conservation – Pacific Islanders cf. Westerners Westernization and the decline of traditional systems
3	1978	Reproductive strategies of coastal marine fishes in the tropics.	Reproductive strategies of tropical inshore finfishes Traditional knowledge Scientists and the verification of traditional knowledge
4	1980	Using knowledge of the reproductive behavior of reef and lagoon fishes to improve yields	Relationship between spawning aggregations and fisheries management
5	1981	Working with fishermen to improve coastal tropical fisheries and resource management	Local knowledge reveals "hidden" factors Unappreciated resource areas Categories of local knowedge Traditional conservation practices Cultural acceptability of proposed management Research methods
6	1982	Traditional conservation methods and protected marine areas in Oceania	Local knowledge and MPAs Traditional conservation and ocean reserves Local knowledge as substitute for lack of formally recorded data Local knowledge holders superior to consultants Particular importance of local knowledge of lunar and seasonal cycles and protection of breeding sites
7	1982	Implications of traditional marine resources use for coastal fisheries development in Papua New Guinea	Integrating traditional mechanisms of resource management and conservation in national fisheries policy and development projects Need for better understanding of traditional fishing rights in PNG Cautioned about fisheries development of locally important food items for large-scale external markets

Table 1 (cont'd). Main topics of the reprinted publications.

Item	Date	Article title	Main topics addressed
8	1984	Marine conservation in relation to traditional life-styles of tropical artisanal fishermen	Value of traditional marine conservation measures and local knowledge for marine conservation and natural history studies Need for systematic collection of local knowledge Increased focus on high schools and tertiary education
9	1987	Knowledge possessed by native Australian fishermen could aid seafood technologists	Fatty acids in fish and occlusive vascular disease Incentive to develop fisheries in northern Australia Traditional knowledge of seasonal variation in the fat content
10	1989	Spawning aggregation of the grouper *Plectropomus areolatus* (Rüppel) in the Solomon Islands	Spawning aggregation of Plectropomus areolatus Fishermens' predictions and author's verification of them
11	1989	Managing small-scale fisheries in Oceania: Unusual constraints and opportunities	Some conditions may preclude economically sound fisheries development Information required for Western-style management often not available Social barriers to capitalistic behavior Occupational pluralism Therefore major role for traditional management and knowledge Poor record of fisheries development projects in the Pacific
12	1990	Fishing and traditional knowledge	Knowledge of spawning aggregations in Palau Example of traditional conservation practises Pacific Islanders centuries ahead of their European counterparts
13	1993	Integrating traditional ecological knowledge and management with environmental impact assessment	Lip-service to importance of TEK Proposed Environmental Impact Assessment based on taxonomic, spatial, temporal and social frames of reference Interdisciplinary teams Determine validity of TEK Ethics of TEK use Proprietary attitude toward TEK
14	1993	The plight of the osfish, or why quantitative sophistication is no substitute for asking the right questions	Failure of statistical analysis and questionnaires Importance of non-random interviews
15	1994	Design of tropical nearshore fisheries extension work beyond the 1990s	Western-style fisheries management worked poorly and even less useful in tropical small-scale inshore fisheries Demands major changes: Training for research and extension Design of fisheries research and extension Prevention of serious overfishing as the objective of management Data-less management Village experiments
16	1994	Co-operative fisheries management: Major changes in training required for government fisheries personnel	Ditto Item 15
17	1994	Pacific Island peoples' science and marine resource management	Anything that contributes to our knowledge of the physical world is part of science Fisheries biologists' attitudes Misappropriation of TEK Need to record knowledge despite risks Romanticising traditional knowledge

18	1998	The case for data-less marine resource management: Examples from tropical nearshore finfisheries	Managing marine fisheries for optimum yields is unattainable Protecting from serious depletion through precautionary management the only practical option Reqirements still too data-rich Therefore data-less management required Sampling infeasible Traditional knowledge and management systems should be adopted as the standard practice Requires a major shift in the thinking and training for biological scientists Rewriting textbooks Nothing new about data-less management
19	1998	Government-supported, village-based management of marine resources in Vanuatu	Renaissance in tradition-based marine resource management in Vanuatu Villagers' initiative Low-cost operation succeeds cf expensive international fisheries development project
20	2000	Ignore fishers' knowledge and miss the boat	Five examples (from Solomon Islands, the Canadian Arctic, Alaska and Kiribati) By ignoring fisheries TEK marine researchers and managers may jeopardize fishery resources and their users Types of critical information that fishers can provide TEK not acceptable to biologists
21	2000	I-Kiribati knowledge and management of Tarawa's lagoon resources	Investigation of local knowledge of marine resources in Kiribati Methodology for fieldwork
22	2002	The renaissance of community-based marine resource management in Oceania	Examines the resurgence of traditional community-based marine resource management
23	2003	Fishers' knowledge and management: differing fundamentals in artisanal and industrial fisheries	Tendency not to comprehend differences between tropical small-scale artisanal fisheries and temperate industrial fisheries Partly to blame for misguided development policies and programs for the former Western fisheries textbooks focus on temperate zone fisheries inappropriate for training tropical fisheries managers
24	2003	Use and misuse of traditional ecological knowledge and management practices	Describes nature, origins and value of TEK Examines why some TEK maladaptive Cultural relativism Implications of biologists ignoring TEK Distortion of TEK by advocates and elites The practical value of and ethical issues regarding TEK Traditional management of marine resources Traditional conservation ethic Traditional environmental malpractice

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