

Marine Resources Management in the Context of Customary Tenure

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Abstract *Although customary marine tenure (CMT) systems for the management of local marine resources occur throughout the world, compared with other models of fisheries management they remain relatively little known. The Pacific Basin is especially rich in CMT systems, which play key roles in overall social, economic and cultural life of societies. Based on a Solomon Island example, we examine the organizational principles and potentials of CMT systems to provide sustainable yields and equitable access to resources, their resilience to external pressures, and mechanisms for ensuring local autonomy in resource control. Next we demonstrate that CMT systems are an expression of traditional ecological knowledge, and show the importance of such knowledge to scientific research and the planning of resource management. Finally, we suggest priorities for research on CMT systems.*

Keywords community-based management, fisheries management, traditional environmental knowledge, traditional conservation, Pacific Basin, Solomon Islands.

Introduction

It is ironic that despite the now well-documented and widely accepted inadequacy of fisheries management in many parts of the "First World" that Western biological and economic models are still those generally recommended for fisheries development and management in Third World contexts. This irony is compounded, first because in many Third World societies there already exist sophis-

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ticated fisheries management systems well-adapted for local use; second, because similar systems also exist (although often extra-legally) in many parts of the First World; and third, because many such Third World systems might be readily adaptable for managing fisheries in the First World.

Much of the Western fisheries management theory is misleading, owing to the widely accepted but erroneous assumption that the misuse of fishery resources stems from the institution of common property.¹ But this ignores the specific socio-cultural context of a given common property, and so ignores local customs and behavior that might modify resource uses.

Resource depletion is not inevitable: users of common property resources are not always selfish and unhampered by social sanctions, as has been conclusively demonstrated by many recent studies of coastal fishing societies that have documented the existence in many widely differing parts of the world of often time-honored, local fisheries management systems that regulate access to and exploitation of resources. The published literature now includes anthologies of case studies of customary marine tenure (CMT) systems, especially from the Western Pacific (Ruddle and Akimichi 1984a), the Pacific Basin and Indo-Pacific Region (Ruddle and Johannes 1985, 1990), the Caribbean and Latin America (Cordell, 1989), as well as from riverine environments in Africa (Scudder and Connelly 1985).² Such systems are not limited to the Third World, as shown by recent comprehensive studies of CMT systems in the mainstream politics of industrialized nations, such as Canada and the U.S.A. (Pinkerton 1989), Japan (Ruddle 1987), Australia (Gray and Zann 1988), and New Zealand (Waitangi Tribunal 1988; Levine 1989).

The Pacific Basin is especially rich in excellent examples of complex and elaborate CMT systems which play key roles in overall social, economic, and cultural contexts. Organizational concepts range from the quasi-ownership of specific sites by individuals, families, clans, or other small social group, to the complex state legal system of Japan. However, in that vast region the local community is often the sole owner that controls the local spectrum of marine habitats. Such CMT systems are a practical antithesis to common property-open access models, and embody fundamental concepts relevant to fisheries management worldwide. Although eroded or even broken-down in parts of the region, especially because of colonialism or neo-colonialism, CMT systems are still used to manage coastal fisheries in a wide range of island societies, under broadly similar

¹ This is well-known. For excellent treatments see McCay and Acheson (eds.) 1987 and Berkes (ed.) 1989, among others.

² In "customary marine tenure", "customary" refers to an institution that has continuous links with the past as it adapts to handling contemporary issues; "marine" refers to the institution as dealing with reef, lagoon, coast, and open sea, including islands and islets within this overall seaspace; and "tenure" refers to a social process of activities in maintaining control over territory and access to resources (Hviding 1989; 1991). The CMT concept thus goes beyond the implication of such concepts as TURF (Territorial Use Rights in Fisheries [cf. Christy 1982]) that the utilization of fishery resources is the only concern of such institutions, or "co-management", the basic concept of which is the mutual accommodation and sharing of management responsibility between local and national systems (although it should be noted that in many areas CMT might eventually benefit by becoming embedded in such a framework).

biophysical and socioeconomic conditions. Increasingly, CMT is challenged by efforts to commercialize and intensify local fisheries. It is also confronted by tourism development and by such land-based activities as logging and mining. This is the case particularly in Melanesia. In a number of instances, local management systems have shown considerable capacity to cope with such pressures (Baines 1985; Hviding 1988; Ruddle and Johannes 1990; Hviding and Baines 1992).

Nevertheless, understanding of CMT systems in the Pacific Basin, as elsewhere, has been hampered by the dominant Western assumption that fish are an open access resource. Although plausible offshore, such a notion is far less applicable to small-scale inshore fisheries, since the resource areas in question are often closely integrated with adjacent land, ecologically as well as conceptually, in terms of local culture. The majority of fishermen and fisherwomen in the South Pacific, as elsewhere in the tropics, are predominantly part-timers, combining fishing and farming. It is typical of this region that land and sea and their associated occupations are seen as economically and nutritionally complementary domains, and not dichotomized along Western lines into "ownable land" and "unownable sea" (Ruddle and Akimichi 1984b; Ruddle 1988). A concept of "corporate estate", a territory held jointly by a kinship-based group and embracing a connected range of terrestrial and marine resource zones, is widespread in the South Pacific (Ruddle and Akimichi 1984b). Examples include the Hawaiian *ahupua'a* (Meller and Horowitz 1987), the Yap *tabinau* (Lingenfelter 1975; Schneider 1984), the Fijian *vanua* (Nayacakalou 1971; Ravuvu 1983), the Marovo (Solomon Islands) *puava* (Hviding 1990), and the estate of the Yolngu aboriginals of North Australia (Davis 1985) (cf. Fig. 1).

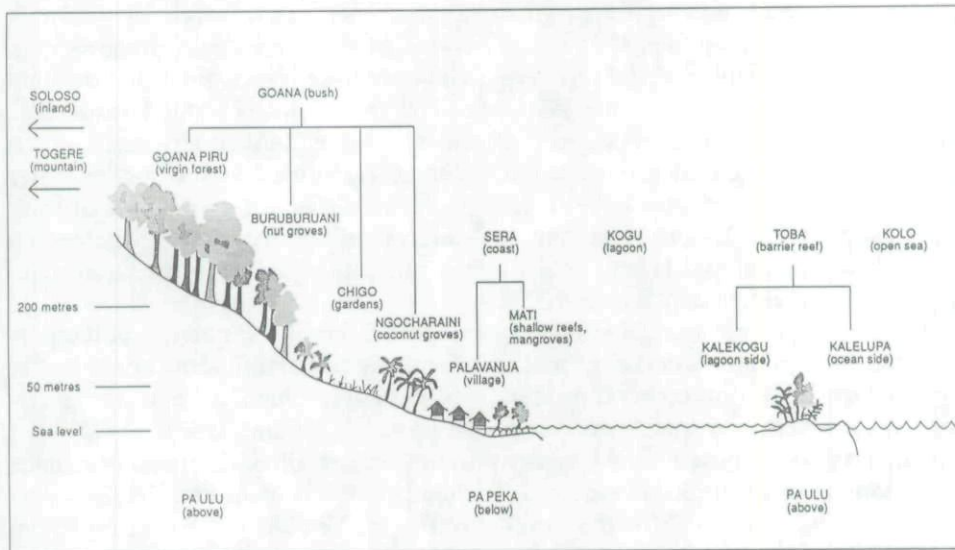


Figure 1. An example of the South Pacific "integrated corporate estate" concept: The Marovo (Solomon Islands) *puava*, showing environmental zones and indigenous classification (after Hviding 1992).

Social Principles: A Framework for the Analysis of CMT Systems

In this section we examine the organizational potentials of CMT systems in terms of their capacity to provide sustainable yields and equitable access, resilience to external pressures, and maintenance of local autonomy in controlling resources. We do this using a case study of a CMT system in Marovo Lagoon, Solomon Islands, which exemplifies social processes generated by basic principles and shaped by initiatives from the world outside. This CMT system is characterized by a high degree of complexity, flexibility, and success in meeting contemporary pressures, and so provides empirical insights into micro- and macro-level processes in the local management of marine areas and resources (Hviding 1990).

A recent review (Ruddle 1988) indicates that the underlying basis of CMT systems in Oceania shows clear correlations among the tenure or ownership of marine areas, the distribution of resource rights, and the organization of activities and political groups. Management systems in the aquatic domain frequently mirror those on land, and are integral components of regional systems of resource holding and management that embrace entire islands or, for example, larger lagoon areas and adjacent shores. Having a firm base in local tradition and customary law, Pacific Island marine tenure systems are intimately bound within the wider cultural system of a society, and consist of complex social relationships regulating the access to marine resources. Although CMT systems may, in economic terms, be considered a form of fisheries management, at a higher level they form part of large-scale socio-political and spatial relationships.

From the available documentation and from established social science theory, it is clear that a corporate estate such as described here does not exist in isolation. Rather, the very nature of a social group as a "corporation" controlling an "estate" (cf. Radcliffe-Brown 1952:34) is based on its coexistence with other, similar groups also exercising corporate rights over similar estates (cf. Keesing 1981). In all the examples mentioned above, CMT forms part of a greater regional system of control over territories and resources, and corporate rights, inherited through generations, involve more than just access to economically valued resources, such as fish: By acting as management units controlling defined territories of sea (and/or land), kin-based groups acquire distinct identities in relation to other groups. CMT systems thus have fishery management as but one aspect of their role in society and history, and contain a number of opportunities for achieving ecologically, economically and socially integrated approaches in resource management (cf. Hviding and Baines 1992).

CMT systems are basically systems of social relationships that involve participants and operators, in groups and as individuals and in different capacities, as right-holders, decision-makers, insiders, and outsiders. Such systems are generated, maintained, and transformed in social process (Hviding 1990).

To understand these processes, an awareness of certain basic social principles underlying their dynamics is required. Ruddle (1988) has identified the following six underlying principles for the South Pacific: (1) Sea rights depend on social status; (2) resource exploitation is governed by use rights; (3) resource use territories are defined; (4) marine resources are controlled by traditional authorities; (5) conservation was traditionally widely practised; and (6) sanctions and punishments are meted out for infringement of regulations. We resume this discussion below.

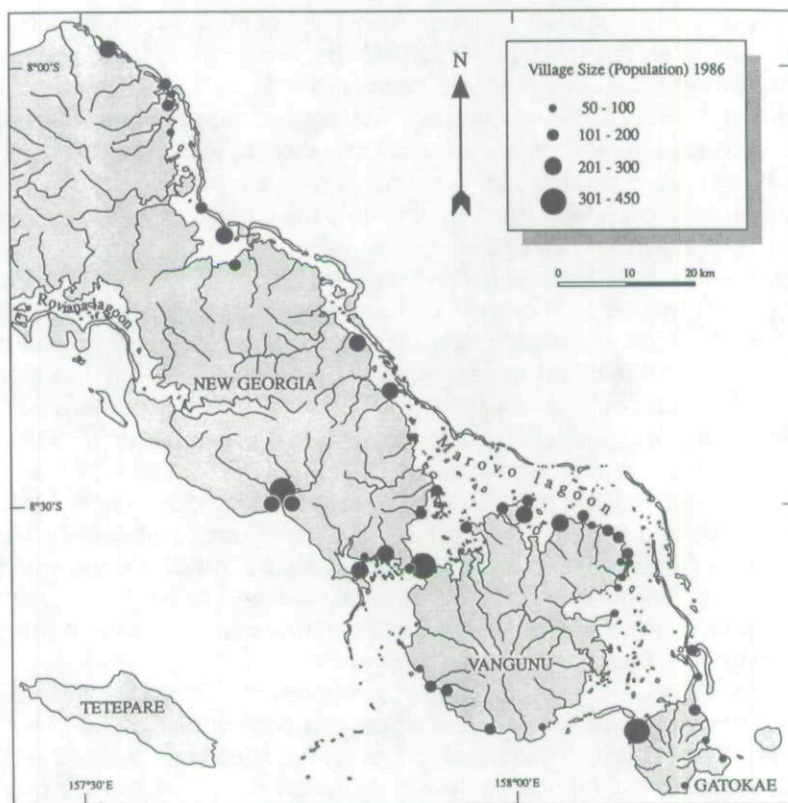


Figure 2. The Marovo area and population distribution, based on 1986 national census (SIG 1989).

A Case Study: Marovo Lagoon, Solomon Islands³

The Marovo area (Fig. 2), in Western Province, Solomon Islands, southwestern Pacific, contains an extensive and ecologically complex 700 km² reef and lagoon environment (Stoddart 1969). This provides the core of existence for a population of some 9,500 persons, living in small villages on and near the coasts of the three high volcanic islands that face the lagoon.⁴

The elevated reef which runs the length of Marovo lagoon contains a wealth of marine resources (Hviding 1988). In particular, the most important fishing grounds of Marovo are located here. A great variety of food fishes (the local taxonomy contains approximately 400 species, most of which are exploited) occurs on and around the barrier reef. In the open sea and around outlying islands, schooling tuna and nesting turtles seasonally support important subsistence fisheries. On the barrier reef flats and further inshore in the deep lagoon, large stocks

³ This case study is based on research in Marovo Lagoon by Hviding, in 1986–87, 1989–90 and 1991–92, for a total of two years. Fieldwork was funded by the Norwegian Research Council for Science and the Humanities (NAVF) and the Institute for Comparative Research in Human Culture, Oslo. The 1986–87 period included one month of research with R. E. Johannes.

⁴ This estimate is based on a projection of 1986 national census data (SIG 1989).

of *bêche-de-mer* and of such commercial shells as trochus and pearlshell variously form the basis of an intermittently booming cash sector in Marovo villages. The coastal mangrove areas contain ample stocks of shells and crabs, exploited mainly by women, and which figure prominently in the subsistence diet of village households. A strong tradition of environmental knowledge, as well as the still essentially lightly exploited nature of most marine resources, provides a strong element of predictability and certainty in fishing and marine gathering (cf. Johannes and Hviding 1987). Local knowledge of natural processes and regular occurrences, such as growth rates of important shells and spawning aggregations of important food fishes, informs decisions made by managers of different corporate descent groups (*butubutu*) about fishery management measures and their enforcement.

Rights of control over resources are held by *butubutu*, mostly in the form of land-and-sea estates (*puava*). As such, the Marovo case exemplifies a basic type of customary resource management widespread in the South Pacific. The system of customary marine tenure, tied to ancestral title and integrated with land tenure, thus embraces more than mere "fishing rights". Reef and lagoon rights are not distributed equally among all villages. Rather, they are held mainly by those descent groups having an historical "origin" as coastal dwellers, and which have reefs and sea as the main component of their holdings. In contrast, groups that were bush dwellers in pre-Christian times now hold mainly land areas, but have obtained extensive use rights in fishing grounds.

Marovo society consists of more than twenty named *butubutu*, half of which have primary rights over sections of lagoon and barrier reef (defined by lateral boundaries). The other half have land rights as their focus. A number of institutions link the different *butubutu*. These are based partly on the reciprocal exchange between neighboring "coastal" and "bush" groups of use rights in fishing grounds and in mainland rainforest, and, for the CMT system, on complexes of joint use between members of *butubutu* that control adjacent sections of lagoon and reefs.

The CMT of Marovo is a highly flexible and adaptive system of local resource management that can handle many contemporary local issues related to subsistence and commercial use, as well as those involving demographic and political change. There is a continuous adaptation of the regulations enforced on marine resource use by different descent groups, with negotiation between individual fishermen and descent groups, based on kinship ties, on who should have access to which areas. In addition to territorial access rights, there is a fluctuating variety of regulations concerning permitted technologies and target species.

In recent years, the Marovo people have become increasingly involved in negotiating access to the rich resources of their estates with a number of external agents, such as national government and transnational resource extraction companies, thus their present CMT system is linked with processes reaching far into the wider world. Large-scale commercial fishing, mining, and logging are all contemporary concerns of Marovo marine tenure, the latter two because they are perceived as potentially serious sources of pollution to the marine resource base. Reef-and-lagoon holding groups have, in recent years, resisted mining and logging developments on the land of "bush" people, out of concerns for potential river-borne accelerated sedimentation damaging their reefs. A number of "pan-Marovo" initiatives, linking most reef-holding groups, have emerged in this process.

Marovo Lagoon has long been of interest for the development of a commercial fishery, better organized than the present intermittent village-based fishing enterprises. However, the development potential may be more apparent than real, because of widespread local opposition to external large-scale fishing, based on a prevailing perception among rights-holders of a limited resource base, and because few people are interested in long-term full-time fishing since their traditional economic strategies are based on a high degree of diversity and flexibility, alternating between subsistence and commercial production and exploiting different resource types. As Rodman (1987) has observed of rural Vanuatu, so too in Marovo, almost no one is willing to be a "full-time anything". In Marovo, fishing groups are of shifting composition, and most people fish commercially only intermittently. The principles of the Marovo CMT system are fundamental in shaping the fishery development potential: Since the rights to fish derive from a person's place in an integrated system of territories and groups, they do not have to be validated by continuous active fishing, as would be the case in a modern fishery cooperative. Further, the "fixed-territory"-nature of Marovo fishing poses a clear spatial constraint on commercial development, since it limits expansion of intensive commercial fishing beyond the area of each fisherman's group. Moreover, fishing could be expanded only marginally beyond the Marovo area owing to nearby deep waters and because there are similar CMT systems along coasts to the west. Thus Marovo Lagoon is a limited, isolated fishing area of defined extent, in which fish stocks could become depleted. This is fully recognized by Marovo people (Hviding 1988).

Parallels between CMT Systems and Fishery Cooperatives

Local commercial fisheries are often organized cooperatively, and frequently serve to reduce dependency, risk, and uncertainty in fishermen's dealings with the market (Acheson 1981). So many different forms of fishermen's organizations have been termed "fishery cooperative" that a general definition is difficult. However, they are commonly characterized by democratic control by the membership (usually by a one-man-one-vote rule), and easy and voluntary entry; by all members sharing equally in capitalization, operations and risks, and profits are commonly distributed according to participation in activities rather than on capital invested; and cooperatives are legally registered associations, rather than loosely organized groups of individuals (Orbach 1980).

Although cooperatives are often viewed as a general solution to many problems of small-scale fishermen (Acheson 1981), many of their organizational concepts pertain more to industrial fisheries. This, plus the many failures of development projects based on them, casts doubts on the general usefulness of fisheries cooperatives. Further, the growing appreciation of CMT systems demands a fresh examination of fishery cooperatives and alternatives presented by local traditional organizations.

In this respect some attributes of the Marovo CMT system are instructive. In Marovo the *butubutu* is a form of indigenous fishery cooperative, although not specialized in fisheries. As a corporate group it performs a variety of tasks related to its land and sea holdings, as well as to its members' relations with other groups and political institutions. On the other hand, the *butubutu* is a type of fishery cooperative according to some of the criteria noted above: It is a recognized

association according to customary law, notwithstanding a lack of registration under State law; each member profits according to activity, because products from group resources are distributed among the membership proportionate to level of fishing activity; the customary rights of each member, that together form the corporate "collection of rights" required for effective resource control of a collective estate, rather than capital *per se*, are contributed; and a *butubutu* is fairly democratically controlled since the traditional decision-making power of leaders is largely subject to the approval of the other resident members. In contrast, easy and voluntary entry is not a characteristic of a *butubutu*, since the only normal way of entering is through inherited rights. Membership in this kind of "fishery management cooperative" is ascribed at birth, and is for all practical purposes a lifetime entitlement. Entering the group through marriage confers only secondary entitlements.

A Marovo *butubutu* functions as a local management organization, regulating resource use in the *puava* (estate) from a basis of exclusive rights of control over marine and terrestrial resources. Active fishermen and fisherwomen and knowledgeable elders monitor environmental changes related to the resource bases. This type of grouping is capable of handling various issues of commercialization and resource scarcity. The crucial element of *butubutu*-level management is that subsistence and commercial exploitation are fully integrated and based on local ideas about self-reliance.

It can be argued, therefore, that introduced cooperative groupings are not needed for solving the local tasks of marine resource management in a place like Marovo. Instead, the focus should be on solving the wider organizational problems of appropriate commercial fishery development, especially those of marketing, transport, storage, provision of equipment, and coping with extralocal organizations. These points are illustrated by an example of reactions in Marovo to the establishment of a commercial fishery project. The local response to and participation in project planning demonstrates the organizational potentials of a viable and adaptive CMT system, particularly in terms of "participatory planning". The example also constitutes a social process via which the six organizational principles, mentioned above, are activated in sequences of actual events.

Local Reactions to Fishery Development

In 1987, the Seventh-day Adventist Church planned to establish in Marovo a large freezer and improved transport and marketing facilities to support organized commercial fishing, so as to increase cash-earning opportunities for the villagers. The project was initiated by expatriate administrators of the church. The initial steering group consisted of expatriate and national church administrators, plus some Marovo representatives. But some of the coastal, reef-holding *butubutu* soon objected that despite having supreme traditional control over fishing grounds they were under-represented. Some influential leaders from coastal groups were then asked to join.

Then the chief of a coastal *butubutu* that traditionally shared its fishing grounds with groups of bush people announced a plan for managing the reefs of his people, now that commercial fishing was about to intensify. He would close to the bush groups defined sections of "his" reefs. He announced that henceforth more than half the fishing grounds of his group would be reserved for the exclusive use

of the primary marine rightholders, and trespass would be punished by placing further limitations on fishing by bush people.

At a meeting in mid-1987, the expatriate members of the steering group recognized some local concern for the future of subsistence resources were commercial fishing to be intensified considerably. They proposed some complex management devices, to be organized by the fishery project, such as zoning of the lagoon for monitoring purposes. In response, they were bluntly informed by a powerful local member of the steering group that management, monitoring, and other conservation efforts were not at all the responsibility of expatriate church administrators, nor of the fishery project. He argued that it was the responsibility of the project to provide storage, marketing, and transport facilities, whereas it was up to the *butubutu* of Marovo and their leaders to ensure the management of fish stocks in their own *puava*. Most villagers endorsed the opportunities offered by the project, but many also emphasized that it was important for the reef-holding groups controlling Marovo's fishing grounds to now strengthen their marine tenure regulations.

The fish freezer started operating in 1988, and has been fraught with a number of difficulties relating not least to the part-time nature of local commercial fishing. Nevertheless, after about a year of operation, some optimism was expressed by both church officials and fishermen, the latter commenting positively that the former had followed the advice given, and had left resource management issues to the reef-holding groups. Through the CMT system, several *butubutu* imposed a number of strengthened limitations on access to reefs for commercial fishing.

For example, some reef-holding *butubutu* restricted commercial fishing by outsiders, *e.g.*, people from mainland bush groups, while maintaining the long-standing use rights of these people to fish for subsistence purposes. This was aimed explicitly at putting a ceiling on the transformation of fish stocks into cash, and thereby to preserve future food stocks. Similarly, certain reef-holding groups have imposed strong restrictions on the gathering of commercial shells by "bush" outsiders, so as to reserve this source of cash for themselves. In these cases, too, the rights of the "bush groups" to catch fish for subsistence or modest marketing were not affected (Hviding 1988). With the demise of the Seventh-day Adventist freezer operation, in 1991 (largely because of financial problems), and the concurrent shift from pearl shells to *bêche-de-mer* as a focus in commercial "marine" products, CMT enforcement throughout Marovo Lagoon became more relaxed. Rather than specific regulations on technologies, economic modes or target species, the general well-being of the lagoon in the face of proposed mining and logging activities has been the main concern of reef-holding *butubutu*.

Social Principles Activated

The example of the Marovo fish freezer demonstrates how key principles underlying a viable CMT system can determine the organization of local fishery development. These underlying principles generate dynamic processes whereby day-to-day management of fishery resources is shaped according to the changing circumstances perceived by local reef-holding groups.

In terms of the social principles (Ruddle 1988) noted above, it is clear that the distinction between bush people and coastal people in Marovo remains crucial to the actual distribution of decision-making power in resource management. In

other words, *sea rights depend on social status*. Further, *resource exploitation is governed by use rights*. A fishery project predicated on the assumption that control over fishing grounds and use rights are equally distributed among Marovo villages would meet with serious problems. In this case, to perceive Marovo fishing rights as being vested with "village cooperatives," each village "owning" its adjacent fishing areas, and to give such village units some formal legal status, would be to override fundamental social relationships whereby a primary right-holder grants secondary use rights according to customary obligations of reciprocity.

Reactions to larger fishery projects also follow a pattern where each reef-holding group formulates its own set of regulations to handle emerging changes in marine resource use within its own defined area. Thus, *resource territories are defined*, in the Marovo case, as in many other CMT systems, by means of recognized marine boundaries. The formulation of area-specific management measures is tied to the uniqueness of each *butubutu's* situation, and handles local variation in a way that would not be possible for a more formal, homogenous, and centralized fisheries management system.

The "hands off"-argument presented to church authorities by an influential local leader is an indication of Marovo people's emphasis on indigenous autonomy, by keeping the control and management of marine resources in local hands. Fishery management legislation of a "foreign" nature imposed by outside agencies is unlikely to elicit compliance in an area like Marovo, where customary resource management continues to have a strong position. *Marine resources are controlled by traditional authorities*, who, further, might insist on playing a key role in project planning. Further, as demonstrated by the chief who announced new restrictions on access to "his" reefs, *sanctions and punishments are meted out for infringement of regulations*.

The ability to monitor changes in fish stocks, to predict ecological consequences of intensified resource exploitation, and to suggest relevant new management measures are important aspects of Marovo people's traditional marine knowledge (Johannes and Hviding 1987; Hviding 1988). Initiatives by individual fishermen provide an input in each *butubutu's* cooperative efforts to formulate a management policy. Basic to this process is a concern for the sustained well-being of each group's limited resource base; *i.e.*, *resource conservation is practised*. That these concerns for sustained yield rely on mostly pragmatic economic motives, which they appear to do in the Marovo case, is a moot point so long as the concerns have positive implications for the resource base.

Reef-Holding Groups in Confrontation with the Tuna Industry

To conclude this case study, processes whereby local reef-and-lagoon managers interact through the CMT system to link with national and international entities are examined. Resource management tasks in Marovo increasingly involve not only different local *butubutu*, but also extralocal participants that include tourist resort operators, yacht crews, transnational fishing, mining and logging companies, and a variety of businessmen based in Honiara, the national capital. The contemporary Marovo CMT system is thus characterized by more complex and far-ranging processes than was the "purely traditional" system (Hviding and Baines 1992).

For example, marine tenure in Marovo now has implications for the interna-

tional tuna-fishing industry. Tuna company boats enter Marovo Lagoon nightly, during the March–November season, to net live baitfish. To meet demands from local reef-holding groups and regulate operations, a national system of formally defined “bait grounds” was established. In Marovo bait ground boundaries are based partly on customary ones (Baines 1985; Evans and Nichols n.d. [1986]; Hviding 1988), and “royalties” are paid on a per night/per vessel basis to designated trustees of each bait ground.

This system, originally intended to comply with the demands of traditional reef-holding groups, has created some conflict in Marovo. Although some trustees act as expected and use the royalties for community benefit, others see themselves, prompted partly by the European-derived official government view of resource “ownership”, as sole “owners” of the bait ground, and keep the royalties for their own use. This, plus disputes over the non-traditional nature of some bait ground boundaries, has led to local court cases.

To avoid conflict, and because of a belief that bait-fishing disturbs food fish stocks, some local leaders have closed grounds. Such closures are generally respected by the tuna boats, but have caused some concern among high-level fisheries administrators because the pole-and-line tuna fishery remains totally dependent on a continuous supply of live bait from areas like Marovo.

This example demonstrates how local-level social principles and concerns embedded in the Marovo CMT system generate processes that have implications far beyond the local fishery and society. The tuna bait ground issue is a striking example of the forceful articulation of local sea rights with national and international systems. Similar cases have occurred elsewhere in Melanesia, as in Fiji and Papua New Guinea, for example (Kent 1980; Johannes 1981; Turner 1991).

It is clear, then, that the concepts embodied in “customary marine tenure” define social institutions which regulate the relationship between society and the marine environment. These institutions involve people as individuals and in groups, and, moreover, people in interaction, using their knowledge and ideas to accomplish certain ends vis-à-vis each other. One facet of a deeper understanding of marine tenure systems is a focus precisely on the events and scenes where people interact and where marine tenure is an issue. This focus must be on what actually happens on a fishing ground, in order to identify patterns in the multitude of decisions made and actions taken by individual fishermen and resource managers (see Hviding 1990).

The essence of dynamics in CMT systems is people managing and negotiating access to valued marine resources, each individual or group acting from a firm basis within a social system; in the Marovo case a flexible and fluid system of adherence to descent groups. Although the Marovo CMT system may be referred to as a traditional resource management system with a basis in “customary law”, this by no means implies that “tradition” is something static and non-changing. Rather, “tradition” or “customary law”, in the Marovo case as elsewhere in the changing worlds of indigenous peoples, is characterized on the one hand by having firm roots in local history, practice, and space, and on the other by being unwritten and non-codified, thus permitting continuous adaptation to changing circumstances. Through such processes of continuous interaction, with constant dual reference to continuity and change, to past generations as well as to present challenges, distinct social groups carry out long-term management of their marine resources, in some cases probably achieving sustainable yields. This affords a

potential means of achieving adaptive and participatory planning of fisheries development through the close involvement of resource-controlling local groups. On the individual level, the twin principles relating to social status and use rights are major determinants in the day-to-day fishing strategies followed by each fisherman: Detailed environmental knowledge indicates where one *should* go fishing to maximize the catch, but marine tenure regulations constrain these choices to where fishing *may legitimately* take place, according to rights held or permissions sought (Hviding 1990).

Finally, it must be emphasized that proper analysis of CMT systems must pay close attention to the macro-level contexts that provide opportunities and constraints for local fishery management strategies. Organizational capacity and potential on the local level is not in itself enough to ensure efficient functioning of a CMT system; it is also a necessary precondition that encompassing legal-political systems acknowledge, if not actively support, the principles underlying local-level resource control and management. For example, in Solomon Islands the implicit recognition given to customary marine and land tenure systems in government legislation (Baines 1985) provides added organizational power, and has made possible the negotiations of the bait ground system. Such a pattern prevails in the Melanesian nations, which is also that part of Oceania where CMT systems appear to be the most capable of coping with contemporary pressures (Hviding and Ruddle 1991).

The Role of Traditional Environmental Knowledge in CMT Systems

Traditional environmental knowledge is an important cultural resource that guides and sustains the operation of CMT systems. Understanding such knowledge, whether accompanied or not by perceptions of inshore marine resources as being finite and therefore depletable, is thus an inseparable part of both research on CMT systems and of management designs based on them. Such knowledge may or may not be linked with a traditional resource conservation ethic.

The attitude of many biological scientists and natural resource managers to traditional knowledge of local environment was formerly usually one of unthinking dismissal. As observed by Chambers, "Modern scientific knowledge and the indigenous technical knowledge of rural people are grotesquely unequal in leverage. . . . it is difficult for some professions to accept that they have anything to learn from rural people, or to recognise that there is a parallel system of knowledge to their own which is complementary, that is usually valid and in some respects superior" (Chambers 1980:20-21).

Such attitudes undoubtedly arise because most biologists have not been trained to seek knowledge through talking with "laymen"; they go first to books, then directly to nature for their answers. At home they begin research by reading, because much of what is already known about local environments there can usually be found in libraries. But when they extend their research to non-Western societies their training blinds them; there important portions of this kind of knowledge can be found only in the heads of certain local people, and it is passed on orally between generations.

Fortunately this attitude has been changing, owing to increased recognition of the value of indigenous environmental expertise. And for a growing number of natural scientists, interviews, and "participant observation"—field research

methods associated mostly with social scientists—have become important research tools. In the Pacific Basin where scientific knowledge of the biology of seafood stocks and their environment lags well behind that available for temperate waters, local knowledge can play an especially important role in marine resource management (Johannes 1980).

Pacific islanders' knowledge concerning the timing, location, and behavior of spawning aggregations of reef and lagoon fishes provides an illustration. Populations of individual such fish are usually thinly and unevenly distributed, making censusing (an important tool of the manager of any wild animal population) almost impossible. But when these fish spawn, they characteristically form large, often docile aggregations at very specific locations during certain seasons, and often on particular lunar phases. Knowledge of the timing and location of such aggregations is of obvious value to fishermen, and collectively the fishermen of Oceania know far more about the local timing and locations of these aggregations than do marine biologists (*e.g.*, Johannes 1981, 1988, 1989). Because they occur at predictable times and places, spawning aggregations provide biologists with excellent opportunities to monitor stocks. In addition, they provide a useful focus for management because exceptionally large catches are often made from them.

It was thus not for lack of interest that marine biologists had previously overlooked the distinctive reproductive strategy of many tropical reef and lagoon fishes and its implications for marine resource management. Native fishermen beat them to this knowledge by centuries because they have always been far more numerous than marine biologists, and they have been plying their trade and passing on accumulated knowledge for far longer.

Such knowledge extends beyond biology to the physical environment, including local currents and the like (*e.g.*, Johannes 1981). In addition, it often includes a remarkably sophisticated and rich mental mapping system which may include named features as small as larger individual coral heads (Nietschmann 1989; Hviding 1992). Since many village fishermen spend much of their lives operating within a relatively small area, this is hardly surprising. The typically high visibility in their waters coupled with the exposure of reef flats during low tides facilitate the development of this intimate spatial familiarity with the fishing grounds. For these same reasons CMT boundaries can usually be defined and perceived with particular ease.

Traditional marine environmental knowledge can also play an important role in the siting and management of coastal protected areas (Johannes and Ruddle, *in press*). It is often superior in important respects to information gained by means of conventional resource surveys performed by imported consultants constrained by insufficient time and money. Local fishermen's knowledge of the timing and location of significant biological events is not restricted to spawning aggregations. Certain otherwise unremarkable beaches may serve as rookeries for nesting sea turtles, or come alive with spawning land crabs during certain lunar periods and seasons (Johannes 1981). What may look like an insignificant and relatively barren islet to a reserve planner during a site inventory made in one season may be thronged with breeding seabirds, sea turtles, or, in rare cases, sea snakes, in others. In the absence of such local knowledge protected area planners are liable to overlook areas with high conservation value.

Traditional environmental knowledge can also be invaluable in environmental impact assessment in coastal areas (Johannes, *in press*). Local people can help

greatly in identifying local vulnerable species and habitats, and locating them in both space and, in the case of migrating animals, time.

However, this does not mean that the value of traditional environmental knowledge can be taken for granted. Fishermen are fallible. Beliefs that declining fish catches occur because "the fish have just gone elsewhere for a while" are not uncommon in some areas, and in some places declining yields may be attributed to sorcery or to a failure to propitiate the gods. Such beliefs may divert attention from the real, and sometimes correctable causes. In addition, local interpretations of natural history phenomena may conflict with established facts. But by dismissing too readily such false interpretations of natural phenomena, the researcher risks overlooking the value of the empirical knowledge underlying them.

These caveats notwithstanding, the potential for the application of traditional environmental knowledge to the management of marine resources in the Pacific Basin is substantial. Such information must not only be collected and verified, it must also be blended with more technical forms of biological research, like population dynamics, population genetics, physiology, and microbiology, among others, before it can be put to best use. In addition, linguistic analysis is sometimes required to determine the exact definitions of local taxonomies, to ensure that fishermen and scientists are talking about the same species. All this is no small matter. But the island fishermen can often show the marine biologist what questions to ask about the environment and where to look for the answers in order to focus research on significant local environmental phenomena.

Traditional Conservation

The term "conservation ethic" has been defined as "an awareness of people's ability to deplete their natural resources and a commitment to reduce or eliminate the problem" (Johannes and MacFarlane 1991). Such an awareness and commitment in relation to marine resources developed in many Pacific Islands.

Resource conservation by local societies, and especially within the rubric of common property resources, is a complex subject and one about which data are lacking to demonstrate quantitatively that any society is practising conservation or that conservation is more beneficial than economic efficiency. Overall, the evidence concerning conservation by traditional fishermen is mixed. But in Oceania several types of marine resource conservation measure may have been traditionally consciously employed to ensure sustained yields (Johannes 1978). The principal among these are the widespread reef and lagoon tenure systems, whereby the right to fish in a particular area was controlled by a local social unit. A wide range of other restrictions on fishing may also have been designed to conserve stocks. Among these were the live storage or freeing of surplus fish caught during spawning migrations, the use of closed seasons (particularly during spawning), the placing of taboos on fishing areas, the reservation of particular areas for fishing during bad weather, size restrictions (although this was uncommon in Oceania), and, in recent times, gear restrictions (Johannes 1978, 1981, 1982). Others, many of which were related to traditional religious beliefs, also functioned coincidentally as conservation devices.

Such practices are not static. And some of the new regulations that village communities devise to cope with changing technology and fishing practises are

explicitly conservationist. In Isabel Island, Solomon Islands, for example:

the community at Kia is contemplating restricting the use of nets with mesh size under 3" [inches] and at Tatamba the community is considering prohibiting the use of poisonous leaves and bush vines which kill young and small fish. Although scarcity of marine products is mentioned only at Buala, the questionnaire [on customary marine rights] would indicate a more widespread awareness of the importance of fisheries management. The Kia and Tatamba communities appear to assume that this is a matter for self-regulation within the community, in the customary manner (Ruttley 1987).

In Marovo, Lagoon, Solomon Islands, several reef-holding groups there have gone beyond the level of contemplation and now enforce a variety of area-specific restrictions, such as prohibitions on the use of nylon gill nets, poisonous leaves, and spearguns, all for explicitly conservational reasons (Hviding 1988, 1991). Nietschmann (1984) mentions that on Uvea, one of the Loyalty Islands,

. . . local villagers recently invoked traditional conservation measures to protect threatened marine resources. The eight villages along the 50 km atoll arc formerly partitioned lagoon and reef environments and resources by customary rights to specific village fishing and crabbing grounds. French-introduced Napoleonic Law does not recognise private or village rights to water space beyond the tide line. Also introduced were efforts to modernise the lagoon-reef fishery, including the establishment of freezers to encourage increased exploitation for local consumption and export. The result was the overfishing and reduction of lagoon fish stocks. Some villages then reimposed their traditional tenure rights, built a fence into the lagoon, banned spearing of fish and crabs and other fishing techniques and banned outsiders. Other villages respected these conservation measures because they still recognised traditional village authority over its resource base.

Some claims regarding the environmental wisdom of traditional peoples have been uncritical. For example, tabooing the hunting of or fishing for sacred species has often been described as a traditional conservation measure. But this cannot be assumed without closer investigation. Prohibitions on the taking of one species which may be abundant locally may result in increased pressure on some other more easily depleted species.

It would be unfortunate to read too much into these observations, however. Richards (1980) states that "a sentimental belief in 'traditional values' and a gut feeling that the 'people know best' without knowing why and under what circumstances, will be . . . unhelpful." The romantic and uncritical espousal of traditional environmental knowledge and management is an extreme almost as unfortunate as that of dismissing it. Traditional peoples have not lived in some preternatural state of harmony with nature. Some of their abuses of natural resources have been, and remain, substantial (*e.g.*, Johannes 1978).

Excessive claims for traditional environmental wisdom have provoked a backlash; some writers now dwell on examples of bad natural resource management among traditional peoples, advancing the notion that traditional environmental practices were basically unsound (*e.g.*, Diamond 1987). For example, much has been made of the extinction of many birds on Pacific islands after their coloniza-

tion by man. The blame is generally put directly on man, whereas little consideration has been given to the possibility that the dogs and rats that came with man played a major role in such extinctions.

The truth lies between these extremes; wise and unwise environmental practices coexist in many, if not most, cultures. Although we are concerned mainly with the former, we do not underestimate the importance of the latter.

Not all traditional management practices were developed explicitly with conservation in mind. Some were more likely designed to provide a means of allocating marine resources. Others have been, overtly at least, the outgrowth of religious concerns not obviously related to conservation.

In addition, not all Pacific island cultures possess a marine conservation ethic. Johannes and MacFarlane (1991) found no evidence for it among Torres Strait Islanders, for example, and they speculate that a conservation ethic is less likely to develop among people whose environmental limits are functionally unlimited (see also Chapman 1985). Torres Strait Islanders, unlike many Pacific peoples, have always had access to marine resources greatly in excess of their needs or abilities to harvest. Other peoples in the region who appear traditionally to have perceived no relationship between their fishing pressure and marine resource availability include the Ponam of Manus, Papua New Guinea (Carrier 1987). But where they exist, traditional conservation ethics and management practices provide a locally sanctioned code of behavior that can be harnessed to further the objectives of modern marine resource management.

However, it is illogical to ascribe directly Western concepts of conservation and human-environmental relationships to non-Western systems. Without detailed on-site verification, it is ethnocentric to assume that either the intent or coincidence of exclusive property rights was conservationist. In many instances in Indonesia and Papua New Guinea, for example, Polunin (1984) asserts that systems of sea tenure are a response to conflict occasioned by resource scarcity. However, this assertion, too, is over-simplified, disregarding, as it does, the distinction between resource conservation as an original intention and as an implication of CMT regulations (Hviding 1989).

The relationship between exclusive tenure systems and resource conservation is further complicated by the relationship between humans and animals—respect for the latter not necessarily resulting in their conservation (Brightman 1987), present ecological situations and future environmental change (Townsend and Wilson 1987), and social norms regarding the use of resources (Carrier 1987). For example, Berkes (1987) observes that the Cree Indians of Canada regard the assumption that animals can be manipulated to ensure future productivity as an example of Western arrogance. Similarly, Carrier (1987) observes that Ponam islanders of Papua New Guinea regard animals as active agents and humans as passive. Thus the latter can do nothing to ensure the future productivity of the former. Accordingly, among Ponam islanders exclusive fishing rights combined with traditional ecological knowledge are perceived not as functioning as a conservation device, rather they serve to fulfil the social obligation to be generous with marine products.

Nevertheless, since the resource bases governed by many CMT systems appear to have been sustained over many social generations, with the social objective of sustained self-sufficiency reinforced by sanctions against individual accumulation to the detriment of the community, they might logically be seen as

conservationist in intent. However, this has often led to conflict with State resource law, and clearly changes in a great many instances under the tensions introduced by development programs. And traditional CMT systems are under assault in Oceania, for reasons often associated with demographic changes and the introductions of new technology and a market economy (*e.g.*, Johannes 1978, 1981). In many cases, customary systems have either disappeared or become greatly hybridized under such pressures, whereas in others they have proven remarkably resilient to progressive adaptation, as in the cases of Japan (Ruddle 1987) as well as Marovo, Solomon Islands (Hviding 1989), and Palau, Micronesia (Johannes 1981).

Priorities for Research and Policy-Design

The preceding indicates a number of general topics for research on CMT systems and for the design and implementation of small-scale fisheries management, both in the Pacific Basin and worldwide. They may be summarized as follows:

(1) The literature on existing CMT systems demonstrates that open access cannot be assumed *a priori* for any small-scale fishery system. Rather, information on territoriality and customary regulations should be sought, and particularly those that demonstrate the resilience of a system under pressure;

(2) Since documentation of CMT systems remains fragmentary and regionally biased, comparative reviews must both pinpoint areas for intensive research (*e.g.*, Southeast Asia, Africa, and Latin America) and define regions where existing knowledge can facilitate the design of contemporary management models based on customary systems (*e.g.*, the South Pacific). It is important to ascertain if the regionally fragmented CMT literature reflects the absence of systems or a lack of research;

(3) CMT research must recognize that "custom" is dynamic, and that although a "customary system" is not codified and remains responsive to change, it retains tenacious roots in local culture and society;

(4) The utility of analytical concepts must be reexamined and interdisciplinary terminology clarified;

(5) Applied research on existing CMT systems should concentrate on their inherent adaptive dynamics and emphasize the outcomes of interactive processes between them and larger political and economic systems, rather than just describing the functioning of such superficial phenomena as local fishery regulations⁵;

(6) Building applied models for fisheries management requires an analytical approach in which local sea tenure institutions are examined in terms of a resource system model (Ruddle and Grandstaff 1978; Grandstaff *et al.* 1980; Ruddle and Rondinelli 1983; Ruddle 1991) that depicts socioeconomic and biological flows with the larger society and with other local resource systems. This is a logical advance from factual accounts that merely record existing institutions;

⁵ Even for the Pacific Basin much of the documentation of CMT systems is anecdotal and fragmentary, and much of the more focused recent literature lacks detailed analysis of the socio-political processes of such systems. There has also been little comparative analysis of systems and their dynamics, and a failure to examine the contemporary political and economic contexts of CMT systems makes it difficult to assess how they relate to the wider world through, for example, fishery development and management projects.

(7) Since fishery management is really the regulation of human activity, the politics of resource use and allocation are crucial. Territorial regulations, gear restrictions, and the like, whether customary or imposed, always entail the exclusion of other fishermen and issues of equity, thus allocation and autonomy are important considerations for policy-making and implementation. Also, since compliance and cooperation by local fishermen operating in a managed system is crucial to success, participatory planning and co-management are fundamental issues;

(8) Research on the politics of resource use and allocation should focus on the interrelationships among economic and political micro- and macro-levels, and particularly on the role of the state in controlling local fishery resources, since most fishery systems are enmeshed in larger-scale processes that extend far beyond the local level, and because institutional change involves micro- and macro-levels in continuous interaction⁶; and

(9) The present and future role of CMT systems requires interdisciplinary examination, with particular reference to such important contemporary topics as the multiple use of resources and areas by several resource systems and in terms of integrated coastal zone management planning, pollution, neglected research topics, like gender and age division of labor, and migratory fisheries and migratory fishing populations.⁷

Concluding Comments

Most Pacific islanders depend, for both subsistence and cash incomes, on both marine and terrestrial resources. Throughout the region the controls on resource use exercised by local groups and leaders embrace land, reefs and sea, a factor that has a strong bearing on resource development and management policies and programs. In the future, many customary resource management systems may no longer be able to operate from a firm and independent basis in indigenous political structures and without government intervention, as they have done for generations. Nevertheless, there is a growing awareness in the region of the need to accommodate CMT systems in inshore fisheries development (Hviding and Ruddle 1991): It is the official policy of Papua New Guinea, Solomon Islands, Vanuatu, and Fiji, for example, that tradition and "custom" must be properly accommodated in the development process.

At the same time, the difficulties inherent in developing and managing reef and lagoon fisheries in areas under customary tenure is a source of frustration for fisheries officials. Much of the recent attention given to CMT systems focuses

⁶ The character and dynamics of any CMT system are tied to existing circumstances of the particular fishery and to wider social, cultural, environmental, political, and economic conditions. Researchers and policymakers must therefore be cautious about transferring experiences and conclusions from one area or fishery to another. Further, although marine tenure can clearly enhance the management of many fisheries, it is not a universal cure-all.

⁷ CMT can function to allocate equitably the catch from a migratory stock when it is in the appropriate tenured area. But CMT is unlikely to be of much value in biological management of such a stock unless all CMT systems into which the stock moves operate jointly to control total harvest levels. This is impractical in many instances. But many species found in tropical nearshore waters are not highly mobile, especially in coral reef and mangrove communities (*e.g.* Sale 1978).

specifically on their potential role as local-level fisheries management mechanisms in contemporary situations, since many appear potentially capable of overcoming the problems of open-access fishing and of generating incentives for rights-holders to harvest efficiently and to conserve and manage the resource. For these reasons they may reduce the burden of government intervention, regulation, and enforcement. From that perspective Johannes (1978), referring also to national policy, observed that a government which neglects the potentials of traditional systems ". . . disposes of a service it gets free and assumes responsibilities it is ill-equipped to handle".

However, it should not be assumed unreservedly that CMT systems in the Pacific Basin necessarily are, were, or will be effective fisheries management systems in every instance. Their long-term function in conserving resources and adapting to changed socio-economic conditions is the subject of considerable debate (*e.g.*, Polunin 1984; Carrier 1987).

But the uneven quality of the available literature and the general absence of detailed evaluations of individual systems still preclude conclusive generalizations. Questions of local rationale and explanation, and of possible conservational functions, can be fully answered only through intensive, localized, and multidisciplinary field research.

Since fisheries development and management programs for the Third World are dominated by Western economists and biologists, and their locally-based, Western-trained counterparts, it is not surprising that programs are dominated by locally inappropriate models. This approach is well-illustrated by most programs of international assistance agencies, the main aims of which have been the economically efficient exploitation of fishery stocks, based on an expansion of effort through capital investment, higher technology in capture and marketing, improved Western-style management, and the organization of marketing. All well and good, were the common property-open access concept both valid and universal. Unfortunately it is not, and many well-intentioned programs often cause irreparable socio-economic and cultural harm to coastal communities.

Alternatives, such as those presented by CMT systems, have rarely been considered in fisheries development programs. CMT systems have survived in so many widely scattered parts of the world for several reasons: They are proven means of ensuring community survival through their capacity to ensure that basic human needs are met; inclusion rights spread the risks inherent in resource uncertainty and scarcity; CMT systems institutionalize equality of access and conflict avoidance or resolution and are adapted temporally to fluctuating resource availability, and so contribute to local community stability. Compared with alternative arrangements they are easily, inexpensively, and locally enforceable.

Thus it has been frequently asserted, although usually with scant proof, that traditional common property systems of inshore fisheries management can play a potentially major role in the modern world by ensuring equitable access to fisheries, as well as in managing and enforcing conservation measures to ensure the sustainability of coastal fisheries. The thesis generally is that the more the responsibility for the control of local resources can be left to local, traditional users, the fewer will be the social, political, legal, conservation-related, and management cost problems that must be addressed by governments. However, it is important to realize that the "fossilization" of tradition through explicit, detailed legal definitions in the terms of state law may both weaken the adaptive flexibility of a

traditional system (*e.g.*, Ruddle and Johannes 1985) as well as incur high social costs (Wilson 1982).

At first sight the adaptation of traditional systems to a modern purpose may appear to invite strong local resistance, since they are often so much part of the way-of-life. But CMT systems, at least in many parts of the Pacific Basin, already incorporate important elements of Western fisheries management. For example, parallel management strategies include limited entry, seasonal, spatial, gear, size or species restrictions, prior appropriation rights and the concept of sole ownership, among others (*e.g.*, Johannes 1978). In fact, many such strategies existed in the Pacific long before their adoption in the West (Johannes 1978). In Western marine economics sole ownership, limited entry, individual transferable quotas, and other such fisheries management schemes are based on the theory of the firm. On the other hand, in many Pacific societies the community is the sole owner, and traditions of resource use and management are enforced by community norms that control the behavior of the membership. But this, too, has its parallels in New England and Western European fishing communities, among others, where socially binding yet unwritten and informal rules carry more weight than official regulations (Acheson 1987).

The design of management schemes should include as much as possible effective indigenous strategies, and should conform closely to existing socio-cultural and marine habitat boundaries, and endeavor to adapt many of the traditional institutions underlying such customary tenure systems as are appropriate for development purposes (*e.g.*, Rondinelli and Ruddle 1977, 1978; Johannes 1978; Emmerston 1975, 1980; Hayami and Ruttan 1985; Runge 1986; Ostrom, Feeny and Picht 1988; Baines 1989). Schemes should also be as simple as possible, to mitigate the potentially high social costs of regulation (Wilson 1982). Many traditional sea tenure systems from the Pacific Basin may prove instructive in terms of their cost effectiveness and social acceptability.

Community-based management systems reduce the need for the expensive surveillance infrastructure required by centrally-managed local fisheries. In this context, it should be noted that in many young Third World nations government have only recently become involved in managing and monitoring local affairs. Most lack the physical and administrative infrastructure, trained manpower capacity and the funds to do this at all, let alone in fine detail. Moreover, Western multi-species management strategies are in their infancy.

Fishermen should also be active participants in designing their own future, since they generally have a much clearer conception of some of the important constraints under which they operate. However, where a tradition is lacking, mobilization of fishermen for participatory planning may prove to be a long process. And faced with growing pressures from intruding vested interests, local fishing communities will need strong official support to defend boundaries to their fisheries.

Another particular problem is attempts by local elites to take advantage of a CMT system. Thus such systems will probably work better in relatively homogeneous societies and where the group size is relatively small (*e.g.*, Berkes 1986). However, it should be recalled that the concept of local management may conflict politically with the concepts of nation-building, particularly in far-flung archipelagic nations as in Indonesia.

Areas traditionally managed locally under common property regimes have

been eroding owing to the pressures of Westernization, rapid population growth, urbanization, commercialization of fisheries, the subsequent re-evaluation of fish as a commodity, with concomitant changes in technology and levels of capital investment, and altered access and distribution rights and obligations. This began decades ago in some places (Johannes 1978), as colonial governments consolidated their power—a process that has continued under neocolonial regimes of independent nation centralization. All this had led to a breakdown of local management and common property regimes.

In this regard, it is to be noted that CMT and associated activities must also be understood in relation to a number of contexts not tied directly to fishing activities; the habit of aid agencies to sectorize projects and thereby failing to see fishery development as an integrated component of rural development is a predominant example. Much remains to be learned about CMT systems beyond an analysis of the traditional fisheries themselves. Interdisciplinary research must also focus on entire national systems of fishery production, and particularly on the relationship between household (traditional) and capitalistic (modern) production within the system. Through site-specific analysis and numerous detailed case studies, this research must also further elucidate the principles of CMT systems and correct many erroneous interpretations that characterize earlier research on the topic, in order to provide systematic information on the great number of such systems operating under an enormous variety of biological, physical, and socio-cultural settings.

Further research will show the characteristics and dynamics of the great variety of CMT systems throughout the world. Such variety, while not precluding the abstraction of generalizable concepts and principles of organization, must also serve to warn policy-makers and fisheries planners that there is no universal panacea for the problems of the equitable and economically efficient management in CMT systems; none of these institutions provides a universal "best solution", since each management system represents a local response to a specific set of opportunities and constraints.

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