
The Performance of Customary Marine Tenure in the Management of Community Fishery Resources in Melanesia

VOLUME 5

Guidelines Towards Effective Co-Management of Coral Reef Fisheries in the Pacific Region



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Introduction

The Guidelines presented in this document represent an attempt to synthesize the findings of a three-year research program undertaken to assess the Performance of Customary Marine Tenure in the Management of Community Marine Resources in Melanesia. The Volume is the final in a series of documents produced from this research. The research was undertaken on behalf of the British Government's Department of International Development, and in collaboration with the Governments of Fiji and Vanuatu and the Marine Studies Program of the University of the South Pacific. The Guidelines are intended to promote a cooperative approach to the management of coral-reef fisheries, what is usually termed 'co-management'. A useful definition of co-management was offered by Pomeroy and Williams (1985) as "The sharing of responsibility and/or authority between the government and local resource users/community to manage the fishery or resource."

What can co-management offer that existing community-based or State systems, acting independently, cannot? The findings from the research program that contributed to these Guidelines suggest that there are many valuable aspects to existing traditional, community-based systems. Whether these traditional systems were focused on conservation or on other objectives is a moot point and there are certainly plenty of examples where existing community objectives are not explicitly conservation-based. However, a partial or total reliance on inshore fisheries resources allied to limited options to exploit new resources creates a certain imperative that communities manage (their) limited natural resources effectively. Evidence from this research and elsewhere indicates that in the contemporary situation there are many communities that are seeking to manage (exploit) marine resources in a sustainable manner utilizing their own institutional capital. But, the evidence also indicates that some communities, particularly those with important commercial fisheries, are struggling to cope effectively with the challenges they face. State fisheries agencies are also under increasing pressure. Their responsibilities lie not with one community fishery but perhaps hundreds that are individually small-scale, geographically dispersed and culturally and ecologically diverse. With the limited funds at their disposal many State agencies are looking for innovative approaches to improve their capacity to contribute to the effective management of their nation's resource portfolio. Co-management is an arena in which both the community and the State can contribute to, and benefit from, a cooperative approach. A cooperation that seeks to optimize the efficiency of each contribution to management.

The document is in five sections. The first section opens by outlining some of the characteristics of the human institutions that manage fisheries at the community and State level, including the types of objectives, both explicit and implicit. Section two highlights some of the physical and technical attributes that are typical of small-scale fisheries. The third section then identifies the implications of the institutional characteristics and physical and technical attributes for the long-term success of current management activities. Included in this section are observations on whether the scale of existing management is appropriate. The fourth section then suggests some of the roles and responsibilities that need to be assigned to the community and, in the fifth and final section, those that should be assigned to the State in a co-management partnership. Throughout the document, examples are offered that support the various observations.

1. Characteristics of Institutional Arrangements

1.1 Community Fishing Rights Areas Based on Cultural Politics

Most readers will be familiar with the cultural diversity within the nations of the Pacific. Even across relatively small island groups, there exist communities (clans, tribes) of quite different cultural and linguistic characteristics.

One of the key expressions of cultural diversity is the varied scale of government and the forms of institutions devised to implement governance. For example, a political unit may be relatively small clan comprising a few hundred people with authority vested in a chief or council of elders (for example, in Vanuatu). Alternatively, government may rest with a larger authority, such as a tribal chief, with a constituency of member communities (for example, in Fiji). The more people held under a single political unit that is responsible for management of access to natural resources, the larger the natural resource base tends to be. A small village would require far smaller fishing grounds than a tribal unit of thousands.

In Vanuatu, for example, political units are relatively small. A community may represent a single political authority, whether it is a clan or a group of clans or there may be a range of nested tiers of authority. From the perspective of natural resources land is the defining issue and a clan would seek to control access to an area of land for sufficient agricultural production. Marine resources are not central to the culture or nutrition (although they of course play a role). Marine tenure tends therefore to reflect those waters and reefs adjacent to a clan's land territory rather than the other way around. This feature determines the long-shore extent of customary fishing rights areas (CFRAs). The off shore extent of CFRAs is largely determined by attributes of the environment which interact strongly with institutional arrangements. Fringing reefs in Vanuatu are typically a narrow strip along the coast. Open waters beyond the reef are not an environment over which tenure can be easily claimed. This interaction explains why CFRAs in Vanuatu are relatively small.

In Fiji, where a single authority can encompass many villages and thousands of

people, the fishing rights areas can be significantly larger. Again, the physical environment plays a role here with expansive areas of lagoon and shallow waters providing opportunities for the off shore expansion of fishing rights areas. Box 1 presents some of the range of sizes (from Vanuatu and Fiji) of CFRAs resulting from this interaction of environment and politics.

Box 1 - Examples of CFRA size observed in Melanesia

Location	Clan CFRA (sq.km. ⁻¹)
Atchin (Vanuatu)	0.03
Wala (Vanuatu)	0.04
Lelepa (Vanuatu)	5.7
Cautata (Fiji)	3.2
Verata (Fiji)	102.4
Vitogo/Vidilo (Fiji)	235.2
Tavua (Fiji)	686.8
Ba (Fiji)	1,534.0

1.2 Implicit and Explicit Management Objectives

The costs of claiming tenure, or control, over a marine space (whatever it's size) must at least be balanced (or preferably) exceeded by the resultant benefits. Why have communities evolved marine tenure in the Pacific region? What are their *objectives* of managing that space and those resources? There are two types of objective. The primary objective is to secure access to a resource for the community and the tribe. This is as true today as it was centuries ago. But once security is established, communities and custodians tend to evolve a quite different set of objectives. Box 2 presents a list of five key objective themes observed in the Pacific today.

Box 2 - Example Management Objectives

- # Observance of Customary Protocols
- # Ear-Marking of Resources
- # To Address Wider Political/Social Issues
- # To Generate Resource Rent
- # To Conserve Resources

Readers can no doubt identify other specific objectives from their own experience but the five listed broadly cover the majority of themes. While these are fairly self-explanatory in themselves, there are some important qualifying observations to be made.

While most of these objectives would have resonance with 'tradition', the fifth objective may not. Pacific Island communities do not necessarily have the same perception of marine ecology as those trained to use western science. As such the possibility that resources could be over-exploited may not ring true for them. As such 'conservation' may not be internalized within a community as part of their norms and values to the same extent that a ceremonial objective, for example, would be. Similarly, concepts of equity, or a fair return for participation in management, may be a foreign concept.

A second important consideration is that it would be wrong to assume that communities operate single management objectives. In most cases there tend to be implicit as well as the clear explicit objectives to any particular management action.

1.3 Wide Range of Management Rules

What rules and regulations do communities utilize to meet their management objectives? Box 3 identifies the key tools observed in the Pacific. The majority of these tools can be found in fisheries text books. But they have also been devised independently by Pacific

communities.

Box 3 - Example Management Tools

- # Seasonal Gear Restrictions
- # Spatial Gear Restrictions
- # Species Restrictions
- # Restrictions on Specific Fishers
- # Closed Areas (MPAs)
- # Catch/Effort Limitations
- # Access Payments

1.4 External Influences on Community Institutions

1.4.1 Changing Institutional Dynamics

The majority of countries in the region were under the governance of a western authority from the mid-to-late 19th century through to the mid-20th century. This resulted in the dissolution of some or all the traditional community institutions. Where traditional systems have since been reestablished they are often quite different from the original. They may incorporate a new authority structure that reflects changes in the wider social and economic characteristics of the area or country. For example, increased economic independence of individuals and families with a community can lead to a demand for increased accountability and transparency in decision-making. New authority relationships may have significant implications for the success of any actions taken by decision-makers.

1.4.2 Economic Development

Associated with economic development in the Pacific region is population growth and migration. In most countries in the region population growth is rapid, perhaps doubling every 25-30 years. One feature of economic

development and population growth is the drift of people from rural to urban environments. This can have implications for both resident and immigrant communities. There may be little cultural or tribal/family connections between the resident and immigrant communities. For this reason, immigrants to urban centers do not usually enjoy access rights to fishing grounds in the peri-urban environment.

1.5 State Institutional Characteristics

The reader will probably be well aware of the characteristics of State fisheries institutions and their objectives. State institutions in the region tend to lack financial resources. Although the majority of State institutions recognize the importance of education and community participation most are limited in their ability to effect a significant contribution in this area. However, State institutions are increasing the level of cooperation with Non-Governmental Organizations (NGOs) and this approach is improving the outreach capabilities of many fisheries departments. Given the priorities of national economic development as stated by most Governments in the region, human and financial resources tend to be focused on increasing production and promoting fisheries development rather than fisheries management *per se*. Box 4 presents a typical suite of objectives for State fisheries institutions in the region.

Box 4 - Objectives of State Fisheries Institutions

- # Manage Fisheries in a Sustainable Manner
- # Develop Fisheries in the EEZ and Territorial Waters
- # Promote Export Fisheries / Value-added Products
- # Devolve State activities to the Private Sector

much been left to the resident communities. The mandate for this management has generally, but not always, been established in national law. Examples, from Vanuatu and Fiji, of the national legal context of the rights of communities to control marine resources are presented in Box 5.

Box 5 - Legal Rights to Manage

Fiji - 'The grant of a [licence] shall be at the discretion of such a [District] Commissioner who shall consult the Fisheries Officer and the subdivision of the Fijian people whose fishing rights may be affected' (Section 13, Fisheries Act)

Vanuatu - 'all land in the Republic belongs to the indigenous custom owners and their descendants' (Vanuatu Constitution, Chap.12, Article 71); The Land Reform Act (Cap 123) defines land as 'extending to the seaside of any foreshore reef but no further'

Both pieces of legislation explicitly recognize the rights of custodians to declare limits to resource exploitation. The important difference between the two countries is the extent to which CFRAs are defined. In Fiji CFRA boundaries have been demarcated and maps are available that display each boundary and the tribal community to which ownership has been allocated. In Vanuatu, there is no such demarcation at present.

2 Physical and Technical Attributes of Small-scale Fisheries

There are three main attributes of interest in this context that are of interest to a resource manager. This should be true whether the management authority is a State agency or a community custodian. These are presented in Box 6.

In some cases, particularly in Melanesia, management of small-scale fisheries has very

Box 6 - Key Physical Attributes

- # The Capacity of the Resource to Support Multiple Users
- # The Ability to Control Access
- # Is Management at the Appropriate Scale?

2.1 The Capacity to Support Multiple Users

For any resource held under tenure the exploitation rate should not exceed that which permits multiple users from enjoying the benefits of fishing. If the number of fishers is appropriate, each fisher should be able to fish without reducing the catches taken by others.

For the manager, resource capacity will determine the most appropriate rules and regulations to be employed. In particular, it will determine the number of fishers that should be given access to the fishing grounds. If this balance is not sensible it is likely to affect the choices made by the fishers. If their perception is that the aggregate level of fishing effort is too high, they are more likely to try and fish elsewhere, perhaps illegally, or to conflict with other users of the same resource.

So what determines a resource's capacity to support multiple users? Box 7 presents some characteristics that have been observed to be important influences.

Box 7 - Multiple Users; Some Key Physical Attributes

- # The Size of a CFRA
- # The Range of Ecology Exploited
- # The Types of Fishery (Subsistence / Commercial)

For a given number of fishers the size of a CFRA will partly determine its capacity. The other major determinant being the resource's productivity within the management area. Both these attributes represent hard constraints on the capacity. So what has determined the size of CFRAs that we observe today? It has already been reported (in Section 1.1) that the long-shore extent of a CFRA is primarily determined by the politics of land tenure. The offshore extent on the other hand is, in the first instance, determined by the bathymetry of the area. In areas where the bathymetry is precipitous, where the seabed slopes rapidly away, a management unit may be just a narrow strip of reef. Box 1 presented a size range of CFRAs observed in Fiji and Vanuatu. In Vanuatu, in particular, where the fringing reef is narrow (<150m), there are numerous clans and where the population density can be locally high, the size of individual CFRA may be very small. An extreme example was observed on Atchin Island where the clan CFRA was 0.03 sq.km.¹

2.1.2 The Range of Ecology

A typical artisanal fishery in the Pacific region exploits a large spectrum of the marine resources potentially available. This enhances the ability of the resource system as a whole to support multiple users. Box 8 provides the reader with an example of the diversity of fin-fish taken in artisanal fisheries in Vanuatu. The numbers here do not necessarily equal the number of species taken; many names cover a number of species that are morphologically similar.

Box 8 - Numbers of Local Names Recorded for Fin-fish on 5 Islands in Vanuatu

Island	Number
Atchin	52
Emua	46
Lelepa	65
Pellonk	75
Uripiv	51

2.1.1 The Size of a CFRA

What methods have been employed by fishers to maximize the number of fishers that the resource management unit can support? Box 9 presents the three key responses of fishers.

Box 9 - The Response of Fishers

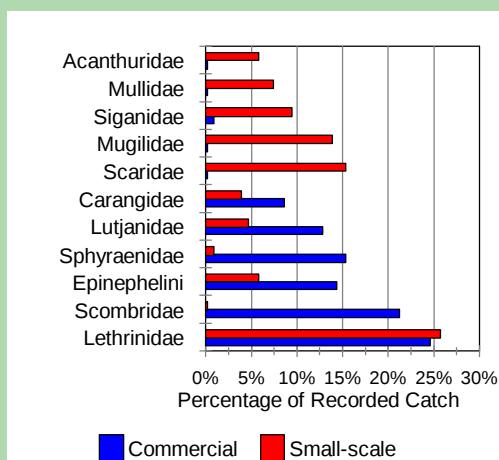
- # Diversity of Fishing Gears and Fishing Practices
- # Seasonality in Gear Use and Practice
- # Seasonality in Location of Effort

2.1.2.1 Diversity of Fishing Gears and Practices

As population pressures increase, gears and vessel technologies evolve to target a larger range of the available ecology. This process is often enhanced by macroeconomic development leading to imports of new fishing technology. Exploitation is most extensive when commercial fisheries develop. Box 10 presents a graphical comparison of catch composition from artisanal/subsistence and commercial fisheries in Fiji.

It is clear that more or less the full spectrum of the reef and neritic fin-fish ecology is harvested.

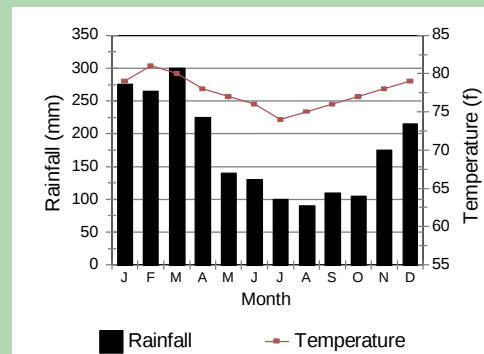
Box 10 - Catch Composition - Fiji



2.1.2.2 Seasonality in Gear Use & Practices

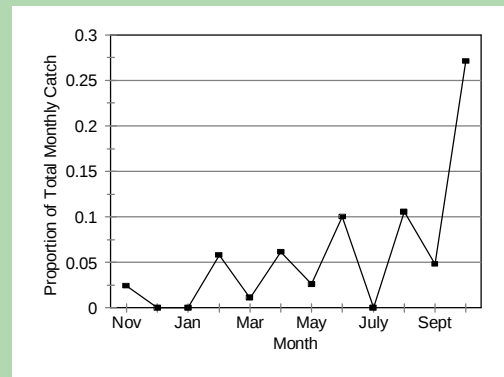
Box 11 presents a histogram of temperature and rainfall from Port Vila, the capital of Vanuatu.

Box 11 - Climate and Seasonality



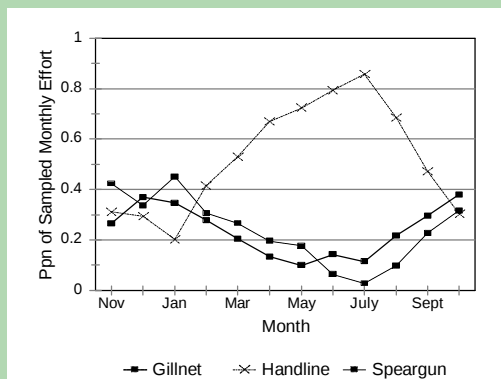
Although there is not a large variation in the mean monthly temperature (<10°F) there is a distinct dry season from around May to October. This results from the South-East Trade winds. Seasonality can affect fishers' use of marine resources in a number of ways. Some species undertake seasonal breeding migrations over both local (e.g., the Scad *Selar crumenophthalmus* and the Mullidae family) or over a much larger range (e.g., Scombridae). Box 12 presents a graphical example of seasonality. In Fiji *Scomberomorus commerson* (Scombridae), known locally as *walu*, undertakes a breeding migration from offshore into shallower waters near the edge of the large patch reef complex found off the western coast of Viti Levu Island. The migration peaks during the wet season in particular from November to February although a second smaller peak in abundance is also recorded around June. The increased relative abundance of this highly valuable fish significantly changes the overall species composition during this short period.

Box 12 - Landings of *Scomberomorus commerson*, Lautoka, Fiji



Seasonal winds and changes in water temperature can restrict the use of fishing gears employed by fishers. For example, in the dry season (typically cooler and with more persistent winds) fishers are often less inclined to use spear-guns and would use hand-lines to a greater extent. Box 13 presents data for seasonality of gear-use at Lelepa Island, Vanuatu.

Box 13 - Seasonality of Gear Use



Seasonality can impact on the location of fishing effort. The effect is most noticeable on fisheries where vessel technology is basic and fishing only one component of the community's resource portfolio. In Vanuatu, for example, fishers from neighbouring clans living on the same island reciprocate in

allowing access to each other's grounds. During the dry season they target fishing grounds that are located on the leeward shores. During the wet season they have the option of expanding their operations to fish windward shores when the SE Trade winds are in abatement. This allows all fishers to operate throughout the year but has the effect of leaving some parts of the resource base relatively unexploited for significant periods of the year. This creates what are in effect short-term closed areas.

2.2 Control of Access

The second main interest of the manager or custodian is that of the ability to control access to the grounds they hold tenure over.

The physical attributes through their influence on the shape and size of CFRAs can affect access control. From the perspective of the manager/custodian the basic issue is of the size of the CFRA. It is clearly to going to be a relatively simple task to undertake surveillance if the CFRA is small. The reader will recall the range of sizes of CFRAs reported in Box 1.

2.3 The Scale of Management

Finally, given the physical attributes and their effects (e.g., seasonal migrations), the manager/custodian needs to consider whether the scale of a management unit, the CFRA, is appropriate.

When considering the scale of management, the main issue is whether management actions are likely to be effective. The key issue that relates to scale of management is whether the basic units are appropriate for the resources. To what extent do the boundaries of a CFRA reflect the underlying distribution of fin-fish resources? We have seen in Box 1 that some CFRAs are very small, a few hundred square metres. Whether this scale of independent management is appropriate depends on the resources to be managed. For sedentary resources such as trochus, a few hundred square metres would be appropriate. In Vanuatu this has already been shown to be successful. But for resources that migrate either daily long-shore movements or offshore breeding or ontogenic (growth) migrations a small scale of management may not be appropriate.

Box 14 displays an example of the small size of CFRAs in Vanuatu. The scale bar located in this figure represents one kilometre. Daily movements by fin-fish (as they seek new feeding grounds, scape predators etc.) are almost certainly going to involve travel through more than one CFRA.

Box 14 - Scale of CFRAs - Vanuatu



In Fiji the CFRAs are again determined by cultural politics. But in this case, a combination of relative political power, a large, shallow lagoon area and larger populations have led to the pattern of CFRAs displayed in Box 15. But the same problem of scale of management occurs. The small, inshore CFRAs cover relatively small areas (as small as 3 sq.km) but of potentially critical mangrove habitat. The larger CFRAs displayed are clearly of a more appropriate scale of management (the largest CFRA in this figure covers a total area of 362 sq.km encompassing 86 sq.km of coral reef habitat). There is typically no collaboration between the inshore and offshore CFRA resource custodians.

Box 15 - Scale of CFRAs - Fiji



3 Implications for Co-Management - Institutional Characteristics

Sections 1 and 2 identified some of the key characteristics and constraints of existing community and State institutions, and physical and technical attributes of the fisheries. This section will evaluate the implications for co-management of these observations. These implications will be outlined for 1) the community and 2) the State. To refresh the reader's mind, Box 16 presents a summary of the characteristics of the community and State institutions.

Box 16 - Institutional Characteristics

Community Institutions

CFRAs based on Cultural Politics
Implicit & Explicit Objectives
Wide Range of Management Rules
Economic Development
Changing Institutional Dynamics

State Institutions

Production Focused
Objectives Potentially Conflict

3.1 CFRAs Based on Cultural Politics

'When an individual has strongly internalized a norm related to keeping promises, for example, the individual suffers shame and

guilt when a personal promise is broken. If the norm is shared by others the individual is subject to considerable censure' (Elinor Ostrom, 1990). The marine environment is a key component of the cultural identity of most coastal communities in the Pacific region. The strength of self and community sanction can play a very important role in providing censure of fishing activities that are detrimental to a community's marine resources. Sanctions of this type represent one of the strongest benefits of the persistence and promotion of community-based management.

3.2 Implicit & Explicit Management Objectives

Another aspect related to cultural norms is the plurality of management objectives. It is particularly important that the implicit, as much as the explicit, objectives of any management action are understood. It is important both for community resource custodians and for State agencies which may be attempting to dovetail management that is explicitly conservation-based with existing community management activities. 'New' or 'foreign' management objectives may simply not carry the necessary weight of community support.

3.3 Wide Range of Management Rules

The generally wide-experience of communities with 'traditional' management rules that equate to 'western, scientific' rules provides a wealth of opportunities for communities to work effectively with the State. But relating this observation back to the *objectives* of any management action, it should be stressed to the community (and extension officers again play a key role here) what your particular objective is.

3.4 Changing Institutional Dynamics

3.4.1 Community Institutions

The development of a capitalist economy, allied with western-based education systems, can have significant implications for traditional authority relationships within a community. Increasingly resource custodians face the possibility that unilateral decisions taken by them will not be fully accepted by the community, especially by the younger generations.

Economic development usually demands division of labour. Instead of each individual providing for himself through agriculture, livestock and fisheries, people often specialize. This creates markets (and often increased demand) for fish. Urban centres, as focal points for wealth generation also encourage market development. This presents custodians with a number of problems.

Firstly, the species taken by commercial fishers are not always species that were previously exploited by subsistence fishers. We saw in Box 10 the quite different catch composition of subsistence/artisanal fisheries compared with commercial fisheries. It is unlikely that whatever traditional ecological knowledge the community held related to these 'new' species. Custodians may be unsure how to monitor their status. This is particularly the case where fisheries target deep-living species (such as the Eteline snappers increasingly targeted in Vanuatu, Fiji, Solomon Islands and Tonga).

Evidence suggests that traditional monitoring (where appropriate for the objective) was primarily visual. If the closed area appeared to have more fish then the objective was being met. If co-management is to develop, the State may usefully interpret for the community key features of local fisheries population dynamics. Such observations demand of the community (with guidance from the State or an NGO) innovative approaches to monitoring the status of their marine resources. An example of such innovation can be seen in Samoa where villages participating in a community management initiative have been trained to visually assess fish populations in local marine protected areas.

There are few places in the Pacific region that have not been touched by western influences. Only limited contact is required for substantial changes to be observed. A number of consequences can be identified. We have observed that CFRAs may be small. Where population growth is an issue, the marine resources in these small CFRAs can be subject to significant pressure. The basis for their establishment does not easily permit expansion, especially as adjacent communities are also likely to be experiencing similar pressures.

Economic development is usually associated

with the growth of urban centers and population immigration. A typical feature of migration is that the immigrant population does not enjoy primary rights of access. There are a number of effects to consider. The social and economic structure of urban and peri-urban communities does not promote communications between custodians and other stakeholders. It is often the case that local custodians may be unaware of the volume of resources being extracted by the immigrants.

Another perspective on institutional dynamics is the effect of commercial exploitation on cooperation and reciprocity. Fishers within a community often cooperate in the use of gear, improving individual efficiency. As markets develop, this cooperation is more likely to involve economic exchange rather than cooperation. This could lead to increased secrecy amongst fishers with regard to their fishing practices and less willingness to cooperate with a community-based co-management approach. A second observation relates to reciprocity. Even across large CFRAs a good deal of reciprocal rights access tends to be enjoyed by primary rights holders. Evidence indicates that increased commercial development can lead to an entrenchment of reciprocity. This has been observed to result in conflict between adjacent communities and between fishers and custodians.

Resource custodians, who are usually senior members or leaders of the community, may seize economic or political opportunities that take them out of their community. This has certainly been observed in a number of sites in Fiji. The traditional institutions, with mechanisms that permitted feedback of information to alert a custodian to problems with the status of marine resources or of resource-based conflict within the community are inevitably broken.

3.4.2 State Institutions

State fisheries departments in the Pacific region tend to have a dual role. On the one hand they have important responsibilities as agents of economic development. On the other hand they promote sustainable resource exploitation.

Clearly there need not necessarily be a contradiction in these roles; there is no reason

why economic development cannot be undertaken in tandem with a precautionary approach to exploitation. The problem is that this rarely happens. The economic pressures on Pacific Island countries are significant and the production units of fishery departments tend to receive the majority of funds. The research and assessment departments often operate on very limited financial resources.

In Section 1.5 examples were offered of the legislative support available to resource custodians to limit exploitation within CFRAs. The implications of such support should be carefully considered. There are two main issues here. With rights come responsibilities. Given the increasingly integrated economies of Pacific Island states, it must be emphasized that resource custodians should take a precautionary approach to exploitation. Most countries in the region seek to minimize imports of food stuffs and waste of domestic supplies is clearly inefficient. The second issue is the question of equity. Management decisions taken by custodians should address wider equity issues across the whole community including immigrant populations. Failure to act in an equitable manner tends to lead to conflict.

4 Implications for Co-Management - Physical & Technical Attributes

Box 17 - Physical & Technical Attributes

Capacity to Support Multiple Users

CFRAs based on Cultural Politics
Diversity of Fishing Gears/Practices
Seasonality of Gear Use
Seasonality in Location of Fishing Effort

The Control of Access

CFRAs based on Cultural Politics
Commercial Development

Appropriate Scale of Management?

CFRAs based on Cultural Politics
Mobility of Marine Resources Varied

Box 17 presents a summary of the essential physical and technical attributes of fisheries in

the Pacific.

4.1 The Capacity to Support Multiple Users

We have already noted that CFRAs are defined by human not marine resource boundaries. Stakeholders have responded to this constraint by developing technical, spatial and temporal diversity and flexibility in their fishing operations. These include multiple gears to target the full range of fin-fish resources and reciprocal access to adjacent CFRAs. But what are the implications of these adaptations? In essence the key point is that potential management actions must be constrained by these imperatives. Community decision-makers and State agencies must be aware of these complex responses if management is to be effective and equitable. Evidence shows us that if management is not sensitive to these adaptations it is likely to engender conflict. Conflict will severely reduce the likelihood that management will be successful.

4.2 The Control of Access

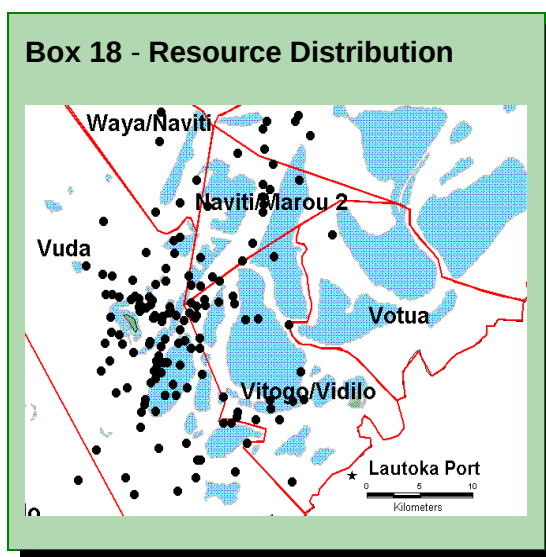
Successful management demands effective surveillance of fishers' behaviour. Where CFRAs are small then surveillance is not an issue; the entire CFRA may be visible from the village. Where CFRAs are large then clearly control of access is expensive. Traditional institutional arrangements allowed for self-monitoring, even when the CFRA was large. Explanations for why this was probably effective can be traced to institutional characteristics, particularly the threat of community sanction. We have also observed that there is a significant difference between the catch composition of subsistence versus commercial fisheries. The species targeted by subsistence fishers generally inhabit shallow (often inshore) waters. Commercial fishers target larger, deep-living species. These species are usually targeted some distance offshore by highly mobile fishers. It is expensive (in time, boats, fuel etc.) for communities to monitor large CFRAs.

Commercial fishers, especially those that do not have a cultural link to the fishing grounds they exploit, often attribute less value to benefits that they expect to receive in the distant future, and more value to those expected in the immediate future. In economic terms this judgement relates to an individual's

discount rate. There are a number of factors that influence the extent of discounting. If future patterns of revenues from resource exploitation were guaranteed, fishers would have a lower discount rate. If there is a risk that future revenues will be variable, it is better to take what you can as soon as you can. Another influence on discount rates is mobility. The higher the mobility of fishers the higher the discount rate. There is no need to worry about whether your actions will adversely affect future yields if you can just move to a new fishing ground. Behaviour associated with high discount rates may also influence others to take a similarly short-term view of resource exploitation/management.

4.3 Appropriate Scale of Management

Box 18 presents the location of fishing trips by commercial fishers targeting the large pelagic scombrid, *Scomberomorus commerson*. The boundaries of five CFRAs and underlying reef areas are identified. This species is a highly valuable resource, and attracts commercial fishers as a unit, as a stakeholder group. Given our observations on the problems with control of access over these large CFRAs poaching is a relatively low risk venture. The fishing trips presented in Box 18 were undertaken by fishers *only* licenced to fish in the Vitogo/Vidilo CFRA located adjacent to the port of Lautoka. They were not licenced to fish in Vuda CFRA. The fishers are following the



resource and not the human-defined boundaries.

Section 1.5 (and Box 5) reported on the legislation that covers issues of traditional management.

There are two important strands to draw together at this point. The size of a CFRA and the institutions that were central to its definition. There are clearly advantages (e.g., community norms and cultural links) to maintaining existing scales of management. But we have seen that in some situations the scale of management may be inappropriate in the contemporary situation. Indeed we have observed the adaptive responses taken by stakeholders (e.g., Reciprocal use of marine space) to what they clearly view as a constraint. But these adaptations are not universal. In larger urban and peri-urban CFRA usually associated with commercial fisheries, the response has been to gain resource rent through the sale of licences or restriction of access to outsiders. All this without a precautionary management structure to replace the inevitable erosion of traditional norms of behaviour and knowledge pathways. In both types of situation there may be a case for aggregating management units. In the case of the small CFRAs which may be nested within a larger political unit such as a clan, tribe, or even just a community of clans, it may be sensible to try and establish some form of co-ordinated management across adjacent CFRAs. In the larger, commercially important CFRAs there may be a case for aggregating management to a state authority which may be the only one capable of effectively managing effort across such large areas of marine space.

5 Towards Effective Co-Management

The extent to which authority in co-management is devolved to user groups can vary. Co-management may simply mean the process of the state informing users of their decisions. By the same token it may mean the abrogation of authority by the state to the community of users. The ideal is probably something in the middle, where management is cooperative. A useful definition for co-management was proposed by Pomeroy and Williams (1994) and is shown in Box 19.

Box 19 - Co-Management Definition

“The sharing of responsibility and/or authority between the government and local resource users/community to manage the fishery or resource”

With co-management various stakeholder groups inevitably have to go through a process of adjustment. This section proposes some of the roles and responsibilities that the different stakeholders could usefully take on.

5.1 Community Roles in a Co-Management Partnership

Box 20 identifies the key contributions that a community must consider if it is to enter into a co-management partnership with the State.

Box 20 - Roles for the Community

1. Identify Management Objectives

Focus Issues:

1. Sustainability
2. Equity

NB Within framework defined by national fisheries policy

2. Implement Management

Develop Management Plan
Set Fishing Rules
Set Institution Rules
Contribute to Monitoring
Enforcement

3. Develop Mechanisms for Effective Communication and Coordination

Within the Community
With Immigrant Stakeholders
With State and NGOs

5.1.1 Identify Management Objectives

In Section 1 we looked at some of the varied management objectives that communities have identified. These may not necessarily include issues of sustainable resource use or equity. It is suggested that community

objectives should attempt to incorporate these two issues. New fishing technologies and potentially lucrative markets provide opportunities for substantial economic reward from exploitation. This is true both for the fisher and for a custodian selling licences. There are now increasing pressures to exploit beyond the capacity of a resource system. Communities are also contributing far beyond their original sphere of influence and sustainability is in the national as well as community interest. Given the increasing economic independence of families with a community, shifting authority relationships and the potential for conflict that ignores traditional sanctions it would be unwise for a community to ignore equity issues. Communities should clearly identify management objectives within these broad constraints.

5.1.2 Implement Management

With a view to meeting the stated objectives, communities would then implement management. There are five components of implementation noted in Box 20. This is the central role of a community's participation in co-management and is what cooperation and responsibility are all about. The State would also contribute and facilitate at this stage of management.

5.1.3 Mechanisms for Communication and Coordination

There are two main areas on interest here. Communication across all stakeholder groups is essential. Within the community it may need the development of new forums for contribution by community members. These may place some sectors of the community in unfamiliar positions but should be encouraged to maximize the mandate. Communication with immigrant stakeholders should also be a focus of community effort, particularly where immigrant stakeholders are pursuing a commercial fishery that may be spatially distanced from the local community. Finally, the State (and, where appropriate, NGOs) should be kept fully abreast of actions taken by the community. Often the establishment of communications will be a necessary precursor to the development of co-management. Communication is two-ways. Both parties should gain. Where both parties are well-informed of each others motives and actions, conflict can be more easily averted

and sustainable exploitation achieved.

The second area of interest is co-ordination. This will be facilitated by communication. We have seen in some CFRA groupings that a reciprocal arrangement has evolved between neighbouring clans. The effectiveness of actions taken by one CFRA may easily be undone by the actions of another, this is true whatever the scale. Where appropriate neighbouring CFRAs should co-ordinate their management activities. Where external agencies are also involved, this can lead to a more efficient use of scarce human and financial resources.

5.2 The Role of the State

Box 21 highlights the key roles for the State (and potentially NGOs).

Box 21 - Potential Roles for the State

1. Set National Framework for Objectives
2. Facilitate Co-Management
 - Provide Legislative Framework
 - Identify Sites Under Potential Threat
 - Assist Management Plan Development
 - Provide Technical Assistance
 - Provide Training and Extension
 - Conflict Resolution
3. National Coordination of Co-Management Initiatives

5.2.1 National Framework for Objectives

We have discussed in Section 5.1 the need for communities to appreciate the wider picture. It would be inappropriate for communities to set management objectives that promoted the use of destructive fishing methods for example. The State could usefully identify a national framework of objectives which could guide communities seeking to establish co-management.

5.2.2 Facilitate Co-Management

Before communities can effectively (co-) manage the resources under their control it

may be necessary that the appropriate legislative framework be established. We have seen two approaches to this in Fiji and Vanuatu.

A more direct intervention by the State should be to take a precautionary overview of the fisheries within its jurisdiction. Some sites may be under potential threat from rapidly developing commercial fisheries or from population growth. The State should attempt to identify these as a matter of policy and to assess the management currently in place (if any). A pre-emptive action may prove a valuable contribution. Again, communication is the key issue here.

There are some excellent models already available in the Pacific (e.g. Vanuatu, Fiji and Samoa) where the State (often in association with NGOs) has usefully contributed to developing management plans with communities. Part of this may involve advice on effective rules and regulations or advice on institutional adjustments. In other areas, the State can provide technical assistance (e.g. growing on juvenile trochus (Vanuatu)) and training and extension services. Commercial development offers communities a potentially valuable source of revenue. Communities may not always have the skills or knowledge to obtain a fair deal from commercial fishers. State institutions can usefully facilitate this process.

Another area of technical assistance that is appropriate in the complex environment of coral-reef fisheries is adaptive management. Fisheries managers have to deal continuously with uncertainty. The results of their actions are difficult to predict and hard to evaluate. A management strategy based on repeated adaptation will assist in dealing with these uncertainties. Indications of when and where adaptation is needed will depend on a feedback or monitoring system.

Box 22 - Adaptive Management

1. Explicitly recognises that the outcome of management actions cannot be predicted;
2. Actively monitors and evaluates any management intervention and change;
3. Compares the outcome with that in other places or in previous time; and therefore;
4. Develops management strategies based on learning and feedback.

It will usually be very difficult to predict the exact outcome of introducing a given management tool or institutional arrangement, due to the complexity of the systems affected and to local variations in habitat characteristics, social factors and, external influences. As a result of these uncertainties, an adaptive management approach is recommended for managers of coral reef fisheries at all levels from community to government.

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