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

## Final Technical Report

MRAG

July 1999

## *Final Report - Administrative Details and Report Structure*

**Administrative Details**

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| TITLE OF PROJECT | R6436: The performance of Customary Marine Tenure in the management of community fishery resources in Melanesia |
| PROGRAMME MANAGER / INSTITUTION | Professor John Beddington<br>MRAG Ltd<br>47 Princes Gate,<br>London SW7 2QA |

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## Report structure

This Final Technical Report is a concise document laid out in the prescribed DFID format. It provides a summary of the purpose, activities and results of the study (new knowledge generated). General conclusions from the study are drawn and a summary of co-management guidelines, which form the principal outcome of the research, is given. Detailed results of the study are presented separately in five volumes of work, which should be read in conjunction with this FTR, and which are referred to throughout the FTR. Details follow:

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

Volume 1: Project Background and Methodology

> This volume describes the demand and need for this study in the context of the RNRRS, and outlines significant research previously carried out. The methodology employed is described.

Volume 2: Fiji and Vanuatu country reports

> The purpose of this project was to describe and evaluate the performance (social equity, and ecological sustainability) of a number of extant CMT regimes in Fiji and Vanuatu, and to identify the ways in which co-operation with government (co-management) could enhance the current system. Volume 2 describes the results of field work and summarises social, institutional and ecological outcomes for each of Fiji and Vanuatu.

Volume 3: Biological Outcomes

> This Volume provides detailed analyses of the data relating to the fishery resources and of their customary management, which were summarised in Volume 2. A separate volume of annexes (see 6.1.2 of this report) provides detiled analyses by species and subarea, which are not given in full in Volume 3. The annexes are an internal MRAG document which may be referred to for further information.

Volume 4: 'A Bayesian Approach to Stock Assessment of Coral Reef Fisheries'

> During 1998, DFID allocated additional funds for a supplementary study entitled 'A Bayesian Approach to Stock Assessment of Coral Reef Fisheries'. This Volume presents the results of that work.

Volume 5: Co-management Guidelines

> This Volume synthesises material from the preceding Volumes of work, and presents co-management guidelines for fisheries subject to tenure arrangements.

In addition to these reports, a number of publications have arisen from the study, or are planned. These are described in Section 6 of the FTR.

## *Acknowledgments*

This project was funded through the UK Department for International Development (DFID) Fisheries Management Science Programme (FMSP), which is managed by MRAG Ltd. Throughout the project, MRAG enjoyed excellent collaboration with:

- University of the South Pacific, Marine Studies Programme
- Fiji Ministry of Primary Industries, Fisheries Division
- Government of Vanuatu, Fisheries Department

Volume 1 presents the project background and the methodologies used. The Volume was prepared by Mr Jim Anderson with help in developing an understanding of the Oakerson Framework from Dr Caroline Garaway and Ms Vicki Cowan (MRAG Ltd).

Volume 2 presents country reports for Fiji and Vanuatu. Data for this volume was collected by Mr Jim Anderson (Vanuatu and Fiji), Mr Kalmasai Kalsakau (Vanuatu) and Mr Timoci Tavusa (Fiji) with key assistance from Mr Felix Poni and Ms Frances Osbourne (Fiji). Dr Philip Townsley provided important field assistance and guidance on the use of rural appraisal methods. The work was greatly assisted by the cooperation and assistance of the fisheries departments of Fiji and Vanuatu and the University of the South Pacific. In particular the project would like to acknowledge Professor Robin South (Marine Studies Programe, USP), Mr Moses Amos (Director, Vanuatu Fisheries Department), Mr Maciu Lagibalavu (Director, Fiji Fisheries Division), Mr Vinal Singh and Ms Nettie Moerman (Bursar's Office, USP) and Mr Jone Maiwailagi (USP). Mr Francis Hickey of the Kuljural Senta Blong Vanuatu (KSBV) provided advice and assistance in interpretation of rural appraisal data throughout the project. The project would also like to thank Mr Ralph Regenvanu (KSBV), Mr Gene Wong (Trading Post newspaper, Vanuatu), Mr Krishna Swamy (Fiji Fisheries Division), Mr Paul Geraghty (Fijian Cultural Affairs) for their help and assistance. Finally many thanks to my friends at the Red Light and Ronnie Nakamals in Port Vila, Vanuatu.

For the work reported in the Volume (3) on biological outcomes, data were collected during fisheries monitoring programmes in each of Fiji and Vanuatu by the following locally appointed staff :

Vanuatu

| | |
|---|---|
| Field Manager - | Kalmasai Kalsakau. |
| Data Collectors - | Douglas Meto (Lelepa); Ben Norman (Emua); Kalsakau Johnna (Pellonk); Smith Samson (Uripiv); Davide Kalorip (Wala); Masten Silas (Atchin). |

Fiji

| | |
|---|---|
| Field Manager - | Timoci Tavusa. |
| Data Collectors - | Felix Poni (Vitogo/Vidilo & Tavua); Epeli Qalo* & Apenisa Botilagi (Tacilevu); Siri Wakatibau & Teresia Wakatibau (Naweni); Tulala (Verata). (* Epeli Qalo sadly passed away in April, 1997.) |

The Centre for Tropical Coastal Management Studies (CTCMS), Newcastle University, was

sub-contracted to undertake the Underwater Visual Census component of this study. The Fiji UVC data were gathered by C. J. Barry (MRAG), A.J. Beeching (CTCMS RA), N.V.C. Polunin (CTCMS) and J.D. Anderson (MRAG) in May-June 1996, with additional data being collected from Tacilevu by J.D. Anderson alone in April 1997. The Vanuatu UVC data were collected by A.J. Beeching (CTCMS RA) and J.D. Anderson (MRAG) in October 1996, with additional data being obtained from Emua by J.D. Anderson alone in September 1997.

A number of people contributed to the analysis and reporting of the data: NDick Polunin (CTCMS) for Chapter 3; Chris Mees, Robert Arthur and Jim Anderson (all MRAG) for Chapter 3; Ashley Halls and Jim Anderson for Chapters 4 and 5. Chris Mees contributed Chapters 1 and 6, and compiled and edited the Volume.

Volume 4 presents a paper on the use of Bayesian techniques for the assessment of coral-reef fisheries. This work was developed by Dr Paul Medley. Mr Jim Anderson and Mr Martin Esseen undertook the field work component of this research at Eretoka Island, Vanuatu.

Volume 5 synthesises the previous material to derive guidelines for management, and was compiled by Jim Anderson with contributions from Chris Mees and Vicki Cowan. The volume is entitled 'Guidelines Towards Effective Co-Management of Coral Reef Fisheries in the Pacific Region'

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# Final Technical Report

## 1 Executive Summary

There has been considerable interest in the potential of community-state partnerships as a means of attaining a more effective management of widely dispersed, small-scale artisanal fisheries. One approach may be to combine the best components of a traditional, or customary, marine tenure system, with appropriate intervention and advice from the state (Christy, 1982, Hviding and Ruddle, 1991, Pomeroy, 1994, Gadil *et al* 1993, Doulman, 1995). It has been assumed that customary management activities are beneficial, both to the community and in terms of the sustainability of natural resources.

The purpose of this project was to describe and evaluate the performance (social equity, and ecological sustainability) of a number of extant CMT regimes in Fiji and Vanuatu, and to identify the ways in which co-operation with government (co-management) could enhance the current system.

In order to evaluate the performance of CMT regimes, assessments were made of the social and institutional arrangements of fishing communities. Assessments were also made of the fisheries resources and the impacts of management interventions using catch/effort sampling and underwater visual census to generate a database. The Oakerson Framework (Oakerson, 1992) was used to structure the complex information generated from each project component and was then applied diagnostically to draw conclusions on the institutional performance of CMT systems.

Arising from these activities, project outputs included a data-set of the socio-economic environment and multi-species fisheries at CMT study sites, and a cadre of local staff trained in rural appraisal and catch/effort sampling techniques. These outputs enabled a comparative analysis of the performance of CMT systems in effecting ecological sustainability and the equity of community-based management.

There were a number of key outcomes to these analyses. In neither Vanuatu or Fiji do Customary Fishing Rights Area (CFRA) boundaries relate to the underlying distribution of the fisheries stocks. CFRA demarcation (and use) was defined according to wider political and social attributes of the communities. There were few examples of community institutions specifically established for conservation of marine resources and the majority of management actions have a suite of diverse biological and political objectives.

There was a considerable range of equity outcomes observed at the different sites. In the small communities of Vanuatu, which display a greater degree of ethnic and economic homogeneity than observed in Fiji, equity was generally achieved. Cooperation between stakeholder groups across adjacent CFRA units was universal and sharing of marine resources across time and space was the norm.

In Fiji equity was variable. Equity was typical in the smaller communities where the population

was largely indigenous, traditional authority remained important and commercial fisheries development limited to the primary stakeholders. In the sites where fishing pressure, particularly commercial pressure, was significant equity was a rare commodity, for both indigenous and non-indigenous stakeholders. This suggests that the realignment of human-resource organisational patterns, commonly observed following economic and political development, may be anathema to community-led sustainable management.

Against western objectives of the long term benefits to ecological sustainability, little evidence for the success of customary management could be demonstrated from this study. Short term benefits, which meet specific community objectives such as ear-marking of resources were apparent. However, management actions do exist which are appropriate to western notions of resource management (e.g. closed areas, effort and gear controls), and institutional arrangements exist within fishing communities to implement them. Thus, within a co-management framework with advice from government fishery departments, it was considered that customary 'management' activities could be adapted for the purpose of achieving long term ecological benefits and sustainability.

In conclusion, extant CMT systems show a degree of flexibility to changing endogenous and exogenous conditions and there is potential to develop resource management strategies mutually acceptable to fishing communities and national government based on the concept of co-management. The project developed co-management guidelines for this purpose from the detailed social, institutional and biological analyses of the human-resource complex. The adoption by target organisations of co-management guidelines will contribute directly to the project goal: 'Optimum sustainable yield from capture fisheries achieved by improved resource management', and the super goal (ie RNRRS goal) of improved management of aquatic resources.

## 2 Background

Coral reef fisheries in the Pacific region exhibit a number of important (and inter-related) characteristics relevant to management by the centralized State agencies. They are typically of small-scale, communications are typically poor between the communities and urban/administrative centres and the fisheries systems are diverse in their individual institutional and environmental attributes. Coral-reefs are such complex natural systems that management is difficult and the techniques themselves are often based on a 'techno-fix' solution. Finally, there may be contradictions in overall management policy within the agency. In particular there is often a lack of coherence within the agency that has a remit to both develop fisheries (particular export commodities) and to promote sustainable use. Funds and training are being made available (often provided by aid-donor countries) for expansion of fisheries but this is not undertaken within the constraints of sustainable, or even pre-cautionary, management.

What are the implications of these characteristics for centralized management authorities in the Pacific region? Although the small scale of individual fisheries implies that investment in the management of one fishery need only be small, the sheer number of what are often village-sized fisheries of as few as 50-100 fishers requires a much larger total investment for the State. The required investment is further increased by the lack of development in communications (poor or no roads, limited telecommunications facilities etc). Simply organizing a meeting of village leaders, who may be absent from the village or some distance away in fields or even out fishing themselves, may require a number of preparatory visits and hence additional expense in time and money. The many individual fisheries display a huge diversity

of attributes including language and cultural variations which is usually manifested as a diversity of form of community institutions. A State official, operating with limited financial and human resources, may be relatively unaware of the nuances of this complexity and diversity. Similarly, the complex environmental and ecological characteristics of so many sites requires of the State agency a suite of potential management responses and the technical skills to implement them in the correct manner. Although many of the region's senior fisheries staff have been trained in management and assessment techniques, they often lack the support of more experienced individuals to assist and guide their work. Applications of management formulae adapted from literature are often applied without a full appreciation of the complexity of the system. Furthermore, 'the long-established biological emphasis in fisheries management has meant that the role of fishermen, (and even more so, fisherwomen) has largely been ignored' (Hviding and Baines, 1994:13; Hassett, 1994).

In combination, these factors can result in management interventions which lack congruence with reality in the fishery (Ostrom, 1990). This lack of congruence may result in attempts to alter or impose institutional structures alien to a communities traditions and norms (e.g. Village Fisheries Development Programme, Vanuatu). It may also result in management (or operational) rules that do not take into account particular physical attributes or accurately reflect technological conditions. The contradictions in policy within the State agency can lead to significant inefficiencies in use of scarce funds. Although agencies have promoted development (through the provision of ice facilities, subsidized vessels, engines, fuel and fishing gears, e.g. in Fiji), there has been little in terms of developing coherent management policies. Adams reported that 'the majority of governments have not pursued any policy at all and have been restricted to crisis management (usually involving an export commodity)' (Adams, 1996:2). In the worse-case scenario centralized management interventions may lead to conflict and discourage sustainable resource use (Jentoft and McCay, 1995).

But many fisheries in the Pacific region have one additional, and crucial characteristic. The presence of customary marine tenure (CMT) systems. These systems, based on wider cultural institutional forms, are community or tribal-based common property-type systems of marine tenure (Ruddle and Johannes, 1990; Hviding and Baines, 1994). In general research has been focused on the documentation of a number of extant CMT systems, and a body of literature exists for Palau (Johannes, 1978, 1981, 1991), Solomon Islands (Hviding, 1988, 1989, 1990), Fiji (Kunatuba, 1989; Fong, 1994; Cooke, 1994), Vanuatu (Amos, 1993; Johannes, 1994) and Western Samoa (Fairburn, 1992). The work of these researchers has resulted in many different interpretations of the function of CMT systems. They may act simply to control invasion of local marine space, to regulate use by groups within the community or tribe or they may act to control exploitation of specific resources and the use of particular fishing gears.

Much that has been written on these systems is positive. Berkes and Farvar (1989) argue that common-property and community-management systems traditionally performed a number of critical roles in the local community. Their role in maintaining livelihood security was vital where the local environment was the sole source of food; common-property systems therefore needed to ensure conservative utilisation of resources (eg Johannes, 1981). Johannes (1994) indicated that 'Vanuatu's example suggests some strategies and conditions that would favour the success of government-support, village-based management of small-scale fisheries in other Pacific islands'. Hviding and Baines (1994:36) concluded that 'CMT systems like that operating in Marovo [Solomon Islands], building not just on local autonomy and self-reliance, but also on highly detailed knowledge of the coastal marine environment and day-to-day monitoring of resource bases, offer potential for appropriate 'self-regulation' of fishing effort.....Traditional resource managers like those of Marovo are proponents of de-centralized

resource management, participatory planning and a non-sectorized approach to rural development'.

However, other researchers have a taken a more cautious line, for example Polunin (1984) undertaking research in Irian Jaya and Papua New Guinea could not determine any conservation basis to the CMT systems he observed there. Although traditional relationships may be based on a deep interaction with the environment (e.g. Johannes, 1981,1994) this does not necessarily equate to management for sustainability. Bulmer, (1982, cited in Carrier, 1987:162), observed that 'the underlying beliefs about the nature of the universe and the powers at work in it are hard, if not impossible, to relate to modern conservationist principles'. Carrier, reporting on his research in Papua New Guinea, noted that 'it is recognized that traditional inter-village fishing rights and other indigenous forms of marine tenure do not guarantee sound management and conservation of fish stocks' (Carrier, 1987:143) and went on to report that 'they [Ponam Islanders] saw divine rather than human action as the salient source of environmental change' (Carrier, 1987:154). Cordell and McKean (1992:197) observed that a 'truely self-regulated fishery presumes not only that fishermen know both the limits of their resources and the impact of their equipment on resource availability, but also that they have the ability to keep the rates of exploitation in line with the productive capacity of the environment. It is doubtful that there is a traditional system anywhere that would meet this presumption'. One of the important implications of this observation is that it may be questionable to place too much emphasis on CMT systems as independent management units, acting completely independently of institutions that may usefully offer advice and a precautionary approach.

Because of the wider political and cultural context of CMT systems it would be wrong to think that they have existed in isolation and that they have only been 'discovered' relatively recently. Cordell and McKean wrote in 1992 that 'in recent years, however, ethnographers have begun to investigate the neglected domain of customary property relations in maritime fisheries and have discovered "sea tenure"'. This may have been true for ethnographers but many of the region's states have incorporated CMT systems into their fisheries policy for decades. The earliest example in the region is probably for Fiji, where the rights of the traditional custodians was recognized in the late nineteenth century. In a speech given by the Governor of Fiji in 1881 he stated:

'Chiefs of Fiji....it is Her Majesty's desire that neither you nor your people should be deprived of any rights to those reefs which you have enjoyed under your own laws and customs; and I may tell you, on my part, that measures will be taken for securing to each [clan] the reefs that properly belong to it, exactly in the same way as the rest of their land will be secured to them....'. These sentiments were formerly incorporated in Fiji's fisheries legislation in the 1942 Fisheries Act which aimed 'to protect rural Fijians' rights to maintain their subsistence livelihood, and to give a measure of basic protection to stocks of food-fish and shellfish' (Adams, 1993).

Other examples from the region include the Vanuatu Constitution. Article 74 of the Constitution states that 'The rules of custom shall form the basis of ownership and use of land in the Republic of Vanuatu'. This definition includes land and reef areas. The Vanuatu Fisheries Act, Cap 158 (1989) demands that aquarium-fish may only be exported with a licence from the Minister of Fisheries but that a 'permission granted under this regulation shall not affect any obligation to reach agreement with custom land owners regarding the use of land and waters for the catching of aquarium fish'. The Western Province of the Solomon Islands promised to 'recognise and respect customary fishing rights and knowledge and use these as foundations

on which to build modern inshore fisheries' (Western Province, 1985:21, cited in Adams, 1996). The Cook Islands Fisheries Act of 1989 devolved some management authority to local island councils although 'these do not necessarily coincide with traditional leadership structures' (Adams, 1996).

However, it should be noted that fisheries departments in the region 'have not been as quick to try and take over comprehensive control of coastal fisheries management,.... This has been because most Pacific Islands already have a strong tradition of local-area fishing rights ownership, wielded by communities and local chiefs. In the Pacific Islands, almost all the voters and certainly most of the traditional power brokers, live in the coastal zone, and the majority of them make full use of their fisheries, and resist attempts to abrogate authority' (Adams, 1996). This observation is a key one because it identifies the strength of independence of CMT systems. The potential of CMT for future fisheries management may be limited because of the desire of these authorities to maintain control.

On the other hand, the shifting economic and social structures of many of the small fisheries in the region can place these traditional authorities under pressure. These systems may be structurally unable to meet the challenge of rapid exogenous change and hence fail to meet the role in fisheries management which many believe they are capable of fulfilling (e.g. Johannes, 1994; Ruddle, 1998). Although as Kunatuba observed 'It is important to note that the social and political setting of a fishing community is not a problem; rather it is a situation. It would prove very costly and time-consuming to try to change that 'situation'' (cited in Ruddle, 1998).

This research project arose in an attempt to assess what the 'situation' actually is in Melanesia and the performance of community-based management under this situation. This was a demand led project, arising from a 1995 MRAG poll of research demands of South Pacific Commission (now the Secretariat of the Pacific Communities) member states. Hviding and Ruddle (1991) undertook a regional assessment (review) of the potential of CMT to contribute to fisheries management in the Pacific region. They indicated what they see as important themes for research. Amongst these themes they argued that research on the dynamics of CMT systems in evolving to meet the demands of changing social, economic and ecological circumstances was critical. Such research would include investigation of the politics of resource use and allocation with its central implications for the formulation and implementation of fisheries co-management policies. They also recommend that investigations into CMT systems were implemented through a multi-disciplinary approach. This project, utilising a multi-disciplinary team, sought to identify the constraints and advantages of extant CMT in Melanesia and the potential for a working (and disciplined) cooperative management between the state and customary marine tenure systems. Figure 1 presents the location of the research activities in Vanuatu and Figure 2 location of sites in Fiji.

**Figure 1 - Location of Research Sites in Vanuatu**

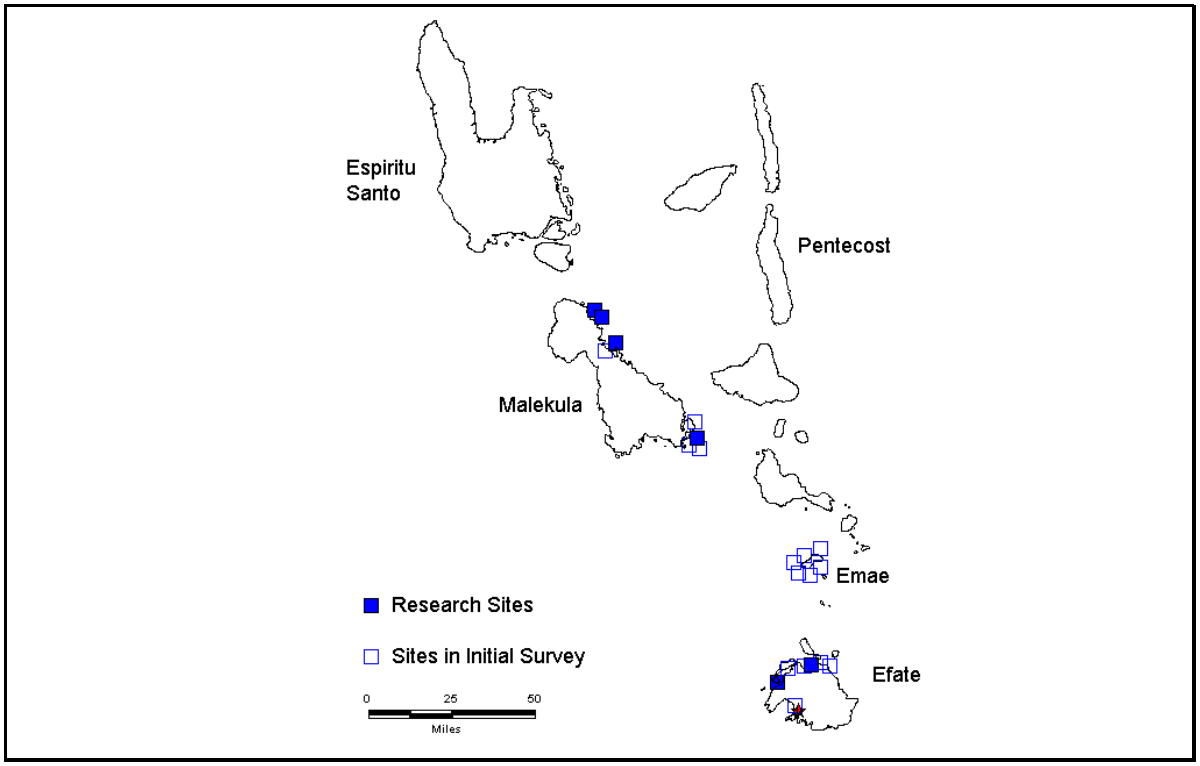
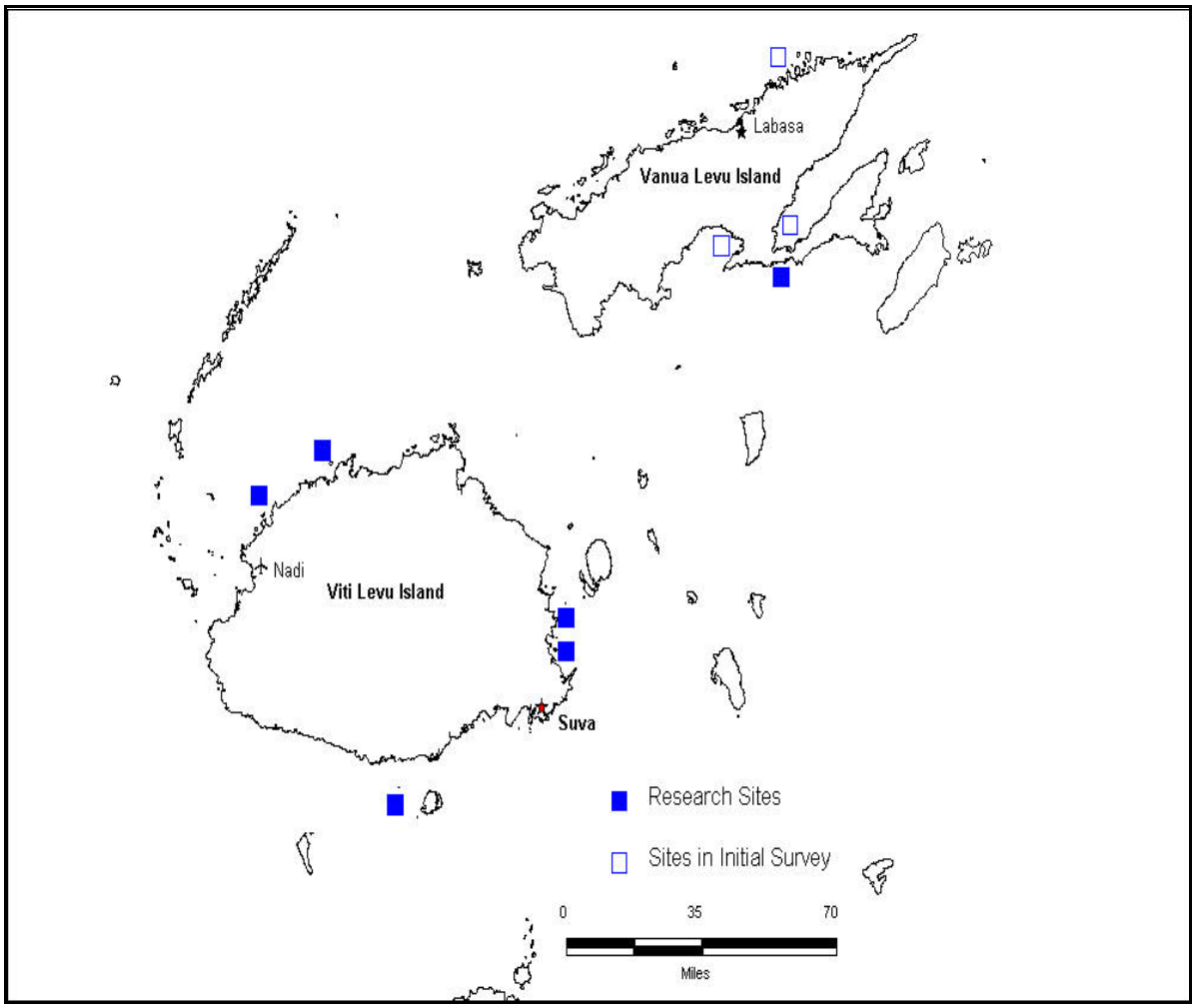


**Figure 2 - Location of Research Sites in Fiji**




## 3 Project Purpose

It has been assumed that customary management activities are beneficial, both to the community and in terms of the sustainability of natural resources.

The purpose of this project was to describe and evaluate the performance (social equity, and ecological sustainability) of a number of extant CMT regimes in Fiji and Vanuatu, and to identify the ways in which co-operation with government (co-management) could enhance the current system. This purpose is directly relevant to the RNRRS goal of improved management of aquatic resources.

## 4 Research Activities

Institutional arrangements and the management strategies based on CMT in Fiji and Vanuatu were categorised based on existing information (Amos, 1993; Cooke, 1994; Fong, 1994; Johannes, 1994). and were verified and augmented by a frame survey of six customary fishing rights areas (CFRAs) in Fiji (known as *qoliqoli*) and seventeen small (village) CFRAs in Vanuatu. A number of sites were selected for further study, these representing a variety of

management strategies operating under different fishing pressures. Target fish species important in the catch, or selected for specific management, were identified during the frame survey. The frame survey also documented physical and technical attributes of the fishery, including description of the types of fishing units and available infrastructure.

A monitoring programme over two years was established to further augment socioeconomic and fisheries appraisals with data collected by village-based data collectors. A locally-recruited field manager was appointed in each country to manage this task and to verify and assure the quality of data collected.

### 4.1 Social and economic assessments

Data on the social and economic context of the CMT systems at each study site were gathered using the semi-structured appraisal techniques proposed by Townsley (1993) and Pido et al (1996). Two MRAG-contracted research staff, Mr Jim Anderson and Mr Phillip Townsley joined with staff from the relevant fisheries departments, staff from Marine Studies Programme and the locally-based Field Managers to undertake the initial rural appraisals in 1996.

The first step in the appraisals was a review of existing literature on marine tenure and management in the two countries studied. The review included collation of statistical information on population in different areas and documentation of the policy and legal framework for both land and marine tenure in Fiji and Vanuatu. When combined with visits to the field and an initial assessment of information on the fisheries characteristics of different areas, the review enabled the identification of a range of potential sites as a frame.

The identified sites were visited and the communities contacted to explain the programme and gain approval for the project's activities in their areas. The initial appraisals were carried out in each community over a 2-3 day period. Key informants in each community were selected as representative of different gender, age and where appropriate different socioeconomic groups. Data were gathered on existing marine tenure arrangements, patterns of use of marine resources, village institutions and local people's attitudes and opinions regarding marine resources and their management. Data on local marketing conditions and on the historical and seasonal context of the fisheries and tenurial arrangements were also gathered. During interviews, extensive use was made of sketch mapping for the illustration and discussion of marine management areas and tenure arrangements as well as for patterns of marine resource use. Ranking exercises were used to establish priorities and approximate levels of exploitation of different resources from different areas.

Using these techniques, a detailed picture of the characteristics of the fisheries' stakeholders and their communities was obtained. Clearly, many sensitive areas regarding the political and social relationships surrounding tenure arrangements could not always be investigated fully in the time available. Further investigations of these relationships were incorporated into the two-year monitoring programmes and undertaken by MRAG staff in collaboration with project field staff.

Following the rural appraisals a number of sites were chosen in each country covering a range of estimated fishing pressures, these are presented in Table 1. In Fiji, the Yanuca Island site was abandoned after 12-months. Data collected at Tavua over the first 9 months was also discarded and a replacement Field Manager and data collector for this site employed. In Vanuatu, the Pellonk village site was changed in favour of Emua Village after 12-months.

Table **1** - The sites chosen for longer term monitoring and research

| **Country**<br>**Site (Village)** | **Period of Monitoring** | **Estimated Fishing Pressure** |
|---|---|---|
| **Fiji** | | |
| Verata (Ucunivanua) | July, 1996 to June, 1998 | Medium |
| Yanuca (Yanuca) | July, 1996 to June, 1997 | Low |
| Tavua (Landing sites) | April, 1997 to March, 1998 | High |
| Naweni (Naweni) | July, 1996 to June, 1998 | Low |
| Naweni (Tacilevu) | July, 1996 to June, 1998 | Medium |
| Vitogo/Vidilo (landing sites) | October, 1997 to September, 1998 | High |
| Cautata (Cautata) | October, 1997 to September, 1998 | Medium |
| **Vanuatu** | | |
| Atchin Island | November, 1996 to October, 1998 | High |
| Wala Island | November, 1996 to October, 1998 | Medium |
| Uripiv Island | November, 1996 to October, 1998 | Medium |
| Pellonk Village | November, 1996 to October, 1997 | Low |
| Emua Village | November, 1997 to October, 1998 | Low |
| Lelepa Island | November, 1996 to October, 1998 | High |

4.2 Fisheries assessments

Volume 3, on Biological Outcomes will address the questions: If traditional models of community management are to be the basis of new co-management initiatives, how effective, across a range of fishing and population pressures, are existing attempts at management based on customary principles, in terms of biological sustainability? What is the status of fishery resources inside managed areas - has management conferred any benefit compared to un-managed open access areas?

To investigate the success of any management interventions, for fish populations and communities it is necessary to understand the effects of fishing and the effects of different management actions. A summary of the key areas of investigation are presented in Tables 2 and 3.

**Table 2 - The effects of fishing**

| Single species effects | Multi-species effects |
|---|---|
| Reduction in density and biomass (and CPUE)<br>Reduction in mean length<br>Increase in growth, and size at age<br>Increase in fishing mortality | Changes in species assemblage<br>Changes in species richness |

For study areas, it will be seen that there are 3 types of management:

**Table 3 - The effects of different management actions**

| Closed Areas | Licensing / restricted entry | Gear controls |
|---|---|---|
| Reduce Effort<br>Depleted stocks recover<br>Reverse effects of fishing<br>Protects important habitats | Reduce Effort<br>Moderate effects of fishing | Reduce Effort<br>Moderate effects of fishing<br>Affect size at capture<br>Alter species composition |

Research Methods

In order to study fishing and management effects, Volume 3 will examine management success across a range of fishing pressures at different sites in Fiji and Vanuatu using a combination of two methods (see Table 4).

**Table 4 - Methods employed to Assess Biological Sustainability**

| 1.Underwater Visual Census | 2. A Fisheries monitoring programme |
|---|---|
| Habitat characteristics<br>Species and family abundance<br>Species assemblages<br>Species length differences | Species length and growth differences<br>Mortality differences<br>Species and family abundance<br>Species assemblages |

A data collection programme was established at the sites identified in Table 1. At each site a local data collector was selected and training in data collection provided by field staff. At each site data-entry forms were provided in the local language. Because of the wide familiarity of fishers with their own language names and the potential problems with training to species-level identification all fish were identified using local language (or in the case of Fiji, dialect) names. Some names were for individual species, some covered a range of morphologically-similar species. Some species, especially sexually dimorphic species, were found to have different names for different periods in their life-cycle. Data was collected on each fishing trip covering details of the fishing trip including the name of the fisher, the duration of the trip, the type of vessel (where appropriate), the gear used and the number of fishers operating together. Data on the subsequent destination of the catch (consumption, market, gift etc) was also collected. Biological data was collected using measuring boards provided by the project (to the nearest 1cm). A random selection of 10 fish (as a maximum) per 'species' were measured by the data collector per trip, following a chose one, discard one protocol. The total number of fish caught of each 'species' was also recorded. The data collectors were employed full-time by the project but it was recognised that not all trips would be recorded especially when a number of fishers arrived at the beach landing site together and for some fishing trips taking place at night. To account for this additional effort, a second data-entry form was provided and the names of those who had fished, but for whom detailed data was not collected, was recorded by date. In the case of Tavua and Vitogo/Vidilo, a data collector with extensive and highly accurate

taxonomic knowledge was employed from April, 1997. At these sites data were collected to species level. The variable costs and wholesale revenues of each trip were recorded at these two sites and cross-checked with fish-dealers.

Two field managers were employed by the project to undertake in-country management of data collection, data-entry (with the assistance of the relevant fisheries departments) and budget management (with assistance from the University of the South Pacific). The field managers followed a two-week collection cycle during which they would visit each site and work with the data collectors. The following two-weeks were spent entering data in the offices of the two fishery departments in Vanuatu and Fiji using a relational database developed by project staff. Additional data on social and economic aspects was also collected by the field managers during their field visits following protocols devised by the project's rural appraisal advisor, Mr Philip Townsley.

Assessment Expectations

Managed areas are expected to have low or zero (closed areas) fishing effort, and for these, only UVC data may be available.

Throughout Volume 3, the effects of fishing on single species and communities of fish, and how management actions have moderated those effects will be examined through:

- Direct comparisons between tabu (managed) and open access areas;
- Correlation of study variables (e.g. mean length, cpue, abundance) with the level of fishing effort applied, to see if this explains any observations derived.

The results from studies reported in Volume 3 are summarised for Vanuatu and Fiji in Volume 2, Chapters 1 and 2 respectively.

The terms ***site***, ***area*** and ***dive-location*** are used consistently throughout this report. Fishing-***sites*** refer to the Customary Fishing Rights Areas (CFRAs) within which fishing **areas** exist and which may be subject to management interventions by the fishing communities. For Underwater Visual Census work a number of replicate **dive-locations** within each area were surveyed.

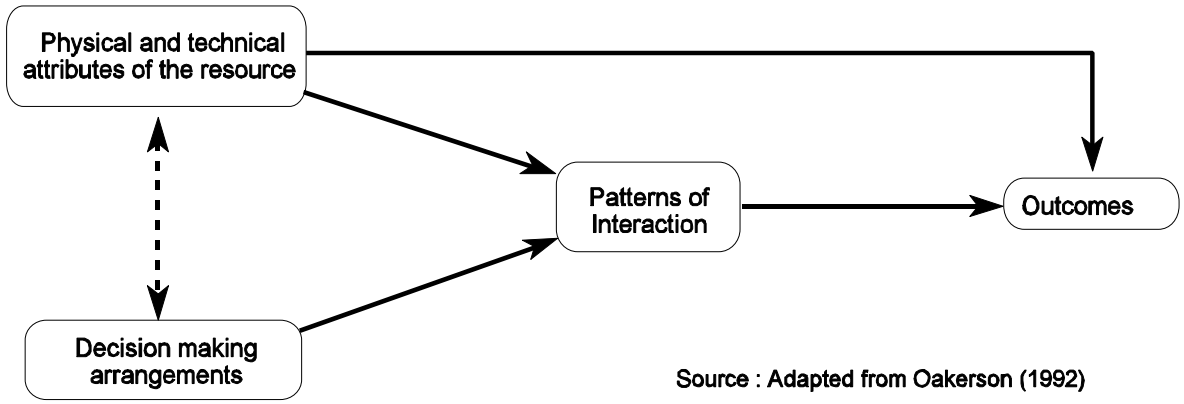
Length frequency data from the fisheries monitoring programme were employed to derive population demographic variables for key species identified in the catch. The von-Bertalanffy growth parameters (K, L4) were derived using a version of the ELEFAN method (Pauly, 1987) with the aid of the computer packagee LFDA (LFDA, a computer aided programme for length frequency distribution analysis, The LFDA Package, vesrion 4.01, MRAG Ltd, 1995, London). Total mortality (Z) for each study species was derived from length converted catch curve analysis (Jones, 1984) applied to aggregated length frequency data each season. The instantaneous coefficient of natural mortality (M) was estimated empirically (Pauly, 1980) at a water temperature of 27$^{o}$C (from the Nautical almanac for the Pacific Ocean). Fishing mortality was derived by subtraction (F=Z-M).

### 4.3 The analytical framework

Customary marine tenure systems have been described as the ways 'in which inshore fishers perceive, name, partition, own and defend local seas space and resources' (Cordell, 1988). This definition, while perfectly accurate, belies the complexity of CMT. CMT is the interaction

of a host of cultural, historical, geographical, biological, legal and technical components. These diverse influences have stimulated the evolution of many different, and complex, expressions of CMT-based management. This complexity creates difficulties for the analysis of even a single expression of CMT let alone a comparative analysis of *different* CMT systems At one level, CMT systems can be assessed using familiar techniques. For example, the *efficiency* of the CMT systems under investigation may be assessed using, for example, the analysis of spatial and temporal catch/effort data. Equity issues can be addressed through economic analyses. However, these techniques do not examine the crucial *interaction*s between fishers, management institutions and the resource. To better understand and later adapt such systems it is therefore essential to adopt a standard framework for single and comparative analysis. To assess the complete management *system* the research therefore employed Oakerson's Institutional Analysis and Development (IAD) framework (Oakerson, 1992), which was originally borrowed from the science of political economy (Ostrom, 1994). The Oakerson Framework (see Figure 3) brings together the outputs of different scientific disciplines into a single system analysis.

Figure 3 - Oakerson's Framework for the analysis of the commons




To achieve this, the framework seeks to identify the fundamental *elements* of a resource system and the relationships between them. The four basic elements to the framework are: (1) the *physical and technical attributes* of the resource, (2) the *decision-making arrangements*, (3) the *patterns of interactions* that result from mutual choice and (4) the *outcomes* that are observed in the resource system.

### 4.3.1 Framework elements

*Physical and technical attributes*

The physical and technical attributes of a resource directly limit and indirectly constrain the outcomes observed. Some attributes, such as the basic productivity of a marine resource, will affect outcomes independent of human action. The attributes set the limits to what outcomes are achievable in any given system. However, the physical and technical attributes of the resource also affect outcomes indirectly by influencing human choice and subsequent action. The nature of the resource, along with any rules in place that determine its use, sets the range of opportunities open to potential appropriators. Individuals make decisions on the basis of these and their resulting actions directly affect outcomes.

*Decision-making arrangements*

There are three areas of interest in this component of the framework. The institutions and circumstances that define the boundaries for legitimate individual and collective choice within a community are known as the conditions of collective choice. These boundaries are implemented via some suite of regulations on behavior (operational rules). Decision-making arrangements also include legal, political and even economic factors (external arrangements) that set the wider context of community management activities and the rules that can be developed.

*Patterns of Interaction*

Patterns of interaction are the aggregate of all the actions taken by individuals within the system. The actions of fishers are dependent on the perception of the costs and benefits associated with different types of action. This will be constrained by physical and technical attributes already mentioned and by the nature of the rules imposed. The role of management is to provide rules that lead to an incentive structure that culminates in the desired patterns of interaction.

*Outcomes*

The final component of the Oakerson framework seeks to assess the outcomes of the management system and any constraints imposed by the physical and technical attributes of the resource. A set of outcomes will include some yield from the resource base, biological (and even physical) effects resulting from the extraction of that yield, and economic and social effects. Outcomes can be directly constrained by the physical and technical attributes but are also dependent on human choices (the patterns of interaction). To determine the outcome of management, evaluative criteria are employed as standards.

The choice of criteria will, of course, reflect the objectives of management. Typically a modern assessment is undertaken in terms of the efficiency of resource use and the equity (or fairness) of the return obtained by stakeholders from cooperating with the management system. It does not necessarily follow, however, that traditional management objectives mirror those of the government's fishery managers, so the evaluative criteria may well be different also.

# 5 Outputs

## 5.1 Summary of Results

This study aimed to use the methodology described in the previous section in order to draw conclusions on the institutional performance of CMT systems in terms of social equity, and ecological sustainability. The primary criteria utilised to assess the performance of CMT institutions was that of equity. In this research the prime equity issue is whether 'individuals are getting a reasonable and fair return on their contribution to a collective undertaking that regulates behaviour' (Oakerson, 1992). The detailed results of this analysis are presented in Country Technical Reports which form Volume 2, chapters 1 and 2 of the FTR.

In relation to ecological performance, the present study aimed to examine the success of customary management actions for fin-fish resources across a range of fishing pressures at different sites in Fiji and Vanuatu. In addressing the question, 'Has customary management

been successful', the criteria used related to western notions of fisheries management success. Management success was not measured against any community objectives for biological management, which were not explicitly stated, although it was possible to establish benefits against certain inferred community objectives. The results of this analysis are summarised in Country Reports which form Volume 2, chapters 1 and 2 of the FTR, and given in detail in Volume 3 of the FTR. The key findings were :

*Summary Social/Institutional outcomes*

Whether CMT systems in Melanesia were originally designed as management tools to ensure the sustainable use of marine resources is a moot point. What is clear however is that in neither Vanuatu or Fiji do CFRAs boundaries relate to the underlying distribution of the fisheries stocks. CFRA demarcation (and use) was defined according to exogenous political and social attributes. In both countries the unit of CFRAs typically lie with the largest political unit. In Vanuatu these are small clans, in Fiji these are much larger tribal units. In Fiji CFRA boundaries were legally demarcated in a process that commenced in the 1960's; there is no such formal demarcation in Vanuatu although the rights of custom owners is recognised in national legislation. Fiji also differs from Vanuatu in its ethnic composition. In Vanuatu 97% of the 160,000 population are indigenous. Approximately 50% of the near 800,000 population of Fiji are non-indigenous people originating from the Indian sub-continent. Finally, Ni-Vanuatu are a far more economically homogenous group (80% of the population are rural) than is the case in Fiji.

In Vanuatu, the research CFRAs were relatively small units (<6 square kilometres of reef). This size is typical of CFRAs through out the country and reflects the marine geography (narrow fringing reefs), the tribal structure (small clan units) and the small communities (only five population centres in the country exceed 1000 people). In Fiji the marine geography is much more heterogenous ranging from relatively narrow fringing reefs to large (>2000 sq.km) areas of lagoon. The size of the CFRAs reflect this ranging from a few sq.km to >500 sq.kms in area. The tribal structure of Fiji is also somewhat different. Again the range is significant with tribal units comprising a few hundred to tens of thousands of people. Tribal units in Fiji are dominated by the single power authority of the chief; in Vanuatu this position exists but is less dominant in the politics of the community.

There were few examples of community institutions specifically established for resource management; such mechanisms would provide feedback to custodians with which management success could be assessed. In the small (homogenous) units of Vanuatu this does not necessarily present such a significant problem, particularly if advice is available from the state fisheries agencies. In Fiji the larger (heterogenous) communities present immediate problems for information feedback. This is further exacerbated through the development of a significant commercial fishery in Fiji. It is almost impossible for native resource custodians (the chief) to obtain adequate feedback from the commercial fisheries fishing across large fishing rights areas for significant financial reward targeting resources previously unexploited by the native population. This problem is exacerbated by the fact that many chiefs now assume important roles in the politics of the country not just the tribe and may not even reside in their tribal area at all. It was noted above that the CFRA as an institution was based on social and political attributes and that it ignored the underlying distribution (and migration) of stocks. There are a number of significant implications of this including the problem of managing such units, independently, for sustainable production.

The primary criteria utilised too assess the performance of CMT institutions was that of equity.

In this research the prime equity issue is whether 'individuals are getting a reasonable and fair return on their contribution to a collective undertaking that regulates behaviour' (Oakerson, 1992). There was a considerable range of equity outcomes observed at the different sites.

In the small communities of Vanuatu, which display a greater degree of ethnic and economic homogeneity than observed in Fiji, equity was generally achieved. The traditional authority structures of Vanuatu society do not necessarily equate to western notion of democracy but it was clear that a good deal of consultation was typical in most communities. Cooperation between stakeholder groups across adjacent CFRA units was universal and sharing of marine resources across time and space was the norm.

In Fiji equity was variable. Equity was typical in the smaller communities where the population was largely indigenous, traditional authority remained important and commercial fisheries development limited to the primary stakeholders. There were examples of adaptive responses by the traditional institutions and of a desire to promote consensus within the community over management actions. A critical point however is that management actions were endogenous responses to tradition rather than following western concepts of sustainability. These sites in Fiji closely resembled in attributes the sites in Vanuatu. In the sites where fishing pressure, particularly commercial pressure, was extensive, equity was a rare commodity, for both indigenous and non-indigenous stakeholders. It has already be noted that commercial developments present significant challenges for resource custodians. An additional challenge is the potential revenue that can be generated through the issuance of licences to commercial fishers. Equity appeared to be the first casualty. For primary rights holders (whose resource rent the licence fee represents) the problem was typically a lack of transparency in the decision-making process prior to issuance of licences and following issuance, in the disposal by the chief of the (communities) revenues. The other is that commercial fishers tend to follow the resource not the human boundary. Poaching was endemic in the large commercial fisheries in Fiji with concomitant loss of equity for stakeholders in the CFRAs subject to poaching. Finally, if significant (ostensibly conservation-based) limits were imposed on commercial fishing, it was inevitably the secondary-rights holders (the commercial Indo-Fijian fishers) that lost their rights of access.

In neither Vanuatu or Fiji was there evidence of Traditional Ecological Knowledge (TEK) being applied to management within the community. The practical use of TEK was to optimise fishing success.

*Biological Outcomes:*

A number of indicators of the status of fishery resources were used to evaluate the effects of fishing and management actions on fish communities (e.g. mean length, mortality, abundance, cpue and species assemblages). The results of these analyses are summarised in Tables 5 through 8.

Table **5** - Summary of Results of Underwater Visual Census (UVC) Studies in Vanuatu

| |
|---|
| **1. Habitat characteristics - Results** |
| No significant differences in habitat characteristics were detected within or between sites |
| Closed areas were not significantly different from unrestricted areas |
| **2. Abundance and Species Assemblages - Results**<br>**Multivariate analyses with MDS and ANOSIM** |
| No significant differences occurred in abundance or species assemblage for any closed areas compared to areas without restrictions |
| **3. Univariate analyses of Abundance - Results** |
| Emua Village - No significant differences between closed and unrestricted areas<br>No significant difference in species assemblage |
| Lelepa Island - No significant difference between closed and unrestricted areas<br>No significant difference in species assemblage |
| Uripiv Island - Lutjanids, mullidae and piscivores more abundant in closed area (222T) than in unrestricted areas |
| Wala Island - Lethrinids and planktivores more abundant in the closed area (215T) than in unrestricted areas |
| **4. Univariate analyses of Species Assemblages - Results** |
| Emua Village - No significant difference in species assemblage between closed and unrestricted areas |
| Lelepa Island - No significant difference in species assemblage between closed and unrestricted areas |
| **5. Univariate analyses of the significance of Fishing effort on Abundance** |
| Weak trend for increasing biomass at low levels of effort. This relationship was only significant for the families Serranidae and Kyphosidae across areas. Habitat was more significant than effort in explaining abundance |
| **6. Univariate analyses of Mean Length** |
| No significant differences in mean length of any species were detected in closed areas in Emua, Lelepa, Uripiv or Wala compared to unrestricted areas |
| **7. Univariate analyses of Mean Length versus Fishing Effort and Abundance** |
| For some species and gears a significant negative correlation existed between mean length and fishing intensity, and a positive correlation with abundance. Mean length of fish in closed areas was consistent with expectation relative to fishing effort and abundance |

Table **6** - Summary Biological Results from Fisheries Monitoring Programme Data in Vanuatu

| **1. Analysis of Mean Length by Species - Results** |
|---|
| No significant difference in mean length between closed areas and unrestricted areas occurred for any species at any site (but between site differences occurred) |
| **2. Mean length and Fishing Effort / Abundance - Results** |
| For some species and gears a significant negative correlation existed between mean length and fishing intensity, and a positive correlation with abundance. Mean length of fish in closed areas was consistent with expectation relative to effort and abundance |
| **3. Fishing mortality - Results** |
| Total mortality was not significantly correlated to fishing intensity or abundance for any species studied, except *Lethrinus harak* (Lethrinidae). This probably reflects inaccuracies in mortality estimation using length based methods of assessment. Insufficient data were available to determine mortality estimates in closed areas except for *Ctenochateus striatus* (Acanthuridae) in the closed area of Lelepa (Area 246T), where total mortality was low |
| **4. CPUE (index of abundance) - Results** |
| Within sites few significant differences occurred in CPUE. The differences were greater across sites. Data were available for 3 closed areas Uripiv (Area 222T), Lelepa (Area 246T) and Emua (Area 264T). The Lelepa closed area had a significantly higher catch rate than unrestricted areas within the relevant site |
| CPUE data were poorly correlated with fishing intensity in both 1997 and 1998 and for each gear type examined. Relative to fishing intensity, the Uripiv closed area (Area 222T) had low/expected catch rates; those at Emua (Area 264T) were as expected. Only those at Lelepa (Area 246T) tended to be high relative to the fishing intensity recorded in the area |
| **5. Species Assemblages - Results** |
| No significant differences in species assemblage occurred between closed and unrestricted access areas, except for fish caught with gill nets in 1997/8. Species assemblages were most different in the closed areas of Uripiv and Emua, whilst in the Lelepa closed area they were more similar to other areas |
| No correlation existed between species assemblages and fishing intensity, reef area or distance (of fishing ground) from the main landing site. These variables were strongly inter-correlated |

Table **7** - Summary of Results of Underwater Visual Census (UVC) Studies in Fiji

| |
|---|
| **1. Habitat characteristics - Results** |
| Within sites, habitat characteristics were similar, and tabu areas were not different from open access areas |
| Between sites, areas differed. Tacilevu was different from all others |
| **2. Abundance and Species Assemblages - Results**<br>**Multivariate analyses with MDS and ANOSIM** |
| Within sites no significant differences were observed by area or dive site in species assemblage or abundance, except for Tavua inshore reefs (121) which had significantly greater biomass than offshore reefs. Across sites significant differences occurred between areas, and between commercial versus semi commercial sites. No significant differences occurred between closed area 201T (Naweni) and unrestricted areas 20/21 (Naweni and Tacilevu) |
| **3. Univariate analyses of Abundance - Results** |
| Closed vs Unrestricted Areas - Greater abundance of lethrinids and planktivores in 201T. Species differences were not conclusive |
| **4. Univariate analyses of Species Assemblages - Results** |
| **5. Univariate analyses of the significance of Fishing effort on Abundance** |
| Mean biomass across sites was not significantly correlated to fishing effort |
| **6. Univariate analyses of Mean Length** |
| No significant differences in mean length of any species were detected in closed area 201T compared to open access areas |
| **7. Univariate analyses of Mean Length versus Fishing Effort and Abundance** |
| |

Table **8** - Summary Biological Results from Fisheries Monitoring Programme Data in Fiji

| **1. Analysis of Mean Length by Species - Results** |
|---|
| None of the key species studies indicated significant differences in mean length of fish in closed areas to those in unrestricted areas at either commercial or semi commercial sites except in areas 18 (Kubuna) and 21 (Tacilevu).<br><br>Significant differences in mean length occurred between commercial & semi commercial (smaller) sites, and in relation to location (fish at Tavua offshore reefs were larger) |
| **2. Mean length and Fishing Effort / Abundance - Results** |
| Few species indicated significant correlations between mean length and fishing intensity and abundance, and except in two cases observations were inconsistent with expectation. Environmental differences or fishing practices (especially between commercial / semi-commercial areas) explained the differences observed. Mean length of fish in closed areas did not differ from expectation. |
| **3. Fishing mortality - Results** |
| For some species, fishing mortality was positively correlated to fishing intensity & negatively to abundance. For closed areas, data was limited. Mortality of fish in area 16 (Verata) and 201 (Naweni closed area) was consistent with the level of fishing effort and abundance. |
| **4. CPUE (index of abundance) - Results** |
| No significant difference in cpue between closed and unrestricted access areas, except 201 (Naweni closed area) in 1997/8 for semi commercial sites. There were no differences in catch rates for licensed areas in commercial sites.<br><br>No correlation of cpue with fishing effort for any gear/ year/ sites combination (all, commercial, semi-commercial) except gill nets at semi commercial sites. No consistent trend for tabu / licensed areas by year/gear, except 1997/8 when 16 (Verata) and 201 (Naweni closed area) were consistent with the level of effort applied. |
| **5. Species Assemblages - Results** |
| At small-scale commercial sites species assemblages were not significantly different between closed and unrestricted areas |
| At commercial sites spp. Assemblage was weakly correlated to number of licences issued per fishing rights area and moderately correlated to access fee charged for these areas. |
| Species assemblage was not correlated to fishing intensity for all sites, small-scale commercial or commercial sites. |
| Significant differences between commercial and small-scale commercial sites occurred - Family assemblages caught by handlines were significantly different between commercial and small-scale commercial sites. |

Little evidence for the success of customary management against western objectives of the long term benefits of resource sustainability could be demonstrated from this study. Short term benefits, which meet specific community objectives such as 'ear-marking' resources for social events or community development initiatives were, however, apparent. However, forms of human-resource organisation ('management') exist which are appropriate to western notions of resource management (e.g. closed areas, effort and gear controls), and institutional arrangements exist within fishing communities to implement them. Thus, within a co-management framework with advice from government fishery departments, it was considered that customary 'management' activities could be adapted for the purpose of achieving long term ecological benefits and sustainability.

In conclusion, whilst there are clearly limitations on the extent to which communities will change in order to adopt human-resource centred organisational patterns rather than, or in parallel with human-social (self) organisational patterns, cultural systems in Fiji and Vanuatu are dynamic, and have in the past adapted to changing circumstances. This suggests that there is good potential to develop resource management strategies, mutually acceptable to fishing communities and national government, based on the principle of co-management in relation to areas of customary marine tenure.

### 5.2 Summary of Co-management guidelines

Volume 5 presents Guidelines Towards Effective Co-Management of Coral Reef Fisheries in the Pacific Region.

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 to support the various observations.

## 6 Contribution of Outputs

### 6.1 Towards DFIDs developmental goals

This project began in 1996 and relates to DFID goals defined in the original RNRRS and FMSP logframes. However, the outputs of the project are also directly relevant to the revised strategy: the RNRKS and the recently modified FMSP logframe.

The DFID RNRRS goal to which the project relates was “to enhance the productivity and productive potential of the land water interface through improved management of aquatic resources” as defined in the FMSP logframe, with the purpose of achieving optimum sustainable yield in capture fisheries through improved resource management. The project directly addressed the FMSP indicative output “ Strategies for the allocation of use rights in small scale fisheries and for the communal management of aquatic resources developed and promoted”. The outcomes of this project are also related to the RNRKS goals of “poverty elimination through sustainable development”, and to the FMSP goal of “improving livelihoods through sustainable enhanced production”, with benefits delivered to the target poor by application of the knowledge generated from this project to develop co-management guidelines.

The target beneficiaries of this project were small scale subsistence and artisanal fishing communities, and national and regional fisheries departments. Small-scale, inshore fisheries represent a critical source of nutrition and income for village communities throughout the Pacific. The rapid population growth that the majority of nations in the Pacific (and the increasing fishing power of fishers using modern gears) requires that these important resources be managed effectively to safeguard the livelihoods of rural communities who are dependant upon them. Collaboration between fishing communities and government in a co-management structure is seen as one way of achieving improved resource management.

The contributions of the project to the DFID and FMSP goals and purposes was an enhanced understanding of extant customary resource management actions as a tool for the sustainable exploitation of multi-species reef fin-fisheries in areas subject to marine tenure. The project also provided a better understanding of the social outcomes of these traditional forms of management, and described their performance under different levels of fishing and population pressure. The institutional arrangements for implementing management actions were also described. Arising from analyses of these outcomes it was concluded that good potential to develop resource management strategies, mutually acceptable to fishing communities and national government, based on the principle of co-management in relation to areas of customary marine tenure exits (see 5.1 above). First draft co-management guidelines were therefore developed. These were presented at national and regional workshops (see 6.2.1 below) to community, government, local and regional NGO stakeholders in the fisheries at the end of the project. Through interactive working groups these guidelines were further developed and form Volume 5 of the FTR.

### 6.2 Promotion of outputs

The guidelines developed will be directly relevant to fishing communities, NGO and government organisations responsible for fisheries management in Fiji and Vanuatu. However, they will be more widely applicable wherever communities have tenure over marine space (i.e throughout the Pacific and globally), and potentially, with some modification, for locations where tenure does not presently exist. Implementation of the co-management guidelines arising from this project is required in order to achieve DFIDs developmental goals. In order to reach both a national (in collaborating countries) and international audience of target organisations and fishing communities, a number of means of promoting project outputs were pursued and will continue to be beyond the life of the project. In particular national and international workshops were held by the project to disseminate results and develop and promote co-management guidelines, and results were also disseminated at a number of other international workshops and symposia (see 6.2.1 below).

A number of technical reports (6.2.2) and publications (6.2.3) were also prepared during the life of the project. To ensure wider dissemination, discussions were held with Professor Robin South of the Marine Studies Programme (MSP) at the University of the South Pacific (USP) with respect to publishing project outputs through the MSP Technical Report Series (USP, MSP was a research collaborator on this project). Various parts of the FTR will be adapted and disseminated in this way. That series has an international distribution of over 100 organisations. It is also intended that scientific papers will be written from material contained in the FTR, including that completed with project collaborators.

As already indicated, implementation of the co-management guidelines is required for them to achieve their developmental benefit. Considerable interest in developing and applying the guidelines was expressed during the project International workshop held in Fiji[1], suggesting that the potential for uptake of the outputs of this strategic research project is good. However, a further adaptive research project would greatly enhance the potential for effective uptake. An adaptive pilot scale demonstration project is thus planned as follow up to this project, and a Concept Note will shortly be submitted for funding through the FMSP. The purpose of the follow up project will be to test the application of the guidelines with an experimental population of the target beneficiaries (ie small scale poor fishing communities), and to investigate the effectiveness of alternative models and target institutions for their implementation. The project will directly address the demand already expressed in Fiji and Vanuatu, and potentially more widely, for example in Tonga, where the Secretary of the Ministry of Fisheries has indicated a desire to implement a co-management strategy. It will address Activity 4.1 of the revised RNRKS-FMSP logframe : 'Develop and promote adaptive management strategies and pilot demonstration projects to validate the application of management tools for the improved management of capture fisheries'.

### 6.2.1 Seminars/Workshops/Conferences

Results were disseminated at a number of national and international workshops and symposia.

> 'The monitoring control and surveillance of domestic artisanal fisheries': FAO/Norway Government regional workshop on fisheries monitoring, control and surveillance, 29

[1]Informal requests to implement the guidelines have already been received from the Government of Vanuatu, and during the international Workshop held in Fiji, a number of other country and NGO representatives expressed an interest in further developing and applying the guidelines.

June - 3 July 1998, Kuala Lumpur and Kuala Terengganu, Malaysia.

'The performance of Customary Marine Tenure (CMT) in the management of community fishery resources in Melanesia': Dissemination to Fishing Communities, Port Vila, Vanuatu 22-25 June 1999. (Presented by JD Anderson)

'The performance of Customary Marine Tenure (CMT) in the management of community fishery resources in Melanesia': Area Workshop, Lautoka, Fiji, 30 June 1999 (Presented by JD Anderson)

'The performance of Customary Marine Tenure (CMT) in the management of community fishery resources in Melanesia', at: Workshop on Aspects of Coastal Fisheries Resource Management, Suva, Fiji, 30 June-2 July 1999 (Presented by JD Anderson and CC Mees)

'The effect of stakeholder interactions on the performance of customary management of marine resources in Melanesia' The 1999 International Symposium on Society and Resource Management-Application of Social Science to Resource Management in the Asia-Pacific Region, 7-10 July 1999, The University of Queensland, Brisbane. (Presented by JD Anderson)

'Customary fisheries management in Melanesia' : Centre for the Economics and Management of Aquatic Resources (CEMARE), University of Portsmouth, CEMARE and MRAG Ltd Joint Research Day, 21 July 1999 (Presented by JD Anderson)

### 6.2.2 Internal Technical Reports

In addition to project quarterly, annual and field visit reports, the following technical reports were prepared by project collaborators. The details contained in these reports have been include in the project final report.

MRAG (1999) Biological Outcomes - Annexes : Detailed univariate and multivariate analyses by species and fishing area.

Polunin, N.V.C. (March 1997) Technical report on the UVC component of the project, based on field work in Fiji and Vanuatu in 1996, and analysis in Newcastle.

Polunin, N.V.C. (May 1999) Fishery-independent assessment of management effects on community fishery resources in Fiji and Vanuatu. Technical report submitted in completion of sub-contract for the UVC component of project R6436 (Note this has been incorporated into the FTR as Volume 3, Chapter 2).

Townsley, P.D. (January 1997) Interim Report of Socio-economic investigator to MRAG Ltd.

### 6.2.3 Publications

Mees C.C. (1999) The monitoring control and surveillance of domestic artisanal fisheries. *In*: Report of a regional workshop on fisheries monitoring control and surveillance, Kuala Lumpur and Kuala Terengganu, Malaysia, 29 June - 3 July 1998, Supplement 2, Technical Papers, pp 93-118. FAO/Norway Government Co-operative Programme - GCP/INT/648/NOR, FAO Rome, February 1999.

Townsley, P.G., J.D. Anderson and C.C. Mees (1997) Customary Marine Tenure in the south Pacific : the uses and challenges of mapping. IIED, PLA Notes 30, October 1997, pp 36-39

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