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## **MMAS Node Synthesis- Fiji**

### **1. Introduction**

The individual node (country) syntheses in the CI/MMAS program are intended to tell the ‘whole story’ of the understanding of MMA development and implementation that emerged from the interdisciplinary science done in association with the program, as supplemented by other data and information from other studies. There are several kinds of products that will emerge from the MMAS program:

- 1) Individual project reports
- 2) Cross-node disciplinary syntheses
- 3) Node syntheses
- 4) Overall synthesis (all studies, all nodes)
- 5) Publications in various literatures from the individual and synthesis reports
- 6) Science-2-Action products produced by CI and the personnel from each node.

In Fiji, as in the other nodes (Belize, Brazil and Panama) research was done in biophysical, cultural, economic valuation, socio-economic and governance topics to develop a complete natural and social scientific understanding of the factors and forces that led to the development and implementation of particular MMAs in Fiji, and the outcomes of that implementation.

In Fiji, the vast majority of MMAs follow a community-based adaptive management approach. In each node, including Fiji, the MMAS program included not only scientific research but also involvement in communication, facilitation, consensus-building and policy and management application.

This synthesis report focuses on the results of the scientific work related to all phases of the program. The report begins with a general introduction to the coastal and marine context in Fiji, and a summary of the important issues and challenges the country faces in these arenas.

Then, the biophysical, socio-economic and cultural, and institutional characteristics of each specific MMA are discussed. Third, the outcomes and changes resulting from each specific MMA are presented.

This is followed by discussions of the summary characteristics and outcomes *across* node MMAs, important factors not directly related to MMAs themselves, important emergent themes, Science to Action initiatives, and a general summary and conclusion

This report is a summary of many different projects. To access the reports of those projects, please go to [www.ci.org/xxxxxx](http://www.ci.org/xxxxxx).

## **2. *Background on coastal and marine management***

### **2.1. General history of Coastal and Marine Management in the node/country**

### **2.2. Current Challenges in Coastal and Marine Management in the node/country**

#### **2.2.1. Coastal development**

### **2.2.2. Inshore fisheries and their management**

The inshore fishery in Fiji can be crudely divided into three; the commercial fishery, the artisanal fishery and the subsistence fishery. Often and increasingly, the lines demarcating these three fisheries are blurred. This is discussed in later sections of this report.

Under Fijian legislation theoretically all commercial catch should be landed at recognised commercial landing sites. Records held by the Department of Fisheries for 2004 indicate that the commercial catch landed at domestic markets totalled 10,969t, with a value of F\$44,903,587. This value is seemingly far greater than that reported in previous years, however is likely still an underestimate as an unquantified proportion of commercial catch is landed at non-recognised and non-monitored sites.

Artisanal fishing has commonly been used in the Fijian context to relate to that portion of the fishery that is informally sold, either by the road side or at informal and non-recognised markets. The artisanal catch of reef fish and invertebrates for 2005 was estimated at 5,994t worth, at estimated market prices, F\$27 million whilst for 2006 the total finfish was worth F\$28.6 million with non-fin-fish worth an additional F\$18 million.

### **2.2.3. Climate change disturbances**

There remains uncertainty over the likely localised impacts of climate change. This uncertainty is greatly increased in the Pacific where many predictive models operating over such large areas consider most small island nations as simply open water. However there are some global trends that can be expected to occur in the SW Pacific region including Fiji and some more localised predicted anomalies. These include prolonged

variations from normal rainfall inducing both drought and flood events, increased intensity of tropical cyclones, increased sea surface temperature and a rise in sea level and possible acidification of oceans.

With such uncertainty over the effects of climate change, regional organisations are working on the precautionary principle; that acidification and increase in sea surface temperature will negatively affect coastal fisheries; that increased run-off from shifting rainfall patterns and increased magnitude of disturbance from stronger cyclones will affect reef habitat health

### ***3. Site-specific disciplinary studies***

At each MMAS country node a range of interdisciplinary science programmes were undertaken. However nested within this national programme in Fiji not all disciplines were undertaken at all sites. Table xx summarises what studies were conducted at which sites. At only three sites (Navakavu/Kalokolevu, Malolo and Waitabu) were ecological, socioeconomic and cultural role studies undertaken. These three disciplines were considered the core set.

Work on the cultural roles related to MMA management provided a national oversight that, whilst populated with anecdotes from individual sites, made conclusions applicable across all sites.

Similarly, the geographic scope of the extinction resistance study was national and did not focus on individual MMAS site but instead work on the hypotnesise around MMAS at a national scale providing resistance to extinction of endangered and important species.

Accordingly, both the results from the study on cultural roles in MMAS and the extinction resistance work are presented in individual chapters and not associated with a particular MMA site.

Province	Site	Thematic study				
		Ecological effectiveness	Socioeconomic and Governance effectiveness	Cultural roles	Economic valuation	Extinction resistance
Rewa	Navakavu and Kalokolevu	√	√	√	-	*
Nadroga	Malolo	√	√	√	-	*
Cakaudrove	Waitabu	√	√	√	√	*
Bua	Kubulau	-	√	√	-	*
Kadavu	Drue and Navuatu	-	-	√	√	*
Tailevu	Verata	-	-	√	-	*

## **4. Biophysical setting**

### **4.1. Fiji**

Fiji is an archipelagic nation consisting of over 300 islands sitting atop the Indo-Pacific plate. The two main Islands of Viti Levu and Vanua Levu are volcanic high islands. Fiji has 10,020km<sup>2</sup> of reef with representation of fringing, barrier and atoll reefs.

Along the south coast of Viti Levu lies one of the longest continuous fringing reefs; though the biogenic or tectonic origin of this structure is unsure. Fringing reefs similarly occur along the southern side of the second large island- Vanua Levu. Where the fringing reef departs from being connected to the high islands a barrier reef is formed; one such barrier reef, the Great Sea Reef or Cakau Levu runs for 200km through the Yasawa Islands off the north-west coast of Viti Levu and along the north coast of Vanua Levu. Further to the east of the two main islands the Lau archipelago is composed of high volcanic islands to the north of the group whilst carbonate islands and atolls predominate.

Fiji lies between 15° and 20° south and spans the 180° International Dateline meridian.

The climate is tropical and warm for most the year though there is a clear distinction between the warmer wet season from November to April and the drier cooler season from May to October. Rainfall is topographically variable; with the east side of the high islands exposed to trade winds inducing orographic rainfall (3000mm at the coast to 6000mm at higher elevations) and the west side being in the rain shadow being drier (2000mm p.a.). Fiji lies within the longitudes traversed by tropical cyclones. An average ten to fifteen cyclones per decade affect some part of Fiji with two to four severe storms directly hitting the islands and causing severe damage.

Fiji is affected by the El Nino/La Nina Southern Oscillation (ENSO) climate pattern on average every five years. One such event in 2000 caused significant increases in sea surface temperatures which was then accompanied by widespread coral bleaching. Whilst recovery from this incident has been demonstrated to have been substantial, repeated

events possibly with increasing frequency and intensity pose a threat to the viability of coral reef communities.

**4.2. MMAS 1- Navakavu/Kalokolevu**

**4.3. MMAS 2- Malolo**

**4.4. MMAS 3- Waitabu**

**5. Socioeconomic and cultural setting**

**5.1. Fiji**

Socioeconomic surveys conducted by the Institute of Applied Science at 29 sites, reported that the average number of houses in a village was 54, with an average household size of 5 in villages averaging 312 people. Average monthly income for all 29 villages was FJD636 (USD400), which was mainly from selling root crops (kava, yaqona, taro, etc.) and marine resources (fish, sea cucumbers), and other paid employment.

**5.2. MMAS 1- Navakavu/Kalokolevu**

**5.3. MMAS 2- Malolo**

**5.4. MMAS 3- Waitabu**

**6. Institutional setting**

**7. Cultural roles**

The objectives of the cultural role study were to:

- Determine the human cultures, cultural contexts, cultural values and cultural roles in communities involved in resource management.
- Determine the extent to which marine management deliver the range of social and cultural benefits required to sustain community support; and
- Assess the cultural influences, relations, practices, and values that affect the people's resource management activities.

MMA's greatly benefited coastal communities. The conservation initiatives made people realize the critical importance of their marine resources to their sustenance and of the need to ensure their sustainable usage. People were made to realize their responsibilities as stakeholders who owned these resources and who depended on these for their livelihood. This was different from earlier roles where the people were mere spectators to what resource management arrangements that government determined and implemented.

The change in community engagement approach enhanced the management of marine resources and boosted rural development activities. People realized the importance of maintaining the health and productivity of their fishing grounds and how these were interrelated to and affected by all the ecosystems around them. The people understood the need for an integrated resource management approach and adopted the ecosystem based method of managing their resources. The resource management activities in the MMA's were being extended into adjacent and surrounding environments.

One common finding of the study reported by people interviewed was that they were getting more resources and were spending less time working to obtain what they wanted. The fishers including men and women were fishing in areas where they had abandoned and were seeing fisheries resources they had not seen in recent times. The people had realized the recovery of their fisheries resources and the marine environment generally. The success in the management of marine resources was extended to other areas of their life and responsibilities. The people were looking for alternative sources of income and were searching for better ways of utilizing their natural resources. Sustainable tourist activities, fisheries development, land use and forestry activities and the sale of artifacts were all being tried in different communities. In many cases, these communities had been assisted by their conservation partners to improve their living conditions.

The studies around Fiji supported the increase in income people earned from their resource management activities. Some of the community groups were earning income from their resource management activities. In Kubulau, there was a scholarship scheme for the villagers' children attending secondary and tertiary institutions. The development partners were also collecting money to support the protection of the marine environment. All of the communities where workshops and meetings had been held were well rewarded for their effort. In many of these communities, assistance was offered to the villagers, village schools, kindergartens and even to the health centres.

The tradition to set up MMAs in local communities was supported by institutions and custom which were however found now to be eroding. Traditional protocols are no longer

strongly followed as in the past while the system of enforcement to deal with non compliance within a community has changed. Traditional relations and ties were found to be not well recognized by government institutions that were now responsible for the use and management of the resources.

Traditional ties and relations were increasingly abused in an effort to benefit unfairly from MMAs. Instances were found where some people were taking advantage of their traditional relations to seek to fish in areas where the owners were observing MMAs. These areas were often opened because a relative sought the permission of a chief using the traditional approach. The study found instances of long standing conflicts/issues and rivalry that caused community members to differ and not fully comply with their management plans. These differences were deep rooted and remain difficult to solve as they were often based on traditional reasons.

Faced with the contemporary need for money, the use of modern equipment and the weakened social systems, this study found that the MMAs in rural Fiji were vulnerable. Members of the communities were pressured by their community obligations (church contributions, payment for education and the need for money) to harvest their resources that they tended to opt for the opening their MMAs. Once the MMA is opened, these communities found it hard to re-close the site or commit to another MMA. Thus, the people relaxed their management plans exposing their resources to greater threats and risk.

Unfortunately the study found there are many improvements needed to ensure the effective operation of MMAs in Fiji. Many of these improvements involved the incorporation of traditional practices and cultural roles into the contemporary scenario. In many cases, for instance, not every one in the village was aware of what was going on. The decision to manage the resources was made by a smaller group including the chief so the involvement of the larger group was dependent on how well the message and decision was made known to others in the group. In many instances, the assumption was wrongly made that all the people were involved together. This study highlighted that this was not the case and that the wrong assumption in the end compromised the community support for resource management.

Government support to sustain customary practices in managing resources was poor. The hauling to court of the high chief of Macuata was indicative of Government's dismal support. Government was still promoting resource development over resource management. The support for fishers was based on the possession of a fishing license. The people that did not have licenses such as the communities that were managing their resources were not eligible for government assistance.

Poaching was also a handicap in rural communities where people were least able to defend their resources. Poaching was taking place without the owners' knowledge or because the local people could not do much as they did not have the resources required for enforcement. In many cases, the people's resolve to maintain their resource management activities was badly undermined by the repeated poaching that the people

relaxed their management activities. In these communities, the feeling was that it was pointless to be refraining from using portions of their qoliqoli if outsiders were going to be the primary beneficiaries. Poaching is a form of stealing and thus should be treated as such by Government. Sadly, commercial fishers and businesses were stealing from the poorest people in rural areas; people who were least able to defend their resources.

Poaching was also a major threat not only because the end result was not an accurate reflection of the resource recovery but the people also lost respect for MMAs if there were regular infringements. In some of the areas, the people decided to relax their resource management activities because of the regularity with which it was poached.

In some instances the study found that communities perceived the MMAs as belonging to their NGO partners resulting in fewer inputs from the people. The common perception was that the resource management work was done for the partners and not the community and its future needs. There was little that the people did on their own initiative. They acted as observers who waited around for the directives from the partners and threatened the MMAs as if it was the partners that would be suffering if they relaxed or ignored their resource management activities. Shifting demand from local communities was common. The local people expected their partners to deliver on all of their evolving needs even though they were not committed to resource management and the partners had met all of their promised support. People needed to see their partners as they were and not as sources of unlimited riches.

The study found instances where there was a poor system of representation in local communities because communication was not well organised. People were not all knowledgeable about what was undertaken, which was a barrier to the full engagement of community members in resource conservation. The lessons learned in trainings or workshops were not well relayed back to communities. On the other hand, the representatives of local communities did not consult with their people before they attended the different meetings in which they represented their people. In addition, these representatives hardly shared the reports from these meeting to the people who were expected to articulate these.

It was evident that traditional leadership was not always well tuned into contemporary challenges. There remains therefore the need for traditional leaders to regularly receive advice on issues they are not well versed with. This was where well organised community-based resource management groups could play an important advisory role. Community leaders needed to understand their responsibilities in leading their people to live in contemporary societies and to look after the interests of their future generations.

In a number of local communities, local communities had formed committees to look after resource management issues as well as development in general. The formation of such committees should be encouraged because of the complexities of the issues that had to be handled by local communities. Development planning and implementation, offer of forest and fisheries licenses and improvement of livelihood of the people are just some of these key issues.

Periods of time between the installations of chiefs were times of instability in many local communities. People took advantage of this time when there was no leader to seek relaxation to their communities' resource management activities. Unfortunately, most resource management activities were relaxed when a chief dies or for occasions when the community was responsible for a purpose for which there was not adequate preparation. In other cases, a new chief would have a different view to resource use so people had to readjust their resource management activities accordingly.

## **8. *Extinction resistance***

The objective of the extinction resistance programme was to assess the effectiveness of existing MMAs in Fiji in safeguarding threatened and endemic species that occur in those MMAs and their critical habitats, and to make recommendations on improving MMA effectiveness. Essentially, to test the hypothesis that MMAs actually do benefit species of concern, and if they do not, to recommend changes in MMA management that can correct the inadequacies.

## **9. *Outcomes resulting from specific MMAs***

### **9.1. *Navakavu/ Kalokolevu-***

#### **9.1.1. *Ecological effectiveness***

The continuum of management intervention from no-take tabu area through surrounding fished area in Navakavu to remote non-managed and (presumably) non-management-influenced fishing grounds in Kalolokelvu provided the opportunity to examine management effects beyond the immediate core no-take tabu.

There was a significantly greater biomass of targeted fish species biomass inside the no-take tabu area compared to the surrounding fished area in Navakavu amongst surveys done both on the reef flat shallow areas and the deeper blue-hole (highly significant) habitats.

The remote from management Kalokolevu deeper surveys had significantly greater biomass of non-targeted species than the fished area in Navakavu; though this pattern was not evident in either opportunistically fished or actively targeted species.

At shallower reef flat survey sites no significant difference in the biomass of actively targeted, opportunistically targeted or non-targeted fish species were found between the fished area of Navakavu and the remote from management Kalokolevu site.

*Making sense of the results*

Navakavu has one of the longer running, better enforced and, according to numerous studies, more ecologically effective no-take zones within MMA sites in Fiji. It was a little surprising therefore that the lack of difference between near-to-no-take and remote non-management-influenced fished species biomass found in this study suggests that there is no benefit accruing beyond the boundaries of the no-take tabu.

There are three possible explanations for this result;

1. There is no export of biomass from the no-take tabu into surrounding areas; that the increase in populations from management is confined only to the no-take zone.

2. High fishing pressure around the margins of the no-take are such that any biomass being exported from the no-take is caught prior to it being encountered on the in-water surveys
3. Methodological deficiencies associated with the design and survey prevented an accurate and statistically representative picture of the population and biomass being acquired

The socioeconomic component of this study and of others conducted at this MMA site all corroborate each other in finding clear belief and perception by resource users of increased fish populations and increased catch through decreased fishing effort in the area adjacent to the no-take since the establishment of the no-take- all of which are indicators of benefits accruing beyond the borders of the no-take.

It seems therefore that of the three possible scenarios either of the second is more plausible than the first.

Fishing pressure in Navakavu is known to be relatively high- with 60% of the average household income found in the socioeconomic component of this study to be coming directly from fishing. In addition to that is the catch that is used for subsistence purposes and would therefore not be counted in household income figures. It remains plausible therefore that fishing intensity is high enough that whilst export of biomass from the no-take is occurring, it is being fished out almost immediately.

Finally, the statistical power of the data collected to detect difference between the near-to-no-take and remote non-management-influenced survey sites was uniformly low across actively targeted, opportunistically targeted and non-targeted fish species.

Assuming variances remained equal in the two samples, the data would only be able to find significant difference if there were double the biomass of fish near to the no-take compared to far from the no-take.

### ***9.1.2. Socio-economic and Governance effectiveness***

Data collected on household income and income sources from households in Navakavu when compared to reference households from two non-MMA sites (Kalokolevu being one of them) revealed the following;

- Average monthly household income in Navakavu was less (though not significantly) than the average for households in the non-MMA reference sites
- Average monthly household income derived from marine related sources in Navakavu was significantly greater than the average income in the non-MMA reference sites
- Average monthly household income derived from fishing in Navakavu was significantly greater than the average income from fishing in the non-MMA reference sites
- A significantly greater number of respondents from Navakavu listed fishing as an income generation source when compared to respondents from the non-MMA reference sites

Respondents from Navakavu were highly significantly more positive about their economic situation now (compared to prior to the establishment of the MMA) when compared to those at the non-MMA reference sites over the same time period.

There was a highly significant greater average rank of responses to the question of whether fishing has become easier since the establishment of the MMA amongst respondents from Navakavu when compared to respondents from non-MMA reference sites over the same time period.

Across a range of statements to gauge environmental awareness and beliefs, respondents from Navakavu showed significantly greater awareness and belief than those from non-MMA reference sites

The average response amongst respondents from Navakavu when asked if their health situation had improved since the MMA establishment was significantly more positive than amongst respondents from non-MMA reference sites whilst seafood consumption amongst respondents from Navakavu was significantly more common and had become significantly more common than amongst non-MMA reference sites.

Whilst the number of conflicts related to fishing reported amongst respondents from Navakavu is low, the occurrence is significantly greater than amongst non-MMA reference site respondents- and this pattern is repeated when referring to incidents of illegal fishing. It may be that this pattern is evident as a result of higher levels of

awareness over what constitutes an illegal fishing activity rather than an actual increase in the rate of incidents.

## **9.2. Malolo**

### **9.2.1. Ecological effectiveness**

Inconsistent with expectations, there was a significantly greater biomass of actively targeted fish species in the fished areas surrounding the no-take tabu areas than in the areas themselves. By contrast there was a significantly greater biomass of non-targeted species within the no-take tabu than in the surrounding fished areas.

There were no significant differences found in percent cover for benthic classes between within and outside the no-take tabu areas at either of the depth zones surveyed.

#### *Making sense of the results*

A year prior to the conduct of the ecological surveys, the paramount chief of the Malolo region passed away. Some of the community based tabu areas that had been implemented in 2005 were opened so that seafood could be provided to mourners at the funeral of the late chief. Whilst ecological data was collected in some sites that had remained closed throughout this period together with some sites that had been opened, overall our results appear to indicate that this fishing may have been intensive and led to the draining of any benefit the tabu may have accrued over the years it was in place. In addition, governance anecdotes indicate that since the passing of the chief and the initial opening of these tabu areas, a pattern of constant, consistent and on-going poaching is now evident at these tabu

sites. At the time the surveys were being undertaken a plan was in place to traditionally re-establish the tabu areas at the next district-level meeting.

### **9.2.2. Socio-economic and Governance effectiveness**

Data collected on household income and income sources from households in Malolo when compared to reference households from two non-MMA sites revealed the following;

- Average monthly household income in Malolo were significantly greater than the average for households in the non-MMA reference sites
- Average monthly household income derived from marine related sources in Malolo was significantly greater than the average income in the non-MMA reference sites
- Average monthly household income derived from fishing in Malolo were no different than the average income from fishing in the non-MMA reference sites
- A highly significantly greater number of respondents from Malolo listed tourism and boat driving/diving as an income generation source when compared to respondents from the non-MMA reference sites- whilst no greater number responded to fishing being an income generation source at Malolo compared to non-MMA site respondents

#### *Making sense of the results*

In Malolo the main source of household income is through tourism- more so at Malolo than at any of the other sites. With much of this tourism being marine based, this sector contributed significantly to household income whilst fishing specifically was not a significant household income generator.

Respondents from Malolo were highly significantly more positive about their economic situation now (compared to prior to the establishment of the MMA) when compared to those at the non-MMA reference sites over the same time period.

There was a highly significant greater average rank of responses to the question of whether fishing has become easier since the establishment of the MMA amongst respondents from Malolo when compared to respondents from non-MMA reference sites over the same time period.

Across a range of statement to gauge environmental awareness and beliefs, respondents from Malolo showed significantly greater awareness and belief than those from non-MMA reference sites

The average response amongst respondents from Malolo when asked if their health situation had improved since the MMA establishment was significantly more positive

Whilst the number of conflicts related to fishing reported amongst respondents from Malolo is low, the occurrence is significantly greater than amongst non-MMA reference site respondents- and this pattern is repeated when referring to incidents of illegal fishing. It maybe that this pattern is evident as a result of higher levels of awareness over what constitutes an illegal fishing activity rather than an actual increase in the rate of incidents.

### **9.3. Waitabu**

#### **9.3.1. Ecological effectiveness**

Results of fin fish biomass surveys showed that there was significantly greater biomass of targeted species of fish found at survey sites conducted at shallow reef flat areas inside compared to outside the no-take tabu area.

Additionally, there was significantly greater biomass of non-targeted and opportunistically targeted fish species at deep (>6m) survey sites inside compared to outside the no-take tabu area. There was no significant difference found at deep sites inside and outside in terms of biomass of targeted species.

No significant difference in any of the benthic cover categories used were found between inside and outside no-take tabu areas in Waitabu, however the statistical power to detect such a difference was uniformly low across all treatments.

#### **9.3.2. Socio-economic and Governance effectiveness**

### **10. Summary characteristics across node MMAs**

### **11. Important factors not related directly to MMAs**

### **12. Important emergent management themes**

#### **12.1. Biodiversity and food security**

#### **12.2. Developing an integrated national plan**

**13. *Science to Action Initiatives***

**14. *Summary and Conclusion***