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EVALUATING THE SUCCESS OF TWO CO-MANAGED FIJIAN MARINE AREAS

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1. Introduction

Fisheries exploitation and other anthropogenic impacts have contributed to the global decline of coral reefs and are a direct threat to the livelihoods and food security of coastal communities (Jackson et al. 2001; McClanahan 2009). In developing countries, such as the island nations of the Indo-Pacific, this is particularly problematic as coral reef ecosystems have great cultural and economic significance and serve as a primary source of protein for local populations (Govan et al. 2009). With continued population growth, coastal development, and climate change issues the ability of these vital ecosystems to support future economic and nutritional needs is uncertain (Kronen et al. 2010) and hinges upon the implementation of effective management regimes to sustain and enhance them. This is particularly challenging as the Indo-Pacific coral reefs are expansive and there are limited government resources available for management and enforcement across most reef areas (Christie and White 2007, Govan 2009).

The management of marine resources has increasingly become decentralized across the Indo-Pacific and based around customary tenure systems, as is the case in Fiji where traditional tribal rights to marine resources have legal recognition (Cooke et al. 2000; Govan 2009; Dressler et al. 2010). This is largely reflective of the failure of top-down strategies for marine management that have disenfranchised and alienated key stakeholders resulting in poor participation and compliance (McClanahan et al. 2006; Berkes 2007; Julia et al. 2008; Ferse et al. 2010). As land and marine areas are key components of Melanesian and Polynesian ethnic and national identity and 80 percent or more of these islands lands are under some form of customary tenure (Goven 2009), sustainable development and social justice issues are intrinsically linked to resource management and conservation and thus require an integrated, holistic approach to resource management. In Fiji and other areas of the Indo-Pacific, educational institutions, NGOs and scientists, and government and private organizations are engaging customary resource owners with other stakeholders in a formal participatory marine co-management program that combines traditional knowledge and practices with modern management tools to ensure environmental integrity along with the social and material well-being of the community (Govan 2009). By involving key stakeholder in the management process, supporting institutions aim to: 1) facilitate the development of appropriate rules to prevent overexploitation and maintain ecosystem integrity, 2) create and reinforce linkages between co-management institutions, and 3) encourage compliance with management rules due to potential benefits acquired through co-management efforts that help to achieve local community objectives as well as national and international management objectives.

Despite the critical influence that participation has on compliance and ultimately management success (Ostrom et al 1999; Gelchich et al. 2006), remarkably less consideration has been given to the development of effective co-management frameworks that facilitate stakeholder participation while much attention has been given to incorporating key ecological principles into the design of effective coral reef management regimes (Almany et al. 2009). As community needs and sustainable livelihoods are often key motivating factors to participation in resource management, integrated approaches that are based around and reinforce traditional tenure and governance systems and jointly consider fisheries management, conservation, and community

development objectives are more commonly being applied in areas with histories of customary tenure (Govan 2009; Ferse et al. 2010). The success of these community-based co-management regimes in achieving the suite of biological and social outcomes generally sought depends greatly on participation and empowerment of traditional tenure units as a basis for governance and enforcing compliance with management rules. In order to develop resilient and locally-appropriate frameworks for resource management institutions, appropriate mixes of traditional tenure and national governance which allow for and facilitate the successful participation of local communities must be implemented (Berkes 2007; Dressler et al. 2010; Ferse et al. 2010). Apart from participation and compliance, some other characteristics of successful and enduring co-management regimes include: 1) well-defined geographic boundaries and rights; 2) appropriate rules and management bodies; 3) capable and respected management bodies; 4) strong conflict resolution mechanisms and enforcement of rules; 5) management bodies that are well-nested within other supporting institutions (Ostrom 1990; Pomeroy et al. 2001; Berkes 2007; Christy & White 2007; Cinner & Aswani 2007).

Fiji, in particular, has great potential for success with community-based co-management of marine resources because it's customary tenure is considered to be relatively-accurately mapped and has a certain degree of legal recognition (Cooke et al. 2000). After approximately a decade of community-based co-management of Fijian marine areas, evaluations of the efficacy of existing management frameworks to achieve effective and durable outcomes are warranted. In this study, we evaluate two adjacent Fijian nearshore fishing grounds (*iqoliqoli*) at the commencement of marine co-management efforts and after five years of similar engagement with co-management partners to determine the success of the management efforts in achieving biological objectives and creating functional management bodies. First, we determine the biological outcomes of two customary Fijian fishing grounds (*iqoliqoli*) by examining changes in target fish abundance and coral cover. Then, we evaluate the local management contexts and institutions for the two *iqoliqoli* to determine whether management efforts led to the establishment of appropriate and effective management institutions. We aim to elucidate factors that are important to the success of Fijian marine co-management efforts.

2. Methodology

2.1. Site background and context

Korolevu-i-wai and Komave districts are located along the southern coast of Viti Levu, Fiji in an area known popularly through the tourism industry as the Coral Coast. The land owning tribes of these two districts are jointly registered legally as the fishing right owners of approximately 9km^2 and 5km^2 respectively of inshore fringing reef area that is adjacent to their tribal lands and traditionally under their tenure. Apart from the approximately 1000-1800 people residing in the four traditional villages and surrounding settlements of each district, there are numerous resorts and backpacker accommodations along the coastal areas interspersed amongst the villages, most of which are on leased land belonging to the traditional tribes of the two districts (Figure 1). Tourism employment and payments from land leases are important sources of income to the

district's residents and some families currently derive income from logging activities, however subsistence farming and fishing are still an important part of the livelihood of most families (Fong 2005). Most of the districts' population resides along with all the tourism development on the narrow flat coastal areas where shallow fringing reefs extend 400-800m offshore before dropping steeply and often vertically to > 50m. Immediately inland from coastal development are steep hills that are now mostly grasslands or planted as pine and mahogany forests, though some watershed areas remain unlogged native forest.

Over-fishing along with wastewater pollution and sedimentation from poor development and land-use practices have led to severe declines in marine resources that were recognized by the customary fishing right owners of Korolevu-i-wai and Komave districts. This prompted fishing-right owners to engage with conservation practitioners in 2002 and 2004 respectively to begin a structured community-based marine co-management program based around their traditional tenure and current legal fishing rights. Resource management plans were developed by fishing right owners for their traditional *iqoliqoli* through a community-based participatory process facilitated and supported by partners of the Fiji Locally-Managed Marine Areas (FLMMA) program (www.lmma.org/fiji).

Both groups of fishing right owners stated the common objectives of enhanced fisheries production and sustainable reef resources for their management plans, identified similar threats to their *iqoliqoli*, and developed similar strategies to address the threats. Overfishing and destructive fishing practices were primary issues identified in both districts and resulted in traditional bans being placed on the use of poisons, harvesting coral or live rock for aquarium trade, breaking corals to harvest marine organisms, SCUBA spearfishing, and the use of small-mesh nets – all practices that are illegal under Fijian law, though rarely enforced by government agencies. Additionally, no-take areas were established by fishing right owners for an agreed-upon initial five-year period with a total of eight small no-take areas (0.1 – 0.8 km^2 in size) being declared across the backreef areas of the two i*qoliqoli*; four no-take areas established by Korolevu-i-wai in late 2002 / early 2003 and four no-take areas established by Komave in late 2004 covering approximately 28% and 34% of the two *iqoliqoli* respectively (Figure 1). The establishment of these no-take areas was based mainly on socio-economic factors (e.g. access to fishing grounds, enforcement potential), with minimal consideration given to ecological factors (e.g. reef condition, size, habitat type inclusion, proximity to rivers, and anthropogenic pollution). The implementation and enforcement of management plans were overseen within each traditional village of the districts by committees traditionally empowered to do so by their villages, and ultimately by a district level committee consisting of representatives from each villages-level committee.

2.2. Biological data collection and analysis

Biological monitoring was conducted across both the designated no-take and fished areas of the two *iqoliqoli* around the commencement of the co-management regimes and after five years of co-management to determine management outcomes. While the initial survey in Komave

coincided with the commencement of the management regime, the initial survey in Korolevu-i-wai occured approximately two years after the commencement of the management regime. Target fish abundances and percent coral cover were sampled in the Korolevu-i-wai *iqoliqoli* between July and November 2004 and July and November 2007 along 81 permanent transects, and in the Komave *iqoliqoli* between September and October 2004 and October and December 2009 along 30 permanent transects (Figure 1). Transects were 100m long, ran perpendicular to the shore, were marked with a GPS so the same area could be relocated for repeated sampling, and were equitably distributed across the reef flat zones with ~40% of transects in each district located within the no-take areas, and the other ~60% located in the fished area. Only three of the four no-take areas in Komave district were sampled.

The abundance of target reef fish and coral cover were chosen as basic indicators of management success. Target fish abundances were recorded in a 5m-wide belt (2.5m to either side) along each transect. Target fish recorded included lutjanids, serranids, lethrinids, siganids, scarids, and acanthurids as these fish are most commonly targeted as food fish and the later three herbivorous families also of significant ecological value as they are thought to be responsible for much of the algal removal on the reef. Benthic composition was sampled using the point-intercept method; the benthic type under the transect tape was recorded by category (hard coral, macroalgae, turf algae, cyanobacteria, crustose coralline algae, sand, other invertebrate) every 50cm along each transect resulting in 200 data points per transect.

To examine changes in target fish abundance, the mean abundance of all target fish were square-root transformed and compared between sampling years for each LMMA using an ANOVA. To examine changes in coral cover in each fishing ground, mean coral cover was compared between sampling years for each district using a Wilcoxon non-parametric paired comparison as the data remained skewed even after transformation.

2.3. Socio-economic data collection and analysis

Data regarding the management context and local institutions in the two districts were collected to elucidate whether management efforts led to the establishment of appropriate and effective management institutions. Data were collected through formal interviews with key informant (KIs) and discussions held with fishing right owners during management planning and evaluation workshops. Interviews with KIs were conducted to quantify local management context including the environmental knowledge and perception of the fishing right owners, the occurrence of destructive harvesting in the *iqoliqoli*, extent and severity of pollution in the *iqoliqoli*, and resource conflict and dependence of the fishing right owners. Data were also gathered from KIs regarding their local management institutions in terms of local origin and compatibility, credibility and capacity, awareness of and participation in management activities, and compliance to and enforcement of management rules. Key informant interviews in Korolevu-i-wai and Komave districts were conducted in 2007 and 2009 respectively using 20 standardized questions from a commonly-used learning framework developed collectively by LMMA practitioners in Fiji. Responses were recorded based on a common grading scale of 1 to

5 (see Appendix A). Key informants consisted of elected village mayors and traditional tribal leaders in each of the eight villages of Korolevu-i-wai (17 KIs) and Komave (16 KIs). All data regarding management context and local institutions were compared between the two *iqoliqoli* and evaluated in terms of the presence of design principles and characteristics that are commonly-found in successful and enduring co-management regimes. To determine whether there were differences in the responses of KIs in the two districts to the questions, Wilcoxon non-parametric paired comparisons were used to compare the mean scores for each of the questions asked during the interviews and Dunn-Sidak corrections were performed on P-values.

3. Results and Discussion

Community-based co-management has been widely applied to marine areas in the Indo-Pacific region with mixed outcomes, some of which were more successfully than others in achieving their management objectives. We studied two adjacent nearshore fishing grounds (*iqoliqoli*) at the commencement of marine co-management efforts and after five years of similar engagement with co-management partners to determine the success of the management efforts in achieving biological objectives and creating functional and effective management bodies. First, we quantified changes in target fish abundance and coral cover across the two *iqoliqoli* to determine if communities met their management objectives of fisheries enhancement and habitat improvement. Then, we evaluate the management context and local management institution to determine the extent to which they have characteristics thought to be critical to successful management outcomes by compared the opinions of key informants in the two communities.

3.1. Biological changes in the iqoliqoli

While significant increases in biological indicators were documented in the Korolevu-i-wai *iqoliqoli* over the study period indicating success of the management regime, the Komave *iqoliqoli* experienced a decline in fisheries resources. In Korolevu-i-wai, overall target-fish abundance in the *iqoliqoli* was significantly greater during the second sampling period ($F=9.517$; $p=0.0024$) increasing from 49.6 fish / 500m^2 (± 4.1 SE) to 65.8 fish / 500m^2 (± 4.4 SE) indicating that the management regime was successful in meeting the primary goal of enhancing fisheries stocks in the *iqoliqoli* (Figure 2a). Similarly, overall coral cover was significantly greater ($Z=6.294$; $p<0.0001$) in the *iqoliqoli* during the second sampling period increasing from 6.1% (± 0.8 SE) to 16.2% (± 1.3 SE) indicating improvements in habitat quality were also achieved (Figure 2b). These increases in fish abundance and coral cover documented in the Korolevu-i-wai *iqoliqoli* reiterate the potential effectiveness of community-based approaches to marine resource co-management. In Komave, however, the management regime was less successful in achieving the goals of fisheries and habitat enhancement. Significantly-less fish were found during the second *iqoliqoli* survey ($F=4.762$; $p=0.0332$) decreasing from 40.9 fish / 500m^2 (± 6.4 SE) to 24.0 fish / 500m^2 (± 3.7 SE) indicating that the management regime was ineffective in halting declining fisheries (Figure 2a). While coral cover

increased significantly ($Z=4.102$; $p<0.0001$) from 1.7% (± 0.3 SE) to 8.6% (± 1.6 SE), there still remains minimal coral cover across the *iqoliqoli* five years after the implementation of the management regime (Figure 2b).

The varied responses of these two adjacent *iqoliqoli* to similar co-management programs are representative of the mixed success of Indo-Pacific community-based marine co-management efforts. While there might be differences in ecological processes such as source-sink dynamics and habitat areas chosen for no-take protection across the two *iqoliqoli* that influenced the success of management efforts, we suspect that these processes are likely to be equally stochastic across the two *iqoliqoli* and thus measurements of these factors were beyond the scope of our study. Despite the fact that selection of the no-take areas established as part of the management plans were done without much consideration of biological factors and based mainly on social factors, the management plan in Korolevu-i-wai was still successful in achieving it's objectives. Thus, management context and the local management institution, important factors that influence biological outcomes of management efforts, are likely to differ between the two districts and have influenced the biological changes we documented in the two *iqoliqoli*.

3.2. Management context

While management context can greatly influence the outcomes of management activities, we found the management contexts of the two districts were remarkably similar and likely were not responsible for the differences in management outcomes in the two *iqoliqoli*. Both districts had similar population levels relative to the fishing ground size and comparable coastal development. Though statistical differences between the responses of key informants (KIs) from the two districts were found for four of ten questions asked in regards to the management context, none remained significant after Dunn-Sidak corrections (Table 1). In both districts, KIs indicated their communities have a moderate to good level of environmental knowledge, and place some to moderate non-material value on nature (Figure 3). Substantial efforts were made by co-management partners to improve the environmental awareness of and value placed on resources by the fishing right owners in both districts as knowledge and consideration of these subjects allow more informed management decisions to be made. Destructive harvesting occurs in both districts, however it is not a frequent occurrence (Figure 3) and thus unlikely to be a major factor influencing the difference in management outcomes observed between the two *iqoliqoli*. Key Informants felt that several, but not most areas were polluted to a moderate degree (Figure 3) and again the similarity of these factors between the two *iqoliqoli* make them unlikely to be major influences in the difference observed between *iqoliqoli*. Most of the pollution identified was from poor wastewater disposal and erosion from poor land use practices. However, the fact that the two *iqoliqoli* were not polluted in their entirety or more severely probably improves the likelihood of success of the management actions taken.

Dependence upon or conflicts for marine resources are thought to exert considerable influence on management outcomes with greater dependence and conflicts making successful management more challenging. Key informants indicated there was some to moderate levels of conflict for marine resources amongst the fishing right owners and between the fishing right

owners and others in both districts. However, key informants also indicated that less than half of the fishing right owner's livelihood comes directly from marine resources and that there were moderate to many non-marine livelihood activities available in both districts (Figure 3). Most of the non-marine livelihood opportunities available are based around the local tourism industry and include employment and monies collected from land leases. These alternative livelihood opportunities take pressure off of the marine resources and likely improve the chances of management success; however, reliance on marine resources for subsistence likely fluctuates as employment levels fluctuate with the tourism market.

3.3. Local management institution

We found striking differences between the management institutions of the two districts that likely contributed greatly to the difference in management outcomes we documented. Key informants in the two districts had significantly-different responses to seven of ten questions about their management institutions, six of which remained significant after Dunn-Sidak corrections (Table 1). In both districts, KIs felt that origin of the marine co-management project was of balanced origin between the local community and external partners demonstrating the fishing right owner's recognition of the need for management rather than it being a top-down imposed process. However, KIs in Korolevu-i-wai ranked the credibility and capacity of the management body, and the level of respect for those enforcing the rules of the management plan significantly highly than in Komave (Figure 3). In Komave, KIs felt the management body and those enforcing the rules had little to no credibility, capacity, or community respect while in Korolevu-i-wai KIs felt they had a fair degree of credibility, and moderate capacity and community respect (Figure 3). In both districts, KIs felt there was moderate compatibility between management plan goals and local values however, there was significantly less consensus about management plan policies and practices and less community participation in resource management activities in Komave than in Korolevu-i-wai (Figure 3). In Komave, there was only limited consensus in the community about the management plan and policies and little participation in management activities while in Korolevu there was strong community consensus of the management plan and policies and a lot of community participation in management activities. This is likely due to the lack of credibility of, perceived capacity of, and respect for the management body. In both districts, KIs also indicated that some to most of the community were aware of the rules of the fishing ground and that there were no to token penalties for those who break the rules (Figure 3). However, compliance with the rules was significantly greater in Korolevu-i-wai than in Komave; compliance was moderate to good in Korolevu-i-wai while only there was no to limited compliance in Komave (Figure 3).

Maintaining the no-take areas was likely a key factor leading to the biological success of the management plan in Korolevu-i-wai and this was recognized by the fishing right owners. During management planning and evaluation workshops held with the fishing right owners from the eight villages in our study area, we learned that all four no-take areas established in Korolevu-i-wai had remained in place for the entire five year period initially agreed upon, while three of the four established in Komave were opened before the five year period. Of these three opened no-take areas in Komave, one was re-established in an adjacent area in mid-2006 then again

opened in late 2008 without being re-established (Navola), another was unsuccessfully re-established in the same location after being opened for several weeks in early 2008 (Biausevu), and the third was never re-established after being opened in December 2008. Fishing right owners in Komave district raised concerns that the no-take areas were opened by some individuals without following proper protocol. This led to the low credibility of and respect for the management body, and ultimately likely led to the lack of compliance to the management rules experienced in Komave and failure to successfully re-establish no-take areas experienced by Komave, Biausevu, and Navola villages. The lack of compliance to the management rules, particularly in regards to the no-take areas is likely what led to the failure of the management plan to halt the decline in fisheries in Komave district. The intact no-take marine areas have greater densities of fish than the fished areas, and a greater percent of reproductively-mature sized fish which likely sustain and enhance the fisheries, however these acquired benefits in the no-take areas are quickly harvested out when the no-take status are not in effect.

The success of the management regime in Korolevu-i-wai was likely influenced by the strong participation of community members in management activities and compliance with the management rules established. The higher levels of participation and compliance with management activities and rules in Korolevu-i-wai was likely due to the greater respect for, credibility of, and perceived capacity of the management body. The management bodies in Korolevu-i-wai operated with more transparency in the decision-making processes of the management plans and stuck to the initially-agreed upon plans which also likely improved the credibility of the management body; this also appears to have resulted in a greater community consensus with the management plan than was found in Komave. The successful outcomes of the initial management plan led to Korolevu-i-wai deciding to make three of the four initial no-take areas permanent, establish an additional fourth permanent no-take area across a larger reef area than previously, as well as establish two additional no-take areas that are to be opened periodically to meet the needs of the village on special occasions. These results reiterate the importance of good governance to successful community-based resource management.

3.4. Conclusions

The differences in local management institutions found between the two districts in our study and associated biological outcomes reiterate the importance of good governance by the management body for successful management outcomes in community-based co-management regimes. In the community where the management body was not respected and there was not a consensus about the management plan, there was less participation in and compliance to management activities and rules despite the similar levels of environmental awareness between the two communities. This highlights the importance of strengthening governance along with environmental awareness and knowledge to improve the biological success of co-management activities. The biological success of the co-management effort in Korolevu-i-wai led to further recognition and buy-in by stakeholders as to the importance of no-take areas to the success of their efforts, and led them to collectively agree to protect more marine area in no-take zones. This again reiterates that co-management efforts should focus on strengthening governance of

the management institution along with environmental knowledge to ensure the sustainability of community-based co-management regimes.

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Figure 1. Map of the Korolevu-i-wai & Komave *iqoliqoli* (fishing grounds) depicting the locations of the locally-managed marine areas, traditional villages, resorts, no-take area boundaries, and transects sampled.

Figure 2. Mean (a) percent coral cover and (b) target fish abundance in Korolevu-i-Wai and Komave district fishing grounds ±SE (N). Asterisks indicate significant differences found between years in each pair of samples.

Figure 3. Mean values ± SE for responses by key informants to socioeconomic questionnaires. Black bars represent Komave District (n=16); Grey bars represent Korolevu-I-Wai District (n=17). Asterisks indicate significant differences after Dunn-Sidak corrections ($p<0.0025$).

Table 1. Results of Wilcoxin non-parametric tests performed on pairwise comparisons of Socioeconomic surveys conducted in Korolevu-I-Wai and Komave districts. P-values in bold are significant differences between the two districts after Dunn-Sidak corrections ($p<0.0025$).

Appendix A. Socio-economic survey conducted with key informants

Figure 1

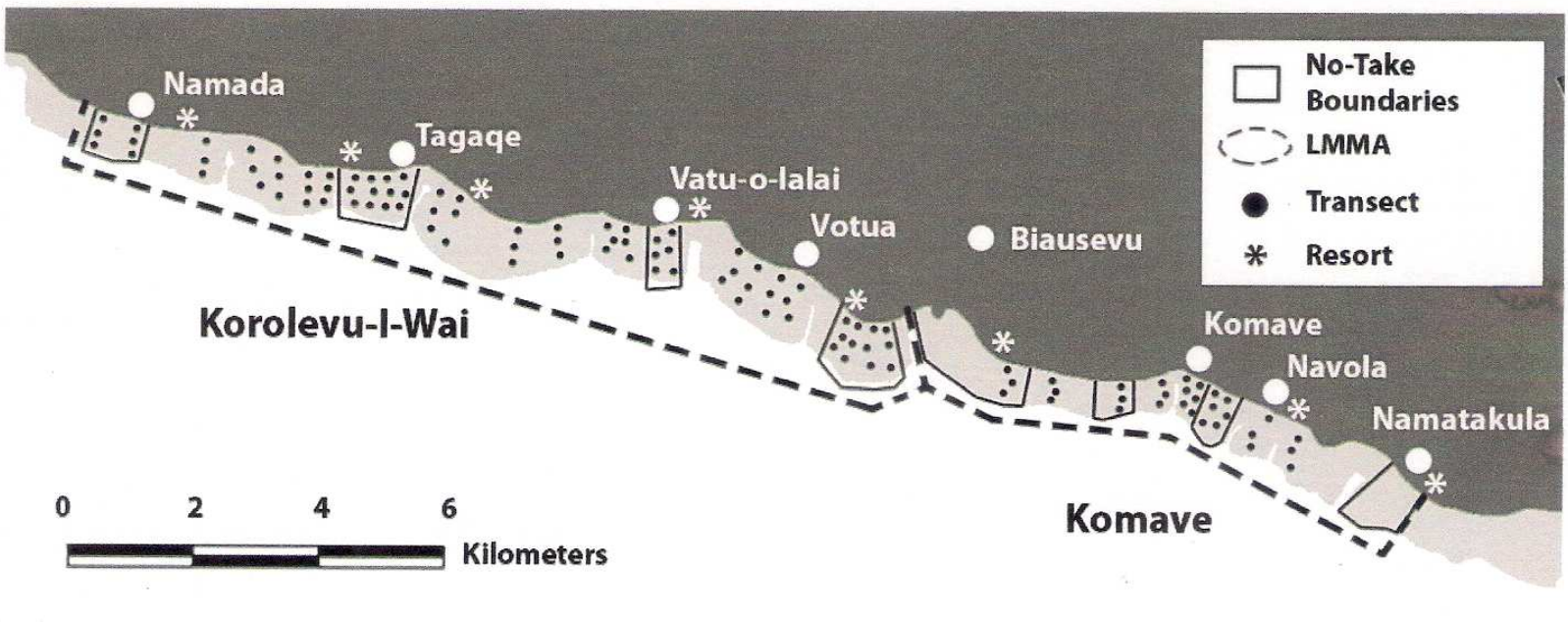

Namada
Tagaqe
Vatu-o-lalai
Votua
Biausevu
Komave
Navola
Namatakula
Korolevu-I-Wai
Komave
No-Take Boundaries
LMMA
Transect
Resort
0
2
4
6
Kilometers

Figure 2

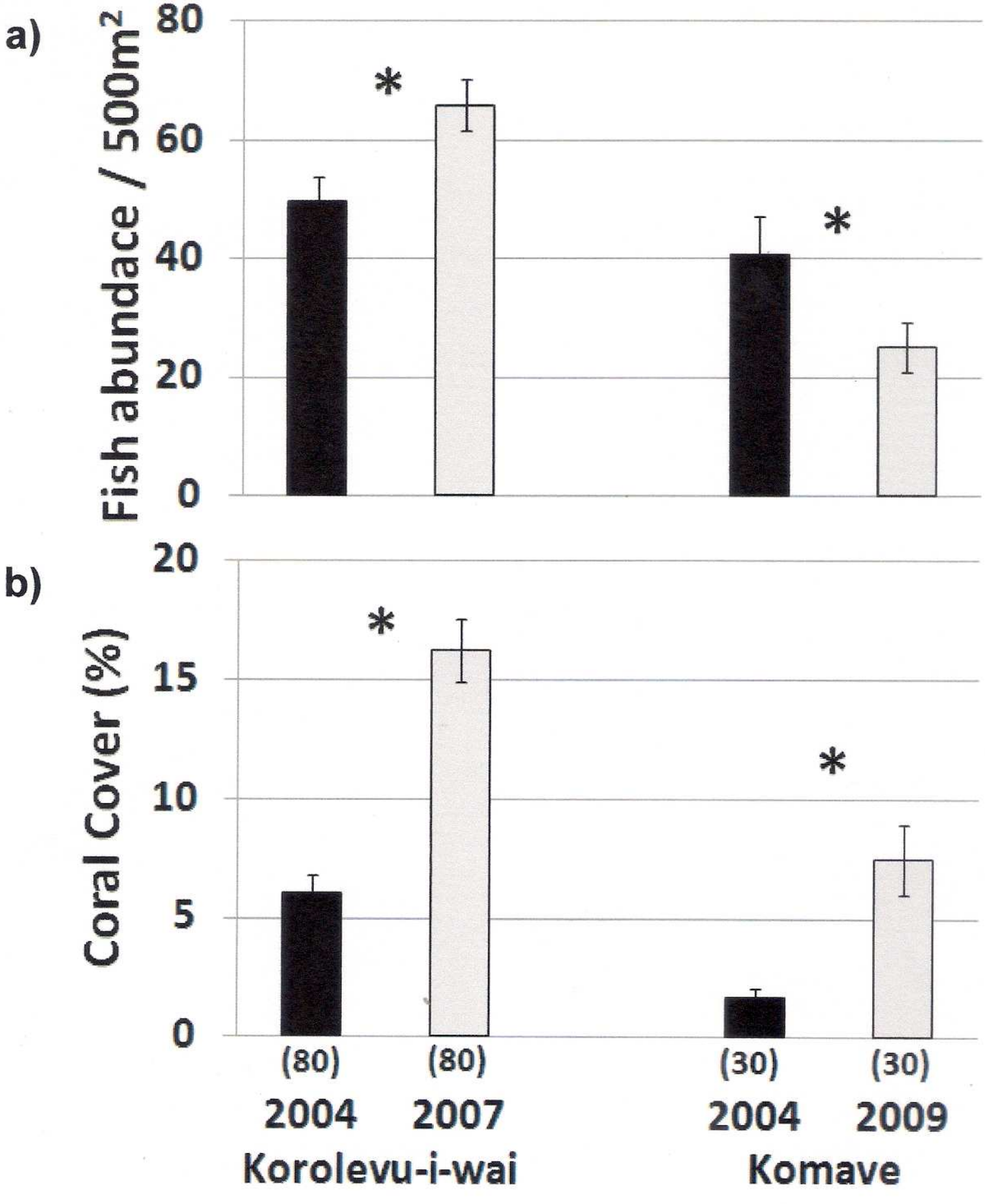
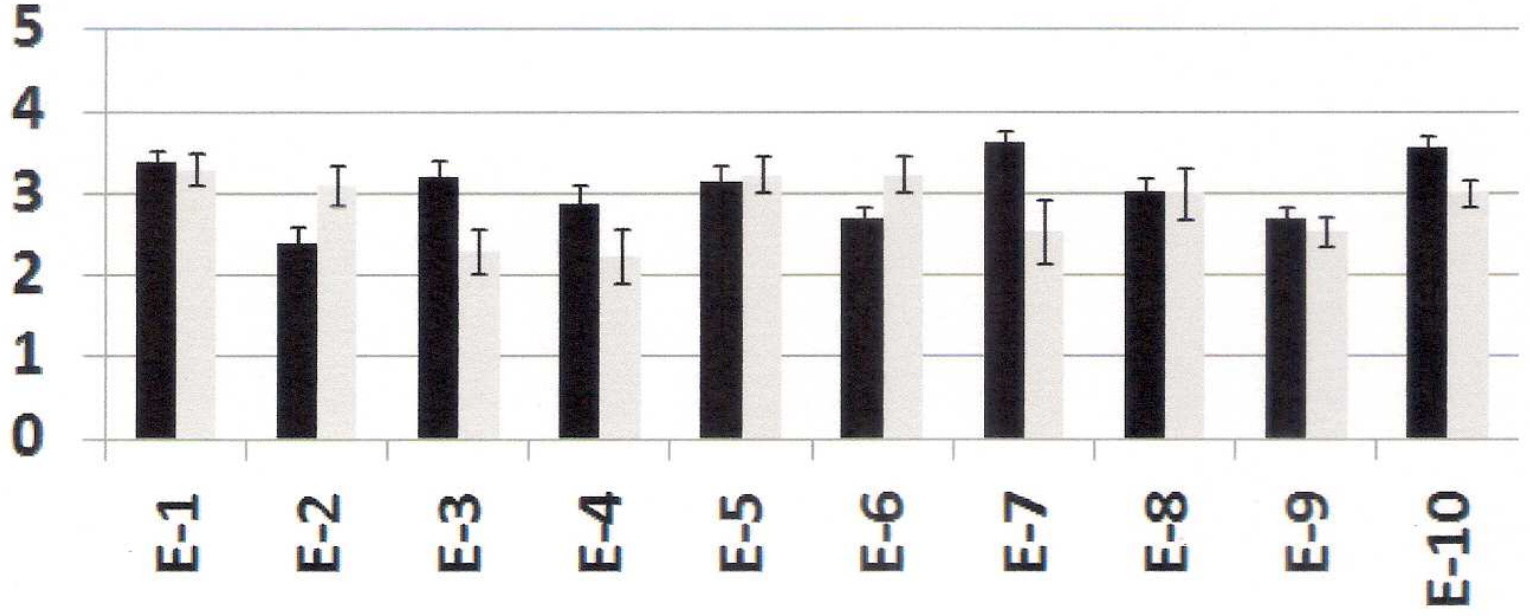

a)
Fish abundace / 500m²
80
60
40
20
0
*
*
b)
Coral Cover (%)
20
15
10
5
0
*
*
(80)
(80)
(30)
(30)
2004
2007
2004
2009
Korolevu-i-wai
Komave

Figure 3


5
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3
2
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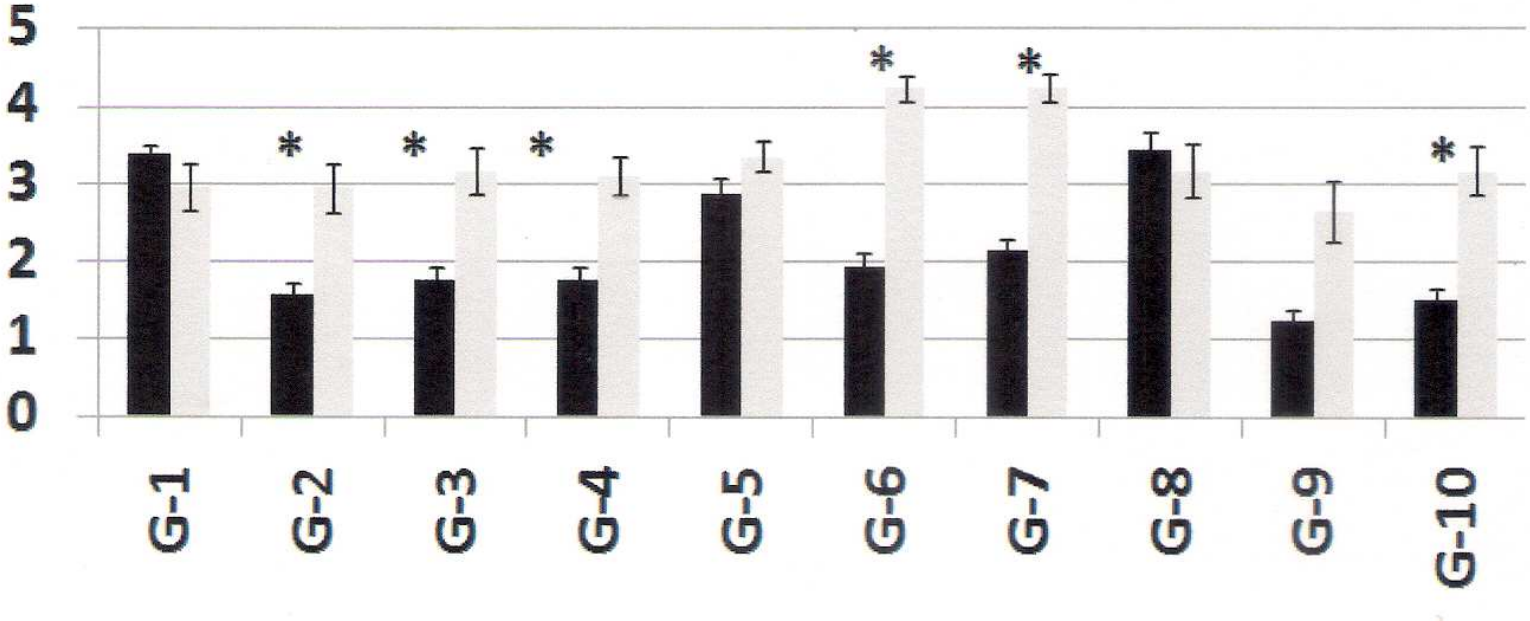
E-10


5
4
3
2
1
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G-1
G-2
G-3
G-4
G-5
G-6
G-7
G-8
G-9
G-10

Table 1

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Question	P - Value
E-1	0.9686
E-2	0.0305
E-3	0.0170
E-4	0.0696
E-5	0.6199
E-6	0.0665
E-7	0.0248
E-8	0.9851
E-9	0.3785
E-10	0.0203

Question	P – Value
G-1	0.2470
G-2	**0.0010**
G-3	**0.0010**
G-4	**0.0004**
G-5	0.1216
G-6	**<0.0001**
G-7	**<0.0001**
G-8	0.7060
G-9	0.0073
G-10	**0.0002**

Appendix 1a

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Management Context

E-1	What is the level of environmental knowledge in the community? *(1=little or none, 2=some, 3=moderate, 4=good, 5=excellent)*
E-2	To what degree does the community value nature for non-material reasons? *(1=no value, 2=some, 3= moderate, 4=strong, 5=only non-material)*
E-3	What is the level of destructive harvesting for subsistence use in the fishing ground? *(1=few/no incidents, 2=limited incidents, 3=some incidents, 4=frequent incidents, 5=constant incidents of destructive fishing)*
E-4	What is the level of destructive harvest for commercial use in the fishing ground? *(1=few/no incidents, 2=limited incidents, 3=some incidents, 4=frequent incidents, 5=constant incidents of destructive fishing)*
E-5	What is the area or extent of pollution in the fishing ground? *(1=none, 2-a few areas, 3=several areas, 4-most areas, 5=entire LMMA)*
E-6	What is the severity of pollution in the fishing ground? *(1=none, 2-minor, 3=moderate, 4-considerable, 5=serious)*
E-7	What is the level of conflict within the community for marine resources? *(1=frequent conflict, 2=some, 3=moderate, 4= limited, 5=no conflict)*
E-8	What is the level of conflict with outsiders for marine resources? *(1=frequent conflict, 2=some, 3=moderate,4= limited,5= no conflict)*
E-9	What part of the community livelihood comes from marine resources? *(1=little or none, 2=some, 3=about half, 4=most, 5=all or almost all)*
E-10	What is the availability of non-marine livelihood activities to the people? *(1=little or none, 2=some, 3=moderate, 4=many, 5=very many)*

Appendix 1b

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Local Management Institution

G-1	What is the degree of local origin of the marine management effort? *(1=all external, 2=mostly external, 3=balanced origin, 4=extensive local, 5=all local)*
G-2	What is the level of credibility of the management body governing the fishing ground? *(1= have no credibility, 2=minimal credibility, 3=fair degree of credibility, 4=large degree of credibility, 5=exceptional credibility)*
G-3	What is the level of community respect for those who enforce the management rules of the fishing ground? *(1=no respect, 2=little, 3=moderate, 4=good, 5=widespread respect)*
G-4	What is the capacity of the management body? *(1=little or none, 2=some, 3=moderate, 4=strong, 5=excellent)*
G-5	What is the level of compatibility between management goals and local values? *(1=no compatibility, 2=limited, 3=moderate, 4=extensive, 5=complete)*
G-6	What is the level of consensus in the community about the management plan policies and practices? *(1=no consensus, 2=limited consensus, 3=moderate consensus, 4=strong consensus, 5=absolute consensus)*
G-7	What is the level of community participation in marine management activities? *(1=no participation, 2=a little, 3=moderate, 4=a lot, 5=fully involved)*
G-8	What part of the community is aware of the local fishing ground rules? *(1=none, 2=a few, 3=some, 4=most, 5=all are aware of the rules)*
G-9	What is the likelihood of receiving a penalty for breaking fishing ground rules? *(1=no penalty, 2=token penalty, 3=average, 4=stiff, 5=maximum by law)*
G-10	What is the level of compliance with the rules of the fishing ground? *(1=no compliance, 2=limited, 3=moderate, 4=good, 5=excellent)*