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7.1 Introduction

In Vanuatu, indigenous Kastom\textsuperscript{27} is central to national identity. Custom served as a rallying point during the struggle for independence and is even the policy platform for some major political parties\textsuperscript{28}. Custom also plays an important role in natural resource management in Vanuatu. At present, strong messages are being sent to communities to embrace, revitalize and re-implement customary marine management practices (Hickey 2001; Ruddle & Hickey 2008). In Vanuatu, this translates into a push to establish customary taboos. Examples of other customary revivals across the globe are widespread, and range from re-learning mat weaving techniques in Samoa, language reacquisition in the Solomon Islands to reinstating natural resource production and management systems in Siberia (Crate 2008; Schischka et al. 2008). But even as the concept of kastom remains powerful to most ni-Vanuatu, its meaning is ambiguous and widely interpreted.

The possibility exists that customary revitalization may represent a process of customary homogenization or imposition. If island communities are scorned because they move outside the sphere of what is considered customary, then there is cause for concern. However, it is often difficult to identify when custom is imposed from positions of power onto those who are disempowered, because the preservation of indigenous identity is a globally appealing and worthy cause. Indigenous custom revitalization is a stated goal of many international bodies (eg. UN, IPACC\textsuperscript{29}, Cultural Survival) and financially supported by many influential grant-making groups (eg. Firebird Foundation, Christensen Foundation, Ford Foundation to name a few).

The validity of some indigenous customs has, however, been subjected to rigorous scrutiny, especially when they contradict internationally accepted norms like democracy or women’s rights. For example, consider the cases where the rights of women are curtailed due to references (often by men) to custom and their traditional place in society as subservient to fathers and husbands (Douglas 2002; Jolly 1996). Today many women’s groups in Vanuatu have been empowered to reinterpret customs and traditions in the context of global norms. In 2001, Hilda Taleo, former director of the Women's Affairs department in Vanuatu remarked that

"Kastom should not be clung to for its own sake, if Vanuatu is to develop, some of its traditions will have to go; after all, we used to have a tradition of eating people."

(Moldofsky 2001)

\textsuperscript{27} Kastom is the Bislama language spelling of the English word Custom
\textsuperscript{28} Namangi-Aute Party, Shepherd Alliance Party, Vanuatu Republican Party and the Nagriamel Custom Movement
\textsuperscript{29} Indigenous Peoples of Africa Coordinating Committee
But the promoted custom practices which do not contradict international norms often escape scrutiny. The academic task is particularly difficult for non-indigenous observers due to perceptions of neocolonialism and exploitation of traditional knowledge. Attempts to bring about academic dialogue on the validity of custom (Kuper 2003) have been criticized as discriminatory and impeding progress on indigenous rights (e.g. Asch et al. 2004). Being such a polarized topic, most prefer to ignore the issue of custom completely, putting it into the proverbial “too hard to deal with” basket. This has been the case among many contemporary researchers in Vanuatu; not willing to risk a renewed research visa. There, as elsewhere, it is easier to broadly promote ‘custom’ resource management than it is to define or question it.

Complicating an investigation into the political foundations of customary marine management paradigms is the paucity of written records, particularly on sensitive political issues. Much of the debate on custom takes place in unrecorded meetings, over the radio and in village nakamals. Thus this chapter explores the foundations of prevailing kastom resource management paradigms by probing the past and contemporary political contexts. I examine how kastom ideological frameworks are used by islanders and by city-based elites in the context of community resource management in Vanuatu. I conclude with a description of how custom has been dynamically adapted since since European contact in the 17th century. I review the social upheavals and pressures that have likely impacted the maintenance of custom management through time. The diaries of the first missionary to Nguna, the Rev Peter Milne, are used to illuminate how pre-contact culture and custom fared in their transition to modernity.

7.2 What is kastom?

Bolton defines Kastom as

“anything understood to be derived from pre-colonial knowledge and practice” (1999)

Since the end of the World War, emerging local political leaders have been searching for an element of ni-Vanuatu identity that was antagonistic to ‘the whiteman’ (Bashkow 2006), and that could put an end to the joint British and French colonial rule that had been in operation since 1906 (Bresnihan & Woodward 2002). Father Walter Lini wrote that he was searching for a symbol to represent how the ni-Vanuatu people had

“consistently struggled and spoken unceasingly against any form of colonialism” (Lini 1980pp 27).

What emerged was Kastom, the flagship platform of the indigenous Vanuaku Pati. It was a symbol crafted by party leaders to politically unify a culturally and geographically diverse people under a single national identity (Keesing & Tonkinson 1982). However, in a context as culturally diverse as Vanuatu, there existed a serious problem with the kastom movement: no single kastom could possibly account for inherent uniqueness of each of Vanuatu’s islands and communities. Many argue that rather than representing some coherent set of practices, kastom is the
“adoption of ethnic strategies... merely an instrumentality employed at a particular political level” (Linnekin & Poyer 1990pp 5):

Figure 36 Fathers of Vanuatu independence and kastom movements (Walter Lini, Barak Sope and Ati George Sokomanu) in the late 1970’s in (Lini 1980)

A disconnect between authentic practice and kastom has been emphasized by a wide body of evidence (Foale et al. 2005; Potter & Majid Cooke 2004; Ward & Kingdon 1995). The kastom movement in Vanuatu was

“defined in context of international politics rather than with 'kastom' as it was employed prior to independence.” (Larcom 1990pp 175)

Nevertheless, many ni-Vanuatu people have been led to believe that the kastom movement accurately promotes a “relatively fixed, unchanging and known set of practices” (Wagner & Talakai 2007). As we have seen, the social and cultural upheavals of the 19th and 20th centuries largely precluded the continuity of ancient or long-enduring customary practices, particularly on Nguna and Pele. Multiple generations had passed since Milne arrived on Nguna with his inflexible doctrines, and there was a notable absence of custom stories, written records or physical artifacts. Thus, there was a strong practical disparity between the historically vindicated

“If kastom was to be used to fight for independence, it would have to be reinvented (Hobsbawm & Ranger 1992), even though the kastom movement sought to promote the ideal that what existed before European contact had always existed. Therefore when kastom is evoked, it is necessarily vaguely contextualized (Fingleton et al. 2008 pp 28). On Nguna, Schultz gave the name “semihistorical traditions” to those ‘kastom’ practices and stories which were presumably ancient, but historically only recently adopted (Schütz 1969b pp 128). Many widely practiced ‘traditions’ are actually of

“varied development, form, fluid nature, and in some cases very recent appearance” and “a whole series of cultural snapshots which may or may not be associated with any great time depth, and which have been heavily transformed by European contact” (Bedford & Spriggs 2008)
Unsurprisingly, a disconnect between rhetoric and reality often creates confusion and anxiety among contemporary ni-Vanuatu attempting to rectify kastom discourse with the desire to adapt to global modernities.

“The discourse about kastom opposes modernity and development, presenting each as alternative models of present practice. Although clearly people understand that in the past things were different, this opposition, which is central to much thinking in the country, does not allow for history.” (Bolton 1999)

7.3 Gatekeepers of Vanuatu kastom

Well past the struggle for independence, a new fight is emerging against globalization, a threat many ni-Vanuatu perceive as neo-colonialism (Miles 1998). In response to pressures to join the market economy, adopt international policies and standards and adapt a Western ideological outlook, many within Vanuatu feel their identity is being usurped. The national government, while recognizing the benefits of international integration, has acknowledged a desire to retain an indigenous identity by promoting research and documentation of indigenous language and culture through the Vanuatu Cultural Center. In 2007, the national government declared the year of the “Kastom Ekonomi” which promoted the value of barter systems, payments in traditional currency and rural modes of production and distribution (Bazeley 2006).

In contrast to the moderate ideologies of the national government, which embrace change but emphasize local identity, an extreme version of anti-globalization has emerged in Vanuatu. The movement is led by a group who I call the ‘gate-keepers of kastom’. Rather than an organized group, I use the term loosely to refer to individuals or organizations which impede evolution, change or adaptation in Vanuatu communities because of violations to the code of ‘kastom’.

The Melanesian Institute of Philosophy30 and the Vanuatu Cultural Center (both funded by the Vanuatu national government) have missions to promote 'customary' resource management strategies throughout the islands. Rather than allowing communities to freely design initiatives that best suit their particular needs, particular customary practices (including the taboo) are heavily pushed. To overcome the inherent diversity of custom and tradition in Vanuatu, kastom gate-keepers in the capital of Port Vila have organized ‘custom classes’ for unemployed youth, advertised as

“an exciting opportunity that will offer the Vanuatu young people a chance to learn their own Kastom and make good use of them.” Vanuatu Daily Post (2008)

30 http://www.dailypost.vu/ArticleArchives/tabid/56/articleType/ArticleView/articleId/2022/categoryId/7/Turaga-celebrates-10year-anniversary.aspx
Figure 37 Graduates of the Port Vila customary revitalization Kastom Skul (Custom School) (Photo VKS), Youth on Nguna dress up in ‘custom attire’ to dance for visiting tourists.

But as we have seen in previous chapters, the custom of one island does not correspond to that on other islands, or even in other villages on the same island (Klinsko 2007). One might legitimately question the scope of custom classes in a country made up of over 84 islands and 113 indigenous cultural-linguistic groups.

Gate-keepers in contemporary Vanuatu reject the notion that non-indigenous ideas may be adaptive or beneficial, and rather promote the idea that what comes from outside is always detrimental to local people. Gate-keepers are commonly chiefs and other members of island governance systems, but they can also be politicians or even expatriate consultants who have lived in Vanuatu for decades. Often there is a personal benefit associated with being a gate-keeper: retaining ‘kastom’ authority or making a living from donor-funded cultural promotion projects or custom schools. Used as a political or economic tool, custom is open to manipulation by kastom elites (Johannes 2003; Rodman 1987). With an unqualified reference to kastom by the gate-keepers,

“divergent and contesting claims can be made at any particular time, all justified to some extent by reference to historical precedents” (Wagner & Talakai 2007)

One example of the manipulation of kastom has been the artificial expansion of the chief as purveyor and incontrovertible head of local governance over the last century in Melanesia (White & Lindstrom 1997). As kastom became increasingly revered in the independence movement, so grew the authority of the kastom leader, or in Vanuatu’s case, the village chief. Chiefs in Vanuatu have readily accepted the increased power of this newly relegated and often inherited role (Huffer & Molisa 1999; Weisbrot 1989). However, in pre-contact society the chief was often required to earn his authority through beneficial acts to his supporters (Bolton 1999). Today, Kastom gatekeepers lament the declining role of the symbolic head of their movement (Hickey 2001pp 133) as more effectual governance solutions to social problems arise (i.e. democratically elected councils and committees).

The kastom debate is often conducted by ni-Vanuatu or Western elite through the newspapers and on the radio (Regenvanu 1999pp 99). Those at the grass roots often find themselves marginalized when discussing desirable change in their own communities. The kastom rhetoric
tends to present Pacific Islanders as "ineffectual" or disengaged in ongoing cultural
transformation processes (Linnekin 1997), suggesting that local indigenous peoples passively
stood by as they were dealt the "fatal" blows of colonialism (Howe 1977) and now
globalization. Via the discourse of elite kastom gate-keepers, local communities are presented
as little more than a disengaged

“subject of historical forces, their cause lost from the start” (Philibert 1992)

Kastom gate-keeping is particularly active in the resource management sector. Writing about
the contemporary phenomenon in ni-Vanuatu communities to establish marine reserves and
taboos Hickey states

"Of concern however is that an increasing number of these taboos no longer have much
or any kastom association or ritualization to anchor them in the deeply rooted
traditions of the past. In fact, this trend has more recently taken yet another step away
from the protection of resources with the inclusion of kastom as its cornerstone. A large
regional environmental organization now sponsors workshops in Melanesia... to
promote MPAs as if they are oblivious to the context of thousands of years of marine
resource management in the Pacific. Truly, from the sacred to the profane” (Hickey
2001pp 133).

It is clear that the political agenda and social inequities associated with kastom discourse make
it an inappropriate framework for an objective evaluation or discussion of long-enduring
indigenous processes and institutions. Promoting political concepts such as ‘kastom’ and
‘whiteman’ within resource management discourse potentially detracts from the adaptability and
flexibility within Melanesian cultural processes and institutions (Hviding 1998). An uncritical
acceptance of resource use and management regime on the basis of a traditional or customary
label might hinder a sound understanding of dynamic cultural adaptation (Johannes 2003).

7.4 Dynamic Kastom

7.4.1 Christianity and Kastom

Many villages still speak of the time before missionization as “the darkness” and recall it as
filled with intolerable hardship and war. While missionaries (like Peter Milne of Nguna)
certainly forced social change in their districts, contemporary sentiment suggests that the
changes were, at some level, eventually embraced by local people. Christianity’s influence on
ni-Vanuatu social organization, the change into the “light”, was swift and widespread.
Bonnemaison noted that

“the diffusion of Christianity, had indeed been incredibly fast, casting away, nearly
everywhere, the systems of political hierarchy” (1994 pp 65).

Today religion is the pillar of ni-Vanuatu society. On Nguna and Pele, the Presbyterian church
and its leaders hold the most influential authority (Curtis 1999; Douglas 2002; Wittersheim
1998). Custom chiefs are now ordained inside churches by Presbyterian pastors.
In his writings, Walter Lini, father of Vanuatu’s independence, captures the prevailing ni-Vanuatu commitment to the teachings of the church.

“*I believe with my whole heart that the church must play its role in politics*” (1980).

But why were these new ideas and livelihood rules adopted so quickly and profoundly, particularly if they had such transformative impacts on the local ways of being? Understanding how and why a foreign ideology like Christianity took such deep root on Nguna and Pele may inform our search for the origins of Vanuatu’s contemporary conservation ethic and discourse.

Change did not come without resistance. During a cruise throughout the islands in a missionary vessel, Steel noted that the residents of Nguna were originally very opposed to the acceptance of Christianity:

“*the young men seem more opposed to it than the chiefs are; their periodical feasts or dancings, which, being connected with the worship of natemate, must also be given up by those who would worship Jehovah. But these feats are regarded by them as the source of their highest enjoyment…the perception of bliss, that they have become so much opposed to, and even enraged against it [Christianity].*” (1880 pp 253)

The missionaries were well aware of the local disinterest in Jesus Christ. Father Jean-Baptiste Jamond wrote in his diary that

“*the people do not want to be converted…They are just not interested. You have only to live with them for a week to realize that.*” (1992 pp 34,35).

Facey speculates that if the colonial navies31 had not been protecting the missionaries and their families, Milne may have

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31 The New Hebrides were jointly governed in a French and English condominium from 1906 until national independence in 1980.
“ended up shot in the back as he stood in the middle of a dancing-ground forbidding the
dancing, kava-drinking and feasting that were raging about him.” (1981 pp 303)

However the disinterest in Christianity was soon overcome throughout much of the archipelago.
Rather than driven by spiritual fulfillment, the rapid uptake of Christianity in Vanuatu was
likely spurred by the desire for material well-being. Bonnemaison writes that the general

“indifference towards European gods vanished when Melanesians realized they could
benefit from having scissors, knives, axes, saws and fishhooks (1994 pp 40). It drove a
wedge “between the group remaining faithful to the traditional social organization and
those stepping into the new ‘modernity’ (1994 pp 45)

The prestige and material prowess of mission-controlled coastal groups would have made them
almost unconquerable in preexisting conflicts by their less fortunate ‘bush’ neighbors.
Missions also provided the first formal Western education to the archipelago, skills that enabled
ni-Vanuatu to hold their own during negotiations with traders. The acceptance of Christianity
by ni-Vanuatu was therefore often made for “tactical reasons” (Bonnemaison & Penot-Demetry
1994 pp 215). The village of Ipai on Tanna Island illustrates the local perspective on the
benefits associated with Christianity. There, local leaders would only submit to baptism if the
Catholic Church agreed to three stringent conditions

1. the mission station could occupy only a small parcel of land
2. children would be schooled to become proficient in European weights and
   measures (for copra trading)
3. the mission must open a store that would continuously supply tobacco

The desire to possess foreign cargo was a salient attribute of much of ni-Vanuatu society during
the period. During a visit throughout the archipelago in 1910, Speiser noted that among local
residents it was

“among the highest ambition to be like the whites, which explains his passion for
wearing clothes and so forth. Only a few elderly men, chiefly men...cleeve strictly to
the old tradition...partly because the European culture undermines the system to which
they owe their status (1990 pp 77).

Bedford and Spriggs suggest that rather than explain cultural and ideological shifts with
arguments of cultural domination, many could have been brought about by the act of imitation.

“neither conquest nor major migratory events need be invoked necessarily to explain
conscious or unconscious processes of imitation, adaptation or inclusion of exotic
cultural practices and material culture” (2008)

However there is little doubt that the people of Nguna and Pele had no alternative than to live
with Milne’s Christianity and its associated cultural realities for over half a century. Many
considered them to be “quite cut off” from any pre-existing ceremonial world views or practices
(Tippett 1987 pp 273). In 1895, twelve customary chiefs on Nguna renounced paganism and
were reordained as Christian chiefs, replete with name changes and burning of their traditional nakpeas (idol drums) (Don 1977pp 204) Figure 48. In 1896, Milne himself rejoiced that

“every village in the Nguna district has renounced heathenism” (Don 1977pp 267).

Here Milne uses the word ‘renounced’, suggesting that islanders themselves made the decision to convert. In his view locals had consciously forgone pagan customs and culture. Somewhat surprisingly, this is a view is shared by many current residents of Nguna and Pele. A local story of Milne’s reign that is told to children across the two islands today ends with the line

“when he came to Nguna there were no Christians, when he died there were no heathens” (Schütz 1969b p 299)

This line was inscribed on the memorial headstone placed by local residents on Milne’s grave in Taloa cemetery on Nguna. Because Christianity is so central to contemporary ni-Vanuatu identity, Tippett waves away criticisms of one-sided acculturation by the missionaries (Sillitoe 1998; Trompf 1989). He argues that societal innovation

“has to be accepted before it becomes a feature of the culture” (Tippett 1987)

While this argument bears the unsavory flavor of justification for the cultural atrocities committed by the early missionaries, it does highlight the important fact that Christianity has been wholeheartedly accepted in the contemporary Pacific. The first converts to Christianity were often radically devout, living under a

“genuine messianic spell...and spent their days waiting for prayers...or any sign that could be interpreted in religious terms. Their aversion and contempt for everything related to their own ancestral beliefs and customs went beyond the wishes of the missionaries themselves” (Bonnemaison & Penot-Demetry 1994 pp 63).

Today, nothing more important exists in most communities than the church and its teachings. All ceremonies, meetings and events are opened by prayer and the blessings of a Christian leader. On current-day Pele there is a strong movement to abolish customary chieftainship and its associated rites, and instead ordain only Christian chiefs who govern according to biblical rules and piety. Bonnemaison notes that in the local worldview

“paganism had been conquered and a ‘biblical nation’ was being shaped. Kastom as a whole was relegated to the sphere of Satan” (1994 pp 55).

Custom and culture on Nguna and Pele was being reshaped, undoubtedly assisted by Christian missionaries, but also by islanders. Locals seemed to be adapting and integrating beneficial elements of Western ideology and rejecting those that were inappropriate. In essence, this period saw the death of one transitional indigenous identity and the collectively supported birth of another.
7.4.2 Kastom retention and reinvention

The labour trade, access to Western material goods, widespread epidemics and death, the cultural taboos of the missionaries, redistribution of land and authority, language homogenization and physical displacement each contributed to fundamentally alter the ni-Vanuatu way of being. On Nguna and Pele specifically, it seems there had been a complete “distortion of the local social structure” (Espirat et al. 1973 p 338). Island world views had been irreversibly altered. And according to Bonnemaison, indigenous identity

“was in disarray and, with it, the basic tenets of traditional life” (Bonnemaison & Penot-Demetry 1994 pp 44).

In 1966, linguist Albert Schutz visited Nguna to record customary stories from pre-contact times. To his surprise, local informants were only able to recall stories from after the coming of the missionary in 1870! He comments that

“whatever tradition of storytelling there might have been a hundred years ago has been submerged by the present culture” (Schütz 1969b pp ix).

One of the most fascinating and powerfully symbolic stories he recorded was a tale recounting the death of the last sacred custom man on Nguna. This mau (magic man) had worked many miracles until the Rev. Milne arrived and shook hands with him, whereupon the mau promptly died (Schütz 1969b pp 221-223). As symbolized by the story, pre-contact identity, custom and practice on Nguna and Pele were in a moribund state middle of the 20th century. Nguna and Pele islands existed in a “cultural vacuum” (Schütz 1969b pp ix), but despite the near complete loss of culture, custom and traditions, Allen asserts that

“important elements have survived in the new context of Presbyterian orthodoxy and market participation”. (Facey 1981 pp 5 )

Some physical elements of culture were directly and often covertly retained. For example, Milne actively prohibited the carving of wooden idol drums and required them to be burnt (Don 1977pp 204-205). Contemporary residents of Pele however, tell of how their great-grandparents
kept a pit prepared in the bush behind the village so that when Milne visited, they could fool him by quickly burying the contraband, only to be exhumed once he left the island. Other than these rare instances of subversion, the funeral of pre-Milne identity was one at which no one on Nguna or Pele had mourned, that is until recently. In the last few decades, a desire to understand pre-contact identity has emerged after the previous 200 years of tumultuous change. Visiting Nguna in 1958, Espirat

“had the impression of a society already strongly acculturated, but on track to restore its traditional structures, or attempting to maintain its cultural memory, but yet searching for inner coherence.” (Espirat et al. 1973)

But how and why did the search for coherence and non-European identity begin on Nguna and Pele? Missionaries were still physically present on the island well past the middle of the 20th century.

It may have been the Second World War that reawakened the possibility of a renewed indigenous identity in the minds of many ni-Vanuatu people (Coulter 1946). From May of 1942 until the end of the war, up to 20,000 US troops manned the bases on Efate, directly across from the islands of Nguna and Pele. To fulfill major labour shortages, the US Army hired thousands of ni-Vanuatu people to build infrastructure, clear forest, undertake pest control, cook and provide fresh produce and meat (White & Lindstrom 1990 pp 32). According to local recollections, the ni-Vanuatu laborers were treated as human beings by their employers, often for the first time in their lives. Their work was critical to the success of the campaign against the Japanese, and locals were encouraged to take pride in the success of the initiative. Perhaps more importantly, the US Army at the time was fully integrated, and African-American soldiers served in equal capacity alongside their white colleagues. Such an equitable relationship between black and white had as yet been unheard of in Vanuatu. An elder from Nguna island recalled that one soldier, ready to depart Efate, told him

“Don’t feel bad. Sometime we’ll come again in peace. We’ll be brothers; we’ll have good times” (Schütz 1969b pp 312)

If African-Americans could be soldiers and brothers with their white colleagues, then why couldn’t the ni-Vanuatu be on equal footing with their once masters?

“The war created in South Sea people desires that can be fulfilled only partly or not at all. Drives that had been gradually entering their old culture have received great impetus; or, where contacts with the outside world were negligible, new drives have been created.” (Coulter 1946 pp 419)

The collective drive to realize these desires for equality sparked a quest to reconnect with something stable, endemic and uniquely Vanuatu: kastom.
7.5 Kastom; a continuous process of adaptation

Ni-Vanuatu people are (and likely have always been) active participants in constructing social institutions, continuously developing adaptive strategies to deal with social, political and environmental realities. Authentic custom is not a rigid, static or unchanging institution. Adaptation often involves cultural evolution and “selective modernization” (Philibert 1981), the process by which novel cultural elements become an enduring part of custom and the prevailing local “intellectual armory” (Geertz 1994). This process of cultural evolution and hybridization is not new to ni-Vanuatu society (Jolly & Thomas 1992; Keesing & Tonkinson 1982; Norton 1993).

“Even before the first contacts with Europeans, Melanesian custom was evolving. Custom is not a legal system which was set once and for all, but a system of attitudes and beliefs which are expressed in different islands at different times” (Bonnemaison 1984).

The evolving state of customary identity has actually enabled islanders to cope with and survive environmental and socioeconomic stressors (Reenberg et al. 2008). Cox sums up the scholastic consensus on the evolution of custom by observing that

"the modern anthropological community embraces a more fluid view of human society, in which communities change through time and space, experience internal developments, and interact with surrounding groups."(Cox 2008)

Throughout the 3000 year history of human habitation on Nguna and Pele, local culture and custom have undergone a continuous process of hybridization driven by

“innovation…and acquisition through interaction, contact-induced change, or direct migration” (Bedford & Spriggs 2008)

Though the Christian institutions outrightly banned many cultural practices, contemporary equivalents have been re-assembled, sometimes even with distinctly colonial undertones (Thomas 1992). For example, contemporary weddings on Nguna and Pele are officiated by a pastor, conducted in a church and bedecked with white lace and shiny shoes. Just as in the past however, today’s weddings place much emphasis on the pre-Milne rituals of property distribution and familial exchange. In another example, contemporary marine reserves are commonly established after long and involved democratic discussions among community stakeholders, but the paramount chief still ceremonially kills a pig to declare the closure.

Therefore, in order to move beyond the political construct of Kastom to derive a historically valid framework for understanding contemporary practices including marine use and management, Philibert argues that analysts take a middle ground by

“knowing the terms in which [ni-Vanuatu] recount their collective experience” (1992)

Similarly Foster encourages those interested in traditional practices to assess how they are
Facey recommends that we must consider

“how the images and narratives...that are generated by nationwide political processes are interpreted and used by local communities” (1995pp 207)

In essence these authors represent the moderate consensus that custom is largely an individual and community affair, an institution not to be codified, interpreted or mandated at a national level. Rather, a robust understanding custom should entail an examination of the meanings that have been locally attributed to it. The evolving nature of ni-Vanuatu custom is a natural process by which novel elements and ideologies can be flexibly incorporated or rejected as appropriate. In contrast to the views of the national Kastom gatekeepers, authentic indigenous identity is just that, an identity that belongs wholly to local people to define and adapt.

7.6 Conclusion

In the search to uncover the foundations of prevailing marine management paradigms, the political nature of kastom rhetoric has been uncovered. In essence this review rocks the canoe of popular thought about marine management in Vanuatu and the wider Pacific.

This chapter finds overwhelming evidence to suggest that contemporary Kastom is strongly influenced by contemporary political contexts. Created to serve as a rallying point in a pre-independence war against colonial domination, it is maintained today in Vanuatu by a group of influential cultural gatekeepers who have, over the nearly 30 years since independence, gained much from its promotion. Their authority is locally unquestionable because it too is proscribed within the ambiguous premise of kastom. Many of these elites make their livelihoods on promoting or revitalizing kastom identity, despite its historical inaccuracy. Until the United Nations required member nations to protect the rights of women and children, kastom ensured that men received continuous servitude from these groups. Because marine management issues do not constitute blatant human right violations, promoting kastom as the guide to managing natural resources allows gatekeepers to maintain at least some unfettered authority. Island communities that are showing signs of innovation and self-determination are dangerous for the kastom gatekeepers, threatening to rock the canoe of their status and prestige. A fight for power likely explains why island communities are persecuted for establishing marine reserves, MPAs or any other initiative that diminishes the authority of kastom elites.

Continuing to overcome challenges to their self determination, the people of Nguna and Pele have developed ways to circumvent the cultural impositions of others and have demonstrated a remarkable capacity to adapt to changing conditions. External elements that are beneficial are adopted, those detrimental are rejected. Some external elements, like Christianity, have been locally adapted to suit the Nguna-Pele way of life. Custom is constantly being reshaped, but actively, and driven by the people of Nguna and Pele. The historical proclivity for cultural innovation suggests that what exists on Nguna and Pele today in terms of marine management is
new. But contemporary practices are absolutely indigenous, and like Christianity, have been adopted and adapted from many sources, despite having no enduring historical roots.

Ultimately, this review suggests that contemporary marine management in Vanuatu is not defined solely by history, culture, socio-economics or environment, but represents a blending of processes, institutions and actors. Here, community initiatives to manage marine resources are “unlikely to conform to universal prescriptions given the unique context” (Lane 2006 pp4). No community should be criticized for innovation, particularly if that innovation is created by necessity to deal with a rapidly changing world. MPAs, marine reserves, taboos are all valid expressions of a contemporary ni-Vanuatu culture, one that is clearly not statically tied to ancient idylls. Selected, adapted and implemented by island communities, these regimes cannot be considered in contextual isolation nor expressed in exclusive binary categories: local vs. foreign.

The path of discovery has been cleared; our understanding of contemporary MPAs and taboos is no-longer curtailed by politically motivated paradigms. Freed from these constraints, we are able to begin making finer and finer distinctions among the diversity of marine management regimes found within Vanuatu today. Research should focus on answering questions that are relevant to island communities like what regimes produce successful outcomes, what social contexts enable different regimes to be selected, and how national consensus on marine management can be reached in such a sensitive and multi-level political context.

Figure 40 Reconsidering the critical variables identified in this Chapter in terms of the social-ecological analytical framework developed for MPA investigations (see Fig. 10)
CHAPTER 8 - ECOLOGICAL OUTCOMES & MPA RULES

8.1 Introduction

Marine reserves are among the most widely used tools for the management and conservation of coral reef fisheries and ecosystems (Wood et al. 2008). There is a strong consensus in the literature that reserves permanently closed to harvest provide biological and ecosystem benefits (Lester & Halpern 2008). In many developing countries however, socioeconomic realities, utilitarian mental models, and dependence on resources inhibits the use of permanently closed marine reserves (Crawford et al. 2006; Foale & Manele 2004; McClanahan 1999). In some countries, there has been an expansion of locally-implemented community conserved areas (CCAs) that often accommodate periodic harvest (See Chapter two and (Berkes 2009).

With usage rules devised to suit the local context, periodically harvested closures may be more appealing to subsistence users and consequently restrictions are more likely to have good compliance (Aswani et al. 2007; Cinner et al. 2005a). Many communities in the Pacific Islands design and implement marine closures to meet social, cultural, or conservation needs. For example, fishing closures in the Pacific Islands, commonly termed taboo, may last weeks, years, or indefinitely and endure infrequent and short-term harvests dictated by social, economic, and cultural processes (Johannes 1998b).

Much of the empirical MPA literature focuses on the outcomes of permanent protection (e.g. Russ & Alcala 2004), whereas periodically harvested marine closures receive little attention, despite their widespread implementation. Accordingly, there exists a clear need to better understand the ecological and conservation potential of periodically harvested closures.

8.1.1 Ecological outcomes of periodically harvested closures

Modeling suggests that rotation of marine closures or periodic harvest may still enable increased biomass or abundance of target species (Gerber et al. 2003; Valderrama & Anderson 2007). Empirical evidence from the Pacific also suggests that nonpermanent closures produce ecological benefits. For example, closures harvested under cultural controls in Papua New Guinea have higher biomass of target fishes than adjacent fishing areas (McClanahan et al. 2006). Likewise, significantly more trochus occur in long-lasting periodically harvested closures than in control areas in the Solomon Islands (Foale 1998).

MPAs opened to periodic, temporary, or rotational harvest often experience an immediate postharvest depletion of resources (Ferraris et al. 2005; Russ & Alcala 1998b) and a slow return to preharvest levels (McClanahan et al. 2007). Rotational strategies in a Hawaiian MPA have been ineffective because during rotations fish stocks were harvested to a degree that prevented long-term improvements (Williams et al. 2006). Likewise, harvests of trochus did not improve after several years of periodic restrictions in Indonesia (Ruttan 1998). However, in the preceding two examples the marine closures were open to significant or long-term harvest in an open-access context. The preceding examples do not reflect the taboo systems in place.
throughout much of the Pacific. These taboo closures often allow infrequent, short-term harvest events in a common-property context.

This chapter examines the ecological implications of permanent and periodically harvested MPAs within a single, contiguous biophysical and cultural area in the Republic of Vanuatu. Specifically, the chapter investigates whether periodically harvested closures produce measurable ecological benefits compared with unfished zones and permanently closed reserves within the same biophysical area.

8.2 Methods

Eight community-based marine closures were empirically investigated (four periodically harvested and four permanent) from December 2006-March 2007 (Figure 23) as part of a larger assessment of marine management. Confidentiality agreements with local villages prevent the association of results with specific communities. Study sites were selected for similar resource use, harvest, reserve management, and enforcement practices Table 6. At the time of fieldwork, all closures had been established for at least 4 years, but none for more than 6 years. Two communities had, in addition to marine reserves, well-enforced complete tenure-area bans on the harvest of giant clams (tridacnids). In areas open to fishing, the most frequent and intense harvest activity focused on fishes, although invertebrates were taken opportunistically.

The periodically harvested closures studied had been harvested no more than twice in the preceding 12 months in single-day harvest events. Periodic harvest events generally focused on fishes (which were speared, hooked, or routed into nets), but, depending on village regulations, invertebrates were also collected. Resources harvested from periodic openings were generally used for village subsistence or celebration rather than commercial enterprise. However, not all villagers participated in the day-long harvest associated with the periodic closure opening (average: 15 people; range: 5-30).

Quantitative interviews with 85% of the study-area population were conducted to determine the number of regular fishers in each village and to gauge dependence on marine resources as a proxy for harvest intensity and catch data (not measurable within fieldwork timeframes). To measure dependence, a series of questions was asked regarding marine consumption patterns, harvest frequency, sea skills, and economic benefit (Cinner et al. 2007). Responses were analyzed with principal component analysis to yield a standardized factor score of marine-resource dependence for each community. The most locally important fishes and invertebrate taxa were identified through interviews and focus groups. Of the important taxa, six reef fish families described as vulnerable to fishing in the literature were considered, and five families described as less vulnerable were considered. Vulnerability to fishing is a function of life history, size, growth rate, harvest value, and consumption popularity (Jennings et al. 1999; Russ & Alcala 1998a). Vulnerable families included Labridae, Scaridae, Haemulidae, Lethrinidae, Lutjanidae, and Serranidae (epinephaline). Less-vulnerable families included Acanthuridae, Balistidae, Mullidae, Nemipteridae, and Siganidae. Based on interview responses, four species of locally targeted tridacnid clams and the topshell (Trochus niloticus) were surveyed.
8.2.1 Experimental design

The experimental design included a multiple-reserve, nested-site, control-impact comparison between reserve types and adjacent control fishing areas. Six closures were included in the comparative analysis (three permanently closed and three periodically harvested) and two closures for supplementary analyses. Survey sites were selected by dividing the reef front into ~150-m sections from aerial photographs and randomly selecting six in each village; three inside the reserve boundary and three outside. Control sites were geographically proximate and contiguous to reserve sites. Within each site, four independent 50-m replicate transects were surveyed, two each at the reef crest and 7-m depth Figure 21. Therefore overall analytical design was balanced with 36 replicate transects within each management zone: permanent, periodically harvested, adjacent control permanent, and adjacent control periodically harvested Figure 20.

Figure 41 Locations of permanent reserves and periodic closures for principal analysis and of the two supplementary analysis reserves, one recently established and one opened to a single-day periodic harvest, and control areas.

To understand the direct impacts of periodic harvest and validate methodological efficacy to detect impacts, a periodically harvested closure opened for a one-day fishing event was
surveys were conducted both three days before and three days after the harvest event. To control for baseline prereserve condition, a single recently established permanent reserve (<6 months) and its adjacent fishing area were also separately considered. These supplementary analyses were also balanced with 12 transects within each zone: closed versus open and before versus after.

Figure 42 Balanced, control impact survey design in-built with replicates at the village, site and depth levels

Figure 43 Schematic representation of transects at each site, 2X50m at the crest and 2X50m at 7m depth.

8.2.2 Ecological assessment

Underwater visual census (UVC) techniques were used to assess ecological parameters (English et al. 1997). On each transect, reef fish abundance and size, invertebrate abundance, and substratum composition were assessed. Potential bias between observers was eliminated by having one person observe fishes, a second observe invertebrates, and a third determine substratum composition throughout the research period. Discrete group sampling was used to minimize behavior biases, surveying large fishes (>15 cm) first on a 5-m belt and subsequently small fishes (3-15cm) on a 2-m belt (Greene & Alevizon 1989). To minimize recruitment
effects, only fishes > 3 cm total length (TL) were recorded. The TL of each fish was visually estimated, maintaining accuracy (<4% error at a distance of 3 m) by frequently practicing on known lengths of tubing (1993). Each fish sighted was classified by family and into 5-cm size categories. Length of fishes > 40 cm was recorded to the nearest 1 cm to allow for more precise biomass conversions.

Target giant clams and trochus were surveyed within a 50 x 2 m belt transect, identifying individuals to species. Substratum composition was estimated by classifying substratum under each of 100 randomly marked points on the transect line into 25 growth form-ecological categories (English et al. 1997), and then condensing them into live coral, dead coral, fleshy algae, turf algae, encrusting algae, smooth surface, coral rubble, sand, mud, deep crevice, and other substratum.

Table 5 Substratum under each transect intercept was recorded as one of the following categories and condensed into the bold headings for analysis (English et al. 1997):

<table>
<thead>
<tr>
<th>Dead Coral Composite</th>
<th>Other Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dead Coral</td>
<td>Sponge</td>
</tr>
<tr>
<td>Dead Coral w/ algae</td>
<td>Zoanthids</td>
</tr>
<tr>
<td>Live Coral Composite</td>
<td></td>
</tr>
<tr>
<td>Acropora branching</td>
<td>Other</td>
</tr>
<tr>
<td>Acropora encrusting</td>
<td>Algal composite</td>
</tr>
<tr>
<td>Acropora submassive</td>
<td>Algal assemblage</td>
</tr>
<tr>
<td>Acropora digitate</td>
<td>Halimeda</td>
</tr>
<tr>
<td>Acropora tabulate</td>
<td>Macroalgae</td>
</tr>
<tr>
<td>Non-Acropora branching</td>
<td>Turf algae</td>
</tr>
<tr>
<td>Non-Acropora encrusting</td>
<td>Rock</td>
</tr>
<tr>
<td>Non-Acropora foliose</td>
<td>Coralline algae</td>
</tr>
<tr>
<td>Non-Acropora massive</td>
<td></td>
</tr>
<tr>
<td>Non-Acropora submassive</td>
<td>Silt/mud</td>
</tr>
<tr>
<td>Non-Acropora mushroom</td>
<td>Rubble</td>
</tr>
<tr>
<td>Heliopora</td>
<td>Sand</td>
</tr>
<tr>
<td>Millepora</td>
<td></td>
</tr>
<tr>
<td>Tubipora</td>
<td>Water</td>
</tr>
<tr>
<td>Soft coral</td>
<td></td>
</tr>
</tbody>
</table>

Statistical analyses

Fish biomass was calculated with family-level length-weight coefficients assayed from Pacific Island reefs (Kulbicki et al. 2005). Post hoc analyses revealed that fish data pooled at the family level did not yield sufficient power to detect significant difference among management regimes. However, fish data pooled into vulnerability groups yielded high power (1-β err prob. > 0.95). Principal component analysis reduced substratum composition data into a single factor score that represented over 50% of variability for each transect. Due to low correlation between normalized ecological parameters and a complex, nested, and mixed-factor experimental design, a series of univariate analyses of variance was used with a Bonferroni correction for type I error. Special, main, and interaction effects of depth, village, and site were built into the nested ANOVA model. A Dunnett T3 multiple-comparison post hoc analysis for unequal variances revealed the significance of differences between reserves and adjacent fishing areas; permanent
and periodically harvested MPAs; and fishing areas adjacent to permanent and periodically harvested MPAs.

The root-mean standardized effect size (D) with a Hedges bias correction was calculated. Effect size measures the strength and direction of the relationship between two variables, complementing measures of statistical significance (Cohen 1988). Effect sizes > 0.8, between 0.5 and 0.8 and between 0.2 and 0.5 are respectively indicative of substantial, moderate, and minimal relationships (Vaske 2002). Standardized confidence intervals were graphed to assess the practical differences between management regimes (Harlow et al. 1997). Principal-component analysis of Likert responses to resource-dependence questions gave a single, standardized factor score that represented 79% of the data’s variability (Table 6). A Kruskal-Wallis test was used to compare village-level socioeconomic characteristics of periodically harvested closure and permanent reserve communities.

8.3 Results

No significant differences were found between the group of communities with permanent reserves and those with periodically harvested closures in potentially confounding factors. These factors included reserve size ($\chi^2=0.0, p=1.0$), percentage of tenured reefs closed ($\chi^2=0.333, p=0.564$), period of closure regime ($\chi^2=1.175, p=0.278$), number of rule violations in the preceding year ($\chi^2=0.467, p=0.495$), and number of dedicated fishers ($\chi^2=0.333, p=0.564$). Communities with periodically harvested closures had a significantly higher mean dependence on marine resources ($\chi^2=5.333, p=0.021$) (Table 6).

Periodically harvested closures had significantly higher abundance and biomass of fishes than openly fished areas (Table 8 and Figure 44). Fishes with vulnerable life histories had higher abundance and biomass in periodically harvested closures than in adjacent controls (Table 4), whereas no significant differences in fishes with less-vulnerable life histories were detected. Abundance and biomass of fishes did not differ significantly between permanent reserves and control fishing areas (Table 8). Abundance and biomass of fishes also did not differ significantly between permanent reserves and periodically harvested closures (Table 8 and Figure 44). Likewise, target fishes abundance and biomass did not differ significantly between fishing areas adjacent to permanent reserves and those adjacent to periodically harvested closures.

Target giant clams were significantly and substantially more abundant in periodically harvested closures than in adjacent fishing areas (Table 7 and Table 8) but there was no significant difference in giant clam abundance between permanent reserves and their adjacent fishing areas or between permanent and periodically harvested reserves. However, there were significantly more giant clams in open areas adjacent to permanent reserves than in areas adjacent to periodically harvested closures (Table 7 and Table 8). The abundance of trochus among management regimes did not differ significantly (Table 8 and Figure 45). Substratum factor scores did not differ significantly among management regimes (Table 8).

Despite a lower sample size, the supplementary analysis of the closure opened for harvest provided sufficient power (1-β err prob. > 0.79) to detect impacts from fishing. A significantly higher abundance of trochus and a nonsignificantly higher biomass of target fishes and
abundance of giant clams was found in the closure before harvest Table 8, Figure 44 and Figure 45. The recently established reserve had significantly higher abundance and biomass of less vulnerable fishes than the adjacent fishing area Table 8 and Figure 45. Biomass of vulnerable fishes between the newly established reserve and control fishing area did not differ significantly. Giant clam abundance between the reserve and adjacent fishing area differed significantly Table 8 and Figure 45. Substratum was composed of significantly less live coral in the newly established reserve than the adjacent fishing area.

Table 6 Size, compliance, and duration of village marine protected areas. * a proxy measure of harvest intensity, standardized factor score based on marine consumption patterns, harvest frequency, sea skills, and marine economic benefit

<table>
<thead>
<tr>
<th>Closure type</th>
<th>Reserve size (km²)</th>
<th>Village reefs closed (%)</th>
<th>Years since establishment</th>
<th>Form of enforcement</th>
<th>Tenure-wide restrictions</th>
<th>No. of rule violations in preceding year</th>
<th>No. of regular fishers</th>
<th>Mean resource dependence*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>permanent</td>
<td>0.21</td>
<td>34.2</td>
<td>customary</td>
<td>limited giant clams</td>
<td>0</td>
<td>20</td>
<td>-0.70</td>
</tr>
<tr>
<td>2</td>
<td>permanent</td>
<td>0.1</td>
<td>25.4</td>
<td>customary</td>
<td>no giant clams, no trochus</td>
<td>0</td>
<td>13</td>
<td>-1.29</td>
</tr>
<tr>
<td>3</td>
<td>permanent</td>
<td>0.07</td>
<td>48</td>
<td>customary</td>
<td>limited giant clams</td>
<td>1</td>
<td>23</td>
<td>-0.59</td>
</tr>
<tr>
<td>4</td>
<td>periodic</td>
<td>0.13</td>
<td>30</td>
<td>customary</td>
<td>none</td>
<td>0</td>
<td>11</td>
<td>1.37</td>
</tr>
<tr>
<td>5</td>
<td>periodic</td>
<td>0.08</td>
<td>41.2</td>
<td>customary</td>
<td>no giant clams</td>
<td>0</td>
<td>9</td>
<td>1.06</td>
</tr>
<tr>
<td>6</td>
<td>periodic</td>
<td>0.21</td>
<td>35</td>
<td>customary</td>
<td>no trochus</td>
<td>1</td>
<td>18</td>
<td>1.58</td>
</tr>
</tbody>
</table>

Recently established | Permanent | Periodic | Pre/post harvest | Periodic

1 2 3 4 5 6

1.4 3.3 3.1 3.8 4.5 3.0 0.4 5
Table 7 Fish, invertebrate, and substratum parameter estimates (mean, SE) in permanent reserves, periodically harvest closures and control areas in Vanuatu. *Principal component analysis score reducing 25 growth form-ecological categorical data

<table>
<thead>
<tr>
<th></th>
<th>Control permanent</th>
<th>Permanent</th>
<th>Periodic</th>
<th>Control periodic</th>
<th>Recently established permanent reserve</th>
<th>Control recent</th>
<th>Pre-harvest periodic</th>
<th>Post-harvest periodic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vulnerable fish abundance (no./ha)</td>
<td>2609(210)</td>
<td>3381(294)</td>
<td>3448(375)</td>
<td>2253(179)</td>
<td>2922(326)</td>
<td>3453(705)</td>
<td>2705(641)</td>
<td>3650(478)</td>
</tr>
<tr>
<td>Less vulnerable fish abundance (no./ha)</td>
<td>2468(160)</td>
<td>2281(153)</td>
<td>2153(143)</td>
<td>2110(178)</td>
<td>4195(633)</td>
<td>2172(197)</td>
<td>2125(59)</td>
<td>2495(378)</td>
</tr>
<tr>
<td>Vulnerable fish biomass (kg/ha)</td>
<td>296(63)</td>
<td>508(93)</td>
<td>669(125)</td>
<td>175(30)</td>
<td>677(239)</td>
<td>707(272)</td>
<td>289(96)</td>
<td>191(34)</td>
</tr>
<tr>
<td>Less vulnerable fish biomass (kg/ha)</td>
<td>261(24)</td>
<td>307(31)</td>
<td>381(39)</td>
<td>302(31)</td>
<td>696(166)</td>
<td>358(83)</td>
<td>156(10)</td>
<td>95(12)</td>
</tr>
<tr>
<td>Tridacnid clam abundance (no./ha)</td>
<td>575(87)</td>
<td>428(82)</td>
<td>411(56)</td>
<td>181(37)</td>
<td>158(63)</td>
<td>167(33)</td>
<td>500(122)</td>
<td>75(48)</td>
</tr>
<tr>
<td>Trochus abundance (no./ha)</td>
<td>244(64)</td>
<td>81(18)</td>
<td>114(35)</td>
<td>231(64)</td>
<td>75(58)</td>
<td>100(41)</td>
<td>175(63)</td>
<td>0</td>
</tr>
<tr>
<td>Substratum composition*</td>
<td>0.12(0.15)</td>
<td>0.35(0.11)</td>
<td>-0.21(0.2)</td>
<td>-0.26(0.18)</td>
<td>-0.8(0.18)</td>
<td>0.8(0.16)</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
Table 8 Nested analysis of variance (ANOVA) and Dunnett’s T3 post hoc significance (p) with Bonferroni correction to compare ecological parameters of Vanuatu marine closure regimes. * Significant at the p<0.05 level.

<table>
<thead>
<tr>
<th>Post hoc</th>
<th>Nested ANOVA, (df 32, error 72)</th>
<th>Permanent vs. control</th>
<th>Periodic vs. control</th>
<th>Control (permanent) vs. control (periodic)</th>
<th>Nested ANOVA; (df 6, error 12)</th>
<th>Recently established reserve vs. control</th>
<th>Nested ANOVA; (df 6, error 12)</th>
<th>Pre vs. post harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>p</td>
<td>p</td>
<td>F</td>
<td>p</td>
<td>F</td>
<td>p</td>
<td>F</td>
</tr>
<tr>
<td>Vulnerable fish abundance (no./ha)</td>
<td>4.867</td>
<td>0.2</td>
<td>1</td>
<td>0.03*</td>
<td>0.73</td>
<td>3.72</td>
<td>0.03*</td>
<td>0.59</td>
</tr>
<tr>
<td>Less vulnerable fish abundance (no./ha)</td>
<td>2.46</td>
<td>0.95</td>
<td>0.99</td>
<td>1</td>
<td>0.59</td>
<td>8.65</td>
<td>0.00*</td>
<td>0.58</td>
</tr>
<tr>
<td>Vulnerable fish biomass (kg/ha)</td>
<td>1.08</td>
<td>0.32</td>
<td>0.88</td>
<td>0.00*</td>
<td>0.42</td>
<td>1.65</td>
<td>0.22</td>
<td>0.77</td>
</tr>
<tr>
<td>Less vulnerable fish biomass (kg/ha)</td>
<td>1.98</td>
<td>0.79</td>
<td>0.6</td>
<td>0.53</td>
<td>0.87</td>
<td>14.12</td>
<td>0.00*</td>
<td>8.71</td>
</tr>
<tr>
<td>Tridancid clam abundance (no./ha)</td>
<td>1.56</td>
<td>0.77</td>
<td>1</td>
<td>0.01*</td>
<td>0.00*</td>
<td>7.32</td>
<td>0.00*</td>
<td>7.81</td>
</tr>
<tr>
<td>Trochus abundance (no./ha)</td>
<td>2.35</td>
<td>0.1</td>
<td>0.95</td>
<td>0.51</td>
<td>1</td>
<td>1.74</td>
<td>0.2</td>
<td>49</td>
</tr>
<tr>
<td>Substratum composition</td>
<td>6.71</td>
<td>0.76</td>
<td>0.09</td>
<td>1</td>
<td>0.49</td>
<td>0.39</td>
<td>0.87</td>
<td>NA</td>
</tr>
</tbody>
</table>
Figure 44 Standardized effect size (ES) with Hedges correction plotted with 95% CI in a comparative study of the ecological outcomes of marine closure regimes. Difference in fish abundance and biomass between reserves (periodic and permanent) and adjacent control areas (1-3), between a recently established reserve and a control, and in a reserve pre- and post-harvest. Graphs (a) (b) describe fish abundance, whereas (c) and (d) describe fish biomass.

Figure 45 Standardized effect size (ES) with Hedges correction plotted with 95% CI in a comparative study of the ecological outcomes of marine closure regimes. Difference in (a) tridacnid clam abundance, (b) trochus abundance, and (c) substratum composition between reserves (periodic and permanent) and adjacent control areas (1-3); between a recently established reserve and a control and in a reserve pre- and post-harvest.
Evidence was found to suggest that small, periodically harvested marine closures on Nguna and Pele facilitated an increase in the abundance and biomass of targeted fishes and in taxa vulnerable to fishing. These results corroborate colloquial knowledge that nonpermanent closures may be effective fisheries management tools. Permanent marine reserves in the Asia-Pacific region commonly fail to meet their objectives due to a lack of compliance (McClanahan et al. 2006) or insurmountable social barriers (Cinner 2007; Foale & Manele 2004). Periodically harvested closures may represent a valid alternative to permanent marine closures in the community context because they are practical, locally appropriate, and as these results suggest, an ecologically adequate management solution in comparison with permanent reserves. Periodically harvested closures may ultimately result in high levels of community acceptance, compliance, and reserve success.

Of critical importance to the ecological effectiveness of periodically harvested closures is the human-controlled intensity and frequency of harvest events (Williams et al. 2006). Effective controls of this type require clear and intact systems of local governance, such as those found in parts of the tropical Pacific, where communities regularly manage the frequency, intensity, and scope of harvest activities (Aswani et al. 2007; Johannes 1998b). Through customary practices, the communities studied here regulate harvest intensity and frequency within and outside reserves so that ecological gains from protection are not completely lost with each harvest event. Local colloquial knowledge presumes that well-managed harvest events do not necessarily affect the long-term accumulation of stocks.

For example significantly lower biomass of vulnerable fishes was found in the closure after harvest (98 kg/ha). This decline may reflect an actual harvest impact or, alternatively, changes in fish behavior immediately after harvest (i.e., fishes are restive with divers and observers). Fish behavior, including response to human activity and flight distance, is variable and often taxon specific, and has the potential to influence visual census results (Edgar et al. 2004). Temporary behavioral disruption from the harvest event potentially masks a relatively stable stock. In fact, local knowledge asserts that closures make fish temporarily “quiet” or tame. Although survey results suggest an immediate reduction in biomass within this reserve, the larger comparative data set suggests that periodically harvested reserves have higher target fish abundance and biomass than controls. Infrequent, light, and well-controlled fishing may therefore have minimal long-term impact on the capacity of closures to maintain coral reef fish communities.

As expected, protection from fishing activity was observed to have the greatest impact on taxa targeted by fishers, and on families with vulnerable life histories. Family-specific response to protection is likely due to a complex interaction between life history, fishing intensity, and site conditions (Jennings et al. 1999; Russ & Alcala 1998a). Therefore, it is likely that the effectiveness of periodic harvest regimes is intrinsically tied to the life-
history attributes of target organisms (Myers et al. 2000), making it an inappropriate management strategy for some taxa. The timing of periodic harvest events is also critical, rendering them particularly destructive if they occur during spawning cycles or other vulnerable periods (Sadovy & Domeier 2005).

Results from surveys conducted before and after harvest events indicate targeted *Tridacnid* giant clams and trochus are particularly vulnerable. This is likely because of limited mobility and the effectiveness of Pacific Island invertebrate fishers. Accordingly, trochus abundance in reserves was not found to be significantly different from controls, which indicates annual periodic harvest may not be a suitable or effective strategy for trochus stock maintenance. This corroborates the findings of other studies of periodic harvest on trochus (Foale 1998; Ruttan 1998). As such, the Fisheries Department in Vanuatu currently advises communities to harvest trochus only when densities reach prescribed levels, rather than relying on arbitrary closure time periods. Periodically harvested marine closures may not always be sufficient on their own to achieve effective management of vulnerable invertebrate resources.

In contrast to the results for periodically harvested closures, significant differences in fish abundance and biomass or in giant clam abundance were not detected between permanently closed reserves and adjacent openly fished areas. Some communities regulate giant clams throughout the entire tenure area, potentially explaining the tridacnid survey results. Permanent reserve communities seem to implement these additional controls and regulations on specific organisms. Simultaneous and mutually supportive management rules, such as the invertebrate restrictions observed, may be effectively used in conjunction with periodically harvested and permanent MPAs to meet specific management objectives.

It is not clear why permanent reserves in the study area seemed to have no measurable impacts on fish parameters relative to control areas, whereas periodically harvested closures did. This result was unexpected. Permanent reserves should theoretically perform better than those allowing periodic harvest (Gerber et al. 2003). Other variables besides permanent or periodically harvested reserve status may be affecting ecological outcomes or the ability of our methods to identify reserve effects. Reef substratum is linked to fish population structure and can potentially confound evaluation of marine-reserve impacts (Kulbicki, 2007). However, substratum was not significantly different among management regimes. The short survey timeframe likely minimized the possibility that fish assemblage patterns shifted significantly during data collection.

Guidetti et al (2008) recommend that reserve effectiveness studies should, in addition to ecological parameters, examine local context including enforcement effectiveness and fishing intensity. Although no significant differences were found between permanent and periodically harvested reserves in potentially confounding factors such as reserve size, percent of area protected, period of protection, or enforcement, empirical data were unavailable on harvest intensity. Anecdotal evidence suggests that fishing is not the predominant subsistence or economic activity for most area residents, although
periodically harvested reserve communities did present higher factor scores for the composite marine-resource dependence variable.

It is plausible that differences among communities in fishing intensity drive the lack of differences between permanent reserves and fished control areas (Graham et al. 2005). The possibility that communities with periodically harvested closures fish open areas more intensely than communities with permanent reserves should be further explored. This hypothesis raises questions regarding the function of the reserves studied here: Have they allowed for biomass accumulation or simply protected against biomass loss? In either case, periodically harvested closures appear to provide some benefit to communities seeking tools to prevent the continued decline of marine resources. Lack of available data on fishing intensity and resource dependence continues to be a critical gap in the science of marine reserves in the Pacific Islands (Zeller et al. 2006).

Communities in the Pacific Islands and throughout much of the developing world may make resource management decisions to ensure food and livelihood security rather than for biodiversity conservation (Bell et al. 2009). However periodically harvested closures likely still provide a significant boost to international conservation targets. Community conserved areas may ultimately provide the balance between seemingly conflicting objectives, particularly in areas where marine management strategies are strongly influenced by cultural practices, economic necessity, and social capacity.

It is expected that benefits will continue to accrue on the Nguna and Pele study reefs under both permanent and periodically harvested closure regimes. This is because coral reef fishes have high longevity and variable growth rates (Choat et al. 2006; Williams et al. 2007) and reserve benefits have been shown elsewhere to amass over decades (McClanahan et al. 2007; Russ & Alcala 2004). Thus, an important research goal for the future should be a comparative understanding of how small-scale periodically harvested and permanent reserves function over longer time periods. Furthermore, an empirically based understanding of the sociocultural conditions that enable or limit the types of locally implemented marine reserves is critical in order to promote effective community-based resource management.

8.5 Conclusion

Nearly two decades have passed since Hilborn and Walters (1992) suggested that fisheries management and conservation be optimized by active experimentation with alternative strategies. This investigation was a practical attempt to better understand the outcomes and effectiveness of reserve alternatives that are currently used by hundreds of communities throughout the tropical Pacific. In this region, sociocultural conditions may render permanent reserves locally unacceptable management strategies. Periodically harvested community conserved areas may better suit contemporary cultural context and may provide ecological benefits. Results from this research suggest that in some short-term contexts, controlled periodic harvest within reserves is, for some vulnerable taxa, an ecologically viable or even preferable alternative to permanent protection. At the same time, the theoretical and empirically demonstrated benefits of long-term permanent
protection are recognized and the author does not suggest that successful permanent reserves should be opened to periodic harvests. By examining alternative marine reserve designs, empirical breadth is added to the debate on locally appropriate and socially acceptable conservation practice.

Figure 46 Reconsidering the critical variables identified in this Chapter in terms of the social-ecological analytical framework developed for MPA investigations (see Fig. 10)
CHAPTER 9 - MOTIVATIONS FOR AND PERCEPTIONS OF COMMUNITY-BASED MPAS

9.1 Introduction

Marine protected areas are rapidly expanding throughout the Pacific region, and throughout most of Vanuatu's islands (Govan et al. 2009 and Chapter six of this thesis). Despite the current expansion of Pacific Island marine reserve initiatives, their suitability in the region has been called into question, principally for an assumed incongruence with local ideologies (Ruddle & Hickey 2008, Foale & Manele 2004). To date however, few studies have specifically set out to empirically examine local people's motivations, expectations and ideological support for Pacific Island marine protected areas.

Recent reviews suggest that the motivation for Pacific Island marine management expansion is grounded in food security concerns (Bell et al. 2009) and not in abstract biodiversity conservation concepts (Adams & Dalzell 1994). That Pacific Islanders lacked an historical conservation ethic has been continuously argued (Spriggs 1997, Steadman et al. 2002), though authors examining contemporary contextual evidence counter that Pacific Islanders make management decisions based on a non-utilitarian concern for the environment (Regenvanu 1997, Johannes 2002a). It has also been argued that Pacific Island socioeconomic, food security or ideological contexts potentially limit the expansion of permanent no-take marine reserves (Ruddle & Hickey 2008), (Foale & Manele 2004) and (Cinner et al. 2006). Despite these hypothesized limitations, the Pacific region, and the country of Vanuatu is witnessing a proliferation of permanent and periodically-harvested community-based reserves. While historical and customary practices inform the present understanding of marine management, contemporary reserve motivations, expectations and support may have evolved beyond historical precedents (Dalzell 1998), (Berkes & Turner 2006) and may provide insight into the recent marine reserve phenomenon in the Pacific.

This chapter aims to understand why communities on Nguna and Pele are currently establishing marine protected areas. Specifically, this paper seeks to describe and contrast the expectations, motivations and ideological support behind the establishment of indefinitely closed no-take reserves, and of closures which allow periodic harvest. It also compares reserve benefits as perceived by local communities to outcomes of ecological quantitative surveys. Understanding how local reserve assessments and decisions are made in the context of data-poor (Johannes 1998a) Pacific Islands has important policy ramifications for the region. These research questions are answered utilizing a comparative research design examining three communities with indefinitely-closed reserves and three communities which allow periodic harvest within closures all located in the central islands of the Republic of Vanuatu.
9.2 Materials and Methods

9.2.1 Study sites and local context

This research was carried out within communities of Nguna, Pele and Emao Islands in the Republic of Vanuatu from 2006-2007. Communities on these adjacent islands speak the same language, share a historical trajectory, and undertake similar economic, cultural and social activities. As seen in Chapter two, community-based coral reef marine reserves in Vanuatu are commonly implemented and enforced by customary chiefs and village leaders, and can be less than 0.05km² (Johannes 1998b). Six communities were selected for this study, each with a village marine reserve in place and consistently enforced for 4-6 years. Three study communities had indefinite closures and three allowed periodic, controlled harvest in their closures. Communities that allowed periodic harvest did not harvest reserves more than twice per year, and the duration of harvest events was for no more than a single day.

9.2.2 Socio-cultural assessment

To understand local residents’ motivations for marine reserve establishment and their perceptions on reserve outcomes, convenience sampling techniques were used in each community until 80% of village adults had participated in a quantitative social science survey. Eighty percent represents the minimum ratio of respondents for a survey to be considered a census. The survey included 55 questions asked in the Nakanamanga vernacular language by a trained local researcher. The questions attempted to gauge local resident’s expectations, support, and perceived outcomes of village marine reserves. For most questions, respondents rated their response on a modified Likert-style scale, with 0 being the lowest with 10 being the highest possible response. Qualitative data was collected during these surveys and also via five key informant interviews in each community with leaders intimately involved in the marine reserve establishment process.

9.2.3 Ecological assessment

Ecological results and methodologies from Chapter eight were used to examine the validity of local resource perceptions. That chapter examined the biomass and abundance of reef fish, trochus, giant clams, and live coral substratum inside and outside community permanent and periodic reserves.

9.2.4 Statistical analysis

Quantitative and qualitative social data were grouped by community type, that is, associated with either a permanent (3) or periodically harvested reserve (3). Quantitative results from both reserve types were compared with multiple ANOVAs, building the interaction effect of village into nested models. Ecological data was analyzed by community reserve type, that is, at the level of permanent reserves (3) and closures that allowed periodic harvest (3). Grouping sites in this manner allowed high statistical power for analysis. For comparison, the interaction effects of depth, site and village were built
into nested ANOVA models. Target fish biomass was calculated with family-level length-weight coefficients assayed from Pacific Island reefs (Kulbicki et al. 2005). For quantitative social and ecological data, the standardized effect size (D) with a Hedges bias correction was calculated to examine the strength and direction differences (Cohen 1988). Effect sizes > 0.8 are indicative of substantial relationships (Vaske 2002). Qualitative interview data was transcribed, coded and thematically analyzed (Boyatzis 1998). Themes were categorized into a quantitative matrix for summative analysis.

9.3 Results

9.3.1 Motivations and expectations behind marine reserve establishment:

The most commonly cited motivation for establishing a periodically harvested marine reserve (57% of key informants) was found to be a response to perceived resource declines.

"Some things in the ocean are beginning to be lost now. Like the green snail. My son has never seen or eaten a green snail. When I was small, I could walk on the reef and I would find them. But I haven’t seen any for a long time” - village housewife.

"Today I see that around here, there isn’t coral reef anymore. Its just dead reef, I see some bad coral that is growing, the brown stuff. I think that our sea environment is dying.” - village church leader

This was also the most commonly cited single motivation for establishing a permanent reserves, though uniquely, these respondents noted a dimension of human causality (56% of key informants).

"The main reason we have the reserve is that we are ruining the reef. When women go to the reef, they break the stones and ruin the reef.” - village fisherman

"The problem was that the mamas and papas and youth take shells that are too small. They take too many, too many that they can’t eat so they just waste at the house.” - village youth representative

These results were confirmed by quantitative analysis with residents from communities with periodic reserves perceiving significantly stronger declines in marine resource levels (p=0.000, F=7.44, df=5/168, D=0.3), target fish stocks (p=0.000, F=8.464, df=5/168, D=0.4), and seafood consumption (p=0.002, F=3.928, df=5/168, D=0.2) than those from communities with permanent marine reserves Table 9. Harmful fishing practices were perceived to be significantly higher in communities with permanent reserves than those with periodic reserves (p=0.000, F=5.924, df=5/168, D=0.5).
Table 9 Mean values of perceived trends and current status of reserve related variables. Mean values can range from 0: lowest response, to 10: highest response.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reserve Type</th>
<th>Likert Mean / 10 points</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td>Perceived decline in marine resources</td>
<td>Permanent</td>
<td>3.4</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>Periodic</td>
<td>6.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Perceived decline in target fish stocks</td>
<td>Permanent</td>
<td>3.2</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>Periodic</td>
<td>6.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Perceived decline in seafood consumption</td>
<td>Permanent</td>
<td>3.6</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>Periodic</td>
<td>4.6</td>
<td>2.8</td>
</tr>
<tr>
<td>Perceived level of harmful fishing practices</td>
<td>Permanent</td>
<td>6.7</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Periodic</td>
<td>5.7</td>
<td>2.3</td>
</tr>
<tr>
<td>Perceived reserve efficacy</td>
<td>Permanent</td>
<td>8.7</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>Periodic</td>
<td>7.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Support for current reserve regime</td>
<td>Permanent</td>
<td>9.8</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>Periodic</td>
<td>9.0</td>
<td>1.3</td>
</tr>
</tbody>
</table>

While some respondents from both community types mentioned specific utilitarian reasons for establishing reserves (e.g. current lack of food or target species) as a motivation for establishing marine reserves (39% of all respondents), most informants from both community types highlighted other, non-utilitarian incentives (88% of all respondents) such as stewardship and environmental responsibility:

“Even before there was a marine reserve, I was always sorry for the little animals and the environment. I want my grandkids to see all the things that I like in the sea.” – village fisherwoman

improved tourism opportunity:

“In the marine reserve, the reef is colorful and there are big plate corals, and this is what tourists want, to scuba dive and take pictures of the reef. What we were hoping for is happening. – village council member

strengthened village tenure:

“Well, the resources in the sea are enough for us to harvest, but other villages are ruining our resources without permission. We needed to make an arrangement to stop them from coming and spoiling our environment”. – village fisherwoman

local NGO promotion:

“We got the idea to start a marine reserve at an NGO and government meeting in Port Vila. We thought that every community should have a conservation area. So that’s when we started it. Our community agreed with this idea and we set up a reserve inside the village boundary.” – member of village reserve committee

and village competition and rivalries:
"I saw that we needed to set it up. Village X was the first community to set one up, then village Y then village Z, so we were the last community on the island and I saw that we needed to set one up too." - village chief

9.3.2 Marine reserve effectiveness and outcomes

Residents of both community types perceive that reserves are working, though the mean was significantly higher in communities with permanent reserves ($p=0.002, F=9.99$, $df=5/169, D=0.4$).

"The reserve is working, I have seen a difference with my own eyes. In the reserve the fish are now everywhere and they are tame" - village fisherman (permanent reserve)

"Things that we hadn’t seen for a long time, now they have increased a lot, and we see them again. They come out of the reserve. The reserve is giving it to us.”
– village chief (periodic reserve)

Residents of permanent reserve communities were found to perceive significantly higher live coral cover ($p=0.000, F=11.321, df=5/168, D=0.5$) trochus abundance ($p=0.000, F=8.115, df=5/168, D=0.4$) and target fish biomass ($p=0.017, F=2.837, df=5/168, D=0.4$) than did residents of periodic reserve communities. No significant difference in people’s perceptions regarding the average giant clam abundance ($p=0.085, F=1.973, df=5/168, D=0.1$) was found between community types. Comparing perceived ecological parameters to those measured in Chapter eight, ecological surveys confirmed that permanent reserves had significantly higher percent live coral cover ($p=0.003, F=2.925$, $df=18/36, D=0.9$) and giant clam abundance ($p=0.006, F=2.657, df=18/36, D=0.04$) than did periodic reserves. However, analysis found no significant differences in target fish biomass ($p=0.188, F=10, df=18/36, D=0.4$) or trochus abundance ($p=0.378, F=1.115$, $df=18/36, D=0.2$) inside permanent reserves and periodic reserves Figure 47.
Figure 47 A comparison of the perceived and empirically measured target fish biomass and percent coral cover in permanent and periodically harvested marine reserves. Means +/- SE.

As asked about local assessments of reserve outcomes, 65.6 percent of respondents from permanent reserve communities noted they based their assessments on direct visual observations, compared to only 6 percent of respondents from periodic reserve communities. In contrast, 90.2 percent of residents from periodic reserve communities based their assessments solely on an assumption of reserve efficacy. Only 8.2 percent of residents from permanent reserve communities based their assessments on assumed reserve efficacy.
“We expect that in the conservation area, marine animals will grow and become plenty. When it’s closed we get lots of resources, that’s the way it works.” – conservation committee member

9.3.3 Local support for MPAs

Though residents from both community types showed strong support for the continuation of their current marine closure regime, residents from permanent reserve communities showed significantly more support (p=0.000, F=5.629, df=5/168, D=0.7) than residents from communities with periodic reserves. When asked to explain why her community supported a permanent closure system over one allowing periodic harvest, one local woman responded:

“Well, when the chief opens a taboo [periodic closure] and takes out the custom marker, we go catch fish, lots of fish. There are lots of resources when you first go in, but that is only for a short time. After we keep going in, then the numbers go down. So it is always up and down, up and down. But we want up and up.” - member of village council

9.4 Discussion

9.4.1 Reserve motivations are reactive and conservation focused

The most commonly cited factors motivating communities to establish marine reserves were found to be conservation-oriented and non-utilitarian. Community closures on Nguna and Pele were found to be a direct response to declining resources or to damaging human uses of the marine environment. These findings provide contrast to studies suggesting that ecological drivers may not be directly responsible for community marine use and management (Turner et al. 2007, Carrier 1987) or that they are established independently of an explicit conservation ethic (Ruttan 1998, Foale & Manele 2004). These motivating concerns may be well-founded, particularly as the fisheries crisis has been well described around the world (Pauly et al. 2005). While some evidence was found for utilitarian closure motivations, these were less commonly cited by local residents.

Importantly, the recently marine protected area phenomenon in Vanuatu appears to be a distinct departure from the assumed pre-contact system of temporary and utilitarian-focused marine taboos (Caillaud et al. 2004). This shift is likely due to changing ecological and social contexts, and local perceptions about complex social-ecological systems. However, while many of these novel conservation closures have not been harvested for decades, communities may yet decide to reopen them at some point in the future should local perceptions of the social-ecological system change.

Different closure types on Nguna and Pele were established following slightly different motivating factors. Human impacts on marine resources were commonly mentioned as a motivation for establishing an indefinite closure. This motivation may demonstrate an
elevated sense of human agency; increasing the likelihood that management measures will be reactive and potentially stricter. In contrast, communities which are responding to resource declines may not acknowledge human agency. If an acknowledgment of human agency is found to be a key factor in a community’s decision to implement a permanent or non-permanent reserve, the finding would provide a clear strategic educational priority for governments and supporting organizations. The relationships between local perceptions and reserve establishment should be further explored.

Some qualitative evidence was found to support the widely-held view that conservation-focused NGOs have aided the push towards Pacific Island protected areas (Turnbull 2004, Cox & Elmqvist 1997, Hviding 2003b). It should be noted however that none of the major international conservation NGOs presently work in Vanuatu. Community marine management advice tends to originate from national government departments (Johannes 1998b), despite limited capacity (Rose 2008 and Chapter two of this thesis). Even with an absence of conservation NGOs and strong government initiative, Pacific Island communities seem to possess a ‘double groundedness’ (2003a) in terms of their knowledge about marine management activities in the region; they are directly influenced by issues and actors operating on supra-local scales. Colloquial awareness about regional protected area priorities and initiatives plays a role in the contemporary renaissance of community-based marine reserves. To avoid mismanagement in a regionalized context, coordinated efforts should be made to provide communities with accurate, empirically validated information about relevant marine reserve regimes on which to base local marine management decisions (Crosby et al. 2002).

9.4.2 Are MPAs working? Data-less assessments of reserve outcomes

Island residents perceive both closure types to be ecologically effective. However, conventional fisheries management theory suggests that reserves are most effective if they are “fully protected” or indefinitely closed (Roberts 2000). In fact, our empirical evidence suggests that local residents perceive indefinitely closed reserves to be significantly more effective than periodically harvested closures for enhancing target fish biomass, trochus abundance and live coral cover. Contrasting and validating these perceptions with ecological surveys was conducted with mixed results. Higher perceived coral cover inside permanent reserves was validated by underwater surveys. Neither local perceptions nor underwater surveys identified significant differences in the abundance of giant clams inside each MPA type. However, there was some incongruence between perceptions and empirical results for fish biomass and trochus abundance. In each of these cases, local people felt no-take reserves performed better while underwater surveys found periodically harvested areas to have higher resource stocks.

These results may be potentially explained by differences in resource mobility; fish and trochus have complex patterns of diurnal and seasonal mobility, whereas sedentary clams and coral remain site based and more continuously observable. It may be harder to accurately estimate the abundance of mobile resources than sedentary ones. Resource perceptions generally depend on observed trends and past states, without empirical records, the opportunity exists for misperceptions. Such a misperception has been well
documented in the case of the shifting baseline syndrome (Knowlton & Jackson 2008). Inhibiting the validation of colloquial marine resource perceptions is the lack of fine-scale time-series ecological data from Vanuatu and the Pacific Islands more generally (Wood et al. 2008, Clua et al. 2005).

Recognizing that marine management decisions in the Pacific are commonly made in the absence of empirical ecological or fisheries data (Johannes 1998a), the accuracy and validity of local perceptions may strongly influence the types of regimes implemented and by extension the outcomes of management. Recent studies on English Channel fishers found that fishermen there have high capacity to accurately detect changes in fish catches over time (Rochet et al. 2008). In contrast to the UK case, fishing is not typically a full-time commercial activity among Pacific Island residents (Turner et al. 2007), but represents one activity within an area of high occupational diversity (Chand 2005). Would non-fishing residents of Pacific-island communities hold equivalent experiential knowledge as professional fishers in a developed country? Dulvy and Polunin (2004) found that the capacity of Fijian fishers to detect declines in important species was relatively low, suggesting that decisions made on perceptions may not be reliable. However, even if perceptions are found to be incongruent with a measurable ecological reality (e.g. Gilchrist et al. 2005), there is consensus that they have a strong influence on environmental decision-making (Weber et al. 2004) and will undoubtedly dictate the future of MPAs in Vanuatu and other Pacific Islands.

Despite the lack of scientific validation on the effectiveness of these small-scale Pacific Island reserves, the fact remains that hundreds of community reserves have been in place and locally supported for decades (Johannes 1998b), and the current trend of expansion continues. Hviding (2006) points out that Pacific Islanders often maintain an “empirical attitude” towards resource management and will employ and adapt strategies based on positive experience. This anecdotal evidence strongly suggests that communities are deriving important ecological or socio-economic benefits from closures. Periodic reserves, while arguably less ecologically effective may present communities with benefits in situations where socio-economic factors prohibit the establishment of a permanent reserve (Cinner et al. 2006). Few empirical ecological studies have examined the effectiveness of non-permanent Pacific Island reserves (Williams et al. 2006, McClanahan et al. 2006, and Chapter eight of this thesis) and this area of research should be expanded.

Whether or not MPAs performance is coinciding with local expectations, strong national and regional resource management policies remain important for filling the gaps and meeting marine resource use objectives (Pomeroy & Berkes 1997). Pacific Island governments enable the effectiveness of small-scale community reserves by facilitating large-scale reserve connectivity, regulating the trade and export of exploited species, arbitrating disputes over marine resource use, prioritizing education and extension activities, coordinating scientific research, and networking communities and other stakeholders. Well-planned government policy may assist communities overcome potential management weaknesses inherent in small community-based systems.
Results from Nguna and Pele demonstrate that marine reserves of both types enjoy very strong local support. This finding is heartening as global experience finds communities willing to participate in protected area regimes only if the perceived benefits outweigh the costs (Gibson et al. 2007). An unbalanced cost-benefit equation may partly explain why the relationship between indigenous peoples and protected areas has been historically antagonistic (Adams & Hutton 2007, Berkes 2007b). Marine reserves in the Pacific Islands, as exemplified by those in Vanuatu, may therefore represent a model community-protected area relationship. A factor contributing to high levels of community support is the locally controlled nature of resource management in the country. With local tenure enshrined in Vanuatu’s constitution (Johannes 1998b), and strongly enforced by communities themselves, marine management regimes are rarely controlled or directly managed by an external party. The region has witnessed a major paradigm shift away from the large, nationally managed protected area regimes recommended by the IUCN in the 1980’s (Dahl 1987) and centralized co-management schemes suggested in the early part of the millennium (Crosby et al. 2002). Rather, enabled by new and adapted environmental legislation in some Pacific Island countries (Techera 2005), there is a trend towards the decentralization, legitimation and support of village-level marine closures, restrictions and governance (Muehlig-Hofmann 2007).

This Nguna-Pele case study indicates that some communities display a strong interest in marine conservation and management, actively seeking guidance and advice from colloquial and scientific sources as they deal with the threats impacting their environment. Strong local support for marine protected areas, both indefinitely closed and periodically harvested, is an indication that, at least in Vanuatu, these community-driven initiatives do not represent foreign ideologies forced upon an unwilling people (Ruddle & Hickey 2008, Gelcich et al. 2008). Rather, as in the Solomon Islands, many ni-Vanuatu communities have accepted the arrival of novel resource management ideas with “xenophilia”, locally adapting and hybridizing them to become their own (Hviding 2006). In Vanuatu, community marine protected area motivations often stem from hybridized Western and indigenous ideologies. Official marine management policy should likewise accept and enable this contemporary hybridization.

9.5 Conclusion: the future of Pacific Island marine reserves

Locally-perceived as the most effective type of closure regime, permanent or indefinite reserves established by communities will likely continue to spread throughout the Pacific Islands. Ultimately however, the future expansion of community-based marine reserves will depend on a continuous and data-less cost-benefit analysis performed by communities. In a region living in a globalized information age, community decision-making may take into account advice from governments, NGOs and scientists, and temper that advice with experiential knowledge, local perceptions and official policy. This process resembles much of Pacific Island history, where its cultures and practices are continually evolving and often involve a self-determined symbiosis (Lindstrom 2008), integration (Spriggs 1997) or hybridization (Cinner & Aswani 2007) between internal and
external ways of knowing. The diversity of the region presents many opportunities for resource management collaboration and improvement (Hviding 2006), and for finding an ideological middle ground in the community conserved area debate (Berkes 2008) and (Jones 2001). The current community-led expansion of diverse marine reserve expressions in the Pacific Islands may represent a novel trend away from the command and control conservation regimes of the past (Holling & Meffe 1996), and towards an adaptive and collaborative approach to marine resource management (Folke et al. 2005).

Figure 48 Reconsidering the critical variables identified in this Chapter in terms of the social-ecological analytical framework developed for MPA investigations (see Fig. 10)
CHAPTER 10 - ENABLING CONDITIONS FOR MPA RULES

10.1 Introduction

Global marine biodiversity and fishery resources are rapidly declining (Jackson 2008; Worm et al. 2006). Marine protected areas (MPAs), which limit or prohibit extractive activities such as fishing, are increasingly being implemented to help control human impacts and sustain the resilience of marine seascapes (Guarderas et al. 2008; Mora et al. 2006; Wood et al. 2008). But in some regions, up to 90% of MPAs fail to meet their management objectives (Kelleher et al. 1995). Failed MPAs can displace usage rights, increase conflicts over marine resources, and marginalize some stakeholder groups (e.g. fishers) in favor of others (e.g. tourism operators), sometimes ending up as ‘paper parks’ with poor compliance (Agardy et al. 2003; Mascia & Claus 2009).

Although there are substantial gaps in the marine science pertinent to MPAs (Sale et al. 2005), many failures have occurred because local human dynamics and institutional constraints were poorly understood or ignored during MPA planning, implementation and management (Christie et al. 2009; Mascia 2003). Sociocultural conditions profoundly influence how people use resources (Cinner et al. 2009) and how or whether they cooperate to manage them (Ostrom 1990). Increasingly, MPAs are being viewed as embedded within linked social-ecological systems and attempts are being made to integrate marine ecology with diverse social science disciplines such as anthropology and commons policy studies (Hughes et al. 2005). For example, interdisciplinary studies across Asia, East Africa, the Pacific, and the Caribbean have consistently found that MPA outcomes are influenced by broader demographic, economic, and institutional contexts, as well as by aspects of MPA design such as size and location (Christie et al. 2009; McClanahan et al. 2006; Pollnac et al. 2001). A key lesson from these studies is that there is no one-size-fits-all MPA strategy. Successful outcomes result, at least in part, from interactions among ecological processes, users, governance institutions, and the sociocultural contexts in which they operate.

Selecting MPA rules is a linked social-ecological issue for managers and conservation planners because different operational rules likely lead to different social and ecological outcomes. As demonstrated in Chapter eight, and in other published studies that have directly compared no-take and periodically harvested MPAs using standard ecological indicators and methods, both systems can show differences in fish biomass when compared to control fished areas (McClanahan et al. 2006). However, periodic harvests have the potential to stunt key ecosystem functions that have been observed over decadal scales in long-enduring no-take marine reserves (McClanahan et al. 2007; Russ & Alcala 2004). Thus there are undoubtedly critical longer-term ecological trade-offs between MPA rule types that policy makers should consider (Lester & Halpern 2008). Additionally, there are social trade-offs with different MPA types, particularly with rules that fully exclude local users (West & Brockington 2006). Periodically harvested MPAs have been shown to provide communities with direct benefits for culturally important events (e.g. wedding feasts) and consequently garner high levels of compliance (Cinner et
Specific operational rules can have very different impacts on stakeholders depending on the sociocultural context in which they operate (Cinner 2007; Foale & Manele 2004).

A critical unanswered question constrains the implementation of successful marine management: do certain sociocultural conditions facilitate the selection of specific types of MPAs (i.e. their operational rules)? As the focal study to answer this question, sociocultural conditions that may enable communities on Nguna and Pele islands to select strict no-take reserve rules or alternative regimes were investigated. Nguna and Pele provide an interesting case for comparative investigation because, as discussed in Chapter two, the governance structure is highly decentralized, and communities are empowered to autonomously develop the rules that they find most appropriate.

10.2 Materials and methods

Critical variables highlighted by other commons case studies were compared and contrasted with contextual social-ecological knowledge about reserve rule selection in Vanuatu (Ostrom 2007). As described in Chapter four, contextual social-ecological knowledge on Nguna and Pele was generated from a series of participatory workshops. Thus variables from theory and contextual local knowledge were investigated Table 6. To investigate the necessary preconditions for selecting no-take marine reserve rules, variables were empirically compared in three Nguna-Pele communities with no-take marine reserves and three with periodically harvested closures. Communities were purposively selected for structured empirical comparison based on their sociocultural similarities (e.g. governance systems, cultural practices, and economic contexts). Structural similarities among communities enabled us to control the variability of several variables identified in the literature, and eliminate them from empirical analysis Table 8. Case study research may be subject to multiple confounding factors, particularly if it compares sites that are socio-economically distinct (eg. Cinner et al. 2007).

Table 10 Variables evaluated in the case study, originating from the wider marine protected area and marine management literature as well as from local expert knowledge. All variables were investigated. Variables in BOLD were used in the fsQCA analysis. Variables in ITALICS were removed from analysis due to minimal variation among cases. Variables with † were quantitatively evaluated, but removed from subsequent analysis due to minimal variation among cases (Cohen’s D<0.2). Codes in parentheses relate to the variables identified in Ostrom (2007).

<table>
<thead>
<tr>
<th>Governance System</th>
<th>Resource Units</th>
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<tbody>
<tr>
<td>Government organizations</td>
<td>Target species mobility</td>
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<tr>
<td>Non-government organizations</td>
<td>Species replacement rate</td>
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<tr>
<td>Sea-tenure/property system</td>
<td>Reef ecological interactions</td>
</tr>
<tr>
<td>Governance rules</td>
<td>Economic value of the resource †</td>
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<td>Species stock size (RU5)</td>
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<td>laws and regulations</td>
<td>Spatial and temporal distribution</td>
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</tbody>
</table>
Data were collected between June 2006 and January 2007. Most variables were measured via a census-type survey instrument administered in the local dialect to >80% of adult residents in the study communities. Some survey questions utilized a modified anchored Likert scale (Pollnac & Pomeroy 2005) to gauge the strength and direction of perceptions about local conditions, while other questions were left open-ended. Key informant interviews and focus groups provided information on demographic variables (estimates of compliance, target species and primary gears).

The number of variables used in the analysis was reduced by constructing composite indices to approximate complex latent indicators (Agrawal 2003). Indices were averages of between 2 and 7 variables, each passing Cronbach’s alpha test of reliability (see Sutton 2007). Individual-level survey data was averaged at the community level. A finite population correction factor for high proportional sampling was applied to estimates of variance (Elzinga 2001). Cohen’s Effect Size (D) was calculated as a measure of the strength of differences between no-take marine reserve and periodic harvest community conditions (Cohen 1988). Conditions which showed no variation (minimal relationships D<0.2) between regimes were eliminated from subsequent analyses.

Fuzzy set qualitative comparative analysis (fsQCA) was used to make inferences about the conditions necessary or sufficient to select particular marine closure operational rules (Ragin 2000). FsQCA accommodates real-world colinearity among predictor variables, it does not require large-N data sets, and it calibrates variables with expert contextual knowledge (see Ragin 2008). Calibration entails identifying variable values that constitute full membership, full non-membership, and crossover points. This process
contrasts with traditional crisp set analysis, which requires that each case be force fit into one of two diametrically opposed categories (membership versus non-membership). It allows for the possibility that variable thresholds exist which influence case outcomes: for example, the hypothesis that increasing population density may disable customary management regimes (Cinner et al. 2007).

Each of the 24 quantitative indicators was calibrated by defining the qualitative anchor points identified above Table 9. Qualitative anchor points enable investigators to distinguish between practically relevant and irrelevant variation within survey responses (Rihoux & Ragin 2009). Some of the data used in the analysis was pre-calibrated at the data collection stage through the use of modified anchored Likert scales with questions like “scale your perception of [condition X] from 0-10, with 5 being a cross-over point.” Conditional variables were calibrated for fsQCA based on the research team’s substantive, local, experiential and contextual knowledge.

The computer software fsQCA (v2.0) was used to generate a truth table, demonstrating the set membership of each case based on the calibration process described above. Because fsQCA may be confounded by limited diversity, conditions showing no variability across cases were eliminated from further analysis (Ragin 2008). Conditions showing no variation included conservation ethic, custom strength, threat trends, declining respect, tourism benefit, cooperation, food availability and wealth. Also, conditions which presented comparative effect sizes of less than 0.2 were eliminated from further analysis Table 8. Conditions showing minimal effect sizes included income, responsibility, wealth, percentage of protected tenure, gear density, seafood availability, sea tenure area and food availability.

Set theoretic analysis allows for the reality that a given outcome may result from several divergent combinations of conditions. Each combination represents an alternative path to reach the same outcome. At times the conditions within each combination are sufficient, but not individually necessary to achieve a given outcome. In some cases, particular combinations always result in a given outcome. These combinations of specific conditions are therefore necessary to achieve a given outcome. An important first step in fuzzy set qualitative analysis is analyzing the necessary conditions, and removing them from subsequent analysis. These will meet the condition of consistency above 0.75 and coverage above 0.5. According to Ragin (2006) “Consistency gauges the degree to which cases sharing a given combination of conditions agree in the outcome.” Consistency is analogous to significance, and signals whether an empirical connection merits close attention. If the fsQCA results are not consistent, the researcher’s hypothesis is not supported. Ragin (2006) defines coverage as the “degree to which a causal combination ‘accounts for’ instances of an outcome.” When there are several paths to the same outcome, coverage may be small. Coverage is analogous to effect size, indicating the strength of relationships. Therefore, using the remaining indicators, the software fsQCA (v2.0) was used to examine the necessary and sufficient conditions for no-take and periodically harvested reserves Table 15, Table 16, Table 17 and Table 18.
10.3 Results

Communities which selected no-take reserves rules were found to have substantially higher (i.e. Cohen’s D effect sizes >0.8) ecological resource knowledge, governance efficacy, population sizes, conservation ethic, enforcement capacity and strength of customary identity than communities which selected periodic harvest rules.

A fuzzy set qualitative comparative analysis (fsQCA) grouped sociocultural conditions into two distinct categories: 1) a set of ‘enabling’ conditions which were necessary to select a specific rule; and 2) a set of influential conditions which increased the likelihood a specific rule being selected. The enabling conditions for communities to collectively choose no-take marine reserve rules were: the presence of effective local governance, a minimum population size (mean 56 adults), and a minimum proportion of residents willing to personally enforce management rules (mean 31%) Table 17. Consistency and coverage for each of the enabling conditions for no-take reserves were high (>0.8 and >0.57 respectively). Without the presence of one or all of these enabling conditions, no-take reserve rules will not likely be selected by a community. In a separate fsQCA analysis, no enabling conditions were identified for the selection of periodic harvest rules.

Subsequent fsQCA analysis showed that in addition to the enabling conditions, communities may be more likely to establish no-take marine reserve rules in the presence of other influential conditions, namely the simultaneous presence of a high number of community organizations and a high mean age of residents Table 18. Consistency and coverage for this solution were only considered moderate (0.65 and 0.49 respectively). In contrast, periodic harvest rules are more likely to be selected when communities present with the following influential conditions: a low level ecological knowledge about target resources and have a relatively low proportion of local residents willing to personally enforce management rules. Consistency and coverage for this combination of variables were adequate (0.82 and 0.57 respectively).
Table 11 Explicitly considering the similarities among study sites on Nguna and Pele islands.

<table>
<thead>
<tr>
<th>MPA Type</th>
<th>1 Permanent</th>
<th>2 Permanent</th>
<th>3 Permanent</th>
<th>4 Periodic</th>
<th>5 Periodic</th>
<th>6 Periodic</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPA harvest frequency/duration</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>annually, 12 hours</td>
<td>annually, 1 day</td>
<td>annually, 2-4 days</td>
</tr>
<tr>
<td>Closure duration (at time of study) (years)</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Marine property rights</td>
<td>customary marine tenure</td>
<td>customary marine tenure</td>
<td>customary marine tenure</td>
<td>customary marine tenure</td>
<td>customary marine tenure</td>
<td>customary marine tenure</td>
</tr>
<tr>
<td>MPA size (ha)</td>
<td>0.21</td>
<td>0.07</td>
<td>0.23</td>
<td>0.08</td>
<td>0.21</td>
<td>0.13</td>
</tr>
<tr>
<td>Closure management</td>
<td>customary</td>
<td>customary</td>
<td>customary</td>
<td>customary</td>
<td>customary</td>
<td>customary</td>
</tr>
<tr>
<td>Main marine habitat used</td>
<td>coral reef</td>
<td>coral reef</td>
<td>coral reef</td>
<td>coral reef</td>
<td>coral reef</td>
<td>coral reef</td>
</tr>
<tr>
<td>Principle marine targets</td>
<td>fish, invertebrates</td>
<td>fish, invertebrates</td>
<td>fish, invertebrates</td>
<td>fish, invertebrates</td>
<td>fish, invertebrates</td>
<td>fish, invertebrates</td>
</tr>
<tr>
<td>Stock status</td>
<td>overfished, declining</td>
<td>overfished, declining</td>
<td>overfished, declining</td>
<td>overfished, declining</td>
<td>overfished, declining</td>
<td>overfished, declining</td>
</tr>
<tr>
<td>Language</td>
<td>Nakanamanga</td>
<td>Nakanamanga</td>
<td>Nakanamanga</td>
<td>Nakanamanga</td>
<td>Nakanamanga</td>
<td>Nakanamanga</td>
</tr>
<tr>
<td>Majority religion</td>
<td>Presbyterian</td>
<td>Presbyterian</td>
<td>Presbyterian</td>
<td>Presbyterian</td>
<td>Presbyterian</td>
<td>Presbyterian</td>
</tr>
<tr>
<td>Population size</td>
<td>small</td>
<td>small</td>
<td>small</td>
<td>small</td>
<td>small</td>
<td>small</td>
</tr>
<tr>
<td>Demographic trends</td>
<td>slightly increasing</td>
<td>slightly increasing</td>
<td>slightly increasing</td>
<td>slightly increasing</td>
<td>slightly increasing</td>
<td>slightly increasing</td>
</tr>
<tr>
<td>Primary subsistence occupation</td>
<td>agriculture</td>
<td>agriculture</td>
<td>agriculture</td>
<td>agriculture</td>
<td>agriculture</td>
<td>agriculture</td>
</tr>
<tr>
<td>Collective choice rules</td>
<td>chief &amp; representative council</td>
<td>chief &amp; representative council</td>
<td>chief &amp; representative council</td>
<td>chief &amp; representative council</td>
<td>chief &amp; representative council</td>
<td>chief &amp; representative council</td>
</tr>
<tr>
<td>Income generating activities</td>
<td>capital city market, village stores, tourism, family remittance, sea transport</td>
<td>capital city market, village stores, tourism, family remittance, sea transport</td>
<td>capital city market, village stores, tourism, family remittance, sea transport</td>
<td>capital city market, village stores, tourism, family remittance, sea transport</td>
<td>capital city market, village stores, tourism, family remittance, sea transport</td>
<td>capital city market, village stores, tourism, family remittance, sea transport</td>
</tr>
<tr>
<td>Location</td>
<td>Central Yasua, South West Pacific</td>
<td>Central Yasua, South West Pacific</td>
<td>Central Yasua, South West Pacific</td>
<td>Central Yasua, South West Pacific</td>
<td>Central Yasua, South West Pacific</td>
<td>Central Yasua, South West Pacific</td>
</tr>
<tr>
<td>Distance to the capital city, Peri Villa</td>
<td>15 minute walk, 30 minute ferry, 2 hour track</td>
<td>15 minute walk, 30 minute ferry, 2 hour track</td>
<td>15 minute walk, 30 minute ferry, 2 hour track</td>
<td>15 minute walk, 30 minute ferry, 2 hour track</td>
<td>15 minute walk, 30 minute ferry, 2 hour track</td>
<td>15 minute walk, 30 minute ferry, 2 hour track</td>
</tr>
<tr>
<td>Migration</td>
<td>minimal and short-term outmigration to capital city</td>
<td>minimal and short-term outmigration to capital city</td>
<td>minimal and short-term outmigration to capital city</td>
<td>minimal and short-term outmigration to capital city</td>
<td>minimal and short-term outmigration to capital city</td>
<td>minimal and short-term outmigration to capital city</td>
</tr>
<tr>
<td>History of marine use</td>
<td>artisanal, limited beche-de-mer/nuts harvesting</td>
<td>artisanal, limited beche-de-mer/nuts harvesting</td>
<td>artisanal, limited beche-de-mer/nuts harvesting</td>
<td>artisanal only</td>
<td>artisanal, limited beche-de-mer/nuts harvesting</td>
<td>artisanal, limited beche-de-mer/nuts harvesting</td>
</tr>
<tr>
<td>Pollution issues</td>
<td>limited village rubbish waste</td>
<td>limited village rubbish waste</td>
<td>limited village rubbish waste</td>
<td>limited village rubbish waste</td>
<td>limited village rubbish waste</td>
<td>limited village rubbish waste</td>
</tr>
<tr>
<td></td>
<td>PERMANENT NO-TAKE RESERVE</td>
<td>PERIODICALLY HARVESTED MPA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>MEAN</td>
<td>SD</td>
</tr>
<tr>
<td>resource knowledge</td>
<td>1.20</td>
<td>2.80</td>
<td>3.68</td>
<td>5.50</td>
<td>3.99</td>
<td>1.38</td>
</tr>
<tr>
<td>local governance efficacy</td>
<td>1.03</td>
<td>6.59</td>
<td>6.98</td>
<td>7.45</td>
<td>7.01</td>
<td>0.43</td>
</tr>
<tr>
<td>resident adult population</td>
<td>1.01</td>
<td>70</td>
<td>22</td>
<td>75</td>
<td>56</td>
<td>29</td>
</tr>
<tr>
<td>conservation ethic</td>
<td>0.92</td>
<td>7.83</td>
<td>8.03</td>
<td>9.39</td>
<td>8.42</td>
<td>0.85</td>
</tr>
<tr>
<td>% likely to personally enforce reserve</td>
<td>0.84</td>
<td>33%</td>
<td>47%</td>
<td>14%</td>
<td>31%</td>
<td>17%</td>
</tr>
<tr>
<td>custom strength</td>
<td>0.75</td>
<td>3.70</td>
<td>4.47</td>
<td>3.78</td>
<td>3.98</td>
<td>0.42</td>
</tr>
<tr>
<td>marine focus- sea skills</td>
<td>0.70</td>
<td>5.71</td>
<td>5.85</td>
<td>5.56</td>
<td>5.71</td>
<td>0.14</td>
</tr>
<tr>
<td>years of formal education</td>
<td>0.67</td>
<td>6.58</td>
<td>6.47</td>
<td>7.93</td>
<td>7.00</td>
<td>0.81</td>
</tr>
<tr>
<td>threat trends</td>
<td>0.63</td>
<td>1.24</td>
<td>1.35</td>
<td>0.78</td>
<td>1.13</td>
<td>0.30</td>
</tr>
<tr>
<td># community organizations</td>
<td>0.49</td>
<td>7.00</td>
<td>7.00</td>
<td>8.00</td>
<td>7.33</td>
<td>0.58</td>
</tr>
<tr>
<td>severity of declining respect</td>
<td>0.44</td>
<td>-3.40</td>
<td>-1.35</td>
<td>-2.24</td>
<td>-2.33</td>
<td>1.02</td>
</tr>
<tr>
<td>tourism benefits</td>
<td>0.42</td>
<td>6.10</td>
<td>8.32</td>
<td>7.53</td>
<td>7.32</td>
<td>1.12</td>
</tr>
<tr>
<td>% with marine primary occupation</td>
<td>-0.42</td>
<td>10%</td>
<td>6%</td>
<td>0%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>% using hook and line</td>
<td>0.35</td>
<td>73%</td>
<td>88%</td>
<td>68%</td>
<td>76%</td>
<td>10%</td>
</tr>
<tr>
<td>age</td>
<td>0.30</td>
<td>37.4</td>
<td>41.7</td>
<td>41.0</td>
<td>40.0</td>
<td>2.3</td>
</tr>
<tr>
<td>external cooperation</td>
<td>0.22</td>
<td>5.58</td>
<td>6.94</td>
<td>6.26</td>
<td>6.26</td>
<td>0.68</td>
</tr>
<tr>
<td>food availability</td>
<td>0.18</td>
<td>5.86</td>
<td>6.79</td>
<td>6.07</td>
<td>6.24</td>
<td>0.49</td>
</tr>
<tr>
<td>total sea tenure km2</td>
<td>0.12</td>
<td>0.63</td>
<td>1.50</td>
<td>0.46</td>
<td>0.86</td>
<td>0.56</td>
</tr>
<tr>
<td>% selling seafood in market</td>
<td>-0.11</td>
<td>73%</td>
<td>88%</td>
<td>5%</td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>gear density</td>
<td>-0.10</td>
<td>0.25</td>
<td>0.57</td>
<td>0.10</td>
<td>0.30</td>
<td>0.24</td>
</tr>
<tr>
<td>% protected tenure</td>
<td>-0.07</td>
<td>30%</td>
<td>10%</td>
<td>50%</td>
<td>33%</td>
<td>18%</td>
</tr>
<tr>
<td>wealth</td>
<td>0.02</td>
<td>5.98</td>
<td>6.37</td>
<td>6.45</td>
<td>6.27</td>
<td>0.25</td>
</tr>
<tr>
<td>% believing in local responsibility</td>
<td>-0.02</td>
<td>94%</td>
<td>76%</td>
<td>11%</td>
<td>61%</td>
<td>43%</td>
</tr>
<tr>
<td>weekly income (vatu)</td>
<td>0.01</td>
<td>4311</td>
<td>3356</td>
<td>5892</td>
<td>4520</td>
<td>1281</td>
</tr>
</tbody>
</table>

Table 12 Variable means at the village and MPA type levels. Strength of differences in socio-cultural variables between MPA types; ordered by Cohen’s effect size D. Effect sizes > 0.8 indicate substantial relationships, 0.5-0.8 moderate relationships, and 0.2-0.5 minimal relationships.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Full membership</th>
<th>Non-Membership</th>
<th>Cross Over</th>
<th>Local knowledge rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>resource knowledge</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>local governance efficacy</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>resident adult population</td>
<td>65</td>
<td>10</td>
<td>20</td>
<td>large villages that are made up of 7 or more 'fareas' (= 3-5 households) ~50 adults, small villages only have 1 farea= &lt;5 households, 10 adults. cross over is 2 fareas=10 households, 20 adults</td>
</tr>
<tr>
<td>conservation ethic</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td>enforcement is typically a village leader's responsibility, leaders make up ~15% of adults, anyone else enforcing demonstrates a high enforcement capacity collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>% likely to personally enforce reserve</td>
<td>0.3</td>
<td>0</td>
<td>0.15</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>custom strength marine focus-sea skills</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>years of formal education</td>
<td>13</td>
<td>1</td>
<td>6</td>
<td>primary school on island ends after year 6, 13 is the highest public schooling available in Vanuatu trends, past state 0-10 minus current state 0-10. all communities have at least 4 organizations: council, men’s fellowship, women’s PWMU and youth group, full membership are communities with 5 others potentially including conservation committee, council of chiefs, tourism committee, planning and development group, water council, solar committee, council of churches, Sunday school group, or kindergarten.</td>
</tr>
<tr>
<td>threat trends</td>
<td>2.5</td>
<td>-2.5</td>
<td>0</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td># community organizations</td>
<td>9</td>
<td>4</td>
<td>6.5</td>
<td>trends, past state 0-10 minus current state 0-10. collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>severity of declining respect</td>
<td>2.5</td>
<td>-2.5</td>
<td>0</td>
<td>because we are agricultural people, only 10% would have a full time marine focus hook and line is a widely available fishing method, roughly half of all residents would fish regularly with this gear. Any more than 3/4 and this is beginning to be a high proportion. In some sea villages it is not uncommon for all adults to fish with hook and line. childhood ends at 18, the youth period continues throughout marriage and childbearing until the individual can become an ordained leader at ~40 years</td>
</tr>
<tr>
<td>tourism benefits</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>% with marine primary occupation</td>
<td>0.1</td>
<td>0</td>
<td>0.05</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>% using hook and line</td>
<td>1</td>
<td>0.5</td>
<td>0.75</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>age</td>
<td>70</td>
<td>18</td>
<td>40</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>external cooperation</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td>food availability</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td>collected as 0-10 pre-calibrated and anchored Likert scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------</td>
<td>-----</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>total sea tenure km²</td>
<td>1.53</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>% selling seafood in market</td>
<td>1</td>
<td>0</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>gear density</td>
<td>1</td>
<td>0</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>% protected tenure</td>
<td>0.4</td>
<td>0.1</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>wealth</td>
<td>7.5</td>
<td>2.5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>% believing in local responsibility</td>
<td>0.75</td>
<td>0.25</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>weekly income (vatu)</td>
<td>20000</td>
<td>0</td>
<td>5000</td>
<td></td>
</tr>
</tbody>
</table>

Village sea tenure is generally quite small, only extending a 50-100meters from the shore in most cases, a large area would considered any >1km². Half of the population selling seafood in the market would be a cross over point. In bush villages, no residents posses marine gear, and in sea villages, every person owns at least one gear type, 0.5 represents every other person owning significant piece of gear i.e. snorkel, canoe, musket. International standards call for between 20-30% of an area to be protected. A small percentage of protection would be less that 10%, a large proportion more than 40%. Collected as 0-10 pre-calibrated and anchored Likert scale. 0.75 represents 3 in 4 people feeling they are directly responsible for management, 0.25 is only 1 in 4 feeling this way. 20,000 vatu is an excellent take for a weekly session at the market, 5000 vatu is enough to cover expenses and earn a small profit.
Table 14 Truth table output from fsQCA showing variable variation among cases. Logical remainders have been eliminated for ease of interpretation. The presentation of the truth table is a prerequisite for fsQCA replicability but does not, in itself, convey readily interpretable results.

<table>
<thead>
<tr>
<th>resource knowledge</th>
<th>governance efficacy</th>
<th>population</th>
<th>enforcement capacity</th>
<th>marine focus</th>
<th>mean education</th>
<th>community organizations</th>
<th>marine occupation</th>
<th>hook and line</th>
<th>mean age</th>
<th>CASES</th>
<th>NO-TAKE</th>
<th>consist</th>
<th>pre</th>
<th>product</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>0</td>
<td>1</td>
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<td>1</td>
<td>0.5025</td>
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<td>0.09</td>
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</tr>
<tr>
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<td>1</td>
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<td>1</td>
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<td>1</td>
<td>0.0832</td>
<td>0.083</td>
<td>0.0069</td>
</tr>
</tbody>
</table>
Table 15 Analysis of Necessary Conditions for no-take rules. The presentation of the Necessary condition analysis is a prerequisite for fsQCA replicability but does not, in itself, convey readily interpretable results.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Consistency</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological knowledge</td>
<td>0.294165</td>
<td>0.854837</td>
</tr>
<tr>
<td>Governance effectiveness</td>
<td>0.911854</td>
<td>0.569642</td>
</tr>
<tr>
<td>Population</td>
<td>0.824638</td>
<td>0.598008</td>
</tr>
<tr>
<td>Enforcement capacity</td>
<td>0.801334</td>
<td>0.651845</td>
</tr>
<tr>
<td>Marine focus</td>
<td>0.699303</td>
<td>0.584256</td>
</tr>
<tr>
<td>Formal education</td>
<td>0.602588</td>
<td>0.525556</td>
</tr>
<tr>
<td>Committees and organizations</td>
<td>0.716487</td>
<td>0.619236</td>
</tr>
<tr>
<td>Maritime occupations</td>
<td>0.546482</td>
<td>0.446461</td>
</tr>
<tr>
<td>Hook and line prevalence</td>
<td>0.524780</td>
<td>0.522273</td>
</tr>
<tr>
<td>Mean age</td>
<td>0.492831</td>
<td>0.514125</td>
</tr>
</tbody>
</table>

*Once necessary conditions have been identified, these must be removed form the analysis so as not to mask important combinations sufficient conditions. The program fsQCA (version 2), uses a Quine-McCluskey algorithms to produce parsimonious solutions for the outcome specified and input case study variables. In each analysis we have placed each of the 6 cases, as reined in the truth table.

Table 16 Analysis of Necessary Conditions for periodic harvest rules. The presentation of the Necessary condition analysis is a prerequisite for fsQCA replicability but does not, in itself, convey readily interpretable results.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Consistency</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological knowledge</td>
<td>0.049953</td>
<td>0.145163</td>
</tr>
<tr>
<td>Governance effectiveness</td>
<td>0.688895</td>
<td>0.430358</td>
</tr>
<tr>
<td>Population</td>
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<tr>
<td>Enforcement capacity</td>
<td>0.427999</td>
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</tr>
<tr>
<td>Marine focus</td>
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</tr>
<tr>
<td>Formal education</td>
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<td>0.474444</td>
</tr>
<tr>
<td>Committees and organizations</td>
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<td>0.380764</td>
</tr>
<tr>
<td>Maritime occupations</td>
<td>0.677549</td>
<td>0.553539</td>
</tr>
<tr>
<td>Hook and line prevalence</td>
<td>0.480021</td>
<td>0.477727</td>
</tr>
<tr>
<td>Mean age</td>
<td>0.465751</td>
<td>0.485875</td>
</tr>
</tbody>
</table>
Table 17 Analysis of Sufficient conditions for No-Take Rules. The presentation of the Sufficient condition analysis is a prerequisite for fsQCA replicability but does not, in itself, convey readily interpretable results.

Model: NO TAKE = f(ECOLOGICAL KNOWLEDGE, MARINE FOCUS, EDUCATION, COMMUNITY ORGANIZATIONS, MARINE OCCUPATION, HOOK & LINE, AGE)
Cases: 6
Algorithm: Quine-McCluskey
True: 1-L

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 1.000000
consistency cutoff: 0.931943

<table>
<thead>
<tr>
<th>raw coverage</th>
<th>unique coverage</th>
<th>consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMUNITY ORGANIZATIONS*AGE</td>
<td>0.492831</td>
<td>0.492831</td>
</tr>
</tbody>
</table>

This solution suggests that the simultaneous presence of multiple community organizations and a high mean age of residents will be sufficient to, or increase the likelihood of, no-take rule adoption.

Table 18 Analysis of Sufficient conditions for Periodic Harvest Rules. The presentation of the Sufficient condition analysis is a prerequisite for fsQCA replicability but does not, in itself, convey readily interpretable results.

Model: PERIODIC CLOSURE = f(ECOLOGICAL KNOWLEDGE, GOVERNANCE, POPULATION, ENFORCEMENT, MARINE FOCUS, FORMAL EDUCATION, COMMUNITY ORGANIZATIONS, MARINE OCCUPATION, HOOK & LINE, AGE)
Cases: 6
Algorithm: Quine-McCluskey
True: 1-L

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 1.000000
consistency cutoff: 0.909636

<table>
<thead>
<tr>
<th>raw coverage</th>
<th>unique coverage</th>
<th>consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>ecological knowledge*enforcement</td>
<td>0.572001</td>
<td>0.572001</td>
</tr>
</tbody>
</table>

This solution suggests that the simultaneous absence sound ecological knowledge and enforcement capacity will be sufficient to, or increase the likelihood of, periodic harvest rule adoption.
10.4 Discussion

10.4.1 Enabling conditions for selecting strict no-take marine reserve rules

Once a community has decided to implement spatial marine management, specific sociocultural conditions must exist before it can select no-take marine reserve operational rules. On Nguna and Pele, the selection of strict no-take rules was found to necessarily depend on the combination of local governance effectiveness, enforcement capacity and population size. Effective local governance and high enforcement capacity have been repeatedly highlighted as important for marine protected area management success in other contexts (Christie et al. 2009; Muehlig-Hofmann 2007; Young et al. 2007). Case studies from other social-ecological systems including management regimes in Ugandan forests, European river basins, and South Asian agricultural systems, also have found that the operational rules for resource use are influenced by enforcement capacity, social capital, and population pressure respectively (Ali 2007; Banana & Gombya-Ssembajjwe 2000; Pahl-Wostl et al. 2007).

Unexpectedly, a minimum population size also was found to be a necessary condition for selecting no-take permanent reserve rules. This finding seemingly contradicts studies which show a breakdown of collective action regimes with increasing population. According to collective action theory, there are thresholds above which collective management regimes cannot function (Olson 1965). Certain variables, like the number of users, may affect different types of MPAs in non-linear and sometimes even opposite ways. Population can have profound influences on how people organize (Gladwell 2000), particularly on aspects of social capital, which can be critical to the collective management of resources (Pretty 2003). For example, in the inter city neighborhoods of the U.S. city of Chicago, population loss was found to weaken interpersonal ties and lower social capital (Sampson et al. 1999). In Vanuatu, very low populations (mean <56 adults) may not support the levels of social capital needed to successfully implement strict no-take reserve rules. In contrast, higher populations were found to enable the selection of no-take marine reserve rules in Nguna-Pele sites. This result is an interesting complement to other studies from Melanesia that find populations of more than 600-1,000 people are associated with the breakdown of periodically harvested MPAs. This breakdown likely occurs because rules that allow intermittent exceptions (such as periodic harvests) may be increasingly difficult to manage in higher population contexts (Cinner et al. 2007). Therefore, there may be different population thresholds associated with the selection and breakdown of different MPA operational rules.

While not necessary, the selection of no-take rules was further influenced by the number of community social organizations and the mean age of residents. The number of community organizations is often a proxy indicator of social capital, strengthening the general argument that the local selection no-take reserve rules requires a minimum of human connectivity and interaction. In an example from an unrelated social-ecological system, higher mean age among hunters from the African nation of Gabon, is related to the extent that resource declines are perceived over time (Papworth et al. 2009). Older
stakeholders may be less likely to suffer from a shifting baseline syndrome (Pauly 1995) and be more likely to reactively establish no-take reserve rules.

10.4.2 Enabling conditions for periodic harvest rules

Although many communities implement periodically harvested closures, fsQCA results suggest that the selection of this rule type is not enabled by any particular necessary conditions on Nguna and Pele. However, the simultaneous absence of enforcement capacity and ecological knowledge increases the likelihood that periodic harvest rules will be selected. Periodic closures likely require less enforcement capacity (and enjoy higher compliance) than no-take reserves because users are not permanently excluded from the resource (Cinner et al. 2005b). Ecological knowledge plays a role in the selection of marine management strategies, particularly in island communities in the Indo-Pacific where there is often a lack of broad-scale, consistent, and locally-relevant environmental education (Foale & Manele 2004).

With few sociocultural constraints, periodic harvest may represent the ‘easiest’ set of rules for local communities to implement. Indeed, non-permanent spatial management is often preferred by fishers globally (McClanahan et al. 2005a; McClanahan et al. 2009). A possible explanation for the popularity of non-permanent closure regimes in some contexts are the similarities in usage rules that they share with cultural taboos (Lam 1998). Periodic harvest rules are also often most compatible with local fishing norms. In The Nguna and Pele cases, periodically harvested closures either do not require extraordinary preconditions or have yet to cross disabling socio-economic thresholds (like population or market pressure) (Cinner et al. 2007).

10.4.3 MPA policy choices: adapting the rules or building capacity

Selecting from different MPA operational rules will often require making tradeoffs between ecological outcomes and human use requirements. No-take marine reserves can have long-term benefits to marine ecosystems and are often advocated by marine scientists and conservation organizations (Agardy et al. 2003). However, in places like the Pacific Islands, periodically harvested closures may best meet local needs (i.e. to provide fish for a feast), have better ecological outcomes (as discussed in Chapter eight), and be preferred by subsistence and artisanal fishers. Consequently, periodically harvested closures enjoy higher compliance than no-take reserves. Compliance is critical in social contexts where enforcement capacity is often lacking (Cinner et al. 2005a).

Based on an improved understanding of MPA-enabling conditions, decision makers are presented with options when developing appropriate MPA rules: 1) choose the rules that best suit local contexts; or 2) build local capacity and capital until desired rules better suit local stakeholders (Jentoft 2005). Building capacity is an expensive and long-term solution, and may require donors and conservation organizations to move beyond traditional participatory conservation approaches (McClanahan et al. 2008). This is not to say that well-functioning no-take marine reserves should be scrapped in favor of periodically harvested closures, but rather that alternative rules may be appropriate
intermediaries in contexts where no-take reserves are not immediately viable or while capacity for no-take rule selection is being developed. A targeted social-ecological approach to selecting MPA rules will help avoid potentially unsuccessful management panaceas (Basurto & Ostrom forthcoming; Meinzen-Dick 2007).

While this study improves understanding of how sociocultural conditions can enable MPA rule selection in communities that have pre-existing aspirations for marine management, these results do not provide insights into how those aspirations develop. Without strong enforcement mechanisms, the implementation of an MPA where it is not locally desired can lead to failure, even if the community possesses the combination of enabling conditions highlighted here. Similarly, the presence of the enabling conditions discussed here is no guarantee for successful MPA ecological outcomes. Thus, there exists a strong imperative for further investigation into enabling conditions for MPA aspiration, selection and success.

Figure 49 Reconsidering the critical variables identified in this Chapter in terms of the social-ecological analytical framework developed for MPA investigations (see Fig. 10)
CHAPTER 11 - MPA DISCOURSE; SEEKING CONSENSUS

11.1 Introduction

The number of community-established protected areas is increasing at an unprecedented rate (Chape et al. 2008) and there are calls to further recognize and facilitate these local-level initiatives as part of multi-scale responses to a changing world (Berkes 2007a; Berkes 2009). As the protected area phenomenon continues to sweep through the Pacific Islands (Johannes 2002b), communities are diversely labeling their closures as protected areas, reserves, sanctuaries, conservation areas, managed areas and taboos (Chapter two and (Caillaud et al. 2004; Keen & Mahanty 2006; Veitayaki 2003).

This multifarious application of protected area terminology raises critical questions for policy makers. Does the diverse typology reflect differences in MPA operational rules such as permanent versus periodically harvested closures? And critically, do the community-established closures of Nguna and Pele (and the rest of the Pacific) meet the IUCN definition of a protected area32?

To improve and clarify the protected area policy arena in the Pacific Islands, this chapter examines the typology of community-based closures in the Republic of Vanuatu. Here particularly there are tangible concerns and confusion caused by the multiplicity of protected area terminology. Questions from confused ni-Vanuatu village resource managers from different parts of the country have dominated several recent national summits. This paper seeks to demonstrate the practical need to resolve the discrepancies surrounding existing protected area discourse, and consider solutions for a region with diverse local management strategies. To ensure that a local point of view is considered in policy planning (Regenvanu 1997) and inform high-level policy makers of on-the-ground realities in the region, this chapter presents protected area discourse from a village stakeholder’s perspective.

11.2 Multiplicity of protected area terminology

As described in Chapter two, the constitution gives all land to ni-Vanuatu customary owners and their descendents along with the duty to “protect and safeguard” national resources and the environment (Government of Vanuatu 1988). Diverse protected area rhetoric has since officially appeared in subsidiary legislation beginning in 1993 with the passage of the National Parks Act, which allows for the creation of “national parks” and the protection of areas that have “outstanding value from the point of view of science and conservation”. The Forestry Act of 2001 allows custom owners to declare “conservation

32 The IUCN (2008) defines a protected area as: “A clearly defined geographical space, recognized, dedicated and managed, through legal or other means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.”

Regardless of the official terminology, many island communities use the word “taboo” (spelled tabu or tapu by ni-Vanuatu people) to refer to spatio-temporal closures (Caillaud et al. 2004). Endemic to the Pacific Islands and first recorded in English in the diaries and journals of Captain Cook (Cook et al. 1784), taboo is now pan-oceanic spatial closure terminology (Hviding 1996). It is not however, the only word employed by communities to describe resource closures. As we have seen in Chapter two, the terms “Conservation Area”, “Protected Area”, “Marine Protected Area” and “MPA”, have recently become part of the colloquial closure vocabulary in even in the most remote corners of the archipelago.

11.3 Closure rhetoric in Vanuatu

11.3.1 Taboos

Taboo is arguably the most commonly employed resource closure term in Vanuatu. The word taboo eludes succinct definition, being diversely applied to a range of situations and scenarios. Speiser (1990) notes that the taboo is “encountered throughout the group, and means nothing more than a prohibition.” In Bislama, the lingua franca of Vanuatu, the word taboo is commonly spoken to misbehaving children, signifying “don’t touch” or “don’t do that”. In that scenario, the indicated activity is not appropriate, usually in any instance. A taboo can signify that practically anything is off limits to use, discussion, harvest, entrance or negotiation. An endemic part of some of Vanuatu’s indigenous local languages, the word taboo has clearly been introduced into others.

On Nguna and Pele, and throughout Vanuatu, taboos are now commonly applied to marine or terrestrial resources. A taboo in the contemporary Vanuatu context typically indicates that the resource or area is temporarily off limits. A taboo closure is enacted with the expectation that the resource will be re-opened for use in the short to medium term. In the minds of most ni-Vanuatu, a taboo is a non-permanent tool to stockpile a resource for use at later date (such as provisioning wedding feasts). While sacred site taboos may be permanently off-limits, these generally do not have a resource use or management objective. In the past, breaking a taboo was avoided for fear of spiritual or supernatural retribution (Colding & Folke 1999; Johannes 1998b), though Christian and colonial influence have much eroded the contemporary belief in these consequences (Foale 2006).

11.3.2 Conservation areas

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33 On Nguna and Pele, the indigenous Nakanamanga language name for a resource closure or prohibition is Natungoroana
‘Konsevesen era’ is now a well-established Bislama phrase. Vanuatu’s conservation areas are established in both marine and terrestrial environments, and are principally supported by the Environment Unit and Forestry Department, though several local and international NGOs have also supported their creation. Unlike in English, the Bislama word ‘konsevesen’ is nearly always used in reference to natural resources. In contrast to the taboo, there is often little expectation by village residents that a conservation area will be opened for harvest in the short or medium-term. Conservation areas are seen as a tool for the long-term enhancement of resources and habitats. Permanent or indefinite conservation areas likely represent a distinct departure from historical practices. Conservation areas are declared and revoked by a village chief, locally enforced, managed through customary governance, and offenses are punishable by village-level authorities.

11.3.3 Protected areas and MPAs

The phrase ‘marine protected area’ and its acronym ‘MPA’ are the most recent additions to the national spatial closure vocabulary. Two national-scale projects launched in 2008 by the Environment Unit and Forestry Department utilize this terminology in reference to village-based closures34. The term ‘MPA’ is most commonly used to refer to a geographically-bounded closure, although this is not always the case35. The Bislama word ‘protek’ is equivalent to its English counterpart, indicating the protection of a variety of objects and themes. Many village residents would argue that they are ‘protecting’ resources inside a taboo, even though the duration of the closure may only three months. In contrast, when communities establish a "protected area", it is, like a conservation area, considered to be indefinitely closed. There may be however, attenuating circumstances when marine protected areas are opened by the village chief to meet community resource needs (religious events etc.) (Tarisesei & Novaczek 2005). As seen in Chapter two, protected areas, marine protected areas and MPAs are fully grounded in local governance institutions, and are declared, legitimized and enforced by the village chief or council.

11.3.4 Others terms

Other terms are used in Vanuatu to describe spatial closures, albeit less frequently. Hideaway Island Marine Sanctuary is a 2.5 hectare permanent closure managed by a tourist resort to maintain coral reef condition for visitors as well as physically protect reefs from nearby village subsistence fishers. In 1983, 100 hectares covering the wreck of the US navy’s SS President Coolidge on Santo Island were set aside as a marine reserve by the Fisheries Act (Government of Vanuatu 1983). Recently, two international donors, Seacology and the Force for Good Foundation, have been directly negotiating with communities to establish ‘marine reserves’ that are closed for at least 10 years. The

34 PoWPA- UNDP initiative to implement the Convention on Biological Diversity’s (CBD) Programme of Work on Protected Areas, VBRMA – Joint initiative funded by the US National Oceanic & Atmospheric Administration (NOAA) called the Village Based Resource Management Areas Network
35 On Nguna and Pele people often use the name marine protected area or MPA to refer to the networking organization there, and not to any particular closure
newly negotiated Efate Land Management Area is indefinitely declared but accommodates ongoing sustainable use.

11.4 Protected area discourse: politics, symbolism and reality

Vanuatu’s diverse conservation terminology has long been a source of confusion and contention among domestic and foreign scholars, developmentalists, conservationists, and village resource managers. While several factors limit collaboration within Vanuatu’s small resource management community, protected area discourse seems to be a nucleus around which other divisive factors coalesce. History demonstrates that what appears to be a purely semantic debate can often be strongly ideological (Chapter seven). This was the case in the international dispute that erupted over the definition of the ‘marine protected area’ (Agardy et al. 2003). Protected area discourse in Vanuatu may present a similar scenario.

Fierce political and land-dominated ideological struggles characterized the lead up to Vanuatu’s independence in 1980 (Van Trease & USP. 1987). As mentioned in Chapter seven, in response to pre-independence political struggles, “kastom” was developed as a political tool with which to solidify the local voice (Tonkinson 1982). The kastom construct is widely used to elevate and celebrate that which is endemic, exalting a pre-European way of being, free from external intervention. However it has also been used by the elite as an untouchable set of norms to amass power and authority (Douglas 2002). The distinction between what constitutes kastom and what does not is often based on, as discussed in Chapter seven, a politically convenient inauthenticity (Jolly 2000), more in symbolism than in historical reality (Lindstrom 2008).

In Vanuatu, the terms taboo and protected area have been unwittingly caught up in the post-colonial debate, politically appropriated to represent two sides of an ideological divide: local against foreign. Taboo, for example, has been dubbed sacred terminology, in contrast to the words “bans”, “marine reserves” and “conservation areas” which have been called profane foreign introductions (Hickey 2001). (See Johannes (2003) for a discussion on the dangers of idealizing traditional Pacific Island practices in this way). Further confounding the kastom issue, ni-Vanuatu resource managers are often not fully aware of the practical aspects traditional management methods, likely because they have only developed in select areas. The Vanuatu Cultural Center promotes traditional marine management, but few villagers are able to give specific example, other than citing the declaration of a taboo.

It is critical to acknowledge that terms like “conservation” and “protected area” are also steeped in rhetorical symbolism. For example, some ni-Vanuatu people may associate these words with land alienation (Nari 2000; Ruddle & Hickey 2008; Techera 2005), a particularly sensitive topic in the current context of customary land leases to foreign investors (Regenvanu 2008). On the other hand, villages experiencing severe declines in natural resources may be actively seeking novel and more powerful regimes and terminologies (Chapter seven). Because a closure is called something else, it may be
perceived to be new. Situated within a globalized context, and with a long history of foreign ‘xenophilia’ (Hviding 2003b), ni-Vanuatu are often reaching out for a system that appears bigger, better and which the rest of the world has seemingly (and perhaps mistakenly) embraced as a resource management panacea (Berkes 2007a).

11.5 Discussion

11.5.1 Vanuatu protected areas: rhetoric or reality?

Ni-Vanuatu communities are implementing a range of endemic, novel and hybridized management regimes, each with different objectives, names and operational rules. While the current typology is by no means concretely fixed, a status quo has emerged. For example, what ni-Vanuatu villages today call a ‘conservation area’ is nearly always a fundamentally distinct management strategy from what is called a ‘taboo’. Long-term biodiversity-focused closures are commonly given non-endemic names, while temporary, utilitarian, or cultural closures are often called taboo. Recognizing and building on the current status quo will greatly reduce the confusion experienced by most Vanuatu stakeholders. However, imposing a one-size-fits-all approach to naming or establishing closures in Vanuatu is clearly not appropriate.

While many of Vanuatu’s closures have conservation objectives, as seen in Chapter seven, unstated secondary objectives also exist. In contemporary practice, closures may represent an important avenue for development materials and aid (Foale 2001; Hviding 2003b), strengthened ownership and territorial claims (Polunin 1984), access to tourism (Eagles et al. 2002), or political power (Foale & Manele 2004; Muehlig-Hofmann 2007). Depending on the objective, some closure terminologies may be more symbolically relevant or hold more political clout than alternatives. For example, if communities seek to gain from interaction with international parties (e.g. foreign tourists), employing globally recognized terms like marine sanctuary may yield the best outcomes. On the other hand, if the closure is established to strengthen customary governance, an indigenous language term may be preferable.

Ultimately, both rhetorical symbolism and functional reality influence the selection of protected area regimes and terminologies in Vanuatu. The complex tensions between post-colonial ‘kastom’ ideology and practical resource management goals make Vanuatu protected area discourse obscure and often ambiguous. To constructively bring the discussion forward, it is important to move beyond divisive dichotomies that artificially pit local against foreign. Intensifying global threats require the urgent use of a more inclusive and multi-scale approach to community resource management (Berkes 2007a). Pacific Islanders can most effectively build management regimes when they have access to multiple knowledge systems, customary and Western-scientific. The most successful examples of community resource management in the Pacific are those that employ hybridized regimes. However, until ideological debates are resolved and hybridized resource management is directly enabled by policy, protected area confusion will prevail.
11.5.2 Spread of hybrid protected area discourse

The expansion and evolution of protected area measures in Vanuatu is often spontaneous, assisted by what Johannes (1998b) calls a ‘prodigious multiplier effect’. This phenomenon, whereby villages or individuals copy the actions of their neighbors, has been documented throughout the archipelago (Tacconi 1997). A similar concept known throughout the Pacific Islands, is that of ‘copycat entrepreneurship’ (Philip 2002). Copycat conservation may prove to be an extremely valuable process for facilitating rapid and widespread replication of effective MPA strategies. It has certainly played a role in Vanuatu’s current protected area phenomenon.

There is a legitimate concern that externally imposed management approaches will be socially disruptive and/or locally inappropriate (Ruddle & Hickey 2008), alienate stakeholders from active management (West et al. 2006), not recognize the complexity of local knowledge (Hviding 2006; Johannes 2003) or derive from an incompatible world view (Igoe 2005; Jepson 2005). Conservation-focused NGOs in the Pacific and elsewhere are notorious (rightly or wrongly) for promoting eco-colonialist or environmental missionary-type agendas on local people (Cox & Elmqvist 1997; Dowie 2008; Roe 2008). In contrast to its Melanesian neighbors however, none of the major international environmental NGOs operate in Vanuatu. The civil society groups, local NGOs and overseas volunteer programs that work in ni-Vanuatu communities must recognize the sovereignty of local communities to chart their own path of resource use and management (Aru 2004; Tacconi 1997). However, none should be ashamed to widely communicate outcomes of successful local and non-local strategies.

Just as other non-indigenous terminologies and ideologies are ubiquitous in Melanesia (e.g. Christianity see Chapter seven), protected area discourse and practice have become inseparable parts of the contemporary ni-Vanuatu world view. The local popularity of protected areas in Vanuatu suggests that communities perceive benefits from these management regimes, and are successfully responding to changing ecological, social and political contexts (Chapter seven). Supporting active local experimentation with closure practices, Vanuatu is continuously demonstrating its flexibility and adaptive capacity in the face of unprecedented change (Jolly 2000; Lindstrom 2008). More scholarly attention should focus on hotspots of protected area hybridization in the Indo-Pacific where management institutions embrace the overlapping concepts of past, present, local, foreign, colloquial and scientific.

11.5.3 Policy implications for Vanuatu’s protected areas

While indisputably providing important ecological benefits, many of Vanuatu’s closures are not managed specifically for biodiversity conservation, and therefore do not meet the IUCN’s protected area definition. For example, most short and medium-term taboos are not “dedicated to achieve long-term conservation of nature” (Dudley 2008). That is not to say, however, that all of Vanuatu’s taboos fall outside of IUCN’s criteria. Taboos that

36 Wan Smolbag Theatre (WSB), Foundation of the Peoples of the South Pacific-Vanuatu (FSPV), Wan Tok Environment Center (WTEC), Live and Learn, US Peace Corps, CUSO, VSO, AVI, JICA
are implemented with long-term conservation objectives could be appropriately be defined as IUCN category II\textsuperscript{37} or VI\textsuperscript{38} protected areas, provided that resource use within the area is sustainable.

Conservation areas, protected areas, and MPAs established primarily for increased aid, tourism or political power might qualify as IUCN protected areas if they are subsequently managed for biodiversity conservation outcomes. More research should examine the potential of the taboo in contemporary contexts to achieve objectives like sustainable use and long-term conservation. In particular, more empirical work is needed to document the ecological outcomes of non-permanent resource closures (see Chapter eight).

In order to avoid falsely inflating Vanuatu’s protected area coverage to the international community (Locke & Dearden 2005), the national government must develop clear guidelines and definitions for the diverse MPA and protected area regimes occurring in Vanuatu. For example, as communities begin to register their community conservation areas (CCAs) under the Environmental Management and Conservation Act, screening should specifically consider a candidate closure’s management strategies, terminology and biodiversity conservation potential. An ideal policy for CCA registration would embrace local closure typology, while standardizing nomenclature at a higher level for national clarity and international reporting. Communities employing taboos, protected areas, or other closures should equally be entitled to national recognition if management leads to conservation outcomes. In this way, the central government can avoid stifling local adaptive processes and continue to encourage communities which, due to socio-economic or cultural contexts, choose to establish alternative management strategies.

To deal with registration, analysis and reporting on contemporary protected areas in the Pacific Islands, national governments will require capacity-building support that extends beyond standard donor funding cycles (Jayaraman & Ward 2006). Long-term partnerships with international groups and academic institutions may be a particularly beneficial strategy in this regard. Continued alliance with locally-grown NGOs like Wan Smolbag Theatre and the Foundation for the Peoples of the South Pacific-Vanuatu will ensure a socially appropriate and beneficial transformation of protected area discourse in the region. Ultimately, regional protected area categorization should be undertaken in a way that is sensitive to and respectful of diverse local management regimes and knowledge systems.

11.6 Conclusion

This Chapter examines the discourse and symbolism attached to the various resource management terminologies currently employed in Vanuatu. With over six distinct terms for spatial closures embedded within Vanuatu legislation, there is little wonder that confusion abounds over exactly what constitutes a protected area or a marine reserve. The Chapter finds that despite the official multiplicity, a consensus has emerged in everyday

\textsuperscript{37}combines ecosystem protection with recreation, subject to zoning (Dudley, 2008)

\textsuperscript{38}natural areas where biodiversity conservation is linked with sustainable use of natural resources (Dudley, 2008)
usage. The word taboo is applied to a closure when there is an expectation of use in the future, or to temporary or periodically opened closures. Conservation Area and Protected Area are used interchangeably when the closure is designed for long-term or permanent resource protection.

In the context of this discursive consensus, the Chapter highlights the symbolism that remains attached to the use of taboo terminology. The Chapter describes the concept of kastom, developed in a pre-independence era as a tool to forward the self-governance agenda, and how the word ‘taboo’ has been swept into the extant political movement which continues to systematically reject the externally derived (conservation or protected area). This chapter also considers the symbolism attached to the words ‘conservation’ and ‘protection’, as it may be exploited by communities to obtain external support from those empathetic to conservation issues (e.g. tourists, the government or aid donors).

Irrespective of the terminologies employed, this Chapter highlights the incredible expansion of marine management initiatives throughout the archipelago. It describes how the protected area phenomenon has been aided by a ‘prodigious multiplier effect’, whereby communities rapidly emulate one another’s resource management regimes. The Chapter provides strong support to the argument that these management tools are as indigenously implemented and owned as any historically traditional tool ever utilized in Vanuatu, and in no way forced on an unwilling people.

Finally the Chapter presents recommendations to improve the efficacy, monitoring and reporting of Vanuatu’s spatial closures at national, regional and international levels. Flexibility must continue to be inherent within Vanuatu natural resource management (Lindstrom 2008), allowing a cross-scalar resilient symbiosis of internal and external resource governance typology and practice. Hybridization of protected area operational rules and rhetoric, combining Western scientific and traditional ecological knowledge, likely presents a valuable policy option for the Pacific region. Rather than overly codify or prescribe panaceas, protected area policy should embrace and enable local innovation and perspectives. It is ultimately through these dynamic adaptive processes that the “intellectual armory” (Geertz 1994) of the Pacific Island region will be strengthened in the face of change.
Figure 50 Reconsidering the critical variables identified in this Chapter in terms of the social-ecological analytical framework developed for MPA investigations (see Fig. 10)
CHAPTER 12  CONTEXTUALIZING COMMUNITY BASED MARINE PROTECTED AREAS IN VANUATU

11.7  Introduction

The large scale participatory research project in Vanuatu on which this dissertation is based set out to achieve a decidedly applied goal: fill gaps in marine protected area science that are of direct relevance to communities on Nguna and Pele islands. While this goal may be slightly too ambitious to accomplish in a single dissertation, the following specific objectives were certainly achieved:

1. Place the study of marine protected areas within a theoretical framework that enables a comprehensive and simultaneous analysis of social and ecological factors
2. Utilize a linked social-ecological theoretical framework to better understand the emergence, evolution and outcomes of marine protected areas in Vanuatu; specifically to understand:
   a. Historical factors and trends that preceded and shaped the current marine resource governance regimes found in Vanuatu
   b. Motivations and expectations of ni-Vanuatu people regarding spatial marine closures
   c. Situational factors that may enable the selection and implementation of diverse marine closure regimes
   d. Ecological outcomes of diverse marine closure regimes
   e. Ways and means by which positive outcomes of marine closures may be fostered and enhanced into the future

This chapter summarizes the achievement of these objectives contained within the chapters of this dissertation, theoretically places Nguna-Pele MPAs within broader social-ecological contexts, discusses empirical limitations, and highlights priority areas for future research.

11.8  Recalling the theoretical framework

As discussed in Chapter three, MPA case study investigations are often hampered by their failure to make effective use of existing social-ecological theoretical frameworks. In that chapter, and those that followed, a strong case was made that community based marine protected areas cannot be understood, investigated or enhanced using a single theoretical approach or disciplinary set of tools. To overcome this constraint, Chapter three presented an adapted form of Ostrom’s 2007 commons diagnostic framework. In the adapted framework, marine reserves and other types of MPAs are theoretically linked to other components of complex systems. By explicitly adding aspects of history, political analysis and cultural ethnography, the dissertation set out to avoid the widely used (but
often narrowly focused) snapshot approach to MPA research (Halpern et al. 2004; Kronen & Bender 2007; Kronen et al. 2002).

Figure 51 Framework presented in Chapter three to investigate MPAs in social-ecological systems

11.9 Returning Vanuatu results to the framework

Using a conceptually linked social-ecological framework will ensure that MPA case studies 1) contribute to broad, theoretical and cumulative learning about social-ecological systems and 2) guide the development of future research by highlighting valuable variables and relationships. In order to achieve these goals, empirical case study results should be identified within the general framework. Figure 52 below pulls together the critical variables and relationships identified in Chapters five through eleven, and codes them into the framework presented in Figure 51.
Figure 52 This figure codes important variables identified in each preceding chapter into the above framework presented in Chapter three. For consistency, numeric coding follows that in (Ostrom 2007). Missing numeric codes are those which Ostrom identified but that were not deemed relevant to this case study of MPAs in Vanuatu.

The following sections of this chapter review the variables and relationships identified in this dissertation and highlighted in Figure 52, and discuss them as they relate to broadly contextualizing community-based marine protected areas.

11.9.1 MPA phenomenon in Vanuatu

Chapter two described how contemporary coral reef closures on Nguna and Pele are diversely and locally implemented. There is a strong precedent for establishing protected areas in the North Efate area and in other parts of Vanuatu (ECO3; this and all subsequent codes in this Chapter refer to Figure 53), particularly over the last decade. Community-based MPAs are enabled by the constitution and other legislation (S8 & GS5b). This chapter also confirms that marine commons dilemmas in Vanuatu are often tackled at the village level; each community on Nguna and Pele establishes its own marine closure. MPA operational rules there often fall into two categories: permanent no-take reserves, and closures that are periodically harvested and then re-closed.

In terms of the framework, these operational rules are part of the governance system (GS), coded here as GS5e. Both types of village closures found on Nguna and Pele are integrated within customary, chiefly and ceremonial practices (GS5a) and appear to correspond with the characteristics of local users (U), resources (RU & RS) and social...
settings (S). Closures seem to be supported by local residents (S9), likely because they themselves directly control rules, tenure, and resource access rights (GS6 & GS7). Governance at the village level presents considerable ecological challenges for marine managers and scientists, who tend to plan MPA strategies at larger ecosystem scales.

Evidence in Chapter two suggests that these challenges can be overcome despite strong village level marine tenure (GS4). Cross boundary cooperative decision-making and governance (I4a) is achieved through networking organizations and bridging institutions (S7). Networks of community MPAs help stakeholders manage both the ecological strengths and weaknesses of different closure operational rules. Although likely not acting completely altruistically, communities on Nguna and Pele have shown they are willing to compromise and collaborate to obtain benefits. Scaling-up collaborative marine governance may be a real possibility in other Pacific Island contexts, particularly if the resultant networks possess contexts similar to those that have enabled success on Nguna and Pele. These factors include:

1. the structure of the NPMPA organization (GS3) emulates previously existing island-wide organizations (GS2), thereby eliciting local trust (I4b)
2. individual villages maintain control of their own tenured closures (GS4); rights granted by legislation (S8) empower communities (S10)
3. there are minimal costs (S1) to impoverished central governments involved with networking because communities are still responsible for day to day management and enforcement (GS8)
4. networking effectively tackles issues that are too large in scope for individual villages to confront (RS3 & RU7)
5. networked villages are geographically proximate (RS9) speak the same language (U2f), share cultural norms (U6) and have similar historical trajectories (HT).

Figure 53 Schematic representation of the critical variables for MPAs and MPA Networks on Nguna and Pele as identified in Chapter two.

Chapter two suggests that if MPAs and MPA networks are flexibly designed to reflect local social, cultural, ecological, political and historical contexts, they may strengthen community marine tenure and associated management rights. The specific social-
ecological conditions which determine MPA outcomes or influence the selection of diverse MPA rules in Vanuatu were empirically investigated in Chapters eight thru ten and are summarized below.

11.9.2 Ecological outcomes

Chapter eight sought to quantify the ecological outcomes of diverse MPA rules on Nguna and Pele. It addressed a critical question asked by local stakeholders: do both types of closures (GS5e) have ecological value (O2)? Results from the comparative study suggest that periodically harvested closures do, in fact, influence the abundance and biomass of targeted fishes and in invertebrate taxa vulnerable to fishing (RU5 & O2). Although non-permanent MPAs are not popular among conservation biologists, they are widely implemented in the Indo-Pacific. These findings suggest that no-take MPA alternatives (GS5e\text{alternative}) may represent a practical, locally appropriate and ecologically adequate management solution in certain social-ecological systems (O1 & O2).

Functionally, the ecological outcomes (O2) associated with periodically harvested closures (GS5e\text{periodic}) are potentially explained by the intensity and frequency of harvesting within and outside reserves (U8d and U8f). Well-managed infrequent harvest events may not jeopardize the long-term accumulation of stocks inside reserves. Ecological gains from each protection-harvest cycle are not completely lost with each subsequent harvest event. The ecological outcomes of MPA closure rules (GS5e) are likely related to the target organism’s life history and harvest vulnerability (RU2). Protection from fishing activity was observed to have the greatest impact on taxa with vulnerable life histories such as the \textit{Tridacnid} giant clams and trochus. These organisms are vulnerable due to low mobility (RU1). But periodically harvested closures were especially effective for those taxa with high social and economic value, and those heavily targeted by fishers (RU4 & S5).

Interestingly, and somewhat counter intuitively, no-take marine reserves (GS5e\text{no-take}) were not significantly different to adjacent openly fished areas (O2). This finding may be explained by the nature of the communities that implement no-take reserves. It is plausible that no-take operational rules are selected by communities that 1) also have other effective management regimes in place (GS5e\text{ex}), (e.g. permanent and tenure-wide bans on giant clams) or 2) exert less harvest pressure on reefs than other communities (US8d).

To be effective, MPA operational rules (GS5e) should be tailored to the specific ecological characteristics of the taxa to be managed (RU), the market incentives operating within the systems (S5), and the human dependence on and use of marine resource (U8). In this multidisciplinary planning context, it is clear MPAs are only a partial solution to effective and adaptive management.
Figure 54 Schematic representation of the critical variables for MPA ecological outcomes on Nguna and Pele as identified in Chapter eight.

11.9.3 Motivations and perceptions

Chapter nine investigated the local motivations for establishing different MPA rules (GS5g). It also sought to ascertain the perceived ecological (O2) and social (O1 & GS5g) outcomes of different MPA types. Results suggest that both types of MPA operational rules (no-take and periodically harvested) (GS5e) are established on Nguna and Pele in reaction to severely declining resources (GS5f, HT2 & HT3). Both types are broadly expected to enhance the quality (RU5) and availability (RU7) of coral reef resources. Interestingly however, local perceptions about the ecological outcomes of their MPAs (O2) did not always correspond with results from underwater census surveys (RU5) (Chapter eight). This suggests that people’s perceptions (U7d), and not just actual outcomes, are critically influential to establishing MPAs.

Marine protected areas of both types on Nguna and Pele are strongly supported by island residents (S9). Rather than being forced on them from external sources (S10), surveys reveal that island communities approach marine management with an attitude of xenophilia. That is to say, communities locally adapt and hybridize both foreign and indigenous forms of management (ECO3) to become their own (S12). The propensity to hybridize management regimes suggests a well-developed adaptive capacity and flexibility (U8e) to deal with an unpredictable and changing future. To enable continued adaptation, marine management policy must avoid rigid closure prescriptions and MPA panaceas. Effective policy will explicitly consider individual village motivations (U7e) and embrace management innovation (GS5e).
11.9.4 MPA enabling conditions

Delving deeper into the selection of MPA operational rules, Chapter ten investigated whether in addition to motivations, contextual variables also enable the selection of different MPA operational rules. For this investigation, the adapted theoretical framework proved particularly useful for selecting and refining study variables. It also helped to identify those variables which are effectively held constant due to structural similarities among Nguna-Pele communities.

Results of fuzzy set qualitative comparative analyses strongly suggest that some socio-economic variables must be necessarily present in order for a village to select no-take marine reserve rules (GS5eno-take). These ‘necessary conditions’ included local governance effectiveness (GS5c), enforcement capacity (GS8) and population size (U1). While governance effectiveness and enforcement capacity corresponded well with other MPA studies, the finding that a minimum population size is necessary for no-take MPAs is somewhat counterintuitive. However, population likely exerts non-linear influence on MPA rule selection and maintenance. Lower and upper population thresholds may be associated with the selection and breakdown of different MPA operational rules (+U1 → GS5eno-take, +U1 → failed GS5ealternative). No-take rule selection was found to be further influenced by the number of village social organizations (GS2), social capital (U6) and the mean age of residents (U2d).

In contrast to no-take rules, no necessary enabling conditions were found for periodic harvest rules (GS5eph périodique). In practical terms, this finding suggests that periodically harvested closures may represent the ‘easiest’ set of MPA operational rules for ni-Vanuatu communities. The presence of some variables however did increase the likelihood of selecting a closure with periodic harvest rules. These included the simultaneous absence of enforcement capacity (GS8) and ecological knowledge (U7). In other words, communities that are not well informed about the environment or are unable to enforce management are more likely to select rules that allow periodic harvest.

Ultimately this improved understanding of MPA enabling conditions suggests that communities interested in developing MPAs should 1) choose the rules that best suit local contexts; or 2) build local capacity and capital until desirable MPA rules suit local
stakeholders. Communities can and do adapt to and within changing contexts (U8e) but may require support and capacity building along the way.

Figure 56 Schematic representation of the critical variables for enabling MPA rule selection on Nguna and Pele as identified in Chapter ten.

11.9.5 Historical reflections

Chapters five through seven sought to understand why MPAs in Vanuatu are criticized for violating or ignoring ‘ancient customary’ marine management practices. In order to fully contextualize the phenomenon of contemporary MPAs on Nguna and Pele these chapters investigated the historical longevity of coastal resource management in Vanuatu.

Archaeological, ethnographic, observational and oral evidence suggests that marine resources in the Nguna-Pele area have been fully exploited (and often overexploited U8d) since the time of Lapita colonization around 3000 BP (U3 & HT4). While ethnographic evidence confirms the existence of social prohibitions including taboos, it appears these were only recently applied to restrict marine resource use (HT1 & RS9), and even then in only a few locations within Vanuatu (ECO3). An exhaustive review of original sources failed to uncover evidence that marine taboos ever existed on Nguna and Pele. Although marine resources were used on these islands, most were probably acquired through trade arrangements (U8c) and not direct harvest (U8d).

Understanding why marine management did not develop on Nguna and Pele is complex. Extensive warfare throughout the archipelago caused widespread cultural isolation (I4c). Isolated communities were unable to share and transfer of marine management knowledge and innovation to other islands (I2). Although the arrival of Christianity brought a period of relative peace, local ideologies and practices were suppressed (S11). Disease (U2g) and depopulation (U1 & S2) also constrained the practice and transmission of maritime knowledge (U2). Over the last two hundred years, much of island life has undergone radical change (HT4 & HT5), change that further suppresses the maintenance and development of marine management. These changes included language (U2f), tenure systems (GS4) chiefly governance systems (GS5a), and even the geographical location of human settlements (RS9 & U4).
Chapter six disputes the claim that a single form of customary marine management exists (or ever existed) in Vanuatu. It also questions whether prehistoric people actively managed marine resources. Criticisms directed at MPAs and no-take marine reserves by cultural elites are likely motivated by considerations of political power, authority (S11) and indigenous identities (S12), rather than practical or historical concerns about village marine management. This review suggests that contemporary marine management in Vanuatu is not defined solely by historical, cultural, socio-economic or environmental variables, but represents a blending of processes, institutions and actors from all components of complex systems. Ultimately, this investigation of the historical trajectory of the Nguna-Pele system demonstrates that communities there have a remarkable capacity to adapt to changing conditions (U8e).

Figure 57 Schematic representation of the critical variables for understanding the historical longevity of marine management and MPAs on Nguna and Pele as identified in Chapters five through seven.

11.9.6 Contested meanings

Having ruled out a historical basis for promoting one set of MPA operational rules over another (Chapter six), Chapter eleven sought to identify practical solutions for enhancing the policies and governance of marine resources in Vanuatu. Opportunities for consensus were sought in order to minimize local and international misunderstandings. This chapter assessed the typology of MPAs from the perspective of local communities.

In general, Chapter eleven found that the MPA discourse used by ni-Vanuatu communities is converging into distinct and definable typological groups (GS5f): taboos are considered non-permanent closures while conservation areas and MPAs are considered indefinitely closed. Much of the remaining debate about MPAs and MPA discourse is promulgated by post-colonial elites who appear to be politically motivated. They dilute marine management efforts by emphasizing divisive and symbolic concepts like kastom. In contrast to suggestions that foreign elements and international NGOs (GS2) are imposing their will on unwilling communities, the evidence suggests that
contemporary MPAs are being established independently by communities and influenced by an indigenous multiplier effect (S7 & ECO3). Communities fully control marine management, and are assisted by national government departments (GS1), legislation (S8) and local networking institutions (S7). In essence, marine reserve and other MPA discourse are no longer foreign but have become ubiquitous within Vanuatu.

Due to their locally defined nature, many of Vanuatu’s community closures do not meet the internationally accepted IUCN definition of ‘protected area.’ Primarily this is because they are not managed specifically for biodiversity conservation (GS5g). Critically however, even MPA rule types that do not meet the IUCN protected area definition do, in fact, produce valuable conservation and social outcomes (O1 & O2). An ideal MPA policy in Vanuatu would embrace local closure typology (GS5f), while standardizing nomenclature at higher levels for national clarity and international reporting (ECO3 & S7). In this way, local adaptive processes will not be stifled and the outcomes of the MPA phenomenon in Vanuatu can be accurately monitored. Policy makers and practitioners should acknowledge the emerging status quo of MPA typology in Vanuatu: taboo vs. conservation area/MPA. That said, if social justice is to be achieved (S10), island communities must remain free to elect marine management strategies that suit their local social, economic, political and ecological contexts (U8e).

Figure 58 Schematic representation of the critical variables for understanding MPA discourse in Vanuatu as identified in Chapter eleven.

11.10 Value of linked social-ecological analytical frameworks

This study provides a novel contribution to the investigation of marine protected areas by demonstrating how 1) different operational rules may each produce valuable ecological and social outcomes; 2) certain operational rules may be more appropriate in specific social contexts; 3) historical, political and cultural contexts influence their expression; and 4) MPAs can be analyzed using a linked social-ecological system framework. In the absence of this type of hierarchical framework, MPA case studies have not yet easily lent themselves to cross-contextual comparison and often fall into ‘my-case-is-unique’
analytical traps (Basurto & Ostrom forthcoming). Analytical traps of this nature assume that each research question, with each group of users, and in each resource system is unique. While each case IS arguably unique, this line of reasoning precludes the search for commonalities among systems. The process of finding patterns across cases, and identifying critical differences defines the process of knowledge generation, a process Ostrom (2007) calls building conceptual maps. The ability to make finer and finer distinctions among similar cases is the basis of diagnostic science, and improving MPA regimes requires that researchers can identify healthy and unhealthy systems.

However, as this dissertation demonstrates, there is also a strong rationale for explicitly considering multiple components of these complex systems. Unfortunately, the deeper one delves into a system, the more complex and unique the interactions become. Although fascinating, it is of little value to the cumulative power of science simply to describe a system to its most intimate detail. To avoid the ‘my-case-is-unique’ trap it is especially important to consider (at least initially) common variables that have been identified in other empirical studies and have been theoretically validated. For example, published research into both water management in India and coral reef management in Papua New Guinea each suggest that distance to market (RS9) can influence resource management operational rules (GS5e) (Cinner et al. 2007; Meinzen-Dick 2007). Therefore this Vanuatu case study also considered this variable. However, by taking advantage of the ‘natural experiment’ (Banana & Gombya-Ssembajjwe 2000) presented by communities with different MPA rules on Nguna and Pele, it was possible to ‘control’ for distance to market, environmental conditions, and several other key factors in the case study design. Carefully structured comparative case study designs of this nature offer a critical methodological workaround for overcoming ‘my-case-is-unique’ analytical traps, particularly when large-N comparative studies are prohibitively costly (Agrawal 2003).

Most importantly for the development of marine protected area science, this kind of linked social-ecological diagnostic framework also ensures that MPA practitioners, policy makers and researchers will avoid falling into the “panacea” analytical trap (Basurto & Ostrom forthcoming). Analytical traps of this nature assume that all resource systems act in similar and predictable ways, regardless of the characteristics of users, historical trajectories or political contexts. Policy makers falling into this trap may promote blue-print or cure-all type solutions to resource use problems. For example, the current global no-take marine reserve paradigm is likely a direct result of panacea trap thinking and analysis (Guenette et al. 1998; Kaiser 2005). This kind of policy making can be dangerous for local people (Agardy et al. 2003; West & Brockington 2006), especially when MPA rules are applied indiscriminately from one context (often a developed country) to another (often a developing country). Resource management panaceas are also more likely to fail in practice (Ostrom et al. 2007), costing taxpayers dearly (MacDonald & Mazany 1984; Meltzoff et al. 2002).

This dissertation demonstrates how a diagnostic framework can help to avoid MPA panacea traps. Specifically this was accomplished by guiding MPA analysis towards multiple components of the linked social-ecological system, including the users themselves, the governance system, the social, economic, and political settings,
characteristics of the resource system characteristics of target resources, and interactions
between components. There will never be one-size fits all approach to resource
management, and the impulse to find one can be tempered by a thorough examination of
the variables identified here. Equally useful, and with strong social justice implications,
the hierarchical and ontological nature of the framework ensures that variables identified
\textit{a priori} by theory and those identified \textit{a posteriori} through contextual experience and
local knowledge can be simultaneously considered. In other words, marginalized people
can equally contribute to knowledge generation; a role that has traditionally been reserved
for the expert researcher. Allowed to guide future marine reserve research, nested
theoretical frameworks will encourage locally-relevant research, while enabling
comparison and cumulative insight from diverse social-ecological systems.

11.11 Drawing conclusions

From a Commons theoretical perspective, this dissertation has systematically examined
the contexts, outcomes and future directions of community-based MPAs in Vanuatu.
Adapting an existing theoretical framework to include historical, political cultural and
social justice concerns helped to conceptualize Nguna and Pele’s marine protected areas
within complex, real-world systems. In this case study the framework assisted in the
formation and design of this empirical research, but also in interpreting findings in a way
relevant to MPAs more generally. Broad conclusions that can be drawn from the
framework results of the Vanuatu case study include;

1. MPAs are intrinsically tied to and embedded within both ecological and non-
   ecological components of complex real-world systems
2. Understanding the factors influencing and influenced by MPAs can be enhanced
   by embracing multidisciplinary approaches and diverse theoretical orientations
3. Epistemologies and processes of knowledge acquisition that incorporate local
   contextual knowledge add depth and breadth to MPA investigations
4. There are an infinite number of alternatives to no-take marine reserve rules,
   hundreds of which are employed by communities throughout the world, and some
   of which may hold important conservation or ecological value
5. MPAs are not the only marine management tool available, and should be
   considered alongside and in tandem with other strategies.
6. MPA rules may be designed to achieve ecological outcomes, but their
   implementation may be motivated by other factors
7. The selection of MPA operational rules may be a direct result of local conditions
   and contexts
8. Indiscriminately applying MPA policy panaceas (like no-take reserves or ‘kastom
   taboos’) is inappropriate
9. Debates over contemporary marine management strategies may be centered more
   in struggles for power, identity, and authority and less in practical marine
   governance
10. Embracing clarity and building consensus will improve MPA collaboration and
    partnerships across scales
There are also lessons derived from the framework results that are directly relevant to Vanuatu’s MPAs;

1. Consensus is emerging among ni-Vanuatu communities that non-permanent periodically harvested closures are called taboos and indefinitely closed no-take closures are called conservation areas or MPAs.
2. Conservation-focused marine management is a relatively new phenomenon in Vanuatu; historical precedents for MPAs are limited.
3. Ni-Vanuatu communities have the legal and moral right to self determination in marine management and governance.
4. Communities in Vanuatu have historically demonstrated a high adaptive capacity; a quality that should be encouraged, supported and flexibly incorporated into future MPA policy.
5. MPAs in Vanuatu cannot be accurately discussed, analyzed or interpreted in a single disciplinary context.

11.12 Limitations

This work represents an in-depth examination of marine protected areas on the islands of Nguna and Pele in the Republic of Vanuatu. Although political ecology approaches helped avoid the ‘thin’ and ahistorical limitations of snapshot research (McCay & Jentoft 1998), the generality of the results it is constrained by the small number of cases examined. Ideally, studies that attempt to quantify mean outcomes or general predictive conditions should be based on large-N samples (Agrawal 2003). Although desirable this was not possible in the limited time and financial contexts of this PhD dissertation. However, expanding the focus of the study to a larger number of community MPAs would have invalidated the ‘natural experiment’ inherent in Nguna-Pele communities with different MPA strategies.

Ecological assessment of different MPA operational rules was based on the contrasts between closed areas and adjacent control or open areas. In experimental biology this is known as a control-impact empirical design. However this form of design is often insufficient to evaluate the causal significance of a variable (for example MPA operational rules), because it does not incorporate a temporal component to the analysis (Stewart-Oaten et al. 1986). Without temporal controls, it is impossible to rule out the possibility that closed sites and control open sites perform differently due to some unknown variable unrelated to protection from harvest (Block et al. 2001). In order to accurately assess the effects of protection, this kind of study should ideally have utilized a Before-After-Control-Impact (BACI) empirical design (Underwood 1992; Underwood 1994). Unfortunately this was not possible because reserves in Vanuatu are commonly initiated by communities without detailed planning or prior baseline assessments.

Another factor which has constrained the breadth of this structured case study comparison was a failure to investigate the social-ecological contexts of communities with no MPAs.
or management regimes. The original study design did, in fact, plan for the empirical investigation of three (3) communities with permanent reserves three (3) with periodically harvested closures and three (3) with no management regimes. However, at the Nguna-Pele Marine Protected Area summit where research priorities were finalized, the research team was only invited into communities with existing MPAs. It is plausible that the communities on Nguna and Pele without management regimes in place felt that this research could disadvantage them in respect to their neighbors. In any case, the field research component of this dissertation took over eighteen months, and adding additional study sites would have significantly extended the required research period. However, if no-management sites were contrasted with those with MPAs, it would enable a much clearer understanding of the enabling conditions for management emergence.

Unfortunately, several variables which have been identified in the literature as critically important to the outcomes of MPAs were not sufficiently investigated in this case study. For example, it is widely acknowledged that harvest intensity, both within and outside MPAs, will significantly determine ecological outcomes (Cote et al. 2001). While it may have been possible to collect detailed harvest intensity data, experience in other South Pacific communities shows this to be a time intensive and often unreliable exercise (Anderson & Mees 1999; Jennings & Polunin 1996a). To measure the real impact and value of MPAs to local residents, a study design incorporating catch per unit effort would have been ideal (Kaunda-Arara & Rose 2004).

Finally, when investigators possess extreme familiarity with their case studies, such as my own with Nguna and Pele, it may lead to overconfident generalization of results or even inaccurate assumptions about the system. This phenomenon has been well-demonstrated in the field of psychology, where practitioners begin to feel they ‘know’ their subject and even start to make unsupported predictions about his/her future behavior (Oskamp 1965). While some elements of this dissertation are based on my experience alone, I hope the reader is convinced that the majority of the findings and conclusions here presented are supported by robust empirical evidence. Unfortunately, empirical field research is the exception to the rule in MPA discourse, debate, and research in Vanuatu, a limitation I hope this dissertation can begin to overcome.

11.13 Future research

The concrete methodological limitations of this study suggest that there is scope for expanding the research questions set out at the beginning of this dissertation. In particular this chapter highlights the need to undertake ecological research on alternatives to no-take marine reserve rules, specifically by utilizing robust BACI survey methodologies in multiple sites around Vanuatu and the Indo-Pacific. There is also a critical need to examine how MPA alternatives create social benefits and work to reduce the present rates of marine reserve failure (Burke & Maidens 2004; Christie 2003; McClanahan 1999). Although historical and cultural analysis suggests that ancient marine management regimes did not evolve on Nguna and Pele, there may be other sites in Vanuatu in which they did. Understanding the nature of any long-existing management
systems will be useful to contemporary communities, and represents a neglected area of research in Vanuatu. A database project to document traditional ecological knowledge was started by the Vanuatu Cultural Center but has since been abandoned. There is also an urgent need to further investigate how new government legislation, like Vanuatu’s Environmental Management and Conservation Act, can be implemented in a way that fosters discursive clarity but also embraces the country’s inherent diversity.

More broadly, this case study of MPAs in Vanuatu contributes to the collective understanding about how and why resource users self-organize to collectively manage natural resources. Over the last twenty years, commons theory has enabled researchers to significantly contribute to and cumulatively learn about the conditions that enable governance success (Baland & Platteau 2000; Dietz & Henry 2008; Dietz et al. 2003; Ostrom 1990; Wade 1988). However the conditions that enable the emergence and evolution of collective action regimes require urgent empirical investigation (McCay 2002). Researchers have examined institutional emergence in forestry and watershed management systems (Anderson White & Ford Runge 1995; Lubell et al. 2002; Ostrom 2000), but like the use of social-ecological frameworks, they have been slow to examine emergence in studies of marine protected areas. In an era where fundamental change defines our existence and our future (Folke & Rockström 2009), there is a critical need to further investigate how collective action emerges and evolves.

The chapter of this dissertation examining the conditions that enable the variable selection of diverse MPA rules only scratched the surface of this exciting field of enquiry. Aided by emerging analytical tools like fuzzy set qualitative comparative analysis (Ragin 2008), the potential to derive broad-scale understanding from carefully designed comparative case studies has never been greater. Like this investigation into the conditions that enable the selection of MPA rules, future research should begin to tease out the conditions that foster the adoption of diverse institutional scenarios. There is a theoretical need to move beyond simply uncovering correlations among variables, but rather to design empirical studies to unearth underlying causality (Stern et al. 2002).

Beyond the scope of the present research is a concern that marine protected area networks may be rapidly turning into the next marine governance panacea. Today they are promoted by many marine scientists almost as a cure-all strategy to enhance marine processes and biodiversity (Almany et al. 2009; Wood et al. 2008). The institutional and governance difficulties of scaling up MPAs into effective networks have also been flagged (Lowry et al. 2009; Ruckelshaus et al. 2008), although robust research designs have yet been developed to address these issues. There is an incredible research opportunity in Vanuatu and other Pacific Islands to investigate cross-scalar MPA institutions and networks. Examples include the Nguna-Pele Marine Protected Area Network and the Vanua’Tai Resource Monitor Network discussed in Chapter six. Research into bridging institutions like these should focus on their governance structure, tensions between costs and benefits at various levels, sensitivities to local interests, outcomes, and of course, the factors that enable their emergence and evolution.
Once sets of general variables have been identified that may account for the emergence or adaptation of marine management institutions, it will necessary to begin constructing databases of multivariate analyses across other social-ecological systems (Chhatre & Agrawal 2008). With moderate-N samples, for example 20-30 sites each in the Solomon Islands, Papua New Guinea and Vanuatu, it will be possible to begin diagnosing the causal agents for institutional emergence, adaptation or degeneration. Acquiring this level of data is not difficult, and is achievable in the next 3-5 years. It will require robust research partnerships among individuals and groups working in these countries.

Strategic research partnerships like those developed in the Pacific (and potentially others with a wider geographic focus) will be necessary to answer critical questions for marine management more generally like 1) what factors influence the speed of marine management adaptation/institutional change?; 2) do rates of institutional change coincide with rates of social-ecological-climate change?; 3) how can groups that do not have adaptive capacity/fast rates of institutional change be transitioned to future scenarios?; and 4) how might improved understanding of marine institutional innovation and emergence be of value to solving broader poverty and development issues?

However, in the current era of rapid and often devastating global change (Barnett & Adger 2007; Folke & Rockström 2009), policymakers can’t wait indefinitely for perfect science (Carter 2008). This dissertation represents the kind of active and frank dialogue between marine protected area science and policy that will hold practical relevance and value for MPAs around the world. It is a dialogue that bases its findings, action and recommendations on adaptive experimentation, much like the way that communities on Nguna and Pele began actively experimenting with management strategies before and alongside the development of scientific analysis.

The type of social-ecological applied policy research required to confront an unpredictable future must move beyond calls to incorporate social science into the investigation of marine protected areas (e.g. Mascia 2003). Future social-ecological systems research will need to examine the multidisciplinary and multiscalar nature of marine governance. It is also critical to understand how different scales interact horizontally and vertically (Armitage 2008; Berkes 2008; Reid et al. 2006), and (building on the work of this dissertation) how contextual factors influence the adaptation and evolution of those multiscalar institutions.

While it is desirable to maintain some aspects of complex systems (e.g. livelihoods, identities etc), long-term systemic sustainability requires that systems develop the capacity to adapt (Anderies et al. 2004; Berkes 2007c; Gunderson & Holling 2002). What are the critical factors that enable adaptation and how do they interact within social-ecological systems? Solving these dilemmas could mean the difference among collapse, persistence or transformation of many global societies.