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Marine resource management challenges in traditional societies: managing and conserving resources at the community level

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There is a diverse history of customary controls over the allocation of coastal space and resources. Traditional fishing societies found in many coastal regions have historically limited effort, catch, and outsider access in their homelands as a means of protecting their stocks. However, the advent of commercial markets, changing behaviors, drastic increases in population, and formalized governments and institutions, has necessitated a more collaborative approach to coastal resource management. One method that has been successfully implemented in several islands in the South Pacific is a cooperative arrangement between village and national or territorial governments. The rationale for such collaboration is the need to utilize government sponsored science and management expertise, as well as enforcement and monitoring capabilities, while ensuring a bottom-up scheme. American Samoa, the only US possession in the South Pacific, has successfully initiated a Community-based Fisheries Management Program (CBFMP) that is actively addressing many areas of coral reef decline, particularly fisheries and fish habitat. This program is a unique marriage between traditional/cultural methods of marine conservation and the resources available at the territorial Department of Marine and Wildlife Resources. Featured aspects of this management effort are the establishment of marine protected areas under the control of village leadership, sustainable fishing practices, and long-term management plans. There have been numerous challenges to full implementation, including funding for equipment, staffing issues, enlisting village support, and inadequate enforcement and monitoring. Discussed herein are some of these challenges, lessons learned, and recommendations for future directions of the CBFMP.

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1. Introduction

Though limited data exist with which to make comparative judgments, and sliding baselines make it difficult to point to optimum states, it is apparent that fish and shellfish catches throughout the tropics have been in decline for many years. (King and Faasili, 1999). In the South Pacific, countries rely upon subsistence level fisheries as an important source of protein. One estimate is that 90% of South Pacific Islanders’ protein is ocean-derived (Lam, 1998). Given the nutritional, cultural, and economic importance of healthy fish stocks to traditional societies in the Pacific, nations and territories have been examining methods to increase catch and protect or restore habitat.

One tool that has gained immense ground in the past two decades is the use of no-take or zoned marine protected areas (MPAs). A 1995 count found over 1,300 MPAs worldwide (Kelleher, 1995). Though many of these, were found to be ‘paper parks’, existing only on a chart, MPAs have generally accepted as useful for increasing or maintaining endangered populations, as well as important habitats and communities when properly implemented (Ticco, 1995). Additionally, it is argued that MPAs are, comparatively, among the least laborious of fishery management methods (Roberts and Polunin, 1993). Worldwide, small-scale fishing communities (e.g. village level) have employed traditional methods of managing nearshore fisheries for centuries. These tenure systems were often based on local resource knowledge and an understanding that such resources are finite (da Silva, 2003; Jonannes, 1987). Such “community-based” management has gained acceptance within western fishery management regimes within the past 20 years, as local resource managers attempt to halt fishery declines, better engage stakeholders, and gain support for often unpopular management decisions. Many Pacific communities are now utilizing a bottom-up approach, in which the goals of the management program are determined at a village or regional level. The current paper discusses the details of one such effort.

2. Setting

American Samoa is a U.S. Territory located approximately 4,200 kilometers south of Hawaii. It is the southernmost of all US possessions, and the only US jurisdiction in the South Pacific. American Samoa is comprised of seven islands (five volcanic islands and two coral atolls). The combined land area of the islands is approximately 150 square kilometers. The five volcanic islands, which are the major inhabited islands of American Samoa, are Tutuila, Aumua, Ofu, Olosega and Ta'u. Tutuila, the largest island, is also the center of government and business. The three islands of Ofu, Olosega and Ta'u, collectively referred to as the Manu'a Islands, are 106 kilometers east of Tutuila. Two outer islands, Rose Atoll and Swains Island, are approximately 255 kilometers and 370 kilometers from Tutuila respectively. Both are quite small, with Rose Atoll in protected status as a National Wildlife Refuge and Swain’s inhabited by a subsistence population of about 20 people. The islands are small, ranging in size from the populated high island of Tutuila (142 km²) to the uninhabited and remote Rose Atoll (4 km²).
The total area of coral reefs (to the 100 m depth) in the territory is 296 km² (Table 1). Due to the steepness of the main islands, shallow water habitats around the islands are limited and consist primarily of fringing coral reefs (85% of total coral reef area) with a few offshore banks (12%) and two atolls (3%). The fringing reefs have narrow reef flats (50-500 m); depths of 1000 m are reached within 2-3 km from shore.

The main islands are all mountainous, and the land is at a premium. The climate of the Territory is tropical humid and rain showers are frequent. Recent studies are proving that biological linkages exist within the Samoan Archipelago, which encompasses both American Samoa and, to the west, the country of Samoa.

**Coral reef status**

Until recently, coral reefs in American Samoa were in a long recovery phase after numerous perturbations ranging from poor water quality in the harbor, crown of thorns starfish outbreaks, storms, and coral bleaching. Although some of the more remote reefs recovered from many of these incidents, those impacted by human activities have been slow to mend. The reefs in Pago Pago Harbor remain the most affected. Population density, commercial activity on and near the water, and historical dumping of civilian, military, and industrial waste in the inner harbor area are all contributing factors to the ecological damage and slow improvement of coral habitats.

While reefs in American Samoa remain “healthy”, compared to locations with multiple uses, the Territory has also experienced, within the past several years, increased incidents in bleaching and disease, impacts from land-based sources of pollution, decades of overfishing, and a drastic increase in population during the latter half of the 20th Century. Shifts in global climate schemes are affecting the Territory’s weather and bringing physical dangers posed by wave action due to coral holes, increased or decreased rainfall, phase and community shifts on reefs, and sea level rise. Most recently, damage occurred
to north shore reefs as a result of Tropical Cyclone Heta. Having relied on the reef ecosystem for protection, food, and goods and services for millennia, residents of American Samoa may face severe disruptions of lifestyle, public health hazards, and a decreased ability to be self-supportive.

Resource management

Coral reef management has strong support in the Territory. The territorial government is an active participant on the United States Coral Reef Task Force. In its collaboration with the U.S. Coral Reef Initiative, the American Samoa Government has participated in and overseen many successful management and science activities, which have increased the effectiveness of inter-agency collaboration on projects and have created greater cooperation among local organizations that have common interests in marine science and conservation.

Resource management of the Territory’s fragile coastal and marine assets is an on-going challenge. Innovative tools, culturally-sensitive outreach, and creative negotiation mechanisms to inform landowners, fishermen, children, tourists and cultural leaders on the importance of resource preservation are required, given the limited economy, landmass, and traditional practices in American Samoa. Several environmental efforts have failed over the years due to a lack of sensitivity.

3. The community-based approach

Perhaps the most important lesson learned in tropical coastal management experience in the past several decades is that laws and regulations enacted by national authorities in developing countries often have little local effect. Instead, a sufficient portion of society must want the change for it to occur and be sustained (Christie and Olsen, 2000). This is due to the fact that management controls are often not practiced at the local level, but rather are handled by a government agency that is often headquartered many miles away. Such situations are not optimal for stakeholder engagement and support, and usually result in a low compliance rate.

In recognition of this, there has been an increase in the number of community-based management programs over the past two decades. This arrangement is also referred to as “co-management”, and often formalizes processes that are already occurring at the local level. Co-management has been defined as “a collaborative and participatory process of regulatory decision-making between representatives of user-groups, government agencies and research institutions.” (Jentoff, 2000). In societies that have retained a traditional cultural identity, co-management can be seen as a way to create a more positive working relationship with political administrations, and distance a village, region, or territory from governance practices that were thrust upon it following 18th and 19th century colonialism. There are many versions of community-based management. In some cases, user-groups are small, and resource issues are few. Some locales have limited government
capabilities, and thus rely on cooperation at the local level. However, in all cases a mutual trust and respect must exist between the management partners. In areas that have more sophisticated government science and management regimes, a situation that allows the village or community to determine management goals and needs, as well contribute to the enforcement and monitoring, while relying on a government agency or non-governmental organization for technical advice and services, capital, and equipment, has become the norm.

4. The American Samoa experience

Village communities in American Samoa have, for centuries, managed their reefs in accordance with traditional fishing and stewardship practices, which were long ago incorporated into the Samoan way of life, or fa’aSamoan. Effective, yet controlled, techniques, such as ‘matamua’-long sharpened polees-, tabooos, and consumptive take, contributed to a sustainable harvest year after year. Nets were made of natural fibers, and were often employed on a large-scale only after village council approval. However, a drastic increase in population during the last century, technological developments, and a shift from a subsistence to an artisanal or commercial fishery, have caused the decline of almost all important food species on Samoan reefs. The Community-based Fisheries Management Program (CBFMP), administered by the American Samoa Department of Marine and Wildlife Resources (DMWR), was implemented in 2001, and is based on a successful model employed in Samoa several years earlier (see King and Faasili, 1999).

Figure 2. Population growth in American Samoa.

The need for a better approach to marine resource management has been illustrated by the results of several long and short-term fisheries studies, including DMWR’s Inshore Creel Survey (see Green 1996, Birkeland et. al 2001, Green 2002, Craig, 2004).

In 2000, using a semi-structured interview (SSI) questionnaire, DMWR staff conducted a survey in 11 randomly selected villages on Tutuila and the Manu’a group. The SSI was determined to be the best method because it relies on a set of questions that acts as a
guide, but gives the interviewee the flexibility to give open ended, opinioned answers. Semi-structured interviews are used more extensively in small-scale evaluations and are useful when interviewees are in a range of categories (e.g. village leaders, various user groups) (Robson, 2000). The survey was primarily aimed at eliciting opinions on the main causes of fish declines, and to determine any recommendations from communities on ways to improve their fisheries (Sauafea, pers.comm.). A high percentage of respondents listed one of three destructive fishing methods (dynamite, bleach, and the local fish tranquilizing chemical found in the root ovanuiakane) as principal factors affecting reef fish populations. Concern about outsider access was also high (19%), followed by discarded fishing nets and trash, at six and three percent respectively (see Figure 3).

![American Samoa Total Catch](image)

**Figure 3. DMWR Inshore Creel Survey catch data.**

The survey was also designed to ascertain where fishing pressure was heaviest. Results indicated that a majority of the respondents (77%) fished only the fringing reef area, with a further 10% fishing both open seas and reef areas. Most of these fishers do so twice to 12 times a month. Few fishers responded that they fished more than 12 times in any given month. This effort, together with past studies undertaken by DMWR, suggested that a program directly addressing input and output controls as well as habitat, was the best starting point for any fisheries-specific community based management in American Samoa.
5. Program extension process

There are three for selecting a village for inclusion in the program: 1) to determine how well organized the Matai (chief) system, Anułam (young women's group), and Aumaga (young men's group) are, 2) determine the level of interest, inferred from an informal meeting with village leaders, and 3) a careful assessment of a) the significance of the marine environment to the village; b) the extent of any known problems with the local marine environment; and c) the willingness to work towards solving these problems.

The first step in the process is to conduct an initial contact with the village chiefs to set a date for a First Meeting with the village council. The program's cultural officer, who is a representative from the government Office of Samoan Affairs, establishes contact with the village mayor and leaders to arrange this meeting. Protocol dictates the presence of the DMWR director, departmental cultural officer, and the lead of the program at the First Meeting, which is formal and traditional. This important meeting provides DMWR with an opportunity to introduce the program in an appropriate manner, and to gain the village's support for the program. After acceptance, group meetings are arranged. The cooperative agreement is given to the village during the First Meeting for their review and signature. The agreement outlines the program responsibilities and obligations of both the government (DMWR) and village.

![Figure 4. Fishing location preferences](image1)

![Figure 5. Fishing effort](image2)
Figure 6. Villager perceptions on fishery issues prior to CEPMP (n= 253).

Group meetings (with the Matui, Amuluma, and Aumaga) are then arranged to identify the main threats to village reefs and fisheries, and to identify any possible solutions. From these group meetings, members of the Fisheries Management Advisory Committee (FMAC) and Monitoring and Enforcement Committee (MEC) are chosen. FMAC members are tasked with drafting a Fisheries Management Plan, and the MEC is responsible for enforcing the provisions of this plan, both with assistance from DMWR. Thus far, most MECs have been helpful and supportive in reporting illegal fishing and other destructive activities observed in their reef areas. MECs are also tasked with conducting regular monitoring of the giant clams (lehusu) stocked by DMWR in their MPAs.

![Diagram showing the process of village DMWR collaboration](image)

**Figure 7.** Outline process of a successful village DMWR collaboration.

**Village management plans**

Within one year of inception, the program contained five villages with promulgated management plans. These villages’ marine protected areas became the catalyst for four additional villages. Currently, the program has seven participating villages (figure 8).

Village plans vary, with some having for spatially-designed no take areas, and others have closures of the entire community area to fishing for one-two years. With specific exceptions for traditional village matters, community MPAs are in effect for one-three years. While not every management plan is the same, general responsibilities of the village include protection and management, adhering to all aspects of the management
plan, voluntariness providing commitments of labor for monitoring and enforcement, and participating in relevant meetings at the village and territorial level. Agency responsibilities include technical assistance and advice, organizing and funding workshops and training, and funding villagers equipment needs.

Figure 8. Community-based Fisheries Management Villages

5. Discussion

Since the creation of the CBEMP, program activity has varied from village to village. Primarily this is due to traditional Samoan events that limit the availability of community members, the levels of commitment to the program from each community, and recent DMWR staffing shortages. Traditional events include funerals, which can last up to a week, weddings, cultural affairs, and seasonal activities. Since most of these are laborious to plan and implement, often there are only one or two individuals left to continuously coordinate MPA efforts.

Pouoa and Alofitu, the first two villages to join the program have, after two years, reopened their closed areas. The third village, Vaitia, reopened its closed area just recently- after two years of co-managing their reef area with DMWR. This time frame was outlined in the villages’ management plans. Subsequent fishing has been limited in scope and gear, as per village regulations. In these three villages, it was noted that fish abundance was greater after two years, and it was generally agreed that catches after reopening the closed areas were higher. However, no empirical data exists with which to statistically illustrate any observed difference. The perception that there are more fish within the closed areas has gained local media attention, and has proved a catalyst for other villages to seek inclusion in the program.

As the program progressed, there has been a perceived increase in environmental awareness in participating villages. Since part of the initial process included identifying
key threats to reef health, villagers are now more aware of acute and chronic problems that affect coral ecosystems. In addition, local resource agencies, such the American Samoa Environmental Protection Agency, Department of Commerce, American Samoa Community College, and the government environmental education group Le Tausagi have utilized the willingness of these villages to be involved with protecting their resources to engage the community with education and outreach targeted at all manner of environmental issues.

6. Lessons learned

Stakeholder support and participation

Implementing such a program in any coastal community is a difficult task. However, in traditional communities, especially ones that have long histories of local control, government intrusion in too many village affairs can be disruptive at the least, and at the most, contentious. To counter this, the CBFMP was formulated to be community-driven, educate villagers about the need to better steward local resources, and to motivate community leaders to action. Much initial emphasis was placed on creating fact sheets and brochures about the program and other fisheries-related issues, as well as partner building, workshops and presentations to the community, government agencies, and the territorial legislature (Fono), and press releases in the local newspaper and radio stations.

Long-term strategic planning

After two years, some of the management plans are already expiring. This has underscored the need to design a system whereby the CBFMP adopts a longer-term strategic plan, which will address major programmatic components, such as goals, funding, monitoring, evaluation, and leadership. One option may then be to develop, implement, and revise within this framework village plans every five-years. These will detail micro-programmatic issues, such as the length (time) of temporal reef closures, the length of re-openings, the level of fishing effort that will be allowed during those re-openings, proactive conservation methods, and other concerns.

Control of outsider access

While most MECs and councils have been successful in obtaining village support and cooperation, a large problem has been outsiders (individuals from other villages and countries) violating village rules. As these individuals do not belong to the village, they have no stake or concern in the management of its resources. Until village regulations are incorporated into the territorial legal system, police and other enforcement-capable agencies are unable to assist much.
Equipment disbursement and maintenance

While DMWR and other on-island organizations, such as the Coral Reef Advisory Group, have provided funding for equipment needs (snorkel gear, binoculars, radios), a system to distribute these to the villagers, as well to ensure that they are being well maintained, has not yet been enacted. Consequently, disputes occasionally arise as to who has equipment, and how much remains in usable shape.

Village organization

With no overarching organization (e.g. an active and regularly meeting CBFMP village network) to serve as a communications and oversight body, the CBFP villages are perhaps losing out on the ability to receive grants that would help them to be self-sufficient. Such a body could take the form of an NGO or a simple a non-profit organization.

Other program needs are:

- **Capacity**

  American Samoa has historically suffered from a lack of staff, especially Samoan professionals. Local training opportunities, four-year university scholarships in the marine sciences, and internship programs for local college students should be priorities.

- **Stakeholder support**

  Support for endeavors that may take several years to show any benefit is lacking. Managers have also had a difficult time persuading villagers and leaders that such programs work, either from lack of background science or inadequate conveyance of case studies and associated information. Other jurisdictions have successfully utilized community members and leaders as presenters at workshops and conferences, which help solidify support and pride in their MPA, and this may work for the CBFMP.

- **Enforcement**

  Though each participating village does have a Monitoring and Enforcement Committee (MEC), without proper motivation and coverage, unwanted activities can, and do, occur. Other impediments to better enforcement within the CBFMP are inadequate funding to hire and equip personnel (boat, vehicle, gas, safety gear) and proper training programs to ensure their safety.

- **Monitoring and evaluation**

  The CBFMP has no coordinated monitoring program. One is needed to determine the efficacy of management, both for the villagers themselves, and grantors that provide monies to establish and help maintain the MPAs. DMWR staff are currently working to design a simple survey to determine fish biomass and coral condition in the MPAs.
7. Conclusion

The CBFMP is seen by many as a successful government-community partnership that has already benefited actively participating villages. The program has also shown, along with other regional efforts, that rather than inhibit quality resource management, traditional controls and customs can be used to augment existing government and NGO programs.

However, due to programmatic deficiencies, success thus far has not been quantified, and in lieu of empirical evidence, managers must rely on word of mouth, good working relationships, and anecdotal evidence to further community efforts in the Territory. This issue has divided managers and scientists and will continue to detract from the successes of the program.

As previously discussed, several lessons have been learned from implementing this program in the Territory. Perception is important in Samoan society, so the appearance of success is often as important as actual success.

Approach is critical, given the strong ties to the traditional way of life. Many plans have failed in American Samoa due to a heavy-handed, top down approach, which immediately puts villagers in a defensive mode. Since the CBFM emphasized village responsibility and ownership, as well as a proactive and accommodating extension approach, the program has been able to avoid some of the problems that have resulted in programmatic failure in American Samoa.

Monitoring has also proved important, even in light of the above-mentioned perception successes. Data resulting from a monitoring program would drive management actions, and would signal a commitment to the program on behalf of the government that some community participants feel is lacking. Indeed at several recent meetings, this commitment has been questioned. Finally, though much of the CMFMP utilizes simple, cost-effective management techniques, some funding is required to ensure that a comprehensive program is realized.

Communities in American Samoa are slowly realizing that a program designed to give them control of their resources is beneficial, and some successes have been realized after only a short time. With the addition of key DMWR staff, and a commitment to rectify program deficiencies, the Community-based Fisheries Management Program of American Samoa should have a bright future.
Acknowledgements

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