TRADITIONAL MARINE RESOURCE MANAGEMENT

IN RAJA AMPAT, INDONESIA

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We certify that we have read this thesis and that, in our opinion, it is satisfactory in scope and quality as a thesis for the degree of Master of Arts in Geography.

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CHAPTER 1

INTRODUCTION

1.1 Nature of the problem

The marine environment is increasingly threatened by exploitation and degradation caused by burgeoning human populations, technological advances, and increased access to markets. About 70% of all fish stocks globally are overexploited, which suggests that the global maximum potential for marine capture fisheries has been reached (FAO 2004). Approximately 64% of Southeast Asia's reefs are threatened by overfishing (Burke et al. 2002), which threatens the livelihoods of millions of coastal people who depend on marine resources for food. Scientists and conservationists are struggling to address the global fisheries crisis, and management strategies are desperately needed to protect the remaining fish stocks and the millions of coastal people who depend upon them for food.

Local marine management strategies, specifically customary marine tenure systems, have been suggested as a means to respond to this global crisis (Ruddle and Johannes 1985; Kuemlangan 2004). Customary marine tenure is defined as the way in which resource users “perceive, define, delimit, own, and defend their rights to inshore fishing grounds” (Ruddle and Akimichi 1984). Building customary marine tenure into modern marine management strategies can help make the strategies more robust by making them more locally relevant and incorporating a vast body of marine resource knowledge into the management system. Customary marine tenure is not enough,

however, to protect marine resources in many parts of the world. Mechanisms must also be put into place to reinforce the rules and enforcement capacity of customary marine tenure, because without these supporting mechanisms, marine tenure can lose its effectiveness. Conservation organizations that build marine conservation strategies on existing local traditions, therefore, must evaluate the social, political, and economic factors that affect customary marine tenure before simply adopting the foundations of marine management into new conservation strategies. Additionally, marine tenure practices that are effective in one area will likely lose their vitality if transferred outside the cultural end ecological context from which they developed, thus the framework may be applied in other areas, but the specific practices will need to be adapted to each local situation (Poepoe et al. 2001).

Adherence to customary marine tenure is strong among communities in Raja Ampat (McKenna et al. 2002; Donnelly et al. 2003). This group of islands off the northwest tip of West Papua, Indonesia spans over 4 million hectares of land and sea (Figure 1.1). It includes four large islands: Waigeo, Batanta, Salawati, and Misool, and hundreds of smaller islands. Raja Ampat possesses over 75% of the world's coral species, the highest hard coral species richness in the world (Donnelly et al. 2003).

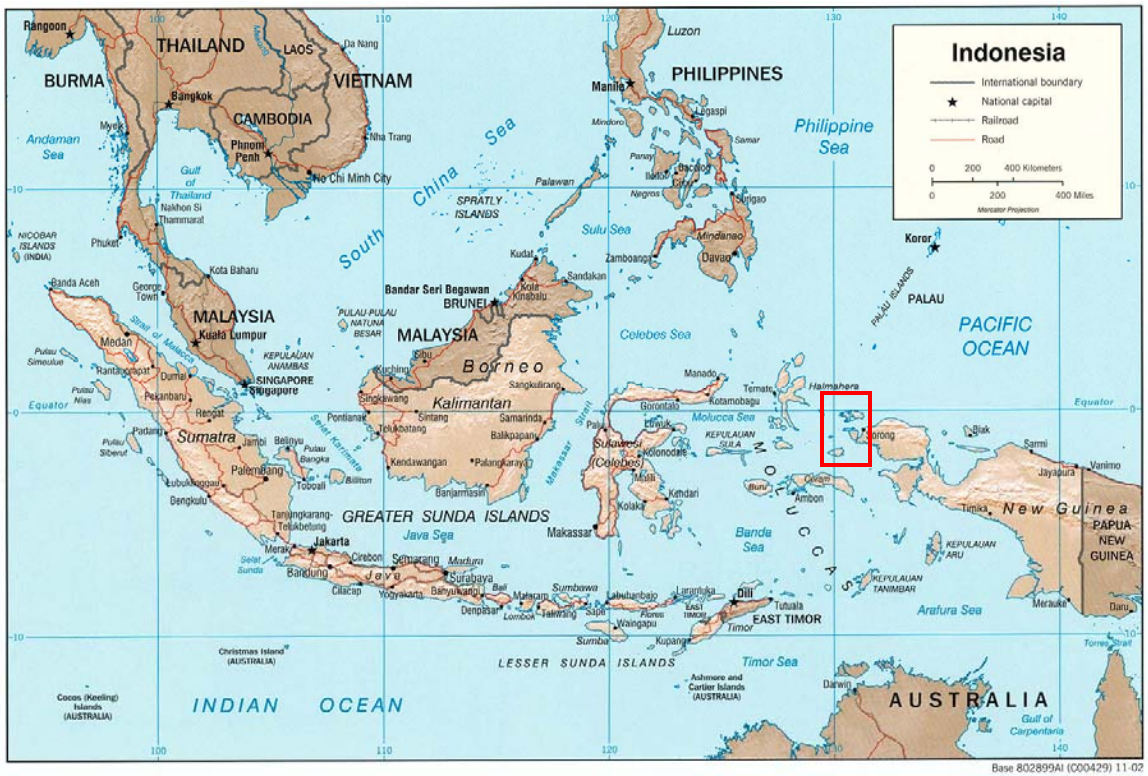

Figure 1.1. Map of Indonesia, Raja Ampat in red rectangle, the western half of the island of New Guinea is now West Papua; (U.S. Central Intelligence Agency 1998)

Threats to the marine environment include destructive fishing, overfishing, turtle poaching, and unsustainable logging, which causes sedimentation run-off and damages coral reefs (Erdmann and Pet 2002; McKenna et al. 2002; Donnelly et al. 2003). To preserve the valuable ecosystem and the livelihoods that depend on these resources, Raja Ampat has been identified as a global priority for protection, and The Nature Conservancy (TNC) and Conservation International (CI) have joined forces to design a conservation strategy for this area (McKenna et al. 2002; Donnelly et al. 2003). Raja Ampat is being considered as a UNESCO World Heritage Site (Hillary et al. 2003), and the Indonesian government has recently established this area as a separate administrative unit, which will give communities a greater say in managing their natural resources

(Donnelly et al. 2003). This structure also offers an important opportunity to include conservation in the spatial planning of the newly formed local government.

Conservation organizations are working in close partnership with the government and local communities to conserve marine resources through the development of marine protected areas (MPAs) in Raja Ampat (Halim and Suebu 2004). This project was developed to support marine protected area design by documenting customary marine tenure, marine resource knowledge and use, the condition of marine resources, and the perception of threat to marine resources in two villages.

1.2 Sasi

The rules and regulations of customary tenure are often referred to as *sasi* in Indonesia. *Sasi* is an Ambonese-Malay term which likely derives from the Malay word "*saksi*" meaning "to witness" or "witness" (Zerner 1994; Pannell 1997). *Sasi laut* refers to rules and regulations controlling marine resources and includes restrictions on fishing gear, species harvested, time of harvest, location of harvest, and who is allowed to harvest natural resources (Bailey and Zerner 1991; Zerner 1994; Ruddle 1994). In addition to regulating access and use of marine resources, *sasi laut* also incorporates a complex set of institutional roles with varying degrees of relationship to religious and government authorities (Zerner 1994). These roles and relationships are critical for maintaining the effectiveness of sasi which has structure and ethics of that are defined by *adat*, or customary law (Harkes and Vozaczek 2002). *Adat* law and national law coexist in Indonesia. Due to post-1998 political decentralization in Indonesia, elements of *adat*

law are reemerging in the governance system of distinct ethnic groups at the local level and play an important role in property and inheritance matters, specifically marine tenure rights (Linnan 1999). Currently, the sea belongs to the state of Indonesia and the fisheries and any management regimes operate under the national law (Harkes and Vozaczek 2002).

1.3 Study area

The Raja Ampat islands of West Papua, Indonesia hold record numbers of marine species: 1074 species of reef fishes and 536 scleractinian reef-building corals have been identified (Donnelly et al. 2003). These islands lie on the Western border of the equatorial Pacific Ocean and northeastern entrance to the Indonesian Throughflow from the Pacific to Indian Ocean. The Indonesian Throughflow is made up of a series of ocean currents that flow from the tropical Western Pacific Ocean through the Indonesian Seas into the South Indian Ocean. Most of the archipelago is on two continental shelf areas that are separated by the Sagewin Strait, and the continental shelf edge creates a strong gradient from clear water to open ocean, and to sheltered and turbid bays (Donnelly et al. 2003).

Two villages, Tomolol and Fafanlap (Figure 1.2) located on the island of Misool in southeast Raja Ampat, were selected for this research because:

- customary marine tenure still exists in both villages;
- both villages have been identified as high priorities for conservation by TNC and CI;

- both are candidate sites for marine protected areas; and
- logistically, they are located near each other and are accessible by boat

Figure 1.2. Map of the Raja Ampat archipelago (Adapted from http://www.thesevenseas.net/images/map_rajaampat_s.jpg)

Tomolol and Fafanlap are located about 170 kilometers southwest of Sorong, a major port located on the western tip of Papua. Tomolol is located at 1º55'S, 130º20'E, and Fafanlap is located at 2º00'S, 130º22'E. There are about 8,716 people on the island of Misool, with 200 in Tomolol and 800 in Fafanlap. Estimates of the total population of Raja Ampat range from 32,000 to 48,707 (Remijsen 2001; Mckenna et al. 2002; Donnelly et al. 2003).

There are three indigenous languages in Misool, *Matbat*, *Ma_ya*, and *Biga* (Remijsen 2001) and many more spoken in Raja Ampat including *Salawati, Kawe*, *Legenyem*, and *Amber* (Donnelly et al. 2003). Approximately, 10% of the population speaks indigenous languages, but all villagers speak Bahasa Indonesian, and children learn Bahasa at school.

Clear distinctions exist between sea-oriented and land-oriented groups in Misool (Remijsen 2001). Although most inland groups have moved to the coast (Remijsen 2001), this distinction explains cultural and religious differences between these populations. The *Ma_ya*, or sea-oriented groups, are Muslims who trace their habitation on coasts back to mythical times (Remijsen 2001). Fishing is their main activity, and this group has trade contacts outside of Raja Ampat, specifically in the Moluccas. The land-oriented groups (e.g., *Matbat*[1]) have been Christian since the mid 20th century, lived inland until the mid 20th century, produce sago as their main economic activity, and have had little contact with outsiders.

[1] *Matbat*, an inland group in Misool, call the Muslim sea-oriented groups *mat lol*, "people of the sea," and refer to themselves as *mat ley*, "land-oriented people."

Most villagers in Raja Ampat are subsistence fishers and have small gardens to supplement marine resources harvest. Artisanal fishers use mostly traditional gear including fishing poles, fishing lines, three or five-pronged spears, traps, and nets, for capturing fishes and sea cucumber. Shellfish, such as trochus (*Trochus niloticus*), pearl oyster (*Pinctada margaritifera*), and green snail (*Turbo marmoratus*), are collected by hand. However, some villagers are more frequently using hookah compressors, dynamite, and cyanide to harvest fishes. These destructive practices cause major damage to the coral reef habitat, and sometimes seriously injure the fishermen (Donnelly et al. 2003).

Although economic opportunities are generally limited to food harvested from small gardens and the sea in both villages, a pearl farm, PT Yellu Mutiara, operating out of Misool, provides jobs for many of the villagers in Tomolol. The company relies on local villagers for labor and works closely with local communities, as the farms have a long term vested interest in the area. PT Yellu Mutiara provided an electricity generator for the village of Tomolol and also has paid for the construction of a large church. The pearl company also provides free transport to and from Sorong. One major advantage of the pearl farms, beyond the income they provide to local communities, is their enforcement capacity. Because cyanide and dynamite fishing are harmful to oysters, the pearl companies deter destructive fishermen and they also have the necessary boats to monitor large marine areas.

In the village of Tomolol, a majority of villagers are *Matbat* and are mostly farmers. The village is built on the top of a cliff by the sea, with a steep path leading to the water. At the base of the cliff, there are a few houses built on stilts over the water, but

these families are all outsiders. Missionaries from Ambon brought Christianity to Misool in the 1930s, and presently, all villagers in Tomolol are Christian (village leader in Tomolol, personal communication, 2006). In the village of Fafanlap, villagers are Muslim, and the *Ma_ya* are the ethnic majority (Remijsen 2001; village leader in Fafanlap, personal communication, 2006). They are mostly subsistence fisherfolk, although sometimes they sell fish in Sorong. Fafanlap is a community built predominantly on the water. The houses are built on stilts over the water, and there is also a narrow strip of houses built along the coast, backed by a steep cliff.

The tradition of *sasi* exists in both Tomolol and Fafanlap. In both villages, *sasi* is instituted for a six month period and restricts the harvest of sea cucumber and shellfish during this time to allow for stocks to regenerate. Harvesting fish is never prohibited because villagers depend on fish as a primary source of protein (village leader in Tomolol, personal communication, 2006). *Sasi* is instituted when the winds blow from the south for a six month period from April to September, and restrictions are lifted from October to April. Council leaders, village leaders, and religious leaders are responsible for instituting and enforcing *sasi.* Changes in the legitimacy of local authority, demographic patterns, economic opportunities, and government regulations, have threatened the viability of customary marine tenure systems, potentially threatening the sustainability of marine resources in Raja Ampat.

1.4 Purpose of the study

The purpose of this project is to compare the evolution of traditional marine management in two different villages in Raja Ampat which will elucidate how effective these strategies may be in conserving marine resources. The villages of Fafanlap and Tomolol were chosen because traditional marine management strategies still exist in both areas, both villages consider themselves indigenous, and both have experienced cultural, political, and economic changes that have impacted the management strategies (Donnelly et al. 2003; Anton Suebu, personal communication, 2006; Yohanis Goram, personal communication, 2006). Gender differences in these villages were also explored to help determine what role women play in marine resource management.

Raja Ampat is an ideal location to research customary marine tenure because there is a long history of traditional marine tenure and nongovernmental organizations (NGOs) are also currently developing a marine conservation strategy there. It is critical to develop an understanding of marine tenure so this data can be effectively integrated into future conservation plans (McKenna et al. 2002; Donnelly et al. 2003; Halim and Suebu 2004).

The following research questions were developed to determine which mechanisms influenced the evolution of *sasi* in Raja Ampat:

1) what are the characteristics of *sasi*?

2) what factors have affected the evolution of *sasi*?

3) what role can *sasi* play in the development of contemporary marine conservation strategies?

By comparing how *sasi* has evolved in two villages that differ in religion, ethnicity, and access to the cash economy, parallels can be made for how viable *sasi* is in other villages in Raja Ampat. This can indicate how relevant *sasi* may be for future marine conservation in the region. The role of gender in affecting marine resource use and management will also be explored to determine how it impacts the evolution of *sasi*. Understanding how *sasi* evolves within different social, cultural, and economic contexts may help to explain how it will evolve throughout the Raja Ampat archipelago in the face of economic and demographic change. Reinforcement mechanisms must be in place for the continued existence of *sasi*, and studying these mechanisms will help to identify which factors are most critical to support traditional management strategies across Indonesia and Melanesia.

1.5 Organization of thesis

This thesis contains seven chapters. After this introductory chapter, Chapter 2 will describe the key concepts and theoretical framework underpinning this study. Chapter 3 will detail the methods used, and Chapter 4 will describe the physical, cultural, and environmental conditions of Raja Ampat. Chapter 5 will explain the research area with case studies of each village, and Chapter 6 will outline the conservation practices and prospects with a detailed description of *sasi* in each village. Chapter 7 will summarize the results of the research questions and will outline the implications of this research and opportunities for future study.

CHAPTER 2

KEY CONCEPTS AND THEORETICAL FRAMEWORK

Understanding how people manage their resources is critically important where environmental exploitation leads to resource degradation. The theoretical frameworks for exploring how humans interact with their environment encompass a variety of disciplines, subfields, and approaches. This research is located within the human-environmental tradition of geography. Aspects of the human-environmental tradition that relate to this research include human geography, cultural ecology, ecological anthropology, the ecosystem approach, feminism, and common property theory. These theoretical frameworks were used to guide the exploration of traditional marine management approaches, specifically *sasi*, in Raja Ampat.

2.1 Research on Human-Environment Interactions

The human-environmental tradition in geography spans the last several centuries and includes several core concepts: the impacts of nature on humans, the impacts of humans on nature, the perceptions of the environment, and environmentalism (Pattison 1963). The effort to explain the degree of interaction between humans and the environment stimulated geographers to generalize how human distribution, actions, and social character were a result of their physical environment. This philosophy was called environmental determinism.

Environmental Determinism became a central theory in Geography and Anthropology in the late 1800s and early 1900s, although its roots date back to the

Greeks (Milton 1997). The premise of environmental determinism is that environmental factors, rather than social conditions, determine culture; thus culture represents an adaptation to a specific environment (Steward 1955). Environmental determinists drew correlations between natural features and human technologies (Milton 1997). For example, Semple (1911) warned that the "derangements in the physiological functions of heart, liver, kidneys, and organs of reproduction" induced "intense enervation" in white settlers in the tropics. Other authors supported the notion that tropical climates resulted in limited evolutionary progress. For example, Huntington (1924) stated that evolution has stagnated in the tropics and discussed the moral degradation caused by a tropical climate. He claimed that "climate influences health and energy, and these in turn influence civilization." Huntington used cartography to support his assertions that climate impacts human progress, using charts to illustrate the distribution of genius, health, and civilization. By the early 1900s, Environmental Determinism was criticized as being dangerously wrong, and was charged with being racist and imperialist (Boas 1913). Writings from the man-land tradition in the 1930s and 1940s focused on discrediting or rejecting environmental determinism.

More recently, geographers are less concerned with how the environment affects culture and more more focused on how humans affect their environment. The field of ecology, specifically cultural ecology, has contributed greatly to helping humans understand their impacts on the environment. Cultural ecology developed in the mid 1900s and is the "study of the adaptive processes by which the nature of society and an unpredictable number of features of culture are affected by the basic adjustment through

which man utilizes a given environment" (Steward 1955). Cultural ecology incorporated concepts both from ecology and from systems theory. Ecology refers to the "dynamic relations between living and nonliving parts of an ecological system" (Moran 2000). A systems approach is the idea that a system is an integral whole and individual components cannot be understood apart from the entire system. Systems ecology views environments as various scales of systems that tend toward equilibrium and homeostasis (Zimmerer 1994). Cultural ecologists viewed humans as a part of the ecology and explored flows of materials and energy and how cultural beliefs and institutions impacted the natural ecology in an area (Stoddart 1965).

Cultural ecology principles are evident in the geography in the 1920s, when Carl Sauer described how cultural landscapes are made up of forms imposed on the physical landscape and called this approach "landscape morphology" (Sauer 1941). For Sauer,

> the natural landscape is being subject to transformation at the hands of man, the last and for us [geographers] the most important morphological factor. By his culture he makes use of the natural forms, in many cases alters them, in some destroys them (Sauer 1963: 341).

Sauer suggests that the relationship between culture and the environment was more complicated than environmental determinism allowed. He criticizes environmental determinism, and points out that it was not nature that caused culture, but culture, working with and on nature that created the contexts of life (Mitchell 2000). He suggests that culture is the agent on the natural landscape, and the ways that humans alter the natural landscape are "derived from the mind of man, not imposed by nature, and hence are cultural expressions" (Sauer 1963: 343). He describes how cultural development and transformation created the places and landscapes in which people lived (Mitchell 2000).

Sauer influenced both cultural geography and cultural ecology (Mitchell 2000). Many of the themes dominating cultural geography in the twentieth century are reflected in Sauer's works such as a focus on the material landscape, interest in cultural ecology and the often adverse impacts of humans on the environment.

Developments in the field of anthropology also influenced the development of the human-environmental tradition in geography. For example, ecological anthropology developed in the 1960s and provided a framework for addressing human responses to environmental problems. Ecological anthropology developed because of dissatisfaction with cultural ecology and environmental determinism. The main influence of this new form of anthropology came from the ecosystem concept in biological ecology. The ecosystem concept views all as part of ecological systems and subject to the same physical laws and was first articulated in the mid 1930s (Tansley 1935). Ecological anthropologists study human populations as parts of ecosystems, and address physiological, cultural, and behavioral human adaptability (Moran 2000). They also explore how a population shapes its environment and how this relationship shapes the population's social, economic, and political life (Salzman and Attwood 1996).

Developments in feminist studies contributed to the human-environmental tradition in geography. The recognition of the role of women in the environment began in the late 1960s and early 1970s. The sub-discipline of feminist geography developed in the mid-1970s. Feminist geography seeks to include the feminist perspective into geography and "emphasizes questions of gender inequality and the oppression of women in virtually all spheres of life" (McDowell 1986). The "ecofeminist" movement reinforced the

development of feminist geography and defends the idea that the environment is a feminist issue (Ruether 1992). Ecofeminism highlights the connection between the domination of women and the domination of nature (Warren 1987). A goal of ecofeminism is to draw attention to these "women-nature connections" and to dismantle them when they are harmful to women (Zimmerman et al. 1993). Some ecofeminists believe that the current environmental problems stem from women's domination by men; eco-feminism is a recent development in feminist thought, which argues that the current global environmental crisis is a predictable outcome of patriarchal culture (Salleh 1988, 138). Ecofeminism provides a theoretical framework to support the redesign of social and economic assessments to include gender considerations.

Incorporating a gender perspective in conservation and development programs contributes to the overall planning and increases the chance that both women and men will participate and benefit from conservation and development (van Ingen et al. 2002). For example, it has been claimed that women have more integrated approaches to conservation planning by including marginalized groups (Diamond 2002). Women have also been effective at setting up community-based marine protected areas with disenfranchised resources users. Women have established social networks and a higher dependence on these networks and the commons, potentially resulting in greater group homogeneity relative to men. This greater group homogeneity can help women develop sustainable environmental collective actions (Agarwal 2000).

Feminist studies can provide important insights into the impacts of gender affecting how men and women use and perceive their environment. These studies,

combined with the integration of a systems approach and the study of how individuals develop their own strategies, is likely to provide the most useful and productive approach to understanding how humans interact with their environment. The emphasis on the role that the individual plays in changing the environment is reflected in research documenting how humans seek to manage their environment and the associated resources.

2.2 Human-environmental research in a marine context

Geographers working in the human-environmental tradition have increasingly focused on coastal and marine issues such as environmental planning, resource management, and development policy because of the recognition of the importance of coastal and marine areas to society (Smith and Vallega 1991). Feminist geography, political geography, and cultural geography all support an improved understanding of how humans interact with the marine environment.

Feminist geography emphasizes the need to increase the role of women in conservation and fisheries management. Research suggests that increased literacy skills for women, improved access to market information, and increased capacity for alternative income generating activities allow for their greater participation in the fisheries management process (Diamond 2002; Bennett et al. 2005). Despite the awareness of the importance of gender in development and environmental projects, and despite the recognition that gender affects knowledge, use, and management of marine resources (Ruddle and Chesterfield 1977; Ruddle 1993), the majority of coastal and marine research fails to address the impact of gender on traditional knowledge and marine

resource use (Rocheleau 1991; Fernandez 1994; van Ingen et al. 2002, Diamond et al. 2003). Decision-making on marine resource use is principally based on input from men because most fisheries researchers are men, most of their informants are men, and consequently, policies often focus solely on the needs and priorities of men (Woroniuk and Schalwyk 1998; Diamond 2002). The lack of attention to women's role in managing marine resources stems from a variety of factors including the lack of sex-aggregated data and the fact that researchers are often unable to include women for cultural reasons (e.g., males dominate discussions, women's opinions may not be culturally valued, women may not speak openly with male researchers) (UNDP 2006).

Geographers are also combining political geography with cultural geography to emphasize that the social construction of ocean space controls human uses of the ocean (Steinberg 1999a). They are also integrating the study of marine boundaries with marine tenure systems and property rights to explore the legal norms underlying marine boundaries (Schug 1996; Scott and Mulrennan 1999; Steinberg 1999b; Psuty et al. 2004).

2.2.1 Customary marine tenure (CMT)

There are many types of marine tenure, ranging from individual, clan, or village-owned (e.g., Micronesia, Melanesia) to complex legal constructs of societies (e.g., Japan and the United States) with a highly integrated, modern and industrial fisheries sector (Ruddle and Akimichi 1984). Although customary marine tenure systems are found worldwide, this paper will focus on customary marine tenure practices in the Asia-Pacific region and their value in marine conservation strategies, as they are well developed in this region and there has been a significant amount of research dedicated to detailed

descriptions of these systems (Johannes 1981; Nietschmann 1983; Cordell 1984; Polunin 1984; Ruddle and Akimichi 1984; Hviding 1989; Harkes and Novaczek 2002). These systems are found in Japan (Cordell 1984; Ruddle and Akimichi 1984), Melanesia (Malinowski 1935; Hviding 1983; Nietschmann 1985; Wright 1985; Carrier 1987; Aswani 1999; 2002; Cooke et al. 2000; Foale and Macintyre 2000), Polynesia (Hoffmann 2002), Micronesia (Johannes 1981; Zann 1985), and Indonesia (Polunin 1984; Harkes and Novaczek 2002).

2.2.2 Concepts of marine tenure and the commons

Differences in worldview, specifically different perceptions of the commons and marine tenure, may explain why it did not occur to western scientists that communities were capable of managing their resources sustainably without external controls until the later half of the 20th century. Ethnographic research on fishing communities throughout the late 1970s and 1980s introduced the notion that the world's inshore seas are not, according to most local maritime cultures, common property (Cordell 1984). While European-influenced laws and economic theories have established that coastal resources and space are common property, the majority of inshore fisheries are regulated under informal, exclusive, communal, relatively closed, or private tenure.

Western concepts of marine tenure differ drastically from indigenous forms of customary marine tenure**.** European forms consider the sea and marine resources to be a "commons" open to all for exploitation, whereas indigenous forms of marine tenure often contain complex systems of rights over marine resources (Nietschmann 1985). Western perceptions of common property developed from the concept of the "tragedy of the

commons" (Hardin 1968). Some authors suggest that the Western view of the common property of marine resources developed from the writing of Hugo Grotius in 1609 (Ruddle and Akimichi 1984). Grotius argued that the sea could not belong to anybody because it could not be occupied, and occupation was the basis of property. Grotius also argued that the sea could provide enough resources for all users. Despite contrary claims by others (notable John Selden 1635), Grotius' views were accepted because they fit the British maritime-based imperial designs and were not dismantled until 1958 by the Law of the Sea Conference (Ruddle and Akimichi 1984).

Studies of local fisheries systems in the late 1970s challenged this perspective (Berkes 1977; Johannes 1977, 1978; Cordell 1984). Scholars recognized that the "tragedy of the commons" model, implying inevitable resource destruction, applied to the open-access, or free-for-all, exploitation of the commons, but it did not hold true for many community-based resource use systems (Berkes 1977). Between 1985 and 1990, a new theory of the commons developed from the accumulation of evidence of marine and terrestrial examples of customary tenure where communities self-regulated their resource use and extraction (Berkes 2005)[2]. The tragedy of the commons was shown to be the consequence of open-access conditions, not common property (Berkes 2005).

Ostrum et al. (1999, 278) defined common-pool, or common property resources, as those "in which (i) exclusion of beneficiaries through physical and institutional means is especially costly, and (ii) exploitation by one user reduces resource availability for

[2] See McCay and Acheson 1987; Berkes 1989; Ostrom 1990; and Bromley 1992 for examples of community-based management that did not result in resource devastation

others." Several key elements that are necessary for the long-term survival of common-pool resource (CPR) institutions include a territory, use restrictions, legality and enforcement, and some degree of equity (Ostrum et al. 1999). Common pool resources may fall under four categories of property rights regimes: open access, private property, state property/state governance, and communal property (Berkes 2005). Open access refers to areas that are free and open to all, without well-defined property rights. Private property regimes have a person or corporation that can exclude or regulate the use of a resource. In state property and governance, the state controls access and regulations regarding a resource. In communal-property, the ability to exclude or regulate access/exploitation of a resource resides within a community of users. These categories are useful for analysis but in reality, resources fall under a combination of property rights regimes (Berkes 2005).

Indigenous views of the commons and common property do not consider the sea and its resources to be a "commons" open to all. For example, in the Torres Strait, resource rights for a specific reef or marine area are distributed among each island community (Nietschmann 1985). "Sea rights" can also be exchanged by Torres Strait Islanders. In Murray Island, Torres Strait, "sea rights" are occasionally given as gifts during weddings or other ceremonies (Johannes and Macfarlane 1984). In marine tenure systems in Oceania, islanders maintain the sustainability of their resources through controlling the types and degree of exploitation of their waters.

> The mechanism is simple. Where fishing rights exist it is clearly to the advantage of those who control them to fish in moderation, for this ensures the future productivity of their fishing grounds. In the absence of such controls it would be

> to the advantage of a fisherman to catch all he could and to use destructive fishing methods in doing so if they simplified his task. If he didn't someone else would. Moderation would be pointless and the resource would therefore dwindle (Johannes 1977, 122)

In the Pacific Islands, traditional methods of sustaining marine resources included seasonal and areal closures, quotas, size, and fishing gear restrictions, restricted entry, ownership of species and fishing techniques, and customary marine tenure (Johannes 1982). In the Ninigo Islands in northwest Papua New Guinea, the sea and marine resources were considered as common property to all, although many villages established marine tenure and restricted access to marine resources (Johannes 1982). Villages controlled marine resource access but this did not guarantee that the resources were sustainably managed.

2.2.3 The role of customary marine tenure systems in conservation

Despite the large number of marine tenure systems worldwide, these systems have only recently been recognized by western scientists, and identified as a tool for managing marine resources sustainably (Hviding 1983, 1989; Ruddle and Akimichi 1984; Ruddle 1994; Aswani 1997; Foale and Macintyre 2000; Johannes 2002; Aswani and Hamilton 2004). The disregard for alternative types of knowledge stems from a tendency to value the presumed absolute "truths" of Western science over other forms of knowledge (Hviding 1996). Local fisheries knowledge is often viewed as unscientific, unsophisticated, and inaccurate (Kile et al. 2000). It is viewed as only locally relevant and not applicable at national levels. In addition, there is often a perceived incompatibility between Western science and local knowledge based on very different

worldviews. Elitism and ethnocentrism are also cited as reason for overlooking the value of local knowledge (Johannes 1981).

> Natural scientists have routinely overlooked the practical knowledge possessed by [fishermen]… It is one manifestation of the elitism and ethnocentrism that run deep in much of the Western scientific community (Johannes 1981, ix).

Finally, many fisheries biologists are not trained in the anthropological methods necessary to interpret meaningfully the local knowledge as it is rooted in complex cultural or religious systems (Hamilton and Walter 1999).

The recognition of traditional marine management by the western scientific community was lacking until the mid 1900's when Clark (1953, 1969) described traditional management practices in Palau and Johannes (1977) described the traditional management of Pacific Island and Melanesia cultures. Johannes emphasized the importance of customary marine tenure for conservation in Pacific Island cultures and Papua New Guinea, suggesting that practices such as closed seasons, species taboos, and village ownership of fishing rights may enhance biological conservation. Another significant achievement of Johannes' work is the integration of biological and social science approaches to marine management. The scientific interest in local knowledge in the 1970s reflected this cross-fertilization between biology and anthropology, and the use of ethnographic techniques such as participant observation, social surveys, and structured and semi-structured interviews (Johannes 1977, 1978; Akimichi 1978).

Since the 1970s, there has been a resurgence of traditional marine management. Johannes (2002) explains that a variety of factors have stimulated this renaissance, such as an increasing awareness among islanders of the growing scarcity of their marine

resources, increased income earned from healthy reefs that attract tourists, growing cultural pride among indigenous peoples, and recent political independence, which has resulted in constitutions granting renewed authority to traditional leaders and customary laws.

Major international and regional non-governmental organizations established working groups on the value of customary marine tenure and local knowledge in the mid to late 1980s such as the World Conservation Union (IUCN) and the South Pacific Regional Environment Programme (SPREP) (IUCN 1980, 1982; Thomas 1988; Johannes 1987, 1989), and WWF (Baines and Williams 1993). Following this trend, David Suzuki mainstreamed the value of local knowledge into the scientific community in the early 1990s (Knudtson and Suzuki 1992). Throughout the 1990s, scholarship on the value of local knowledge has flourished, often focusing on the valuable role that local knowledge can play in modern resource management (Johannes 1989; Warren et al. 1993; Williams and Baines 1993; Dyer and McGoodwin 1994).

An idealization of traditional approaches and values followed the recognition of the value of incorporating local knowledge and traditional management practices into western management regimes. The belief that indigenous peoples hold the key to successful conservation strategies led to a romanticized view of all indigenous people as living in harmony with nature and holding valuable ecological wisdom. For example, tropical fishermen in developing countries are being touted as "prototypical sustainable resource managers whose local natural history knowledge in some case rivals or surpasses Western science" (Cordell 1978; Johannes 1981; Nietschmann 1982 in Cordell

1984, 304). The view of indigenous people as conservationists and the "ecologically noble savage" (Buege 1996) has dominated much literature and undermines the actual value of local knowledge. Richards (1980, 185) warns against "a sentimental belief in 'traditional values' and a conviction that the 'people know best' without knowing why and under what circumstances."

The notion that indigenous people have a traditional marine conservation ethic has been challenged in the last several decades (Polunin 1984; Ruddle et al. 1992; Hviding 1996). Anthropological, archeological, and biological literature illustrate that traditional fishers are often responsible for resource degradation and exploitation (Foale and Day 1997; Jackson 1997; Aswani 1998; Foale 1998; Jackson et al. 2001). This research led scholars to question whether customary marine tenure systems were established to produce conservation results (Johannes 1981; Polunin 1984; Wright 1985; Carrier 1987). For example, Polunin (1984) challenged the belief that marine tenure areas were established for conservation; he asserted that customary marine tenure in Papua New Guinea and Indonesia was non-conservationist in thinking, motivation, or function. Polunin argued that the defense of territorial marine boundaries was due to inter-group rivalry and power struggles as opposed to wise management of resources. Polunin further postulated that these traditional tenure systems would be overcome by modernization, so they were not worthy of protection. He suggested that marine tenure was developed most commonly as a result of conflict over marine areas.

> Overall, the strong impression given is that exclusive areas became established not because people wished to conserve resources, but rather because they tended

> to exploit more and eventually came up against neighboring people doing the same sorts of things (Polunin 1984, 267).

Polunin also found that many tenured marine areas were established simply as a seaward extension of tenured lands, and were established opportunistically, not in an effort to protect marine resources. He warned against the assumption that indigenous people in Papua New Guinea and Indonesia had a traditional marine conservation ethic.

> If traditional reserves do not typically promote conservation in any practical sense, if they often inhibit development which, it is claimed, should go hand-in-hand with conservation, and if we cannot codify their structure, what is there left? … I am not suggesting that the system be abolished – in countries such as Papua New Guinea this would, in any case, be impossible – but rather that, in this context, we cannot prop it up with spurious evidence of supposed roles in conservation. (Polunin 1984, 279)

Work in Ponam Island, Papua New Guinea (Carrier 1987) also supports the notion that customary marine tenure was not established for conservation. Carrier suggests that in Ponam, the tenure system was established as an intrinsic part of the complex system of gift-giving where locals gain social credit through generosity, i.e., giving marine resources as gifts. In Papua New Guinea, the concept of resource conservation, i.e., the western conservation ethic, is incomprehensible to local resource users because they do not recognize that their subsistence harvests may have significant negative environmental impacts (Carrier 1982). Even Johannes (1981), who supports the role of customary marine tenure in modern conservation strategies, also admits that some marine tenure systems are too inefficient or subdivided to result in conservation. He points out that marine tenure cannot control increasing capitalization, which may result in resource destruction.

Wright (1985) presents evidence that in Papua New Guinea, regulation of marine resources was not established to ensure resource availability for the next generation. He suggests that in subsistence economies, personal benefit is more likely the focus of resource management. In Papua New Guinea, taboos on species and areas were put in place to benefit the welfare of the coastal communities, not for conservation of resources. Fossil evidence demonstrates that heavy resource use resulted in local extinctions (e.g., *Dugong dugong, Nassarius* sp.) in areas of high population density.

Therefore, customary marine tenure systems may be developed for a variety of reasons and conservation is just one of them; other reasons include conflict management (Acheson 1981; Berkes 1992), resource equity (Berkes 1992; Lobe and Berkes 2004), political control (Polunin 1984; Chapman 1987), or the enforcement of cultural values (Wenzel et al. 2000).

2.3 Summary

This customary marine tenure research builds on the recognition from the human-environmental tradition in geography that humans are active participants in resource management, and that historical, policital, and religious factors all influence how resources are managed. Despite the theories that suggest that the ecosytem approach is best suited to small tribes with primitive technologies, and that under these conditions, many of the human-environment interactions are embedded in cultural traditions, this research demonstrates that even in these cases, technological changes are occurring that are affecting the human-environment interactions. These changes must be taken into account to adequately understand the impacts of humans on their environment.

Cultural ecology, ecological anthropology, feminist geography, common property theory, and customary marine tenure research provide a framework for understanding how resources are controlled and regulated in a community. Hardin (1968) proposed a top-down approach by governments to control resource exploitation. Some economists have suggested the use of licensing, limited entry, individual transfer quotas to manage resources (National Research Council 1986). Anthropologists and social scientists have suggested systems that have been managed by local communities (Ruddle and Akimichi 1984; McCay and Acheson 1987; Ostrum 1990; Dyer and McGoodwin 1994), while others suggest co-management (Pinkerton 1989). Often, and in the case of Raja Ampat, these approaches work together to manage marine resources. It is important to note that rules and strategies governing common property resources are unique to a particular area, they must be "congruent with the physical environment and characteristics of the community" (McGinnis 1999, 8).

CHAPTER 3

METHODS

This chapter outlines the quantitative and qualitative methods used during this research project. A variety of ethnographic techniques were used including participant observation, semi-structured and unstructured interviews, and archival research. Multiple research methods were employed to enable triangulation to assess the reliability and validity of the data (Baxter and Eyles 1997). All interviews and surveys were conducted in Bahasa Indonesian with the help of a female translator from Papua.

3.1 Research schedule and site identification

This study is based on fieldwork conducted from August 1-31, 2006 on Misool island in Raja Ampat, Papua, Indonesia to document marine tenure and the role of *sasi*. The villages of Fafanlap and Tomolol were selected because *sasi* is still practiced in both, although *sasi* has significantly eroded in many villages in this region (McKenna et al. 2002; Donnelly et al. 2003). This research builds on previous ecological assessments in these islands that addressed the status of marine resources and socio-economic conditions (McKenna et al. 2002; Erdmann and Pet 2002; Donnelly et al. 2003; Halim et al. 2005).

To identify the research sites, a trip to Misool was conducted in March 2006 to speak with a village leader and the Portfolio Manager of The Nature Conservancy's Raja Ampat program to discuss the concept of this research project. They recommended the villages of Tomolol and Fafanlap in southeast Misool as the most appropriate field sites based on feasibility, priority for marine conservation, and local support. In this

preliminary trip to Southeast Misool, contacts were made, field sites were selected, and the necessary permits to do research in Papua were determined. The Nature Conservancy office in Raja Ampat helped to secure the necessary visas and approval to do research.

3.2 Ethnographic techniques

A variety of ethnographic techniques were used to document *sasi* and explore its evolution and role in Raja Ampat including unstructured interviews, structured, semi-structured, participant observation, and archival research.

3.2.1 Unstructured interviews

Prior to each interview, introductions were conducted and the purpose of the research and the reasons for conducting the interview were explained to the respondent with the help of a translator. Each respondent was told that the purpose of the interview was to learn about the respondents' perceptions of issues related to marine resources and management, and that there was no right or wrong answer. They were told that the interview would likely take about one hour, were asked if they had any questions, their questions were answered, and then the interviews began. This approach is recommended to help informants feel comfortable with the interview process (Robertson 1994).

Initially, several unstructured interviews were conducted with villagers to learn about local customs, traditions, and cultural values. These interviews also helped build rapport with members of the community in a less formal context. During these interviews, information was collected on oral histories and life histories, as these can provide personal accounts of significant events and perceptions (Hay 2001). Oral

histories are essential in Raja Ampat because there is so little written history of this area. The oral histories included descriptions of demographic changes, migration patterns, and environmental history, which provide a context for environmental change. Life histories also provide a context for understanding how gender roles are inherited. The benefits of unstructured interviews included the ability to collect detailed information about the history of the villages and perception of change over time (Clifford and Valentine 2003). The disadvantages are that it is difficult to determine patterns in marine resource use and management without having specific questions and a way to measure the responses. Unstructured interviews are an important part of establishing the context for understanding the patterns that result from structured interviews (Hay 2001).

3.2.2 Structured interviews

The structured interviews were used to collect data on traditional marine resource knowledge and management, the perception of condition and threat to marine resources, and the evolution of customary marine tenure. The advantages of the structured interviews are that they provided a mechanism for comparison between men and women and between villages on key issues, because each respondent was asked the same questions in exactly the same order (Clifford and Valentine 2003). To ensure that the questions were not ambiguous, or difficult to understand, and were appropriate, local experts including a traditional leader and participants of a previous socioeconomic assessment in Raja Ampat were consulted to review the questions and make adjustments. Some questions from previous marine resource use assessments in Raja Ampat were included as well, and these had been field tested in previous monitoring activities

(Donnelly et al. 2003). During this review process, local terms for marine resources and fishing gear and cultural practices were incorporated wherever possible.

One of the major challenges of the structured interviews was the length. Generally, after an hour of answering specific questions, some interviewees appeared bored and preferred to spend more time talking about topics of their choice. If too much leeway was allowed in the interviewing process, the structured interview became too long which was tiring for both the interviewer and the respondent. Another challenge was overcoming suspicion caused by the written survey questions and the recording of data. Holding the list of questions and marking responses during the interviews occasionally created suspicion because many of the respondents were unable to read. When the respondents were shown the interview questions and understood that their responses were being recorded, some villagers seemed uncomfortable. While it may have been more comfortable not to write down the responses, it would have been impossible to collect the quantity of data without recording the responses during the interview. A tape recorder was used during the unstructured interviews which generally was not a problem. However, one woman covered her face and laughed when she understood how the tape recorder worked. She did not want to speak if her voice was recorded, so the tape recorder was turned off and written notes were taken instead. The majority interviewed did not mind being recorded. Despite the challenges of the structured interviews, they provided data that was essential to quantify the results.

3.2.3 Semi-structured interviews

Semi-structured interviews were conducted with key informants to complement the survey results. The questions asked in these interviews were content focused, as opposed to question focused (Hay 2001). The respondents were encouraged to elaborate on specific details of marine tenure and management approaches, and spend more time discussing the topics that were of greatest interest to them. The benefit of this technique is that the participants were more engaged because it was more of a dialogue, where they could influence the direction of the conversation more than the structured interview.

One of the challenges of providing less structure was that some of the respondents would explain peripheral ideas in great detail. In the beginning of the key interviews, the focus of the research was explained so the respondents knew what type of information was sought. Occasionally, the conversation would need to be redirected if the respondent went too far off topic, although this did not happen often because most of the villagers understood the research focus. Some of the peripheral conservations resulted in interesting revelations that were not captured in the structured interview questions. For example, one woman discussed how her clan could not eat certain species of fish because they were considered ancestors. This information helps to provide a context for a cultural appreciation and connection to the marine environment which is important for understanding how members of the village interact with the marine environment.

3.2.4 Participant observation

Participant observation has been recognized as a valuable way to help elucidate the meanings of place and the contexts of everyday life (Clifford and Valentine 2003). This technique was used before, during, and after interviews to complement the data collected. Through this method, details about houses, gardens, and fishing practices (e.g., harvest techniques and types of fishing gear) were collected. Participant observation and general observation were used to gather sensitive information. For example, many villagers that participated in destructive fishing techniques, such as blast fishing and cyanide, did not admit to these activities. During some of the interviews, a compressor with a rubber hose attached to it was identified in the room. The compressor is used with cyanide to stun the fish for easier collection. In another home, shark fins were observed drying on the roof, although the respondent said that there was no shark finning in the village. In these cases, observation was used to verify data collected. Through participating in some of the activities, like harvesting shellfish, valuable information was gathered about how the men and women interacted to harvest and process marine resources. Finally, one of the villagers invited us to watch the process of moving fish from one holding tank to another to prepare for sale to a live reef food fish trade fisherman. Through this exercise in combination with several snorkeling trips offshore, data was collected on the harvest of rare and threatened species, average size harvested, and the lack of these species on surrounding reefs, potentially indicating overfishing.

Participating in activities helped build rapport with the villagers and also helped provide a context for understanding the values and motivations of the villagers (Clifford

and Valentine 2003), although one of the limitations of this study was the very short field time in each village. Despite participation in local activities, the limited time and language barrier made it difficult to connect with villagers.

Participant observation is focused on developing awareness through being a part of the spontaneity of everyday interactions (Hay 2000). While this is true, it is important to be aware that participating in any activity has the potential to change it, thus any observations recorded are impacted by the presence of the researcher (Schwartz and Schwartz 1955).

3.2.5 Archival research

Archival research on *sasi* in surrounding areas like Halmahera, which is adjacent to Raja Ampat and has similar cultural and religious influences, provided the context for understanding what factors influence the evolution of *sasi* (Zerner 1994; Pannell 1997; Evans et al. 1997; Harkes and Novaczek 2002). A previous linguistic study provided valuable demographic information including migration patterns, population patterns, and clan histories (Remijsen 2001). The success of the interviews was influenced by the previously completed archival research and prior discussions with Nature Conservancy staff members who had experience working and communicating with villagers in Raja Ampat. For example, basic protocol, such as opening every meeting with an offering of betel nut and cigarettes, was established beforehand and was a requirement for opening dialogue and relationship building. Additionally, it was necessary in each village to ask the village leader to set up a village meeting and provide introductions to the villagers,

explaining the purpose of the research, and then the villagers were free to ask questions or seek clarifications. In one village, this happened twice, once spontaneously upon arrival and then later that evening with the majority of the village present. In another village, this introduction was coordinated with the church service, where the village was already gathered for Sunday service.

3.3 Questionnaire design

A trip was conducted to Indonesia at the end of July 2006, and meetings were set up with several Nature Conservancy staff members who had collected and processed socioeconomic and biological data from Raja Ampat to determine what methods worked and what did not work in their data collection. The methodology and survey questions were refined with these staff members and participants of a Coastal Rural Appraisal (CRA) team who explored socio-economic issues, local perceptions on resource status, and marine resource utilization in coastal villages in Raja Ampat in 2003.

The survey questions were taken from a general monitoring protocol developed for The Nature Conservancy's perception monitoring program in Indonesia (Halim et al. 2005). The surveys were developed for sites across Indonesia, but were adapted to address specific issues in Raja Ampat. Some questions were eliminated from the original survey and others were added to address *sasi*, and the impact of gender, large pearl companies, and government regulations on *sasi*. Once the final survey was completed (Appendix A), it was translated into Bahasa Indonesia and then reviewed by Nature Conservancy outreach officers and policy coordinators to ensure that it was clear and

would be appropriate for villages in Raja Ampat. It was also reviewed and refined by a member of the Traditional (*Adat*) Council in Raja Ampat.

3.4 Data collection

In 2006, data was collected in Fafanlap and Tomolol to document customary marine tenure, marine resource knowledge and use, the condition of marine resources, and the perception of threat to marine resources. Winds blow from the south in Raja Ampat during the months of April to September making the voyage from Sorong to Misool dangerous due to rough seas. Locals mentioned that it would be risky to travel to Misool in early August, but no other options were available. From August 4th –August 11th, four different boats were taken from Sorong. The first boat ran aground on a coral reef and the other three were forced to turn back due to rough seas, the largest waves were 7 meters high. The only way to get to the field sites was by air as the sea was not passable, so a helicopter was booked from Sorong to Misool. Several weeks later, the trip back to Sorong was conducted by speed boat because the seas had calmed. In Fafanlap, the *Kepala Kampung* (Village leader) hosted us in his house, and we stayed at a former clinic in Tomolol.

Research was conducted in Fafanlap from August 12-23 and from August 23-31 in Tomolol. Originally, nine days were planned in each village to split the time evenly, but delays waiting for the speedboat prevented this and eleven days were spent in Fafanlap and eight days were spent in Tomolol. Four in-depth interviews, two men and two women, were conducted with key informants from each village. The key informants were individuals in the community with a detailed knowledge of the village, marine

resource use, and customary marine tenure. They were selected based on input from local village leaders, a traditional leader and member of the *adat* council in Raja Ampat, and community outreach staff from the Nature Conservancy who have experience working with these communities. Older members of the community who were originally from the village were targeted for traditional marine knowledge. These villagers were able to provide longer term perspectives of how marine resource stocks have changed over time, and how traditional marine management strategies have evolved. These interviews were unstructured and provide the context for the more focused surveys that address traditional marine resource knowledge, use, and management, the perception of condition and threat to marine resources, and the evolution of customary marine tenure. A total of 60 surveys were completed (30 people from each village, 15 men and 15 women). Surveys were conducted with young (over 18 years), middle-aged (35-55 years), and elderly men and women (over 55 years). A group of villagers was selected using a previous population census conducted by the Nature Conservancy in 2003.

The regional and village populations were determined by a 1998 population census (Sorong Dalam Angka 1998, in Remijsen 2001), and previous anthropological studies (Remijsen 2001; Donnelly et al. 2003). Settlement patterns were defined for both villages based on previous studies (Remijsen 2001; Donnelly et al. 2003), surveys, and unstructured interviews. To document knowledge of marine resources, survey topics included the identification of various types of fishing gear and activities in the village, abundance and distribution of key species for food and income, methods for harvesting

marine species, spawning times and behavior of marine species, and statements regarding the importance of coral reefs, mangroves, and seagrasses.

Through a series of unstructured interviews, a list of local terms for marine species and fishing gear was compiled for each village (Appendix B). Large color photographs of marine species were passed around groups of four to five villagers, and species names were recorded in the predominant local languages of each village, Bahasa Indonesia, and English. The list was refined through repeated discussions with different groups of villagers. This information was also supplemented by in-depth interviews with local experts of marine resources and tenure. The perception of threat to marine resources was elucidated through survey topics including identification of the main environmental problems in the village, new technologies for marine harvest, changes in village management strategies, and those responsible for creating and solving problems with marine resources. Finally, customary marine tenure information was compiled through a combination of in-depth interviews with local experts, and survey questions addressing marine tenure rules, rights, penalties for breaking tenure, adherence to tenure, knowledge of tenure, and how economic, political, and demographic change affect customary marine tenure.

3.5 Data analysis

The data collected from the structured interviews was compiled into a spreadsheet to allow for comparison between villages and between men and women. The mean and standard deviation of responses were determined for each survey question. Percentages of total responses for each village were determined to compare similarities and differences

in perception of threat to marine resource, effectiveness of marine resource management strategies, fishing gear used, importance of specific marine resources, marine knowledge, and the role of women in marine resource management. Male and female responses were quantified to determine what percentage of men and women provided a particular answer, so patterns could be determined in how men and women responded different or similarly about particular environmental issues.

The key interviews were transcribed from a tape recorder in Bahasa Indonesia and were translated into English. They were then analyzed to establish the context for the patterns that resulted from the surveys. The key interviews were unstructured and provided a body of discourses to complement the survey data. These discourses were analyzed to provide specific information about the villages and marine resource use, knowledge, and management, in addition to analyzing the particular way that villagers discussed and understand these topics. Patterns in speech were identified and noted, hesitations in answering certain questions were noted, and interactions between respondents, interviewers, and other villagers present during the time of the interview were noted. Specific interactions between male and female family members were noted to help establish the context for gender relations in each village.

Once the patterns from the surveys were determined, and the context was established through the unstructured, semi-structured, participant observation, and archival research, the trends were placed within the theoretical framework of common property theory and ecofeminism for further investigation. Wherever possible and practical, quotations were included to reflect how meanings are expressed in the

respondents' own words. These quotations were pulled from the tape recorded transcriptions. The use of quotations has been identified as a critical way to build rigor into interview analysis in qualitative research (Baxter and Eyles 1997).

The Nature Conservancy's Raja Ampat field team and a member of the traditional leader's council in Raja Ampat graciously agreed to review and comment on the results of this project to help provide validation. This team helped check for inconsistencies, completeness, accuracy, usability, and confidentiality. Additionally, because some of the survey questions had been used in previous assessments in these villages, the results from previous assessments were compared to the findings in this study and the trends in village responses were similar. The previous assessments included a larger sample size of about 100 people per village, thus providing a more accurate view of trends in responses. The results from this study have been made available to both villages and include the theoretical framework that informs the study, research questions, and methods used to collect and analyze the data.

3.6 Challenges and lessons learned

A number of challenges exist when collecting data, particularly when interviewing women. The most difficult challenge is that women do not have free time in either village, whereas men were often available for interviews throughout the day. While conducting research in the villages, women were never observed resting. Most often, women were observed with babies in their arms, and were doing housework or other tasks. In the structured interviews, it was often a challenge to keep the female respondent engaged because of many distractions. For example, nearly every woman interviewed

from young adults to the elderly was holding a child, and was often caring for several children during the interview. This made it difficult to maintain the flow of the interview because women were often breastfeeding or entertaining their children while participating in the interview.

Another challenge was that it was difficult to interview a woman in the presence of her husband or male family member. On nearly every occasion this occurred, the woman would either stop talking entirely, even when we explained that we wanted her thoughts, or she would simply repeat what her husband answered. During one notable exception, a woman openly disagreed with her husband, although she allowed him to provide his input first. In other cases, women that were more dominant would interrupt and provide answers for younger women or women that were shyer. These challenges made it difficult to record the perspectives of the women interviewed. To address these challenges, the most effective approach was to try to schedule interviews with women when we knew that the men would be out of the house.

Key informants were selected based on input from local village leaders, a traditional leader and member of the *adat* council in Raja Ampat, and community outreach staff from the Nature Conservancy who have experience working with these communities. The input from the local village leaders, traditional leaders, and outreach staff was consistent, reinforcing the idea that the individuals selected were the most likely to hold specialized knowledge of marine resources and tenure. Identifying respondents for structured interviews was more problematic. The goal for the structured interviews was to identify and interview a cross-section of villagers. A previous population census,

conducted by the Nature Conservancy in 2003, was used to provide a list of villagers. Upon arrival in each village, the list was shown to the village leader, as requested, and he then crossed off all villagers that were not available. In both villages, many of the villagers worked outside the area and were not available for interviews. When pre-identified names were omitted, the next name on the list was selected. One weakness of this method is that there was no way to guarantee if the person removed was not available or the leader did not want them to be interviewed. Often the village leaders would try to identify more educated community member for interviews. While this made some of the interviews easier, it skewed the data by making the surveys not random. In some cases, the educated villagers spent long periods of time outside the village, thus some had less knowledge of village customs than others who had stayed in the village.

Another challenge of the survey list was that the villagers wanted to see the list. For future studies, it would be better to be more explicit about how the list was generated to reduce suspicion of how the names were identified. However, ultimately before any interviews take place, the names must be approved by the village leader, making it a challenge to maintain a random sample, even when the need for such a sample is explained.

The short time in the field, twenty days, resulted in limitations in data collection and rapport with the communities. Building relationships takes time in any community, but especially in communities with limited access to outsiders. Ten days in each village did not allow for much time to engage the community outside of interviews. More time would have provided more relaxed days, with less pressure to complete the interviews in

such a short time. This would have allowed for more flexibility in scheduling interviews, making them more convenient for villagers. Many of the fishing tasks are seasonal, and spending time throughout the year would have allowed the opportunity to observe and participate in activities that only occur at certain times (e.g. the celebration to end *sasi)*. Spending more time in the villages would also provide more context for understanding local practices and habits. The limited field time also resulted in a limited sample size. For example, only 30 villagers in each village participated in structured interviews and only 4 in each village participated in unstructured interviews. Although the village populations were quite small, 200 in Tomolol and 800 in Fafanlap (Remijsen 2001), these numbers are not large enough to represent the perspectives in the community. It would be necessary to interview more people to develop a broader understanding of the perspectives in each village. One major challenge of this is that many of the villagers work outside the village, either in other villages, fishing in the sea, or in the forests. Therefore, it can be difficult to find villagers at home during the day to interview. Many are at work or are busy doing household chores.

Originally, single-sex focus groups of 10-12 people were planned following the in-depth interviews and surveys, but due to time constraints, this was not possible. Single-sex focus groups have been identified as a successful way to engage both men and women (Diamond 2002; van Ingen et al. 2002). The focus-groups would have helped to formulate a common point of view and could have stimulated members to fully contribute. This approach can stimulate dialogue and encourage women and men to defend their views because of the support received by the focus-group (Diamond 2002).

Another critical benefit of using focus groups is that they help authenticate data collected. They are also useful to raise consciousness if different perspectives are introduced that they may not have had access to prior to the group discussion.

CHAPTER 4

PHYSICAL, CULTURAL, AND ENVIRONMENTAL CONDITIONS OF RAJA AMPAT

4.1 Geography

Raja Ampat is a group of islands off the northwest tip of West Papua, Indonesia that encompasses 4 million acres of land and sea (Donnelly et al. 2003). It includes four main islands: Waigeo, Batanta, Salawati, and Misool (Figure 1.2), in addition to hundreds of smaller islands. These islands are located west of the mainland of Papua between 0°20'S and 2°15'S latitude and 129°35'E and 131°20'E longitude. Winds blow from the southeast between May and October and from the northwest between December and March. Raja Ampat holds the highest marine biodiversity in the world (Donnelly et al. 2003). Many of the islands are surrounded by coral reefs that supply local communities with marine resources and families rely on these resources (e.g., reef fish, sea cucumbers, and shellfish) for food and livelihoods.

4.2 Social and demographic characteristics

4.2.1 Language

There are many indigenous languages in Raja Ampat including *Matbat, Salawati* (dialects include *Ma_ya, Kawit, Banlol*), *Kawe*, *Legenyem*, and *Amber* (Donnelly et al. 2003). Although 10% of the population speaks indigenous languages, all villagers speak *Bahasa Indonesian*. In Misool, there are three indigenous languages: *Matbat*, *Ma_ya*, and

Biga (Remijsen 2001). School children learn *Bahasa* at school, but regional dialects of *Bahasa* are common.

4.2.2 Population and migration

Raja Ampat is sparsely populated with a total population ranging from 32,000-48,707 (Remijsen 2001; Mckenna et al. 2002; Donnelly et al. 2003). Many communities have lived in Raja Ampat for generations and consider themselves to be indigenous, although they are descended from people from neighboring areas including the Moluccas, Seram, Ternate, Bajo, and Biak. Other groups, such as the *Matbat*, *Salawati*, *Kawe* or *Lengenyem* people, claim to be indigenous people. Increased migration from other parts of Indonesia has led to a decline in the indigenous population, currently only 10% of the population, and some speculate that migration to this area will increase from Papua, the Moluccas, and Indonesia as investment in natural resource based industries increases (Donnelly et al. 2003).

Prior to Dutch occupation in the 20th century, Raja Ampat was dominated for 400 years by the north-Moluccan sultanate of Tidore. There were four *rajas* (kings) from Waigeo, Salawati, west Misool, and east Misool, and several dignitaries (*kapitan laut* – literally “fleet commander”) in Salawati and Misool. The *rajas* and *kapitan laut* paid a yearly tribute to the sultan. These villages had access to a trade network with the Moluccas and with the western tip of West Papua. Contact with the Moluccas resulted in the introduction of Islam and Christianity in Misool.

In an ethnographic study of Raja Ampat, a distinction was established between sea-oriented and land-oriented groups (de Clercq 1893). Although all groups that lived inland have now moved to the coast (Remjisen 2001), the distinction between land and sea-oriented groups explains the primary socio-cultural division within the original population of the Raja Ampat archipelago.

4.3 Economic characteristics

Most people in Raja Ampat live in subsistence economies supplemented by the harvest of sea cucumber, green snail, and trochus. The growing use of cash has led to an increased dependence on marine resources as a commodity, which has resulted in an increase in destructive fishing practices. Due to the large and sparsely populated area, protection of marine resources from exploitation by outsiders is difficult. The prevalence of destructive fishing, largely by outsiders, has led to some young people using destructive techniques because they feel like they have no other alternatives. The pearl company provides jobs to surrounding villages and transportation to Sorong, the regional capital in West Papua, which provides access to goods and the cash economy.

4.3.1 Destructive fishing practices

Blast fishing is common across Indonesia and has caused the destruction of coral reefs throughout much of Southeast Asia (Pet-Soede and Erdman 1998; Fox et al. 2005; Fox and Caldwell 2006); Raja Ampat is no exception. Fishermen use dynamite or other explosives to stun or kill schools of fish for easy collection. Most villagers suggest that only outsiders do blast fishing, specifically those from southeast Sulawesi, although it is

likely both locals and outsiders that employ this technique. Cyanide is also commonly used to harvest fish for export in the live reef food fish trade. The live reef food fish trade transports large numbers of reef fish like Napoleon wrasse (*Cheilinus undulatus*) and groupers to restaurants in Hong Kong and other parts of China. The live reef food fish trade fishermen use cyanide and other poisons to stun large fish, which kills other smaller marine organisms, especially coral. Although exporting Napoleon wrasse from Indonesia is illegal, the trade is so lucrative that it still occurs. Although many know that using poison does damage to the reefs, the incentive to use cyanide and bombs is high because there are few other income alternatives. On previous reef assessments (Erdmann and Pet 2002; Donnelly et al. 2003) and a short survey in 2006, there were very few large grouper observed. Because Napoleon wrasse are slow growing with a low replacement capacity, they are easily overfished and listed as threatened by IUCN (Donaldson and Sadovy 2001).

4.3.2 Trochus, sea cucumber, and shark fin trade

Trochus shells are harvested for both subsistence and export; the shells are used for jewelry, inlay, and mother-of-pearl buttons for clothing. Sea cucumbers are harvested for food and commercial purposes; they are gutted, boiled, smoked, and then dried for export, mostly to Asia where they are a delicacy (WWF and IUCN 1995). The commercial trade in trochus and sea cucumber has been active in Raja Ampat since the 1930s. During that time, the Japanese showed an interest in exploiting trochus and sea cucumbers, and from 1928-1935, large quantities of sea cucumber and trochus were exported from Sorong and Misool (e.g., by 1935, Papua was exporting 40 tons os sea

cucumber) (Klein 1934; in Palomares and Heymans 2006). By the mid 1930's, the export of sea cucumber from Papua reached 40 tons (Boschma 1937; in Palomares and Heymans 2006). In the late 1980's, the neighboring countries, Papua New Guinea and Solomon Islands, achieved annual exports of US$1 million (WWF and IUCN 1995). In Papua, the average sea cucumber production was only 5.5 tons/year from 1960-1984, but rose steeply to almost 700 tons dried weight (equivalent to at least 7,000 t green weight) by 1991, and according to estimates, total yields of 1000 tons/year can be sustained if adequate management strategies are in place for Papua (SPC 1996). In 1999, exports were only 370 tons (valued at US$3.9 million), likely due to localized overexploitation (Palomares and Heymans 2006).

The shark-fin trade has been active throughout Indonesia for decades. During a 2002 rapid ecological assessment (Donnelly et al. 2003), very few sharks were observed. Philippine fishing companies provide roofing, generators, and outboard motors to villagers in northern Raja Ampat in exchange for access to customary tenure areas to fish for sharks. The company pays a small access fee (e.g., Rp500,000 ~ US$54.00) and returns the small and medium-sized shark carcasses to the villagers for food. The 2002 assessment suggested that it is mostly nonresidents who are responsible for overfishing of sharks.

4.3.3 Pearl farm

There are currently two operating pearl farms in Raja Ampat, one in Misool (PT Yellu Mutiara) and one in Waigeo (PT Cendana Indopearl). The pearl companies negotiated a lease with the customary owners to use a large marine area. The companies

rely on local villagers for labor and work closely with local communities, as the farms have long term vested interest in the area. For example, PT Yellu Mutiara employs about 200 villagers from the area surrounding the pearl farm and has a 20 year lease that was renewed in 1997. PT Yellu Mutiara provided an electricity generator for the neighboring village and also has paid for the construction of a large church. The pearl company also provides free transport to and from Sorong. One major advantage of the pearl farms, beyond the income they provide to local communities, is their enforcement capacity. Because cyanide and dynamite fishing is harmful to oysters, the pearl companies deter destructive fishermen and they also have the necessary boats to monitor large marine areas.

4.4 Government structure

Indonesia is divided into provinces and these are subdivided into regencies. In 1963, when Indonesia took over Papua from the Dutch, Raja Ampat became part of the Sorong Regency. From 1963-2000, there were only four Districts in the Sorong Regency: Waigeo Utara (North Waigeo), Waigeo Selatan (South Waigeo), Misool (including the Kofiau islands), and Samate (including Batanta and other surrounding islands). In late 2000, the four districts were divided into seven: Waigeo Utara, Kepulauan Ayau (Ayau Islands), Waigeo Selatan, Waigeo Barat (West Waigeo), Misool, Misool Timu Selatan (southeast Misool) and Samate. In 2002, Raja Ampat became an autonomous Regency through the enactment of Law No. 26. This law was established as part of the central government's attempt to devolve authority to the regions and established fourteen new Regencies in the Papua Province. The seven districts remain intact. The Raja Ampat

Regency is responsible for all government, development, and social services as identified in autonomy laws (Law No. 22, 1999; No. 25, 1999; Law 21, 2001), and because it is a new Regency, the first Regent is recommended by the Governor of Papua for the approval of the Minister of Interior Affairs, not elected by the Parliament. The Parliament is tasked with electing the Regent six months after the Parliament is established. The Regency is a local level of government that has its own legislative body and is headed by the regent (*Bupati*) who is elected by popular vote. Each regency is divided into districts. Fafanlap and Tomolol are part of the Misool Timu Selatan (southeast Misool) district. This district is headed by a "Head of District" (*kepala Distrik*). The district is subdivided into a village (*kampung*), which is headed by the village leader (*kepala kampung*).

4.5 Environmental characteristics

Raja Ampat holds the highest coral richness in the world, with over 75% of the world's hard coral species (Donnelly et al. 2003). Reef fish are extremely abundant and 1,074 species of reef fish have been identified (McKenna et al. 2002; Donnelly et al. 2003). Fish stocks were generally abundant for the following: fusiliers (Casionidae), snappers (Lutjanidae), jacks (Carangidae), and sweetlips (Haemulidae), but there was a scarcity of large groupers (Serranidae), Napolean wrasse (*Cheilinus undulatus*), and sharks (McKenna et al. 2002; Donnelly et al. 2003). In several environmental assessments, coral reefs were found to be in relatively good health throughout the region, although some areas showed evidence of bomb craters and overfishing (McKenna et al. 2002; Donnelly et al. 2003) (Figure 4.1). There was no evidence of large scale damage

from coral bleaching, disease, or reef predators (e.g., *Acanthaster planci*, *Drupella*) (Donnelly et al. 2003).

Figure 4.1. Bomb crater off Fafanlap

Both green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtle nesting and foraging populations are found in Raja Ampat. Leatherbacks (*Dermochelys coriacea*) are also common, but are not known to nest in the region. Many local communities harvest turtle eggs and green turtles for meat; while hawksbill turtles are harvested for their valuable shells. Mollusk species richness is also quite high; nearly 700 species have been recorded (McKenna et al. 2002). Commercially valuable molluscs (e.g., *Tridacna* and *Strombus*) occurred widely, but populations were low. Mangroves are not widely represented, although they are present in Misool in areas where estuarine flats and tidal rivers provide sufficient habitat (Donnelly et al. 2003).

Results from a marine biological assessment in Raja Ampat, that were based on narratives of early European expeditions in various museums and libraries in Europe and local archives in Papua, suggest a 50% decline in sightings of turtles, fishes and invertebrates from the late 1800's to present, potentially due to increased human population pressure on marine resources (Palomares and Heymans 2006). The expansion of the Balinese turtle fishery in Indonesia in the mid 1970s severely depleted the green turtle populations in Sulawesi, Maluku, and Papua (Polunin and Nuitja 1981). Invertebrates (e.g., mollusks and sea cucumber) are continuously extracted despite signs of overexploitation. Research suggests that the existing stocks of fish, shellfish and echinoderm can support subsistence fisheries, but not commercial fisheries like trawling (UBC 2006).

CHAPTER 5

TOMOLOL AND FAFANLAP CASE STUDIES

5.1 Social and demographic characteristics

Tomolol and Fafanlap are located in southeast Misool (Figure 1.2), one of the four main islands of Raja Ampat. There are about 8,716 people in Misool, with 200 in Tomolol and 800 in Fafanlap (Remijsen 2001). The village of Tomolol is built on the top of a cliff by the sea with a steep path leading to the water. The houses are generally made of wood or less frequently from concrete and they have thatched or tin roofs (Figure 5.1). At the base of the cliff, there are a few houses built on stilts over the water, but these families are all considered outsiders.

Figure 5.1. Wooden houses in Tomolol with thatched and tin roofs

Fafanlap is located about 50 kilometers south of Tomolol. The village of Fafanlap is built predominantly on the water. The houses over the water are built on stilts, and there is also a narrow strip of houses built along the coast, backed by a steep cliff (Figure 5.2).

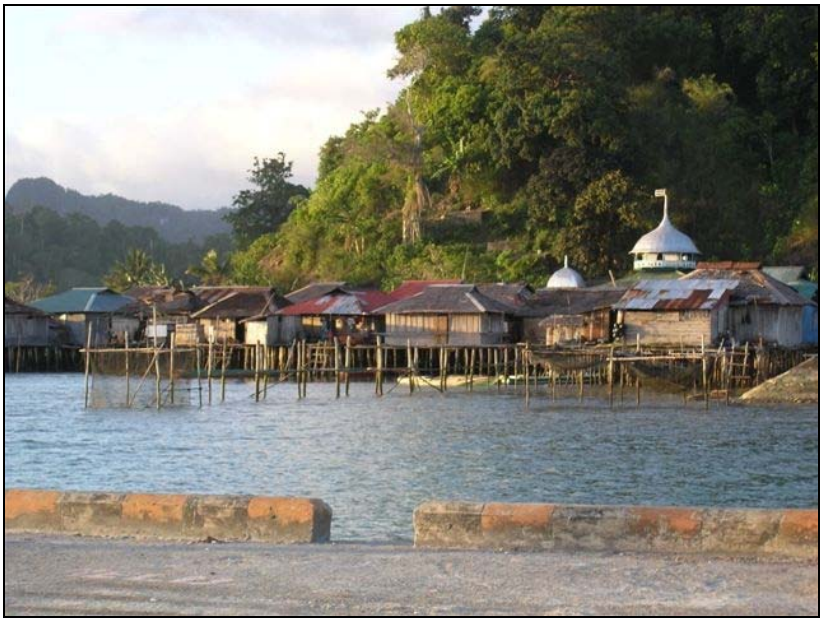

Figure 5.2. Houses in Fafanlap built on poles

In Tomolol, the majority of villagers are *Matbat* (80% of those interviewed considered themselves *Matbat*). The *Matbat* refer to themselves as *mat ley* (landward people). The *Matbat* are a land-oriented group that originally came from the forest (village leader in Tomolol, personal communication, 2006).They walked from the forest to the coast and established the village of Tomolol during the war between the Dutch and Indonesia (mid-20th century). After the war, the government announced a resettlement plan and asked all of the villagers in Tomolol to move to a new adjacent village called Benlol. Half of the villagers moved to Benlol and half moved to a village called Limalas.

Missionaries from Ambon brought Christianity to Misool in the 1930s (village leader in Tomolol, personal communication, 2006), and consequently 100% of the villagers in Tomolol are Christian. The *Matbat* organized into a clan structure (*marga*). There were originally six clans: Moom, Mjam, Fadimpo, Falon, Faam, and Mlui. Within each clan, there were a number of families. For example, the Moom clan has eight families. The original families in Tomolol are from Aduwei, Seget, and Kei.

In Fafanlap, the *Ma_ya,* the sea-oriented group, are the ethnic majority. The *Ma_ya* trace their origin to Waigeo, an island north of Misool in Raja Ampat. There are six clans that are recognized as the original people of Fafanlap: Soltief, Macab, Bahale, Wainsaf, Banlol and Matelkate. The Soltief clan met with the indigenous people of Misool on an island called Pulau Mustika, and at a time when there was no religion in Misool. During this meeting, Soltief was appointed the traditional leader and the *Matlol* ("people of the sea") people moved to a place called Tip Pale ("tip" in *Matlol* means "pool" and "pale" means "big"). In Tip Pale, the *Matlol* people were introduced to Islam which was brought from Banda. The *Matlol* people moved to another village called Kafopop, later known as Usaha Jaya. From there, the *Matlol* people spread to Fafanlap and surrounding villages. In Fafanlap, 47% of those interviewed identified themselves as *Matlol*.

Both Tomolol and Fafanlap have village leaders *(kepala kampung)*, traditional (*adat*) leaders, and religious leaders. These community leaders control use and access to marine resources. The *kepala kampung* is an elected position whose role is to appoint staff and serves as the primary link with the higher local levels of government and the

central government. Any problems that arise in the village are resolved through the *kepala kampung* before they are taken to external agencies. In addition to the *kepala kampung*, each village also has traditional leaders although their power has weakened.

5.2 Economic characteristics

5.2.1 Large scale industries

The live reef food fish trade is active in Fafanlap (Figure 5.3, 5.4), but not in Tomolol. A live reef food fish trader in Fafanlap said that all of his fish were caught using hook and line, not cyanide, but none of the fish in his holding pen had marks from a hook suggesting that they were caught using cyanide. He stated that once he has enough fish, usually every several weeks, he calls a buyer from Sorong to pick up the fish and sell them to Hong Kong. He also mentioned that he was teaching others in his village how to harvest these fish for the live reef food fish trade because it such a lucrative industry. In Fafanlap, villagers commented that if they wanted to participate in the live reef food fish trade industry, they would be supplied with boats and necessary equipment. The live reef food fish trade nets in Fafanlap held mostly small Napoleon wrasse (25-38 cm.) and a few coral trout (*Plectropomus leopardus*).

Figure 5.3. Live reef food fish trade holding pen

Figure 5.4. Fishermen dip juvenile Napoleon wrasse (*Cheilinus undulatus*) in freshwater to kill parasites

The pearl company has a greater impact in Tomolol than in Fafanlap because it is located closer to Tomolol and leases marine space from the clans in Tomolol. In Tomolol, there are mixed feelings about the presence of the pearl company. The village leader mentioned that the opportunity to work for the Pearl company provided an incentive (i.e., alternative income) for the young people not to harvest marine resources as a primary source of income. The positive impacts of the company are the jobs provided for both young and older villagers without extensive experience needed. The company also helps support village infrastructure. Most villagers in Tomolol are supportive of the pearl company as long as it is well-managed and follows the contract. Some complaints of the pearl company are that the company workers harvest more than just the oysters; they also take other marine resources for food and additional income. Customary tenure holders have no ability to limit this because of the contract that they

signed, giving the rights to the company. Problems have arisen regarding payment for the area to clans, either the payment is not enough, or the payment is given to the wrong clan, i.e., the clan that does not have tenure rights over the area. One villager said that there is a conflict with the pearl company because the *Matlol* people in a neighboring village, Yellu, gave the pearl company the right to farm the area without discussing it with the people of Tomolol, who are the customary owners.

> We don't want to exacerbate the problem, even though according to *adat* we have to sue them because the area is under our customary right. It is true that there was an agreement between the Fadimpo clan with those in Yellu a long time ago, but this agreement did not allow the right to ownership, it was given only to manage and to keep and conserve the resources (villager in Tomolol, 2006).

Also, some villagers commented that the company did not always follow the contract and did things that were not written in the contract without first coordinating with the people who have the customary rights over the area. One villager reported that while the pearl company provides substantial income to many villagers in Tomolol, the company gives a small amount of money to the *adat* leaders to "persuade us and cover their trespasses."

5.2.2 Economic opportunities in villages

Economic opportunities varied greatly between Fafanlap and Tomolol. Villagers reported quite different main occupations in each village (Table 5.5, Figure 5.5). Most villagers interviewed in Tomolol reported farming (predominantly sago) or working for the pearl company as their main occupation. Other jobs in Tomolol include teaching, carpentry, and village leadership. No one in Tomolol identified fishing as a primary occupation, although several villagers said that fishing was a secondary source of income.

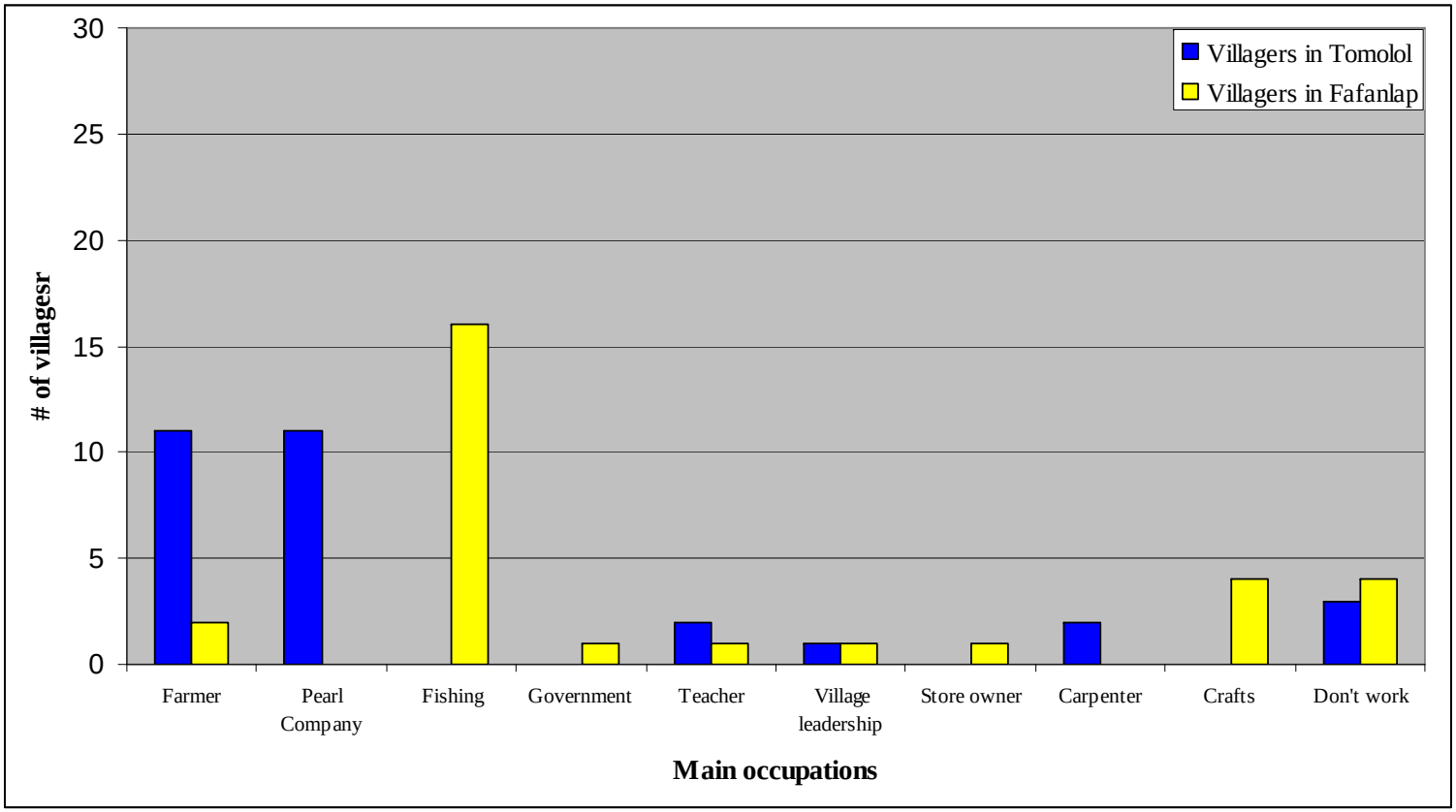

Figure 5.5. Main occupations of villagers in Tomolol and Fafanlap

Other secondary sources of income included collecting sea cucumbers and shellfish, working for the pearl company, boat making and carpentry. In Tomolol, women reported only farming or working for the pearl company as main occupations, while men worked a range of other jobs mentioned above.

The main economic activity of the *Matlol* people in Fafanlap is subsistence fishing, and most villagers identified fishing as their main occupation (54%). Sometimes fish are sold in Sorong, the regional capital on the mainland of West Papua. Other jobs include making crafts like fishing nets or woven mats, farming, government work, teaching, village leadership, and owning a shop. No one in Fafanlap mentioned that they worked for the pearl company as their main occupation. As in Tomolol, there are not as many job options available for women in Fafanlap. Women only reported fishing and making crafts as main occupations while men reported all other options. Farming was identified as the most popular secondary source of income, followed by weaving mats, fishing, collecting sea cucumber and shellfish, boat making, shop keeping, and roof making.

One possible explanation for the difference in jobs in each village may be due to cultural backgrounds. As mentioned earlier (Section 5.1) the *Matbat* of Tomolol originated in the forest and they are a land-oriented group, whereas the *Matlol* people of Fafanlap are a sea-oriented group. It is logical that the *Matbat* with historical ties to the forest would be adapted for farming, whereas the *Matlol* with ties to the ocean would be adapted for fishing. However, once the people from Tomolol moved to the coast, they began to fish to supplement their incomes, although many villagers said that they only fished for food in Tomolol. In Fafanlap, although most villagers identified themselves as

fishermen and fisherwomen, many villagers had gardens that they would either harvest for personal use or for sale. Location could also be another explanation for the preference for fishing in Fafanlap and farming in Tomolol. In Fafanlap, the villagers live right on the water and access is easy; whereas in Tomolol, villagers must walk down a steep cliff to the water and boat access is limited due to the topography. The fact that Fafanlap is more integrated into the cash economy with more goods from outside the village is likely because of more regular access to Sorong. This may also explain why there are more store owners and craft makers in Fafanlap, because of closer ties to outside markets and resources. There was only one kiosk in Tomolol with very basic goods available (e.g., eggs, rice, and noodles, petrol), whereas there were several shops in Fafanlap that were stocked with more goods. Additionally, it was impossible to buy fresh vegetables in Tomolol because most people harvested only for subsistence use, and even seafood was not available, in contrast to Fafanlap which had much more variety and a greater supply of seafood and vegetables.

5.2.3 Dependence on marine resources

When asked to identify the most important marine resources for food in the village, nearly all interviewed in Tomolol and Fafanlap identified fish and shellfish (Table 5.6, Figure 5.6). Turtle was identified as a significantly more important marine resource for food in Tomolol than in Fafanlap. This could be due to cultural preference for turtle meat in Tomolol, or it could also be due to easier access to turtle nesting beaches and/or larger turtle populations in Tomolol. Most crabs are caught in the mangroves, and mangrove populations may be greater adjacent to Fafanlap, making crabs more easily accessible. These possibilities would need to be verified by further

environmental assessments. Urchin, squid, and shrimp were more frequently reported in Fafanlap perhaps because of their greater dependence on marine resources. Villagers in both areas complained that it is now harder to find the same number of sea cucumber and trochus than they used to be able to harvest. Villagers in Fafanlap harvested more trochus than those in Tomolol because trochus were relatively abundant offshore from Fafanlap, whereas trochus were not present offshore from Tomolol based on reports by numerous villagers in Tomolol. This could be due to less favorable environmental conditions for trochus in Tomolol, as villagers there said that trochus had never been abundant offshore.

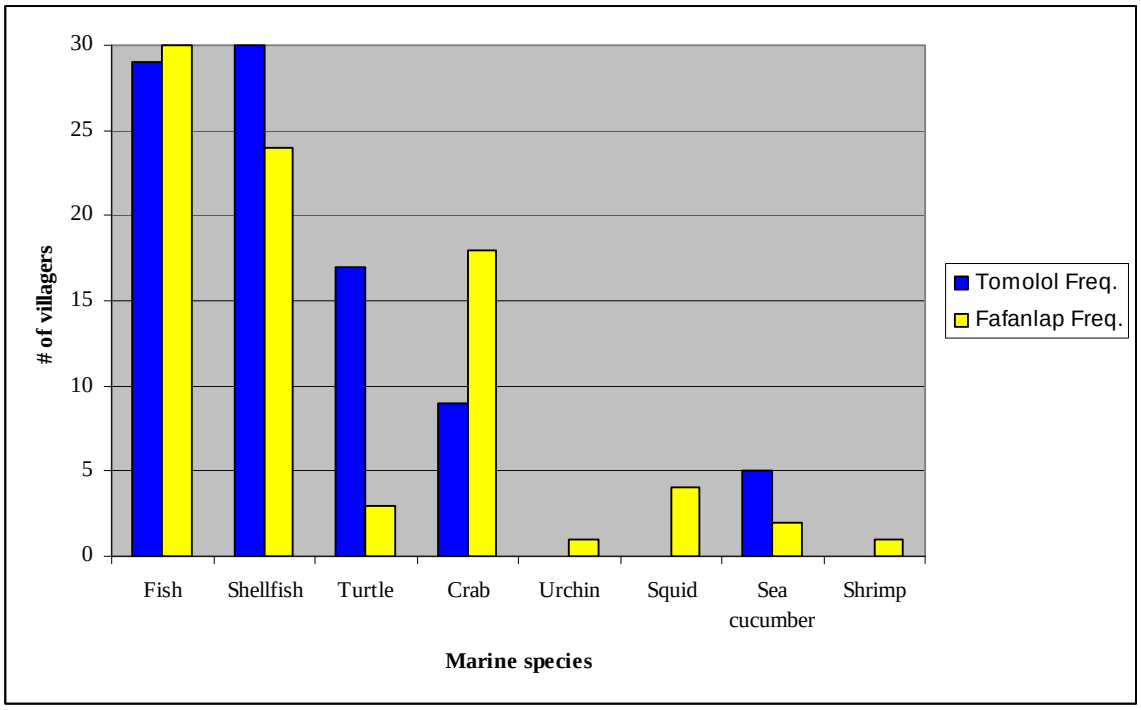

Figure 5.6. Most important marine resources for food in Tomolol and Fafanlap

The most important marine resource for income differed somewhat from the most important marine food resources (Table 5.7, Figure 5.7). The most important marine resource for income in both villages is sea cucumber. This could be because they are extremely easy to harvest and can even be harvested by hand, although spears are also

used for collecting them. Sea cucumbers are also lucrative and are easy to dry for sale at a later date, which is important when markets are far from the villages. Fish was identified as a more important resource for income in Fafanlap possibly because there are more opportunities to sell fish to outside markets (e.g. live reef food fish trade) and possibly more opportunities to sell fish locally as well within the village. Shellfish are a more important marine resource for income in Fafanlap perhaps due to a greater dependence on marine resources overall and also perhaps because of availability. Many villagers in Tomolol mentioned that they did not have easy access to shellfish offshore, whereas shellfish are abundant off Fafanlap. Few people in either village identified shrimp and shark as important resources for income.

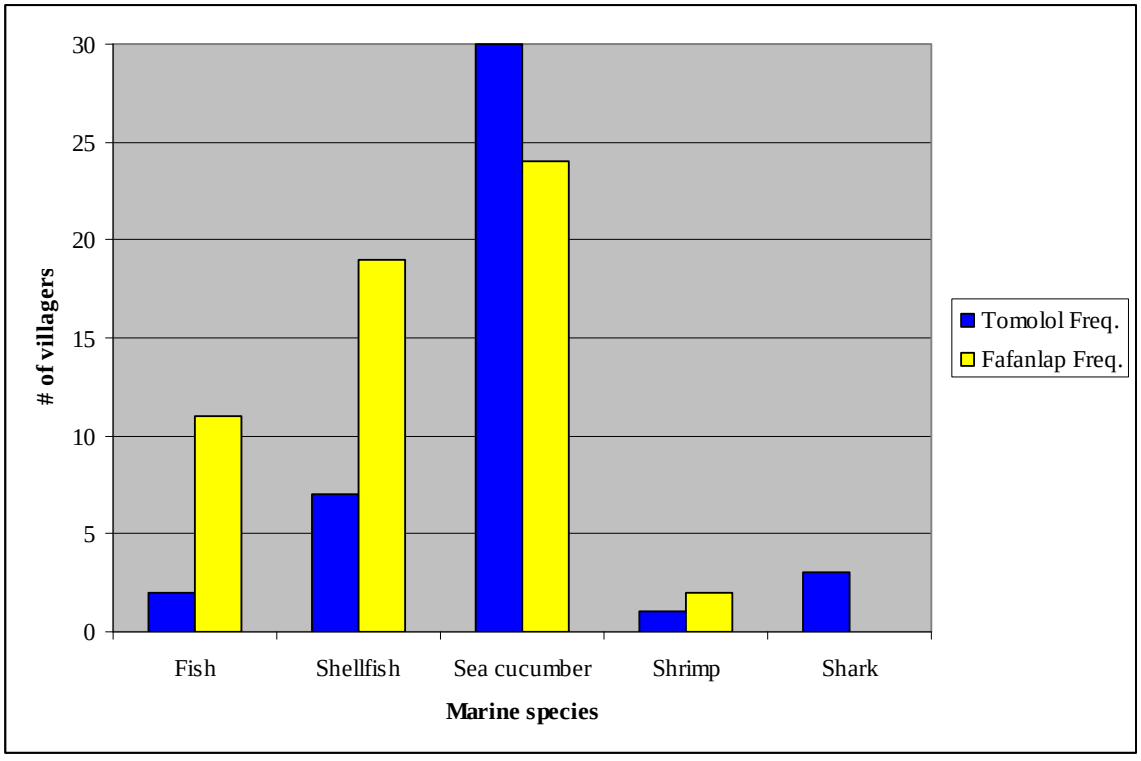

Figure 5.7. Most important marine resources for income in Tomolol and Fafanlap

5.3 Perception of Environment

5.3.1 Perception of marine habitats and species

Villagers in both Tomolol and Fafanlap depend on marine resources for food and livelihoods. Coral reefs are found along the coast of both villages. According to a rapid ecological assessment in 2002, the coral reefs and associated species off Fafanlap are mildly threatened by sediment, overfishing, marine pollution, and destructive fishing, and coastal development, while those off Tomolol may not be as threatened yet by these human impacts (Donnelly et al. 2003) with the exception of possibly overfishing.

Nearly all men and women interviewed in Tomolol (>90%) stated that the coral reefs and mangroves around the village are in good or very good condition (Table 5.8, Figure 5.8). In Fafanlap, 80% said that coral reefs are in “good” or “very good” condition, while over 90% said that the mangroves are in good” or “very good” condition.

More villagers in Tomolol may have reported better coral reef and mangrove conditions because the reefs and mangroves may be in better condition than in Fafanlap, although this would need to be verified by ecological assessments. Alternatively, they may perceive their reefs and mangroves to be in better condition based on lower existing threats to these habitats, although this is unlikely as more villagers in Tomolol reported mangrove deforestation and overfishing than villagers in Fafanlap (Table 5.9).

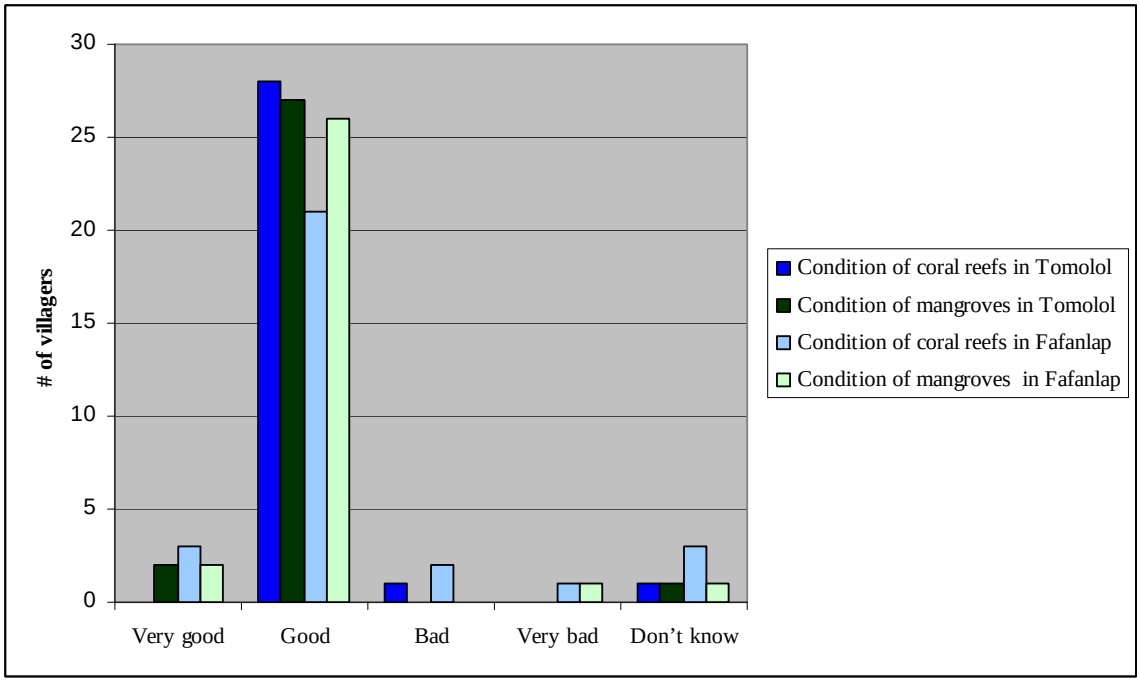

Figure 5.8. Perception of condition of coral reefs and mangroves in Tomolol and Fafanlap

One reason why one villager in Fafanlap suggested that the reefs and mangroves were in "very bad" condition is that this person was misinformed. Further, due to the small sample size (n=30) per village, only one person in Fafanlap stated that the reefs were in "very bad" condition and one person said that the mangroves were in "very bad" condition. Despite the generally positive views of current reef and mangroves health in both villages, numerous environmental threats were identified in both villages.

5.3.2 Perception of threats to environment

The main environmental problems identified in Tomolol were deforestation and soil erosion and blast fishing, and in Fafanlap, they were blast fishing and cyanide, and soil erosion (Table 5.9, Figure 5.9).

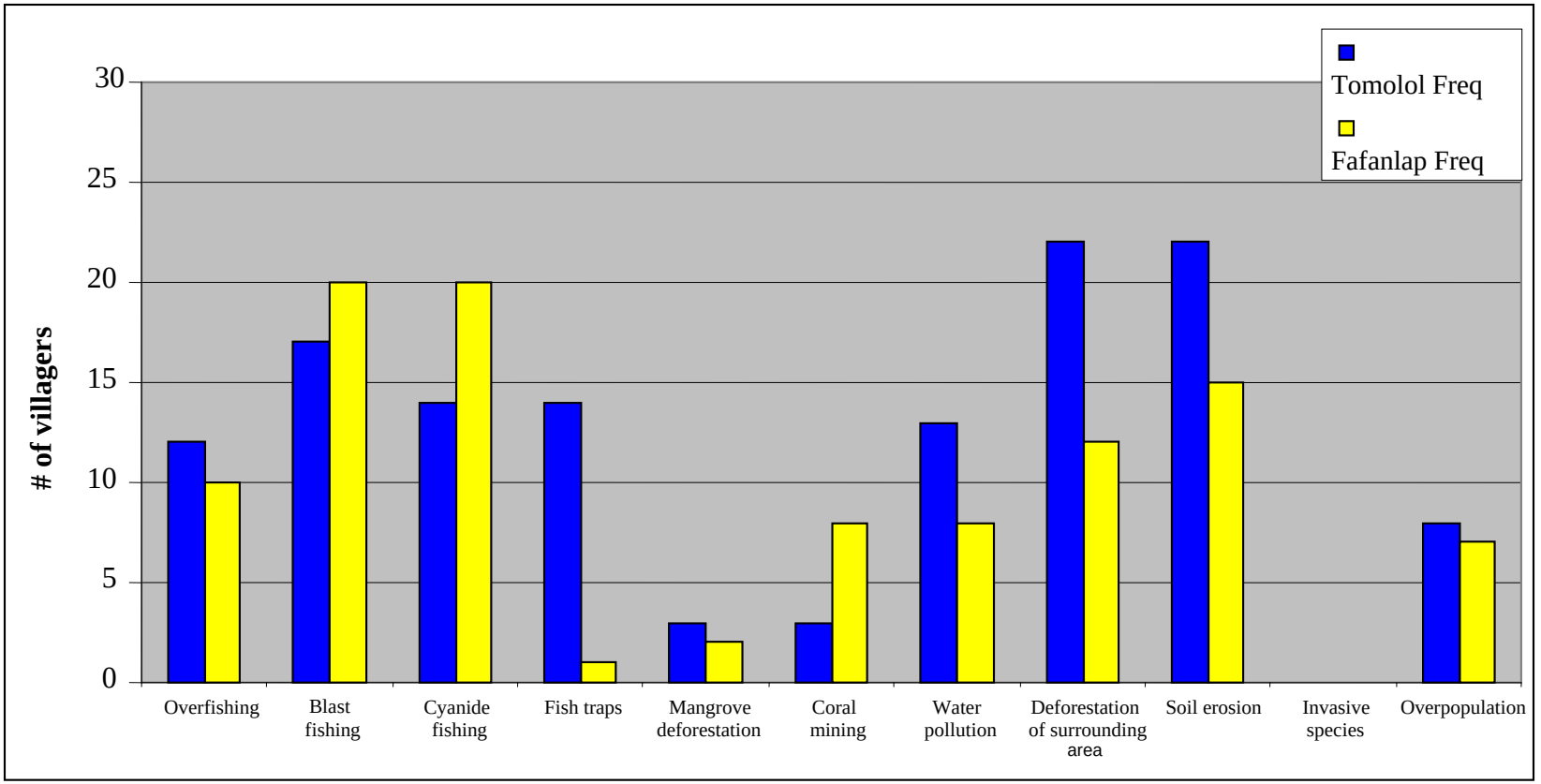

Figure 5.9. Perceived major environmental problems in coastal and marine environments in Tomolol and Fafanlap

Villagers in Tomolol most likely identified deforestation as a major threat, because they have a greater dependence on the forests and spend more time in the forests gardening and collecting firewood than villagers in Fafanlap who depend more on the marine resources than terrestrial resources. Villagers in Fafanlap were more likely to identify threats to marine resources than villagers in Tomolol, with the exception of overfishing. Evidence of destructive fishing techniques was greater in Fafanlap than in Tomolol, thus it would be expected that more people would report destructive fishing techniques as a threat in Fafanlap. However, countering this, there is a stigma against using illegal techniques to harvest marine resources and it is possible that villagers were either afraid to suggest that destructive techniques are used in the village or simply did not want to admit their use.

The villagers in Tomolol suggested that fishermen from Buton and Sorong are largely responsible for the destructive fishing techniques such as bombs and cyanide. Others mentioned that people from other villages in southern Misool also used bombs and cyanide, harming marine resources in Tomolol. Another factor that may have an impact on the community's perception of threat to the environment is that The Nature Conservancy has held conservation workshops in Tomolol, but not in Fafanlap, prior to the time of this survey. Conservation workshops are likely to increase awareness of threats to the coastal and marine environments. Water pollution was identified as a threat by more villagers in Tomolol than in Fafanlap. This could be because Tomolol is closer to the pearl company, and several villagers mentioned that the pearl company always throws waste such as nets and plastics into the ocean.

5.3.3 Perception of present and future coastal and marine conditions

Villagers in both Tomolol and Fafanlap expressed concerns that the coastal and marine environment has deteriorated in the last decade. In Tomolol, almost 75% stated that the current conditions of the marine environment around the village are worse than they were ten years ago, compared to nearly 67% in Fafanlap (Table 5.10, Figure 5.10).

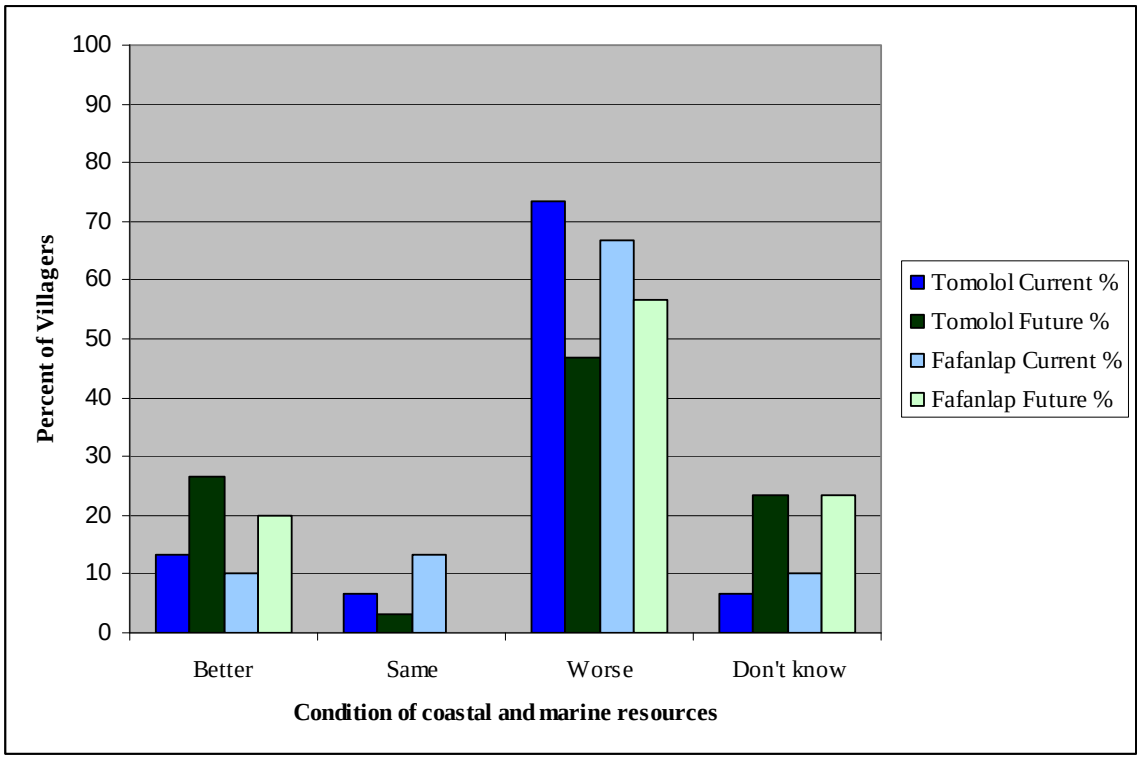

Figure 5.10 Perceptions of current (compared to ten years ago) and future coastal and marine conditions in Tomolol and Fafanlap

When asked how the conditions will change in Tomolol in the next ten years, almost half said that conditions will get worse, and just over one quarter said that conditions will improve. When asked how the condition will change in Fafanlap in the next ten years, more than half said that they will get worse and only 20% said that conditions will get better. Perceptions of the future state of coastal and marine resources are more optimistic in Tomolol. This could be because of the environmental workshops

that have been held there, combined with the fact that they have less illegal activity in their coastal waters, with less destructive fishing methods used than in Fafanlap. They also have a more intact marine management system, which will be discussed in the next chapter. Villagers in Fafanlap have likely witnessed more illegal activities (using bombs and cyanide to harvest fish), because more villagers use destructive fishing methods than villagers in Tomolol. This information is based on survey responses and visual and auditory observations (presence of hookah compressors and blasts from dynamite) in the villages.

5.3.4 Perceptions of those responsible for causing and solving environmental problems

In Tomolol, the majority of villagers identified the village leader (27%) and private businesses (23%) as the major creators of environmental problems, and about 17% identified local villagers as the creators (Table 5.11, Figure 5.11). When asked which businesses were responsible, villagers mentioned the pearl company. The pearl company was most likely identified by villagers in Tomolol but not Fafanlap because the pearl company is closer to Tomolol and villagers there mentioned that it polluted the water. In Fafanlap, villagers identified local villagers (33%) and the village leader (17%) as the primary creators of environmental problems. It is likely that villagers in Fafanlap identified local villagers as more responsible for causing environmental problems than villagers in Tomolol, because more environmental destruction occurs in Fafanlap that is initiated by locals. Villagers in Fafanlap reported higher incidence of destructive fishing methods than villagers in Tomolol. Roughly an even number of villagers in Tomolol and

Fafanlap (13% and 10%, respectively) suggested that "others" were responsible for creating environmental problems, and all of those specified "others" as "outsiders."

When asked about who was most likely to solve the environmental problems in each village, few villagers in each Tomolol and Fafanlap mentioned local villagers (Table 5.12, Figure 5.12; 3% in Tomolol, 7% in Fafanlap). Roughly equal numbers of villagers in both villages identified the Head of District and non-governmental organizations. Interestingly, despite the larger number of villagers in Tomolol that identified the village leader as the cause of environmental problems, a greater majority in Tomolol identified him as the solver of environmental problems. Nearly three-quarters of the villagers in Tomolol identified the village leader compared to less than half of the villagers in Fafanlap. Therefore, it is likely that villagers in Tomolol feel that the village leader plays a greater role in the exploitation and management of the environment than villagers in Fafanlap.

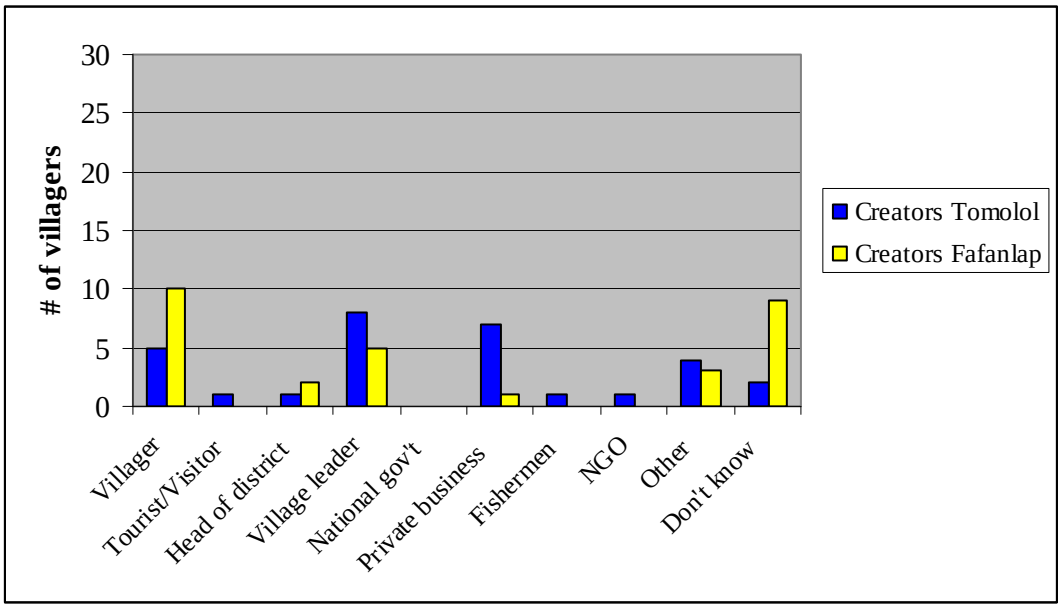

Figure 5.11. Perception of creators of environmental problems

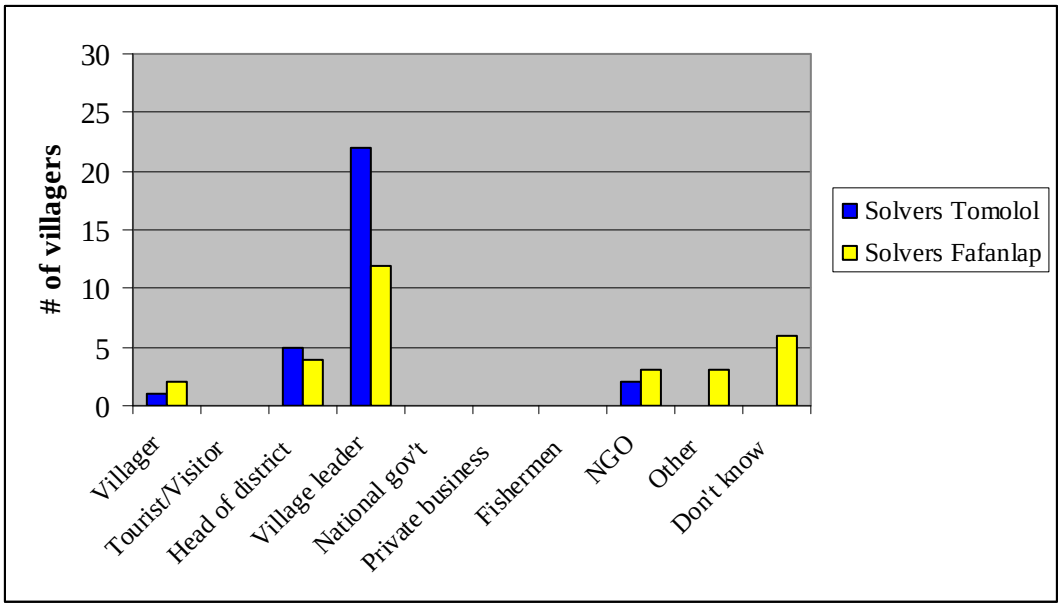

Figure 5.12. Perception of solvers of environmental problems

5.4 Fishing practices and marine resource harvest

Most villagers in Raja Ampat are subsistence fishers and have small gardens to supplement the marine resources harvested. Marine resources contribute the bulk of protein to villagers in Raja Ampat. Fishing effort has increased in the last several decades and marine resources are declining. Fishermen across Raja Ampat complain that the resources are declining and fishermen have to fish farther from shore than their parents did to harvest less fish and shellfish.

5.4.1 Fishing gear

Artisanal fishers use mostly traditional gear including fishing line, fishing poles, nets, spears, and traps. Fishing line is now made of monofilament and wrapped around mangrove wood handles or plastic (Figure 5.13). Both fiber and monofilament nets are used and most nets come from Sorong, although one man mentioned that his fiber nets are from Taiwan and are used for catching sharks (Figure 5.14). Scoop nets made from

mangrove wood (*sabsub*) are also used to collect shrimp (Figure 5.15). Fishing poles are made of sago and the line is monofilament (Figure 5.16). Spears are used to catch fish and harvest sea cucumber. Spears are made of bamboo and the spear tip is made of steel. The spears have one prong (*kalun*) or three or five prongs (*kalawai*) (Figure 5.17, Figure 5.18). Traps are used to catch fish (Figure 5.19.).

Figure 5.13. Monofilament fishing line wrapped around mangrove wood

Figure 5.14. Fiber nets on left, green monofilament net on right

Figure 5.15. Woman in Fafanlap demonstrating scoop net

Figure 5.16. Woman in Fafanlap holding fishing pole made of sago

Figure 5.17. Man in Fafanlap holding a one-pronged spear

Figure 5.18. Three-pronged spear in Tomolol

Figure 5.19. Fish trap in Fafanlap

Shellfish, such as trochus, oyster, and green snail, are collected by hand. Generally, villagers use their hands and goggles (Figure 5.20) in the day and at low tide for harvesting shellfish and sea cucumber but at night, the villagers use a spear with a kerosene lantern to harvest sea cucumbers.

Figure 5.20. Man wearing wooden goggles in Fafanlap

Figure 5.21. Compressor and hose (partially covered with a blue tarp)

However, some villagers are more frequently using compressors (Figure 5.21), dynamite, and cyanide to harvest fish. These destructive practices cause major damage to the coral reef habitat, and sometimes seriously injure the fishermen.

All villagers in both Tomolol use predominantly traditional fishing gear, 100% interviewed (n=30) use hook and line. Traditionally, villagers would make a fishing pole from bamboo or sago, and the line was rope made from a tree (Latin: *Gnetum gnemon,* common name: Melinjo, *Matbat* language: *mein*). A grass seed was used as a weight. The grass seed was bluish in color and Papuans have also used this seed to make souvenir bracelets and necklaces. Small shrimp were used for bait. Today, villagers use nylon instead of rope. Nearly all families use a three or five-pronged spear to catch fish and a one-pronged spear to harvest sea cucumber. Both nylon and fiber nets were brought in by the pearl company and can be purchased from Sorong, and only a few villagers had nets.

Compared to Tomolol, more modern gear is used in Fafanlap, although traditional gear is also still common (Table 5.22, Figure 5.22). All villagers interviewed in Fafanlap reported using hook and line, and many families reported using spears for harvesting sea cucumbers and catching fish, as in Tomolol. A majority (83%) of villagers in Fafanlap reported using fish traps, compared to 17% in Tomolol. Only one fish trap was seen in Tomolol, whereas many were seen in Fafanlap. Additionally, the village leader in Tomolol mentioned that they were trying to keep fish traps out of Tomolol because of the damage that they can do to the coral reefs when deployed. Additionally, sometimes fishermen break corals to weigh down the trap and check the traps infrequently, leading to unnecessary bycatch. This awareness may have come from a conservation workshop held in Tomolol by the Nature Conservancy. Villagers in Tomolol reported that the dynamite, cyanide, compressors, gill nets, seine nets, trawling, and fish traps are mostly used by outsiders.

A greater incidence of trawling, gill nets, seine nets, bombs and compressors were identified in Fafanlap. This is likely because villagers in Fafanlap have greater access to fishing technologies from Sorong, and may also face greater pressure from outsiders to use these methods to harvest marine species for sale. Furthermore, villagers in Fafanlap rely more heavily on marine resources for income than villagers in Tomolol (see section 5.2), thus are more susceptible to over-harvesting marine species to enhance their profit. Interestingly, more villagers in Tomolol reported the use of cyanide than in Fafanlap. This is unusual because greater use of compressors in Fafanlap would likely lead to greater cyanide use, as cyanide is used with compressors to stun and collect reef fish.

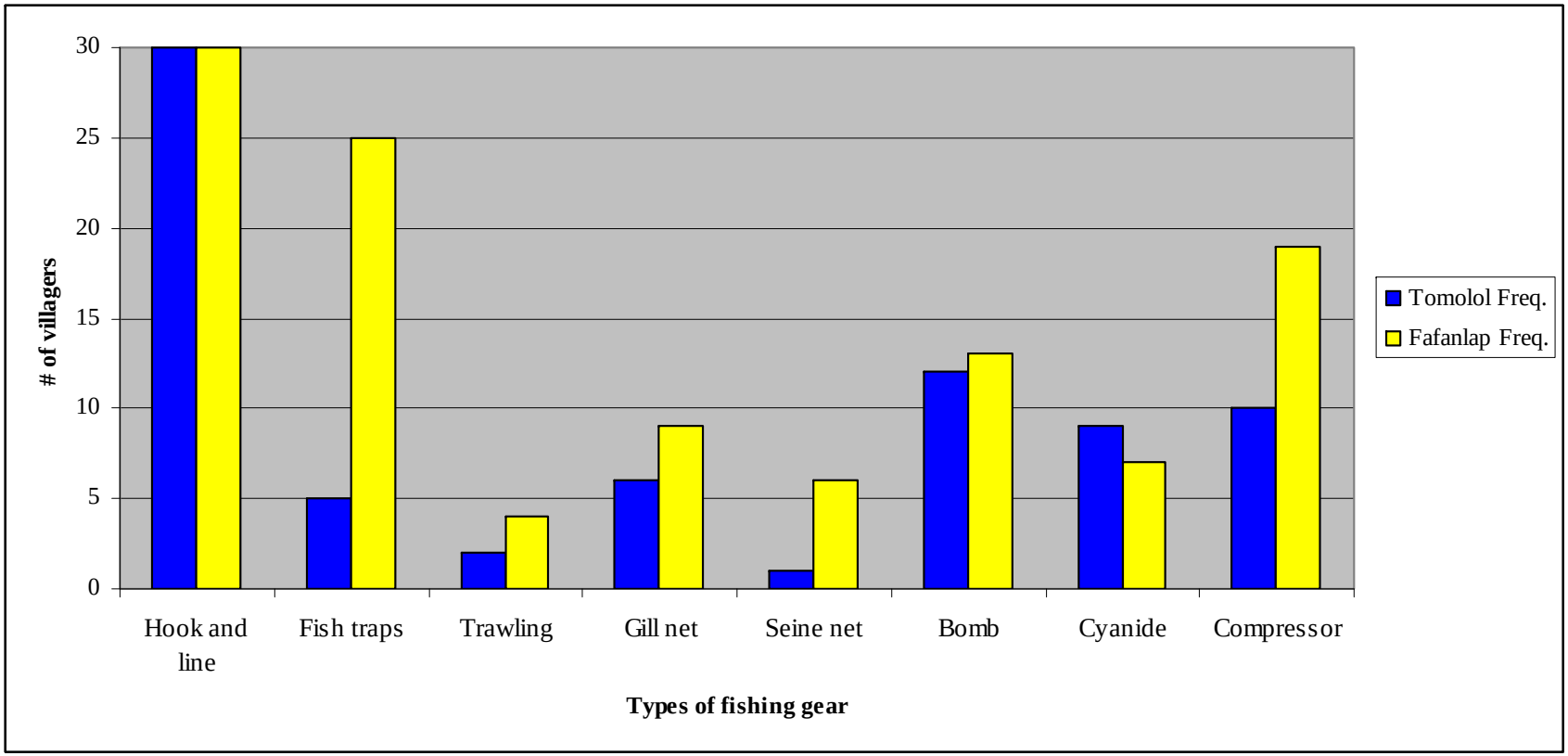

Figure 5.22. Fishing gear used in Tomolol and Fafanlap

Some possible explanations of this are that villagers in Fafanlap are hesitant to admit to the use of cyanide because it kills coral reefs. More likely however, the increased report of compressors in Tomolol was because of the close proximity to the pearl company. Several villagers in Tomolol mentioned that the pearl company uses compressors, but without cyanide.

5.4.2 Coastal and marine activities

Villagers in both Tomolol and Fafanlap reported engaging in a variety of coastal and marine activities including reef gleaning, turtle harvest, shark fining, coral mining, sand mining, crab harvest, swimming and diving, mangrove harvest, sea cucumber harvest, and giant clam harvest (Table 5.23, Figure 5.23).

Nearly all villagers in both villages reported reef gleaning (97% in Tomolol, 100% in Fafanlap). In Tomolol, 40% more villagers identified turtle harvest than in Fafanlap. This could be due to cultural differences resulting in different preferred diets. Some authors suggest that Muslims in Indonesia do not eat turtle meat (Parsons 1964), although this is an unlikely explanation because over half interviewed in Fafanlap admitted to harvesting turtle and all villagers in Fafanlap are Muslim. In Tomolol, turtles were identified as an important food resource nearly 50% more than in Fafanlap (see section 5.2.3), thus it is quite likely that villagers in Tomolol prefer to eat turtle, regardless of the reason for their dietary preference. Other possibilities are that harvesting turtle is often done for ritual purposes and is closely associated with *adat* (Chan and Liew 1996; Suárez and Starbird 1996) which is more intact in Tomolol than in Fafanlap.

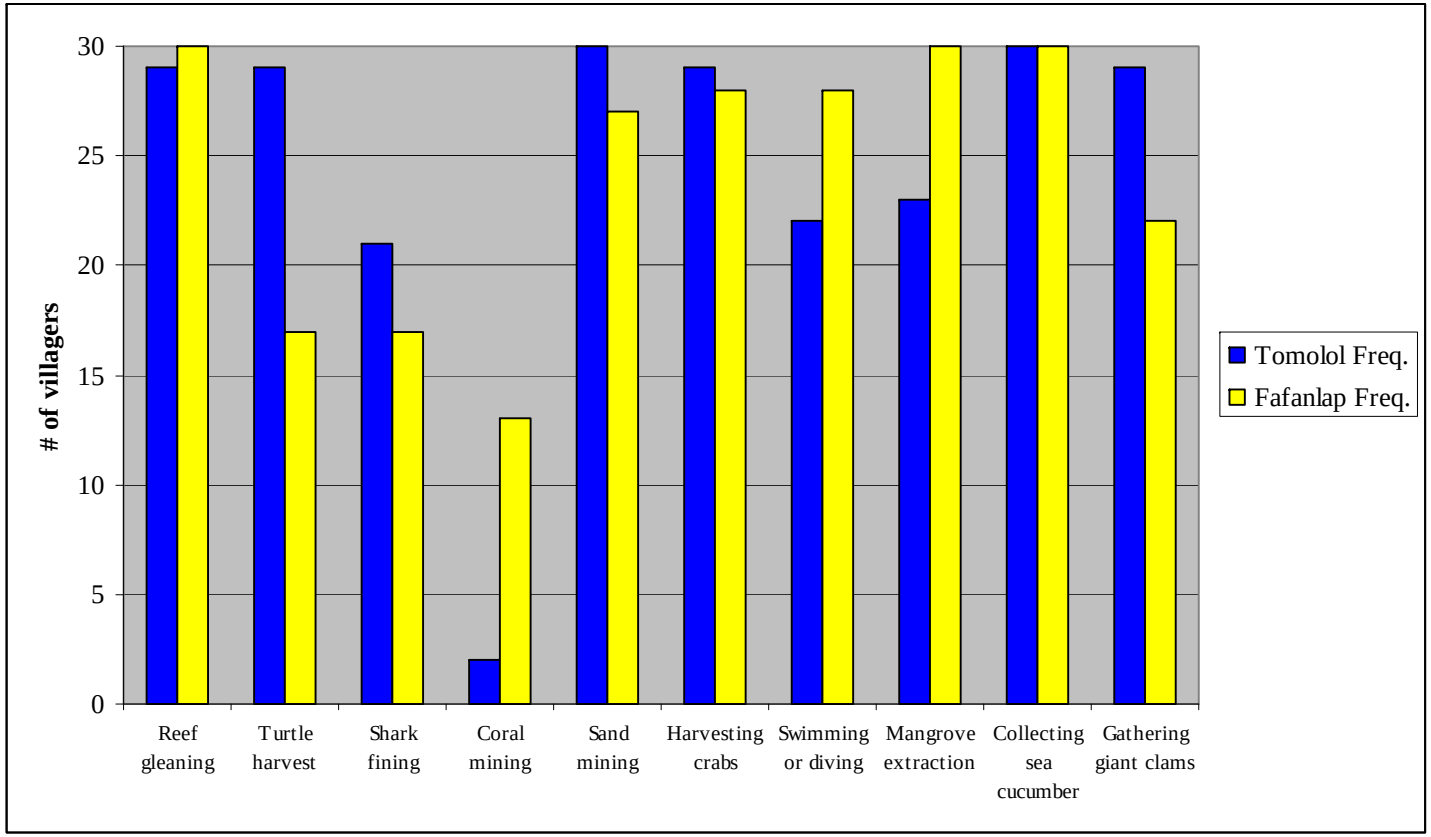

Figure 5.23. Coastal and marine activities reported in each village

Some villagers may also be reluctant to admit to harvesting turtle if they know that there is stigma associated with it because they are endangered. Finally, turtle harvest may also be dependent on proximity to turtle nesting beaches or larger turtle populations. More villagers in Tomolol reported shark finning than in Fafanlap, which supports the findings that more villagers in Tomolol mentioned shark fins as an important marine resource for income (10% in Tomolol, compared to 0% in Fafanlap, see section 5.2.3). It is important to note that one possible reason that no one identified shark as an important marine resource for income in Fafanlap, and the villagers there regularly said that no one collects shark fins, may be because of the stigma associated with harvesting sharks. Bans on shark finning have been adopted for most international waters, and the shark fin trade has led to several species of sharks being listed as vulnerable or endangered on the CITES Red List (IUCN 2006). Despite the report that no villagers in Fafanlap collect shark fins, shark fins were visible drying on roofs in Fafanlap and the village leader in Fafanlap showed me a collection of various shark fins that he had received from local villagers (Figure 5.24).

Figure 5.24 Dried shark fins and tails on left, dried sea cucumber on right

No one in Tomolol mentioned owning shark fins, nor were any visible drying in the sun. Shark finning occurs in both villages by locals and likely by outsiders as well. Coral mining was much more prevalent in Fafanlap perhaps because there is greater access to the markets in Sorong, on the mainland of Papua. Additionally, the reefs off Fafanlap are closer to shore and more extensive than those off Tomolol, making mining more practical.

Reported incidence of sand mining and harvest of crabs and sea cucumbers were about equal in both villages. In Fafanlap, 20% more villagers reported swimming and diving than in Tomolol. This may be due the fact that villagers in Tomolol originated from the forest and are also less dependent on the marine environment than villagers in Fafanlap who are coastal people. Additionally, villagers in Fafanlap live right on the water, and in many cases, over the water, whereas villagers in Tomolol must walk down a steep cliff to get to the ocean. More villagers in Fafanlap reported mangrove harvest. This could be because of the presence of a larger area of mangroves adjacent to the village. More villagers in Tomolol reported mangrove deforestation as an environmental threat, which may mean that the mangrove forests in Tomolol are less abundant, thus there is less opportunity for harvest. Finally, 24% more villagers in Tomolol reported harvesting giant clams than villagers in Fafanlap. This may be because the populations of giant clams are more abundant in the waters off Tomolol. However, Fafanlap has more fishermen from outside exploiting its reefs, which may have caused a decline in giant clam populations. This would need to be verified by further environmental assessments.

5.4.3 Gender and fishing practices

In both Tomolol and Fafanlap, fishing duties are shared between men and women and overlap considerably. According to one woman in Tomolol, “both men and women do either onshore or offshore fishing, this tradition has existed since our ancestors.” This is unlike many other villages in Indonesia, where tasks are sex-aggregated (Woroniuk and Schalkwyk 1998; Ruddle 2000). Although villagers in both Tomolol and Fafanlap repeatedly stated that fishing duties are shared between men and women, and there are no differences in fishing tasks (87% in Tomolol and nearly 70% in Fafanlap), tasks and gear were actually aggregated by sex in both villages (Table 5.25, Figure 5.25).

In Tomolol, many types of fishing gear are only used by men, such as trawls, gill nets, seine nets, bombs, cyanide, and compressors. In Fafanlap, villagers reported similar results, that seine nets, bombs, cyanide, and compressors were also only used by men. Of those villagers who reported the use of fish traps in the village, the majority in both Tomolol and Fafanlap said that fish traps were only used by men. In Fafanlap, some villagers said that men used more varieties of fishing gear than women. One villager said that women used fishing poles made from sago with a nylon thread, while men used many different fishing techniques compared to women. He also mentioned that mostly men make fishing nets, and only men mend the nets, but many of the nets are bought in Sorong, and are not made locally.

None of the gear included in the survey was identified as only used by women in Tomolol. In Fafanlap, no gear was reportedly used by only women except for hook and line, and only three villagers suggested that hook and line were used only by women, while the majority suggested that hook and line were used by both men and women.

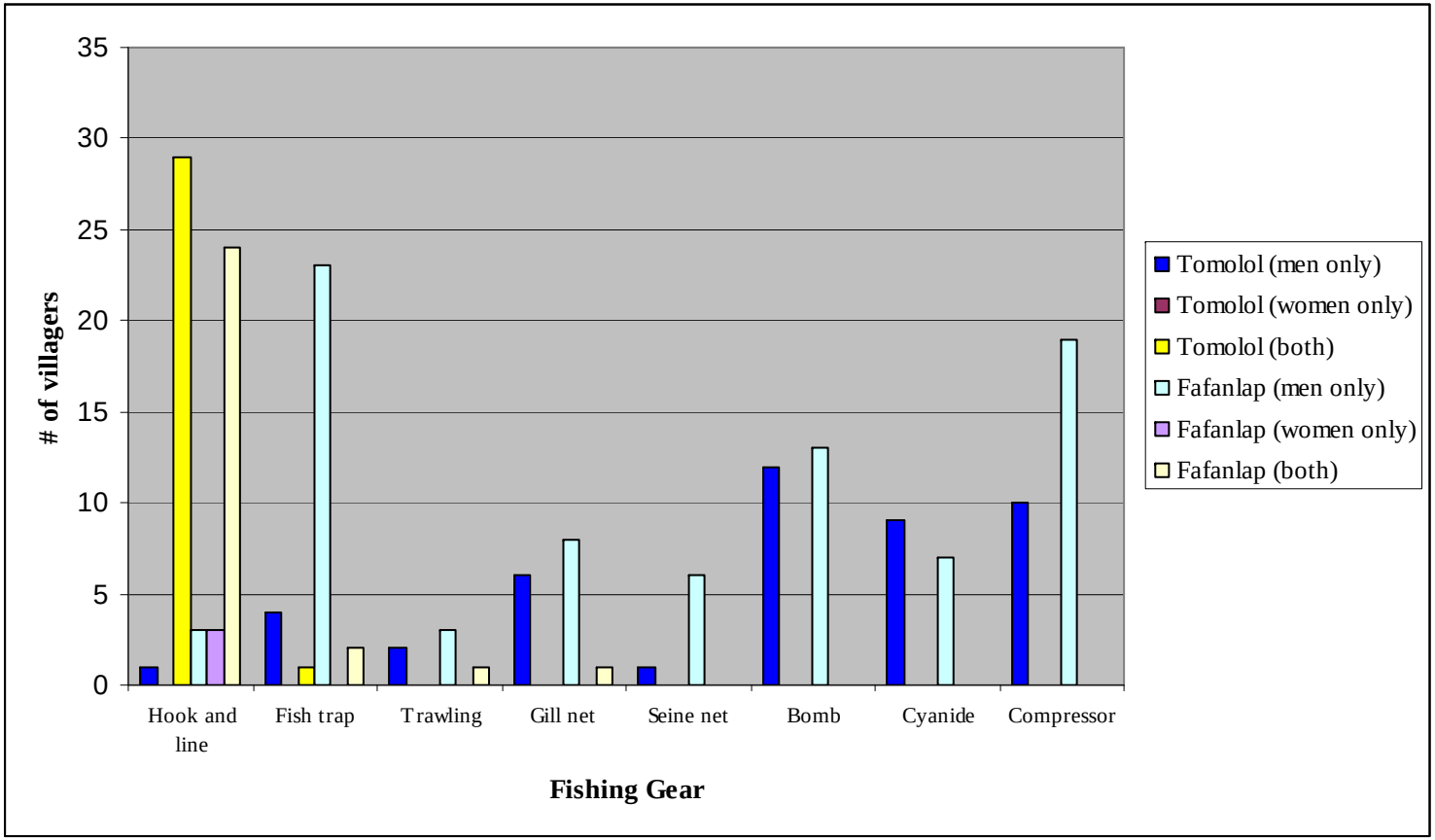

Figure 5.25. Types of fishing gear used in village, aggregated by sex.

It is likely that women do not use bombs, cyanide, and compressors due to the inherent dangers of using these technologies. Several women said that they knew men who had lost limbs or died using dynamite and died using compressors. Some of the fishing techniques that require more strength or fishing farther offshore (trawling, gill nets, and seine nets) are generally done by men, because it may be necessary for women to stay home or closer to shore to take care of children. However, some villagers mentioned that men, women, and children fish together both onshore and offshore.

Men and woman have different roles in fishing and marine activities in both villages (Table 5.26, Figure 5.26). While a majority of villagers (over 90%) in both Tomolol and Fafanlap reported that both men and women harvest sea cucumber and do reef gleaning, many of the other tasks are only done by men. A majority of villagers reported that turtle harvest, shark finning, and coral mining were only done by men in both villages. These activities are most likely done by men because they require a lot of physical strength. Most villagers suggested that swimming and diving, collecting crabs, harvesting giant clams, and collecting mangrove wood were done by both men and women, although a few villagers in both Tomolol and Fafanlap said that these activities were done only by men, and one villager said that harvesting giant clams was only done by women. In Tomolol, sand mining was identified by half of those interviewed as a task only done by men, while the other half suggested it was done by both men and women. Most people commented that men mined the sand and women carried it. In Fafanlap, most villagers said that only men mined sand, while a few said that both men and women mined sand. With very few exceptions, no tasks were identified as only done by women.

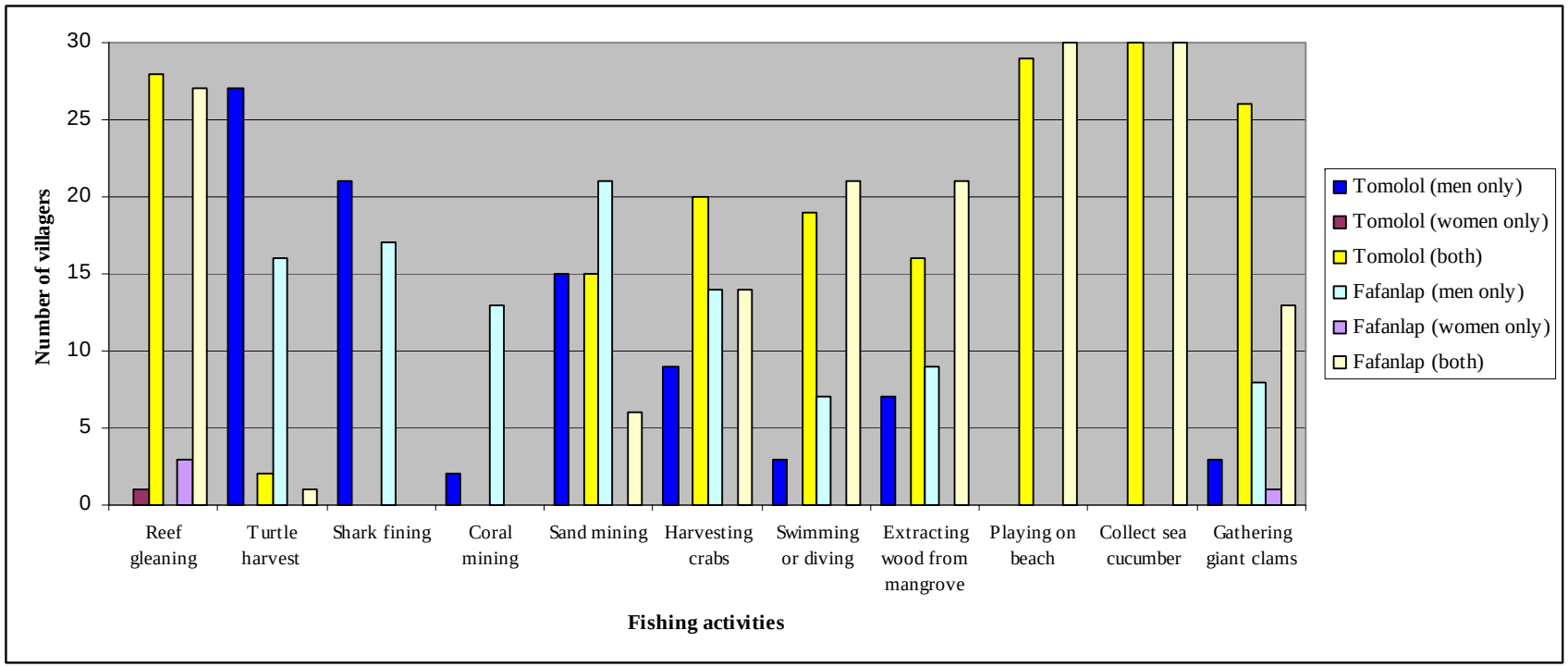

Figure 5.26. Types of fishing activities, aggregated by sex

Overall, women and men seemed to share fishing tasks and marine activities. However, women did not participate in activities that were dangerous or required significant amounts of physical strength. Research in other areas suggests that women tend to be more involved in post-harvest activities such as processing fish (Diamond 2002; van Ingen et al. 2002). In Tomolol, men and women both process and clean fish, but only women smoke the fish. Buyers come to the village to purchase marine resources, and both men and women prepare and sell the harvest to the buyers. Buyers are generally *Matlol* people from neighboring villages including Fafanlap, Lilinta, and Usaha jaya, but also Chinese-Indonesian business men come from Sorong to buy marine resources. Mostly, shellfish and fish are only harvested for food, but sea cucumber are cleaned, dried, and sold to buyers. According to many villagers in Tomolol, men and women both know about where to harvest marine resources, but neither have detailed information about marine species' spawning habits.

In both villages, men were more likely to report the following environmental problems than women (Table 5.27, Figure 5.27): overfishing, blast fishing, cyanide, fish traps, mangrove deforestation, deforestation of surrounding area, and soil erosion. In Tomolol, women were slightly more likely to report coral mining than men, while in Fafanlap, men were more likely than women to report coral mining as an environmental problem. Roughly equal numbers of men and women in both villages said that overpopulation was a problem, and no one in either village reported invasive species as a problem.

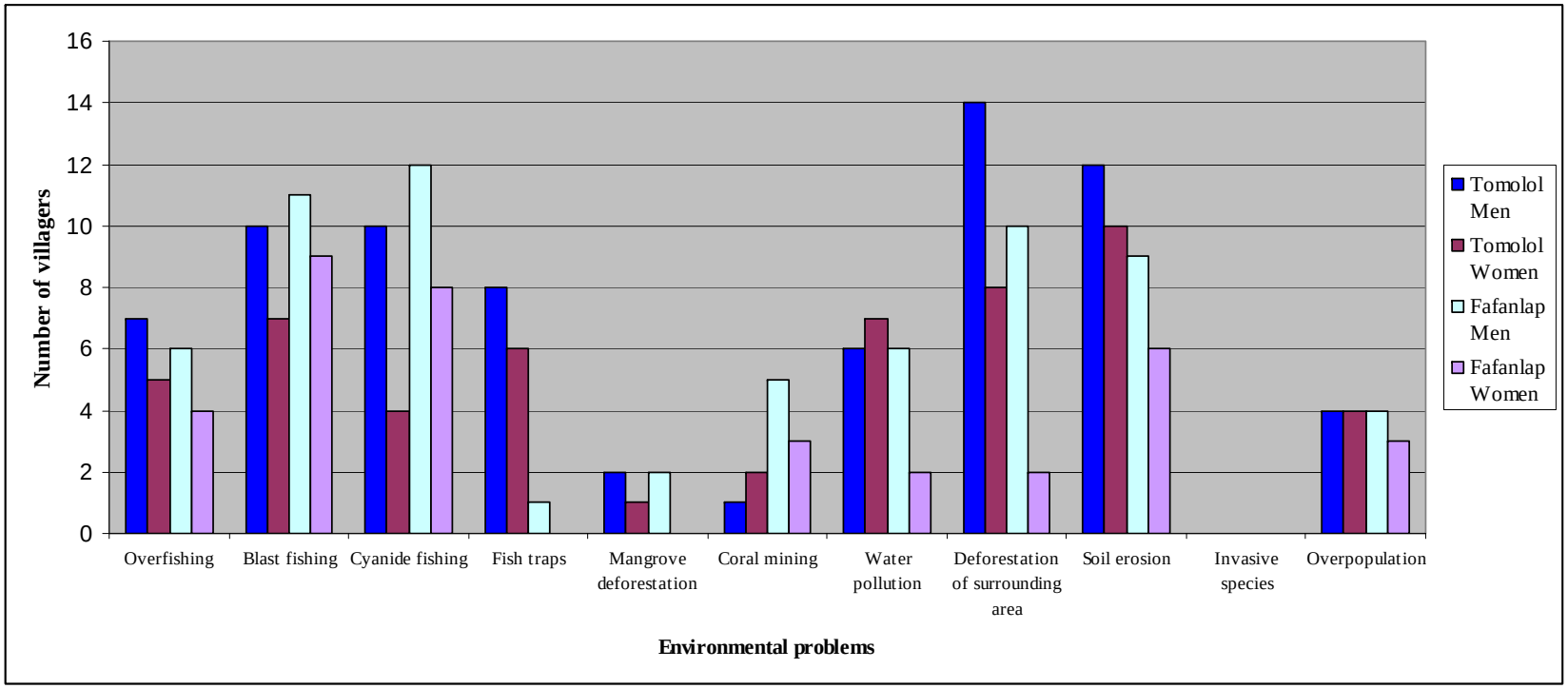

Figure 5.27. Perceived major environmental problems in coastal and marine environments in Tomolol and Fafanlap, aggregated by sex

A higher number of women in Tomolol reported water pollution than men, and in Fafanlap, more men reported water pollution as a problem. One reason why more women reported water pollution in Tomolol might be that a greater number of women work for the pearl company in Tomolol, thus they may be more aware of the problems caused by the company. It is possible that men in both villages report higher incidences of environmental problems because they are more aware of the problems than the women. This greater awareness may be because the men have a higher education than the women in both villages and these issues may be discussed in school or they may be discussed at village meetings attended mostly by men. Another possibility is that men may feel freer to discuss problems openly than women, thus while the women may be aware of the problems; they may not feel they should discuss the problems. Some environmental workshops that have been held have only involved men, and the women may not be aware of the problems identified in the workshops. These results underscore the need to include women in village meetings and workshops.

Not only do women and men perceive environmental threats differently, they also perceive the responsibilities of those who cause and solve environmental problems differently (Table 5.28, Figure 5.28, Table 5.29, Figure 5.29). Most men in Tomolol identified private businesses (i.e., pearl company) as the primary cause of environmental problems, while women in Tomolol identified the village leader as the primary cause of these problems. In Fafanlap, men were significantly more likely to identify local villagers as the cause of environmental problems, whereas women were more likely to say they did not know, or identify the village leader.

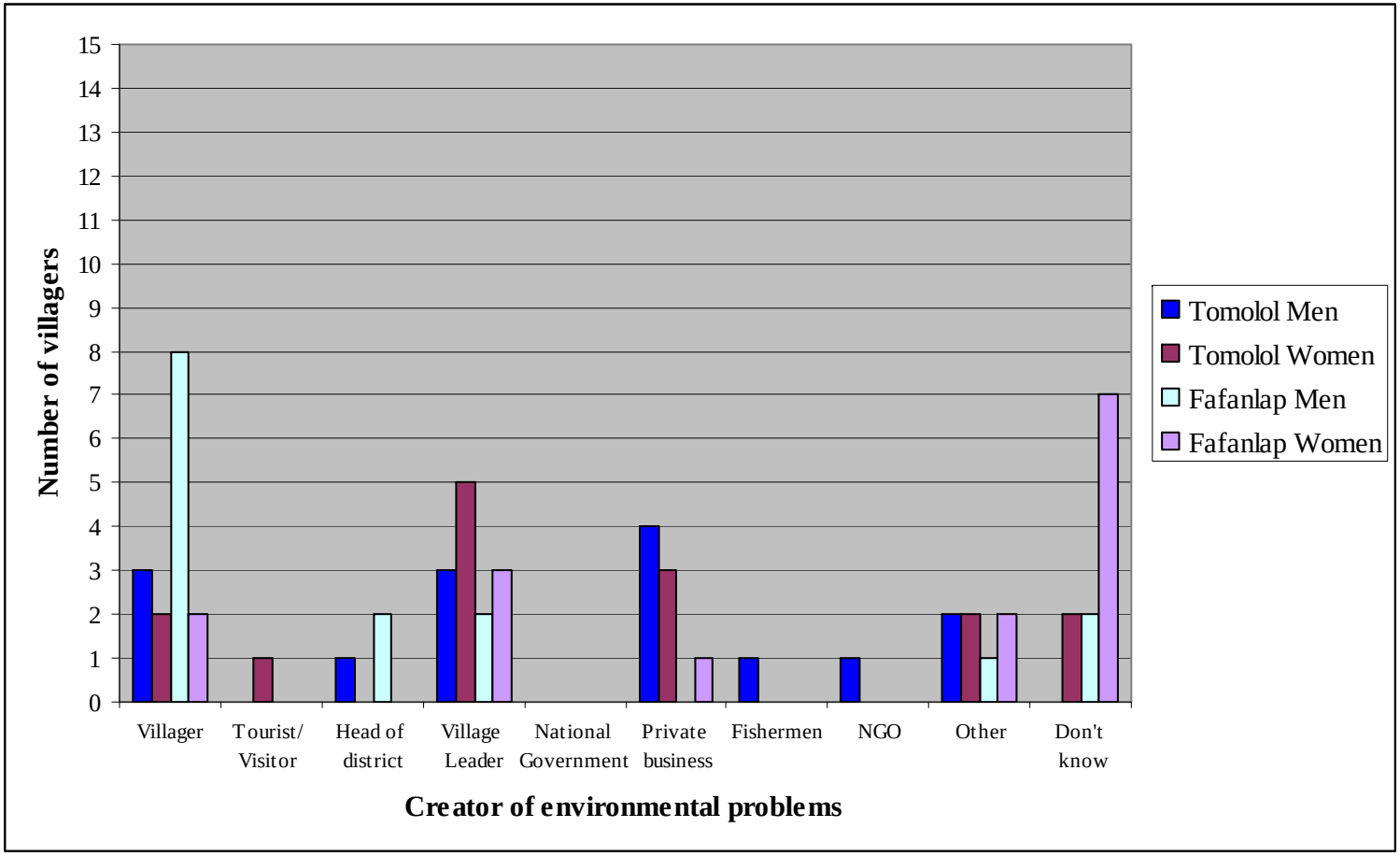

Figure 5.28. Perceived major creators of coastal and marine environmental problems in Raja Ampat

In Fafanlap, it is likely that such a large proportion of men identified local villagers as the cause of environmental problems because many men in the village admitted to using destructive fishing techniques. Women were less likely in both villages to identify local villagers as the cause of environmental problems, possibly because they did not feel comfortable admitting that they knew about villagers using destructive technologies, some of which are illegal (e.g., bombs). Only men in both villages mentioned the head of the district as the cause of problems, which may be because women have little to no contact with the head of the district, whereas men are involved in government positions and meetings that would likely involve the head of the district. No one in either village suggested that the national government was responsible for their environmental problems, suggesting that the problems are generally perceived to be caused locally. Only one man in Tomolol suggested that non-governmental organizations were responsible for the environmental problems.

The majority of women in both villages identified the village leader as the one able to solve environmental problems. This is surprising because women were also more likely to identify the village leader as the cause of these problems. Therefore, women may have more faith in the village leader's ability to create or solve environmental problems. The majority of men in both villages identified the village leader as the one most able to solve environmental problems. Roughly an equal number of men and women in both villages mentioned the head of district was the best able to solve these problems, although many fewer identified the district head than the village leader.

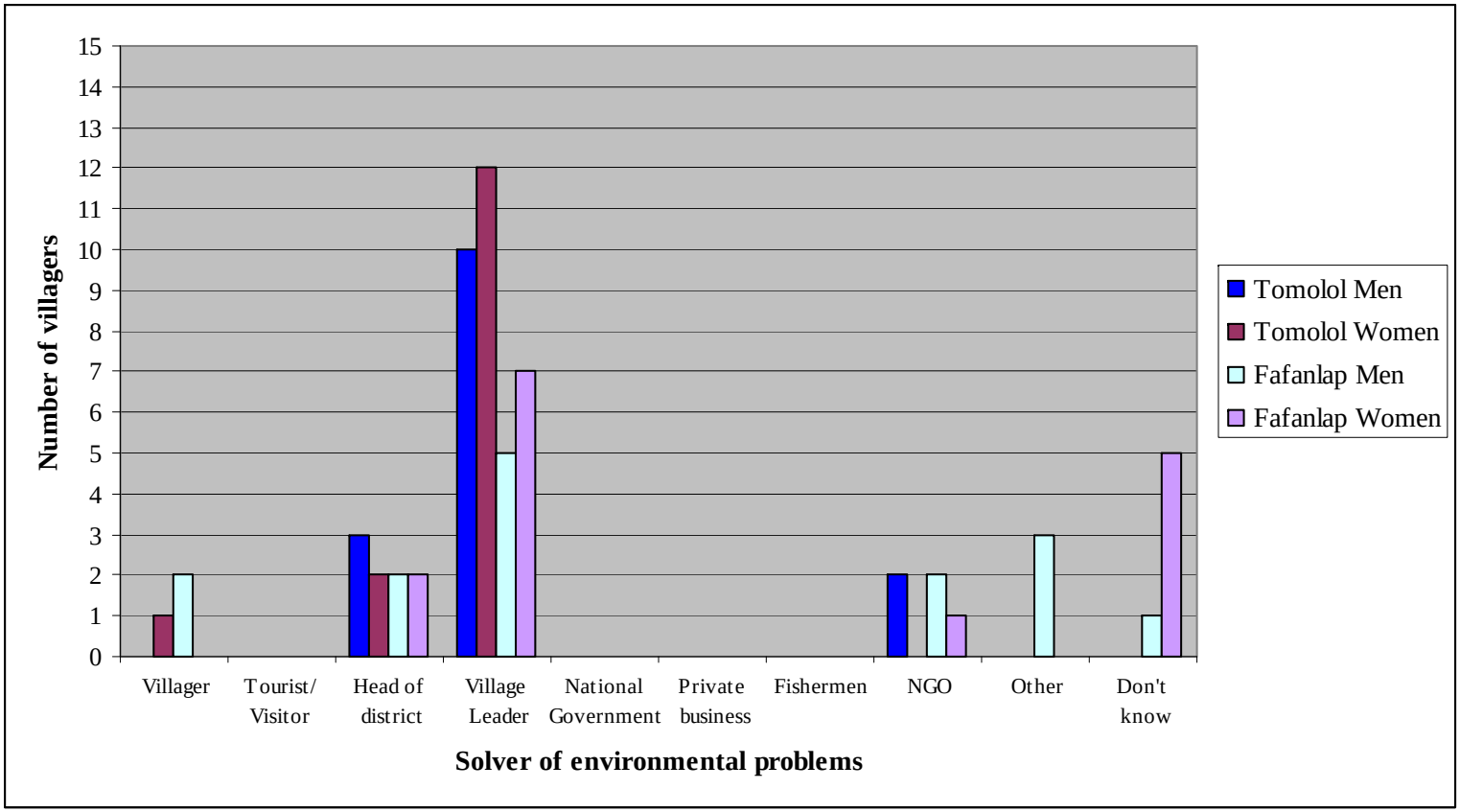

Figure 5.29. Perceived major solvers of coastal and marine environmental problems in Raja Ampat

No one suggested that the national government could solve environmental problems, reflecting either a lack of faith in the government's ability to address these problems, or perhaps recognition that the problems are better addressed at the local level, as indicated by the belief that the village leader is best positioned to address environmental problems. Several men in Fafanlap identified the category "other" as responsible for solving environmental problems and these men specified the army, police, and *adat* leaders. Few villagers in both villages identified non-governmental organizations as likely to solve environmental problems and of these villages, more men than women identified non-governmental organizations. This may be because women were not included in previous workshops, or it may mean that women have less faith in the ability of non-governmental organizations to solve environmental problems.

The results of this section indicate that much work needs to be done to include women in meetings and workshops that address environmental problems and solutions. Clearly, men and women perform different activities, use different fishing gear, and have different perceptions of threats to marine resources in Tomolol and Fafanlap. These differences demonstrate the need to engage women more effectively in resource monitoring and conservation activities. Further, the fact that women reported less incidence of environmental problems than men, may indicate that data collected from women only may under represent existing environmental threats, or data collected from men only may over represent environmental threats.

Men in both villages were 40% more likely than women to suggest that the current state of marine resources was worse than ten years ago. Men in both villages were more likely than women (~30% in Tomolol, and 20% in Fafanlap) to suggest that the

status of marine resources would be worse in the future. Therefore, it is possible that women in both villages are either less aware of the realities of the environmental threats or may perceive the severity of the threats differently. It is unlikely that women have a more optimistic view of the future of marine resources than men because an equal percentage of men and women in both villages said that the marine resources would be better in the future (~27% of men and women in Tomolol, and 20% of men and women in Fafanlap).

5.5 Conclusion

Although Tomolol and Fafanlap are similar in that both villages have diverse marine environments and communities that depend on these environments for food and livelihoods, how the villagers perceive and use their resources is quite different. Both villages have very different cultural and ethnic backgrounds, which affect how they use their marine resources. Different economic opportunities result in differing levels of exploitation of marine resources. The increased threat to marine resources in Fafanlap may indicate what is to come in Tomolol. Although villagers in Tomolol also rely heavily on terrestrial resources (e.g. sago), they still depend on the marine environment and will need to work to protect these resources before they are lost. The history of reliance on marine resources in both villages is demonstrated by the customary ownership traditions that define marine resource access and rights. These traditions form the foundation of *sasi*, which will be described in detail in the next chapter.

CHAPTER 6

CONSERVATION PRACTICES AND PROSPECTS

Sasi is an important institution in Raja Ampat and still exists in many villages of Raja Ampat. *Sasi* is still practiced in Tomolol and Fafanlap, and in both villages, it is instituted for a six month period to restrict the harvest of sea cucumber and shellfish. Harvesting fish is never prohibited. *Sasi* is instituted from April to September when the winds blow from the south. Restrictions are lifted from October to April. Council leaders, village leaders, and religious leaders are responsible for instituting and enforcing *sasi,* and although it still practiced in Tomolol and Fafanlap, social and cultural influences have led to differences in *sasi*. This section outlines the characteristics of *sasi* in these two villages.

6.1 Objectives of sasi

Villagers in Tomolol provided a variety of reasons for the development of *sasi*. Many villagers said that the ancestors instituted *sasi* because they were concerned with the sustainability of resources. The village leader said that the ancestors would dive in the ocean to detemine the status of marine resource, and based on species numbers would open or close access to marine resources. One woman interviewed said that *sasi* was instituted to protect marine resources from outsiders,

> Our ancestor instituted *sasi laut*, *sasi* in the marine environment, because they were afraid that the outsiders would come and destroy the marine resources. They also wanted to keep the resources for next generation (female villager in Tomolol, 2006).

Sasi may also be instituted based on the tasks of villagers. For example, in some months, the villagers take on additional jobs that keep them busy. During this time, the ocean may

be closed to prevent outsiders from taking the resources while the villagers are unable to defend their resources. One man said that *sasi* was also instituted to raise funds for a village project. For example, if villagers wanted to build a church, they might institute *sasi* because after the *sasi*, the resources would increase so they could harvest more resources and make a profit. When asked if *sasi* was ever instituted for cultural reasons, such as a ceremony or a funeral, the villagers said no, only for resource sustainability.

In Fafanlap, villagers suggested many similar reasons for instituting *sasi*. Some stated that their ancestors instituted *sasi* to protect the resources for the next generation. Others suggested that the seas were closed during the windy season because the fishers could not harvest marine resources during this time because it was too dangerous due to high wind and wave action, although inshore fishing for fish was still possible. A third reason for the development of *sasi* was for biological reasons; the villagers believed that closing the sea for six months would allow populations of marine species such as trochus, green snail, and sea cucumber to recover from over-harvest.

6.2 Rules and regulations

Customary ownership rights exist throughout Raja Ampat and are rooted in the clan system. In Tomolol and Fafanlap, villagers recognize ownership rights based on their clan affiliation. Rules and regulations exist in both villages that control the species harvested, gear used, when species can be harvested, and yield. These rules are unwritten and are passed down through word of mouth. Many villagers in both Tomolol and Fafanlap suggest that there are no regulations regarding who is allowed to fish and where you can harvest resources. In both villages, over 70% said that there are no regulations regarding who is allowed to fish and where you can collect marine resources.

Although the rules and regulations exist in both villages, there are differences regarding the restrictions that are in place to control marine resource harvest. On average, villagers in Tomolol reported 30-40% more restrictions than villagers in Fafanlap regarding when people can harvest marine resources, what species can be harvested, and what gear can be used. Not only did more villagers report restrictions in Tomolol than in Fafanlap, more villagers in Tomolol reported that most people know and follow marine tenure regulations. When asked whether "most people", "some people", or "few people" know the marine tenure regulations for marine resources in the village, over 60% in Tomolol said "most people" compared to only 20% in Fafanlap (Table 6.1, Figure 6.1).

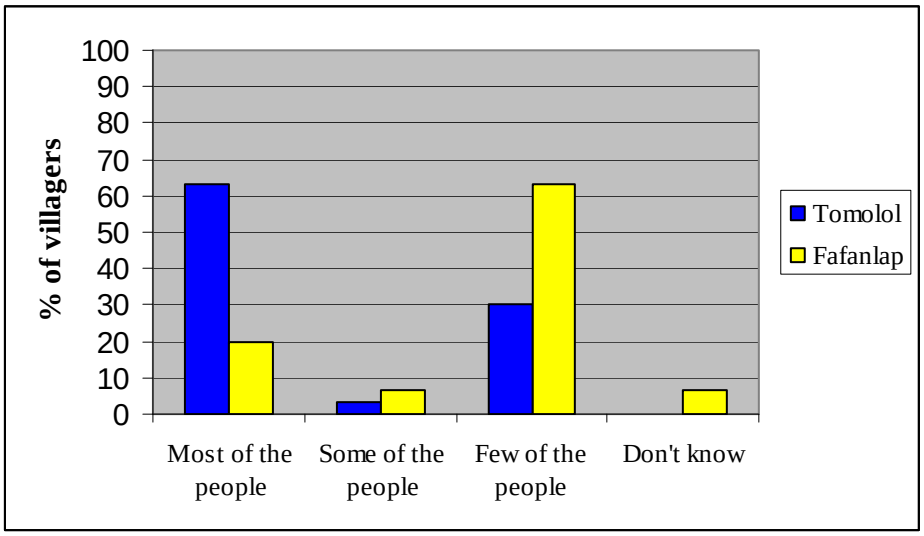

Figure 6.1. Percent of villagers that know marine tenure regulations in village

About half of those interviewed in Tomolol stated that "most people" in their village follow customary marine tenure, compared to less than 5% in Fafanlap (Table 6.2, Figure 6.2). Over 80% of the villagers in Fafanlap acknowledged that few people followed marine tenure regulations.

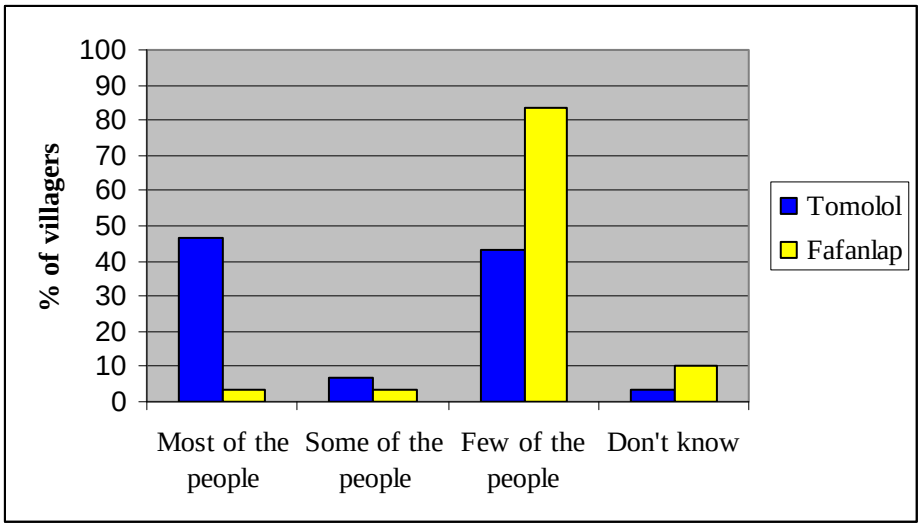

Figure 6.2. Percent of villagers that follow marine tenure regulations in village

6.2.1 Rules and regulations in Tomolol

In Tomolol, each of the original clans had a customary rights area which was marked from the mountains to the coast. Landmarks such as islands and mountains were used to mark the customary boundary and the ancestors gave a name to every place they considered their property. Boundaries also existed in the ocean, but there were no clear lines. The boundaries were identified by islands or beaches. One villager said, “we don’t need a map or writing, we’re told by our parents that our customary area is from this island to that island.”

Clans were tasked with monitoring and managing their customary marine areas, and if someone trespassed, all of the clan members would work together to decide how to address the transgression. The ownership rights were shared among all families in a particular clan. Men have ownerships rights while women have only use rights. For example, ownership rights are granted to the son but only after the father dies, whereas the daughter will be given the right for resource use only. Marine resource ownership

rights cannot be given away to people outside of the clan who hold the tenure rights, but resource use rights can be given to outsiders. Customary rights to use resources can be given to someone outside the family only if it is agreed through a family meeting attended by all family members. The clan who owns the area can give a permit to allow a person to harvest in their tenured area, but that person must pay to harvest marine resources there. If a businessman comes to negotiate a clan's resources, then the payment for use must be shared among the family members in the clan. Allowing resource use is a contractual arrangement and can be disallowed if the person violates the agreement or contract. Customary ownership rights cannot be taken away, but rights to use a resource can be taken away.

Villagers in Tomolol said that they have customary ownership rights because they are *Matbat*, indigenous to Misool. Several villagers mentioned that sometimes the *Matlol* people in Fafanlap incorrectly called themselves *Matbat* to claim indigenous rights, because they had no ownership rights to the marine environment.

In Tomolol, the clans decided when *sasi* would be instituted. *Sasi* could be instituted for one or two years or several months, depending on the agreement. The village leader said that currently *sasi laut* follows the season of the wind. When the wind blows from the south, the sea is closed, and when the wind starts blowing from the west, it is opened. During the windy season, *sasi* can last from one to three months, and is usually conducted once or twice a year.

In Tomolol, *sasi* could be instituted to limit or eliminate harvest of all marine resources except fish, or it could be instituted for only one species. *Sasi* was often instituted for sea cucumber and hawksbill turtle. Sometimes, a limit would be placed on

the number of turtle that could be harvested per year. For example, one or two green turtle could be harvested per year but only for food. Shellfish, shark, and shrimp were also limited by *sasi*. Bony fishes were never controlled by *sasi*. One man said, “How we can live, what will we eat if we aren’t allowed to take the fish at all.” The determination of what species are not allowed to be harvested and the time that the taboo lasts is determined by the clans.

A majority of villagers in Tomolol reported that gear restrictions do exist, but these are a combination of government law and *sasi* regulations. Villagers reported that there were never any regulations regarding how much of a particular marine species could be harvested because there has always been an abundance of marine resources. However, many villagers commented that today, it is harder to catch large numbers of marine species.

6.2.2 Rules and regulations in Fafanlap

Villagers in Fafanlap, considered themselves to be indigenous in Misool with ownership rights. In Fafanlap, any member of the original clans has customary rights to marine resources. Boundaries in the ocean exist that outline resource ownership and use between villages. People use landmarks such as islands to identify the boundaries that have been in place since the ancestors. The customary rights for use cannot be taken away. These rights can be given to others, but those who own the rights must condone it and resource ownership rights cannot be transferred outside of the family. Outsiders who married to local villagers in Fafanlap would inherit the usage rights of locals.

In Fafanlap, a villager explained that if someone from another village lived in Fafanlap or had a family relationship with someone in Fafanlap, they had the right to harvest anywhere. Villagers from three surrounding villages, Kofiau, Tomolol and Limalas, were also allowed to fish there. However, people from other villages needed permission from the *adat* leaders to fish.

In Fafanlap, villagers that reported restrictions on when people can harvest marine resources, mentioned that *sas*i is usually conducted for six months during the windy season, when the winds blow from the south. Even if the winds are calm, people are not allowed to harvest certain species during *sasi*. Marine species restricted during *sasi* include sea cucumber, trochus (*Trochus niloticus*), oyster, and green snail (*Turbo marmoratus*), but not fish. Fish can always be taken during *sasi* time.

One villager in Fafanlap said that traditionally, there were no customary regulations against certain types of fishing gear because the gear used was traditional. Before nylon was available, people used *nyimu*, a type of fishing line made from yarn. However, with the introduction of bombs and cyanide, laws were developed to limit destructive fishing gear. Thus, a majority of villagers reported gear restrictions exist currently, but this is a mix of government and *sasi* regulations. No restrictions on yield were reported in Fafanlap.

6.3 Penalties for breaking sasi

The penalties for breaking *sasi* varied greatly in both villages and included a written warning, fine, confiscation of catch, confiscation of gear, and confiscation of boat. These penalties were generally enforced by village leaders. In Tomolol, more

villagers reported penalties for violations of *sasi* than in Fafanlap (Tables 6.3 and 6.4, Figures 6.3 and 6.4).

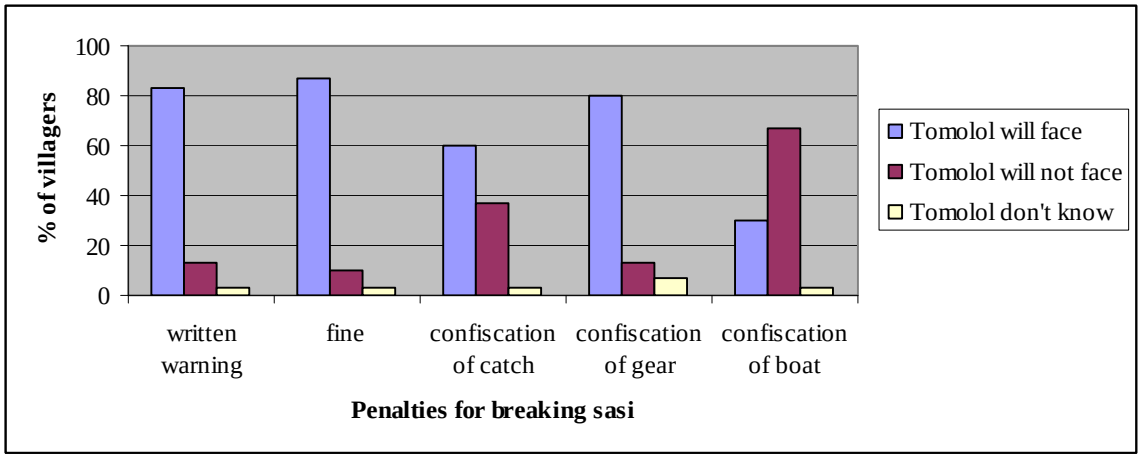

Figure 6.3. Penalties for breaking *sasi* in Tomolol

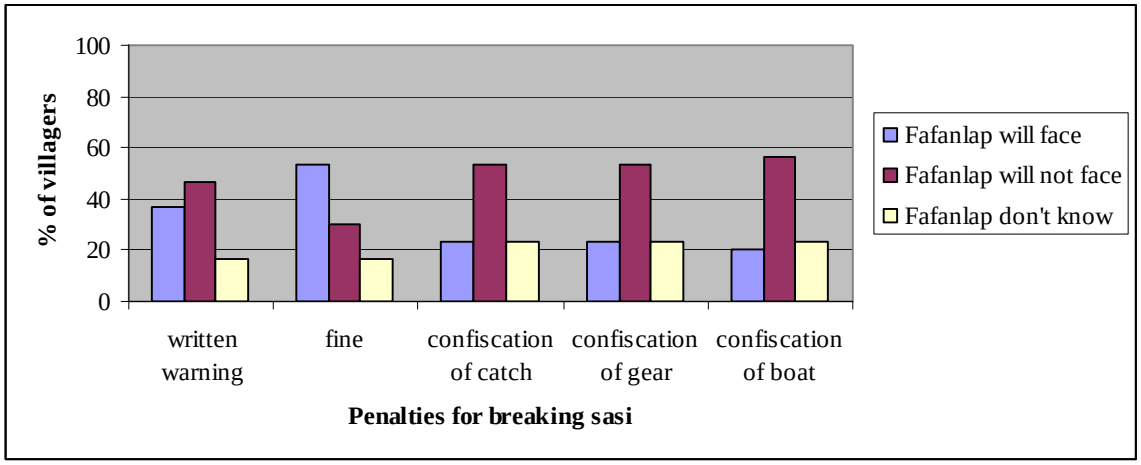

Figure 6.4. Penalties for breaking *sasi* in Fafanlap

In both villages, most penalties for breaking customary marine tenure are dealt with at the local level, and punishment is usually determined by the village leader. Technological advances such as dynamite, cyanide, and trawling are addressed through government regulations because these did not exist when the customary law was developed. These violations are usually addressed at higher levels of government such as

the district level. More punishments exist for breaking customary marine tenure in Tomolol, and there is greater consensus among villagers regarding what the punishments are, which suggests that customary marine tenure regulations are stronger in Tomolol than in Fafanlap. Further supporting this, a greater number of respondents in Fafanlap (20%) reported that they did not know whether penalties existed for breaking marine tenure, compared to Tomolol (less than 5%).

6.3.1 Penalties for breaking *sasi* in Tomolol

If someone broke *sasi*, they would have to pay a penalty. The most common penalty for breaking *sasi* under *adat* law is the payment of a fine. The majority of villagers reported that violators will face a fine, written warning, confiscation of gear, and confiscation of catch (Table 6.3, Figure 6.3). Less than 5% of villagers said that violators may also go to jail. More traditional punishments include giving up valuable possessions such as antique plates. Antique plates were traded to locals by the Dutch in exchange for birds such as the bird of paradise (*cenderawasih*) and crested pigeon (*mambruk*). Now, there are government regulations that regulate *sasi*. Several villagers suggested that if someone broke *sasi*, their boat as well as fishing gear would be confiscated until the fine could be paid. If the fine could not be paid, the villagers would keep the boat and gear. For example, there is a Johnson (long boat with motor) that was confiscated from a Butonese fisherman who was arrested for fishing without asking the village permission. The owner never came to pay the fine, so the boat is now owned by the village. While some suggested that the practice of confiscating the boat and gear was done traditionally, one man said that the confiscation of the boat was a new penalty that was not done under *adat* law, but was due to a government regulation.

Currently in Tomolol, if someone breaks *sasi* and cannot pay the fine, then their case could be brought before the district head if the case cannot be resolved by the church and village government. Generally agreement is reached at the local level, but in some cases, such as blast fishing, offenders are reported to higher levels. Government regulations prevent the use of bombs, potassium, and trawling. If these technologies are used, often the villages report offenders to the district head or Regent. In Tomolol, between one and four people get arrested per *sasi* season per year. About a third of villagers interviewed in Tomolol stated that they have a problem with outsiders taking their resources. When asked what they would do if they saw someone taking their resources, the majority said that they would tell the village leader (*kepala kampung*), while some suggested contacting the police, taking the transgressors' yield, providing a verbal warning, reporting the transgressor to the enforcement officers in the pearl company, or reporting them to the head of the district (*kepala desa*).

6.3.2 Penalties for breaking *sasi* in Fafanlap

In Fafanlap, villagers' responses varied regarding the penalties for breaking *sasi* (Table 6.3, Figure 6.4). The majority of villagers reported that violators will face a fine only for breaking *sasi*, and about 10% of villagers said that violators may also go to jail. Some suggested that a fine should be paid to the village leader who should use the money for village income. One villager mentioned that so far the villagers have never seen any benefits from this money. Another mentioned that a violator would be admonished by the village leader or *adat* leaders, but would not have to pay a fine or have their gear or yield confiscated. Some suggested manual labor such as collecting stones, building roads, ditches, or houses for village use. Several villagers mentioned that another punishment

was to make the violator of *sasi* stand in the sun for several hours; “he would have to stand in the sun until he gives up.” Some said that there was no confiscation of fishing gear, yield, or fishing boats, while others said that half of the yield could be confiscated and sold, and this money would be shared equally among the clans. The other half of the yield would be given back to the transgressor as respect for his hard work in harvesting the marine resources.

Most villagers in Fafanlap suggested that if someone broke *sasi*, they would be punished according to customary law. The process for reporting *sasi* violations in Fafanlap was to report the transgression to the village leader. Before the Indonesian government was in place, the transgression would be reported to the *adat* leader and they would convene and decide an appropriate punishment. About a third of villagers interviewed in Fafanlap stated that they have a problem with outsiders taking their resources. The majority of those interviewed said that they would notify the head of the village (*kepala kampung*) while less frequent responses included the police, traditional leader, army, or reporting the transgressor to the pearl company. One villager said that he was scared to deal with the transgressor directly,

> I saw a speedboat with people using potassium and wanted to stop them but me and my friends did not have the courage. If I faced the problem again, I would go to army or pearl farm police (villager in Fafanlap, 2006).

Other villagers in Fafanlap expressed hesitation to tell the village leader; “I do not have courage to speak to village leader because he is involved in corruption.”

6.4 Sasi ceremonies

Sasi ceremonies are still performed in Tomolol and Fafanlap, although they are eroding in Fafanlap. Traditionally, several ceremonies were conducted to initiate *sasi* in Tomolol. During a meeting of the traditional leaders, the ancestors took a vow in the presence of a stone and a triton shell. These objects were put in the center of the group of people and the participants vowed to initiate *sasi*. If *sasi* was broken, the participants believed that the offender would be punished by the stone and the shell. Following this ritual, the participants made an "X" with bamboo and placed it on the beach to signify that nobody could cross that area. They believed that if someone crossed the "X", they would get sick or have a problem with their body. Another villager said that the bamboo "X" was adorned with flowers, betel nut, and betel nut leaves, and this "*sasi* tree" was planted in the shore to let people know that *sasi* was in effect. Another meeting of traditional leaders was held to end the *sasi* and at that time, and they decided when the next *sasi* would be initiated. All villagers would gather in boats along the shore and the *adat* leader would announce that *sasi* was over. Betel nut was prepared and hung on the *sasi* tree. At this time, villagers in Tomolol did not believe in God, but believed that inanimate objects held magical powers. People also ate betel nut, lime powder, yellow rice, and fried fish, and gave some to their ancestors as an offering. When villagers in Tomolol want to initiate *sasi*, the news is spread by word of mouth. The people in Tomolol would announce to people in the neighboring villages that *sasi* will soon be in effect and ask them to inform everybody that people in Tomolol are about to do *sasi*.

Villagers in Fafanlap said that ceremonies are still performed to mark the end of *sasi*, when the ocean is opened up for harvest. To mark the end of *sasi*, an *adat* ceremony is held. Villagers gather together and prepare betel nut, lime, rice cakes cooked in

coconut leaves, tobacco, and pieces of different color fabric. These objects were hung on the branch of a tree, resembling a Christmas tree. This decorated tree is called *samsom* in the *Matlol* language. This tree was planted by the shore. Before the tree is planted, the villagers whisper a prayer to the ancestors or gods. It was noted that this prayer was purely traditional, with no relation to Islam, the religion of all villagers in Fafanlap. The prayer is a request for an abundant harvest, with enough to cover the needs of the villagers. Following the prayer, the villagers jump into the ocean to harvest marine resources. The villagers usually go out to sea for fifteen days to harvest marine resources. Trochus and green snail were harvested during this time because they are found far from the coast. Trochus harvests were often so large that it would not fit in the boats, so fishermen would bury it on an island and people would come back the next day or at a future time to take the rest home. After fifteen days, the villagers would return to the village to work, especially if they had government jobs or held leadership positions in the village. When people returned to the village, they generally fished close to shore for other resources like sea cucumber and other shellfish.

While some villagers in Fafanlap said that there are no ceremonies that occur when *sasi* is initiated, several elders said that ceremonies were still performed to mark the closing of the sea. The *adat* leaders would gather the villagers together to announce when *sasi* would be initiated. *Sasi* was instituted and the seas were closed when the winds blew from the south, and *sasi* ended when the winds blew from the west. As in Tomolol, when *sasi* is instituted in Fafanlap, the announcement is spread by word of mouth. When local villagers meet folks from other villages, they spread the information to them. However, as *sasi* is linked to the change of seasons, villagers already know generally when it will

be initiated. To institute *sasi*, the elders would rip young coconut leaves and tie them to a strong small tree and plant by the sea. They said that there were no religious prayers, but the villagers hoped that nobody would break the rules decided by the *adat* leaders. One villager mentioned that although this ceremony is still conducted today, mostly the elders attend.

6.5 The evolution of sasi

Based on evidence from interviews in both villages and following a pattern of decline throughout the region (Zerner 1994; Mantjoro 1996; Thorburn 2000; Harkes and Novaczek 2002), the institution of *sasi* has declined in both Tomolol and Fafanlap. *Sasi* seems to be stronger in Tomolol than in Fafanlap for several reasons: 40% more people in Tomolol said that most villagers know the *sasi* regulations and half of those interviewed in Tomolol said that most villagers follow *sasi*, whereas less than 5% in Fafanlap said that most villagers follow *sasi*. While this indicates that more people in Tomolol follow *sasi*, it also demonstrates that about half of the villages in Tomolol do not still follow *sasi*, thus is has eroded in Tomolol as well. Villagers in Tomolol reported significantly more restrictions than villagers in Fafanlap regarding when people can harvest, what species can be harvested and what gear can be used (about 30-40% more restrictions reported). Villagers in Tomolol were 40% more likely to report that violators of *sasi* would face a penalty than villagers in Fafanlap. These proportions suggest that not only is adherence to *sasi* greater in Tomolol than Fafanlap, but the rules and restrictions of *sasi* governing marine resources use and management have a greater influence in Tomolol. Supporting this, villagers in Tomolol consistently stated that *sasi* is still strong, whereas in Fafanlap, nearly all of those interviewed said that *sasi* has eroded. The

following section explains the factors that have affected the evolution of *sasi* in both villages leading to the perpetuation of *sasi* in Tomolol and the decline of *sasi* in Fafanlap.

The factors that have affected the evolution of *sasi* in Tomolol and Fafanlap are changes in the legitimacy of local authority, changes in *sasi* ceremonies, demographic patterns, gender, economic opportunities, consumption patterns, and the influence of outsiders and new technologies. Based on the influence of these factors, a number of reinforcement mechanisms must be in place for the existence and perpetuation of *sasi* in these villages.

6.5.1 Changes in the legitimacy of local authority

The relevance of local leaders in both villages has changed over time. Traditional leaders that used to hold powerful positions in Fafanlap are losing their influence in village politics. The religious leader also had limited influence. In Tomolol, the traditional leaders were more powerful and their leadership was reinforced by the religious leaders maintaining the important role that they both played in the village.

When asked who is responsible for solving marine resource degradation in their villages, 73% of those surveyed in Tomolol stated that their village leader was the most qualified person, while only 40% of those interviewed in Fafanlap felt that their village leader was best positioned to address these problems. Villagers stated repeatedly that no one follows *adat* anymore in Fafanlap. *Adat* is an Indonesian term that refers to a set of local and traditional laws and conflict resolution mechanisms, i.e. customary laws. It is also roughly translated as custom or tradition and can refer to traditional leadership. The religious leader and traditional leader of Fafanlap stated that it is necessary to revitalize

local institutions and positions that reinforce *adat's* structure such as *raja*, and *kapitan laut.*[3] This comment is significant because it reflects the idea that *sasi* is dependent on *adat* for legitimacy.

When *adat* declined in Fafanlap, there was no authority to take its place. According to one villager, "there is no clear institution of *sasi* now, no one feels responsible for maintaining *sasi*." Therefore, *sasi* has declined because there is no authority to reinforce it. Although Islam plays a central role in village life in Fafanlap, there are no linkages between Islam and *sasi.* Islamic prayers have not been incorporated into *sasi* ceremonies and Islamic leaders do not play a role in the perpetuation of *sasi*. However, the Imam of Fafanlap is also a traditional leader, and as a traditional leader, he does play a role in *sasi*. There was no existing mechanism to support adherence to traditional law in Fafanlap. Traditional leaders in Fafanlap have lost power and influence, and the power is largely held by the village leader.

In Tomolol, *adat* leadership has also declined somewhat, but the authority of the church has taken its place. In Tomolol, *sasi adat* has evolved into *sasi gereja*, *sasi* enforced by the church. A traditional leader in Tomolol said that both *sasi adat* and *sasi gereja* are still practiced, and that there is no major difference between the two. Therefore, the authority of the church has not totally superseded *adat*, but they mutually reinforce each other. He said that *sasi adat* existed before people "knew religion," but once the villagers became Christian, *sasi adat* became *sasi gereja* because it combined the elements of religion into it, such as praying before and after *sasi*. A village elder

[3] These titles refer to when Raja Ampat was under Moluccan rule, and the leading clans in Raja Ampat were vassals. There were four *rajas* (kings) and dignitaries called *kapitan laut* (Remijsen 2001).

stated that in *sasi gereja*, there are no prayers offered to honor the ancestors, no prayers offered to give thanks to the ancestors or chiefs, and no bettle nut offered.

> We only pray to God, surrender our heart to Him. *Adat* is still practiced too sometimes, but just a little, for example, when we make the sign for *sasi* [the bamboo "x"]. For the rest, we only pray (villager in Tomolol, 2006).

Sasi gereja began in the late 1900's in Tomolol, although some villagers suggested that *sasi gereja* only began in the 1960's, after Christianity was brought in. The first Christian church congregations were formed in the 1930s in three villages in Misool: Biga, Limalas, and Tomolol. Missionaries from Ambon in the Moluccas brought Christianity to Misool. In the mid 1970s, there was a meeting conducted by two pastors that was attended by many Christians in Raja Ampat. During that meeting, the congregation decided to replace *sasi adat* with *sasi gereja*. Church committees from Tomolol attended this meeting, and brought the ideas back to Tomolol. In *sasi gereja*, most villagers state that the village leader decides when to institute *sasi*. However, an older member of the village said that customary ownership determines who institutes *sasi gereja*. Villagers with customary rights can ask church leaders to institute *sasi*, or church leaders will decide to initiate *sasi* on their own.

Villagers in Tomolol stated that *adat* leaders and church leaders work together to support *sasi. Sasi gereja* is applied to both marine and terrestrial resources. Villagers in Tomolol had a wooden sign that was placed on coconut palms to prevent people from taking the coconuts (*sasi kelapa,* Figure 5.6), and also the sign was taken to the ocean to let the villagers know that it was *sasi* time and certain marine species could not be harvested, like sea cucumber (*sasi teripan).*

Figure 6.5. *Awas: ada larangan gereja* (Watch out: church prohibition exists)

Several villagers in Tomolol stated that when *adat* authority declined, people stopped following *sasi* because no one feared the repercussions. However, once *sasi adat* became *sasi gereja,* people followed it because they feared God and they believed that God would make them sick or die if they broke customary regulations. For example, one villager said, "if someone breaks the rules, how he would be punished is his business with God. God Himself would warn him or punish him." Another villager said, "Now, God is our priority. If we do a wrongdoing, or break *sasi*, we would have problem with our harvest. The harvest would not go well; we wouldn't get much of the yield or we get nothing." Further, if someone in the village fell ill, villagers would say that they had broken *sasi,* thus the abundance of marine resources was seen not only as providence from God, but also the reflection of adherence to Christian values and practices. This is significant in a village where all are devout Christians, and the Christian church is the center of village life. In Tomolol, positions of religious authority support the institution of *sasi* and are maintaining its effectiveness. Other authors have suggested that in the Moluccas, Christian values are more effective than *adat* norms in providing the people

with conflict resolution skills, resulting in a more robust *sasi* system (Purwaka and Sunoto 1997). The Christian Church has also been recognized as a perpetuator of *sasi* in the Kei Islands of eastern Indonesia, where the closing of *sasi* is announced at the beginning of church services and traditional ceremonies are combined with church prayers and offerings. The Kei people claim that these practices reinforce *sasi*, saying that in addition to tradition, *sasi* has the blessing and strength of the Christian God (Thorburn 1998).

In Tomolol, the village leader plays an important role in raising awareness of the importance of *sasi* for conserving marine resources. The village leader's role is particularly important because many of the villagers lack schooling, usually only to an elementary level. The village leader said that people in Tomolol were aware of the importance of marine conservation because in every meeting, he and others explained the importance of marine conservation. Conservation workers from non-governmental organizations came and talked to the village leaders about the need to protect marine resources, and the leaders shared the information with the community. The main message was that the goal of conservation is to protect their resources from outsiders who destroy the resources using bombs and cyanide. Initially, the villagers were suspicious because they thought that the conservation measures would prevent them from harvesting resources, but the village leaders went door to door explaining the need for marine conservation. This finding supports the importance of trust and political entrepreneurship as key variables that facilitate the effectiveness of communal property regimes (Ostrom 1990; Taylor 1990; Acheson 2003).

Political entrepreneurs often play a critical role in generating support for rules and regulations that control access to resources, leading to resource conservation. Villagers also have to trust that the village leader has the authority and capacity to protect the resources, which is the case in Tomolol. This is supported by the fact that nearly three quarters of those interviewed in Tomolol identified the village leader as able to solve the environmental problems in the village, compared to only 40% in Fafanlap. Trust in the s*asi* system itself to protect marine resources is also important and appears to be stronger in Tomolol because half of those interviewed in Tomolol said that most villagers follow *sasi*, whereas less than 5% in Fafanlap said that most villagers follow *sasi*.

6.5.2 Changes in *sasi* ceremonies

Traditionally in both villages, ceremonies were held to initiate and mark the end of *sasi*. The *sasi* ceremonies in Tomolol have changed, largely due to the change from *sasi adat* to *sasi gereja*. In *sasi gereja* in Tomolol, a church service is held to initiate *sasi*. A small wooden board with a warning written on it (e.g., Watch out, now is *sasi gereja*) would be brought into the church and money would be given as an offering. A church member would announce what marine resources are not allowed to be harvested. The board would then be taken to the shore. When *sasi* ends, the board is taken and brought back to the church, and another offering is given to thank God. The clans would get together to agree how much they should give to the church for the offering. Therefore, the board has replaced the traditional tree and bamboo "x" that was previously used to mark the beginning and end of *sasi*. Also, prayers are now offered to God as opposed to the ancestors, and instead of the traditional preparation of betel nut, rice, and flowers, villagers would just give an offering of money to the church. The main motivation of this

practice may simply be fundraising for the church. Church leaders play a role in deciding when to institute and end *sasi*, with the *adat* leaders. One woman in Tomolol suggested that the change from *sasi adat* to *sasi gereja* has resulted in women playing a less important role in *sasi* ceremonies, because the traditional preparations are no longer common and instead families bring money to church, there is no need for the women to prepare anything. In Fafanlap, the *sasi* ceremonies have not changed in substance, but the practice has signficantly eroded. Furthermore, not all villagers attend the *sasi* ceremonies, generally just the elders.

In Tomolol, the ceremonies have changed to incorporate Christian elements, but they are still held and the entire village is present for the announcement of when *sasi* will begin and end which takes place in the church. In Fafanlap, the Imam, or religious leader, stated that the ceremonies for instituting *sasi* have no relationship with Islam. He also stated that the *sasi* ceremonies were "purely custom and tradition." In Fafanlap, there is only a ceremony to mark the initiation of *sasi* and villagers said that mostly only the elders attend this ceremony. The ceremonies supporting *sasi* have eroded in Fafanlap, which has contributed to the erosion of the institution of *sasi*. The changes in the *sasi* ceremonies also demonstrate that *sasi* has eroded more in Fafanlap, but that the church is in integral part of the perpetuation of *sasi* ceremonies in Tomolol.

6.5.3 Changes in demographic patterns

Demographic characteristics and patterns impact the effectiveness of the *sasi* system in both Tomolol and Fafanlap. These results corroborate the findings of common property scholars who suggest that homogeneity and group size facilitate the effectiveness of communal property regimes (Ostrom 1990; Taylor 1990; Acheson 2003).

Homogeneity is a likely factor in the support of the sustainability of the *sasi* system in Tomolol because villagers in Tomolol are more ethnically homogenous than in Fafanlap. In Tomolol, 80% of villagers considered themselves indigenous (*Matbat*), whereas in Fafanlap, only 43% of those interviewed identified themselves as indigenous (*Matlol*).

Group size may also play a role in the maintenance of *sasi*. With 800 people in Fafanlap and about 200 in Tomolol, increases in population may be adversely impacting *sasi*, because in Fafanlap *sasi* is much more eroded. Additionally, a small percentage of villagers in Tomolol and Fafanlap (30% and 20%, respectively) said that increases in population would adversely impact *sasi*.

Migration patterns have also shaped the evolution of *sasi* in Tomolol and Fafanlap. Large numbers of Butonese and Buginese have migrated to Southeast Misool to access the rich fishing grounds, which has resulted in a more heterogeneous community in Fafanlap. When asked whether increased migration would affect the *sasi* system, over 70% in Tomolol, compared to less than 50% in Fafanlap, said that increased migration would adversely affect *sasi*. This could be because Fafanlap has already experienced more migration that Tomolol, and Fafanlap has already lost many of its marine tenure traditions. Other migrants are introduced from large companies like the Indonesian fishing company in southeast Misool, the pearling operations in Waigeo and southeast Misool, the nickel mine on Gag, and oil mining in eastern Salawati (Donnelly et al. 2003). While often providing valuable resources to the communities, the companies are bringing about rapid changes in the lifestyle of several villages in the Raja Ampat archipelago.

Other factors that may play a role in changing settlement patterns are the impacts of government provided health care and education in Indonesia. The Indonesian government provides education and health care based on total population in a location. Therefore, some villages in Raja Ampat that are very small, may move closer together to fulfill a census criterion that brings a primary school teacher or a health care worker (Remijsen 2001).

In the last several decades, migration to Raja Ampat has accelerated considerably. According to a population census in 1998, the population of Raja Ampat was 35,338 (Sorong Dalam Angka 1998, in Remijsen 2001). In 1953, the total population was only 12,004 (Miedema and Stokhof 1993). This population explosion is likely due to the Indonesian government's organized migrations (*Transmigrasi*) to Raja Ampat and more broadly, West Papua (Remijsen 2001). The migration program was established to solidify political control over the region. Because the Indonesian government is encouraging large migrations to Raja Ampat, it is important to explore the impacts of increased population and increased exposure to different cultures on traditional marine management. The erosion of traditional marine management in some villages may suggest a larger trend. Researchers of *sasi* in eastern Indonesia report the erosion of *sasi* (Zerner 1994; Mantjoro 1996; Thorburn 2000; Harkes and Novaczek 2002), suggesting that this trend will likely face all of Raja Ampat.

6.5.4 Changes in economic opportunities

The introduction of a pearl farm in southeast Misool, PT Yellu Mutiara, has changed the economic opportunities for villagers in Tomolol. In Tomolol, 37% of those interviewed stated that their main occupation was working for the pearl company. The

presence of the pearl company was not as apparent in Fafanlap and no one interviewed reported working for the company. The pearl farm negotiated a lease with villagers in Yellu, Misool, to use a large marine area. In exchange for use of the customary marine tenure area, the pearl company provides jobs to locals, an electricity generator, and the construction of a new church in Tomolol. Employees of the company earn a minimum of Rp600,000 per month, which is the provincial minimum standard (Donnelly et al. 2003).

The company provides free transport and freight to and from Sorong which has resulted in an increase in the availability of outside goods and increased dependence on the cash economy. In Tomolol, 74% of villagers interviewed believe that access to cash and commercial goods will adversely impact customary marine tenure, compared to only 40% in Fafanlap. This is likely due to a preference for the currently available products in Fafanlap from Sorong or ignorance of its consequences, and the erosion of customary marine tenure already in Fafanlap. This pattern of erosion of *sasi* due to access to the cash economy was also demonstrated in Maluku, where marine *sasi* was most eroded on the island closest to the largest regional urban center and a rapidly developing consumer culture (Harkes and Novaczek 2002). Tomolol is not yet dependent on outside goods other than rice, thus villagers are more aware of the impacts that commodities will have on traditional lifestyles.

Some view the pearl company as supporting marine conservation and *sasi* because they have monitoring and security capacity, which are essential to stop destructive fishing in the area. Because cyanide can kill oysters, the pearl company has been effective at limiting cyanide fishermen, turning four vessels with cyanide over to the authorities since 1996 (Donnelly et al. 2003). The pearl company plays a critical role in

enforcement because in Raja Ampat, police and locals do not have adequate enforcement capacity to prevent the violation of customary marine tenure or government regulations against destructive fishing. Enforcement capacity is essential to support the ability of marine tenure to conserve marine resources, thus the enforcement capacity of the company can reinforce the perpetuation of *sasi* by maintaining its effectiveness by protecting marine resources from exploitation. The pearl company also provides economic opportunities that impact the conservation of marine resources in Tomolol, because many of the young villagers in Tomolol work for the pearl company, so they have an alternative source of income as opposed to those in Fafanlap who may be tempted to use destructive harvesting techniques which are lucrative.

Job and educational opportunities in Sorong, on the west tip of Papua, are luring younger villagers from Fafanlap due to the increased transportation between Fafanlap and Sorong. A number of villagers in Fafanlap commented that *adat* declined because the younger generation was no longer interested in *adat*. A traditional leader stated that among today's generation,

> it is common that *adat* is not attractive, not sacred, not something that should be maintained. A*dat* was strongly practiced 50 years ago, so no wonder the young generation doesn't know very much about it or doesn't have enough understanding of their ancestor's customs or traditions (village leader, 2006).

He also stated that 25% of *sasi* violations in the village were caused by outsiders, while 75% of *sasi* violations were caused by locals in the village. He mentioned that it was difficult to face the young generation because they are motivated by money and are often involved in bribery. Another villager in Fafanlap said that a long time ago, people followed *adat* but today, the "young people work outside the village or study outside and

they come back with new ideas and do not want to follow old regulations." Therefore, despite the economic benefits provided by better job and educational opportunities in the larger cites, they are resulting in a decline in the legitimacy of traditional laws and customs.

6.5.5 Dependence on marine resources for livelihood

Marine resources are also significantly impacted by the cultural use patterns in the communities. For example, villagers in Fafanlap depend more on seafood as their staple diet, while villagers in Tomolol eat seafood, but also rely heavily on small gardens that supplement their diet. In Tomolol, about 37% of villagers interviewed worked for the pearl company, and 37% said they worked as farmers. In Fafanlap, the majority of the villagers identified fishing as their main income generating activity, and only 7% identified farming as their primary source of income (Table 5.5, Figure 5.5). No one interviewed in Tomolol said that fishing was their major source of income. However, 100% of villagers interviewed in Tomolol stated that sea cucumber was their most important marine resource for income, followed by shellfish, whereas in Fafanlap, 80% mentioned sea cucumber as the most important marine resource for income, 63% said shellfish, and 37% said fish (Table 5.7, Figure 5.7).

Collecting marine invertebrates plays an important role in additional income for villagers in Tomolol and for both primary and additional income in Fafanlap. Valuable marine invertebrates include *Holothurian* (sea cucumber), *Trochus niloticus (*top shells), and *Turbo marmoratus* (green snails*).* In Fafanlap, several villagers harvested live grouper and wrasse for the Live Reef Food Fish Traders to sell to the Hong Kong markets. People in Tomolol are able to harvest sea cucumber and invertebrates

throughout the year, whereas villagers in Fafanlap were limited to harvesting during the calm season. The price for sea cucumber ranged from USD$1-20/kg, $12/kg for green snails, and $2.60/kg for trochus (Donnelly et al. 2003). A live reef food fish trader in Fafanlap said that he could get approximately USD$40/kg for Napolean wrasse, USD$15/kg for grouper, and USD$5-7/kg for coral trout, *Plectropomus areolatus.* Both villages reported drastic declines of sea cucumber and shellfish in recent years due to overharvest.

If there is no dependence on marine resources, then there is no reason to maintain *sasi*. Because villagers in Tomolol and Fafanlap rely on marine resources for food and income, *sasi* maintains relevance to help ensure that these resources are sustained to support the needs of the communities.

6.6 Role of women in sasi and marine management

Despite the numerous benefits of including women in conservation strategies (Agarwal 2000; Diamond 2002; van Ingen et al. 2002) and management systems such as *sasi,* there are conflicting viewpoints on the role that women should play in *sasi* in both Tomolol and Fafanlap. Women are sometimes excluded from full participation in marine management based on cultural perceptions that women are inferior to men and have no place in traditional management structures like *adat,* which underpin the authority of *sasi.*

Women do play a role in the perpetuation of *sasi* through participation in ceremonies and passing down stories. In Tomolol, villagers said that an important role of women is to pass down the story about *sasi* to their children and grandchildren, although, most men and women interviewed said that they learned about *sasi* from both their mothers and fathers and grandfathers and grandmothers. *Sasi* was told to the next

generation through a story. "Our parents told a story to us, what and how *sasi* is. Usually our parents were sitting and chewing betel nut, or smoking while telling us about *sasi*." In addition to passing on the story of *sasi* to children, traditionally women played an important role in the preparations for the *sasi* ceremonies. During *sasi adat*, women prepared the betel nut, yellow rice, and sago; they also prepared the bamboo "X" that marked when *sasi* was in effect. Some villagers in Tomolol stated that women have no role in deciding when to institute *sasi*, although some women said that women are involved in this decision and work together with the men to decide when *sasi* should be instituted.

Villagers in Fafanlap, reported generally the same roles of women in *sasi* and marine management that was identified in Tomolol, specifically their role in the preparation of food and the tree for the *sasi* ceremony, reminding their husbands not to break *sasi*, and transferring knowledge and traditions of *sasi* to their children and grandchildren. According to villagers in Fafanlap, marine resource knowledge and knowledge regarding *adat* is passed from parent and grandparents to children through story telling. The stories describe *adat* regulations and how to harvest resources (e.g., what fishing gear and techniques should be used). This knowledge is transferred equally to sons and daughters.

To determine perceptions governing the role of women in *sasi* and conservation in Raja Ampat, the following questions were asked: 1) would engaging women more in management of marine resources improve, have no effect, or harm customary marine tenure; 2) if women's knowledge of marine resources were incorporated into customary

marine tenure, would it improve, have no effect, or harm CMT; and 3) what roles can and should women can play in conserving marine resources.

Despite cultural perceptions that women are inferior to men and have no place in traditional management structures, in Tomolol, a significant majority of those interviewed (97%) stated that customary marine tenure would be improved by engaging women more in management of marine resources, compared to 70% in Fafanlap (Table 6.6, Figure 6.6).

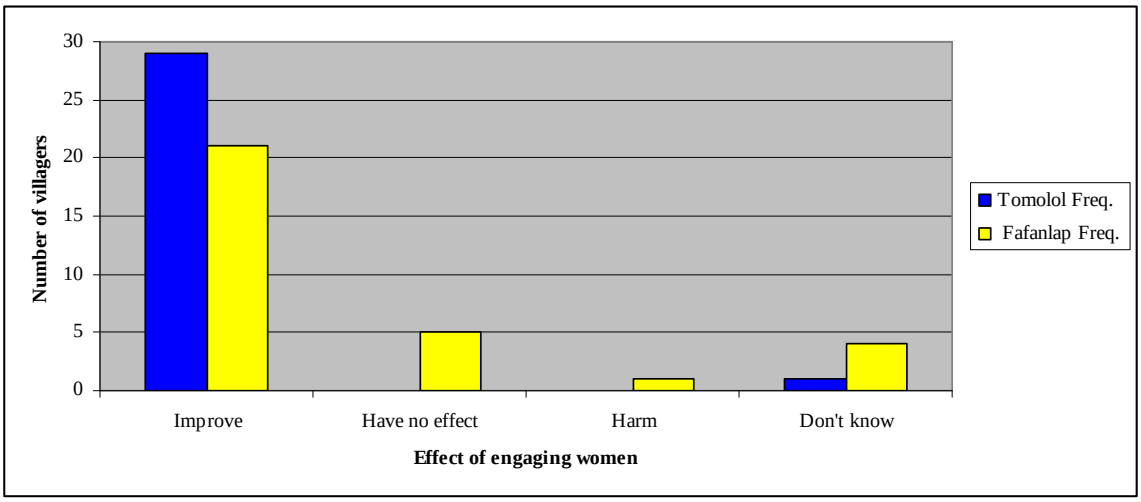

Figure 6.6. Effect of engaging women more in customary marine tenure

There are several possible reasons why this response was so high. One possibility is that the villagers were answering the question with the response they thought that I wanted to hear. Although this is unlikely because the villagers that openly discussed why women should not be included in management, were extremely open about the fact that women were inferior, this included both men and women. Secondly, “women playing a role in management” may mean a number of things, which may not threaten male authority. For example, many villagers mentioned that women could play an important role in enforcement by reporting transgressors to the village leader. Therefore, the men in

the village are still responsible for the decision-making, i.e., the punishment, but the women still play a role. Finally, the question may have been a difficult one to understand because it is largely subjective. This is a possibility because when this question was asked in the surveys, it often took a bit of explanation to describe what was meant by the question.

Villagers in both Tomolol and Fafanlap were asked how customary marine tenure would be affected if women's knowledge of marine resources were incorporated (Table 6.7, Figure 6.7). Interestingly, less villagers (10% less in Tomolol, 30% less in Fafanlap) believed that incorporating women's knowledge of marine resources would be beneficial than incorporating women into marine management.

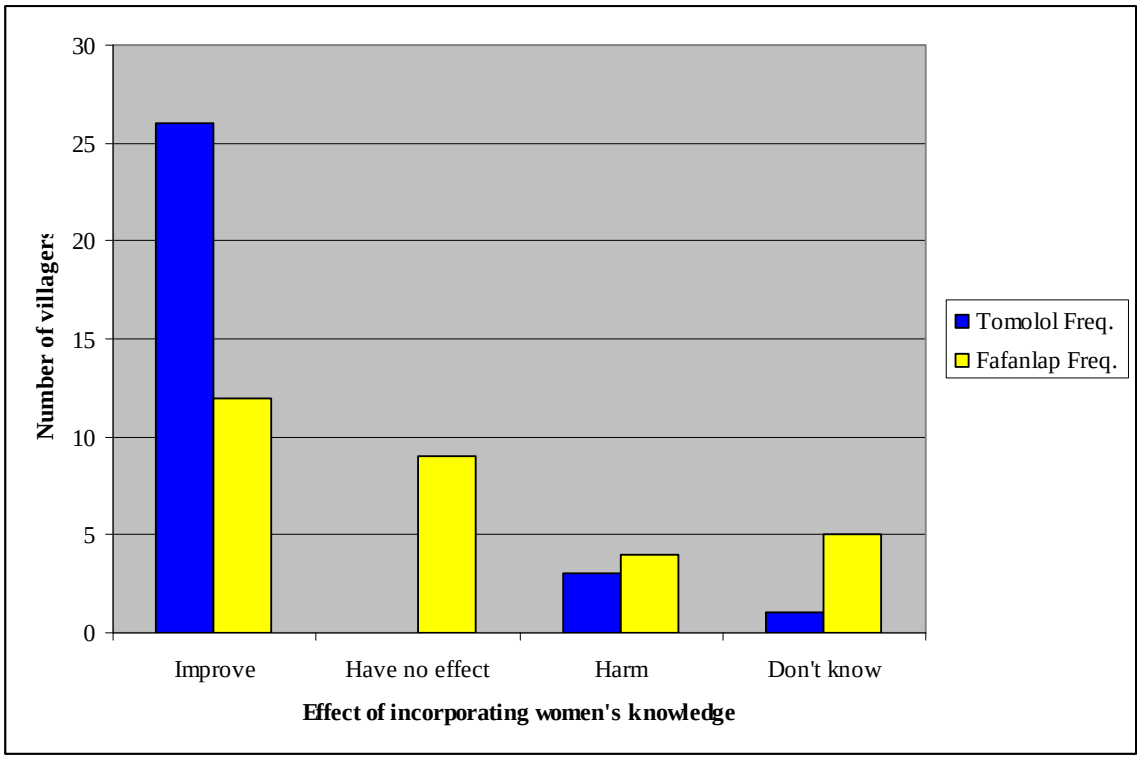

Figure 6.7 Effect of incorporating women's knowledge of marine resources into customary marine tenure

This may be due to the perception that women's knowledge is considerably less than men's. Women in both villages had a significantly lower education level than men, as evidenced by previous surveys (Halim et al. 2005), and informal discussion with villagers. Although studies suggest that men and women have different types of knowledge and that gender differentiated knowledge is a result of the gender division of labor (Agarwal 2000), in Fafanlap and Tomolol, men and women did shared fishing activities and it was not clear that women performed any specific tasks that men did not also perform, which made it difficult to determine whether women had different knowledge than men. When villagers were asked about who had specialized fishing knowledge and specialized knowledge of marine resources, in both Tomolol and Fafanlap, villagers recommended the *adat* leaders (all men), the village leaders (both men), and a few elderly members of the village (nearly all men). Both men and women interviewed suggested that men knew more about this specialized knowledge.

Significantly more villagers in Tomolol (87% in Tomolol compared to 40% in Fafanlap) stated that incorporating women's knowledge into customary marine tenure would improve it. Based on the responses of the villagers, one possible reason that more villagers in Fafanlap did not support the integration of women's knowledge into marine management was that all villagers are Muslim in Fafanlap, and women play a secondary role to men in Islam. Several villagers mentioned that women do not play a role in *adat*, but this is not likely the cause of the difference in responses because *adat* is stronger in Tomolol than in Fafanlap, thus if *adat* discouraged the inclusion of women in management, more villagers in Tomolol would have stated that women should not be included.

When the data regarding the effect of women's knowledge of marine resources on marine tenure was aggregated by sex, a significantly larger percentage of males supported the incorporation of women's knowledge in both villages, and more women in both villages thought that marine tenure would be harmed if women's knowledge were incorporated (Table 6.8, Figure 6.8).

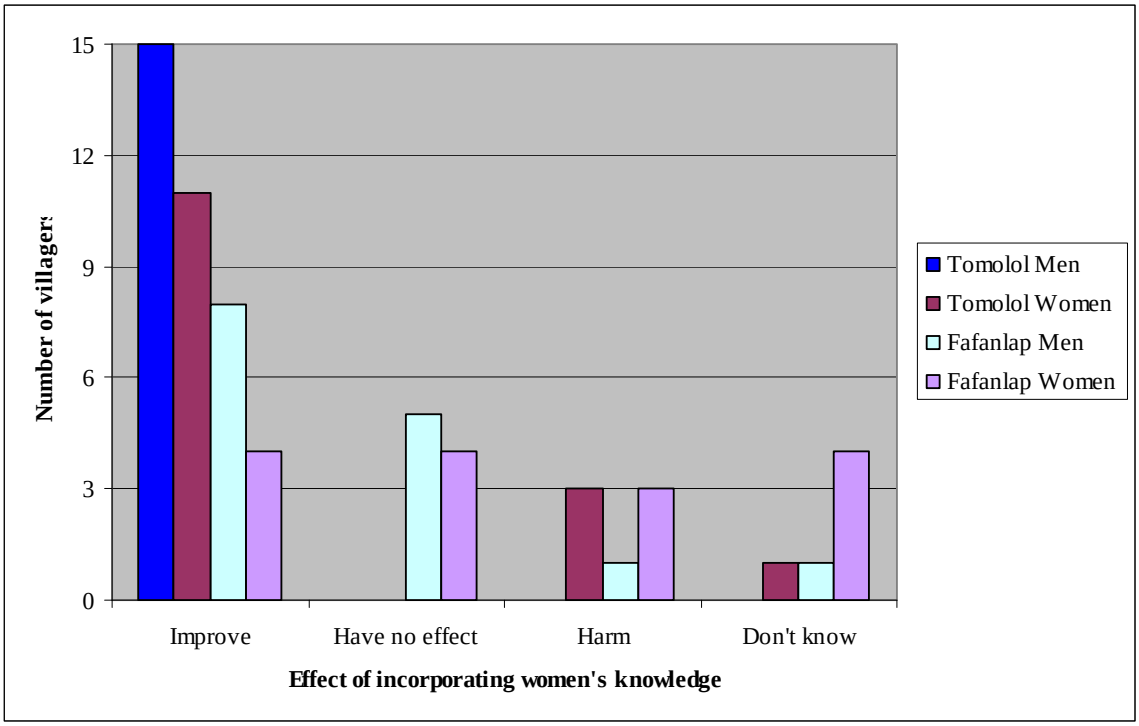

Figure 6.8. Effect of incorporating women's knowledge of marine resources into customary marine tenure (aggregated by sex)

These results indicate that some women in both Tomolol and Fafanlap undervalue their knowledge of marine resources and their contributions to customary marine tenure, or some felt that they actually have less to contribute. Their knowledge of marine resources did seem to be less detailed than men's based on informal interviews regarding details of fishing methods and species behaviors. However, the lack of detail they provided in these interviews may also be due to shyness and unwillingness to speak to outsiders. Based on

their responses to why incorporating women's knowledge would not be beneficial to customary marine tenure, it is more likely that they undervalue their contribution based on perceived weaknesses in women's nature. The women in Fafanlap who did not think that their knowledge would improve *sasi* and marine management said that "sometimes women cannot be quiet," and "women gossip too much and there is the possibility of fighting between men and women." Other women in Fafanlap said that "women cannot be involved in *adat*," None of the women interviewed in Tomolol who said that customary marine tenure would be harmed by incorporating women's knowledge provided an explanation.

All men in Tomolol and a large majority of women (73%) stated that customary marine tenure would be improved by incorporating the knowledge of women, indicating that women's knowledge is valued by a majority of villagers and women play an important role in tenure in Tomolol. One male villager in Tomolol qualified that women's knowledge would improve *sasi* and marine tenure, only if they had a good understanding of *adat*. In Fafanlap, 53% of men said that customary marine tenure would be improved by incorporating women's knowledge (compared to 27% of women), 7% of men said it would be harmed (compared to 20% of women). In Fafanlap, the men that supported the integration of women's knowledge said that women should be included because they do the harvesting and fishing, "the ocean is for both men and women, they have same rights," and one man said that "although the elder women in village cannot read, they can speak." The men who were not in favor of incorporating women's knowledge mostly commented on *adat* not having a role for women: "*adat* is only for men," "*adat* goes with Islam and under Islamic laws and regulations, women come after

men," and one man suggested that "women may make problems for their husbands and it is difficult to have women in *adat*." Women in Fafanlap that supported the integration of women's knowledge said that women and men both fish together, thus share the same knowledge of the marine environment. One woman in Fafanlap said that it is important to include women's perspectives because women

> need to have a voice. There are differences in perspectives between men and women and women and men perceive threats differently. Men always underestimate the problems like bombs and cyanide but women keep reminding their husbands not to do it. Women may not change the way that men act, but at least they can be heard.

When results of the effect of engaging women more in customary marine tenure were aggregated by sex, similar patterns emerged (Table 6.9, Figure 6.9). More men in both villages said that incorporating women into customary marine tenure would improve it. Also, more men and women in Tomolol reported that it would improve marine tenure to engage women more, and only women in Fafanlap suggested that it would harm marine tenure to include women more in management. This supports previous findings that villagers in Fafanlap are less supportive of engaging women in marine tenure than villagers in Tomolol.

Mies and Shiva (1993) state that a mission of ecofeminism is to redefine how societies look at productivity and activity of women and nature, because previously they have both been viewed as passive and exploited based on this misconception. The responses of men and women in both villages reinforce the need to redefine how villagers view the productivity of women and the role they play in marine management.

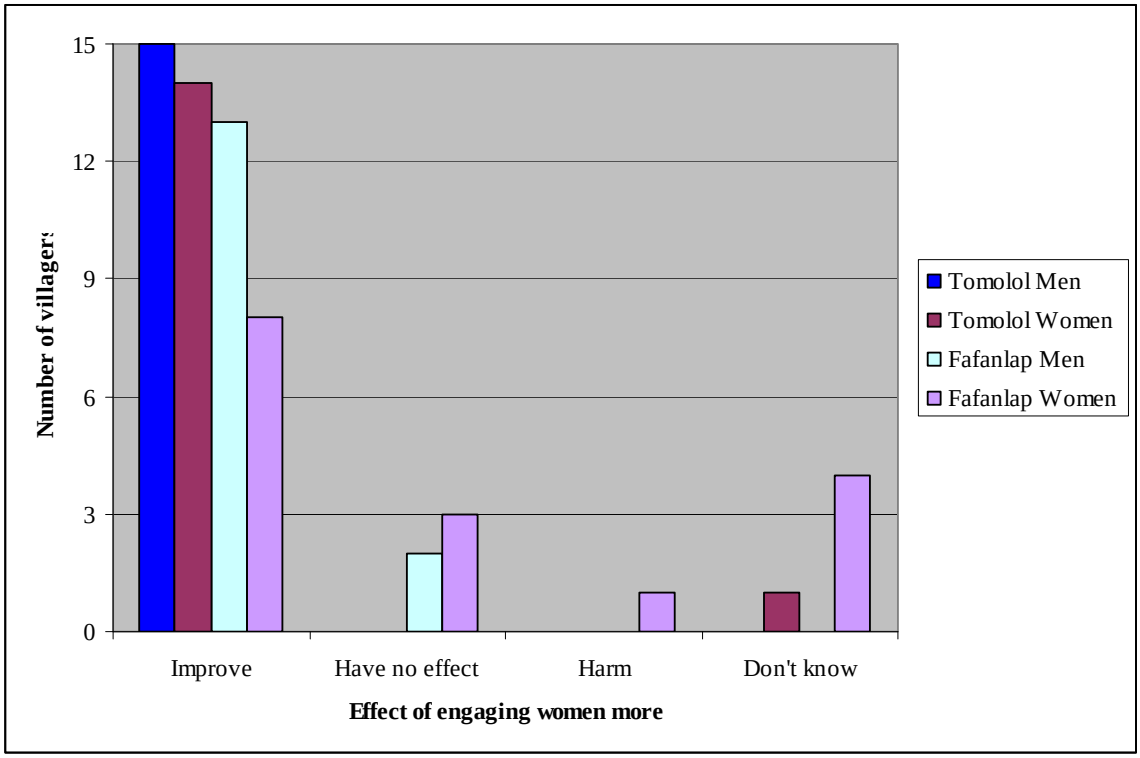

Figure 6.9. Effect of engaging women more in customary marine tenure (aggregated by sex)

Additionally, the fact that men were more supportive than women of including women in management and also of incorporating women's knowledge into management in both villages, suggests that it is critical to include women in programs to increase awareness of the important role women play in marine management, because they themselves undervalue their contribution to management.

Numerous challenges exist that inhibit women's ability to effectively engage in marine conservation in Raja Ampat. These challenges have been defined for other locations and include: the lack of data on women in fisheries (Diamond 2002; Sharma 2003), the view that women are not recognized as stakeholders so are not consulted in surveys (Diamond 2002; Kinch and Bagita 2003), the reality that women often are not engaged in village decision making (Kinch and Bagita 2003), the perception that

women's work in the fisheries sector is not productive and is viewed as an extension of the domestic sphere (Sharma 2003), and the fact that women share a disproportionate workload (Kidu 1997).

This research helps to address the lack of data on women in fisheries and the exclusion of women from marine resource surveys, but other challenges still exist. Villagers in both Tomolol and Fafanlap noted that often, only men attend the village meetings, and women are not considered to have the right to speak. Men and women from both villages suggested that meetings should include both men and women, and that women may feel more open to speak up if in a meeting of only women. Many of the female villagers suggested that separate meetings should be held for only women so that the women would have a chance to speak openly. They also said that these meetings should be held in the village, but could be linked with other villages to facilitate sharing of information.

When asked why women's participation is important in conservation meetings, many villagers suggested that women play an important role in enforcement and reminding their husbands to follow customary regulations. For example, the village leader in Tomolol, stated that women can often be tougher then men when they encounter illegal activity. He said that in village meetings, many of the women would speak up and remind their husbands not to break the rules. Several female villagers in Tomolol suggested that women can report suspicious activity to a village leader if they encounter it while out fishing, and they can help monitor the ocean to prevent outsiders from exploiting marine resources. A female villager in Fafanlap said that women want to be involved in conservation activities, and she mentioned that it is important for

conservation groups to specifically invite women to meetings, in addition to men, to ensure their participation. She said,

> It's true that women always inspire men (husbands) how to act and encourage them to not violate *adat* or government regulations… It would be better if every meeting or gathering is attended by both men and women. Women need to speak up if they have disagreement with men. Men and women also need to share information and knowledge (female villager, 2006).

A village and religious leader in Fafanlap said that women need to be involved in conservation activities.

> Men can't work alone; they need women to support them. Women also need to be included in the meeting or any activities related to conservation program so that they can learn and contribute their thoughts, or just to remind their husband about how important the conservation is for next generation (Village and religious leader, 2006).

When asked what roles the women can play in conserving marine resources, the village leader in Tomolol suggested that

> usually women would like to support their husband's opinions. Those who are educated could give their views or ideas in the meeting, or spread information to other women [in the village]. There is no prohibition against women speaking in the forum, but it would be better if the women were put separately, so they could feel free to speak up (village leader, 2006).

The village leader in Tomolol said that women would like to actively participate, and as long as they are given access to information and attend the meetings, they can be even more active than men. However, he noted that too often, only men attend the meetings, and women are not considered to have the right to speak.

To engage women in conservation strategies and management of marine resources, women can be encouraged to speak using culturally appropriate and non-threatening ways to elicit information (e.g., single-sex focus groups, interviewing men and women separately in a household) (Diamond 2002). These methods have been

inspired by the developments in ecofeminism, which suggest that the involvement of women is essential to adequately address current environmental problems (Warren 1987; Ruether 1992; Zimmerman et al. 1993). Women in both Tomolol and Fafanlap mentioned that women should be interviewed separately from men for them to feel open to share their views.

Case studies aimed at increasing the involvement of women in conservation planning demonstrated that it is important to include women from the beginning as it is hard to include women in a meeting once the meeting has already been called and there is a poor turnout of women (van Ingen et al. 2002). It is also important to ensure that the time and place are suitable for women and that women are clearly invited. Women in Fafanlap and Tomolol mentioned the importance of inviting women and also the need to find a suitable time and place, suggesting that the meeting would have to be held within the village boundaries or only single women could attend, because married women would have to take care of their families and would be less likely to leave the village. Culturally, it is also important to discuss the need to involve women with the village authority. This is essential in both Fafanlap and Tomolol, as it is cultural protocol to meet with the village leader and with other *adat* and religious leaders to explain any upcoming meetings or activities in the village.

Finally, education and access to information were identified as important factors in women's ability to actively participate in conservation activities. This supports previous work documenting the links between an increased role of women in conservation and women's education (Diamond 2002; van Ingen et al. 2002; Bennett et al. 2005). As Diamond (2002) and Bennett et al. (2005) note, increased literacy skills for

women and improved access to information regarding markets allows for greater participation in marine management. It is important to keep in mind that even in villages where customs and traditions marginalize women, methods exist which can improve the participation of women (van Ingen et al. 2002).

6.7 Conclusion

Sasi has evolved differently in Tomolol and Fafanlap, two villages which differ in religion, ethnicity, and access to the cash economy. Factors that affect the evolution of *sasi* in both villages include changes in the legitimacy of local authority, changes in *sasi* ceremonies, demographic patterns, gender, economic opportunities, the influence of outsiders and new technologies, and consumption patterns. *Sasi* must be reinforced by local authority to legitimate the institution. The authorities that support *sasi* must have power and legitimacy in the community. For example, in Fafanlap, legitimacy of local leadership has declined, both traditional leaders, religious leaders, and the village leader had limited influence. The decline of these authority figures undermines *sasi* because there is no authority to support it. Although traditional leadership has also declined in Tomolol, the authority of the church has taken its place and the authority of the church reinforces *sasi*. *Sasi* ceremonies are also reinforced by the church in Tomolol, which help maintain the traditions, whereas in Fafanlap, the ceremonies are not reinforced and are eroding.

Demographic factors also seem to play a role in reinforcing *sasi*. Increases in migration and population may influence the erosion of *sasi*, suggesting that maintaining an ethnically homogenous population is important for maintaining *sasi*. Intermarriage with outsiders may undermine the traditional authority within a village, because the

clans' authority is less recognized by outsiders. In Tomolol, smaller population and greater group homogeneity may help maintain the effectiveness of *sasi*, whereas the larger population and more heterogeneous village in Fafanlap may adversely impact the effectiveness of *sasi.*

Women seem to play a less important role in *sasi* and in village politics in Fafanlap than Tomolol. This may be due to cultural differences. More villagers in Tomolol stated that incorporating women's knowledge into customary marine tenure would improve it. This difference may be due to religious differences, in Tomolol all villagers are Christian and in Fafanlap all villagers are Muslim. Several villagers in Fafanlap suggested that one reason more villagers in Fafanlap did not support the integration of women's knowledge into marine management was that women play a secondary role to men in Islam. Increased participation of women may strengthen *sasi* in Raja Ampat, although further studies would be needed to confirm this.

Economic opportunities differ in both villages and also play a role in the evolution of *sasi.* More frequent access to Sorong provides greater job and educational opportunities for villagers in Fafanlap, which lures young villagers away from Fafanlap and has contributed to the younger generation losing traditional values and practices. Villagers in Fafanlap reported greater use of destructive fishing gear and greater access to destructive fishing technologies and markets that exploit marine resources (e.g., live reef food fish trade). Regular trips to Sorong provide increased access to destructive technologies and markets. Up until now, Tomolol has been able to maintain the use of traditional fishing techniques. The economic and demographic changes in Fafanlap may foreshadow what is to come in Tomolol. With increased pressure to purchase goods from

Sorong, and other parts of Southeast Asia, and increased pressure to participate in destructive technologies and markets, Tomolol may soon face the threats that are currently affecting Fafanlap. Villagers in Tomolol have much less frequent access to Sorong and also have the pearl company, which provides a source of income that discourages damaging reef resources.

Dependence on marine resources is necessary for the perpetuation of *sasi*. If villagers no longer rely on marine resources for food and livelihood, there is no incentive to maintain *sasi*. Dependence on marine resources for livelihoods differs between Fafanlap and Tomolol; most villagers in Tomolol are farmers or work for the pearl company as their primary income generating activity, whereas most villagers in Fafanlap are fishermen. Perhaps the villagers in Fafanlap depend more greatly on marine resources, thus are more pressured to exploit these resources for profit.

In Tomolol, *sasi* is more intact and plays a greater role in marine resource use and management. Villagers in Tomolol demonstrated a greater awareness of rules and regulations regarding who is allowed to fish, where marine resources can be harvested, when they can be harvested, what species can be harvested, and what gear can be used. Villagers also mentioned greater incidence of penalties facing those who break customary regulations including a written warning, payment of a fine, and confiscation of catch and gear. They also stated that most villagers are aware of customary regulations regarding marine resources. By contrast, villagers in Fafanlap reported fewer regulations regarding marine resource use and management and a lower incidence of penalties for breaking regulations than villagers in Tomolol. The only penalty that a majority of villagers identified in Fafanlap was a fine.

In both villages, penalties for breaking customary regulations are handled at the local level and punishment is usually determined by the village leader. Technological advances such as dynamite, cyanide, and trawling are addressed through government regulations because these did not exist when the customary law was developed. These violations are usually addressed at higher levels of government such as the district level. Villagers in Fafanlap also said that few people in their village are aware of customary regulations regarding marine resources. Additionally, villagers in Fafanlap reported fewer adherences to customary regulations than villagers in Tomolol. Interestingly, despite these differences, an equal percentage of people in both villagers (93%) said that *sasi* is sufficient to protect marine resources if supported by government regulations. This information strongly suggests that despite the erosion of *sasi* in terms of practical implementation, the underlying principles of *sasi* and the framework that it provides are locally recognized to be a valuable mechanism for the control of exploitation of resources. This information also suggests that *sasi,* where it exists, has the potential to play a valuable role in marine conservation in both Tomolol and Fafanlap, and in other villages in Raja Ampat.

CHAPTER 7

CONCLUSION

7.1 Research Summary

The seas in Raja Ampat are not considered to be open access. A marine tenure system exists in Raja Ampat and contains a complex system of rights over marine resources that restrict resource access and use. Marine resources in Raja Ampat are considered communal property and are supported by customary and government regulations. This arrangement supports the theory that, although common pool resources may fall under four categories of property rights regimes: open access, private property, state property/state governance, and communal property, resources actually fall under a combination of property rights regimes (Berkes 2005). Further, the "tragedy of the commons" has not occurred in Raja Ampat because communities have self-regulated their resource use and extraction. *Sasi* exists in both Tomolol and Fafanlap and was developed because ancestors were concerned with the sustainability of resources. Generally, *sasi* limits the harvest of a range of species including sea cucumber and shellfish, but never fish, and it is instituted for six months (April to September) in both Fafanlap and Tomolol. Both villages reported that original clans had customary rights to harvest resources, and outsiders must be given access rights from these clans to allow the outsiders to harvest within village boundaries.

A number of factors contribute to the perpetuation and effectiveness of *sasi*. The existence of rules regarding fishing times (e.g., seasonal restrictions), locations, and technology (e.g., use of specific fishing gear) proved to be an important factor in the perpetuation of the *sasi* system in Tomolol and Fafanlap. Graduated sanctions also exist in both villages but are more prevalent in Tomolol than in Fafanlap. Social sanctions such

as shaming and ridicule, economic sanctions such as imposing fines and destruction of gear, and supernatural sanctions such as divine retribution in the case of *sasi gereja* exist in both villages. Self-policing and government intervention were noted in both villages when laws were broken regarding resource access and use. Finally, the *sasi* practice of opening and closing the sea to extraction helps maintain populations of marine species, thus encouraging equity among villagers. The presence of these factors supports Ostrom's suggestion that a territory, use restrictions, legality and enforcement, and some degree of equity are all necessary for the long-term survival of common-pool resource institutions (Ostrum et al. 1999). However, the decline of *sasi* suggests that either these factors are breaking down, or other factors are at play that influences the survival of the *sasi* system.

7.2 Role of *sasi*

Sasi is declining throughout Melanesia and Indonesia and Raja Ampat is no exception. Because *sasi* is in decline (Zerner 1994; Mantjoro 1996; Thorburn 2000; Harkes and Novaczek 2002), some might suggest that it is not a viable institution and should not be built into emerging marine conservation strategies. However, *sasi* is considered an effective tool to protect marine resources in eastern Indonesia (Bailey and Zerner 1991; Mantjoro 1996; Harkes and Novaczek 2002). It has been described as ensuring biodiversity values and has been viewed as an environmentally sustainable set of practices (Bailey and Zerner 1991; Rahail 1995). *Sasi* has also been viewed as ensuring fair and equal access to resources, the "sustainable management of sedentary marine species," subsistence requirements and a continuous income (Bailey and Zerner 1991; Pannell 1997).

Sasi incorporates practices that support good marine management and conservation strategies such as participation, flexibility, and adaptability (Soselisa 1998). It also includes a realization of the value of maintaining the relationship between community, supernatural powers and environment, and among members in a community. Management and conservation concepts inherent in *sasi* include open and closed areas and seasons, community tenure rights over an area, limiting access to resources, controlled harvest and distribution of benefits, and locally developed and agreed upon regulations (Harkes and Novaczek 2002). Therefore, *sasi* has an important role to play as the basis for development of modern marine management strategies, because these concepts are generally known and thought to be legitimate. This reduces the potential cost of enforcement and public education. Studies of *sasi* in neighboring areas have demonstrated that villages with *sasi* are more active in managing marine resources than those with no *sasi* at all, suggesting that the presence of *sasi* positively correlates with for development of modern marine management strategies. Due to the demonstrable societal benefits, embodiment of principles underlying modern fisheries management, and its potential to conserve marine species and habitats, *sasi* provides an important mechanism to support conservation.

While these positive aspects of *sasi* are important, it is also dangerous to generalize the form and content of *sasi* (Pannell 1997). *Sasi* does have limitations. For example, although *sasi* has the potential to provide ecological benefits by restricting access and harvest of marine species, its effectiveness is limited by lack of adequate enforcement capacity including boats and staff, and by outsiders that illegally harvest marine resources. Further, it has not been demonstrated that *sasi* is effective in supporting

pelagic species or highly migratory species because it is unlikely that protecting small areas of coral reef can protect the larger fisheries unless these areas happen to be critical spawning or nursery habitats for pelagics. The fact that in both Tomolol and Fafanlap, villagers reported a decline in all marine species suggests not only that *sasi* is not capable of conserving marine species at the current rates of harvest, but also that centralized fisheries management regulations are also failing to maintain these resources.

Despite the decline of marine resources, a majority of villagers in Tomolol and Fafanlap (over 90% in both villages) stated that *sasi* is sufficient to protect their marine resources if supported by government regulations. This is especially surprising in Fafanlap, where nearly all villagers bemoan the decline of marine resources and over 80% of those interviewed said that few people follow *sasi*, and yet nearly all of the villagers emphasize the importance of *sasi* in protecting marine resources. One villager mentioned that it is important to reinstitute *sasi*, because

> it's part of the culture, part of the custom. We believe that *sasi* is a strong regulation capable of sustaining marine resources, but it is strengthened by the support of government regulations (villager in Fafanlap, 2006).

Another villager said that "*sasi* is important to conserve resources because closing the sea allows the marine species to regenerate." Nearly all villagers in Fafanlap mentioned that the number of marine resources has declined and expressed concern for the future. One woman said

> I am worried because I've noticed that the resources have decreased. What about my grandchildren? What will they eat? How will they make a living? These days, we have to spend a lot of time in the water but we are not able to harvest very much (female villager in Fafanlap, 2006).

The existence of *sasi* suggests that certain management concepts are known and valued as part of local culture (Harkes and Novaczek 2002). Villagers clearly feel that the institution of *sasi* is useful for protecting marine resources, as demonstrated by their faith in its ability to protect their resources with the support of government regulations.

Sasi is not a homogeneous or comprehensive institution (Harkes and Novaczek 2002), and it takes many forms not only from one location to another within a particular context (Zerner 1994; Pannell 1997). Its survival is dependent on the political, economic, historical, and cultural context in which it is embedded. One of the challenges that conservation groups face is whether *sasi* can maintain relevance despite social, demographic, and economic changes. Even if a marine tenure system is currently "working" to achieve conservation; it may not be able to do so in the future. *Sasi* has the potential to maintain the sustainability of marine resources for a variety of reasons. If population pressures remain low, the management structure may maintain resources sufficient for the existing population, but if population increases, the system may not be able to maintain the resources at a high enough level to sustain the needs of the local population. The increased population of Fafanlap and the erosion of *sasi*, compared to the smaller population in Tomolol and the greater adherence to *sasi,* supports this idea. Additionally, new pressures from development and market changes may create new conflicts over resources that the traditional systems are unable to settle. The conventional wisdom is that economic and demographic changes, like population growth and increased consumption, will weaken customary marine tenure systems (Aswani 2002). Fear of eroding customs is also cited as a reason that customary marine tenure systems may be disregarded in conservation strategies (Kuemlangan 2004).

Some suggest that it is not useful to resurrect the past by entrenching traditional fishing patterns, or rather the modern distortions of them, into the administration in Papua New Guinea (Haines 1982). Clearly, it does not make sense to "entrench" traditional methods that may become obsolete with coming change into governmental policies, legislation, or conservation strategies. However, despite large-scale changes, communities have maintained viable systems of customary marine tenure that work to conserve marine resources (Ruddle 1998; Aswani 2002). While methods may become obsolete, and customary marine tenure systems may erode, the values and traditions underlying the system are embedded in the cultural context where the system developed, thus these provide the basis for developing marine conservation strategies. Modern conservation strategies that reinforce local values and traditions are more likely to have local support and buy-in, and more likely to be sustainable, ensuring that these resources will continue to provide for the communities that depend upon them for survival.

7.3 Government and role of non-governmental organizations

Customary marine tenure is not enough to protect marine resources in Raja Ampat. Customary regulations need to be reinforced by government regulations. In both Fafanlap and Tomolol, 93% of those interviewed suggested that *sasi* was sufficient to protect marine resources, although nearly all specified that *sasi* should be supported by government regulations. Government laws are necessary to support *sasi* in both villages because traditional laws were not set up to address new technologies such as destructive fishing methods. Government regulations also provide a mechanism to prevent outsiders from exploiting Tomolol's and Fafanlap's marine resources. Further, when outsiders violate *sasi*, it can encourage locals to do so as well, so having government regulations

which reinforce the traditional regulations, helps *sasi* maintain effectiveness and relevance for both locals and outsiders.

Indonesia has a complicated history of marine laws that conflict at the national and regional level due to decentralization that occurred in the late 1990s. The first proposal of a marine park in Indonesia was in 1975. In 1978, criteria for what constituted a protected area were defined and a proposal for a marine park system was developed. The Basic Provisions for the Management of Living Resources Act was passed in 1982, linking sustainable management of the living environment to improved human welfare. Despite the decades of legislation addressing the marine environment, there is no one statute or law governing coastal resources in Indonesia. Coastal resources are governed by 22 statutes and lower level laws with dozens of implementing agencies (Ginting 2002).

Since 1999 in Indonesia, a series of laws have been enacted that shifted management of nearly all social, economic and environmental issues to the regional level. District and municipal governments are able to set policy regarding resource use and spatial planning. *Kabupaten* (district) governments have been granted the right to manage marine resources and the coastal seas four miles from shore. For example, under Law No. 22/1999 on Regional Administration, Provincial Governments are held responsible for the management, use and conservation of marine resources in their own territory, within territorial waters. This law granted villages "natural autonomy." The law supported the Village Representative Board (BPD) whose role is to "protect local customs and traditions, make village regulations, gather and channel community aspirations, and supervise organization of village governance" (Article 104). The law also states that

Kabupaten regulations must acknowledge and respect village rights, customs, and traditions (Article 110 and 111). Some suggest that the shift from state to village rule has great potential for developing or reviving community-based common property resource management regimes (Thorburn 2002).

The most significant recent law regarding marine resources is Law 32/2004. This law includes the broad authority granted to regional governments to manage their own affairs from Law No. 22/1999. Law 32/2004 clarifies earlier ambiguities in the previous 1999 law and defines the roles of regional governments (Article 13 and 14) and also has provisions that support traditional rights (Article 2). Law 32/2004 also supports the rights of communities to be involved in the development of regional regulations (Article 139) and reinforces the need for regional regulations to comply with the existing legal framework (Article 139). Article 10 of Law No. 22/1999 was also clarified to state that traditional fishing rights were not affected by newly established regional maritime areas. However, some districts have prevented traditional fishermen from entering district waters, thus the law is not always followed at the district level (Patlis 2005).

In 2004, several laws were developed that include provisions to stop destructive fishing (e.g., use of cyanide and dynamite) and pollution in fishing management areas (Law 32/2004; Article 8 of Law No. 31 of 2004). Villagers in Fafanlap and Tomolol were aware of these laws because they mentioned that there were national laws against destructive fishing, but not *adat* law against these practices because blast fishing and cyanide were not used in the past when *adat* laws were developed. Therefore, having national laws that address modern threats was viewed as essential in addition to support existing customary laws. Despite the lack of enforcement capacity in both Tomolol and

Fafanlap to protect their customary areas, the presence of the pearl farm provided enforcement capacity that reinforced government laws against illegal fishing. It is important to note that government laws without adequate enforcement are useless.

When asked about the role non-governmental organizations should play in Tomolol, some suggested that the non-governmental organizations could provide a boat and work with villagers and village leaders to enforce the regulations protecting marine resources. It was noted that the boat should have sufficient speed to effectively monitor and enforce local laws protecting marine resources. Villagers also mentioned that an important role for non-governmental organizations was to establish an office in their village to help control outsiders from exploiting a village's marine resources. One woman mentioned that a non-governmental organization could report violations and problems to the local government because the government had no idea what was happening at the village level.

The villagers also emphasized the need for the non-governmental organizations to come and talk to the villagers about conservation every few months through village meetings. One villager suggested that movies highlighting problems and successes in other areas would be an effective method for communicating the importance of conservation. During fieldwork, underwater photographs were taken of healthy coral and fish communities and blast fishing and anchor damage just offshore in Fafanlap. These photographs were uploaded on a computer and shown to the community to raise awareness of the human impacts that can damage corals and fishes. These photographs were extremely popular and many villagers would gather nightly to see the images. This is an effective way to demonstrate the need to conserve marine resources and habitats.

Conservation organizations should work together with local governments to reinforce the role of local authority figures, which are necessary to support and legitimize *sasi*. If religion plays a major role in community life, as it does in many villages in eastern Indonesia, integration of church and *sasi* can be mutually reinforcing, thus ensuring the perpetuation of *sasi*. Conservation organizations may also work with the Pearl companies to encourage them to develop contracts with the clans that hold legitimate marine tenure rights to reinforce the clan structure and authority. Conservation groups and local governments could be encouraged to use and support traditional titles and structures to maintain a strong cultural and spiritual basis for marine resource management (Harkes and Novaczek 2002). It is essential to develop the support and participation of the younger generation in conservation meetings and activities to encourage them not to use destructive fishing techniques that provide large economic benefits in the short-term, while destroying future livelihood opportunities.

Identifying local champions that support conservation is an important strategy for encouraging conservation principles in communities. To maximize effectiveness, it would be strategic to identify local champions in several groups, e.g., a traditional leader, a motivated young person, an influential woman in the community, and a religious leader, to help support conservation measures and activities. Working with local village leaders, local governments, and local non-governmental organizations, it is important to encourage the direct and equitable benefits for villagers and control over revenues of resource management. This encourages incentives to comply with regulations and reinforces the effectiveness of *sasi* in conserving resources. Incentives have been identified as an important mechanism in ensuring that rules are followed and individuals

support actions that benefit the public good (Olson 1965; Acheson 2003). A necessary first step in developing modern marine conservation strategies in Raja Ampat is to document *sasi*, to assess the factors that impact the evolution of *sasi* and to identify the reinforcing mechanisms that must be in place to perpetuate *sasi* and help conserve marine resources. Once these have been identified, local communities can work together with non-governmental organizations, and local governments to reinforce the practices and customs that support conservation.

7.4 Implications for future research

Clearly marine resources are threatened in Raja Ampat based on ecological and social assessments. Destructive fishing practices exist and pressures to use destructive techniques and overexploit marine resources will likely increase due to growing market opportunities. Results from this study demonstrate that *sasi* provides a valuable framework for marine conservation strategies in Raja Ampat.

Men and women perceive the threats to marine resources and the solution to these threats differently in both Tomolol and Fafanlap. Therefore, it is critical to include both men and women in workshops and conservation activities. Single sex focus groups were mentioned repeatedly by both men and women to ensure that women feel free to speak openly. Research demonstrates that focus groups should be kept small (e.g., 10-12 people) and homogenous to maintain effectiveness (van Ingen et al. 2002). As mentioned in Section 5.1.5, women should be explicitly invited, the time and place of the meeting should be suitable for women, and the need to involve women should be discussed with the village authority. Finally, links between increased education of women and increased role on women in conservation activities have been demonstrated (Diamond 2002),

specifically literacy skills to allow women greater participation in fisheries management process, improvement of women's access to information regarding markets and improved capacity building for alternative income generating activities (Bennett et al. 2005).

Women have played critical roles in developing alternative livelihoods (Diamond 2002). Several income generating opportunities for women that were identified by women in Tomolol and Fafanlap were selling sago and abalone. One woman mentioned that abalone could sell for 150,000 rupiah (US$15.85) per kilogram. Other women suggested that *Trochus niloticus* and shrimp could be farmed in a traditional way and sold for additional income.

In both villages, women also expressed an interest in playing a role in enforcement, thus opportunities for their involvement should be considered when developing enforcement strategies. Women mentioned that workshops must be held in each village if women were to join, because only single women could attend workshops outside their own village because married women would not be able to leave their families. Several women suggested that a small local women's organization could be established to encourage women to remind their husbands, children, and other women to conserve marine resources. One woman who is the leader of a local women's group, *Alliance Perempuan Maya Raja Ampat*, thought that this group would be a good vehicle for encouraging women to contribute to workshops and meetings that address marine resource use and management.

Gender was a component of this analysis, but detailed gender studies are essential for establishing a baseline of how men and women interact to use and manage their marine resources in Raja Ampat. It would be interesting to see whether villages that

reportedly do not value women's contribution to marine management and knowledge have more or less intact *sasi* systems. Detailed socioeconomic assessments can highlight the contributions that women make in the fisheries sector and the harvest of marine resources. Non governmental organizations should make an effort to document strategies that successfully incorporate women in conservation workshops and trainings and share these results more broadly.

The results of this research demonstrate the importance of *sasi* for two villages in Raja Ampat and highlight the role that *sasi* can play in marine conservation strategies. Written information on *sasi* in Raja Ampat is lacking, and projects that document details of *sasi* in Raja Ampat are necessary and valuable. It would be interesting to compare the evolution of *sasi* in these villages to other villages in Raja Ampat to determine whether the trends are reflected more broadly. For example, studies could compare Christian and Muslim villages throughout Raja Ampat to determine what role religions play in the evolution of *sasi.* Additionally, it would be useful to see what other reinforcement mechanisms must be in place for the existence of *sasi*, beyond the mechanisms defined in this study. To establish how *sasi* contributes to marine conservation, further environmental assessments are necessary to elucidate how marine resources and habitats differ under different *sasi* systems.

The existence and evolution of *sasi* is clearly impacted by a variety of socio-economic and political factors in both Tomolol and Fafanlap. The declining influence of traditional leaders, emergence of influential religious leaders, migration patterns, presence of large companies, marine resource use patterns, and government regulations affect the role that *sasi* plays in each village. The erosion of *sasi* and traditional

management approaches has been document throughout Southeast Asia, Micronesia, and Melanesia (Johannes 1978; Polunin 1984; Ruddle et al. 1992; Hviding 1996). However, a critical point is that *sasi* does not erode and then disappear. *Sasi* has been "continuously reinterpreted by a variety of actors, following the trajectory of changing institutional interests and images" (Zerner 1994). As power structures, economic opportunities, and community values change, *sasi* absorbs these changes and as reinvented again. Furthermore, whether *sasi* effectively supports marine resource conservation or ever did, is not necessarily the bottom line for determining its relevance to conservation strategies. *Sasi* reflects the complex series of relationships that define a particular place, and as such, is an important indicator of current values. Therefore, whether *sasi* actually achieves conservation should not be the deciding factor for whether it is built into new marine conservation strategies. By building *sasi* into these strategies, non-governmental organizations and local conservation groups are ensuring that the strategies reflect local values, local power structures, and the dynamism that defines communities everywhere.

APPENDIX A

FIELD SURVEY

Name: Sex: Date:

Section 1: Respondent's Background Information

No.	Questions	Answers
101	How old are you?	Age
102	What is your ethnicity?	
103	What is your current marital status? Circle only one answer	Single (never married).....1 Currently married.....2 Separated/divorced/widow.....3
104	Were you born in this village or were you born elsewhere?	Born in this village.....1 Born elsewhere.....2
105	How long have you lived in this village?	Less than 1 year.....1 1 to 3 years.....2 3 to 5 years.....3 more than 5 years 4
106	What is your main occupation? (i.e. what do you do for a living?)	_____ _____ _____ Not working at present.....000
107	In addition to your main occupation, do you have other income-generating activities?	Yes .....1 No.....0
108	What other income generating activities do you have?	_____ _____ _____
109	How old were you when you first went fishing/collecting marine resources?	Age _____
110	Who taught you to fish/collect marine resources? Family member (specify), Other (specify)?	Family member.....1 _____ Specify Other.....2 _____ Specify
111	Do you have siblings?	Yes .....1 No.....0
112	Did your siblings (male/female) learn the same tasks?	Yes .....1 No.....0
113	If your siblings learned different tasks, please list them.	Male sibling tasks: _____ _____ _____ Female sibling tasks: _____ _____ _____

Section 2: Knowledge of marine resources

No.	Questions	Answers				
201	I will read a list of fishing gear. Please tell me if this gear is used in your village and if it is used by men, women, or both	Yes	No	Men	Women	Both
	• Hook and line.....	1	0	2	3	4
	• Fish trap (Bubu).....	1	0	2	3	4
	• Trawling.....	1	0	2	3	4
	• Gill and net.....	1	0	2	3	4
	• Seine net.....	1	0	2	3	4
	• Fishing with explosives.....	1	0	2	3	4
	• Fishing with cyanide.....	1	0	2	3	4
	• Hookah compressor.....	1	0	2	3	4
202	I will read a list of fishing activities. Please tell me if this activity is done in your village and if it is done by men, women, or both	Yes	No	Men	Women	Both
	• Reef gleaning.....	1	0	2	3	4
	• Capturing turtles.....	1	0	2	3	4
	• Shark fining.....	1	0	2	3	4
	• Coral mining.....	1	0	2	3	4
	• Sand mining.....	1	0	2	3	4
	• Capturing crabs.....	1	0	2	3	4
	• Swimming or scuba diving.....	1	0	2	3	4
	• Extracting wood from mangrove.....	1	0	2	3	4
	• Playing on the beach.....	1	0	2	3	4
	• Fishing for sea cucumbers.....	1	0	2	3	4
	• Gathering giant clams.....	1	0	2	3	4
203	What are the most important marine resources for food?	_____				
204	What are the most important marine resources for income?	_____				
205	Does the abundance and distribution of sea cucumber fluctuate throughout the year? If so, What causes this fluctuation?	Yes.....1 No.....0 _____				
206	Does the abundance and distribution of red snapper fluctuate throughout the year?	Yes.....1 No.....0				

	If so, What causes this fluctuation?	_____ _____ _____
207	Do you know the spawning times and spawning behaviors of: • Sea cucumber..... • Trochus..... • Red snapper..... • Napolean wrasse.....	Spawning Time: Yes 1, No 0 / 1, 0 / 1, 0 / 1, 0 Spawning Behavior: Yes 1, No 0 / 1, 0 / 1, 0 / 1, 0
208	What is the best method for catching sea cucumber?	_____ _____ _____ _____
209	What is the best method for catching trochus?	_____ _____ _____ _____
210	What is the best method for catching red snapper?	_____ _____ _____ _____
211	What is the best method for catching Napolean wrasse?	_____ _____ _____ _____
212	If respondent is male: Do you think that your knowledge of marine resources is different than other men in this village? Do you think that your knowledge of marine resources is different than your wife or sister? If respondent is female: Do you think that your knowledge of marine resources is different than other women in this village? Do you think that your knowledge of marine resources is different than your husband or brother?	Yes 1, No 0 1, 0 1, 0 1, 0
213	Now I will read you some statements related to coral reefs. Again, please tell me if you strongly agree, you agree, you are undecided, you disagree or strongly disagree with these statements.	Strongly Disagree Disagree Undecided Agree Strongly Agree

214	The reefs are important for protecting beaches and coastal villages from storm waves	1	2	3	4	5
215	Coral reefs and mangroves are important for maintaining fish stocks	1	2	3	4	5
216	In the long-run, fishing would be better if we cleared all corals	1	2	3	4	5
217	There isn't much I or other people in my village can do to protect the surrounding coastal and marine environment	1	2	3	4	5
218	Seagrass beds have no value to people	1	2	3	4	5
219	Mangroves have no value to people	1	2	3	4	5

Section 3: Perception of condition and threat to marine resources

No.	Questions	Answers
301	How would you rate the condition of coral reefs near your village: very good, good, bad, or very bad?	Very good.....1 Good.....2 Bad.....3 Very bad.....4 Don't know/not sure.....8
302	How would you rate the condition of mangroves around your village?	Very good.....1 Good.....2 Bad.....3 Very bad.....4 Don't know/not sure.....8
303	Do you think that the conditions of the marine environment around your village are better, the same or worse than they were 10 years ago?	Better.....1 The same.....2 Worse.....3 Don't know/not sure.....8
304	Do you think that during the next 10 years the condition of the marine environment around your village will improve, will stay the same or will get worse?	Will improve.....1 Stay the same.....2 Will get worse.....3 Don't know/not sure.....8
305	What do you think are the main environmental problems in the shores and the sea around your village? • Overfishing/diminishing fish stocks..... • Fishing with explosives..... • Fishing with cyanide..... • Fishing with fish trap (bubu)..... • Mangrove cutting..... • Coral mining..... • Water contamination..... • Deforestation of surrounding area..... • Soil erosion in surrounding areas..... • Invasion of foreign species..... • Overpopulation..... • Other problems (specify)..... • Don't know/not sure..... • There are no major environmental	Yes / No 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0

	problems.....	
306	In your opinion, who has the main responsibility for creating these problems? CIRCLE ONLY ONE. IF THE RESPONDENT CITES MORE THAN ONE ASK OF WHICH ONE WHO HAS THE MAIN RESPONSIBILITY	People in village.....01 Tourists/Visitors.....02 The Bupati.....03 Village Leader.....04 National Government.....05 Private Businesses.....06 Fishermen.....07 Non-government organization.....08 Other_____10 (SPECIFY) Don't know/not sure.....98
307	Who do you think the most qualified people to tackle these problems? CIRCLE ONLY ONE. IF THE RESPONDENT CITES MORE THAN ONE ASK OF WHICH ONE WHO HAS THE MAIN RESPONSIBILITY	People in village.....01 Tourists/Visitors.....02 The Bupati.....03 Village Leader.....04 National Government.....05 Private Businesses.....06 Fishermen.....07 Non-government organization.....08 Other_____10 (SPECIFY) Don't know/not sure.....98
308	Has the villages approach for managing marine resources changed since you were a child? If so, how?	Yes No 1 0 _____ _____ _____
309	Since you were a child, have technologies changed that have impacted your experience of fishing?	Yes No 1 0

Section 4: Customary marine tenure

No.	Questions	Answers
401	Are there any rules in this community regarding: • Who is allowed to fish ..... • Where you can collect marine resources..... • When you can collect marine resources..... • What species can be harvested..... • What gear can be used for harvest..... • Yield.....	Yes No 1 0 1 0 1 0 1 0 1 0 1 0
402	If you have the right to fish in a particular area, can that right be taken away?	Yes No 1 0
403	If you have the right to fish in a particular area, can that right be transferred to others?	Yes No 1 0
404	Do you have a problem with outsiders taking your marine resources? If so, how do you address this?	Yes No 1 0 _____ _____ _____
405	Please tell me if a person may face the following penalties for breaking customary marine tenure regulations? • Written warning..... • Fine..... • Confiscation of catch..... • Confiscation of gear..... • Confiscation of boat..... • Other_____	Will face / Will not face / Don't Know 1 0 8 1 0 8 1 0 8 1 0 8 1 0 8
406	Do you think that in your village, most of the people, some of the people, or few of the people know the customary regulations for marine resources?	Most of the people know.....1 Some of the people know.....2 Few of the people know.....3 Don't know/not sure who knows....8
407	Do you think that in your village, most of the people, some of the people, or few of the people follow customary marine tenure?	Most of the people do.....1 Some of the people do.....2 Few of the people do.....3 Don't know/not sure who does.....8
408	Do you think that customary marine tenure is sufficient to protect your marine resources?	Yes No 1 0
409	Would it improve, harm, or have no effect on customary marine to incorporate women's knowledge of marine resources?	Improve.....1 Have no effect.....2 Harm.....3

		Don't know/not sure.....4
410	Would it improve, harm, or have no effect on customary marine to engage women more in the management of marine resources?	Improve.....1 Have no effect.....2 Harm.....3 Don't know/not sure.....4
411	How strongly will the following changes affect customary marine tenure in this village: • Increased population • Increased migration in and out of the village • Government regulations • Access to more cash and commercial goods	Strongly affect / Mildly affect / No affect / Don't know 1 2 0 8 1 2 0 8 1 2 0 8 1 2 0 8

APPENDIX B

LIST OF MARINE SPECIES AND FISHING GEAR (LOCAL TERMS)

Holothurians – sea cucumber

Scientific (common name)	**Bahasa Indonesia**	**Matlol**	**Matbat**
Actinopyga echinites (deep water redfish)	teripang babon	kacobit	teo balak
Actinopyga lecanora (stonefish)	teripang malam	te wipin	teo mnom
Actinopyga mauritiana (surf redfish)	teripang gosok	te bat	teo bat
Actinopyga miliaris (blackfish)	teripang malam	te male	teo mnom
Holothuria (Microthele) nobilis (black teatfish)	teripang susu	mata wo matmetem or sagatlen	teo sui
Bohadschia argus (tigerfish)	teripang bintik or bintang	te lit	teo lit
Bohadschia similis (chalkfish)	teripang ikan	te in	teo jin
Bohadschia vitiensis (brown sandfish)	teripang benang	te lit	teo lit
Holothuria (Acanthotrapeza) coluber (snakefish)	teripang soasoa	te bet	teo bet
Holothuria (Halodeima) atra (lollyfish)	teripang minyak	te lomos	teo mnik
Holothuria (Halodeima) edulis (pinkfish)	teripang (?)	te lomos	teo lomos
Holothuria (Metriatyla) scabra (sandfish)	teripang gosok	te bat	teo bat
Holothuria (Microthele) fuscogilva (white teatfish)	teripang susu	mata wo bus	teo suy
Holothuria (Microthele) fuscopunctata (elephant trunkfish)	teripang sepatu	te rangan	teo hapatu
Stichopus horrens (dragonfish)	teripang kucing	te ma	teo mao
Pearsonothuria graeffei	teripang kong kong	kacobit mara	kasubut

(flowerfish)			
Stichopus chloronotus (greenfish)	teripang japong (?)	Japong	jampong
Stichopus hermanni (curryfish)	teripang kong kong	kacobit	kasubut
Thelenota ananas (prickly redfish)	teripang nanas	te waglefo	teo padang
Thelenota anax (amberfish)	teripang balok (racun)	te iri	teo dangan

Fishes

Family	**Scientific (common name)**	**Bahasa Indonesia**	**Matlol**	**Matbat**
Angelfish	*Pomacanthus annularis* (blue-ringed angelfish)		malimnyolim	
Angelfish	*Pomacanthus sextriatus* (six banded angelfish)		malimnyolim	
Barracuda	*Sphyraena barracuda* (great barracuda**)**		sabalan	kajep
Barracuda	*Sphyraena flavicuada* (yellowtail barracuda)		tagalun	
Barracuda	*Sphyraena genie* (blackfin barracuda)		tagalun	
Billfishes	*Makaira indica* (marlin)	setuhuk hitam	sili	
Butterflyfish	*Chaetodon octofasciatus* (eightband butterflyfish)		tamilam	
Butterflyfish	*Chelmon rostratus* (copperband butterflyfish)		tamilam	
Butterflyfish	*Heniochus acuminatus* (longfin bannerfish)		tamilam	
Eagle and manta ray	*Aetobatus narinari* (eagle ray)	pari burung	famine	famni
Eagle and manta ray	Bat ray (?)	pari kelewar	kawap (bat)	
Eagle and manta ray	*Mobula spp.* (manta ray)		falaia	fakajubus
Eagle and	*Myliobatis*			fambal

manta ray	*tenuicaudatus* (eagle ray)			
Eagle and manta ray	*Taeniura lymma* (blue spotted ray)		fame	
Filefish	*Aluterus scriptus* (scrawled filefish)		kasabum	
Grouper	*Anyperodon leucogrammicus* (slender grouper)		moot	
Grouper	*Cephalopholis formosa* (bluelined hind)		kayot	
Grouper	*Cephalopholis miniata* (coral hind)		kayot	
Grouper	*Cromileptes altivelis* (humpback grouper)	kerapu bebek, kepau tikus	motkisi	
Grouper	*Epinephelus fasciatus* (blacktip grouper)		kayot	
Grouper	*Epinephelus lanceolatus* (giant grouper)		moot	
Grouper	*Epinephelus merra* (honeycomb grouper)		moot	
Grouper	*Epinephelus spp. (*grouper)	kerapu	moot	mloi
Grouper	*Plectropomus leopardus* (leopard coralgrouper)		pu	wi
Grouper	*Plectropomus laevis* (saddleback grouper)		pu	pulwai
Grouper	*Plectropomus maculates* (spotted coralgrouper)		pu	pulwai
Grouper	*Plectropomus oligochantus*		pu	pulwai
Grouper	*Variola albimarginata* (white-edged lyretail)		pu	wi
Grouper	*Variola louti* (coronation cod)		pu	pulwai
Guitarfishes	*Rhina ancylostoma* (bowmouth guitarfish)	pari hidung sekop	falaya	fatamlam
Guitarfishes	*Rhynchobatus djiddensis* (giant guitarfish)	pari kekeh	karubit	

Hammerhead, bonnethead, or scoophead sharks	*Eusphyra blochi* (hammerhead)	cucut martil	wo fanaga	
Jack	*Caranx ignobilis* (giant trevally)		raselbus	wolfan
Jack	*Caranx melampygus* (bluefin Trevally)		mafi	waibuk
Jack	*Caranx sexfasciatus* (bigeye trevally)		mafi	waibuk
Jack	*Elagatis bipinnulata* (rainbow runner)		paca	wol
Jack	*Gnathanodon speciosus* (golden trevally)		kabalilik	
Mackerels, tunas, bonitos	*Gymnosarda unicolor* (dogtooth tuna)		boin	
Mackerels, tunas, bonitos	*Scomberomorus commerson* (narrow-barred Spanish mackerel)		wol	
Parrotfish	*Calotomus carolinus* (Carolines parrotfish)			kaku
Parrotfish	*Cetoscarus bicolor* (Bicolor parrotfish)			win
Parrotfish	*Chlorurus bleekeri* (Bleeker's parrotfish)			wun
Parrotfish	*Chlorurus bowersi* (Bower's parrotfish)			peten
Parrotfish	*Chlorurus japanensis* (palecheek parrotfish)			peten
Parrotfish	*Hipposcarus longiceps* (Pacific longnose parrotfish)			ajaf
Parrotfish	*Leptoscarus vaigiensis* (blue-spotted parrotfish)			kamlin
Parrotfish	Parrotfish	kakatua	kokom	katiti
Parrotfish	Parrotfish - blue (spp?)	kakatua biru		kabat
Parrotfish	Parrotfish - white (spp?)	kakatua putih	byan	wun, ajaf (2 species)
Parrotfish	*Scarus chameleon* (chameleon parrotfish)			wun
Parrotfish	*Scarus flavipectoralis*			peten

	(yellowfin parrotfish)			
Parrotfish	*Scarus forsteni* (whitespot parrotfish)			wun
Parrotfish	*Scarus frenatus* (bridled parrotfish)			majo
Parrotfish	*Scarus ghobban* (blue-barred parrotfish)			wun
Parrotfish	*Scarus globiceps* (globehead parrotfish)			wun
Parrotfish	*Scarus hypselopterus* (yellow-tail parrotfish)			wun
Parrotfish	*Scarus niger* (dusky parrotfish)			fadongu
Parrotfish	*Scarus quoyi* (Quoy's parrotfish)			peten
Parrotfish	*Scarus rubroviolaceus* (ember parrotfish)			majo
Puffer	*Arothron stellatus* (puffer)		kaput	
Puffer	*Diodon liturosus* (porcupinefish)		kaput	
Rabbitfish	*Siganus argenteus* (forktail rabbitfish)			mli
Rabbitfish	*Siganus corallinus* (blue-spotted spinefoot)		inting	
Rabbitfish	*Siganus guttatus* (golden rabbitfish)		yospin	kamut
Rabbitfish	*Siganus javus* (Java rabbitfish)		yospin	jos
Rabbitfish	*Siganus lineatus* (golden-lined spinefoot)		yospin	kamut
Rabbitfish	*Siganus puellus* (masked spinefoot)		inting	mokaminis
Rabbitfish	*Siganus punctatissimus* (gold-spot rabbitfish)		kamuf	jitin
Rabbitfish	*Siganus punctatus* (goldspotted rabbitfish)		yospin	jitin
Rabbitfish	*Siganus spinus* (spiny		kamuf	mli

	rabbitfish)			
Rabbitfish	*Siganus vermiculatus* (vermiculated spinefoot)		yospin	jinhaidan
Rabbitfish	*Siganus virgatus* (barhead spinefoot)		inting	
Rabbitfish	*Siganus vulpinus* (foxface rabbitfish)		inting	auling
Requiem sharks	*Carcharhinus amblyrhynchos* (gray reef shark)		wo wol	woi
Requiem sharks	*Carcharhinus melanopterus* (blacktip reef shark)		selemeten	woi
Requiem sharks	*Triaenodon obesus* (whitetip reef shark)		wo	woi
Snapper	*Aprion virescens* (green jobfish)		sek	
Snapper	Lutjanidae (snapper)		kanoso	
Snapper	*Lutjanus argentimaculatus* (mangrove red snapper)		kumyan	man
Snapper	*Lutjanus bohar* (red snapper)	kakap merah	kumyan	man
Snapper	*Lutjanus rivulatus* (blubberlip snapper)		kumyan	
Stingrays	*Dasyatis* (stingrays)	pari kembang	famalelen	
Surgeon	*Acanthurus bariene* (roundspot surgeonfish)			pajolon
Surgeon	*Acanthurus blochii* (ringtail surgeonfish)			pajolon
Surgeon	*Acanthurus fowleri* (Fowler's surgeonfish)			pajolon
Surgeon	*Acanthurus leucocheilus* (palelipped surgeonfish)			pajolon
Surgeon	*Acanthurus lineatus* (striped surgeonfish)			auling
Surgeon	*Acanthurus maculiceps* (white-freckled surgeonfish)			pajolon
Surgeon	*Acanthurus mata*			fail

	(elongate surgeonfish)			
Surgeon	*Acanthurus nigricans* (whitecheek surgeonfish)			pajolon
Surgeon	*Acanthurus nigricauda* (Epaulette surgeonfish)			pajolon
Surgeon	*Acanthurus nigrofuscus* (dusky surgeonfish)			pajolon
Surgeon	*Acanthurus nubilus* (bluelined surgeon)			pajolon
Surgeon	*Acanthurus olivaceus* (orangespot surgeonfish)			pajolon
Surgeon	*Acanthurus pyroferus* (chocolate surgeonfish)			kamilam
Surgeon	*Acanthurus thompsoni* (Thompson's surgeonfish)			fajolon
Surgeon	*Acanthurus triostegus* (convict surgeonfish)			pengfau
Surgeon	*Acanthurus xanthopterus* (yellowfin surgeonfish)			pajolon
Surgeon	*Ctenochaetus binotatus* (twospot surgeonfish)		payolom	kasaim
Surgeon	*Ctenochaetus striatus* (striated surgeonfish)		payolom	
Surgeon	*Ctenochaetus strigosus* (spotted surgeonfish)		payolom	
Surgeon	*Ctenochaetus tominiensis* (tomini surgeonfish)		payolom	
Surgeon	*Naso annulatus* (whitemargin unicornfish)		salya	hajai
Surgeon	*Naso brachycentron* (humpback unicornfish)		salya	hajai

Surgeon	*Naso brevirostris* (spotted unicornfish)		salya	hajai
Surgeon	*Naso hexacanthus* (sleek unicornfish)			ijos
Surgeon	*Naso lituratus* (orangespine unicornfish)		payolom	hajai
Surgeon	*Naso unicornus* (bluespine unicornfish)		salya	hajai
Surgeon	*Naso vlamingii* (Vlaming's unicornfish)		salya	hajai
Surgeon	*Paracanthurus hepatus* (palette surgeonfish)			fail
Surgeon	*Zebrasoma scopas* (twotone tang)			kamilam
Surgeon	*Zebrasoma veliferum* (sailfin tang)			auling
Triggerfish	*Balistoides viridescens* (titan triggerfish)		sumfala	
Triggerfish	*Pseudobalistes flavimarginatus* (yellowmargin triggerfish)		sumfala	
Wrasse	*Cheilinus fasciatus* (red breast wrasse)		saforon, or salaiforon	
Wrasse	*Cheilinus undulates* (humphead wrasse)	napoleon	maman	kalaupa
Wrasse	*Choerodon schoenleinii* (sp?) (black-spot tuskfish)		kabat	
Zebra shark	*Stegostoma fasciatum* (leopard shark)		wo kaluf	

Marine Species

Scientific (common name)	**Bahasa Indonesia**	**Matlol**	**Matbat**
Amusium spp. (scallop)	simping	pinsamlim	pinhawa
Cassiopeia, Aurelia (jellyfish)	ubur-ubur	Sa	isai
Cassis cornuta (horned helmet)	kima kepala kambing	tapiu kaut	
Charonia tritonis (triton	bia trompet	tapiu	falu

conch)			
Crassostrea (oyster)			kafo
Cypraeidae (cowrie)		kalkain	
Diadema setosum (sea urchin)	bulu babi	katim	kateim
Hippopus hippopus (horse-hoof clam), *Tridacna derasa* (smooth giant clam)	kima tapak kuda, kima selatan		haleptomlon
Loligo spp. (squid)	cumi cumi	nasnus	tasu
Melo umbiculatus	timbaruan	kale	
Mytilidae (mussel)		kalawu	
Mytilidae (mussel)	bia sendok	kajofon	kajofon
Octopus spp. (octopus)	Gurita	kit	kamwal
Panulirus (lobster)	Udang	isin	
Penaeus (shrimp)	Udang	kacana	kasam
Pinctada margaritifera (black-lip pearl oyster)	kerang mutiara	sapepel, japi japi	kafosa, iwi
Scylla serrata (mangrove crab)	Kepiting	kafa	
Tridacna gigas (giant clam)	kima raksasa	sancan	kasim
Tridacna squamosa, Tridacna maxima	kima sisik, kima besar		mawoi
Trochus niloticus (trochus)	bia lola, susu bundar	dajur	kallo
Turbo marmoratus (green snail)	batu laga (matubulan)	la	la

Sea Turtles

Scientific (common name)	**Bahasa Indonesia**	**Matlol**	**Matbat**
Chelonia mydas (green sea turtle)	penyu hijau	fenkawa*	fenkawa
Dermochelys coriacea (leatherback turtle)	penyu belimbing	fenkabomtol	
Eretmochelys imbricata (hawksbill turtle)	penyu sisik	fenutubom	fentamlon

*fenkawa because ‘fen’ = turtle in Matlol and ‘kawa’ = seagrass and these turtles eat seagrass (fen is also turtle in Bahasa Matbat)

Fishing gear

English	**Bahasa Indonesia**	**Matlol**	**Matbat**
goggles	kacamolo	caramin	
fishing rod	pancing	uf	wil

net	jaring	landar	landat
scoop net (for shrimp, 1 person)	serok	sabsub	
scoop net (for shrimp, 2 people)		tabuas	
spear with 1 prong, iron tip for sea cucumber	tombak	kalun	kaluwun
spear with 3 prongs for fish	trisula	kalawai	taleen
spear with 5 prongs for fish	tombak mata lima	kalawai	taleen

APPENDIX C

LIST OF TABLES

Table 5.5. Primary occupations in Tomolol and Fafanlap

	Villagers in Tomolol		Villagers in Fafanlap	
	Freq	**%**	**Freq**	**%**
Farmer	11	36.7	2	6.7
Pearl company	11	36.7	0	0.0
Fishing	0	0.0	16	53.3
Government	0	0.0	1	3.3
Teacher	2	6.7	1	3.3
Village leader/staff	1	3.3	1	3.3
Store owner	0	0.0	1	3.3
Carpenter	2	6.7	0	0.0
Makes craft (net, cakes, mats)	0	0.0	4	13.3
Don't work	3	10.0	4	13.3
Total Respondents	30	100	30	100

Table 5.6. Most important marine resources for food in Tomolol and Fafanlap

	Villagers in Tomolol		Villagers in Fafanlap	
	Freq	**%**	**Freq**	**%**
Fish	29	96.7	30	100
Shellfish	30	100	24	80
Turtle	17	56.7	3	10
Crab	9	30	18	60
Urchin	0	0	1	3.3
Squid	0	0	4	13.3
Sea cucumber	5	16.7	2	6.7
Shrimp	0	0	1	3.3
Total Respondents	30	100	30	100

Table 5.7. Most important marine resources for income in Tomolol and Fafanlap

	Villagers in Tomolol		Villagers in Fafanlap	
	Freq	**%**	**Freq**	**%**
Fish	2	6.7	11	36.7
Shellfish	7	23.3	19	63.3
Sea cucumber	30	100	24	80
Shrimp	1	3.3	2	6.7
Shark	3	10	0	0
Total Respondents	30	100	30	100

Table 5.8. Perception of the condition of coral reefs and mangroves in Tomolol and Fafanlap

	Condition of coral reefs in Tomolol		Condition of mangroves in Tomolol		Condition of coral reefs in Fafanlap		Condition of mangroves in Fafanlap	
	Freq	**%**	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**
Very good	0	0.0	2	6.7	3	10.0	2	6.7
Good	28	93.3	27	90.0	21	70.0	26	86.7
Bad	1	3.3	0	0.0	2	6.7	0	0.0
Very bad	0	0.0	0	0.0	1	3.3	1	3.3
Don't know	1	3.3	1	3.3	3	10.0	1	3.3
Total respondents	30	100.0	30	100.0	30	100.0	30	100.0

Table 5.9. Perceived major environmental problems in coastal and marine environments in Tomolol and Fafanlap

Perceived major environmental problems	Villagers in Tomolol		Villagers in Fafanlap	
	Freq	%	Freq	%
Overfishing	12	40	10	33
Blast fishing	17	57	20	67
Cyanide fishing	14	47	20	67
Fish traps	14	47	1	3
Mangrove deforestation	3	10	2	7
Coral mining	3	10	8	27
Water pollution	13	43	8	27
Deforestation of surrounding area	22	73	12	40
Soil erosion	22	73	15	50
Invasive species	0	0	0	0
Overpopulation	8	27	7	23

Table 5.10. Perceptions of current (compared to ten years ago) and future coastal and marine conditions in Tomolol and Fafanlap

	Tomolol				Fafanlap			
	Current		Future		Current		Future	
	Freq	%	Freq	%	Freq	%	Freq	%
Better	4	13.3	8	26.7	3	10.0	6	20.0
Same	2	6.7	1	3.3	4	13.3	0	0.0
Worse	22	73.3	14	46.7	20	66.7	17	56.7
Don't know	2	6.7	7	23.3	3	10.0	7	23.3
Total respondents	30	100.0	30	100.0	30	100.0	30	100.0

Table 5.11. Perceived major creators of coastal and marine environmental problems in Raja Ampat

	Tomolol		Fafanlap	
	Freq	**%**	**Freq**	**%**
Villager	5	16.7	10	33.3
Tourist/Visitor	1	3.3	0	0.0
Head of district (Bupati)	1	3.3	2	6.7
Village Leader (Kepala desa)	8	26.7	5	16.7
National Government	0	0.0	0	0.0
Private business	7	23.3	1	3.3
Fishermen	1	3.3	0	0.0
NGO	1	3.3	0	0.0
Other	4	13.3	3	10.0
Don't know	2	6.7	9	30.0
Total respondents	30	100.0	30	100.0

Table 5.12. Perceived major solvers of coastal and marine environmental problems in Raja Ampat

	Tomolol		Fafanlap	
	Freq	**%**	**Freq**	**%**
Villager	1	3.3	2	6.7
Tourist/Visitor	0	0.0	0	0.0
Head of district (Bupati)	5	16.7	4	13.3
Village Leader (Kepala desa)	22	73.3	12	40.0
National Government	0	0.0	0	0.0
Private business	0	0.0	0	0.0
Fishermen	0	0.0	0	0.0
NGO	2	6.7	3	10.0
Other	0	0.0	3	10.0
Don't know	0	0.0	6	20.0
Total respondents	30	100.0	30	100.0

Table 5.22. Fishing gear used in Tomolol and Fafanlap

	Tomolol Freq.	**Tomolol %**	**Fafanlap Freq.**	**Fafanlap %**
Hook and line	30	100	30	100
Fish traps	5	17	25	83
Trawling	2	7	4	13
Gill net	6	20	9	30
Seine net	1	3	6	20
Bomb	12	40	13	43
Cyanide	9	30	7	23
Compressor	10	33	19	63
Total respondents	30	100.0	30	100.0

Table 5.23. Coastal and marine activities in Tomolol and Fafanlap

	Tomolol Freq.	Tomolol %	Fafanlap Freq.	Fafanlap %
Reef gleaning	29	96.7	30	100
Turtle harvest	29	96.7	17	56.7
Shark fining	21	70	17	56.7
Coral mining	2	6.7	13	43.3
Sand mining	30	100	27	90
Harvesting crabs	29	96.7	28	93.3
Swimming or diving	22	73.3	28	93.3
Mangrove extraction	23	76.7	30	100
Collecting sea cucumber	30	100	30	100
Gathering giant clams	29	96.7	22	73.3

Table 5.25. Types of fishing gear used in village, aggregated by sex.

	Tomolol Freq (men only)	Tomolol % (men only)	Tomolol Freq (women only)	Tomolol % (women only)	Tomolol Freq (both)	Tomolol % (both)	Fafanlap Freq (men only)	Fafanlap % (men only)	Fafanlap Freq (women only)	Fafanlap % (women only	Fafanlap Freq (both)	Fafanlap % (both)
Hook and line	1	3.3	0	0.0	29	96.7	3	10.0	3	10.0	24	80.0
Fish trap	4	13.3	0	0.0	1	3.3	23	76.7	0	0.0	2	6.7
Trawling	2	6.7	0	0.0	0	0.0	3	10.0	0	0.0	1	3.3
Gill net	6	20.0	0	0.0	0	0.0	8	26.7	0	0.0	1	3.3
Seine net	1	3.3	0	0.0	0	0.0	6	20.0	0	0.0	0	0.0
Bomb	12	40.0	0	0.0	0	0.0	13	43.3	0	0.0	0	0.0
Cyanide	9	30.0	0	0.0	0	0.0	7	23.3	0	0.0	0	0.0
Compressor	10	33.3	0	0.0	0	0.0	19	63.3	0	0.0	0	0.0

Table 5.26. Types of fishing activities, aggregated by sex.

	Tomolol Freq (men only)	Tomolol % (men only)	Tomolol Freq (women only)	Tomolol % (women only)	Tomolol Freq (both)	Tomolol % (both)	Fafanlap Freq (men only)	Fafanlap % (men only)	Fafanlap Freq (women only)	Fafanlap % (women only	Fafanlap Freq (both)	Fafanlap % (both)
Reef gleaning	0	0.0	1	3.3	28	93.3	0	0.0	3	10.0	27	90.0
Turtle harvest	27	90.0	0	0.0	2	6.7	16	53.3	0	0.0	1	3.3
Shark fining	21	70.0	0	0.0	0	0.0	17	56.7	0	0.0	0	0.0
Coral mining	2	6.7	0	0.0	0	0.0	13	43.3	0	0.0	0	0.0
Sand mining	15	50.0	0	0.0	15	50.0	21	70.0	0	0.0	6	20.0
Harvesting crabs	9	30.0	0	0.0	20	66.7	14	46.7	0	0.0	14	46.7
Swimming or diving	3	10.0	0	0.0	19	63.3	7	23.3	0	0.0	21	70.0
Extracting wood from mangrove	7	23.3	0	0.0	16	53.3	9	30.0	0	0.0	21	70.0
Collect sea cucumber	0	0.0	0	0.0	30	100.0	0	0.0	0	0.0	30	100.0
Gathering giant clams	3	10.0	0	0.0	26	86.7	8	26.7	1	3.3	13	43.3

Table 5.27. Perceived major environmental problems in coastal and marine environments in Tomolol and Fafanlap, aggregated by sex

	Tomolol Freq (men)	Tomolol % (men)	Tomolol Freq (women)	Tomolol % (women)	Fafanlap Freq (men)	Fafanlap % (men)	Fafanlap Freq (women)	Fafanlap % (women)
Overfishing	7	46.7	5	33.3	6	40.0	4	26.7
Blast fishing	10	66.7	7	46.7	11	73.3	9	60.0
Cyanide fishing	10	66.7	4	26.7	12	80.0	8	53.3
Fish traps	8	53.3	6	40.0	1	6.7	0	0.0
Mangrove deforestation	2	13.3	1	6.7	2	13.3	0	0.0
Coral mining	1	6.7	2	13.3	5	33.3	3	20.0
Water pollution	6	40.0	7	46.7	6	40.0	2	13.3
Deforestation of surrounding area	14	93.3	8	53.3	10	66.7	2	13.3
Soil erosion	12	80.0	10	66.7	9	60.0	6	40.0
Invasive species	0	0.0	0	0.0	0	0.0	0	0.0
Overpopulation	4	26.7	4	26.7	4	26.7	3	20.0

Table 5.28. Perceived major creators of coastal and marine environmental problems in Raja Ampat, aggregated by sex

	Tomolol Freq (men)	Tomolol % (men)	Tomolol Freq (women)	Tomolol % (women)	Fafanlap Freq (men)	Fafanlap % (men)	Fafanlap Freq (women)	Fafanlap % (women)
Villager	3	20.0	2	13.3	8	53.3	2	13.3
Tourist/Visitor	0	0.0	1	6.7	0	0.0	0	0.0
Head of district (Bupati)	1	6.7	0	0.0	2	13.3	0	0.0
Village Leader (Kepala desa)	3	20.0	5	33.3	2	13.3	3	20.0
National Government	0	0.0	0	0.0	0	0.0	0	0.0
Private business	4	26.7	3	20.0	0	0.0	1	6.7
Fishermen	1	6.7	0	0.0	0	0.0	0	0.0
NGO	1	6.7	0	0.0	0	0.0	0	0.0
Other	2	13.3	2	13.3	1	6.7	2	13.3
Don't know	0	0.0	2	13.3	2	13.3	7	46.7
Total respondents	15	100.0	15	100.0	15	100.0	15	100.0

Table 5.29. Perceived major solvers of coastal and marine environmental problems in Raja Ampat, aggregated by sex

	Tomolol Freq (men)	Tomolol % (men)	Tomolol Freq (women)	Tomolol % (women)	Fafanlap Freq (men)	Fafanlap % (men)	Fafanlap Freq (women)	Fafanlap % (women)
Villager	0	0.0	1	6.7	2	13.3	0	0.0
Tourist/Visitor	0	0.0	0	0.0	0	0.0	0	0.0
Head of district (Bupati)	3	20.0	2	13.3	2	13.3	2	13.3
Village Leader (Kepala desa)	10	66.7	12	80.0	5	33.3	7	46.7
National Government	0	0.0	0	0.0	0	0.0	0	0.0
Private business	0	0.0	0	0.0	0	0.0	0	0.0
Fishermen	0	0.0	0	0.0	0	0.0	0	0.0
NGO	2	13.3	0	0.0	2	13.3	1	6.7
Other	0	0.0	0	0.0	3	20.0	0	0.0
Don't know	0	0.0	0	0.0	1	6.7	5	33.3
Total respondents	15	100.0	15	100.0	15	100.0	15	100.0

Table 6.1. Percent of villagers that know marine tenure regulations in village

	Tomolol Freq (men)	Tomolol % (men)	Tomolol Freq (women)	Tomolol % (women)	Tomolol Freq (both)	Tomolol % (both)	Fafanlap Freq (men)	Fafanlap % (men)	Fafanlap Freq (women)	Fafanlap % (women)	Fafanlap Freq (both)	Fafanlap % (both)
Most of the people	8	53.3	11	73.3	19	63.3	3	20.0	3	20.0	6	20.0
Some of the people	1	6.7	1	6.7	1	3.3	2	13.3	1	6.7	2	6.7
Few of the people	6	40.0	3	20.0	9	30.0	10	66.7	9	60.0	19	63.3
Don't know	0	0.0	0	0.0	0	0.0	0	0.0	2	13.3	2	6.7

Table 6.2. Percent of villagers that follow marine tenure regulations in village

	Tomolol Freq (men)	Tomolol % (men)	Tomolol Freq (women)	Tomolol % (women)	Tomolol Freq (both)	Tomolol % (both)	Fafanlap Freq (men)	Fafanlap % (men)	Fafanlap Freq (women)	Fafanlap % (women)	Fafanlap Freq (both)	Fafanlap % (both)
Most of the people	7	46.7	7	46.7	14	46.7	0	0.0	1	6.7	1	3.3
Some of the people	1	6.7	1	6.7	2	6.7	1	6.7	0	0.0	1	3.3
Few of the people	6	40.0	7	46.7	13	43.3	14	93.3	11	73.3	25	83.3
Don't know	1	6.7	0	0.0	1	3.3	0	0.0	3	20.0	3	10.0

Table 6.3: Penalties for breaking *sasi* in Tomolol and Fafanlap

Will Face

	Tomolol Freq	**Tomolol %**	**Fafanlap Freq**	**Fafanlap %**
Written warning	25	83.3	11	36.7
Fine	26	86.7	16	53.3
Confiscate catch	18	60.0	7	23.3
Confiscate Gear	24	80.0	7	23.2
Confiscate boat	9	30.0	6	20.0

Will not face

	Tomolol Freq	**Tomolol %**	**Fafanlap Freq**	**Fafanlap %**
Written warning	4	13.3	14	46.7
Fine	3	10	9	30
Confiscate catch	11	36.7	16	53.3
Confiscate Gear	4	13.3	16	53.3
Confiscate boat	20	66.7	17	56.7

Don’t know

	Tomolol Freq	**Tomolol %**	**Fafanlap Freq**	**Fafanlap %**
Written warning	1	3.3	5	16.7
Fine	1	3.3	5	16.7
Confiscate catch	1	3.3	7	23.3
Confiscate Gear	2	6.7	7	23.2
Confiscate boat	1	3.3	7	23.3

Table 6.6. Effect of engaging women more in customary marine tenure

	Tomolol Freq	Tomolol %	Fafanlap Freq	Fafanlap %
Improve	29	96.7	21	70.0
Have no effect	0	0.0	5	16.7
Harm	0	0.0	1	3.3
Don't know	1	3.3	4	13.3

Table 6.7 Effect of incorporating women's knowledge of marine resources into customary marine tenure

	Tomolol Freq	Tomolol %	Fafanlap Freq	Fafanlap %
Improve	26	86.7	12	40.0
Have no effect	0	0.0	9	30.0
Harm	3	10.0	4	13.3
Don't know	1	3.3	5	16.7

Table 6.8. Effect of incorporating women's knowledge of marine resources into customary marine tenure (aggregated by sex)

	Tomolol Freq (men)	Tomolol % (men)	Tomolol Freq (women)	Tomolol % (women)	Tomolol Freq (both)	Tomolol % (both)	Fafanlap Freq (men)	Fafanlap % (men)	Fafanlap Freq (women)	Fafanlap % (women)	Fafanlap Freq (both)	Fafanlap % (both)
Improve	15	100.0	11	73.3	26	86.7	8	53.3	4	26.7	12	40.0
Have no effect	0	0.0	0	0.0	0	0.0	5	33.3	4	26.7	9	30.0
Harm	0	0.0	3	20.0	3	10.0	1	6.7	3	20.0	4	13.3
Don't know	0	0.0	1	6.7	1	3.3	1	6.7	4	26.7	5	16.7

Table 6.9. Effect of engaging women more in customary marine tenure (aggregated by sex)

	Tomolol Freq (men)	Tomolol % (men)	Tomolol Freq (women)	Tomolol % (women)	Tomolol Freq (both)	Tomolol % (both)	Fafanlap Freq (men)	Fafanlap % (men)	Fafanlap Freq (women)	Fafanlap % (women)	Fafanlap Freq (both)	Fafanlap % (both)
Improve	15	100.0	14	93.3	29	96.7	13	86.7	8	53.3	21	70.0
Have no effect	0	0.0	0	0.0	0	0.0	2	13.3	3	20.0	5	16.7
Harm	0	0.0	0	0.0	0	0.0	0	0.0	1	6.7	1	3.3
Don't know	0	0.0	1	6.7	1	3.3	0	0.0	4	26.7	4	13.3

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