ISSN 1818-5614

Social and economic context of marine resource depletion in Gagil and Maap, Yap State, FSM

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IWP-Pacific Technical Report (International Waters Project) no.41

Global Environment Facility

United Nations Development Programme

Pacific Regional Environment Programme

SPREP IRC Cataloguing-in-Publication data

Foale, Simon.

Social and economic context of marine resource depletion in Gagil and Maap, Yap State, Federated States of Micronesia / by Simon Foale. – Apia, Samoa : SPREP, 2007.

iv, 46 p. ; 29 cm. – *(IWP-Pacific Technical report, ISSN 1818 – 5614 ; no.41).*

ISBN: 978-982-04-0364-2

Marine resources – Federated States of Micronesia, Yap State. 2. Marine mineral resources – Socio economic aspects – Federated States of Micronesia, Yap State. 3. Marine resources conservation – Federated States of Micronesia, Yap State. 4. Fisheries management – Federated States of Micronesia, Yap State. I. International Waters Project (IWP). II. Secretariat of the Pacific Regional Environment Programme (SPREP). III. Title. IV. Series.

333.916 4

This report (originally written in 2004) was produced by SPREP's International Waters Project, which is implementing the Strategic Action Programme for the International Waters of the Pacific Small Island Developing States, with funding from the Global Environment Facility.

The views expressed in this report are not necessarily those of the publisher.

Cover design by SPREP's Publication Unit
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Acronyms

CMT	Customary Marine Tenure
CPUE	catch per unit effort
FA	Field Assistant
FSM	Federated States of Micronesia
GEF	Global Environment Facility
IWP	International Waters Project
MPA	Marine Protected Area
PCU	Project Coordination Unit
PPA	Participatory Problem Analysis
PC	Project Coordinator
SPC	Secretariat of the Pacific Community (formerly the South Pacific Commission)
SPREP	South Pacific Regional Environment Programme
TEK	Traditional Ecological Knowledge
UNDP	United Nations Development Programme

Executive summary

Background

The central aim of the International Waters Project (executed by the Secretariat of the Pacific Regional Environment Programme) is to address the root causes of coastal and marine environmental degradation in each of the 14 participating countries. In Yap State, which serves as the pilot location for IWP in the Federated States of Micronesia (FSM), IWP proposes the use of MPAs as a marine resource management tool. The present study is aimed at determining both the social and economic context of resource depletion in Yap State, as well as the socio-economic impact of the implementation of MPAs. The project is focused on four clusters of villages on the main island group, in the districts of Rumung, Maap, Gagil and Gilman (see Fig. 1).

The population of the main group of islands in 2000 was 7,391. With a total land area of 100.4 km^2 this gives a population density of 73.6 people/km^2. However, prehistoric population densities are likely to have been at least four times this figure. Population growth is slow compared to less developed Pacific states. The economy is heavily subsidized by US aid, under the Compact of Free Association, which has meant that higher levels of education and health care have been available in FSM than in many other Pacific countries. This has a significant bearing on the likely level of community support for MPAs as a fishery management tool. However the state-supported Customary Marine Tenure system, which will be examined closely in this study, means that any lack of cooperation between tenure-holding groups could potentially pose problems for MPAs.

Part 1

Part 1 includes an introductory section that outlines the biological and ecological rationale for the use of MPAs as a hedge against widespread overfishing. It emphasises the importance of a careful consideration of both Customary Marine Tenure (CMT) and Traditional Ecological Knowledge (TEK) in relation to the scale at which fish stock replacement processes take place. This will have significant bearing on whether an MPA system receives sufficient support from local communities to be effective. It also presents the demographic and economic context in the participating communities.

Part 2

Part 2 documents the procedures and outcomes of engagements with (i) community groups and (ii) local facilitators (Field Associates, or FAs), in Gagil and Maap, two of the four communities involved in IWP on Yap.

The meetings with community groups comprised two main processes:

- A briefing on the biological and ecological basis of the MPA as a fishery management tool that can deliver economic benefits to communities, and the spatial and temporal scales at which this occurs; and
- Participatory Problem Analysis (PPA; described in detail in Mahanty and Stacey 2004) exercises aimed at determining the root causes of environmental degradation and its associated economic impacts.

The meetings with the Field Associates comprised an overview of the socioeconomic surveys, and solicited their feedback on survey content and protocol.

Meetings with Gagil and Maap communities were held on 22 and 25 August 2004, respectively. A PowerPoint presentation that graphically elaborates the biological and ecological rationale of MPAs as fishery management tools was printed out, copied and provided to each community representative. In the case of Maap an electronic presentation of

the PowerPoint material was also possible. The meetings included discussions of this material, as well as the topic of Customary Marine Tenure, the Participatory Problem Analysis process (reported in Part 3), and a brief introduction to the socioeconomic surveys (Part 4). The meetings were successful, and both the author and Project Coordinator (PC) gained the impression that there is a high level of appreciation among community members of the usefulness of MPAs as management tools, and a commitment to MPA implementation and monitoring. Community members clearly comprehended and appreciated the presentations, but comprehension was obviously significantly enhanced when the PC presented the material in Yapese.

The briefings with the Field Associates were aimed at familiarizing them with the socioeconomic surveys, ensuring that they were comfortable with the questions and format of the surveys, and soliciting feedback. The socioeconomic survey forms are attached as Annexes 3–5.

Part 3

Limited PPAs were conducted at meetings with community representatives from Gagil and Maap districts on Yap (it was not possible to meet with Gilman or Rumung communities). The outcomes of the PPA meetings are elaborated in this volume, along with a discussion of the relative utility of the PPA process at this stage in the Yap IWP.

In the collective opinions of the Gagil and Maap community representatives, the major cause of environmental degradation is overfishing. This is the result of inadequate capacity to enforce customary marine tenure, which is related to a combination of declining respect for traditional authority and logistical constraints. A significant proportion of fishers violating CMT are said to be town residents who fish on weekends. Whether any of these town residents have customary rights to the areas they fish is unknown at present.

The Maap women's group placed a greater emphasis on pollution as a root cause of reductions in numbers of economically important reef invertebrates, though their responses were more equivocal than those of the men. Scientific data on sedimentation and nutrient and chemical pollution levels in the lagoon at Maap is apparently lacking, and as such the above statements by the Maap women deserve further investigation. The responses of the Maap women also indicated that some tensions are present between men and women over marine resource management.

Part 4

Data from socioeconomic (household and finfisher) surveys are presented to complement the findings of the PPA process described in Part 3; once again only Maap and Gagil residents participated in the survey. These surveys are based on the Pacific Regional Oceanic and Coastal Fisheries Management (PROCFish) Project[1] survey format, modified to suit the particular socioeconomic environment of Yap. The household surveys covered a total 15 households (13%) from Maap, and 17 households (10.7%) from Gagil; totals for the finfisher survey were 15 (13%) from Maap and 19 (12%) from Gagil.

Principle findings of the Yap IWP socioeconomic survey are as follows:

Subsistence use of fish is high: about 70% of respondents in each village reported having consumed fresh fish with the past 24 hours, and around the same proportion reported someone in their household going fishing more than once a week.

Consumption of canned and frozen forms of protein was also high, with 54% of Maap

[1] The PROCFish project, which is implemented by the Secretariat of the Pacific Community, is operating in 17 Pacific Island countries and territories; see http://www.spc.int/coastfish/Sections/reef/PROCFish_Web/default.aspx

respondents and 70% of Gagil respondents having consuming these foods within 24 hours of the survey. (Incidentally, many respondents consumed both fresh fish *and* other forms of protein in the same meals.)

Six of the fifteen Maap respondents (40%) reported consuming turtle within the previous month, while none of the Gagil respondents did.

The surveys found that fishing effort was spread over lagoon, mangrove, reef edge and open sea habitats, with reef edge reportedly being used the most. However this data should not be relied upon to gauge relative fishing pressure on these habitats. Other data suggest that lagoon stocks may be more susceptible to fishing pressure than other stocks in other areas.

Most (82%) of respondents earned less than USD100/week, with 72% having more than one source of income. Marketing of agricultural commodities (including betel nut) often complemented a salary, which was earned by 63% of households. Salaries were the primary source of income for 51% and secondary source for 12%. Only 9% of respondents listed fishing as a primary source of income (16% as a secondary income source). This low level of primary dependence on fishing, and the prevalence of other forms of income, particularly salaries, constitutes an important potential buffer to any economic impact caused by the establishment of MPAs.

A total of four fishers (all from Gagil) said that they would experience a reduction in income if an MPA were established. Only one of these said that he would not be able to fish elsewhere.

Customary Marine Tenure does not appear to pose a major problem for the establishment of MPAs. It is, however, potentially problematic for the dive industry. In an effort to address present conflicts between CMT rights-holders and commercial dive operators, Part 4 also addresses the new Marine Parks Bill. The issue is relevant to IWP because of the plan to place an MPA around a popular dive site at Gagil. Some areas (e.g. Miil Channel and the reefs around Rumung) appear to be well protected already as a result of the strong control over access by local custodians.

The design of a public education and communication program will be pivotal to IWP's success, particularly for Maap and Gagil. Provision of assistance to the local high school with curriculum development will probably also benefit the management of marine resources in the long term.

The results of the socioeconomic surveys provide insights into the social and political factors that allow overfishing to take place. The planned ecological surveys,[2] which will include Catch Per Unit Effort (CPUE) data generated by villagers, will provide a more detailed description of the condition of fish and marine invertebrate stocks on Yap, and the rate at which they are being fished. Careful attention should be given to assessing lagoon fish stocks, which will require other methods than the popular and ubiquitous Underwater Visual Census.

[2] Ecological surveys were undertaken subsequent to the preparation of this report. See PICRC 2007.

Part 1

Introduction to IWP Yap

The International Waters Project (IWP) is funded by the Global Environment Facility and executed by the Secretariat of the Pacific Regional Environment Programme (SPREP) in partnership with 14 Pacific Island countries. The objective of the project is to help participating countries improve the management of their environment and coastal resources by supporting "pilot" projects in each participating country. These pilot projects will assist countries (communities and governments) to identify and address the "root causes" of environmental degradation and to design and implement possible solutions at the local and national level. Community based activities may include "low tech" solutions to addressing environmental degradation, while national level activities may involve activities that have a broader or more strategic focus.

In Yap State, which serves as the pilot location for IWP in the Federated States of Micronesia (FSM), IWP proposes the use of Marine Protected Areas (MPAs) as a marine resource management tool, focussing on four separate sites on the main atoll: Rumung, Maap, Gagil and Gilman (see Figure 1). These areas include 10 villages with a total population of more than 500 people (see Annex 1). The project is intended to promote increased community involvement and responsibility for local resource management and conservation. If successful, the project could provide a model for what can be achieved in coastal communities throughout FSM.

IWP will focus on the social and economic causes of marine resource depletion in Yap (characterised by overfishing or activities that harm fisheries habitats). This is a collaborative effort between traditional resource owners, government and nongovernment organisations, and other stakeholders within Yap.

The project is steered by the Yap IWP National Task Force, which includes representatives from the community sites, government and non-government organisations. The day-to-day management of the pilot project is provided by the Project Coordinator (PC), who is located with the Division of Marine Resources.

At each site a management plan will be developed to address the root causes of the degradation of fisheries. Subsequently, a system of marine protected areas in Yap will be established. Achieving this will require a series of phased activities involving key stakeholders from the communities and other relevant groups. These include:

- Stakeholder engagement and planning for stakeholder consultations;
- Conducting initial participatory consultations (participatory problem analyses or PPAs) with stakeholders to identify the root causes of fisheries problems;
- Implementing social, economic and environmental baseline assessments to assess the scale of problems and causes;
- Identification and selection of solutions to address root causes; and
- Development of action plans for implementation.

MPAs as management tools

MPAs are the fishery management tool of choice for the Yap IWP. The rationale for MPAs appears simple but is quite complex on closer examination, and is supported by a very small body of empirical data (Russ 2002, Willis et al. 2003). Consequently, a brief review of the scientific rationale behind the use of permanent closures as a fisheries management tool is presented here.

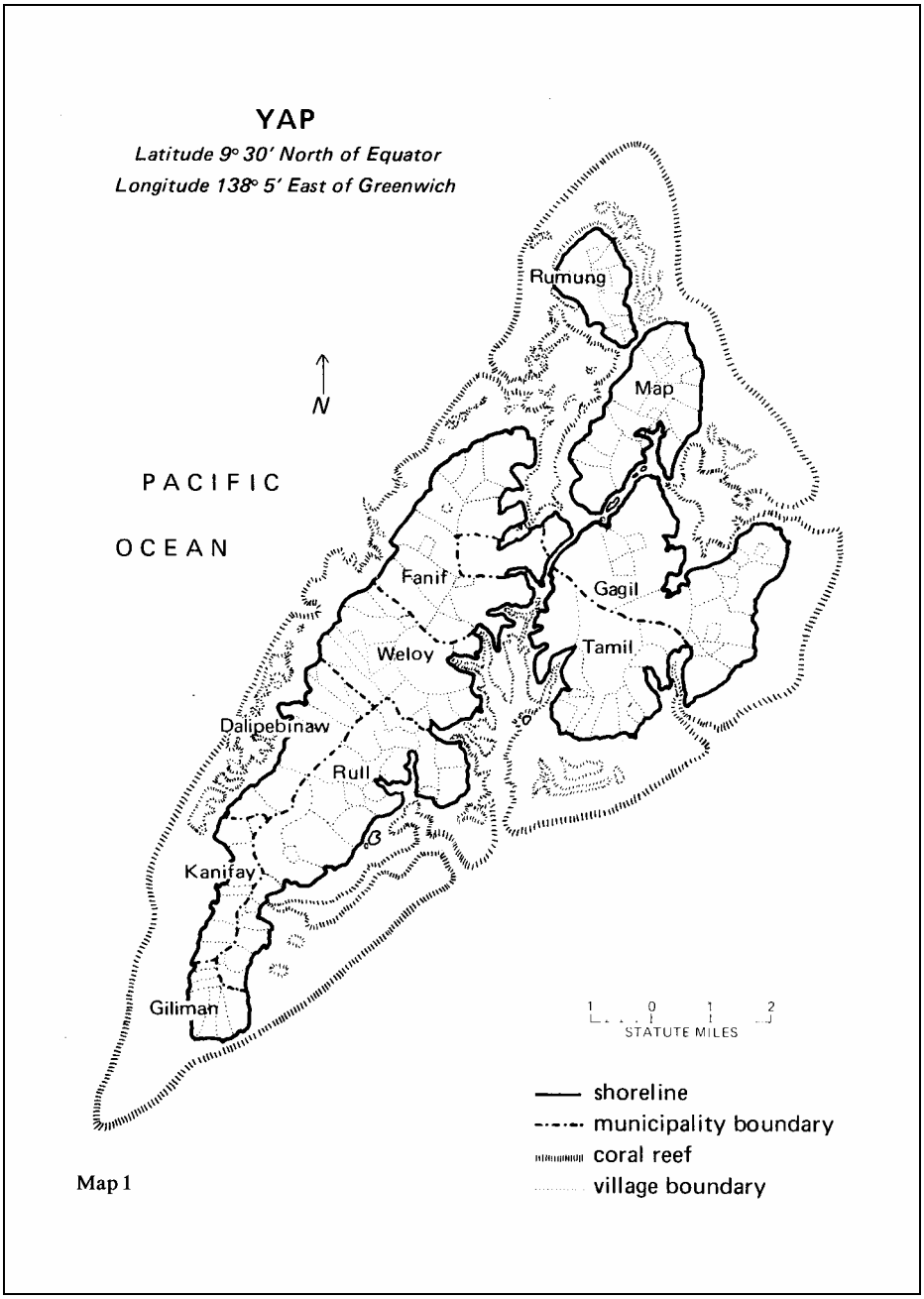


Figure 1: Map of Yap

Benefits and impacts of marine protected areas

The purpose of the IWP in Yap is to "promote sustainable coastal fisheries via a system of marine protected areas established and maintained through a collaboration of traditional resource owners, government and non-government organizations, and other stakeholders in one management framework" (Anon 2002). The use of MPAs is being advocated around the world, particularly the developing world, in part because MPAs are relatively uncomplicated to implement compared to technically demanding yield-based management measures such as quotas. This makes MPAs very suitable for developing countries, especially those with highly diverse multi-species fisheries and relatively weak administrations. The reason for choosing to establish MPAs in Yap is that inshore fisheries and their supporting environments are experiencing increasing pressure from both fishing and (localized) pollution as the population of Yap increases (Goldman 1994a, Anon 2002). Some species (e.g. *Tridacna gigas*) are apparently overfished, while the case for others rests on anecdotal evidence (Goldman 1994b).

MPAs serve to protect fisheries from "recruitment collapse" or "recruitment failure", which occurs when too many mature adults are removed from a given population, resulting in a sharp decline in the rate of egg production and recruitment, with consequent drop in fishery yields (Cushing 1981). MPAs serve to protect fish and other economically important species from fishing pressure, allowing populations to expand and produce a surplus of both adults and larvae, some of which are (naturally) exported to neighboring fished areas (Russ *et al*. 2004). Russ (2002) refers to the export of adults as the "spillover effect", and the export of larvae as the "recruitment effect".

Russ (2002) clearly articulates one of the most critical issues to deal with when proposing to use MPAs as a fishery management tool: "To be effective as fisheries management tools, marine reserves should display net export of fish biomass that more than compensates for the loss of fishing area required to set up the reserve". Because increases in fishery yield *outside* the reserve (as a result of export from the reserve) may not be realized for 5–10 years (Russ et al. 2004), the loss of fishing area within the reserve will have a short-term negative impact on the incomes of people who normally fish in those areas. This is clearly one of the most important issues that the IWP socioeconomic baseline study will attempt to describe in detail. Another important issue that will be explored is whether there are economic alternatives available to those fishers who stand to lose a significant proportion of their income during the initial or later stages of MPA implementation.

Customary Marine Tenure (CMT) is one of the most frequently discussed aspects of fishery management in the Pacific is (e.g. Johannes 1981, Carrier 1981, Ruddle and Johannes 1985, 1990, Ruddle et al. 1992, Hviding 1996, Aswani 1999, Foale and Macintyre 2000, Foale and Manele 2004). On Yap it appears that control over the marine resources in internal waters (i.e. the area within 12 miles of the outer edges of the barrier reefs) comes under the traditional CMT system, and ultimate power to make decisions about exploitation and management is vested in local chiefs (Goldman 1994a, Tafileichig and Inoue 2001). As the IWP project proposal clearly recognizes, this implies that the success of any MPA project depends entirely on the support of the local communities and their chiefs.

It is therefore important to understand the geography of CMT divisions with respect to the range (or extent of reef areas) over which fish stocks self-recruit (c.f. Foale and Manele 2004). In other words, if a permanent fishing closure is placed on an area of reef where a person usually goes fishing, will that person will be able to go fishing outside of this area (in areas that will benefit from adult spillover and larval recruitment from the reserve), or will all other areas be closed to them because they are owned exclusively by different tenure-holding groups? The latter is clearly a worst-case scenario, and the discussions in project documents (e.g. Anon 2002, and PCU informal notes on discussions with IWP Project Coordinator) suggest that CMT systems on Yap may be flexible enough to accommodate some movement of fishers across CMT boundaries. There is clearly a sharing of some fishing rights between Maap and Gagil communities. In most Pacific societies CMT is very complex and many people enjoy rights of some kind beyond their immediate home territory.

In addition to potential issues raised by CMT, grass-roots support for the MPA project over time will depend a great deal on how well the ecological and economic rationales for the project are understood by villagers and their chiefs. This point has been made strongly by Noah Idechong and Andrew Smith (2004). The issue hinges significantly on the link between the scientific logic of fish population dynamics and local understanding of the environment. There is a rich and complex body of traditional ecological knowledge (TEK) described from many parts of the Pacific (e.g. Johannes 1981, Johannes et al. 2000, Johannes and Hviding 2001), but most of this knowledge is focused on locating fish in space and time, and maximizing catches (e.g. Callaghan 1988, cited in Goldman 1994a), although notable exceptions do occur (Johannes 1978, 2002). Knowledge of the ways in which fish populations replace themselves is dominated by supernatural explanations in many Pacific indigenous knowledge frameworks, with the result that people can be quite fatalistic about declines in fish

stocks (Foale 1998, Foale and Manele 2004). A review of various IWP documents (e.g. Anon 2002) suggests that there is quite a strong conservation ethic on Yap, and possibly also a high level of awareness of the mechanics of stock replenishment functions of MPAs. However there are also indications that there are other factors to consider, such as the following observation by Idechong and Smith (2004):

> …we got the impression that most thought that the project would simply provide funding for implementing MPAs in their areas…

It is important to disentangle any dependency issues from among what may be a variety of motivations for supporting the project (c.f. Foale 2001, Hviding 2003). A careful exploration of local understandings of stock replacement processes is likely to prove very useful in determining the likely strength of support for MPAs in the face of the inevitable short-term economic sacrifices that are entailed.

It is necessary to ensure that community expectations do not exceed the magnitude and temporal scale of the likely benefit flows from the proposed MPA project. As mentioned above, it may be that any significant increase in catch per unit effort *outside* of the MPAs will be not be measurable within five years of their establishment (Russ 2002, Russ et al. 2004). If a stock has been heavily fished, it will take several years of protection before densities can build up sufficiently to begin exporting adults and larvae in significant numbers. Adult spillover effects are likely to be measurable long before recruitment effects, but they tend to be much more localized in extent, and may be confined to within 250 m of the reserve boundaries (Russ et al. 2004). The scale at which recruitment effects occur will vary dramatically between species, depending on larval longevity and prevailing current patterns. A critical prerequisite for success of the project will be community involvement in catch-per-unit-effort (CPUE) monitoring in non-reserve areas, both prior to and for each year following establishment of the reserves.

Demographic context

The total population on Yap, including outer islands, in 2000 was 11,241. The population of Yap Proper was 7,391. The total land area of the four main islands of Yap is 100.4 km^2 (Goldman 1994a), giving a population density for Yap Proper of 73.6 people/km^2. This is not yet at a level that could be considered overpopulated (100 people/km^2 is a common yardstick), but it is a relatively high density compared to that of Solomon Islands (16 people/km^2) or PNG (12 people/km^2). The population of Yap prior to European contact (which decimated populations due to introduced diseases) may have been between 28,000 and 34,000 (Schneider 1956, cited in Labby 1976: 2). Assuming this figure is for the main islands only, the population density was at least 280 people/km^2, which would have led to significant resource pressure, and quite possibly the development of a range of indigenous resource management and conservation institutions.

The annual growth rate for the FSM as a whole between the 1994 and 2000 censuses was 1.3%. This is a significant slowing of population growth (also evident in Fig. 2) from the 1973 to 1980 growth rate, which was 2.1%. One important reason for the decrease in growth is emigration.

The population of the villages where the project has proposed to establish MPAs are given in Annex 1.

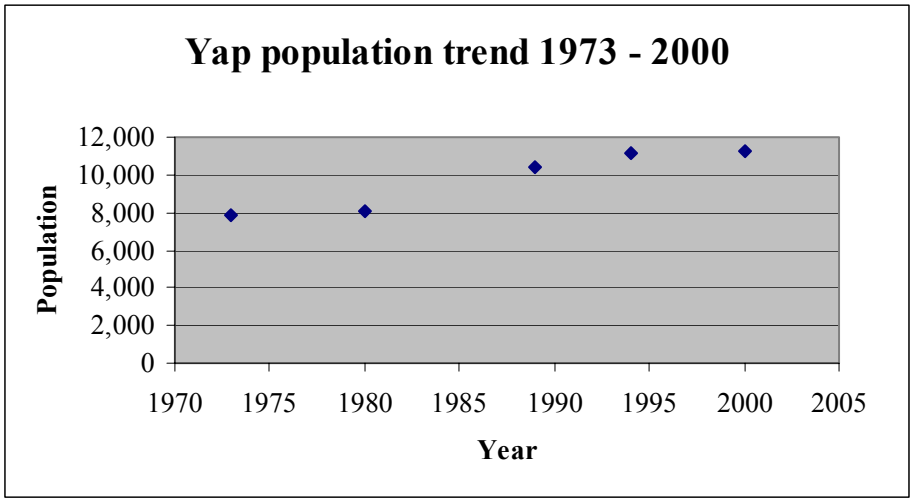


Figure 2: Yap population trend

Economic context

Yap State appears to represent an interesting mix of a strong reliance on subsistence production, which is apparently driven mainly by women, along with large aid grants from the USA through the Compact of Free Association (see Fig. 3). While there have been fears that this aid would be cut in 2004 (Goldman 1994b), this does not appear to have eventuated, and current indications are that the aid will continue as long as specific "compliance requirements" are met.

Nakano (2001) calculated that imported rice accounted for only about one quarter of the starch consumed on Yap. Locally grown giant swamp taro on the other hand accounted for about two thirds. No statistics are apparently available on subsistence fish consumption, and this consequently forms a priority of the baseline survey work undertaken for IWP. Subsistence fish consumption will also be assessed as part of the EU-funded PROCFish project[3] in 2005, in Yap as well as other FSM states.

Employment and income

The data in Table 1 indicate an increase in the number of households with cash incomes (from 73% to 78%) between 1994 and 2000.

Table 1: Household incomes

	1994 Census	**2000 Census**
No. Households	1925	2030
Have cash income	1400 (73%)	1578 (78%)
Median income (Yap proper)	6800	7399
Median income (outer islands)	3800	4242

Sources: 1994 and 2000 Censuses (Office of Planning and Budget Yap State Government 1996a, 1996b; FSM Statistics Unit 2006).

[3] See footnote 1.

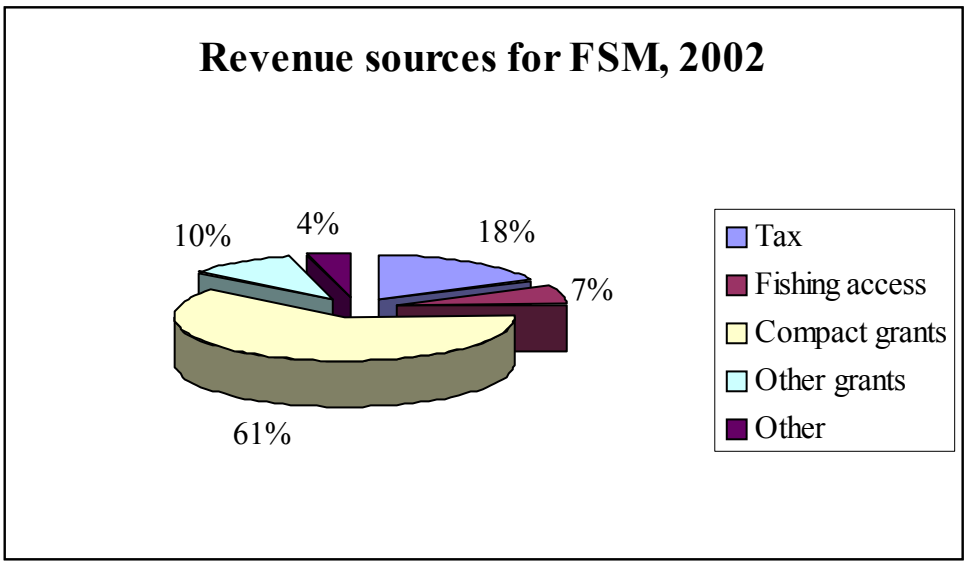


Figure 3: Revenue sources for FSM, 2002.

Employment statistics for the relevant regions of Yap (Table 2) show that employment and subsistence work are both increasing (note that some categories are not mutually exclusive); Rumung is a partial exception, showing a decrease in the number of people having formal work. There has been a significant rise in median income in all villages except Rumung (Table 3). In 1994 the number of people engaged in fishing as employment were as follows: Rumung 2; Maap 2; Gagil 7; and Gilman 5.

Table 2: Summary employment statistics by region

Municipality	Total		Total employed		Formal work		Subsistence		Market oriented	
	1994	2000	1994	2000	1994	2000	1994	2000	1994	2000
Rumung	69	63	34	49	12	8	14	19	8	18
Maap	295	358	109	178	92	108	15	66	2	–
Gagil	432	475	224	385	150	176	74	198	1	3
Gilman	115	137	56	89	45	58	11	6	0	14

Table 3: Income per annum by municipality

Municipality	Mean Income (USD)		Median Income (USD)	
	1994	2000	1994	2000
Rumung	3,011	3,225	2692	2,333
Maap	4,298	7,173	2992	5,083
Gagil	5,196	11,336	3353	7,232
Gilman	4,848	9,354	3472	6,071

Remittances

Since 1986 residents of the FSM have been migrating to the US, Guam and Saipan in large numbers, in search of higher living standards and employment opportunities. Many of these emigrants send remittances back to their home islands.

Part 2

Stakeholder analysis and assessment participation plan

A large number of stakeholders at several levels are listed in the stakeholder inventory, which was prepared for the Yap IWP project in March 2004 (Annex 2). It was not considered necessary to liaise with most of the higher-level stakeholders (Regional and FSM National Government levels) for this socioeconomic baseline study. At the Yap State level it was considered useful to meet briefly with the people listed in Table A2–1. However, the main priority with the socioeconomic analysis was to interact directly with residents from the relevant villages.

Briefing and training

Partners for the project include (i) the FSM Project Coordinator (PC), (ii) the target communities as a whole, and (iii) the Field Associates. The partner communities were selected by the PC on the basis of concerns expressed by communities regarding marine resource management, and their willingness to participate in the project. Field Associates were largely self-selected. Briefings and trainings were delivered to both target communities and Field Associates.

The first set of briefings was delivered to groups of community representatives (including the Field Associates) as an introduction to the PPA exercises (outcomes are reported in Part 3). This briefing involved:

- an introduction to the IWP process;
- a PowerPoint presentation outlining the biological and ecological rationale of Marine Protected Areas as fishery management tools;
- an explanation of Catch Per Unit Effort and its importance for measuring the performance of the fishery; and
- a brief overview of the socio-economic surveys and their role in assessing the social and economic impact of MPAs on the community. The socio-economic surveys were not dealt with in detail in these briefings however; the emphasis was more on the first three points, and the PPA process.

The second category of briefing/training was delivered to the Field Associates alone, and involved a detailed review of the socio-economic surveys (Annexes 3 to 5). The Field Associates were asked to comment on any questions in the surveys that they thought would be problematic, and to suggest additional questions or changes.

Meetings and briefings with community groups and Field Associates

Meetings were held the Gagil and Maap communities; in Gagil the meeting involved men only, but in Maap meetings were held with both male and female representatives.

Gagil Community Meeting

The Gagil meeting took place at Riiken on 22 August 2004, and was attended by nine men from the community. The briefing on the rationale for MPAs was delivered in print from with a verbal explanation by the author. The men as a group expressed their satisfaction with the briefing, and with the idea of conducting the socioeconomic surveys.

Figure 4: Meeting with community representatives at Riiken

Gagil Field Associate briefing

A meeting was held with three Field Associates to review the socioeconomic surveys (Annexes 3-5). The Field Associates were acquainted with the questionnaires, feedback was received on the format, and potential problems with the questions. The exercise resulted in minor redesign of both survey forms. Diet is one parameter on which accurate data may not have been obtained: FAs commented that some respondents may not answer the diet question honestly, anticipating that people may want to exaggerate the amount of high status foods (including but not restricted to fish) they have eaten. The FAs added that children would be more likely to give an honest answer to the diet question. In is important to determine as accurately as possible the importance of reef fish in the diets of people in each of the target communities.

Figure 5: The PC (right) explaining an aspect of the socioeconomic surveys to the FAs for Gagil.

Maap Community Meeting

Meetings with Maap Community Representatives were held at Toruw village on 25 August 2004 (first men and then women). A PowerPoint presentation was used in conjunction with printed handouts. Community Representatives expressed satisfaction with the material contained in the presentation, and were happy about the general format of the surveys as canvassed during the meeting.

Figure 6: The PC delivering the PowerPoint presentation on MPAs to the Maap women

The author delivered the accompanying talk, in English, to the men, while the PC delivered the talk to the women in Yapese, after a brief review by Sarah Mann, in English. This latter experience convinced the author that despite the high level of education, and impressive competence with English throughout the Yap community, communications in the local language are clearly more desirable where this is possible. The increased attentiveness of the women during the Yapese delivery was obvious.

Figure 7: Maap women during the PowerPoint presentation delivered by the PC.

Maap FA Briefing

A briefing of Maap Field Associates on the socioeconomic surveys was held at Maap on 26 August 2004 and attended by four male Field Associates plus Peace Corps volunteer Sarah Mann, who resides in Toruw. One mistake was discovered on the Fisherman form during the discussions, but apart from this the briefing went well and the FAs said they were comfortable with the format and the task in general. The one Yapese female FA for Maap was not at this meeting but will hopefully be briefed by Sarah or one of the others and will be able to remain involved with the survey work.

Figure 8: FAs at Maap during the socio-economic survey briefing

Raising community awareness regarding key ecological processes

Despite the very rich body of Traditional Ecological Knowledge (TEK) possessed by many Pacific Islands fishers, knowledge of a number of key processes — such as the microscopic dispersive phase in the life cycle of most marine fauna — are often missing from these frameworks. A detailed understanding of these processes is vital if local communities are to appreciate and support the rationale for MPAs as fishery management tools. The presentations made to the community groups sought to deliver that information to community members in an accessible and abundantly illustrated format, helping them to better appreciate how MPAs can increase fishery yields and economic well-being over the medium to long term.

Observations and discussions with the Community Representatives indicated that they found this information both comprehensible and valuable in the context of the Yap IWP, and were more supportive of the goal of the project as a result of this information package. After the meeting with community representatives at Gagil, the PC commented that they had been formerly entertaining the idea of harvesting in the MPA area at some time in the future, and that the presentation had convinced them of the benefits of leaving the area permanently closed.

Part 3

Participatory Problem Analysis (PPA)

Introduction

The root causes of environmental problems are often numerous and complex, involving many stakeholders, who may be reluctant to see their own role in generating the problems. PPA (also called root cause analysis or problem tree analysis) is an effective means of arriving at the root causes of a problem in a workshop context. The tree begins with a problem (such as declining reef resources) and breaks into "branches" that trace the causes of the problem (Mahanty and Stacey 2004). The technique can often force people to confront their own role in environmental problems, which has the effect of motivating people to take a more active role in combating the problem. An example is given in Box 1 below.

Figure 9: The community consultation at Riiken village, Gagil.

Box 1: Example of the PPA process from Maap

At the outset, we assume the following statement is true: that there are fewer fish on the reef than there used to be, and that this is something that requires some intervention on the part of fishers and other stakeholders.

Q. Why are there fewer fish now?

A. Because of over-fishing.

Q. Why is there over-fishing?

A. Because of poaching by both subsistence and commercial fishers.

Q. Why is there poaching?

A. Because of difficulty of enforcing customary regulations on access.

Q. Why is enforcement difficult?

A. Because 1) we can't catch the poachers and 2) if they come from our own village we don't want a confrontation.

[*NB here the chain branches, hence the problem "tree" descriptor*]

Q1. Why can't you catch them?

A1. Because they come poaching outside the reef when the tide is low and we can't get across the lagoon in our boats.

Q2. Why do you want to avoid a confrontation with your fellow villagers?

A2. Because we have to live with them!

The above two responses are about at the end of each thread of questioning. Other more detailed examples are given in Mahanty and Stacey (2004), and the above of course is a real example from the PPA consultation at Maap conducted on this visit to Yap.

Gagil and Maap PPAs

Gagil men

The Gagil community PPA process was conducted (with men only) on 22 August, following the introductory talk about Marine Protected Areas.

Due in part to the location where the meeting environment was held it wasn't possible to engage the audience in the classic workshop format, with for example flip charts and post-it notes. Moreover the group was unanimous at the start of the meeting that they were less interested in determining the root causes of overfishing (which they said they were already quite clear about) than they were in discussing the ways in which MPAs could help recover the fishery. However we were able to follow PPA threads on a number of issues (by asking questions and taking notes), and these are outlined in both narrative and diagrammatic style (Fig. 10).

We began with the premise that numbers and sizes of fish have been decreasing noticeably and that this is cause for concern and action. The only proximate cause that the group were interested in talking about was overfishing. Sedimentation and chemical pollution from laundromats were dismissed as being relatively insignificant.

The two main methods seen to be causing overfishing were gillnets and night spearfishing, in combination with the fact that respect for traditional reef rights (i.e. tenure) had been lost. Night spearfishing was the more complex of the two issues. In the past, violations of tenure were tolerated if the fishing (originally involving handlines) was done at night, because very few people used the technique; in addition, if the owner did not see transgressor he would not feel obligated to impose sanctions, in what appears to be a process analogous to "turning a blind eye" to the deed. The relative rareness of night fishing meant that it was not a problem in terms of fishing pressure. When underwater flashlights were introduced in the 1960s, the same approach was applied to night spearfishing, except that this fishing method has a much greater impact on the fishery than hook and line. Consequently, although people now realize that night fishing is destructive, the group implied that there is a reluctance to punish transgressors, partly because of the lack of any traditional regulatory framework in this particular context. This of course is combined with a reluctance to confront people about poaching, particularly if they come from one's own village.

The existence of the technology to allow commercial fishing (e.g. freezers and ice-machines) was seen not so much as a problem as simply an aspect of the bigger problem of commercial fishing. On the other hand, gillnets, like underwater flashlights, *were* seen as something of a problem, though this was not followed through by the group. This is an issue that the author also raised in other meetings and it appears that while these could potentially be regulated at government level, there may be difficulties in achieving this.

In summary, the most important ultimate cause of overfishing, in the opinion of the men in the Gagil group, was the difficulty of enforcing restrictions on access due to a reluctance to confront poachers (or even local residents) who are fishing using unsustainable methods. The group saw the MPA as a major step towards solving this problem, but worried about enforcement, and said there were more non-rights holders than rights-holders fishing in the area. They thought that informing the public about the existence of the MPA (which they declared off-limits in January 2004), and how it will work to protect and enhance fisheries would be the best way to increase social pressure against poaching. They have organized a number of radio announcements advertising the fact that the area is closed since that time.

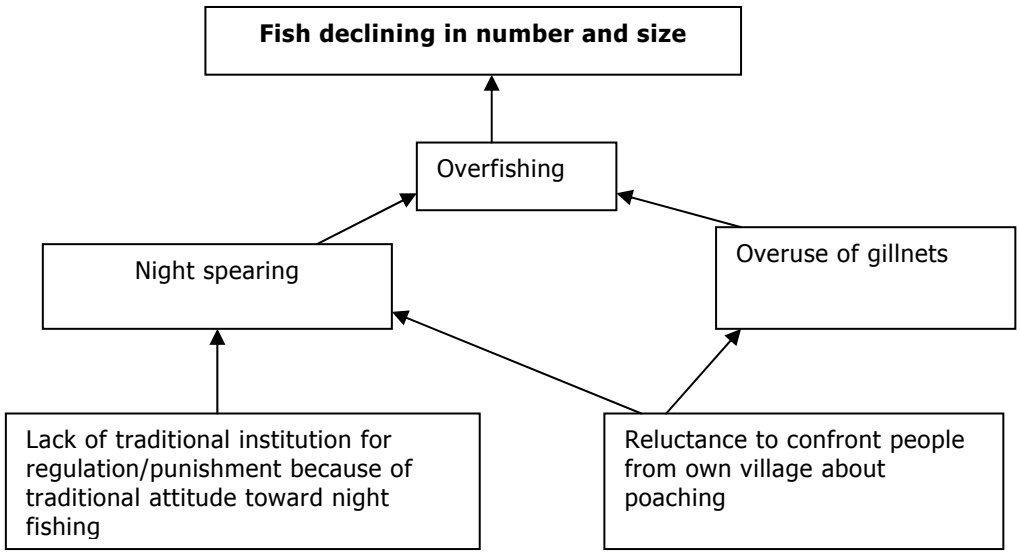


Figure 10: Problem tree developed through Gagil PPA

The various conflicts between reef owners and the diving tourism operators in Colonia are addressed below (see Part 4), but the men posed an interesting question during the course of the discussions, which may be regarded as a problem, though not one that is obviously amenable to the PPA process. They asked: "Does the practice by tourist operators of feeding,

and therefore attracting, sharks in large numbers, result in a significant negative impact on fish populations in the area, due to increased predation by the sharks, which are now resident?" They added that the sharks in the channel are now very aggressive and can be quite a bother to them when they are fishing. The author was unable to answer the question with any confidence, but this would be an interesting issue to examine in the context of an ecological survey of the area.

Maap men

The Maap PPA process was undertaken on 25 August 2004. The Maap men talked in detail about the problems surrounding enforcement of traditional fishing rights. Like the Gagil men they believed that the dissemination of information about the economic benefits of MPAs is probably the best way to engender wider community support for the closures and therefore a reduction in poaching. The schematic representation is given below (Fig. 11).

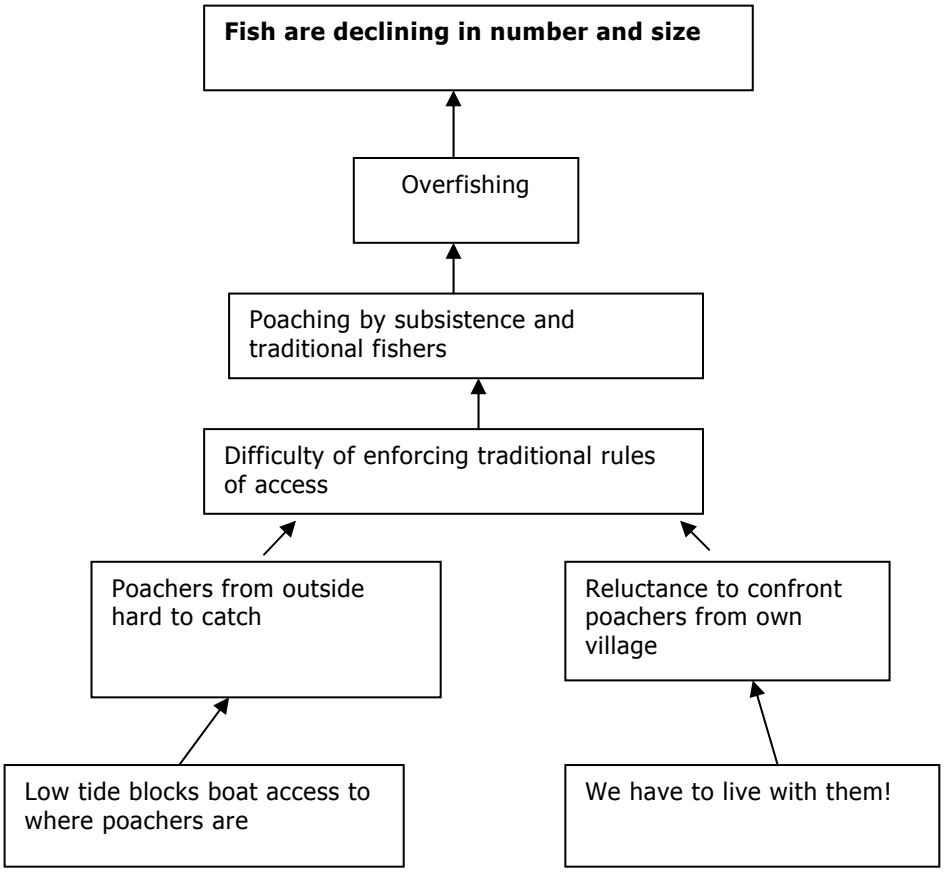


Figure 11: problem tree developed through PPA by Maap men

Maap women

About a dozen women attended the meeting on 25 August 2004. The process began with the question: What are the causes of the decline in size and numbers of fish? The following responses were obtained:

- Commercial fishing
- Erosion from gardening and burning of grassland
- Rubbish going into rivers

- Laundromat effluent
- Increasing human population relative to fish (i.e. subsistence pressure).

Three of these causes were pursued: fishing (subsistence and commercial), and laundromat effluent. About half of the women thought that the effluent was more important than the fishing, and the other half thought it had about the same importance. This may be because many of the species that women harvest occur inshore, however we were not able to pursue this in any detail during the meeting. This should be examined by ecological surveys. Interestingly, when asked what they thought their own role in the production of laundromat effluent might be, several women retracted their statements about the relative importance of the effluent.

The cause of overfishing was unanimously declared to be poaching, often by men from the village, and included poaching of clams in the clam farms in the lagoon. The PPA thread then ran as follows:

Q. Why were they poached?

A. There is no respect for reef rights [i.e. customary marine tenure] any more.

Q. Why not?

A. Because of modernization. Parents no longer have the chance to teach their children about the traditional rules, so the children grow up ignorant of these things, and as such don't respect them.

Q. What to do about this?

A. "Shoot the men!"

The last response, while joking, indicates the overwhelming nature of the problems generated for resource management by the massive social change that has taken place in Yap over the last century or more. This obviously includes some form of gender divide with regard to management, which may not be so easily explored by a male consultant with limited time and language skills. Additional discussion of the issue may be attempted after analysis of the socioeconomic survey responses and further reading and interviews.

Comments on local participation in the PPA process

Community attendance at the PPA meetings was poor, particularly given that two entire communities (Gilman and Rumung) were apparently too busy to attend any meetings. The number of participants at the Gagil meeting was low and included no women. This meeting was held on a Sunday, after church services. The Maap meeting had the highest attendance, including some women, but again, numbers were not commensurate with the size of the community. However it was during a weekday when many people would have been at work, which suggests an overall higher level of community-level commitment and interest in the project in Maap. The author was not able to gauge how representative the various meeting attendees were of the larger community, though the absence of women in the Gagil meeting is clearly a shortcoming. Possible reasons for poor or non-attendance include:

- The recent (April 2004) severe damage caused by Typhoon Sudal meant that many people were still busy repairing their houses.
- There may be an attitude of project- or aid-dependency on Yap, with people unwilling to attend meetings if they can't see a direct material benefit from doing so.
- There may be internal political tensions between some communities or community members and IWP.
- People may not see the importance of the PPA process.

- Poor timing and publicizing of the meetings.

The cause is most likely to be a combination of the above factors. Most of the people the author spoke to on the first visit, whether in groups or individually, were ambivalent about the utility of PPA as a process for discovering the root causes of the problem. The Gagil meeting perhaps showed this most clearly. Community representatives commented that they have long been aware that the main problem is overfishing, along with the difficulties they are experiencing in preventing illegal access to fishing grounds by both outsiders and their own community members. They have been almost unanimous in their support for the MPAs as a management tool, though with some trepidation regarding enforcement of the closures. They also almost unanimously believed that success would ensue from increased awareness of the need for prevention of widespread overfishing, and the role of MPAs in achieving this.

The PPA process, as conducted in Yap, does appear to be useful, as it assists people to think about issues that they might otherwise be disinclined or unwilling to think about and articulate in discussions regrading resource management. These include subtle and sometimes imperceptible (but important) processes of social change that result in shifts in patterns of resource governance that may be detrimental to the long-term well being of the community. It is unlikely, however, that the PPA process has provided enough information to develop a complete picture of (i) the likely social and economic impact of an MPA program; and (ii) the most appropriate forms of outside assistance that would ensure the success of the program.

Potential shortcomings of the PPA process include:

- people attending the PPA meetings may not be representative of the community as a whole, particularly given the small number of people present;
- not all information necessary to establish an MPA may be collected through a PPA, and PPAs may need to be supported by the collection of other information (e.g. data on relevant social parameters, including level and sources of income, importance of fishing for subsistence and cash, and politicized issues such as the potential trade-offs between fishing and rent from diving tourism); and
- outputs of meetings can sometimes be dominated by statements made by one or a few people, whose opinions may not be representative of the broader community, or even of the other participants.

Consequently it is useful to employ tools such as questionnaire surveys, participant observation and semi-structured interviews to obtain data that may give a different or more detailed insight into the social and economic impact of MPAs on the participating communities. This will then allow the agencies involved to formulate appropriate strategies for assisting the participating communities.

Part 4

Socioeconomic survey findings

Introduction

The data presented here are summarized from the Household Survey (see Annex 3) and a Finfisher Survey (attached as Annex 4), as well as interviews and meetings with villagers and other stakeholders, including chiefs, dive operators, and government fisheries staff (see Annex 5). The data are used to broadly describe:

- the level of reliance in Maap and Gagil districts on fish for food and cash at the village level;
- the potential social and economic impacts from fishery closures in the areas

designated for MPAs in those districts;

- the role of the state in the process of establishing and enforcing the MPAs; and
- the past, present and future relationship between fisheries and dive tourism in Yap.

These issues will be discussed in the light of other social and economic data on Yap.

It should be noted that there is at present no scientific data on the status or trends in inshore finfish stocks (that the author is aware of) that can corroborate the statements made by many villagers that fish are declining in size and abundance in Yap. However, an ecological baseline assessment is scheduled for the four sites for late 2004, which will hopefully provide additional scientific knowledge on the status of stocks.[4]

The socioeconomic surveys were carried out from 29 September to 6 October 2004. The number, gender and residence of the survey respondents are given in Table 4 below. Surveys were not conducted in Gilman and Rumung due to lack of engagement with the project by those communities at the time.

Table 4: Survey respondents.

	Household Survey		Finfisher Survey	
	Maap	**Gagil**	**Maap**	**Gagil**
Male respondents	10	5	14	19
Female respondents	5	12	1	0
Total	15	17	15	19
Total households in Municipality	115	158	115	158
Percentage of households surveyed	13%	10.8%	13%	12%

Potential economic and social impact of MPAs

Overview

Fisheries management through establishment and enforcement of closures will result in some immediate economic impacts. The closures would be undertaken with the expectation that lost in fishing opportunities would be more than compensated for at some time in the future by the increased availability of fish. According to fishery models proposed by Halpern et al. (2004), fishery production can be enhanced even with up to 50% of a given area closed to fishing. However, this and other work espousing MPAs as a fishery management tool assume that, following a closure, fishers can access any part of the remaining open access areas. This is not the case on Yap, where customary tenure systems constrain access to alternative fishing grounds. This raises several questions:

1. How important is fishing, for both subsistence and cash generation?
2. In cases where fishing in other areas is impossible, and/or involves some cost, by what means could people cope with such a cost?
3. Are there other, non-economic factors (e.g. sovereignty, spiritual values) that need to be considered as well?
4. Will the people who have rights to fish in the closed areas be able to fish elsewhere?

[4] See PICRC 2007.

As mentioned above, a large fraction (more than half) of FSM's income, including that of Yap State, is derived from support under the Compact of Free Association with the United States. This largely funds the government and public service, which is the single biggest employer on Yap. This means that for a significant proportion of the population, the resulting shock to the subsistence economy is likely to be buffered by the funds flowing to the government sector. The following survey data gives an idea of the importance and spread of this income in the Maap and Gagil communities.

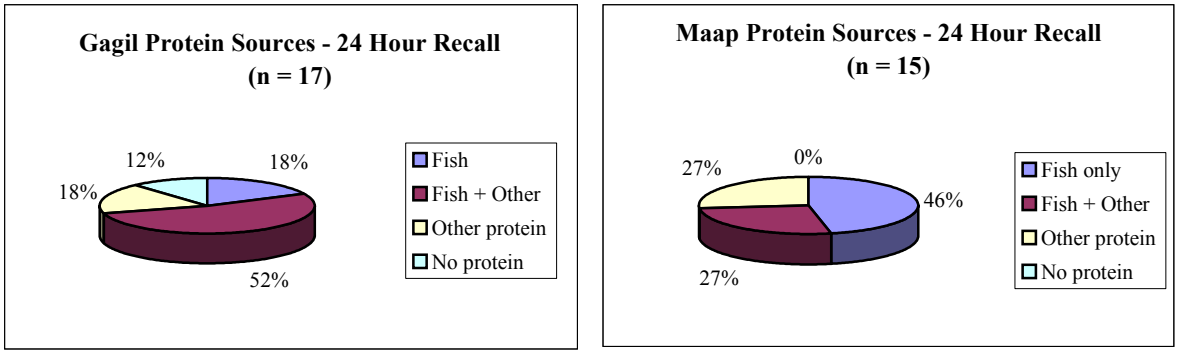
Household surveys

Subsistence Fishing

To gain information about the importance of reef fish for subsistence, the socioeconomic surveys included questions about the composition of the previous two main meals (morning and evening), and about fresh fish consumption over the previous week. The data (Figs. 12 and 13 below) indicated a high frequency of fresh fish consumption in both villages. Half of the respondents who had eaten no fresh fish in the previous 24 hours stated that they had eaten some in the previous week. Most respondents (69%) said they went fishing more than once a week. On average, 3.6 meals/week contained fresh fish (both villages combined). Canned fish was consumed on average 3.1 days/week.

A survey of Yapese households by Egan (1998) found that 34% of the protein consumed was of local origin and 66% was imported. The fact that many of the respondents in the Maap and Gagil surveys consumed both fresh fish and other (mostly imported) forms of protein together makes it difficult to meaningfully compare the two data sets. Moreover some of the non-fish protein, such as chicken, could have been either local or imported, which is not distinguishable in the present data set. The small sample size of this survey and the lack of any opportunity to validate the data add to this difficulty.

Six of the 15 Maap respondents said they had eaten turtle in the last month, while none of the 17 Gagil respondents had.



Figures 12 and 13: Proportion of the last two main meals containing fresh fish for Maap and Gagil survey respondents. "Fish" includes marine invertebrates. "Other protein" includes any kind of fresh, frozen, or canned meat or fish, and eggs. "Fish + Other" represents respondents who consumed protein from both of these categories in the last 24 hours. Data from both of the last two main meals were combined for each respondent.

Just under half (44%) of the respondents said that they fished in more than one habitat, while 28% fished in only one. The rest (28%) gave no response to this question. Only two respondents said that the only habitat they fished was the open sea, which indicates a high reliance by villagers on inshore resources. A total of 17 (53%) said that their fish came from lagoon or reef flat (as the sole or one of many habitats) and nine (28%) included mangroves among the habitats from where they obtained their fish. Nine respondents did not answer this question.

Boats were owned by 11 respondents (34%). There was no apparent correlation between income level and boat ownership. The gender divide in fishing activity, evident from the preponderance of men among the respondents to the Finfisher Survey, is further underscored by the fact that 15 of the 18 household survey respondents who said that they had obtained fish from a family member or relative were women. Conversely, 11 of the 13 who listed themselves among the people who caught the fish eaten in their household were men.

The household survey included questions about consumption of marine invertebrates but the responses to these were contradictory and of limited use. It appears that women do most of the collecting of marine invertebrates and an accurate impression of their activities in this regard will require a more focused approach than we have taken here. However, the fact that only three respondents listed marine invertebrates (crabs in two cases and trochus in one) among the items in their last two meals suggests that pressure on these resources is not particularly high.

Income

Just over half of the respondents reported earning between USD 50 and USD 100/week, while 28% earned less than USD 50/week, which gives a total of 82% who earned less than USD 100/week (Table 5). We have combined the income data for Maap and Gagil from this survey due to the small sample sizes and similarity of the figures.[5]

Table 5: Weekly income (Maap and Gagil combined). (n=31)

Income/week	Proportion of respondents
<50	28%
50-100	54%
100-150	3%
150-200	0%
200-300	6%
>300	6%

Most (23 of the 32 respondents, or 72%) reported having more than one source of income. Everyone with more than one source of income engaged in "marketing", "betel nut" or "agriculture" as his or her primary or secondary income-earning activity. The categories "marketing" and "agriculture" potentially subsume "betel nut", and many people said that the Maap community as a whole makes a lot of money from sales of betel nut. (All eight respondents who listed "betel nut" as their primary or secondary income source came from Maap). There was no significant difference between Maap and Gagil in the number of respondents earning salaries.

Table 6: Primary income source (Maap and Gagil combined). n=32

Income/week	Proportion of respondents
Salary	51%
Agriculture	9%
Betel nut	16%
Marketing	9%
Fishing	9%
Other	6%

Only three respondents (9%) gave "fishing" as their primary source of income (Table 6). However five respondents (16%) listed fishing as a secondary source of income. It was not possible during either field trip to conduct surveys of urban-based commercial fishers who accessed reefs or other near-shore habitats in the areas of Gagil and Maap. Salaries were given by 51% of respondents as their primary source of income, and another 12% listed salaries as a secondary source.

[5] For comparison the Yap 2000 Census gives the median weekly income for Maap and Gagil as USD 99 and USD 133 respectively. Mean weekly incomes are higher USD 129 and USD 179 respectively) due to the large size of the few highest incomes. It is possible that respondents were understating their income by a small amount in our surveys.

Expenditure and standard of living

No detailed data on household expenditure was obtained. Some general information is available, however. Public primary and secondary education are free on Yap (there are also two private church-affiliated primary schools, charging between USD25–75/month). About 75% of households in Yap Proper have access to electricity (including 59.1% in Maap and 66.7% in Gagil); the cost is USD 0.17/kilowatt hour. In 2000 there was an average of one telephone subscription per household. In 2004 the number of Yapese who owned cell-phones increased dramatically, mainly as a result of the emergency relief funding made available after Typhoon Sudal (in April 2004). There were 1.14 registered cars per household in 2000; roads connect most villages to Colonia.

Beer consumption is a conspicuous part of daily life, but information on its impacts (in terms of violence and anti-social behavior) is not available. There is a drug rehabilitation and counseling centre on Yap and alcohol apparently accounts for a substantial proportion of household expenditures for most families.

Most people (83.5% in Maap and 72.4% in Gagil) have access to piped or tank water, though only 19% of houses have a toilet that meets US sanitary standards. Health care is generally of a high standard compared to the some Pacific Island countries, but not to the standard found in developed countries (e.g. US or Australia). There is a relatively well-equipped hospital in Colonia. Diseases such as dengue and nutritional deficiencies are prevalent, as are diabetes, cardiovascular disease and cancer. The average life expectancy at birth in Yap State is is 70.1 and 71.1 for males and females respectively (2000 Census).

Religion

According to the Yap State Census Report for 2000, 74.9% of Yap Proper is Roman Catholic with the remaining fraction being comprised of other Christian denominations (8.2%), other religions (8.3%) and people declaring no religious affiliation (or not responding to the survey) (8.5%). The Municipality of Maap is comprised of 63.5% Catholic, 8.5% other Christian denominations, 15.5% other religions, and 12.5% no religion/no response. In Gagil there are 85.4% Catholics, 7.5% other Christian denominations, 2.6% other religions, and 4.4% no religion/no response. The high “no religion” figure for Maap (12.5%) is interesting as it may contain a cultural revivalist / traditionalist element that is reacting against perceived cultural imperialism of the introduced religions. The composition of the category “other religions” is unclear for Maap.

The significance of this distribution of religious affiliations for fishery management is not likely to be great. In Melanesia the Catholic Church has had a relatively sympathetic approach to traditional customs, unlike the Seventh Day Adventists (SDAs) and some other protestant denominations, which have typically forced people to renounce their traditional belief systems, including ancestor worship, and to destroy sacred sites. On the other hand, the SDAs tend to follow the Old Testament ban on eating “fish without scales”, which can have beneficial effects on stocks of some invertebrate species, as well as turtles and eels in some places. But there are very few SDA adherents in Maap (2%) and Gagil (0.5%).

Finfisher surveys

A total of 15 Finfisher surveys were completed for Maap and 19 for Gagil. All but one of the respondents was male, mirroring the strong preponderance of men involved in fishing on Yap (Egan 1998). Ages of the respondents ranged from 25 to 67 with an average age of 41. Most fishers (94%) said they fished all year round, both day and night (79%), and most fishing trips (79%) were between 2–6 hours in duration. The major difference between Maap and Gagil districts for this survey was that most Gagil fishers (68%) used mangroves while few Maap fishers (20%) used this habitat (Table7). This may be due to the relative proximity of mangroves to the Gagil villages compared to Maap. Most (71%) fishers said that they

sometimes used a boat for fishing, while only four (three from Gagil and one from Maap) said they never used one.

Table 7: Use of habitats by fishers (pooled data from Maap and Gagil). n=34

Habitat	Percentage of fishers using habitat	Average days/week
Mangrove	47%	0.8
Reef	85%	1.7
Lagoon	47%	0.9
Open sea	53%	1.1

The major fishing techniques used by respondents were spearing at night (79%), spearing during the day (74%), and gillnetting (68%). Gillnet mesh-size ranged from 2.5–4 inches. The three fishers who reported using more than one technique per trip used spears and nets; 38% used trolling, 29% hand lining, 29% cast netting, 21% deep hand lining. Four fishers used a spear while walking, and one used casting with a pole from a boat.

Reported catch sizes ranged from 10 pounds (4.5kg) to 75 pounds (34.1kg) with an average of 30.7 pounds (14kg).

Eight fishers (three from Gagil and four from Maap) said they sold their catch. Two of these sold fish within the community, five sold outside, and one sold both inside and outside. Three sold to individuals, four to shops, two to a market and one to an agent. Most fishers used more than one preservation technique with ice (79%), freezer (68%) and refrigerator (41%) dominating. Three fishers smoked fish and two dried fish.

Four fishers from Gagil (equal to 12% of all fishers, but 21% of those from Gagil) said that they would experience a reduction in income if an MPA were established. Only one of these said that he would not be able to fish elsewhere.

Customary marine tenure

The following discussion of systems of land tenure and social organisation on Yap draws primarily on the work of Labby (1976), and Lingenfelter (1995). Clan (*ganong*) affiliation on Yap is matrilineal and women typically marry out and move to the husband's estate at marriage. Affiliation with estates (*tabinaw*) is typically inherited patrilineally, but even after moving away, women retain a particular set of rights over their own natal estates, which can be invoked under certain circumstances. Thus there is a set of cross-cutting rights formed by the constant association of clans with new estates through the movement of women, necessitating the initiation of gift exchanges (*mitmit*) between the woman's natal estate and the husband's estate at marriage. Labby (1976) describes this constantly changing relationship between clans and estates as dialectic (i.e. composed of opposing social forces) and observes that it is regularly epitomized by the expression: "Our land belongs to someone else; someone else's land belongs to us". Men typically inherit land (a part of their natal estate), through their father, but this is conditional on their having made the land productive through their own efforts and perhaps more importantly through the labor of their wife and their progeny.

In traditional Yapese ideology, women are accepted onto a new estate in exchange for their production of children, and their (agricultural) labor. Likewise men have to earn their place in the estate through their own contribution to this productivity. Becoming established on an estate meant becoming qualified to "speak" on behalf of the estate, and all the ancestors who had come before and contributed to it's productivity and present status. All leadership and authority is vested in the land and is referred to as *Pilung* (*pi* = person, or give; *lung* = voice). The term for village chief is *pilung ni pilbithir* or "ancient voice".

There is a highly complex system of social stratification on Yap that is broadly summarized by the concepts *tabugul* (sacred, high, pure) and *taay* (profane, low, impure). Stratification occurs within and between households, villages and municipalities. Thus there is a strict system of ranking among villages and these rankings appear to be clustered, partly as a result of regional alliances (Lingenfelter 1975: 134). According to Lingenfelter, when asked most Yapese tend to slightly exaggerate the rank of their village. High rank (*pilung*) confers privileged access to resources, and high-ranking chiefs have the power to take land away from lower ranking (*pimilingay*) people. The ranking system is dynamic in theory but quite rigid in practice. High-ranking men rarely marry women from low-ranking villages. An extreme form of the social stratification system on Yap is seen in relations between mainland Yapese and outer islanders who are subject to quite rigid restrictions as to where they can go, and what land they can stay on. Labby (1976: 85) suggests that this system may have evolved out of the overpopulation of Yap prior to colonization, and the fact that some people ran out of land before others forced them to seek land from those who still had it, and obliged them to accept a lower status, in fact to be treated as the children (*fak*) of the landed groups. These lower-ranking people (including the outer islanders) were also obliged to pay various kinds of tributes to their landed hosts. The people of Gacpar and Wonyan in Gagil had a special relationship with outer islanders in this respect.

The significance of this caste system for IWP is difficult to judge. The villages of Wonyan (Gagil) and Wachaelaeb (Maap) are the highest-ranking villages within their respective municipalities; the highest-ranking municipalities are the ones with paramount chiefs, which in 1975 at least, included Tomil, Rull, and Gagil (Lingenfelter 1975: 135). It appears that government jobs are concentrated in the hands of people from the higher-ranking municipalities.

Regarding marine tenure, Lingenfelter (1975: 88-89) observes:

> Certain estates, usually of high rank, own all the fishing grounds within the reef. Fishing rights sometimes are parceled out to various estates or households and careful distinction is made among methods of fishing permitted and prohibited. Rights to use nets of all kinds, to stones, to fish traps, and to particular methods of fishing all are owned by an estate. Unlike land, fishing resources are shared easily and the payment, though depending upon the size of the catch, is small. Communal fishing enterprises are common, and are accomplished through a similar organization to that for gardening.

The above concurs with the description of Customary Marine Tenure by Tafileichig and Inoue (2001), though they add that the traditional system is ratified by the state. As stated previously, closure of part of the coastline to fishing may carry the risk that some or all of the people who normally fish there will be forced to fish in areas where they may or may not enjoy customary rights. Most people contacted by the author (and the flexibility described by Lingenfelter above) suggest that this risk is not high.

Both the household and finfish fisher surveys contained questions that attempted to ascertain this. Only six (19%) of the 32 respondents to the household survey listed a place other than the name of their village as the place they normally went fishing. Of the ten respondents to the finfish fisher survey who answered the question “Are there other places you can go fishing?” (in the event that their normal fishing ground is closed by the MPA), only one answered “no”. Most people I interviewed about this issue, including Chief Andrew Ruepong (of the Council of Pilung), contended that fishing rights were sufficiently flexible that most people would be able to fish in territories to which they had no rights or weak rights, as long as they asked the “owners” first. The fact that many fishing expeditions are group efforts means that people with rights to various different territories can band together to fish all or any of those territories and share the catch.

It is likely that the flexibility regarding fishing rights is at least partly due to the relatively low

importance of commercial fishing within the two communities studied and the strong buffering of the subsistence economy by the cash economy. The fact that inshore marine resources are not intensely commodified means that rules about access are more relaxed and flexible than they might be if fish had a higher commodity value. Below we review another context in which a very different kind of thinking is occurring with regard to marine tenure.

MPAs, the diving industry, and the draft Marine Parks Bill

The two most popular diving locations in Yap are Miil Channel to the north of Runuw (in northern Fanif) and Goofnuw Channel to the north of Riiken (Gagil). These places have large aggregations of manta rays, which are a primary attraction for dive tourists visiting Yap. An arrangement was made several years ago between the largest dive tourism operator, Bill Acker of Manta Ray Bay Hotel and Yap Divers, and members of a Fanif family, headed by Raphael Dobchran, who claimed rights to the Channel.

Acker agreed to pay access fees (hereafter called "diving rent") to the family in exchange for permission to take tourists diving there. Interestingly the other smaller dive operators on Yap had agreed to pay a subsidiary royalty to Bill Acker that apparently allowed them access to the same area. About two years ago, a dispute broke out between Raphael Dobchran and other members of the Fanif community about who should be receiving the diving rent from Bill Acker's operation. This dispute was heard in the Municipal Court and Dobchran lost the case. Since that time, neither Acker nor the other dive operators have been paying diving rent for access to Miil Channel. At the time of writing, Dobchran had taken the case to the Yap State Court for appeal and a hearing is pending. Cyprean Mungunbay, who is an Associate Justice as well as a leader of the Gagil community, is involved in hearing this case.

During the fieldwork for this study, an exchange took place between Acker and members of the Gagil community, represented by Gabriel Faladay and Cyprean Mungunbay, in which the Gagil community demanded diving rent from Acker for tourist access to Goofnuw Channel. Acker expressed concern that payment would potentially have a snowball effect where all communities on Yap owning reefs would demand rent and he would not be able to meet these many new demands. In the meantime representatives of the Gagil community have issued a ban on all diving in Goofnuw until the matter of diving rent is resolved.

The Assistant Attorney General, Victor Nabeyan, with the assistance of the Yap Visitor's Bureau, has now drafted a Marine Parks Bill that attempts to establish a standardized system for the payment of rent by diving tourists to the reef owners. The Bill is likely to be further refined before being tabled to become an Act. The draft Bill does not attempt to differentiate between rent based on the existence of protective measures and rent based on CMT alone.

The approach taken by the Bill is likely to be the best way to deal with the issue of CMT and diving tourism on Yap. The need for a resolution of the matter is underscored by the significant economic impact that a decline in diving tourism could have, at least for a proportion of the urban population. For example, data from two of the four diver operators in Yap (Yap Divers and Nature's Way) suggest a gross income of over USD 1.5 million/year.

These examples indicate people can be very specific and firm when enforcing CMT in situations where large amounts of money are at stake (also commonly observed in Melanesia; see Foale and Macintyre 2000, Macintyre and Foale 2004, Otto 1998).

Discussion and recommendations

The PPA sessions indicated that residents were concerned about overfishing, whether practiced by locals or outsiders, and believed this to be the result of a combination of weakened local governance and social and logistical barriers to controlling the activities of outsiders. The

household and finfish fisher surveys, as well as interviews and other sources of data, complicate this picture somewhat, as discussed below.

What is the true condition of fish stocks?

The MPA project in Yap was established under the assumption that finfish stocks on Yap are decreasing in abundance and size. No scientific evidence is available to either confirm or contradict this. Anecdotal evidence from local dive operators indicates that fish sizes and abundance on the outer reef have not changed significantly over the past decade (although changes to fish community structure following typhoons were noted). All the dive operators contacted indicated that they could not comment on the abundance of fish in the very large lagoon system as they do not dive there. An important question is whether the lagoon is subject to higher (and indeed unsustainable) fishing pressure than the outer reef slope. There is clearly significant fishing pressure on the lagoon stocks from gillnet fishing, but the data from the finfish fisher survey (frequency of use of different habitats, and fishing gears) does not satisfactorily clarify this issue. This should be looked at closely be means of an ecological assessment. Note that any uncertainties should not constitute a rationale for abandoning a precautionary approach to fishery management on Yap.

Box 2: Control by communities over poaching

During the PPA sessions and associated interviews in Maap and Gagil, a number of villagers commented that outer islanders do occasionally poach fish on the outer reef slope within the territories of the villages, and that they usually choose to go at low tide when it is difficult for reef owners to get in a boat and apprehend them. An outer islander from the Fisheries Department commented that outer islanders, who mainly fish from Colonia to Gilman, have noticed that some communities are more "strict" than others about access by outsiders to their reefs. The people from Rumung were said to be by far the strictest, and apparently defend their territory the most energetically. Consequently outer islanders who poach tend to concentrate their activities in the areas where the reef owners are less strict. These comments match my own observations of fish behaviour in Miil Channel and corroborate comments from various interviewees (including villagers from Maap and some dive operators) that poachers do not operate at Rumung despite the absence of any formal (government) protection. Clearly there are significant differences among the different communities as to the degree of respect they command over their territories. Whether this is related to the hierarchy of estates (*Tabinaw*) on Yap is not clear from this small amount of information.

What factors influence local-level governance of marine resources on Yap?

There appear to be two primary factors influencing the degree of protection exercised by reef owners over their territories and the fish stocks they support: (i) the relative economic importance of these territories and their fish and (ii) the strength of authority that traditional owners are able to exercise over their reef territories. This determines whether or not fishers (insiders or outsiders) choose to violate the traditional rules of access that apply to a particular area (see Box 2).

It is apparent from the household survey data that the economic importance of fish is offset significantly by the availability of other sources of protein, including imported canned and frozen meat purchased with cash (most of the latter stems from public sector employment). It does appear that fish are still important (though not central, and probably less important than they once were) in terms of ritual exchange relations on Yap (Egan 1998: 263–268). No detailed information was obtained on this for the communities involved in IWP, however. The following questions thus remain unanswered: What is the relative significance to local governance of fish stocks of:

(i) the reduction in the subsistence value of fish in the post-colonial era (as a result of increased consumption of imported foods); and

(ii) the decline in respect for local authority over access as a result of acculturating forces of modernization?

In addition, the profoundly hierarchical nature of Yapese society and the complex inter-*Tabinaw* power dynamics may well have had some bearing on the strength of local control over access to reef resources in the two sites. However, these are issues that have remained unanswered due to the brief timeframe of the study.

The role of state-level fishery management

As with Melanesian states such as Papua New Guinea and Solomon Islands, the level of state control exercised over inshore fisheries is minimal. This was apparent from the fact that there is obviously a thriving trade in bêche-de-mer taking place at the present time despite the existence of an official moratorium on this fishery. Hence the likelihood of the state being able to enforce gear or species restrictions does not appear high at present and the community-based MPA approach being taken by the IWP may still have a slightly better chance of improving inshore fishery management on Yap.

However the fact that some communities, such as Rumung and northern Fanif, are already enforcing restrictions on access to some of their reefs, more or less independently of the IWP or any other form of outside assistance, is worth noting and should be examined further.

Recommendations

1. A permanent closure of any area of lagoon and reef in Yap may significantly reduce or even eclipse CMT rights for a number of people. Depending on their access to other sources of food/income (such as government salaries), these people may be forced to negotiate access to other areas where they have weak rights or no rights. Fortunately, there is a relatively relaxed attitude to access rights in some areas, which suggests that most people can adapt to MPAs without experiencing significant economic disadvantage. Nevertheless, it will be important that people in both target areas and neighbouring areas are well aware of the fishery management rationale for MPAs. This will require a well-planned communications program in which everyone is well informed of the spatial extent of the closures, the extent to which they are permanent or temporary (because this has apparently not been finalised), and the fact that people who previously fished there will have to fish elsewhere.
2. The success of an MPA program will require systematic and carefully managed monitoring of CPUE in areas outside of the MPAs (particularly neighbouring areas), as these areas would be expected to benefit most quickly from the existence of an MPAs (as a result of adult fish spillover from the MPA; see Russ 2002). An assessment of CPUE will require careful training of local fishermen and systematic follow-up and support from suitably experienced and qualified fishery personnel. CPUE monitoring should be taking place at several sites adjacent to the MPAs, and at least once a year for a minimum of five years following the closure.
3. The high average level of education of Yapese people (64.1% of the population have completed high school and 25.4% have a tertiary qualification; Yap State Census 2000, see FSM Statistics Unit 2006) confers a great advantage for fishery management interventions, as the principles of fishery management require a level of scientific literacy that is more likely to be present in an educated population (see Foale 1998). An effort should be made to build on this educational background by developing locally relevant fishery biology material in the high school curriculum. In this way, the future leaders of Yap will be better informed of the biological and ecological mechanisms by which MPAs benefit

fisheries. Public education programs, perhaps including material broadcast on the radio, would also be highly beneficial.

4. Any ecological assessments should carefully consider the relative impact of fishing on lagoon stocks. The author was unable to obtain quantitative data to substantiate the case for a higher level of fishing pressure in the lagoon. However, a number of Yapese attested to this in interviews. At the same time the relatively large distance of the reef slope from the shore and the large number of gillnets in use suggest that lagoon fish stocks are likely to be under significant pressure in some places. Methods such as the Leslie-DeLury depletion method (Smith and Dalzell 1993) and/or size-frequency analysis will probably be more useful than Underwater Visual Census (which is better suited to the clear waters of outer reef slopes) for monitoring the condition of these stocks. Reef slope fish stocks should also be monitored, but an investigation of both fishing activity and stock densities inside as well as outside the reef is recommended.

Lessons learned from the surveys

The most important lesson from this exercise is that time should be allowed to pilot the surveys (i.e. test them on a few members of the community), for the benefit of both Field Associates and respondents, before undertaking the full survey. Both the Field Associates and the respondents in this study did clearly not understand several questions in both the household and finfisher surveys. The opportunity to pre-test was also related to delays by the IWP Yap team in commencing surveys in villages.

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Annexes

Annex 1: Communities involved in Yap IWP

Site:	Municipality	Location of proposed MPA	Approximate area of no take zone (ha)	Villages involved	Population (2000 census)
1	Gagil	Gofnuw channel reef and blue holes, high biodiversity, culturally important site	a. 52 b. 14 c. 43	Riken Wanyan	34 196
2	Rumung	Ma'aw MPA, pristine sand, coral and seagrass meadows, abundance of clams	142	Riy Gaanaun	23 26
3	Maap	Reef system off eastern Maap, pristine waters, coral, sand and sea grass meadows, possible spawning aggregation site	a.12 b. 148	Waned Bechiyal Toruw Wacholab	72 26 36 39
4	Gilman	Southern Yap Buguw MPA, linked communities from mangrove to seagrass meadows to coral, sand reef, reef slope and coral cave with nutrient rich waters and concentrations of fish, culturally important site	312	Anoth Towoway	40 19
All		All proposed areas are within high priority "Areas of Biological Significance (ABS) " designated in TNC workshops	723	10 villages in 4 Municipalities	511

(Source: Original Project Proposal).

Annex 2: Yap IWP Stakeholder Inventory (March 2004)

Table A2-1: National level stakeholders, their roles and key issues to be discussed with them to support information collection

Stakeholder	Organisation / role	Key Issues / questions
Joseph Giliko, Director R&D	National Task Force, overseeing the project	Deliver briefing on the outline of the Socio-economic study, and solicit feedback
Jesse Tamel, Deputy Director R&D	National Task Force, Same as above	Deliver briefing on the outline of the Socio-economic study, and solicit feedback
Andy Tafileichig, Chief MRMD	National Task Force, Housing the project	Deliver briefing on the outline of the Socio-economic study, and solicit feedback; discuss marine tenure issues in detail.
Leo Yinug, Director EPA	Management of environment protection and conservation	Deliver briefing on the outline of the Socio-economic study, and solicit feedback; obtain views on current marine pollution and sedimentation issues
Tommy Gilmatam, Assistant Director, Health Services	Dispensary system and public health	Ask for health data; including incidence of ciguatera poisoning
Margie Falanruw, Scientist	Yap Institute of Natural Science; National Task Force	Briefing / feedback; ask about fishery and pollution issues, and relative importance of subsistence in the village economies. Discuss potential involvement of YINS.
Andrew Ruepong	Council of Pilung (main islands)	Ask about tenure, and relations between Yap Proper and Outer islands in terms of fishing rights
Hilary Tacheliol	Council of Tamol (outer islands)	Ask about tenure, and relations between Yap Proper and Outer islands in terms of fishing rights
Andrew Yalilman	General Manager, Yap Visitors Bureau	Ask about importance of tourism in the State's economy, and the extent of benefit distribution beyond dive operators. Discuss tenure, diving royalties, and Pay-and-display idea.
Francis Itimai	Chief, Office of Planning and Budget	Ask about latest prognosis regarding the withdrawal of American Aid from FSM, and any detail economic stats at village level.
Charles Chieng	Director, Yap CAP; National Task Force, YBSAP Coordinator	Briefing and feedback; Ask about any threats to marine biodiversity.
Rosa Tacheliol	Director, Department of Education	Discuss environmental education curriculum, and get feedback on level of awareness of fishery biology and the MPA rationale.
Laura Tiningded	Coordinator, Yap Women's Association	Discuss the broad picture of women's fishing, species involved, and likely economic impacts of closures; Gauge interest in conducting ongoing fisheries monitoring for relevant species.
Tamdad Sulog	Chief, Department of Agriculture	Discuss erosion and sedimentation issues, as well as role of subsistence farming in the economy.
Theo Thinnifel	Manager, Yap Fishing Authority	Briefing and feedback. What is the nature of the access rights commercial fishers have on local reefs? Ask for views on strategies for conducting surveys with commercial fishermen and buyers.
James Limar, Manager, and Mike Gaan, Consultant	Small Business Development Centre	Briefing and feedback; Ask about the potential for ecotourism at village level, and discuss the nature of capitalist enterprise on Yap

Stakeholder	Organisation / role	Key Issues / questions
		generally.
Lourdes Raboman	College of Micronesia (Yap Campus)	Briefing and feedback; get opinion on potential for incorporating students into the ongoing fishery monitoring work
Bill Acker, Dave Vacella, Sue Yasui and Al Ganang	Owners of Yap Divers, Beyond the Reef, Nature's Way, and ORC	Briefing and feedback. Ask about the access arrangements they have with reef owners. Ask about Pay and display. Ask about potential involvement with fishery monitoring work.

Table A2-2: Key stakeholder groups and issues to be investigated

Stakeholder in each Village	Key Issues / Questions / strategies
Village Chiefs	Deliver briefing of the IWP objectives and the material on the rationale for MPAs in the introductory section of this report and get feedback. Discuss: 1. Tenure (with a view to determining the best strategy for detailed interviews about it among villagers), 2. Local knowledge about stock replacement processes, 3. Relative importance of fishing in the village economy, 4. Issues around enforcement once the MPAs are declared and marked out. 5. Size and placement of MPAs, 6. Catchment issues, 7. Appropriate protocol and strategy for the survey work, 8. Ideas on ongoing monitoring work. 9. Decision making structures and processes in villages.
Women's Group	As for Chiefs, above
Youth Groups	Deliver same briefing on IWP objectives ? as for Chiefs and women above. Ask for views on likely problems with enforcement. Gauge interest in involvement with monitoring work.
Elementary School	Possible engagement with ecology education(the IWP is able to pilot activities relating to environmental education with schools. to support marine coservation and management)
Church Group	Possible engagement with communication and public awareness activities of the project
Fishermen	Village-based fishermen are probably best engaged on an individual basis through the survey work (see below).
Fisherwomen	Some engagement already through the Women's Group, and also through the surveys.
Store Owners	If possible solicit records of fish bought and sold – this will be very useful data. Other fish buyers (larger scale, in town) will also be targeted by the surveys (see below).
Laundromat Owners	Are they generating marine pollution? If so, can this be measured, and what can be done? Crosscheck with Leo Yinung at the EPA.

Annex 3: Household survey

Household demography and consumption survey

QUESTIONNAIRE FORM (Yap revision)

Target Group:

- Head of household, or
- Women responsible for preparing food for the household

Objective: To gather detailed information on:

- average household size and composition,
- average household consumption pattern,
- average number of fishers by gender, and
- average number of boats per household.

Village	
Date	
Name of surveyor	

Person interviewed *(confidential information, names will not be published)*			
Name	Age (years)	Gender	
		male	female

HH.1 How many people usually live and eat in your household?	☐ enter number of people	
Do you normally eat main meals together?	Yes / No	
What did you eat and drink for your last two main meals at home? (list all components of each meal)	Morning:	Evening:

SKIP THE NEXT THREE QUESTIONS IF NO FRESH FISH REPORTED IN PREVIOUS ANSWER

If fresh fish was consumed for either or both meals give local name(s)		
If fresh fish were consumed how were they obtained? (tick box)	Caught by you	
	Caught by family member	
	Caught by friend	
	Given by relative	
	Given by friend	
	Bought privately	
	Bought from store	
On which reef was the fish caught?		
Does anyone in your household go fishing ***more than*** once a week?		
If yes, where do they go? (reef, lagoon, channel, reef flat, mangroves, open sea, etc)		
If yes, what do they normally fish for? (name commonly caught fish or invertebrates)		
HH.4 Does this household own a boat?	yes ☐ no ☐ how many? ☐ which type?	
HH. 5 Where does the cash money in this household come from? (the sources of money contributed by any of the people who live here usually) (rank options, 1 = most money, 2 = second-most, 3 = third-most, etc)	**Income source:**	**Rank:**
	Salary	
	Remittances	
	Agriculture	
	Fishing	
	Other (name:)	
What is the average weekly cash income for this household?	<50	
	50 – 100	

<table>
<tr><td rowspan="4">HH.6 During an average/normal week, how often do you prepare fish for your family? (tick box)</td><td></td><td colspan="8">number of days per week:</td></tr>
<tr><td></td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>or, specify</td></tr>
<tr><td>fresh fish</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>other seafood</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>canned fish</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>HH.10 Where do you normally get your shellfish, crabs and lobsters from, and which source is the most common? (tick box and rank from 1- 3)</td><td colspan="9">tick ✔ rank (1-3)
☐ ☐ caught by me or someone else from this household
☐ ☐ get it from someone else (no money paid for)
☐ ☐ buy it; name place: _____</td></tr>
<tr><td>Did you eat turtle at any time in the last month?</td><td colspan="9">Yes / No</td></tr>
</table>

THANK YOU!

Annex 4: Finfisher survey

Finfisher survey questionnaire form (Yap revision)

Target Group:

- Fishers (men and women 15 years and older) from households surveyed

Objective: To gather detailed information on:

- average catch size and composition,
- fishing techniques,
- proportions of catch for subsistence, gift and sale, and
- methods of conserving and preserving seafood.

Village	
Date	
Name of surveyor	

Person interviewed *(confidential information, names will not be published)*			
Name	Age (years)	Gender	
		male	female

F.1	Which areas do you fish? (tick ✔ boxes and use chart)	☐ coastal reef ☐ lagoon ☐ channel ☐ pelagic/open ocean ☐ mangroves
F.2	How many times per week do you fish in each of these habitats? (tick ✔ boxes)	coastal reef / lagoon / mangroves / pelagic/ open ocean ☐ ☐ ☐ ☐ ____ times/week/month ☐ ☐ ☐ ☐ ____ times/week/month ☐ ☐ ☐ ☐ ____ times/week/month

F. 4 How long is your normal/ average fishing trip, including transport time to/from fishing site, fishing and landing times? (tick ✔ one box)	☐ < 2 hours ☐ 2-6 hours ☐ 6-12 hours ☐ > 12 hours
F.5 When do you go fishing? (tick ✔ one box)	☐ only during the day ☐ only during the night ☐ day and night
F.6 Do you fish all year? If no, which months do you NOT fish? (tick ✔ boxes)	☐ yes ☐ no J F M A M J J A S O N D ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
F.7 Which fishing techniques do you use? (tick ✔ boxes)	☐ handlining ☐ castnetting ☐ spearfishing (diving) ☐ spearing daytime at night ☐ trolling ☐ gillnetting: mesh size_____ (in inch or cm) ☐ spearing while walkir ☐ canoeing ☐ deep bottom handlining ☐ poison: which poison do you use?_____ ☐ other techniques (specify) _____

F.8	Do you use only one technique per fishing trip, or do you use several during one trip? (tick ✔ box) If more than one, which techniques do you combine during one trip? (list)	☐ one technique/trip ☐ more than one technique/trip ▼ which ones? _____
F.9	How much do you catch during a normal fishing trip? (your catch or share of catch only) (use size charts)	☐ **pounds** size class: A B C D E F no of fish: ☐ ☐ ☐ ☐ ☐ ☐
F.11	Where do you sell your fish? (tick ✔ box)	☐ only within the community ☐ only outside the community, which place?_____ ☐ within and outside the community which place?_____
F.12	To whom do you sell? (tick ✔ box)	☐ individuals ☐ shop ☐ market ☐ middleman/agent

F.13 Which preservation method do you use for your catch? (tick ✔ box)	☐ none tick ✔ method — regularly — sometimes ☐ ice (during fishing trips) ☐ ☐ ☐ refrigeration ☐ ☐ ☐ freezing ☐ ☐ ☐ smoking ☐ ☐ ☐ drying ☐ ☐ ☐ other methods, specify: _____ ☐ ☐
If you regularly go fishing at _____ (proposed MPA area), would an MPA there cause a large reduction in your income?	
If yes, are there other places you can go fishing?	

THANK YOU!

Annex 5: People attending community meetings in Gagil and Maap, and dive operators interviewed

Gagil
1. Gabriel Falalay
2. Claude Safthal
3. Tommy Gamachuu
4. Harold Nueg
5. Isaac Moonruw
6. Cyprian Mugunbey
7. Louis Mawfel
8. Charles Gilgaayan
9. Norbert Yiftheg

Maap (men):
1. Edmund Pasan
2. Francis Yifith
3. Robert Giliney
4. Martin Laman
5. Miguel Kigimnang
6. John Ranganbay
7. Gaataman Dugchur
8. Rudy Taisurgam

Maap (women)
1.Agnes Bulmaeg
2. Christina Guper
3. Lucy Owuch
4. Elizabeth Mingeyub
5. Marinda Margow
6. Veronica Burchu
7. Carol Yirwer
8. Mangarpin Laman
9. Christina Laabchun
10. Linda Laagmay
11. Stephanie Laalung
12. Sarah Mann

Dive operators
Bill Acker, Freddie Gull (Yap Divers)

David Vacella, Gordon Keiji (Beyond the Reef)

Sue Yasui (Nature's Way)

Annex 6: Terms of reference

- In consultation with the IWP Project Coordinator and IWP/PCU, review work completed to date in relation to IWP Yap including work plans that The Nature Conservancy, SPREP, and IWP Yap developed for the project;
- Compile any relevant existing socio-economic information on the communities to provide an initial profile of the communities;
- Review and revise the current IWP Yap stakeholder analysis (local and national level stakeholders);
- Develop a detailed work plan for a socio-economic baseline survey in consultation with Yap stakeholders;
- Develop a plan for stakeholder participation in the assessment (who, why, when, how stakeholders will be involved);
- Summarise the compilation material and revised stakeholder analysis in a short 'plain English' report (not more than 15 pages). This report will form volume 1 of the socio-economic assessment (see below).

Briefing and training of local facilitators and partners:

- Identify local facilitators/partners to assist in the assessment and provide an outline of any planning, briefing or training required to be delivered session-by-session;
- In consultation with IWP Yap and the PCU, brief and train local facilitators to assist in assessment. Where appropriate, this should draw on material from the SPREP Resource Kit for Facilitators of Participatory Natural Resource Management (Mahanty and Stacey 2004);
- Prepare a report on any training conducted. This report will form volume two of socio-economic assessment (see below).

Coordinate Participatory Problem Analyses (PPA) with stakeholders:

- Coordinate Participatory Problem Analyses (PPA) with stakeholders to identify the root causes of marine resource degradation problems across the four sites; document results and provide feedback to stakeholders;
- Prepare a report on the PPA conduct. This report will form volume three of the socio-economic assessment (see below).

Coordinate socio-economic baseline information collection and analysis

- In the light of existing socio-economic information, the revised stakeholder analysis, PPA results and other relevant information, prepare a socio-economic survey to support and validate the findings of the PPA. Preparation will include identification of topics to be covered and methods to be used to collect information (e.g. PLA tools, questionnaires, focus groups, semi-structured interviews, observation etc) (see Annex 2). Where appropriate, the methodology being used under the EU funded SPC PROCFISH reef fisheries assessment project should be considered and incorporated into the survey (household and fisher questionnaires);
- Coordinate and undertake the socio-economic survey and the write up of results;
- In conjunction with the IWP Yap facilitate a series of village and stakeholder feedback meetings on the findings of the survey and next steps for implementation.
- Prepare a report (see below) on the findings and outcomes of the survey. This report will form volume four of the socio-economic assessment.

In addition the consultant is engaged to:

- In consultation with IWP Yap and PCU assist in communications activities as necessary to support the assessment (e.g. public relations, community feedback on results);
- Liaise and coordinate with other partner agencies and stakeholders such as those organizations involved in ecological baseline assessment work to support the Yap
- In consultation with the Yap IWP National Coordinator, IWP Yap National Task Force, local community committees and SPREP IWP Project Coordination Unit, the author is required to design and coordinate a socio-economic baseline assessment for the IWP pilot project in Yap.