



Support for the Establishment of Effectively Managed Platform Sites as Foundations for Resilient Networks of Functionally-Connected Marine Protected Areas

Kimbe Bay, West New Britain Province, Papua New Guinea

FY06 Annual Report

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Objective 5	Design and begin implementation of a Bismarck Sea MPA network.		
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Support for the Establishment of Effectively Managed Platform Sites as Foundations for Resilient Networks of Functionally-Connected Marine Protected Areas

Kimbe Bay, West New Britain Province, Papua New Guinea

Project Background

Of Papua New Guinea's many islands, one of the largest is New Britain. It is home to towering volcanoes, tropical forests, and pristine coral reefs. Kimbe Bay on New Britain's north shore is a large bay covering 700,000 hectares (1.7 million acres) with a population of approximately 170,000 people. Oil palm cultivation and timber harvesting are the island's primary industries.

Kimbe Bay is one of the treasures in what scientists call the "Coral Triangle." Stretching from Bali in the west, to the Solomon Islands in the east, and to the top of the Philippines in the north, the Coral Triangle contains approximately 76 percent of the world's 794 reef-building coral species and roughly 20 percent of all known fish species. Kimbe Bay has global conservation significance because of a rare combination of shallow-water coral reefs, mangroves and seagrass beds that are adjacent to a dramatic drop off into deepwater (>2000 m) with sea mounts, hydro-thermal vents, and upwellings. The Bay is a known conservation priority for coral reefs, leatherback turtles, dugongs and a number of cetacean species including sperm whales. The deepwater upwellings make it a prime area for pelagic species such as tuna, dolphin and shark and give the bay's coral a high degree of resistance and resilience against bleaching.

The key threats to the ecosystems of Kimbe Bay are:

- Runoff and sediments from timber harvesting, gardens and oil palm plantations;
- Destructive fishing practices (e.g., "poison rope") and over harvesting of marine resources, especially in mangroves and inshore reef areas; and
- Commercial harvesting of marine resources, such as sea cucumber and mother-of-pearl.

GCP has supported conservation actions at Kimbe Bay since 1999. These initial efforts focused on: strengthening the organizational and technical capacity of a local marine conservation NGO, Mahonia na Dari ("Guardians of the Sea"); increasing community awareness and participation in conservation planning and actions; developing the scientific and analytical basis for the creation of a resilient network of marine protected areas in Kimbe Bay; and piloting the establishment of locally managed marine areas (LMMAs) that build on local customs and tenure arrangements.

In 2002, The Nature Conservancy and local partners used TNC's participatory conservation area planning methodology to begin developing a comprehensive management plan for Kimbe Bay. This coincided with the development of a global framework for tropical marine conservation that emphasizes the establishment of functionally connected networks of marine protected areas (MPAs) that are resilient in the face of global climate change. As a result, the Conservancy developed a revised set of objectives and activities that focus on implementing a network of MPAs—including LMMAs—in Kimbe Bay and catalyzing the creation of ecologically linked MPA networks in the surrounding Bismarck Sea ecoregion in partnership with local NGOs, as well as WWF and WCS.

The Nature Conservancy, with GCP support, has set the following Kimbe Bay outcomes:
By 2008, a large-scale, resilient MPA network is designed for Kimbe Bay, at least 20% of high priority areas are effectively protected, and an additional 30% in the process of being protected.

The Conservancy's GCP II proposal also identified a second goal for 2008:
The design of a large-scale, resilient network of MPAs in the Bismarck Sea in partnership with Conservation NGOs with an MPA network at Kimbe Bay as a platform site.

Overall Assessment of Progress and Management Issues

The first iteration of the design for the Kimbe Bay Marine Managed Area network was completed in July 2006. The MPA design identifies "Areas of Interest" where we will work with local communities to effectively conserve their marine resources. The design is based on biophysical and socioeconomic design principles, results of high priority research conducted in the last few years, and input from key stakeholders (local communities, governments and industry). In particular, a socio-economic study and current modeling were completed this year, and provided inputs to the MPA design process. (The socio-economic study will also contribute substantially to our whole range of strategies in Kimbe Bay.) Through workshops in Kimbe and Port Moresby, substantial progress was made in getting the endorsement of key stakeholders (local communities, industries and local, provincial and national government), with whom we will work to refine and implement the design over the next few years. If implemented successfully, the MPA network, together with our other strategies of marine resource management and land use management, will achieve our twin goals of protecting biodiversity and addressing marine resource management in Kimbe Bay.

Work on a policy and legislative framework for the wider MPA network in Kimbe Bay was boosted with the enactment of an environmental management law by the Biella Local Level Government (LLG). Biella joins Hoskins and Talasea LLGs, which passed similar laws in 2005; all the coastal areas in the greater Kimbe Bay area are now covered by such legislation. Progress was made in creating committees at the local government level to implement this legislation. These committees will be responsible for supporting the creation of conservation areas (Locally Managed Marine Areas-LMMAs). Still remaining is to identify a legislative framework beyond the Conservation Areas Act that can provide for the Kimbe Bay MPA network which also covers off-shore and deep water areas.

In August-September 2006, a Rapid Ecological Assessment was conducted in the Northern Bismarck Sea. It focused on Manus Island and offshore islands reefs in Manus Province, and Tigak Islands and New Hanover in New Ireland Province. The survey confirmed that the Northern Bismarck Sea is an area of high biodiversity, including over 400 species of coral in both. In Manus, coral reef communities are in excellent health, although there was some damage from the recent severe storms in the area and localized incidences of dynamite fishing on some coastal reefs. The reefs in Manus were also outstanding in terms of their healthy populations of coral reef fishes, including large and vulnerable species. These were some of the healthiest coral reef communities we have seen for a long time. Unfortunately, the reefs in New Ireland were not in such good condition, with some reefs seriously affected by Crown-of-Thorns starfish and coral

bleaching. Fishing also appears to be more of a concern in New Ireland, with fewer large reef fish observed.

In June, a Conservation Audit of the Kimbe Bay program was conducted. The purpose of these audits is to assess a program's adherence to TNC's conservation approach and its application of the Conservation Action Planning (CAP) process. The Kimbe Bay audit was conducted in conjunction with initial FY07 GCP work planning. The audit identified a number of strengths in the program, including strong relationships with local communities, a sound understanding of threats to biodiversity in the area, and "situation analyses" that identify some of the complex linkages between conservation targets, stresses and sources of stresses. Of particular note, the audit highlighted the relatively high quality of the program's objectives, activities, and work planning, and recognized the contribution of the USAID GCP to this. The report also made a number of recommendations for improvements in the program. An action plan to implement priority recommendations is currently being developed by the Kimbe Bay team.

The program experienced some delays during the year related to community outreach, establishment of new LMMAs by interested communities, and creating a comprehensive community-based monitoring program. These were mostly due to one-time staff-related circumstances that should not continue to affect progress in this area. We have also established a community development team within the program, comprising a coordinator and four facilitators, who will take on responsibility for many of these activities. Unfortunately, progress on identifying and implementing sustainable financing options continued to be delayed during FY06. A viable long-term financing plan must be based on sound cost estimates that can only be calculated once the details of the network are decided and once the management arrangements and responsibilities are developed and put in place. Now that the initial MPA design is complete, better performance on this component of the project is expected next year.

Objective 1: Increase understanding of the importance of marine ecosystems and ensure long term support for their conservation by local communities and other stakeholders in Kimbe Bay.

Activity 1.1: *Build community awareness and promote marine conservation approaches among interested communities.*

Results Anticipated in FY06:

- At least seven communities have initiated specific activities to conserve and sustainably use their marine resources as a result of awareness activities and technical assistance provided by the project.
- Experience gained working with these communities provides a solid basis for engaging other communities in Kimbe Bay in conservation strategies, including development of a network of MPAs that includes LMMAs.

In October 2005, a meeting was held among the Kimbe team and their counterparts working with the TNC project in the Adelbert Mountains to exchange information on community engagement and to make recommendations on next steps to take in this area at Kimbe Bay. The conclusion of this meeting was to carry out focused education and awareness campaigns with the seven

villages that have expressed interest in working with the Conservancy and to provide technical assistance for the establishment of LMMAs.

In August, TNC hired as a Community Development Coordinator as part of the Kimbe Bay team; he had previously been the on-site coordinator for the socio-economic study conducted during the past year (see Activity 2.4). In addition, two Community Development Facilitators were hired in July, and an additional two in September. The team will begin full operations as of October 2006. During the first quarter of FY07, the former community development coordinator from the Adelberts project will be contracted to provide training for the team.

Boundaries for LMMAs in three communities—Tarobi, Ewasse, and Baikakea—have been marked out with full community participation. Submissions to formally gazette these areas under the recent LLG environment law have been prepared, and are expected to be approved by December 2006. In addition, baseline studies of the proposed LMMA sites in Ewasse and Baikakea were conducted in August; the Tarobi LMMA baseline was not completed because of the temporary relocation of Tarobi villagers due to volcanic activity in that area. We are hopeful this work can be completed in October 2006.

Follow-up contacts have been made with the other communities in eastern Kimbe Bay that expressed interest in creating LMMAs. A detailed plan and schedule for working with these communities has been developed by the Community Development Coordinator with assistance from the recently-hired Pacific Island Countries Conservation Planner based in Brisbane. It will provide the basis for engaging with these communities in FY07.

Activity 1.2: *Increase Provincial, and Local Level Government Support for Conservation at Kimbe Bay.*

Results Anticipated in FY06:

- Support by Provincial and Local Level Governments for marine conservation in Kimbe Bay increased.
- Key PNG government agencies are aware of and support the MPA strategy for Kimbe Bay.

Stakeholder workshops were held in Kimbe town for stakeholders of the western side of the bay in Quarter 1 and in Bialla for stakeholders of the eastern side of the Bay in Quarter 2.

Participants in both workshops came from major private businesses, relevant government agencies, provincial administration, village leaders, LLG officials and politicians, and senior government officials. Positive feedback was received from most of the participants from the workshops – including from the Provincial Planning, Talasea District Administration, Talasea, Hoskins and Bialla LLGs and the private sector participants from NBPOL and Hargy. Two concrete examples of positive outcomes from these workshops are the final passage of the Bialla LLG environmental law (see Activity 2.1.1), which had been pending for some time, and the allocation by the Talasea LLG of financial support to its LMMA committee.

In addition, briefings of local and provincial government agencies in the Kimbe Bay area, to provide information and obtain their views on the results of the initial design options for the MPA network (see Activities 2.5.1 and 2.5.2), were held in August.

Activity 1.3: *Initiate consultations with key national government agencies and local industries to gain support for marine biodiversity conservation at Kimbe Bay*

Results Anticipated in FY06:

- Local Stakeholder partners, particularly in the industry sector, and others are well informed of the proposed Kimbe Bay marine conservation program.
- All governmental agencies at the national level are fully informed of the proposed Kimbe Bay marine protected area.
- Initial discussions with these agencies and industries of possible partnership in 2007.

Local industries in the Kimbe Bay area participated in the activities summarized under Activity 1.2 above. As one result, NBPOL has raised with us the possibility of TNC participation in a roundtable discussion on guidance and criteria for environmental standards for the oil palm industry.

A national stakeholder workshop with participation from national government agencies and others was held in early September 2006, to provide information and obtain their views on the results of the initial design options for the MPA network (see Activities 2.5.1 and 2.5.2). The participants at the workshop—which included all the key Government stakeholders (Department of Environment and Conservation, National Fisheries Authority, National Planning, Maritime and Safety Authority, Department of Transport), other Government Agencies and NGOS (e.g., CELCORE, WWF)—endorsed the vision for the ‘Kimbe May Marine Management Area’ and the MPA network design.

Activity 1.4: *Develop communications strategy and materials to support stakeholder engagement and partnership development.*

Results Anticipated in FY06:

- Increased level of government engagement in the establishment of the MPA
- Four LMMA established
- Increased support of Community leaders for LMMA and MPA establishment
- Increased willingness of NGO and tourism partners to collaborate on establishing MPA
- Passing of the Bialla LMMA legislation to support LMMA and MPA activities

A communication plan is in place which identifies how we can best communicate information to our target audiences using the most appropriate communication methods. It identifies the audiences we need to communicate with, the relevant communication materials needed, preparation of the appropriate communication materials and then disseminated outlines, the most appropriate medium through which to disseminate information to each of the audience identified. Our target audiences are:

- Communities, in particular the 15 located in “areas of interest” identified in the initial design of the Kimbe MPA (see Activity 2.5.1)
- Community leaders
- Local Level Governments
- Provincial and national governments

- NGOs
- Stakeholders (logging)
- Stakeholders (commercial agriculture)
- Stakeholders (hotel and marine operators—resorts, shipping)
- Stakeholders (other industries, e.g., oil palm companies)

For the communities, we plan on showing videos, doing oral presentations, presenting posters, pins, shirts, laplaps, stickers etc. to them for general awareness purposes as well as strengthening our partnership with them. For the government audiences and other stakeholders we want to present the initial design plan for conservation in the Kimbe Bay area and tell them that we will be willing to provide technical advice, and that they will make the decisions. Messages will be delivered through presentations, information briefs, reports and present awareness coffee mugs and laplaps etc.

Our main priority will be raising the awareness of community leaders and the communities in the areas of interest identified in the initial MPA design, and relevant government agencies and authorities. One of the major activity will be the preparation of materials for Turtle Awareness.

In addition, in 2005 we produced a poster presentation targeting the wider scientific community. The poster was presented at the 1st International Marine Protected Areas Congress (IMPAC) in October 2005. The poster raised interest in and the profile of the Kimbe Bay MPA Network.

Activity 1.5: *Identify potential partners and conservation “champions” among graduates of high school marine education program.*

Results Anticipated in FY06:

- Potential future partners and conservation “champions” identified among MEEP graduates.
- Data obtained on MEEP impacts to help strengthen and support future MEEP modules.

With funding from the Conservancy’s Asia-Pacific Partnership program, we worked with Mahonia na Dari to hire an intern to work with them. Rather than hire an outside consultant to conduct the follow-up MEEP study, we agreed with Mahonia to incorporate this task within the terms of reference for the intern. The intern will be co-supervised by the Conservation Scientist on the Kimbe Bay team. The contract with the intern was completed in September and a joint TNC-Mahonia work plan has been agreed upon. We expect this study will be completed by December 2006.

Objective 2: Design and implement a functionally-connected network of LMMAs and MPAs in Kimbe Bay.

Activity 2.1: *Put in place an appropriate legal and policy framework for the MPA*

Activity 2.1.1 *Facilitate the approval and implementation of a Local Level Government Marine Management Law by Kimbe LLGs.*

Results Anticipated in FY06:

- Bialla LLG approves the Marine Environment Management Law
- LMMA Advisory Committees for Talasea and Hoskins LLG established and functional.
- Advisory Committee and LLG members understand their roles and functions in the implementation of the LLG Marine Management Law.

The third and final LLG in the Kimbe Bay area—Bialla—passed an environment management law in June 2006, similar to legislation approved earlier by Hoskins and Talasea LLGs. A LMMA advisory committee, as provided for in these laws, has been established in Hoskins and an interim committee in Talasea. The Talasea committee is in the process of being formalized. Bialla is currently in the process of establishing its LMMA committee; formal appointment of the committee expected by the end of September.

The training for the three LMMA committees included in the FY06 implementation plan has been postponed until next year, pending formal establishment of all of the committees.

Activity 2.1.2 Identify appropriate legal instruments and implementing agencies under which MPA network can be established and managed

Results Anticipated in FY06:

- Draft outline of the MPA Law

At the national stakeholder workshop held in September (see Activity 2.5.2), discussions were held regarding an appropriate legal framework for the management of the Kimbe Bay MPA. Dr. Eric Kwa made a presentation which highlighted that a number of government agencies have or are attempting to insert in their legislation provisions for establishment of MPAs, and there is confusion as to which agency should be responsible for legislation regarding MPAs. Even existing legislation has deficiencies that need to be addressed to make them workable. At the workshop, it was agreed to convene another workshop to focus on governance issues. It will be held in mid October with all line government agencies and other NGOs. Dr. Kwa has been contracted to organize and facilitate this workshop, with support from the Kimbe Bay team.

Activity 2.2: *Expand and Strengthen the Participation of LMMAs as Part of the Kimbe Bay MPA*

Activity 2.2.1 Standardize the LMMA Process

Results Anticipated in FY06:

- Simple, easy-to-use guidelines for the creation and management of LMMAs available to interested communities and advisory committees in Bialla, Hoskins and Talasea LLGs.

The recently-hired Pacific Island Countries Conservation Planner has prepared a draft “community engagement” process based on the successful Adelberts project, is compatible with TNC’s Conservation Action Planning (CAP) process, and is adapted to the LMMA process. The draft has been sent to the Kimbe Bay team for their review and assessment of practicality. A meeting is planned for October 2006 to review the draft. As part of this, an earlier draft document on the process of establishing a LMMA, prepared by the Kimbe Bay team, will be adapted and finalized. The current vision is to produce a

document that sets out the process simply and in plain language for use with communities (and translated into Tok Pidgin), a more detailed set of guidelines for TNC Kimbe Bay staff to use, and eventually a set of training materials.

Activity 2.2.2 Implement community-based monitoring program for LMMAs

Results Anticipated in FY06:

- Basic community monitoring training completed for new LMMAs.
- Baseline studies conducted in collaboration with communities for new LMMAs
- Four new LMMAs monitored on a semiannual basis.

Monitoring training (based on the ReefCheck methodology) was provided for ten community representatives from the western Kimbe Bay in October-November 2005, and for six communities (as well as representatives from Manus and Kavieng) in June 2006. Baseline studies at the proposed LMMA sites in Ewasse and Baikakea were conducted in August; the Tarobi LMMA baseline was not completed because of the temporary relocation of Tarobi villagers due to volcanic activity in that area. We are hopeful this work can be completed in October 2006.

Three women were trained in LMMA socio-economic monitoring methods in western Kimbe Bay. These women, Ruth Kura, Julie Meta and Antonia Giru, came from Pasiloke, Patanga and Garile villages, respectively, in the Talasea LLG area. Baseline monitoring in these women's communities was completed in May 2006.

A comprehensive community-based monitoring program, based on a review of various monitoring methodologies, was drafted by the Community Conservation Specialist on the Kimbe Bay team. It is currently being reviewed by the Melanesia Marine Scientist and a finalized version will be available in November 2006.

Activity 2.2.3 Conduct and analyze results of long-term scientific monitoring and compare with results of community-based monitoring

Results Anticipated in FY06:

- Analyses of conservation results of LMMAs based on long-term scientific monitoring that can be used for improved management.
- Methods developed to compare results from scientific and community-based monitoring as input to LMMA component of long term Kimbe Bay MPA monitoring plan.

Continued annual monitoring by James Cook University was conducted again this year. A contract for an additional three years of monitoring by JCU was executed.

Time-series analysis of the JCU monitoring data over the past eight years indicates that the live coral cover for the reefs which JCU has monitored has steadily declined. The decline seems to be exacerbated by a number of factors, including recent coral bleaching events and the smothering effect of the corals by sedimentation. The decline in coral cover caused a parallel decline in fish biodiversity, both in marine reserves and in areas open to fishing. Over 75% of reef fish species declined in abundance, and 50% declined to less than half of their original numbers. The greater

the dependence species have on living coral as juvenile recruitment sites, the greater the observed decline in abundance. Several rare coral-specialists became locally extinct. A conclusion by JCU researchers based on this monitoring effort is that fish biodiversity is threatened wherever permanent reef degradation occurs; marine reserves will not always be sufficient to ensure their survival.

The monitoring by JCU is limited to reefs in the western end of the bay, along the Williamez peninsula. Most of these are inshore fringing or patch reefs. Therefore, the results do not reflect the conditions of reefs elsewhere in the bay, including in the eastern region. The biophysical regime prevailing in the area of study is thought to be different from that existing elsewhere in the bay, where the area of study is basically in an enclosed area, which limits the influence of high energy waves and oceanic currents to flush out the sediments that settle on the nearshore fringing and patch reefs. For this reason, one should interpret the JCU results with caution and not generalize to the whole bay.

Preliminary comparisons between the JCU monitoring results and community-based monitoring results in LMMAs have been made. Unfortunately, meaningful comparisons between these two methodologies have been extremely limited by three factors: (1) a very minimal amount of community based monitoring data has been collected within the LMMAs of interest; (2) many of the species that are monitored by JCU were not identified as targets by community monitors; and (3) different sampling methodologies have been used, and are not directly comparable. Clearly, there is a need to select key target species that have been shown by scientific monitoring to respond positively to protection, and make these targets the focus of a more rigorous and better supported community based monitoring efforts. The Melanesian Marine Scientist and the Community Conservation Specialist are working on such a plan and it will be complete by December 2006.

Activity 2.3: *Enhance biophysical scientific input into MPA network design*

Activity 2.3.1 Improve understanding of currents through modeling

Results Anticipated in FY06:

- Review of published literature on the Bismarck Sea and regional circulation
- Description of the wind and tidal regime of the Bismarck Sea
- Map of the seasonal and inter-annual circulation patterns from observed and modeled data
- Animation of the surface circulation from a numerical model
- Summary of oceanographic processes observed in satellite imagery: regions of upwelling, river plumes, fronts and comparisons with model.
- Recommendations on further research required for Kimbe Bay.

A broad scale hydrodynamic model of the Bismarck Sea has been completed by the Australian Institute of Marine Science. This model provides a good representation of ocean currents at the regional scale. The results of this study have provided important information for understanding patterns of connectivity within the Bismarck Sea.

The broad scale model also provides some indication of hydrodynamic patterns within Kimbe Bay. Limited information available at this scale indicates that the east and west side of the bay tend to be different in terms of their hydrodynamic regimes. This pattern is confirmed by patterns in biological communities (e.g., fish community types are different on east and west sides of the bay). Based on this information, the MPA design was stratified into two sections (east and west) to take into account best available information on connectivity within the bay.

Further studies are now required to understand more about biological patterns of connectivity within Kimbe Bay and the Bismarck Sea. The broad scale model of the Bismarck Sea has provided a strong basis for finer scale hydrodynamic modeling to be conducted within Kimbe Bay. AIMS and JCU are currently advertising for a PhD student to conduct fine scale modeling of Kimbe Bay, to complement the biological studies of connectivity in the bay. Once completed, these studies will allow us to further refine our understanding of biological patterns of connectivity in Kimbe Bay and the Bismarck Sea, which will be used future iterations of the MPA design.

Activity 2.3.2 Identify and verify reef fish spawning aggregation at Kimbe Bay

Results Anticipated in FY06:

- Priority spawning aggregation sites verified and subsequently incorporated into first generation of MPA design options.

In April 2006, eight potential SPAG sights were surveyed. Several of these sites had been surveyed previously in March 2005. At three of these, spawning aggregations were confirmed, bringing the total number of confirmed sites in Kimbe Bay to six. All verified SPAG sites were incorporated into the initial MPA design, with verified multi-species sites included as the highest priority sites. SPAG sites that have been identified through local knowledge surveys but not yet independently verified were given a low priority ranking in the initial MPA design.

Activity 2.4: *Enhance understanding of socio-economic issues as input into MPA network design*

Results Anticipated in FY06:

- Socio-economic information and recommendations – including marine tenure, access rights, perceptions of marine reserves, marine resource use and value, and cultural areas of significance – reflected in initial MPA design options.

The socio-economic study, conducted in six coastal villages in the Kimbe Bay area, was completed. Results were available at the July MPA design workshop (see Activity 2.5.1). The study has increased our understanding of resource uses, cultural factors, gender roles, and other important socio-economic considerations that will inform overall management of the Kimbe Bay program. In addition to contributing to the MPA design, study results will also inform our two other, complementary conservation strategies for Kimbe Bay (see Objective 3). A summary of the key findings of the study is attached as Annex A to this report.

Activity 2.5: *Design a multi-use Marine Protected Area Network for Kimbe Bay*

Activity 2.5.1 Generate initial design options for review by key stakeholders

Results Anticipated in FY06:

- First draft of the Kimbe Bay MPA design completed

TNC staff were trained in analytical software for marine reserve design (MARXAN) by TNC's Global Marine Initiative experts at an Ecosystem Based Management Workshop in Brisbane in March 2006. High priority research and stakeholder input for MPA design was also completed in March, and the results were digitized into GIS layers. A Second Scientific Workshop was held in Brisbane (April 2006) to review and refine the data layers, and to work out how to use this information to apply biophysical and socio-economic design principles using the MARXAN software. Based on this, design options for MPA network generated in May-June.

These design options were reviewed at a Third Scientific Workshop in Kimbe Bay (July 2006), and first iteration of the MPA network design was developed for stakeholder consultation. The design identifies "Areas of Interest" where we will work with local communities to effectively conserve their marine resources. Manual accounting has shown that the first iteration of the design has been successful in applying the design principles and addressing stakeholder interests. The final iteration of the design will be developed based on further input from key stakeholders.

At the Third Scientific Workshop, substantial progress was also made towards an integrated implementation plan for the MPA network and two other strategies (marine resource management and land use management) for Kimbe Bay. This includes a plan for integrating CAP targets and key ecological attributes (KEAs), and a revised plan for technical consultations with stakeholders.

Activity 2.5.2 Conduct consultations with key stakeholders on initial design options

Results Anticipated in FY06:

- Stakeholder input reflected in draft MPA design

We consulted widely among key stakeholders to raise awareness of the proposed MPA network, and to understand their needs and interests. During our meetings with key stakeholders, it became clear that there were few technical counterparts from partner organizations who may be willing and able to participate in the technical design process. For this reason, we decided that that best option was to make sure we understood their needs and interests as best we could, so we could incorporate them in the MPA design, but to limit participation in the July design meeting primarily to TNC staff.

Stakeholder interests were used as some of the primary data layers for developing the first iteration of the MPA network design. Key information used included areas where communities are and are not interested in MPAs, areas that are already under some form of protection (e.g., LMMAs, tambu or spirit areas, dive sites), and areas to avoid due to incompatible use (e.g., ports and shipping channels, towns, large scale agriculture, etc.). Manual accounting has shown that

the first iteration of the design has been successful in addressing the needs and interests of key stakeholders.

The first iteration of the MPA design comprises “Areas of Interest” (see Annex B) where we will work with local communities to effectively conserve their marine resources. However, it will be the communities themselves who decide what areas to protect within these Areas of Interest (with strategic advice from TNC), since they are the resource owners and decision makers.

Two stakeholder workshops were organized to discuss the initial design options developed in July. The first was held in Kimbe in August, attended by 50-60 participants, including senior government agency representatives, LLG presidents and ward members, NGOs and industries. A report of the workshop will be circulated to all participants, as well as government offices, industries and others. The meeting resulted in a strong endorsement of the first iteration of the proposed MPA design.

The second was held in Port Moresby on September 12, to engage national government agencies and other important stakeholders at that level. The workshop was hosted by TNC and the Bialla, Hoskins and Talasea LLGs, and was attended by over 30 participants. Key Government Agencies (e.g., Department of Environment and Conservation (DEC), National Fisheries Authority (NFA), Transport Department, Maritime and Safety Authority), other Government departments (e.g., Foreign Affairs) and the NGO community all attended the workshop. The National Stakeholder workshop endorsed the ‘Kimbe Bay Marine Management Area’ vision and the MPA network design. Workshop participants accepted the MPA design as presented and were most impressed with the level of technical work that went into the design. There was unanimous support for the MPA as it met the country’s obligation to establish protected areas and protect and manage its marine resources. In particular, NFA fully supported the MPA design as it was consistent with its new drive to get the local communities to be involved in resource management.

Activity 2.6: *Verify and initiate monitoring of turtle nesting beaches in eastern Kimbe Bay*

Results Anticipated in FY06:

- Estimate of leatherback turtle nesting population within Kimbe Bay
- Location of turtle nesting beaches incorporated into MPA design options
- A regular turtle nesting monitoring program designed

Turtle local knowledge surveys and field verification in the western side of Kimbe Bay (the peninsula) was completed. At least three species (green, hawksbill, leatherback) nest there, but numbers of nesting turtles is unknown. General areas of nesting beaches were identified. Ground-truthing surveys on turtle nesting beaches in eastern Kimbe Bay conducted in first quarter of FY06 verified three turtle nesting beaches. In addition to these beaches, a small island (Lilua Islet) off Tarobi village was also identified as a nesting island for turtles where three nests were found during the survey. Seasonality was also identified through local knowledge surveys: the leatherback nesting season is from January to March. Information on these sites was included in the data on which the initial MPA design options were developed.

A monitoring program for these turtle nesting beaches is being developed. Questionnaires have been distributed to villagers in the vicinity of the nesting beaches to be used to record sightings and other information on turtles. Two of the three nesting beaches in the eastern bay are near communities that have expressed interest in establishing an LMMA. Data collection will form part of LMMA monitoring in these areas.

The TNC Conservation Scientist conducting these surveys found evidence of local consumption of leatherback turtles on two of the three nesting beaches. As a result, we are placing priority on developing awareness materials on turtles, and integrating these into LMMA training, where appropriate. Community development facilitators have undertaken general consultations and awareness activities in nearby communities. Turtle awareness materials are being developed, based on the RARE/Pride campaign model.

Objective 3: Develop other long term strategies for marine conservation in Kimbe Bay with the full participation of major stakeholders

Activity 3.1: Complete and Communicate Results of Conservation Action Plan for Kimbe Bay

Results Anticipated in FY06:

- CAP documentation for Kimbe Bay provides scientific foundation for strategy development
- Results of CAP reviewed with stakeholders and their input obtained to inform strategy

The CAP documentation envisioned in this year's work plan was completed. This included a viability assessment of estuaries, and a "situation analysis" for some targets and threats that provides insight into the complex connections among a number of factors in Kimbe Bay and helps inform strategy. Results of the CAP process were presented and discussed with stakeholders in the Kimbe Bay area in December 2005.

As noted in the introduction to this report, in June 2006 a Conservation Audit was conducted of the Kimbe Bay program. The audit resulted in a number of findings and recommendations related to the CAP process. Among these were the need to fully reconcile the CAP conservation targets with those being used in the MPA design process; to reassess and more fully document the rationale for the selection of targets; to upgrade the CAP workbooks to the latest version to include Key Ecological Attributes (KEAs) in order to provide a clearer understanding of target viability and to inform the selection of objectives and performance indicators; and to expand the situation analysis to other threats.

The CAP targets were reconciled with the MPA design network targets and principles as part of the MPA Network design workshop in July 2006. The CAP targets provided broad surrogates of biodiversity within which finer scale MPA network design targets were nested. This finer breakdown allows the full scope of environmental and geographical variation to be sampled by MARXAN when developing the MPA network design. It also ensures that key design principles, particularly in relation to representation and replication are effectively considered.

The Kimbe Bay team and Melanesia Program Director are currently developing an action plan to implement the other major recommendations of the Conservation Audit.

TNC is currently developing a “Rapid CAP” methodology for use with stakeholders in situations like Kimbe Bay. This methodology is currently being piloted in a few sites, and is expected to be ready for wider application in 2007. We decided to wait until the key recommendations of the Conservation Audit are incorporated into the Kimbe Bay CAP and until the Rapid CAP methodology is further tested before producing a simplified version of the CAP for local communities.

Activity 3.2: *Develop strategy to discourage land use practices that result in sedimentation and other run-off into the marine system.*

Results Anticipated in FY06:

- Improved understanding of current land use practices and approaches to promoting better land use practices
- List of improved land use options for villages

TNC continued to have discussions with NBPOL representatives regarding the conclusions of the land use study conducted in November 2003. In past discussions, NBPOL had expressed concerns about the data used for a model in the study to calculate the relative contribution of oil palm and forestry to sedimentation in the bay. At the most recent meeting, in August 2006, NBPOL was much more collaborative and accommodating than in previous discussions of the report, and agreed to look again at the report and offer constructive comments, with a view to finally publishing the report.

As described in our implementation plan for FY06, a complementary land use strategy study was carried out this year by a consultant. It included a literature review and field study on site in Kimbe Bay. The study identified six major land uses in the area:

- palm oil plantations;
- village gardens;
- other cash crops;
- commercial forestry;
- small scale forestry; and
- urban and infrastructure development.

The study found that there are strong linkages between the different land uses. For example, expansion of village gardens and their displacement to steeper areas is driven to a large extent by oil palm development (both through oil palm being planted on areas previously used for food production, and rapidly increasing population being drawn to the area to work on oil palm plantations or settlement schemes). Commercial logging is often followed by oil palm development, and coconut and cocoa plantations are being replaced by oil palm in many areas. Urban and infrastructure development is also being driven to some extent by oil palm industry development.

Natural processes such as land-slips can also contribute to erosion and sedimentation, and can be exacerbated by poor land-use practices. Similarly, forest fires can have a major impact when conditions favor them, such as in 1998 when dry weather associated with the El Nino event led to large-scale fires in many areas (probably exacerbated by increasing fragmentation of forests).

The study identified a number of land-use strategies and actions, including:

- Improve knowledge of current land-use and likely future developments;
- Work directly with land-users to increase awareness of impact of gardening practices on water and focus on improving practices;
- Work with oil palm companies, local/regional authorities, and donors to find ways of providing suitable areas for gardening in and around oil palm plantations and settlement schemes; and
- Cooperative engagement with oil palm companies to improve their practices.

These studies will be used to guide further development of our strategies to address threats to coastal and marine biodiversity from land use practices.

Activity 3.3: *Develop strategy to promote sustainable resource use and management by eliminating destructive and unsustainable exploitation of marine resources, especially fisheries.*

Results Anticipated in FY06:

- Process and agenda for developing specific marine resource use strategy developed.

Planning for the development of a marine resource use strategy for Kimbe Bay was discussed at the July MPA design workshop. It was agreed to give attention to developing this strategy over the coming year, including updating the threats analysis in the CAP. The strategy will be completed in FY07.

Objective 4: Identify and implement sustainable financing options for the Kimbe Bay MPA network.

Activity 4.1: *Conduct a cost analysis by Conservation Area Planning (CAP) strategy and management action*

Results Anticipated in FY06:

- Detailed estimates of conservation costs for the MPA network and land use strategies identified in the CAP for Kimbe Bay

As noted in the FY06 implementation plan, work to identify and implement sustainable financing options will follow completion of the detailed MPA design and other conservation strategies for Kimbe Bay. These were not done with sufficient time to allow progress to be made on the sustainable financing activities this year. However, now that the MPA design has been developed and has received positive feedback from local and national stakeholders, we expect that these activities will finally proceed in FY07.

Activity 4.2: *Identify and initiate design of specific finance mechanisms*

Results Anticipated in FY06:

- Preliminary conservation finance mechanisms identified and under final review before being tested.

Delayed until FY07.

Activity 4.3: *Prepare sustainable financing conceptual framework and scenarios as input to MPA network design*

Results Anticipated in FY06:

- A sustainable financing conceptual framework developed and different financial scenarios designed.

Delayed until FY07.

Objective 5: Design and begin implementation of a Bismarck Sea MPA network.

Activity 5.1: *Conduct reef fish spawning aggregation awareness and management at Tigak and Manus*

Results Anticipated in FY06:

- Two-year monthly spawning aggregation seasonal trend result.
- National Fisheries Board presentations on progressive seasonal monitoring results with recommendations for seasonal and annual closures.
- Bathymetric mapping of two key SPAG sites in Kavieng and three key SPAG sites in Manus.
- Recommendations on spawning aggregation management strategies provided to Manus Provincial Government.

A central element of the grouper spawning aggregation work in Kavieng and Manus has been monthly monitoring programs at three aggregation sites in Manus and two aggregation sites in Kavieng. The data collected through these monitoring programs over the past two years has been analyzed. Monitored grouper aggregations in Manus are much larger and in better health than aggregations in Kavieng. Seasonality is very similar between all sites, with aggregations of brown-marbled grouper (*Epinephelus fuscoguttatus*) and the squaretail coral grouper (*Plectropomus areolatus*) peaking between the months of March, April, May and June each year. Smaller aggregations of *P. areolatus* occur at all sites and locations throughout the year. At most monitored sites local fishers report improvements in grouper abundances following management. The perceived improvement among local fishers is clear from the monitoring data collected from the aggregation site at Dyual. This site was heavily fished for the live reef food fish trade (LRFFT) in 2003 and completely closed to all forms of fishing in 2004. Bathymetric maps of all five sites were made in 2006 and these 3D maps are being used to aid in the spawning aggregation research.

The LRFFT was allowed into Manus in July 2005, and unfortunately one of the monitored sites in Manus was opened up to the LRFFT. Monitoring results show a very rapid decline in the abundance of *P. areolatus* at this site following LRFFT activities. Data from this site and

surrounding unfished “control” sites provides the first example in the world where we have information before, during, and after LRFFT activities at a spawning site, and a preliminary paper outlying these findings is currently in press:

Hamilton R and Matawai M (*In Press*). Live reef food fish trade causes rapid declines in abundance of squaretail coral grouper (*Plectropomus areolatus*) at a spawning aggregation site in Manus, Papua New Guinea. *SPC Live Reef Fish Trade Bulletin*.

Ongoing monitoring will help confirm the impact of the LRFFT and also allow assessment of the rates of recover at protected sites. It is noteworthy that while one community on Southern Manus opted to enter into the LRFFT, others have not. The Pere community recently decided to ban all fishing at its spawning site (previously subsistence fishing was allowed) and they have also set up additional MPAs. The story of the Pere and surrounding communities’ struggles to conserve and manage their spawning aggregations has been captured very effectively in several awareness videos (in English and Tok Pidgin).

We now have a good knowledge of seasonality for these species, which puts us in an excellent position to recommend seasonal closures for Manus and Kavieng. Unfortunately, the PNG National Fisheries Authority has yet to invite TNC to speak about the LRFFT and management options. However, in August 2006, Dr. Richard Hamilton gave a presentation to the Manus Provincial Government Administrator and all of the Assistant Administrators on the importance of conserving spawning aggregations and the results of the Manus monitoring program. This talk generated a lot of interest, and there was much discussion among administrators about completely banning the LRFFT in Manus or introducing a seasonal ban (February to July) on the LRFFT at a Provincial level. We will be following up on this.

Recently, Dr. Hamilton received a \$50,000 grant from the National Fish and Wildlife Foundation to assess the degree of connectivity between protected spawning aggregation sites and grouper nursery areas in Manus. This research will be done in collaboration with staff from JCU, and will provide a framework for designing a connected resilient network of MPAs in the Manus region. This research will also help to fine tune MPA network design protocols for the Indo-Pacific.

Activity 5.2: *Provide support to program implementation by TNC field offices in Kavieng and Manus*

Kavieng Field Base

Results Anticipated in FY06:

- Enhanced field presence of TNC in Kavieng area and improved coordination with activities of partner organizations.
- Monthly spawning aggregation monitoring
- Coordination of Tigak/New Hanover Marine Assessment
- Active member of partner coordinating committee

TNC’s Kavieng office continues to be a base for coordination and collaboration with partners for marine conservation in this region. TNC serves as the secretariat for the New Ireland Marine

Assessment Coordinating Committee chaired by the PNG National Fisheries Agency (NFA). This committee coordinated the implementation and logistics for the REA conducted in August 2006 (see Activity 5.3). It will also serve as the central dissemination point for REA findings. The office coordinates twice-monthly monitoring of spawning aggregation sites in the area; during the year, TNC hired two field assistants for SPAGs monitoring working out of this office. In addition, TNC Kavieng staff sponsored and accompanied two community representatives to participate in the PNG LMMA network meeting held in July 2006.

Manus Field Base

Results Anticipated in FY06:

- Enhanced field presence of TNC in Manus and improved coordination with activities of partner organizations.
- Monthly monitoring of spawning aggregations.
- LLG Environment and Conservation Law drafted.
- Community Awareness on Destructive Fishing Practices and LLG Environment Law
- Drova Island LMMA discussed and developed with all stakeholders

TNC established a permanent office in Manus at the Lorengau Harbourside Hotel, a local partner. This has improved TNC visibility with other NGOs, who often use our office. TNC is a member of the Manus Marine Assessment Coordinating Committee that provided support for the REA in this region conducted in August (see Activity 5.3). Other members include WWF, NFA, the provincial government, LLG, Lorengau Harbourside Hotel, National Broadcasting Commission, and Manus Tourism Office.

As with the office in Kavieng, the Manus office coordinates monthly SPAGs monitoring, and hired two field assistants this year for this work and community awareness activities. In addition, the field base has coordinated with other community based organizations in Manus to collate and distribute Live Reef Food Fish Awareness materials in response to the industry presence in the province. As a result of the awareness activities, many communities have begun to reject the industry presence in the province. The field base also coordinated and hosted contractors filming a reef fish spawning aggregation awareness video. The awareness video will be used to raise the profile and targeting of reef fish spawning aggregations and their vulnerability to over fishing.

Development of a LLG environmental law for Pere, modeled after similar legislation in Kimbe Bay, has been slightly delayed. Creating an LMMA on Drova Island is linked to enactment of this legislation, so was also delayed. A lawyer has been contracted and is currently working on a draft of the legislation for consideration by the Pere LLG. It is expected that this will be completed before the end of 2006.

Activity 5.3: Conduct ecological assessments and collect baseline data

Results Anticipated in FY05:

- Marine assessment completed for the Tigak Islands, New Hanover and Djaul Islands and Manus province.

- Baseline field survey completed for Drova Island in Manus.
- Recommendations on high conservation and resilient reefs for conservation.

A rapid ecological assessment was conducted in the Northern Bismarck Sea from 13 August to 6 September 2006, and focused on two key areas of interest to the Conservancy: Manus Island and offshore islands reefs in Manus Province, and Tigak Islands and New Hanover in New Ireland Province. The survey comprised two components: an assessment of coral reef diversity and reef health, and an assessment of marine resources of importance to government and local communities (key fish species were surveyed, and a survey of key macroinvertebrates will follow in the next few weeks). The survey was conducted in partnership with national and provincial government agencies, local communities, and other key partners in these two areas (WWF in Manus, WCS, Gillet Preston and Associates).

The survey confirmed that the Northern Bismarck Sea is an area of high biodiversity, including over 400 species of coral in both areas surveyed. In Manus, coral reef communities are in excellent health, although there was some damage for the recent severe storms in the area and localized incidences of dynamite fishing on some coastal reefs. The reefs in Manus were also outstanding in terms of their healthy populations of coral reef fishes, including large and vulnerable species. These were some of the healthiest coral reef communities we have seen for a long time. Unfortunately, the reefs in New Ireland were not in such good condition, with some reefs seriously affected by Crown-of-Thorns starfish and coral bleaching. Fishing also appears to be more of a concern in New Ireland, with fewer large reef fish observed.

Information from the REA will provide a basis for designing a large scale network of MPAs in the Bismarck Sea, and enrich existing ecoregional-scale planning efforts for the Bismarck Sea.

Annex A

Summary Findings of Socio-Economic Study of Six Coastal Villages in Kimbe Bay

The socio-economic study was conducted in six coastal villages in Kimbe Bay (from west to east): Kulungi, Gaungo, Tarobi, Baikakea, Potou and Baea villages. The study findings revealed that these communities rely heavily on both land and marine resources to meet everyday subsistence and cash income needs, and much of their cultural identity, beliefs, and ancestral stories draw on elements from the marine environment.

The coastal plains between Kimbe and Bialla have the highest population densities in the province at 130 persons/km². The study indicates that over one-third of the population have migrated to the area from elsewhere in the province and mainland PNG. Resource owners in Kimbe Bay are facing several challenges, including as (a) changing village socio-political systems, (b) high population growth rates (both urban and rural), (c) poaching of marine resources, (d) increasing use of destructive fishing methods, (e) rising cash needs, and, (d) in some areas, the loss of traditional income sources like copra and cocoa. These environmental, social and economic changes are affecting local marine management systems and are presenting challenges for the design of effective MPAs.

From the study, two key intersecting processes affect the use of marine resources in Kimbe Bay: (1) the high rate of population growth and (2) the rising cash needs of villagers which are changing people's relationships with land and marine resources, leading increasingly to the commercialization of natural resources throughout the Bay.

Despite a decreasing reliance on a subsistence-based economy, fish and shellfish are major dietary items, alongside garden produce, in all six study villages. The most frequently consumed fish species reported by coastal communities in declining order of importance were Trevally (Batbat), Mullet (Karua), Rabbit-fish (Kalili), Tuna (Atun) and Surgeon Fish. Trevally was consumed by 77% of households across all villages, while Mullet, the second most frequently consumed species, was mentioned by half of sample households. Compared with fish catches, a much larger proportion of shellfish meat is for subsistence purposes rather than for cash income generation. In declining order of importance, the most important types of shellfish consumed across all villages were: Kina, Strombus spp, Burrowing Giant Clam and Ark Clam.

The balance of terrestrial and marine-based livelihood strategies is evident and varies between the six study villages. It is also discovered that the utilization of marine resources and the types of cash income activities pursued in each village reflect, to an extent, the degree of accessibility of each village. Villages which are relatively remote from towns and markets are more dependent on marine resources for their subsistence needs and cash incomes than those with high market accessibility.

There tends to be an inverse relationship between dependence on export cash crops and exploitation of marine resources for cash income (which also relates to the accessibility of each village). Oil palm/cocoa was the most frequently top ranked income source for both men and women in the three most accessible villages of Kulungi, Baikakea and Gaungo. For Tarobi Village, which was fourth on accessibility, oil palm was the most frequently top ranked income source for men, and Bislama for women. Fish sold at local markets was the most frequently top ranked income source for both men

and women in the two most isolated villages of Potou and Baea. The survey also revealed that commercial fish trade is not well developed in Kimbe Bay.

In all six study villages, people perceived, to varying degrees, a reduction in the abundance of commonly harvested marine resources. Trochus shell and beche-de-mer (both sold commercially), were the only marine species identified across all six villages as declining significantly in numbers. The commonly harvested Kina shell, from mangrove habitats, although still widely available, was recognized as declining in abundance by Gaungo, Tarobi, Baikakea and Baea villages. The villages that perceived the greatest changes in the abundance of shellfish and other invertebrates were those villages closest to urban centers and large population concentrations, namely Kulungi, Gaungo and Baikakea villages.

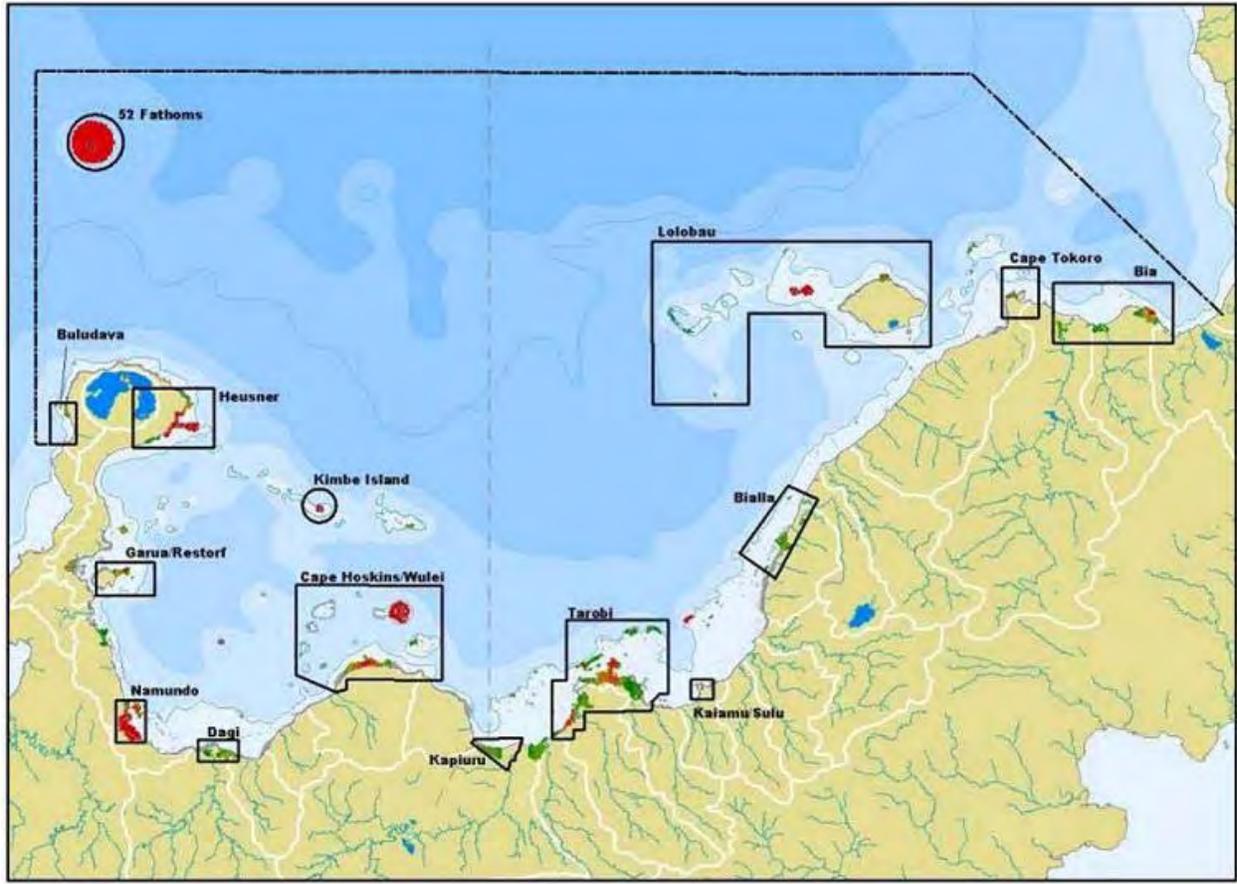
From the findings, the most common explanations given for the decline in the abundance of specific species were the over-exploitation of marine resources, changes to marine habitats and destructive fishing methods. The poaching of marine resources by 'outsiders' was considered to be an important factor explaining declining stocks of marine resources by people living in villages near urban centers, land settlement schemes or oil palm plantation compounds where large numbers of migrants reside.

The deterioration of marine habitats noted by several villages to explain species depletion is notable for its geographical concentration around villages close to urban centers, major waterways, smallholder and estate oil palm holdings, and areas experiencing other significant land-use change, particularly forest clearance. Mangrove systems, estuaries and inshore sandy flats were identified by Kulungi, Gaungo, Baikakea and Tarobi villagers as those habitats undergoing most change. The least accessible villages of Potou and Baea were the only villages where marine habitats were perceived by the residents to be in good condition.

While there is a perception among coastal communities that the over-exploitation of some marine resources, the use of destructive fishing methods and certain land-use practices are leading to changes in the abundance of marine resources and the quality of marine habitats, few strategies have been implemented to address these problems. Despite the lack of action to overcome these environmental issues, many villagers acknowledge that these problems require urgent attention. All coastal communities visited during this study showed support for further conservation awareness and the potential adoption of LLG Marine Environment Law.

Key recommendations to be incorporated would include: (a) develop good relationships with marine resource holders; (b) incorporate local knowledge and local management and tenure systems into measures to protect and conserve the marine biodiversity of Kimbe Bay; (c) develop marine conservation strategies that accommodate the economic requirements of people resulting from population growth and the rising material aspirations of the population; (d) reduce dependence on marine income sources by encouraging the rehabilitation of cocoa and coconut smallholdings in isolated villages now that new buyers (e.g., KBSA and Agmark) are entering the market; (e) continue and expand education campaigns in Kimbe Bay; (e) identify conservation champions in the community and villages to engender community support for the design and introduction of local MPAs; and, (f) conduct further fisheries research and livelihood studies to improve understanding of how different livelihood strategies pursued by villages affect their use of marine resources.

Annex B



MPA Network Design: Areas of Interest