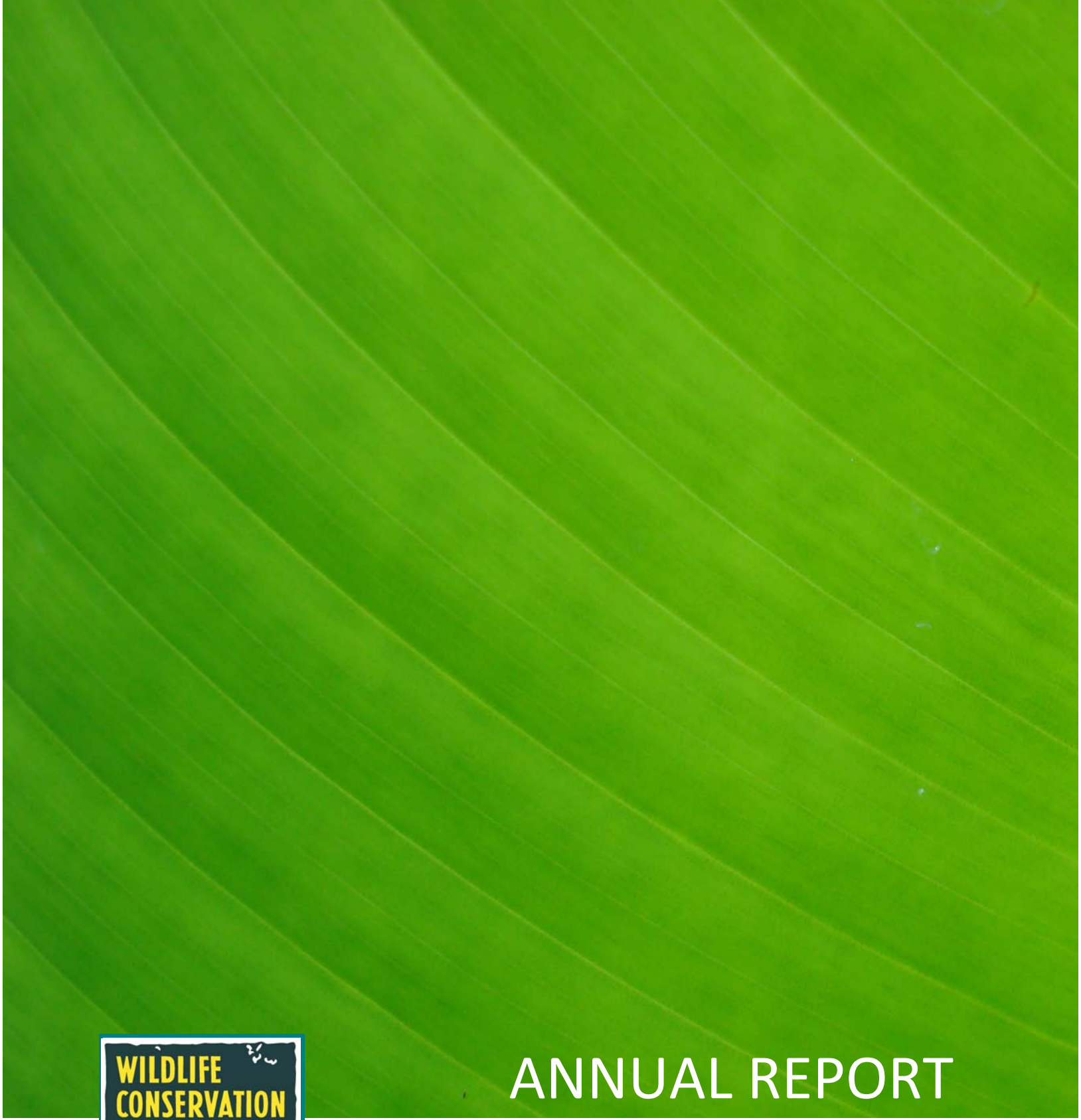

ANNUAL REPORT

WILDLIFE CONSERVATION SOCIETY
FIJI COUNTRY PROGRAM 2012

EXECUTIVE SUMMARY

This report highlights the Wildlife Conservation Society (WCS) Fiji Country Program's achievements from January to December 2012. Our Science, Management and Communication activities continue to focus on three main themes: (1) integrating ecosystem-based management principles into planning for natural resource management and strategies for climate-change adaptation; (2) designing protected area networks that confer resilience to climate change disturbance and preserve ecosystem services; and (3) strengthening local and national capacity for management planning and enforcement.

In 2012, our collaborative scientific studies focused on:

- Assessing the impact of periodic harvests of tabu areas on achievement of short-term and long-term objectives;
- Designing resilient marine and terrestrial protected area networks, including those linked across land and sea, to meet local and national objectives;
- Predictive spatial mapping of factors potentially related to reef resilience;
- Identifying transmission pathways of benign bacteria between social groups; and
- Assessing the status of cetacean populations around Vatu-i-Ra Reef.

In our efforts to help strengthen natural resource management across Fiji, WCS Fiji:

- Replicated the Kubulau EBM plan model to adjacent districts of Wainunu (Bua) and Wailevu (Cakaudrove), as well as assisted Nadi and Solevu districts (Bua) to initiate management actions;
- Enabled Kubulau District to adapt their EBM plan to improve resilience to climate impacts;
- Increased capacity for monitoring and enforcement by facilitating fish warden (refresher) trainings for Wainunu, Kubulau and Wailevu districts;
- Provided oversight to development of roadmap for ICM plan for Ra and Bua provinces; and
- Increased local capacity to design resilient MPA networks and respond to coral bleaching crises.

In 2012, WCS Fiji launched an educational comic book, “The Adventures of Joji Goby”, at 5 primary schools in Kubulau and Wainunu district. We also communicated outputs from our work at the 12th International Coral Reef Symposium in Cairns, Australia and the Society for Conservation Biology Oceania meeting in Darwin, Australia. In addition, the Kubulau EBM model was selected as one of the top 10 finalists in the Rareplanet Solution Search: “Turning the Tides for Coastal Fisheries” (http://www.rareplanet.org/challenge), and was recognized by The Prince’s Charities International Sustainability Unit as a successful model of fisheries management (http://www.pcfisu.org/marine-programme/case-studies/fijian-subsistence-fisheries).

Lastly, WCS Fiji has maintained a strong presence on national and regional committees and steering groups, including the: Protected Area Committee, Integrated Coastal Management Committee, and Fiji Locally Management Marine Area network Executive Committee and various working groups. Through these organisations, WCS Fiji has worked to help achieve national objectives in biodiversity protection, conservation planning, coastal management and climate change preparedness.

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INTRODUCTION

This report highlights the Wildlife Conservation Society (WCS) Fiji Country Program's achievements in Fiji from January to December 2012. WCS Fiji activities at the beginning of the year focused on strengthening district scale management. Our staff undertook a considerable number of consultations with village leaders and the Kubulau Resource Management Committee to finalize an adaptive management cycle in Kubulau District. The adapted EBM plan was approved by the Kubulau Bose Vanua in March. At the same time, WCS Fiji staff consulted with newly formed resource management committees and decision-makers in Wainunu, Nadi and Solevu (Bua) and Wailevu (Cakaudrove) district to develop management actions and build their capacity for management implementation.

In April, WCS staff collaborated with Institute of Applied Science staff from the University of the South Pacific (USP) to assess the impact of a two week opening of the Navakavu tabu area after 10 years of protection. Combined with the results of an earlier (2008) intensive harvest from a tabu adjacent to Kia Island, Macuata, which we published early this year, WCS Fiji used the information to develop a compelling case for a broad-scale research project to identify the thresholds at which tabu areas in Fiji could be harvested to provide some short-term socioeconomic benefits without compromising long-term food security. This project received funding in October and we conducted our first experimental harvest of a tabu area with the community of Kiobo in Kubulau District to assess the ecological impact using different survey methodologies. We brought on University of Western Australia PhD student Jordan Goetze to take the lead on assessing ecological impact to fish populations, while WCS is additionally collecting information to gauge community expectations, socioeconomic needs, and actual benefits from harvests.

In July, WCS staff Stacy Jupiter, Rebecca Weeks, Akuila Cakacaka, Yashika Nand and Margaret Fox presented results from our work at the 12th International Coral Reef Symposium in Cairns. Topics of our presentations ranged from designing resilient MPA networks to opportunities for managing fish spawning aggregations to factors contributing to high fish biomass in Fiji. Fiji was well represented at the conference, with a special evening talanoa session on Locally Managed Marine Areas. WCS Fiji Director Stacy Jupiter also participated in a media briefing on the benefits of LMMAs to communities.

In August, WCS staff Margaret Fox, Yashika Nand and Waisea Naisilili collaborated with Dr. Cara Miller of the Whale and Dolphin Conservation Society to conduct a repeat survey to assess the status of cetacean populations around the vicinity of Vatu-i-Ra Island, Ra Province. The team confirmed the location as a breeding ground for migratory humpback whales, and recorded the 2012 Fiji Humpback Whale Song from this pod. Also in August, in partnership with SeaWeb and the Fiji Locally Managed Marine Area network (FLMMA), WCS Fiji helped to launch a national campaign to protect reef fish spawning aggregations. The event was launched with a public ceremony during Hibiscus Festival and a surprise flash mob.

We increased our efforts in terrestrial and freshwater conservation this year through a grant from the Critical Ecosystem Partnership Fund. To support a prioritization exercise, WCS staff Kini Koto and Waisea Naisilisili assessed the presence of overhanging culverts crossing rivers through the Mt. Navotuvotu-Mt. Kasi corridor, while Kini and our collaborator Aaron Jenkins later conducted rapid assessments of freshwater fish diversity to search for sensitive and endemic species. Our GIS team of Natalie Askew, Ingrid Qauqau and volunteer Gander Wainiqolo later incorporated all of the survey information into a conservation planning scheme to identify priority mataqali with whom we should consult to discuss the

development of Community Forest Parks and Riparian Buffer Zones. Consultations were carried out in October by WCS staff Akanisi Caginitoba, in partnership with the Department of Forestry and iTaukei Lands Trust Board.

For four weeks in November and December, the WCS marine team conducted baseline surveys of reefs in western Bua province to evaluate the status of existing tabu areas, as well as identify sites of high resilience potential for expansion of MPA networks. This information will be presented back to communities and the Bua Provincial Office during district-level planning workshops in 2013. While the marine team was away, our livelihoods and management staff, Ged Acton, Akanisi Caginitoba, conducted workshops to develop a kuta mat weaving cooperative among women in Bua and Cakaudrove provinces as a source of alternative livelihood, and they participated in a workshop to develop a Bua Yaubula Management Support Team as part of the FLMMA network.

In terms of staffing turnover, in mid-2012, our postdoctoral research Dr. Rebecca Weeks returned to Australia to pursue a position at the ARC Centre of Excellence for Coral Reef Studies at James Cook University. We additionally formally hired Natalie Askew as our mapping specialist and Ged Acton as our stakeholder engagement officer. Former WCS employee Gander Wainiqolo volunteered for our program and in November was awarded a prestigious 6-month Conservation Leadership Program internship award, which she will take up with WCS Fiji in the first half of 2013.

WCS Fiji continued to pursue opportunities for local staff training. In February, Margaret Fox and Waisea Naisilisili traveled to Bangladesh to receive practical training on cetacean survey skills from the WCS Ocean Giants Asia Program staff. Akuila Cakacaka was accepted into a year-long NGO Leadership and Management Course, accredited through Unitec of New Zealand. In August, Sirilo Dulunaqio participated in a beche-de-mer survey training led by SPC, while in September, Akanisi Caginitoba attended a week long climate adaptation course in Vanuatu led by GIZ. WCS Fiji finance manager Nischal Narain continues to pursue his MBA through a USP extension course, while Ingrid Qauqau is advancing in her postgraduate diploma in Environmental Studies, also at USP. Meanwhile, WCS also provided training through delivery of a course on the principles of reef resilience, led by Yashika Nand, aimed at FLMMA practitioners and partners.

WCS Fiji continued to engage in government planning processes, including the revitalization of the Integrated Coastal Management (ICM) Committee and oversight towards the development of a provincial-level ICM plan through Ra, funded through an ADB-GEF Coral Triangle project to the Department of Environment. We have also assisted the Department of Environment through consultations on implementation of the GEF PAS forest conservation project and for priorities for allocation of GEF STAR funding. We have additionally maintained an active status on the national Protected Area Committee.

This report focuses on WCS Fiji's achievements during 2012 under our three main themes of Science, Management and Communication. We additionally highlight our engagement with national and regional planning processes. Consistent with our Memorandum of Understanding (MoU) with the Fiji Department of Environment, we note the links to national priority strategies under the NBSAP Implementation Framework 2010-2014, as well as the National Climate Change Policy. Lastly, we describe our projected activities for 2013, including their: funding status; relationship to national priorities; potential outputs; location in Fiji; project partners; donors; timelines; and level of investment in conservation and management action.

SCIENCE

The following sub-sections present a synthesis of completed and ongoing scientific activities by WCS and partners for 2012.

Inshore Fisheries Management

Identifying Factors Linked to High Fish Biomass in Fiji

STATUS: In progress

FUNDING: David and Lucile Packard Foundation (2007-31847; 2009-34839), US National Oceanic and Atmospheric Administration (NA10NOS4630052), Gordon and Betty Moore Foundation (540.01)

PARTNER ORGANISATIONS: (For Totoya work): Pacific Blue Foundation, Waitt Institute, Wetlands International-Oceania

OUTPUTS:

- *Conference presentation:* Jupiter S, Cakacaka A, Naisilisili W, Dulunaqio S, Weeks R (2012) Factors influencing success in traditional management of Fijian reef fisheries. 12th International Coral Reef Symposium, Cairns, Australia, 8-12 July
- *Journal article:* Jupiter SD, Weeks R, Jenkins AP, Egli DP, Cakacaka A (2012) Effects of a single intensive harvest event on fish populations inside a customary marine closure. Coral Reefs 31:321-334
- *Journal article* on fishing in Namena in prep

RESEARCH HIGHLIGHTS:

Although Fiji is located some distance east from the center of the Coral Triangle region and, by any measure of human pressure, is not considered particularly remote, select surveys by WCS of community-managed marine protected areas at Kia Island's Cakaulevu Tabu (tabu being the Fijian name for a customary fisheries closure), Kubulau District's Namena Marine Reserve, and Totoya Island's Sacred Reef indicate exceedingly high levels of reef fish biomass. With mean values between 2 to 6 T ha^{-1}, these sites are comparable to some of the highest levels of fish biomass recorded in the Pacific at Kingman and Palymyra in the Line Islands and Kure Atoll in the Northwestern Hawaiian Islands, which are all managed as national monuments within US territories and protected by their extreme geographic distance from population centres (Figure 1). We undertook a critical evaluation of the conditions at Namena Marine Reserve, Cakaulevu Tabu and Daveta Tabu to identify the factors that contributed to highly elevated reef fish biomass and factors that can contribute to its demise.

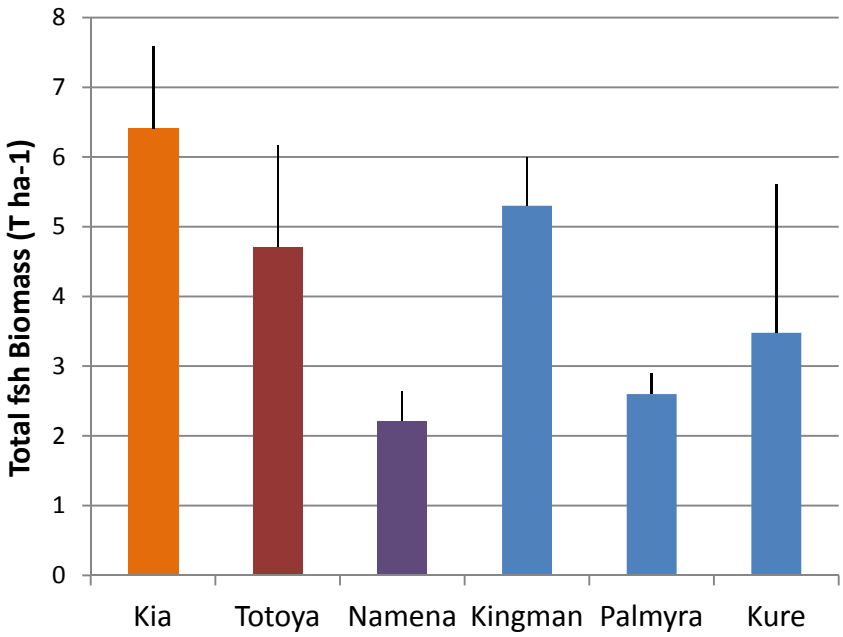

Figure 1. Mean total fish biomass (T ha^{-1} ± 1 SE) from three barrier reefs at sites in Fiji (Kia Island, Macuata in 2008 – Jupiter et al. 2012[1]; Totoya Island, Lau in 2011 – WCS, unpublished data; Namenalala Island, Bua in 2009 – Jupiter & Egli 2011[2]) compared with reference sites of near-pristine fish biomass sampled from the central Pacific (Kingman and Palymyra atolls in the Line Islands, 2005 – Sandin et al. 2008[3]; Kure Atoll, Northwest Hawaiian Islands 2008-2010 – Williams et al. 2011[4])

In Namena, our monitoring records between 2007 and 2009 showed consistently high fish biomass compared with adjacent outside areas, generally above 2 T ha^{-1}. The factors influencing the MPA's success can generally be attributed to: size (> 60 km^2); longevity of protection; natural geomorphologic and oceanographic conditions supporting high productivity through lower trophic levels; and strong enforcement (Jupiter & Egli 2011). Yet despite these attributes, there was a breakdown in protection in 2010 as one of the mataqali with traditional fishing rights in the area felt that they were not adequately being compensated for loss of access to their fishing ground. They were also unhappy about annual payments for the conservation lease for the Namenalala Island, which had not been adjusted for inflation since 1983. In early 2010, mataqali members camped on the Namenalala and fished on a commercial scale for several months.

[1] Jupiter SD, Weeks R, Jenkins AP, Egli DP, Cakacaka A (2012) Effects of a single intensive harvest on fish populations inside a customary marine closure. Coral Reefs 31:321-334

[2] Jupiter SD, Egli DP (2011) Ecosystem-based management in Fiji: successes and challenges after five years of implementation. Journal of Marine Biology 2011 doi:10.1155/2011/940765

[3] Sandin SA, Smith JE, DeMartini EE, Dinsdale EA et al. (2008) Baselines and degradation of coral reefs in the northern Line Islands. PLoS ONE 3:e158

[4] Williams ID, Richards BL, Sandin SA, Baum JK et al. (2011) Differences in reef fish assemblages between populated and remote reefs spanning multiple archipelagos across the central and western Pacific. Journal of Marine Biology 2011 doi:826210.821155/822011/826234

Our monitoring records[5] of fish community structure indicate a major, signifcant loss of fish biomass inside Namena in 2010, and a major change in community structure as the fishers removed nearly all target and upper trophic level speces (Figure 2). Once the chiefs became aware of the magnitude of the situation, they took quick and decisive action. Through traditional processes and meetings between village leaders, they resolved their differences internally such that no one lost face and compensation payments were reinstated to the clan. As an outcome, the fishing ban was again well-respected and, as of 2011, the fish populations recovered such that they were not significantly different from 2009 (Figure 2).

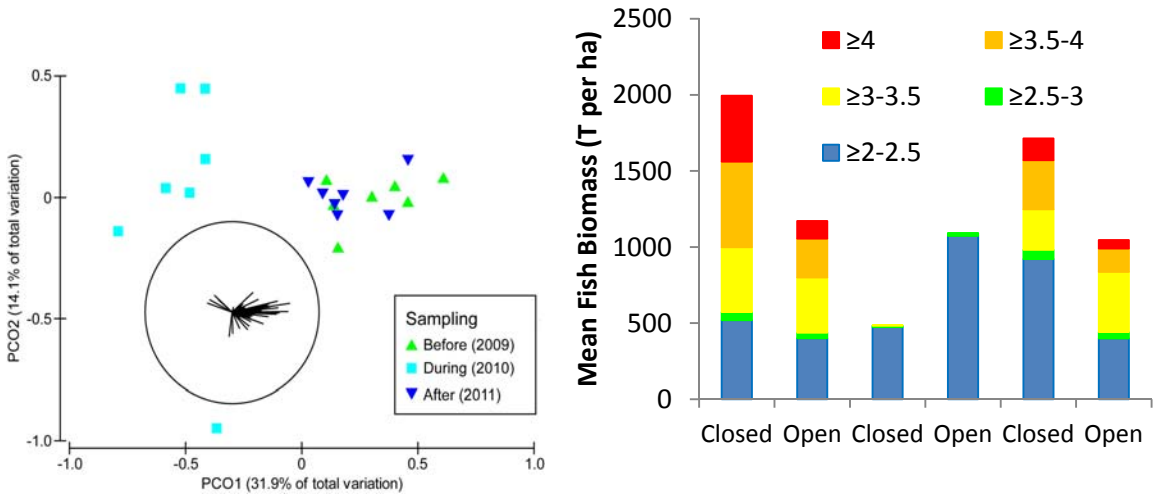

Figure 2. LEFT: Principle components ordination of fish community biomass by species at sites surveyed inside and adjacent to Namena in 2009 (green), 2010 (turquoise), and 2011 (blue). RIGHT: Mean total fish biomass inside (closed) and adjacent (open) to Namena with the amount of biomass indicated by trophic level group. Trophic levels for each species were obtained from fish diet information found on FishBase.

In September 2008, the mean total reef fish biomass (6.4 T ha^{-1}) inside Cakaulevu tabu, adjacent to Kia Island, is the highest that WCS has recorded at any site in Fiji. Conditions facilitating these high biomass levels included: size (> 15.5 km^2); longevity of protection; natural geomorphologic and oceanographic conditions supporting high productivity through lower trophic levels; strong enforcement; and distance from market access. Three days into the survey, the communities collectively decided to harvest the Cakaulevu tabu to raise funds to support school, church and provincial fees for island residents. Initially, the goal was to raise FJD$12,000 (USD$7,492 based on exchange rates from 22 September 2008, the first day of the harvest) from the sale of invertebrates (predominantly beche-de-mer) and fish. This goal was exceeded on the first day, and upon realizing the potential for profit, community members extended the harvest period for 5 weeks. Residents and traditional fishing rights owners living

[5] WCS monitoring of Namena and adjacent fished areas was carried out in 2009, 2010 and 2011 using methods described in: WCS (2010) WCS-Fiji marine biological monitoring handbook. Version 3.1. Wildlife Conservation Society Fiji, Suva, 50 pp. Available from: http://www.wcsfiji.org/Portals/82/WCS_Marine_Monitoring_Protocol_v3-1.pdf

outside of Kia Island who returned for the event fished in shifts over 24 h periods from Mondays through Saturdays.

Like the opening of Namena, the opening of Kia saw the loss of large-bodied, primary targets species and an increase in roving grazers with lower trophic levels (Jupiter et al. 2012). However, unlike Namena, although the fishing ban in the Kia tabu was re-instated, follow-up surveys by WCS showed no recovery and even a greater loss of fish biomass from the tabu. Nearly all of the primary target species were removed from both the tabu and adjacent control area by 1 year later. Our results suggests that once the communities had established links with middlemen from seafood export companies, who by this time had moved onto Kia Island, the financial incentive of guaranteed sales eroded their respect for traditional authority.

Our third example of a site with highly elevated reef fish biomass is from Totoya's Daveta Tabu, located on either side of a passage through the barrier reef at the south part of the island. Daveta Tabu was declared off limits to fishing about 70 years ago after the burial at sea of a stillborn son of one of the former high chiefs, however the previous high chief lifted the ban around 20 years ago. Although we found considerable high levels of fish biomass inside Daveta Tabu(4.7 T ha^{-1}), the values were not significantly different from the adjacent areas that were presumably opened to fishing and the community composition based on fish species biomass was also not significantly different (Figure 3). Thus, it is likely that the reefs maintain some protection through the lingering stigma of the stillborn baby, as well as the naturally dangerous conditions around the passage. However, given that the proportion of fish biomass in upper trophic levels is more similar to areas open to fishing adjacent to Namena and Kia (before their harvests; Figure 3), it is possible that light levels of fishing are impacting community composition.

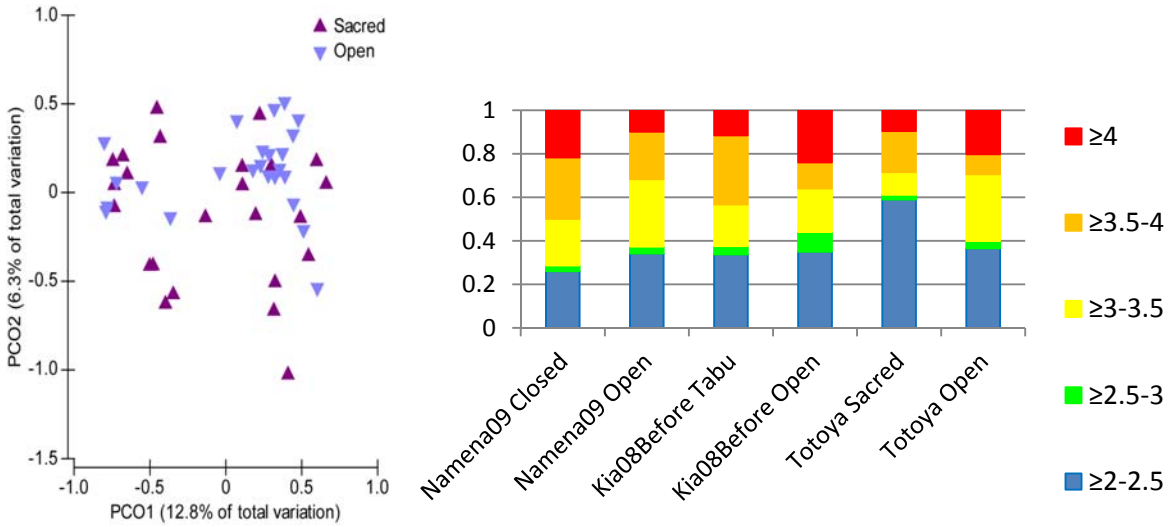

Figure 3. LEFT: Principle components ordination of fish communities based on species biomass inside (purple) and adjacent to (blue) Daveta Tabu. RIGHT: Proportion of total fish biomass in each trophic level class at sites within and adjacent to Namena in 2009 before fishing began, within and adjacent to Cakaulevu Tabu in 2008 before the harvest, and inside and adjacent to Daveta Tabu in 2011.

In summary, based on our learning from the three sites in Fiji, we identify five main factors that influence the very high values of fish biomass initially recorded at sites in Fiji: (1) large distance from urban centres and markets; (2) natural geomorphology and oceanographic conditions that promotes high productivity; (3) large area under protection; (4) longevity of protection; and (5) strong respect of chiefly authority, as manifest in the willingness to obey customary rules and/or, in the case of the management conflict in Namena, the ability to swiftly negotiate a resolution through traditional protocol. We additionally highlight other factors can contribute to management failure, including: (1) encroaching markets, which when coupled with light fines for breaking rules and ineffectual customary punishments, leave little incentive to obey fishing bans; (2) lack of defined protocols for stopping fishing once a tabu ban has been lifted; and (3) lack of awareness of how fishing intensity impacts fish populations and the amount of time required for ecological recovery.

NEXT STEPS:

- Prepare manuscript on Namena opening for journal submission
- Incorporate lessons into guidelines for managing periodic harvests (see below)

LINKS TO NATIONAL PRIORITIES:
This project supports **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries. The information collected through the scientific work will also support **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 5:** Support the ecosystem-based approach throughout Fiji, recognising that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience and **Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

Assessing Impacts of Periodic Harvests on Reef Fish Populations

STATUS: In progress

FUNDING: David and Lucile Packard Foundation (2012-38137); Pew Fellows Program in Marine Conservation pending

PARTNER ORGANISATIONS: Fiji Locally Managed Marine Area Network, University of the South Pacific – Institute of Applied Sciences

OUTPUTS:

- *Journal article:* Jupiter SD, Weeks R, Jenkins AP, Egli DP, Cakacaka A (2012) Effects of a single intensive harvest event on fish populations inside a customary marine closure. Coral Reefs 31:321-334
- *Popular article:* Jupiter S (2012) “Are our fishy fundraisers breaking the bank?”, MaiLife Magazine, No. 60, May 2012, p. 64

RESEARCH HIGHLIGHTS:

Historically, Pacific island communities employed a variety of tools to control marine and coastal resource use, including periodically harvested fishing closures. Such customary management tools were used to accumulate and redistribute food as wealth, without the need or intention to provide lasting fish stocks for the future. Due to high levels of infant mortality, high rates of maternal death during childbirth, and tribal warfare, population density across pre-colonial Melanesia was likely very low. Thus, the level of resource extraction required to meet community needs during periodic harvests may have been light enough to allow for the dual achievement of immediate socioeconomic gain and longer-term food security. However, rapid modernization has altered social conditions. Through market globalization and increasing access to efficient gear, there is unprecedented threat to coral reef fisheries in the region through overharvesting, and unregulated periodic harvests can rapidly deplete all positive benefits of protection through focused fishing efforts, as well observed from harvest of the Cakaulevu Tabu area adjacent to Kia Island (see *Identifying Factors Linked to High Fish Biomass in Fiji* above). Because the establishment of permanent no-take marine closures is generally socially unacceptable in Melanesia, there is an urgent need to determine the thresholds at which closures can be sustainably harvested to achieve both short-term socio-cultural and longer-term conservation objectives and the appropriate indicators of these thresholds. This current project is investigating the impacts of varying harvest duration at locally managed marine area (LMMA) sites in Fiji and developing guidelines to improve their sustainable management.

The overall goal of the project is to provide local decision-makers in Melanesia with scientifically sound recommendations for developing and/or adapting management regulations for customary marine closures that include:

- Harvest targets that achieve social objectives while also ensuring long-term food security and conservation; and
- Clearly defined decision-making processes to cease fishing if harvest targets are exceeded.

The incorporation of these best practice guidelines into management implementation will ideally lead to balanced attainment of local socioeconomic and cultural needs with sustainable fisheries across Melanesian LMMAs.

In 2012, we gathered information on conditions on fish community structure and benthos inside and adjacent to tabu areas before and after harvests of Cakau Naitaga tabu in Kubulau District (Bua Province), as well as after the harvest of the Navakavu tabu in Suva District (Rewa Province). The Navakavu data are being compared with data collected by Marine Managed Areas project in 2008. From Navakavu, preliminary analyses showed that in 2008, there was significantly greater total fish biomass in blue hole habitats compared with adjacent fished sites, however this difference was no longer observed immediately after the harvest event. For reef flat areas, the only significant differences were related to sites, with no significant differences observed related to sampling time or protection status.

For the Cakau Naitaga harvest, we are collaborating with PhD student Jordan Goetze from the University of Western Australia to evaluate which of three methods most cost-effectively

records impact from harvest extraction. We surveyed before and after a 1 week harvest using underwater visual census, diver operated video, and baited remote underwater video surveys. During the harvest event, we recorded all fish and invertebrates landed and the fate of each (e.g., consumed, given away, sold). We additionally conducted household interviews of residents in Kiobo village regarding motivations and expectations for harvesting tabus to be compared with actual benefits received. These data will inform what survey methods are used for four experimental tabu harvests of varying durations to be conducted in 2013.

NEXT STEPS:

- Identify the differential impacts of varying harvest durations in Fiji on target fish species and species groups and their potential for recovery given differing life histories based on before-after surveys of 4 harvests in 2013 and follow-up surveys in 2014
- Identify whether socioeconomic expectations for harvests in Fiji are achievable, equitably distributed, and compatible with long-term food security objectives based on information obtained from household surveys;
- Increase understanding within Fiji LMMA communities of the impacts of periodic harvests, coupled with improved management and governance structures within Fiji LMMA communities, leading to better regulation of take during harvest events to maximize achievement of short-term social and longer-term food security objectives
- Develop a funding proposal to assess a broader suite of variables that affect harvest ecological and social impacts across Melanesia

Figure 4. Sample of catch from harvest of Kiobo village's Cakau Naitaga tabu in Kubulau District.

LINKS TO NATIONAL PRIORITIES:
This project supports **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries. The information collected through the scientific work will also support **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 5:** Support the ecosystem-based approach throughout Fiji, recognising that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience and **Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

Conservation Planning

Strengthening Terrestrial Management Across the Mt. Navotuvotu-Mt. Kasi Corridor

STATUS: Ongoing

FUNDING: Critical Ecosystem Partnership Fund (60909)

PARTNER ORGANISATIONS: iTaukei Affairs Board, NatureFiji-MareqetiViti, Department of Forestry, iTaukei Land Trust Board, iTaukei Lands and Fisheries Commission, Provincial Offices

PROJECTED OUTPUTS:

- Local agreement to protect 10 community forest parts with total areas of ~1825 ha and river buffer zones covering 50 km of rivers with high conservation value, whose management is nested within 5 district level EBM plans
- Kuta mat weaving cooperative established and profiting from regular sale of mats
- Development of management support networks to ensure monitoring and enforcement

RESEARCH HIGHLIGHTS:
The forests within and surrounding the KBAs of Mt. Navotuvotu and Mt. Kasi in Fiji are recognized as critical for conservation both because they contain globally threatened species and because they are sites of national significance for biodiversity conservation. The forests surrounding Mt. Kasi have the highest known single-site species richness on Vanua Levu. They include the IUCN red-listed critically endangered *Astronidium kasiense* and *Gardenia anapetes*, and the vulnerable *Metrosideros ochrantha*, all of which are endemic plants to Fiji. *A. kasiense* and *G. anapetes* are additionally found in the Mt. Navotuvotu KBA. While the biodiversity of freshwater fauna from the KBAs is currently unknown, streams within the relatively pristine forests of adjacent districts (Kubulau and Wainunu) in the corridor between Mt. Navotuvotu and Mt. Kasi contain at least 5 species of endemic freshwater fish (*Redigobius leveri*, *Glossogobius* sp., *Stenogobius* sp., and two species of *Stiphodon*). The streams also support sensitive species, such as *Eleotris melanosoma, Butis amboinensis*, *Kuhlia munda, Giurus hoedti* and *Redigobius bikolanus*, that are conspicuously absent from other Fiji catchment streams where forests have been cleared and non-native tilapia introduced.

The forests and freshwater areas of the Mt. Navotuvotu-Mt. Kasi forest corridor are under imminent threat from logging, mining and invasive species. Fifty-nine percent of the Mt. Navotuvotu KBA is currently allocated as logging concessions, while 80% of the Mt. Kasi KBA is under mining tenement. Without management, there is a high risk that: (1) IUCN red-listed plant species will be lost through direct clearing; (2) endemic and vulnerable freshwater fish species will be lost through direct and indirect effects of sedimentation; and (3) there will be irreconcilable damage to downstream coastal and marine ecosystems.

Community members and provincial administrators have expressed concern over these threats. At a recent Protected Area Committee (PAC) planning workshop with provincial administrators organized and facilitated by WCS, representatives from the Cakaudrove provincial office and NGOs identified the Mt. Kasi region as a candidate site for a forest reserve. Representatives from the Bua provincial office proposed conservation sites around Wainunu and Kilaka rivers as well as forest management around the Mt. Navotuvotu and Kilaka forests. The terrestrial working group of the PAC has named the Mt. Navotuvotu KBA as one of its top 10 priority locations to increase the current level of terrestrial area under protection in Fiji from 2.9% closer to the 20% target by 2020 set under Fiji's Programme of Work on Protected Areas.

WCS has conducted the following activities in 2012 in support of establishment of community forest parks and riparian buffer zones in areas of high biodiversity across the Mt. Navotuvotu-Mt. Kasi corridor, where there is strong community will to implement conservation measures:

- Freshwater biodiversity surveys were carried out 31 July-8 Aug, covering 9 sites in Koroalau (Turiwai Creek), Wainunu (Nalomate River, Nuku Creek, Wailoaloa Creek, Dawacumu Creek) & Dama (Nasea Creek, Velolo Creek). Endemic fish were found at all sites. Sites were selected where forests were most likely to be intact (i.e., forest cover mapped by satellite and areas selected >5 km from roads and human settlements) and not previously surveyed.
- In June, spatial data (maps) were gathered on environmental threats to rivers and forests from government and private companies that indicate detailed information on past, current and future logging, location of hanging culverts, proposed sites of mining interest, and farming suitability.
- Biodiversity data or proxy data were gathered (e.g., new forest function map, records of endemic species) and were subsequently processed into spatial data layers.
- Spatial prioritization of land parcels and riparian buffer zones was carried out using Marxan software, and 21 top priority clans (*mataqali*) have been identified, as well as priorit river buffer zones which fall in their land (Figures 5-6).
- Initial landowner consultations have been conducted with the 21 priority clans, using a team from WCS Fiji, Dept of Forestry, iTaukei Land Trust Board and the Provincial Offices (Figures 5-6).
- Village visits were made to determine location of women trained in *kuta* weaving and to assess potential for establishing a cooperative for round *kuta* mats. Weavers mapped *kuta* wetlands and attended skills-sharing workshops in November.

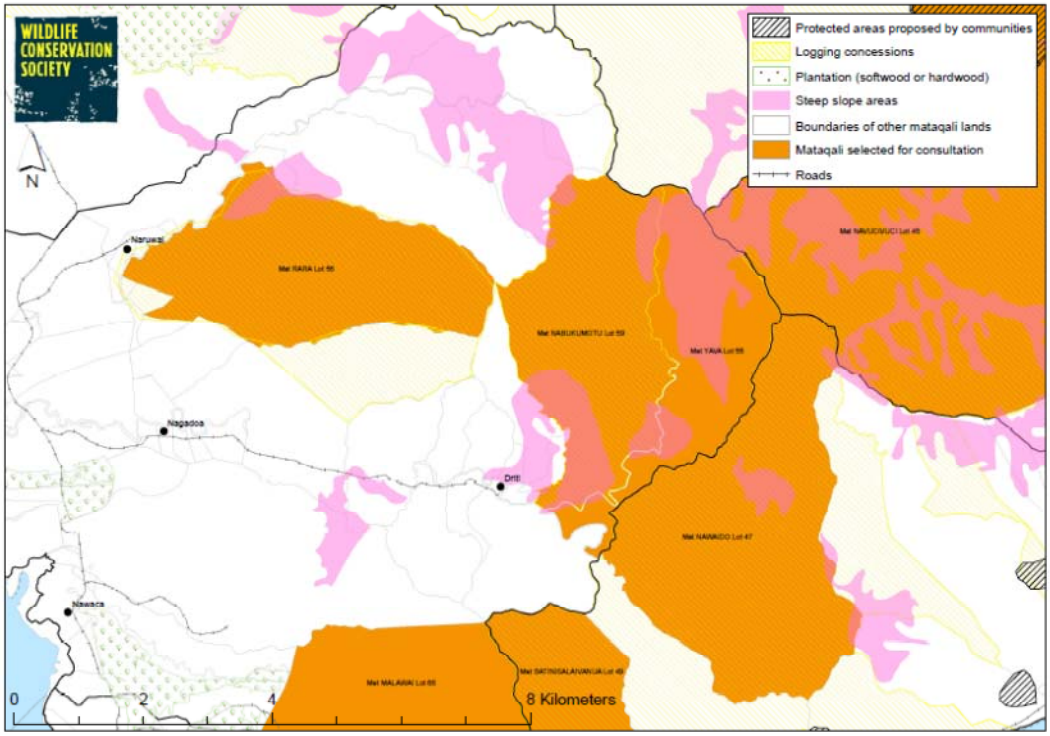

Figure 5. Example map used in initial landowner consultations to show priority mataqali land areas selected by the analysis, plus threats and protected areas.

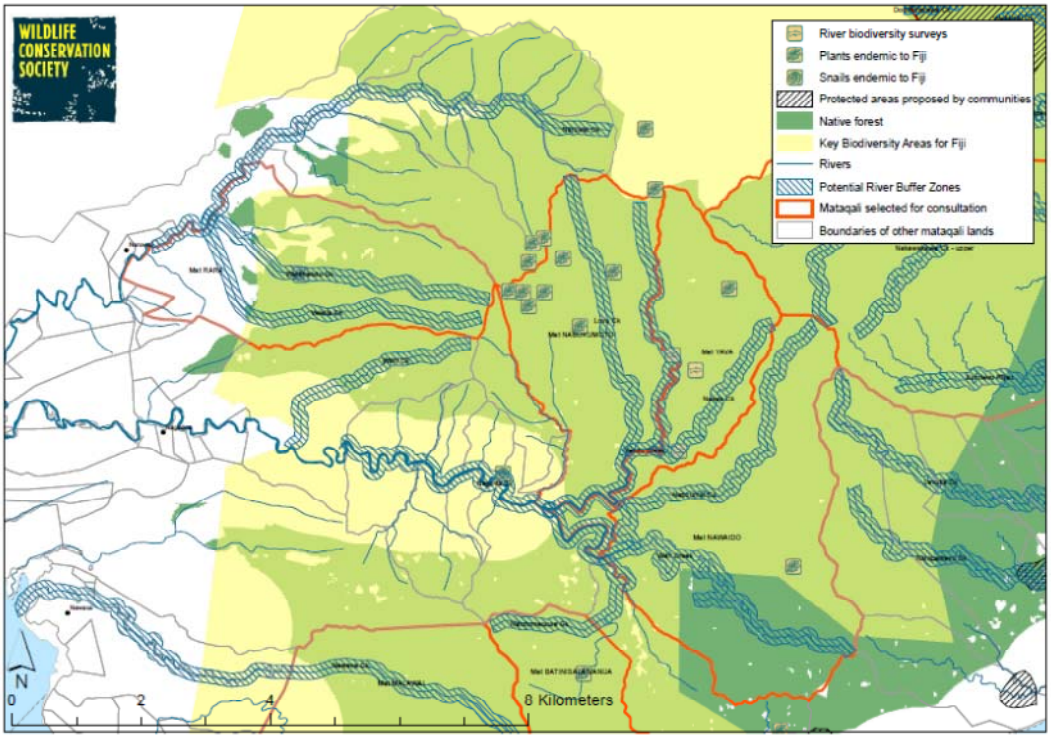

Figure 6. Example map used in initial landowner consultations to show biodiversity information and proposed river buffer zones.

NEXT STEPS:

- Follow up landowner consultations in January 2013 in order to define proposed protected areas, agree management rules, draft clan-level action plans
- Incorporate clan-level action plans into new or existing district-level Ecosystem-Based Management plans
- Development of business plan for kuta mats
- Work through the national Protected Area Committee to develop new Protected Area legislation that would legally recognize local authority to manage Community Forest Parks and Riparian Buffer Zones.

LINKS TO NATIONAL PRIORITIES:

The activities under this grant support the following objectives: **NBSAP Implementation Plan Thematic Group 1 (Forest Conversion), Strategy 2:** Promote research and awareness on forests and terrestrial resources, **Objective 2.2:** By 2012, promote at least 2 case studies on the relationship between forests cover and ecosystem services, **Action 2.2h**: Undertake a survey on current status of biological resources, specifically those of subsistence and economic importance and those that are threatened or need attention for protection; **NBSAP Implementation Plan Thematic Group 7 (Inland Waters), Strategy 1:** Improve and update information on status of wetlands and wetland biodiversity, **Objective 1.1:** By end 2011, national wetland inventory of habitats (as well as their flora and fauna) produced as baseline for national planning, **Action 1.1b:** Collate and update information into spatially registered database; and **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.1**: By end 2011, complete list of priority terrestrial and marine sites developed, **Actions 2.1a-c**. This project also supports Fiji's **National Climate Change Policy Objective 5: Adaptation, Strategy 5**: Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.

Designing Resilient MPA Networks

STATUS: Ongoing

FUNDING: David and Lucile Packard Foundation (2009-34839, 2012-37915), US National Oceanic and Atmospheric Administration (NA10NOS4630052), John D and Catherine T MacArthur Foundation (10-94985-000-GSS)

PARTNER ORGANISATIONS: N/A

OUTPUTS:

- *Journal Article:* Weeks R, Jupiter SD (in review) Adaptive co-management of a marine protected area network in Fiji. Conservation Biology

- *New Protected Area Networks* endorsed in Wainunu and Solevu districts (Bua) and awaiting endorsement in Nadi (Bua) and Wailevu (Cakaudrove) districts
- *New Data Collected* from Vuya, Dama, Bua, Lekutu and Navakasiga districts in Bua Province

RESEARCH HIGHLIGHTS:

In 2012, WCS processed reef resilience data collected from coral reef habitats in the qoliqoli of Solevu, Nadi, Wainunu (Bua), and Wailevu (Cakaudrove) to produce eleven indicators of either resistance to climate disturbance or ability to recover from disturbance (Table 1).

Table 1. Eleven indicators of reef resilience measured at WCS survey sites

Resilience indices	Measure
Coral community dominated by bleaching-'resistant' or 'tolerant' taxa	Site susceptibility index, derived from coral genera susceptibility to bleaching (from the literature) and dominance at site (1)
Substrate availability	Proportional cover of coral and crustose coralline algae to other substrate types (2)
Coral population structure	Number of coral recruits (3) (to 10 cm) per 6 m^2
Herbivore abundance and functional diversity	Total herbivore biomass (4), as proportion of highest site; herbivore functional group richness (5) and evenness (6)
Fishing pressure	Total fish biomass (7), as proportion of highest site
Shading from high, steep-sided islands or reef topography	Site observations of physical shading (e.g. from overhangs) (8) and canopy shading (e.g. from tabulate corals) (9), scored 1-5
Proximity to upwelling or exposure to strong currents	Site observations of current strength and flushing (10), scored 1-5
Reef exposure at low tide	Site observations / local knowledge of reef exposure at low tide (11), scored 1-5

The values for each indicator were normalized and added together to produce a single resilience score for each site. A continuous resilience layer was created by assigning the mean resilience score from surveyed sites to each reef polygon, using the finest resolution reef habitat classification from the Millennium Coral Reef Mapping Program dataset, made available to WCS Fiji by Dr. Serge Andrefouet of Institut de Recherche pour le Développement (IRD), Noumea. Following a precautionary principle, reefs with no survey sites were assumed to have low resilience.

WCS staff used the conservation planning software Marxan to produce spatial maps of priority areas for management across a planning region that included Wailevu, Kubulau, Wainunu, Nadi and Solevu. To improve habitat representation, a target to include 30 percent of the area of eleven coral reef types was adopted, echoing the target for the Kubulau MPA network. To promote inclusion of critical areas for resilience, inverse cost layers were applied to preferentially selected sites with high target fish biomass and resilience scores. Socioeconomic

costs were considered to be uniform, as it was assumed that community decision-makers would integrate their own social, cultural and economic priorities more effectively than could be achieved through attempts to spatially model or predict these factors. Existing MPAs were "locked in" to the design. Output maps with options for MPA network design were presented for discussion at the management planning workshops in Wainunu (with representatives from Nadi and Solevu districts in November 2011) and Wailevu (February 2012). The high chief of Wainunu District endorsed all of the protected area boundaries and management rules in March 2012. The Wainunu protected area network was launched with a formal blessing ceremony on June 1, 2012. The new Wainunu protected area network includes 6.1 km^2 of resilient marine habitats, plus 45.8 km^2 of terrestrial and freshwater habitats. The new Wailevu protected area network, which awaits endorsement from the Tui Wailevu, includes 32.9 km^2 of resilient marine habitats, plus 18.9 km^2 of terrestrial and freshwater habitats. The Solevu protected area network has been endorsed by the Bose Vanua and includes 34.4 km^2 of resilient marine habitats, plus 6.8 km^2 of terrestrial and freshwater habitats. The draft Nadi protected area network still needs final consultation, but includes 18.9 km^2 of resilient marine habitats, plus 3.0 km^2 of terrestrial and freshwater habitats.

At the request of the Bua Provincial Office, WCS sought funding to replicate the management planning model in the currently unmanaged districts of western Bua Province (Vuya, Dama, Lekutu, Navakasiga). With a new grant from the David and Lucile Packard Foundation, WCS surveyed the reefs across representative habitat types in all districts of western Bua, including Bua qoliqoli and reefs around Yadua Island (Figure 7). These data will be used as input into Marxan analyses in 2013 in order to provide recommendations for MPA network design to be shared with communities during large-scale management planning workshops. A WCS intern, Gander Wainiqolo, has received a prestigious Conservation Leadership Program fellowship to undertake this work in 2013.

NEXT STEPS:

- Develop recommendations for MPA network designs using resilience principles and Marxan software.
- Present recommendations to communities during district-level management planning workshops
- Conduct follow-up consultations with communities to refine proposed MPA network boundaries.

LINKS TO NATIONAL PRIORITIES:

This work supports **NBSAP Implementation Plan Thematic Area 3 (Inshore Fisheries) Strategy 4:** Design new ecologically relevant inshore MPAs, **Objective 4.5:** By mid-2014, 20% of communities with existing MMAs will have agreed to add additional MPAs, **Action 4.5a:** Consult with communities at existing MMA sites to determine willingness to add MPA sites to their MMA; as well as **Objective 4.6:** By mid-2014, 25% of the communities will have established new management structures for new MPAs, **Action 4.6a:** Consult with communities at priority regions outside of existing MMAs to establish new MPA management structures. This work also supports the draft **National Climate Change Policy Adaptation Strategy 4:** Support the

development of adaptation technologies and systems that are sustainable, consider traditional knowledge and are culturally acceptable.

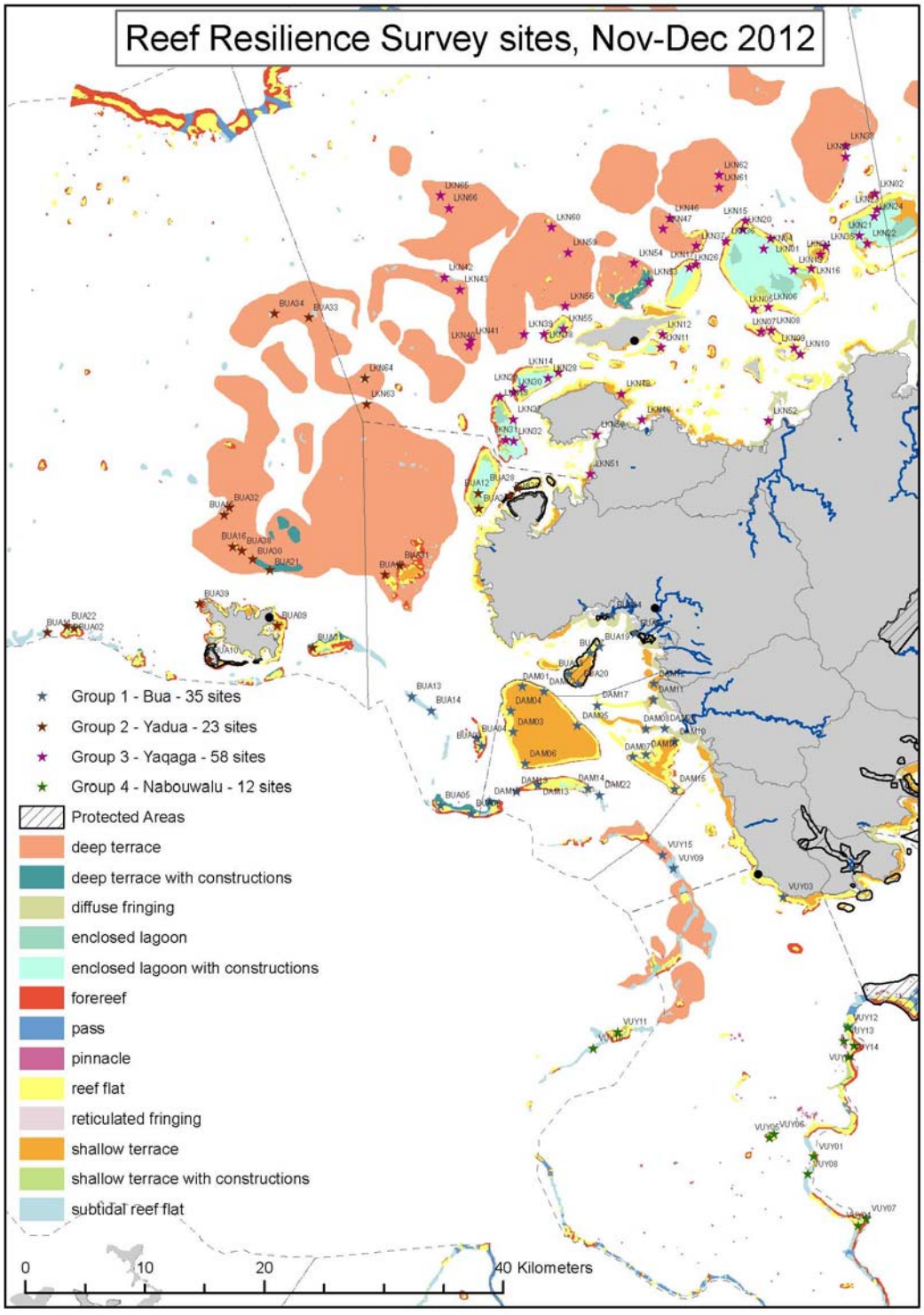

Figure 7. Proposed survey sites locations for Western Bua across representative Millenium Coral Reef Mapping geomorphic reef classification types.

Predictive Mapping of Coral Reef Factors Related to Resilience Potential

STATUS: Complete

FUNDING: David and Lucile Packard Foundation (2007-31847; 2009-34839), Gordon and Betty Moore Foundation (540.01), US National Oceanic and Atmospheric Administration (NA10NOS4630052)

PARTNER ORGANISATIONS: Simon Fraser University, University of Queensland

OUTPUTS:

- *Journal Article:* Knudby A, Jupiter S, Roelfsema C, Lyons M, Phinn S (in review) Mapping coral reef resilience indicators for management in Fiji. Remote Sensing
- *Journal Article:* McClanahan TR, Donner SD, Maynard JE, MacNeil MA, Graham NAJ, Maina JM, Baker AC, Alemu J, Beger M, Campbell SJ, Darling ES, Eakin CM, Heron SF, Jupiter SD, Lundquist CJ, McLeod E, Mumby PJ, Paddack MJ, Selig ER, van Woesik R (2012) Evidence-based resilience assessments to support coral reef management in a changing climate. PLoS ONE 7:e42884. doi:42810.41371/journal.pone.0042884

RESEARCH HIGHLIGHTS:

There are various frameworks to assess factors that may confer resilience potential for coral reefs. A recent review by McClanahan et al. (2012) suggests 11 key factors for which there is both expert consensus and considerable empirical evidence. However, these assessments have generally only been able to give resilience scores for single sites, making them difficult to incorporate into most conservation planning software (e.g. Marxan) that requires values spatially distributed across an entire planning region. A better approach would be to model spatially explicit measures of resilience factors so these could be incorporated into planning software while simultaneously considering other recognized MPA design criteria. Table 2 lists important resilience these factors from McClanahan et al. (2012), to which WCS Fiji contributed, with notes on the ability to map them with current remote sensing technology.

Our study aimed to investigate the ability to model and map several of these factors using high resolution satellite data and field observations from Kubulau District, Bua, where WCS and colleagues have already collected considerable amounts of field data and completed habitat maps. Specifically, we used field data of fish assemblages and benthos to test the ability to map the following factors: #1) stress-tolerant coral taxa, #2) coral diversity, #6) herbivore biomass, and #10) coral recruitment (Table 2).

Table 2. Key coral reef resilience factors identified through expert review (McClanahan et al. 2012). The spatial resolution at which each can be mapped is indicated as "fine" (< 5m pixel size), "medium" (5-100 m pixel size) or "coarse" (>100m pixel size). From Knudby et al. (in review)

#	Resilience Factor	Resilience component	Mapping potential	Spatial resolution
1	Stress-tolerant coral taxa	Resistance	Limited ability to map coral taxa.	Fine
2	Coral diversity	Resistance	Could potentially model measures of habitat diversity or use texture measures to describe habitat composition.	Fine
3	Historical Temperature Variability	Resistance	Existing sea surface temperature (SST) data products can be used to evaluate historical SST variability.	Coarse
4	Nutrients (pollution)	Resistance and Recovery	The concentrations of chlorophyll a (chl-a) and colored dissolved organic matter (CDOM) can be used to evaluate historical nutrient levels, but accuracy poor in coral reef areas .	Coarse
5	Sedimentation	Resistance and Recovery	There is currently no operational data product for sediment load in the water column.	Coarse
6	Herbivore biomass	Recovery	Biomass of herbivorous fish can be predictively mapped from lidar or multispectral data.	Fine
7	Physical Impacts	Recovery	Physical disturbances that substantially alter the reef structure can be mapped with high resolution satellite data.	Fine / Medium
8	Coral Disease	Resistance and Recovery	Direct mapping of coral disease is not currently possible.	Coarse
9	Macroalgae	Recovery	The location of dominant macroalgae cover can be mapped using standard classification techniques.	Fine / Medium
10	Coral Recruitment	Recovery	Coral recruitment cannot be directly mapped, but can potentially map environmental correlates of recruitment. Dead coral is mappable under ideal conditions. Crustose coralline algae have not been mapped directly with remote sensing.	Fine / Medium / Coarse
11	Fishing Pressure	Recovery	Fishing pressure cannot be mapped directly, but may be quantified with proxy variables.	Fine / Medium

We also included two other resilience-related factors: a) herbivore functional group richness, as resilience may depend on having the full complement of ecological processes, and b) the cover of live coral and crustose coralline algae, both an indicator of algal-coral dynamics when coupled with macroalgal cover and a proxy for the amount of substrate available for coral settlement following a mass bleaching event. We did not investigate those factors for which data products are already available (#3, #4), those that can be mapped with existing methods (#5, #7, #9), or those for which we do not have spatially distributed field data (#8, #11).

We used high spatial resolution satellite data to derive environmental predictors, and used these in random forest models, with field observations, to predict resilience indicator values at unsampled locations. Predictions were compared with those obtained from universal kriging, and from a spatially uniform baseline model. Prediction errors were estimated using cross-validation, and the ability to map each resilience indicator is quantified as the reduction in prediction error compared to the baseline model. We found that results are promising (> 10%) for fish herbivore functional group richness, stress-tolerant coral taxa, and the cover of live coral and crustose coralline algae (Figure 8), but maps cannot yet be adequately achieved for the other factors using existing data and modeling techniques.

In the context of marine spatial planning, planners now have the potential to consider reef resilience in addition to habitat and feature representation in decision-support software, allowing them to capture properties that maximize the overall resilience of an MPA network. For example, within Marxan software, a target could be set to incorporate into an MPA network 90% of planning units with herbivore biomass in the top quartile of the predicted range. Alternatively, the inverse of resilience indicator scores could be used as cost layers in Marxan, which avoids the need to subjectively define threshold resilience values as Marxan would preferentially planning units with high resilience scores to minimize costs. These approaches represent a considerable advancement over the current practice of designing or adapting MPAs based resilience scores compiled from field data collected from relatively few sites across the planning region.

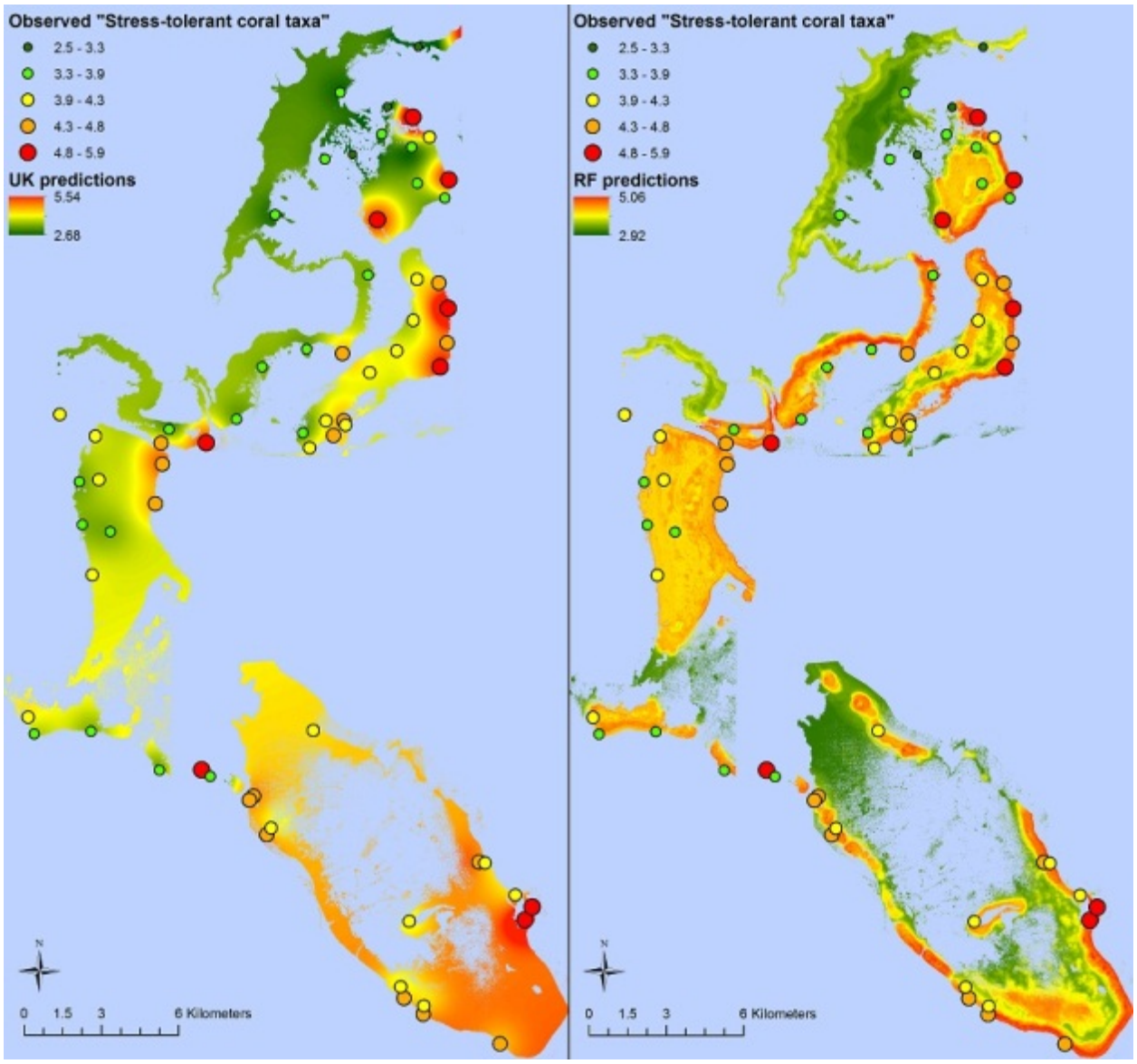

Figure 8. Observed and predicted values of "Stress-tolerant coral taxa" for the study area. Left: predictions based on the Universal Kriging (UK) model. Right: predictions based on the Random Forest (RF) model. From Knudby et al. (in review)

LINKS TO NATIONAL PRIORITIES:

The information collected through the scientific work supports **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 2:** Include vulnerability assessment and climate change impact projections into resource management planning, such as integrated coastal and watershed management plans, **Strategy 6:** Develop and make accessible hazard maps of coastal, riverine, urban and inland areas in Fiji, and **Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

Land-Sea Prioritization to Maximize Coral Reef Health While Achieving Terrestrial Biodiversity Targets

STATUS: Ongoing

FUNDING: David and Lucile Packard Foundation (2010-35664)

PARTNER ORGANISATIONS: ARC Centre of Excellence for Environmental Decisions (CEED), University of Queensland

OUTPUTS:

- *Journal article:* Klein CJ, Jupiter SD, Selig ER, Watts M, Halpern B, Kamal M, Roelfsema C, Possingham HP (2012) Forest conservation delivers highly variable coral reef conservation outcomes. Ecological Applications 22:1246-1256
- *Journal article in prep:* Klein CJ, Jupiter SD, Watts M, Possingham HP (in prep) Evaluating the influence of terrestrial protected area options on coral reef condition in Fiji

RESEARCH HIGHLIGHTS:

In 2011, WCS and collaborating partners at the University of Queensland, University of California-Santa Barbara and Conservation International created a model for conservation in Fiji with the purpose to maximize coral reef condition through investment in terrestrial protected areas across Fiji's coastal watersheds, focused on the three main islands of Viti Levu, Vanua Levu and Taveuni. The simple model estimates coral reef condition as influenced by watershed-based pollution and fishing impacts. These stressors were chosen as they are the only stressors for which we have consistent data across the whole study region that can be mitigated through implementation of a protected area. The model was published in Ecological Applications (Klein et al. 2012) and was presented to the Protected Area Committee (PAC) in 2011.

During the presentation to PAC, a criticism was brought up that the model did not simultaneously consider terrestrial priorities when selecting optimum areas for conservation action. Therefore, in this current project, we are improving on the model developed by Klein et al. (2012) to evaluate how implementation of different options for terrestrial protected area networks would impact coral reef condition in Fiji. As systematic conservation planning has not been used in Fiji to identify potential terrestrial networks, we first designed several 'potential' networks that achieve conservation goals of Fiji's Protected Area Committee. These options included:

- 40% representation of the distribution of each vegetation type on each island, unless the vegetation type does not exist on the island.
- 40% representation of vegetation types, but also including the number of mataqali tenure blocks intersecting the selected area as a cost.

We aimed to determine how much each network, if implemented, would impact coral reef condition and also how well they achieve the terrestrial targets. We compared the results of our networks to other conservation scenarios, in terms of reef condition and representation of vegetation communities:

- Existing protected areas only;
- Proposed "high priority" areas for conservation determined by the terrestrial working group of the PAC; an
- A scenario in which 20% of the land that delivers the most benefit to coral reef condition was selected.

Results indicate that while the areas selected for terrestrial protection using a systematic approach were better able to achieve terrestrial habitat representation targets, the resulting protected area network actually yielded less potential benefits to coral reef condition than the priority areas selected by the terrestrial working group of the PAC. However, when 20% of the study region's vegetation is protected without regard to terrestrial conservation goals (i.e., only benefits to coral reef are considered), improvements in coral reef condition are 1.8-2.8 times greater per unit area. As a consequence of these outcomes, we will suggest to the PAC that potentially they might want to modify the boundaries of top forest priorities slightly to both maximize representation of target vegetation classes and maintenance of health in adjacent coastal and marine systems

NEXT STEPS:

- Present results to Fiji Protected Area Committee
- Submit article to peer-reviewed journal

LINKS TO NATIONAL PRIORITIES:
The activities under this project support the following objectives: **NBSAP Implementation Plan Thematic Group 1 (Forest Conversion), Strategy 2:** Promote research and awareness on forests and terrestrial resources, **Objective 2.2:** By 2012, promote at least 2 case studies on the relationship between forests cover and ecosystem services; and **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.1**: By end 2011, complete list of priority terrestrial and marine sites developed, **Actions 2.1a-c**.

Catchment to Reef Processes and Human Livelihoods

Ecosystem Links to Human Health

STATUS: In progress

STUDY TITLE: Biogeographic signals within the bacteria of the human gut provide first clues to tracking microbes across individuals and landscapes

FUNDING: Grants to Massachusetts Institute of Technology

PARTNER ORGANISATIONS: Massachusetts Institute of Technology (Dr. Ilana Brito - lead), Ministry of Health, Fiji National University

OUTPUTS:

- *Proposal submitted:* "Assessing mechanisms of transfer of waterborne bacterial disease in vulnerable communities in Fiji" to the Australian Development Research Awards Scheme
- *Conference presentation:* Identifying the sources and transmission pathways of human-associated bacteria: Charting a road map for the potential spread of typhoid (presented by Dr. Brito at the Expert Panel on the Control of Typhoid Fever in Fiji workshop in August)

RESEARCH HIGHLIGHTS:

In 2011, WCS-Fiji in collaboration with Ilana Brito, postdoctoral associate at the Massachusetts Institute of Technology, launched a pilot study to examine the spread of bacteria across landscapes and between individuals to develop an approach to study the spread of typhoid bacterium within the rural populations of Fiji. The study was designed to survey and capture transmission routes of both commensal and pathogenic bacteria within a community and between individuals and their environment through high-throughput sequencing and analysis of microbial communities. The goal was to develop a roadmap for bacterial transmission that could serve as a model for the spread of typhoid fever.

Effective prevention and containment of a disease requires identifying the source or the transmission pattern of infections. Although studies of the direct transmission pathways of pathogenic bacteria have been done, they often fall short due to variable clinical presentation and misdiagnoses. Cases of typhoid fever represent just a sub-set of those infected, since many infected individuals are asymptomatic carriers. Our technique centers on utilizing the endogenous bacteria present within our bodies and environments to create a roadmap to identify bacterial "superhighways", which may be exploited by typhoid bacteria and to identify "hotspots" that serve as bacterial reservoirs. One hypothesis is that landscape features, such as intactness, may help or hinder the flow of bacteria. For example, converted landscapes may have more runoff and therefore more bacterial carriage, which could result in bacteria carried for far longer distances.

The fieldwork for the pilot study was conducted over the course of one month in 2011 in several villages of within the pristine district of Wainunu and the more converted landscape of the Macuata District. Approximately three hundred individuals volunteered for participation in the study. Bacterial samples were taken to represent the areas within the human body that have the greatest exposure bacteria and also represent well-utilized routes taken by pathogens. Environmental samples were also taken from the soil and animal samples. In 2012, we performed high-throughput sequencing on these samples to identify shared bacteria.

One of the most striking observations of our data is that there is a bio-geographic signal amongst the individuals that participated in our study. Bacteria from individuals from the same village look remarkably similar to each other. This observation trumps any other potential source of bacteria. For example, individuals who live in different villages but both fish daily have different microbiota living within than two people from the same village, one a fisherman and the other a farmer. Another observation is the prevalence of oral pathogens within the study community. It remains to be seen if these pathogens are more 'promiscuous' than other bacteria in the mouth. Research is ongoing to determine if individuals' environments are more likely to contain similar microbes as they are or vice versa. If this is the case, it will provide evidence for the flow of bacteria, which can be used in a follow-up study to identify whether typhoid can be observed in the environments of those affected by this bacterium, and importantly, what environmental features promote the spread of this endemic pathogen.

NEXT STEPS:

- Source funding for a more broadscale study coupling genetics, epidemiology, and ecology to identify relative contributions of different landscape and behavioral factors to the spread of typhoid fever.

LINKS TO NATIONAL PRIORITIES:
The project supports the **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 9:** Build the capacity of the health and agriculture sectors to respond effectively to climate sensitive diseases, including the strengthening of disease surveillance and control systems, and early warning mechanisms for climate sensitive human and livestock diseases

Conserving Biodiversity

Cetacean Surveys of Vatu-i-Ra Seascape

STATUS: Complete

FUNDING: Marisla Foundation

PARTNER ORGANISATIONS: Whale and Dolphin Conservation Society, Department of Fisheries

OBJECTIVES:

- Capacity building for field cetacean survey techniques
- Assessment of Vatu-i-Ra Passage and vicinity as a breeding ground for humpback whales and migratory corridor for cetaceans

RESEARCH HIGHLIGHTS:
The Vatu-i-Ra Passage and its vicinity is a migratory corridor for oceanic mega fauna, particularly cetaceans. Anecdotal records through interview survey of coastal villages within the Vatu-i-Ra seascape in 2011 identified this region as a cetacean hotspot. This presumed hotspot was confirmed to indeed host a multitude of cetacean species during a 1 wk survey of this area

in August 2011. This survey confirmed the presence of bottlenose dolphins (*Tursiops truncatus*) in Fiji's waters, breeding populations of humpback whales (*Megaptera novaeangliae*) and the presence of other smaller cetaceans that frequent this area. This was also the first WCS Fiji survey that was solely dedicated to the study of these marine mammals, with technical support from WCS Ocean Giants Asia Program Director, Brian Smith, to assist local staff.

To enhance capacity building for local staff in undertaking cetacean surveys, two Fiji field staff, Margaret Fox and Waisea Naisilisili, underwent training for 3 weeks with the WCS-Asia Ocean Giants in Bangladesh in March this year. This training comprised the different aspects of cetacean research including the following: (1) survey and transect design planning; (2) spotting cetaceans and identifying the species; (3) data recording; (4) taking biopsy samples using a cross-bow for DNA fingerprinting; (5) taking photos of the different cetaceans (dolphin fins, whale flukes) for photo identification; and (6) "cleaning" cetacean photos and identifying them using software imaging.

In August 2012, WCS Fiji collaborated with Dr. Cara Miller of the Whale and Dolphin Conservation Society (WDCS) to resurvey the Vatu-i-Ra Passage and its vicinity for 9 days to confirm if breeding populations of humpback whales frequent these waters as their breeding ground. Transects were designed to traverse the area where humpbacks were sighted in 2011 (Figure 9).

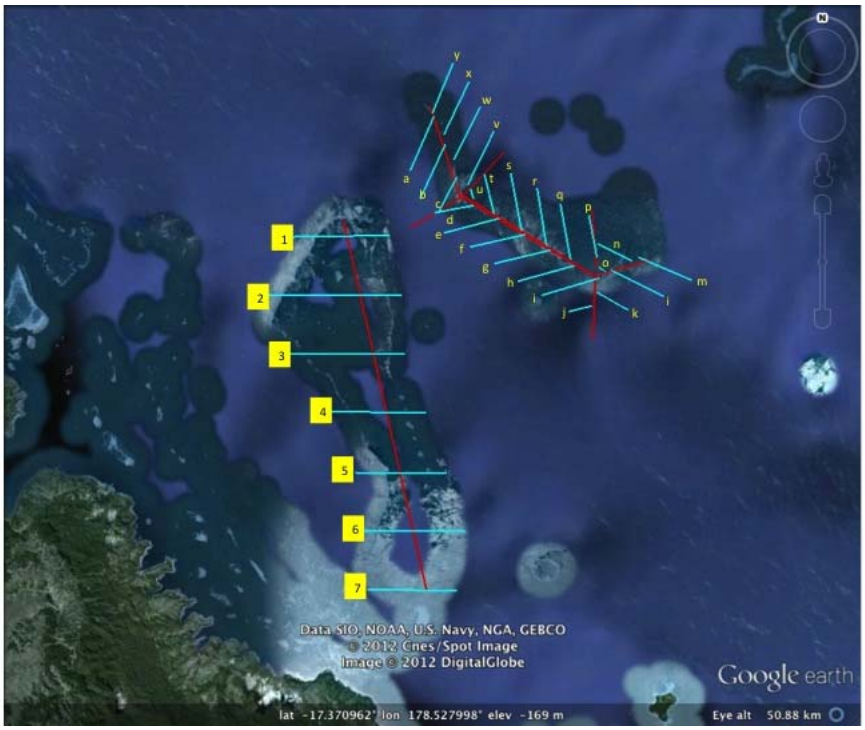

Figure 9. Transects paths for August 2012 cetacean surveys within the vicinity of Vatu-i-Ra Passage and Vatu-i-Ra Island.

We incorporated land-based, boat-based and acoustic surveys, with the land-based team based at the highest point of Vatu-i-Ra Island. For the acoustic survey, we lowered a hydrophone into the water at a 10 m depth to listen to cetacean activity either in the form of odontocete clicks or humpback whale songs. The latter was very useful in gathering information on cetacean presence and density even when cetaceans could not be visually sighted due to unfavourable weather conditions.

Through a combination of the above methodology, we identified: 10 -12 groups of breeding humpback whales mainly as a single individual or as a mother-calf pair; 2 pods of short-finned of pilot whales (*Globicephala macrorhynchus*), including juveniles with one pod numbering 40 and another 5 individuals (Figure 10); a pod of common bottlenose dolphins (*Tursiops truncatus*), comprising 13-15 individuals including juveniles; and 3 pods of spinner dolphins numbering 100, 12 and 60 individuals, respectively, with the 2 larger pods also boasting juveniles of this species.

The 2012 survey confirmed that the Vatu-i-Ra Passage and its vicinity is indeed a migratory corridor for these megafauna and supports breeding populations of humpback whales. A highlight includd recording of a 20 minute "Fiji Humpback Whale Song of 2012" that identifies this whale pod for this particular year, as songs vary annually. Humpback whale song is specific to pods and it is expected that all male Fijian humpback whales will sing the same song which would be similar yet unique from other pods in Oceania such as in Tonga or New Caledonia.

Figure 10. (LEFT) Humpback whale breaching near Vatu-i-Ra Island barrier reef. (RIGHT) Short-fin pilot whale.

NEXT STEPS:

- Consult with Fisheries and other stakeholders about developing increased regulation in the "doughnut hole" area falling outside of qoliqoli boundaries around the Vatu-i-Ra passage.
- Incorporate special cetacean management areas into district-level EBM plans and provincial-level ICM plans.

LINKS TO NATIONAL PRIORITIES:

This project supports the **NBSAP Implementation Plan Thematic Group 5 (Threatened and Endangered Species) Strategy 1:** Increase access to expertise/increased efforts made in the

fields of quality research, **Objective 1.1:** By 2012, resource inventories are compiled for at least 10 target species; **Action 1.1b**: Undertake a comprehensive terrestrial and freshwater/marine biodiversity resource inventory.

MANAGEMENT

The following sub-sections present a synthesis of completed and ongoing activities that have strengthened and supported community-based natural resource management in Fiji

Spreading Ecosystem-Based Management

Adaptive Management in Kubulau District

STATUS: Completed

FUNDING: David and Lucile Packard Foundation (2010-35664), US National Oceanic and Atmospheric Administration (NA10NOS4630052)

PARTNER ORGANISATIONS: FLMMA, Kubulau Resource Management Committee (KRMC), the Coral Reef Alliance, Kubulau Business and Development Committee

HIGHLIGHTS:
Since 2005, WCS has assisted communities in Kubulau District to establish a network of 3 large no-take marine protected areas (MPAs) and 17 smaller, periodically harvested closures (*tabu* areas). The initial network design was informed by both biological data and extensive consultation with communities. In 2009, management of these areas was formalised when village chiefs endorsed the Kubulau Ecosystem-Based Management (EBM) Plan, Fiji's first ridge-to-reef management plan that includes rules and regulations for all of the terrestrial and marine habitats in the district.

In 2011, two factors motivated a revision of the Kubulau EBM Plan: the need to improve management effectiveness of existing MPAs, and the desire to improve resilience to climate change impacts. Results from biological monitoring indicated variable management effectiveness of existing MPAs, which was attributed to MPA size, habitat productivity, level of compliance with management rules, and the duration and level of protection (i.e. the frequency of permitted harvests within tabu areas). Non-compliance was primarily attributed to poor awareness of MPA boundaries, although residents admitted deliberate poaching due to conflict over access rights, and high levels of external poaching were observed.

Climate change was recognized by community members as a threat to coral reefs at the time the Kubulau EBM Plan was developed, however, when the MPA network was designed, no data were available to explicitly incorporate reef resilience considerations. To identify critical areas for reef resilience, new underwater visual census surveys were undertaken in 2010 at 53 sites throughout the qoliqoli to collect data on reef fish species abundance and size, benthic

community composition, coral population structure and recruitment, and physical site characteristics likely to reduce temperature stress. These data were analyzed to produce a single resilience score for each site, as the weighted sum of ecological and physical indices of likely resistance to, or recovery potential from, climate-related disturbance. In addition, a gap analysis of habitat representation within the existing Kubulau MPA network, facilitated by newly acquired high-resolution Millennium Coral Reef Mapping Program data, indicated that whilst some reef types were well represented, others were largely absent from the network.

Conservation planning software (Marxan) was used to produce maps of priority areas for management not included within the current MPA network. To improve habitat representation, a target to include 30% of the area of ten coral reef types was adopted, following the target defined during the initial MPA network design phase. Socioeconomic costs were considered to be uniform on the basis that community decision-makers would integrate their own social, cultural and economic priorities more effectively than could be achieved through attempts to spatially model or predict these factors. Instead, resilience scores were applied as an "inverse cost", so that reefs with higher predicted resilience were preferentially selected to be included in MPA networks. Existing MPAs were retained in the design.

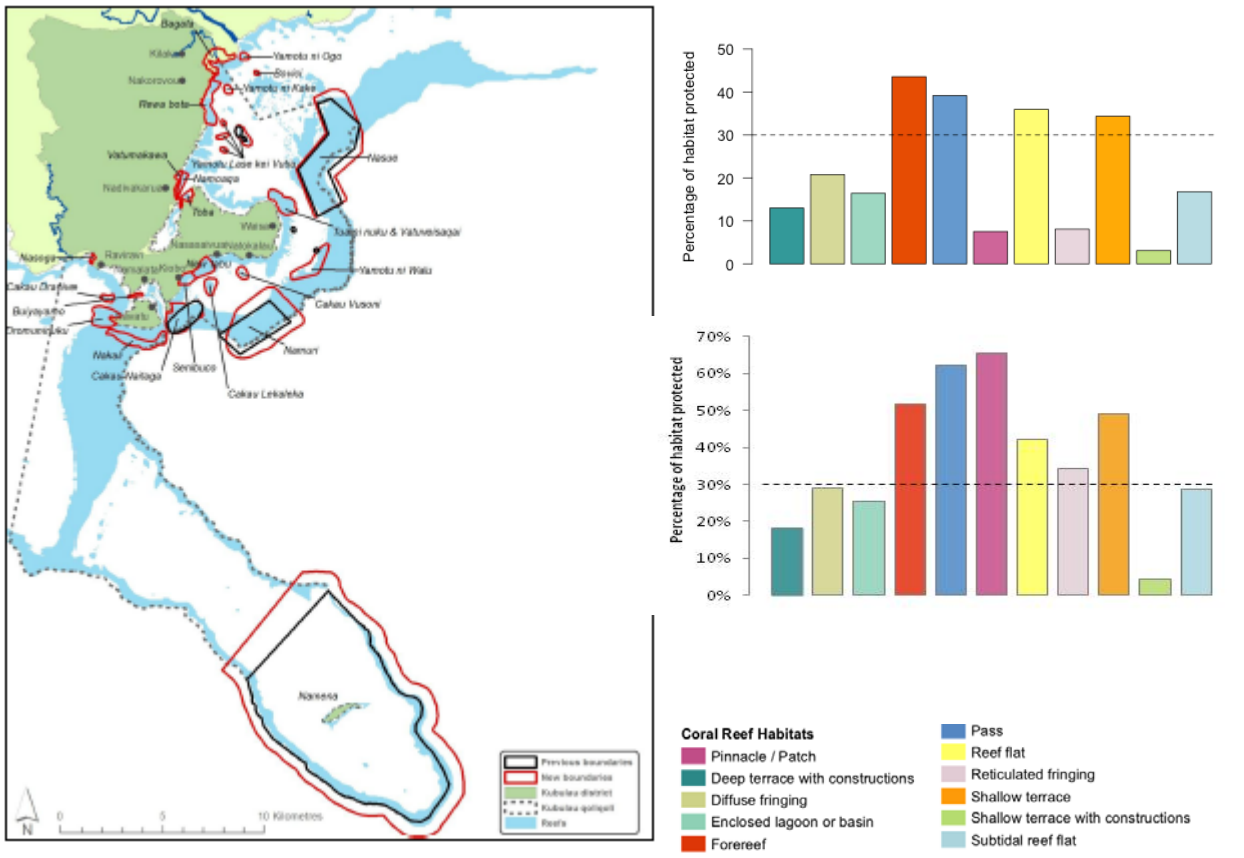

Figure 11. LEFT: Original (black) and adapted (red) boundaries of the Kubulau MPA network. TOP RIGHT: Representation of coral reef habitats within the original Kubulau MPA network. BOTTOM RIGHT: Representation of coral reef habitats within the adapted Kubulau MPA network.

In July 2011, WCS facilitated a three-day adaptive management workshop in Kubulau, attended by KRMC members, village representatives, the Tui Kubulau (high chief), and other government stakeholders (approximately 60 participants in total). Large format maps with recommendations for selection of new MPAs were presented to break-out groups representing different geographic areas in Kubulau. Following the workshop, changes to MPA boundaries and management rules proposed by participants were digitized by WCS staff and compiled into three options: (1) existing MPA boundaries; (2) boundaries proposed by workshop participants; and (3) boundaries recommended by WCS following scientific best-practice, for example extending protection to deep-water areas between protected patch reefs to minimize edge effects.

WCS conducted repeated follow-up consultations with stakeholders from each village in 2012 to arrive at final changes to the MPA network and EBM Plan that were approved by the Bose Vanua in March 2012. These changes included: addition of five new tabu areas; significant increase in size of three existing tabu areas, with clarified and simplified boundaries; and addition of 500 m buffers were added to the three district marine reserves (Figure 11). The MPA network now includes three district NTAs and 21 village tabu areas. An additional 35 km^2 has been placed under management, increasing the total area of the MPA network to 120 km^2, which is equivalent to 44% of the Kubulau qoliqoli.

NEXT STEPS:

- Assistance to Kubulau communities with monitoring and enforcement of adapted EBM Plan

LINKS TO NATIONAL PRIORITIES:

This work supports **NBSAP Implementation Plan Thematic Area 3 (Inshore Fisheries) Strategy 3:** Maintain existing protected areas, **Objective 3.2:** By 2014, biodiversity surveys show no decline in numbers related to 2010 levels and there is a 15% increase in biomass of targeted species inside MPA compared with outside, **Action 3.2ab:** Monitor core set of existing MPAs for biodiversity and fisheries resources compared with unmanaged sites; and **Strategy 4:** Design new ecologically relevant inshore MPAs, **Objective 4.5:** By mid-2014, 20% of communities with existing MMAs will have agreed to add additional MPAs, **Action 4.5a:** Consult with communities at existing MMA sites to determine willingness to add MPA sites to their MMA. This work also supports the draft **National Climate Change Policy Adaptation Strategy 4:** Support the development of adaptation technologies and systems that are sustainable, consider traditional knowledge and are culturally acceptable.

EBM Management Planning at the District Level

STATUS: Ongoing

FUNDING: John D. and Catherine T. MacArthur Foundation (10-94985-000-GSS), David and Lucile Packard Foundation (2010-35664), US National Oceanic and Atmospheric Administration (NA10NOS4630052)

PARTNER ORGANISATIONS: FLMMA, Kubulau Resource Management Committee (KRMC), Department of Fisheries, Department of Forestry, iTaukei Land and Fisheries Commission, Ministry of Agriculture, iTaukei Affairs Board, iTaukei Land Trust Board

HIGHLIGHTS:

In Fiji, people and wildlife are inextricably bound together in a relationship based on tradition and necessity. This critical linkage is the foundation of WCS's work in the Bua Province and the neighbouring district of Wailevu in Cakaudrove Province, supporting communities to develop and deliver Ecosystem-Based Management (EBM) plans at district level. Collaboration between communities is informed by extensive scientific assessments, as well as incorporating local and traditional knowledge. The aim is to support sustainable natural resource use and conservation whilst strengthening local culture and livelihoods of communities to ensure their health, prosperity and resilience.

Figure 12. MPA blessing ceremony at the launch of Wainunu District EBM Plan in June 2012.

In June 2012, the district of Wainunu launched their EBM, based on the template from neighbouring Kubulau District (Figure 12). A final draft of the Wailevu District EBM plan has

been prepared and awaits endorsement from the Tui Wailevu and district chiefs. The districts of Nadi and Solevu are progressing towards similar management plans of their own. Together, the management plans for these four new districts cover rules regulating activities in 93.1 km^2 and 73.8 km^2 of new marine and terrestrial protected areas, respectively, as well as activities in the surrounding land and sea matrix.

NEXT STEPS:

- At the request of Bua Provincial Council, WCS will engage the districts of Vuya, Dama, Bua, Navakasiga and Lekutu to develop complementary EBM plans between 2013-2014 (Figure 13).

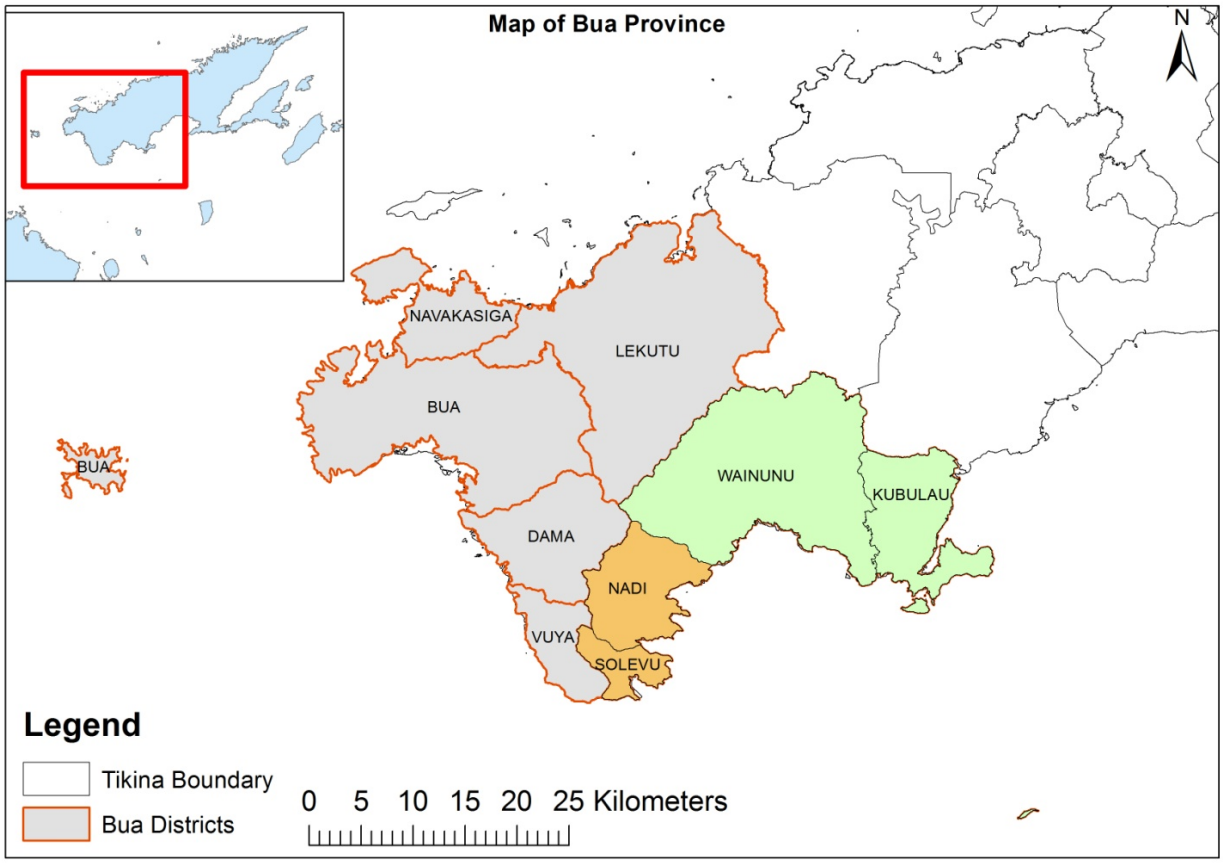

Figure 13. Map of progress for EBM plan development in Bua Province. Green – completed EBM plans; Orange – district plans in development; Grey – plans to be developed between 2013 and 2014.

LINKS TO NATIONAL PRIORITIES:

This project supports **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.2**: By 2014, develop management structures and implement paths to gazettal at highest priority sites, **Actions 2.2b-c**; and **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 4**: Design new ecologically relevant inshore MPAs, **Objective 4.6:** By mid-2014, 25% of the communities will

have established new management structures for new MPAs, **Action 4.6a:** Consult with communities at priority regions outside of existing MMAs to establish new MPA management structures. This work also supports draft **National Climate Change Policy Adaptation Strategy 5:** Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.

Provincial-scale engagement

Development of Roadmap for Bua Integrated Coastal Management Plan

STATUS: Ongoing

FUNDING: David and Lucile Packard Foundation (2012-37915)

PARTNER ORGANISATIONS: (Main partners include) Bua Provincial Office, iTaukei Affairs Board, FLMMA, District Resource Management Committees

HIGHLIGHTS AND NEXT STEPS:
Integrated coastal management (ICM) is defined as "a continuous and dynamic process by which decisions are taken for the sustainable use, development, and protection of coastal and marine areas and resources". The term 'integrated' implies the integration between different sectors (e.g. tourism, agriculture, national planning and fisheries), stakeholders (government, private sector and NGOs), scales (national and local), disciplines (physical science and social science) and spaces (land and sea). ICM principles are strongly reflected in district-level EBM plans that WCS is assisting communities to develop (see *EBM Planning at the District Level* above) and a range of recent activities in the province of Bua. Local villages and districts, in partnership with Bua Provincial Council, WCS and other partners, are therefore already establishing ICM practices at the local level.

Running concurrently with village development planning activities and providing coverage of the whole province, these district EBM plans will provide the basis for a Bua Provincial ICM Plan that integrate the district-level management objectives with provincial-level development goals. This is in direct support of the Fiji National Biodiversity Strategy and Action Plan Implementation Framework 2010-2014's thematic section on Coastal Development. Section 8(3) of the Fiji Environment Management Act 2005 invites the National Environment Council to task a "committee for coastal zone management to prepare a coastal zone plan." WCS Fiji Director Stacy Jupiter has been a member of the Integrated Management Committee (ICMC) since its establishment in 2009, and has contributed to the development of a National Coastal Plan Framework which recommends that ICM plans be developed at the provincial level and thereafter consolidated into a national plan. In September 2011, WCS facilitated the first workshop for the four provinces of the Vatu-i-Ra Seascape to consider how each might move beyond protected area networks into holistic planning for all activities that impact the coastal zone. As part of this project, WCS will follow up on the proposed recommendations for ICM

implementation through further consultations with the Bua Provincial Office, communities, and stakeholders to: develop a roadmap for a provincial ICM plan; use social networking analysis to ensure that we adequately identify all relevant stakeholders needed to scale up district-level LMMA management into a provincial-level ICM plan; and facilitate stakeholder workshops with the Bua YMST to develop zoning schemes consistent with district-level plans. In support of these consultations, WCS will prepare provincial level maps of biodiversity features for conservation, current and potential development sites, as well as vulnerabilities to climate change. This work will support a complementary ICM planning process for Ra Province being led by the Fiji Department of Environment with funding through an Asian Development Bank-Global Environmental Facility ICM project for Coral Triangle countries plus Fiji and Vanuatu. As the Fiji ICMC serves as a steering committee for the project, the WCS Fiji Director will be able to easily facilitate cross-project knowledge sharing.

A sustainable and relevant Provincial ICM plan will be one for which most stakeholders share a sense of ownership. The range of competing stakeholder interests and scientific uncertainties present challenges that are likely to affect wider adoption and up-scaling of ICM in Bua. It will be important to develop shared understanding and goals whilst fostering community ownership, building capacity and utilising local networks effectively. In 2012, WCS has conducted preliminary consulations with the Bua Provincial Office team to discuss development of the roadmap for the Bua ICM Plan, and we have developed a five month schedule from November 2012 in which to work closely with the Provincial Council and key stakeholders on pre-planning research and capacity building.

LINKS TO NATIONAL PRIORITIES:
This workshop was in support of **NBSAP Implementation Plan Thematic Group 4 (Coastal Development) Strategy 1:** Strengthen national guidelines for inter-sectoral coastal development, **Objective 1.3:** By 2014, a national coastal development plan to be developed to regulate/monitor coastal development activities; **Action 1.3b:** ICMC will collate and develop the coastal development plan with relevant stakeholders targeted to mainstream all current and planned development activities. The workshop also supported the following strategy from the draft **National Climate Change Policy**: **Adaptation Strategy 2**: Include vulnerability assessment and climate change impact projections into resource management planning, such as integrated coastal and watershed management plans.

Building Capacity and Awareness

Reef Resilience Training of Trainers Workshop

STATUS: Complete

FUNDING: John D and Catherine T MacArthur Foundation (10-94985-000-GSS), The Nature Conservancy

PARTNER ORGANISATIONS: Fiji Locally Managed Marine Area Network

OUTPUTS:

- *Outcomes Report:* Nand Y, Jupiter S, Weeks R, Fox M, Nakeke A (2012) Reef Resilience Training Workshop: Outcomes report 8th - 9th February, 2012. Wildlife Conservation Society, Suva, Fiji. 35 pp
- *Communications materials:* Reef resilience posters developed with principles for identifying signs of reef stress and designing resilient MPA networks

HIGHLIGHTS:

To minimize the impact of climate change on reef ecosystems and help them thrive in the future, WCS introduced the concept of reef resilience during a 2 day workshop in February 2012 for partners of the Fiji Locally Managed Marine Area network (FLMMA), who include representatives from communities and conservation organizations. The workshop was aimed at educating reef managers with the science and benefits of reef resilience principles in order to improve management strategies. Twenty-one people attended, including Yaubula Management Support Team leaders from Macuata, Cakaudrove, Koro, Gau and Ovalau-Motoriki, as well as representatives from universities, NGOs, government and private sector.

Throughout workshop, WCS introduced the concepts of planning for reef resilience within an adaptive management framework. WCS focused on low-technology, low-cost community-based techniques to identify resilient reefs and help communities protected them within a network of MPAs. Emphasis was given to the components of reef resilience used to design resilient MPAs as a better management strategy to face climate change impacts.

One of the most important outcomes of the reef resilience training workshop was the community based bleaching response plan that was developed during one of the group activities which could be adapted to most of the communities within Fiji (Figure 14). The bleaching response plan is very simple and requires minimum expertise but is developed based on observations with four major components: (1) coral health and impact assessment plans; (2) early warning systems; (3) management action plans; and (4) socio-economic implication plans. The other achievement of the workshop was the enthusiasm participants had to implement reef resilience principles in different parts of Fiji. Most of the community representatives went back to their sites with an implementation plan that includes updating communities about impacts of climate change, the concepts of reef resilience and resilient MPA design as a priority.

Figure 14. Participants at Reef Resilience Training workshop working through components of their bleaching response plan.

NEXT STEPS:

- Distribute reef resilience posters (Figure 15) to remaining YMST groups and FLMMA sites
- Follow-up with YMST groups to assess whether resilience principles are being incorporated into LMMA site management

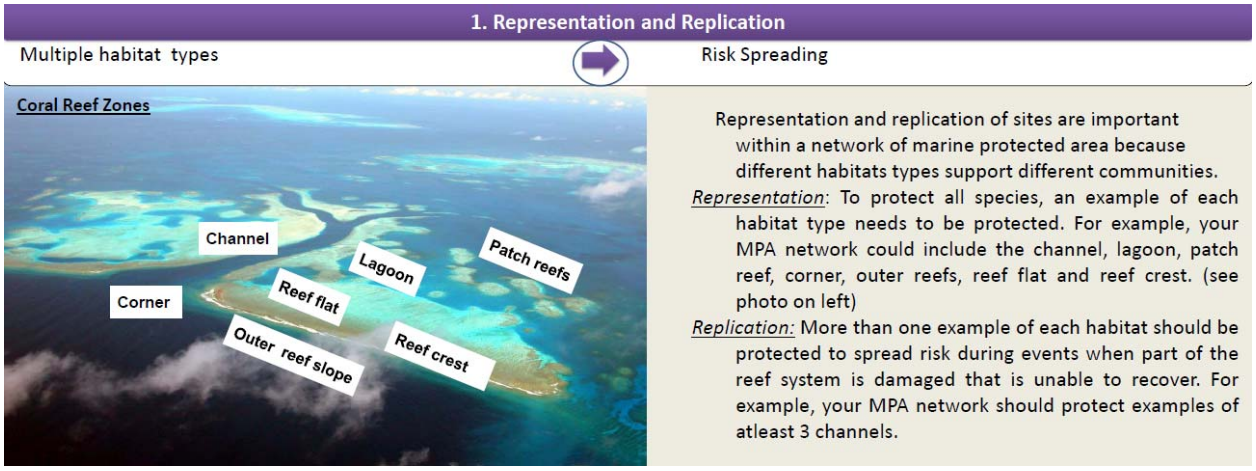

Figure 15. Portion of poster developed with basic guidelines for designing resilient MPA networks.

LINKS TO NATIONAL PRIORITIES:

This project supports **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5, Action 5.3a:** Provide all MMA sites with a management plan template and assistance developing management actions. Capacity building through training received from this workshop will allow site-based managers to support **Fiji Climate Change Policy Objective 5**

(Adaptation), Strategy 2: Include vulnerability assessment and climate change impact projections into resource management planning, such as integrated coastal and watershed management plans,

Investigating Opportunities for Alternative Livelihood Projects

STATUS: Ongoing

FUNDING: Critical Ecosystem Partnership Fund (60909), David and Lucile Packard Foundation (2010-35664), Flora Family Foundation

PARTNER ORGANISATIONS: Fiji Locally Managed Marine Area Network

HIGHLIGHTS:
If communities rely on limited income streams such as farming or fishing, increasing demand for money can lead to unsustainable exploitation and degradation of their natural resources. WCS is investigating opportunities for communities to develop environmentally-friendly economic activities, such as ecotourism and micro-enterprise, as a means of empowering local communities, diversifying their sources of income.

In 2012, this has focused on development of a women's cooperative for selling mats and other handicrafts weaved from *Eleocharis dulcis*, the fine-stemmed freshwater reed known locally as kuta. Kuta weaving is a traditional skill for women on Vanua Levu and WCS hopes to help preserve this local knowledge, as well as revive and generate income from based on a cooperative structure. A 'training of trainers' workshop held in November 2012 has catalyzed the skills transfer within and between communities in this regard.

Figure 16. Participants of kuta mat weaving training workshop display their handiwork.

NEXT STEPS:
WCS is also investigating the potential to up-scale virgin coconut oil (VCO) production through increased community collaboration and are mapping local eco-tourism initiatives as a basis for planning and marketing activities.

LINKS TO NATIONAL PRIORITIES:
By providing means to alternate revenue streams, this activity in principle supports **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 9**: Reduce demand for marine natural resources and biodiversity products. However, monitoring will be required to evaluate whether revenue is additive or alternative.

Management Support Training with Resource Management Committees

STATUS: Complete

FUNDING: David and Lucile Packard Foundation (2010-35664)

PARTNER ORGANISATIONS: Kubulau Resource Management Committee, FLMMA

HIGHLIGHTS:
WCS has undertaken the following of activities supporting community-based planning and management in 2012:

BUA PROVINCE
Wainunu

- Community consultations on district management issues and emerging strategies (all villages in Wainunu, January 2012)
- Management Support Workshop with Wainunu Resource Management Committee (Nakawakawa village, 28-29 February 2012)

Nadi

- Community consultation and awareness raising (all villages in Nadi, 1-2 March 2012)
- Consultation and awareness workshop (Sawani, 20 June 2012)

Solevu

- Community consultation and awareness raising (all villages in Solevu, 1-2 March 2012)
- Consultation and awareness workshop (Nawaido village, 20 June 2012)

CAKAUDROVE PROVINCE
Wailevu

- EBM Planning Workshop (Nabalebale village, 31 January – 2 February 2012)
- Wailevu West Management Support Workshop (Vunidamoli village, 17-18 April 2012)

- Wailevu East Management Support Workshop (Bagata village, 19-20 April 2012)
- Management Support Workshop with Wailevu West Resource Management Committee (Vunidamoli village, 12 September 2012)

LINKS TO NATIONAL PRIORITIES:
The management support workshops and associated activities support the following objectives: **NBSAP Implementation Plan Thematic Group 1 (Forest Conversion), Strategy 3:** Improve land-use practices through enforcement with well monitored land-use policy and logging codes, **Action 3.1d:** Promote community awareness on destructive influences of land-based activities and unsustainable harvesting practices on aquatic biodiversity, **Action 3.2e:** Identify important forest corridors and develop mechanisms and implement forest conservation or forest restoration activities in these locations, **Action 3.2g:** Secure the priority/core sites through appropriate arrangements with the current landowners or TFRO and **Action 3.2m:** Encourage and assist landowning and TFRO communities to document their traditional knowledge of biodiversity and its uses and develop their own local strategies. The workshops also support: **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 4**: Design new ecologically relevant inshore MPAs, **Objective 4.6:** By mid-2014, 25% of the communities will have established new management structures for new MPAs, **Action 4.6a:** Consult with communities at priority regions outside of existing MMAs to establish new MPA management structures; and **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5:** Strengthen natural resource leadership, management and governance**, Objective 5.4:** By 2010, resource managers at 50 selected sites are recording incidents of destructive fishing and by 2014, multi-sectoral enforcement plans developed for all MMA sites, **Action 5.4a:** Develop strategic, multi-sectoral enforcement plans.

COMMUNICATIONS

The following sub-sections present a synthesis of completed and ongoing activities that WCS Fiji has undertaken to improve communication between our organization, community partners and external stakeholders.

The Adventures of Joji Goby: An Educational Comic Book

STATUS: Complete

FUNDING: Disney Friends for Change Initiative

OUTPUTS:

- *Comic Book:* Ledua T (2012) The Adventures of Joji Goby. Wildlife Conservation Society, Suva, Fiji
- *Puppet show launch in 5 rural primary schools*

HIGHLIGHTS:

With funding through the Disney Friends for Change Initiative, WCS Fiji produced a comic book that chronicles “The Adventures of Joji Goby” as he searches for his family (Figure 17). When he misses the mass migration upstream, he teams up with Crab and Snail to conquer the many challenges along their path due to human modification of the river system. The comic book is designed to teach children and adults alike about the threats to Fiji's waterways and how they can better look after their rivers. The hazards that Joji faces are based on factors identified through research by WCS and Wetlands International-Oceania to be substantial threats to native freshwater fish.

Figure 17. Cover of English version of The Adventures of Joji Goby

On March 15-16, WCS Fiji staff launched the comic book at 5 schools in the Kubulau and Wainunu districts, Bua Province. Prior to the event, we obtained approval from the Ministry of Education and the headmasters of each school. Each presentation included:

- A formal offering of a set of comic books (in Fijian language) for the schools to use and incorporate into their teaching curriculum;
- A puppet show performance of the story by WCS staff, complete with question and answer sessions; and
- Presentation of t-shirts and river care packets to designated Goby Youth Ambassadors, with instructions on how to use a checklist to identify whether district rules for stream management are being obeyed.

Overall, we were able to reach over 750 students, teachers and parents between the following schools: Ratu Emeri School, Nakorovou Village, Kubulau District (~120 primary school students);

Kubulau District School, Kiobo Village, Kubulau District (~120 primary school students); Wainunu Seventh Day Adventist School, Nakabuta Village, Wainunu District (~80 primary school students); Adi Eliane School, Batinivuwai Settlement, Wainunu District (~90 primary school and ~20 pre-school students); and Ratu Luke School, Daria Village, Wainunu District (~200 primary school and ~120 secondary school students).

The reports back from the headmasters and teachers were glowing. The headmaster of Ratu Emeri confided that one student told him that they will need to clear the cassava and taro gardens planted for the teachers because they are within 30 meters of the stream, which is in violation of the rules of the Kubulau ecosystem-based management plan. The headmasters from both the Wainunu Seventh Day Adventist School and Adi Eliane both announced that they will help the children put into practice the messages about environmental management that they have been taught. Finally, the high chief of Kubulau, Ratu Apenisa Vuki, was particularly touched as the artist, Tui Ledua, is from Kubulau and his work will therefore inspire the young students to similar achievements.

An article featuring the launch and photos from the event appeared in the May edition of MaiLife magazine. A link to a video with highlights from the launch can be found here: http://wcsfiji.org.fj/the-adventures-of-joji-goby/. The comic book was further distributed at the IUCN Species Forum in the Solomon Islands in April 2011 and by the Fiji Delegation to the Ramsar Convention Conference of Parties in Bucharest, Romania in August 2011.

LINKS TO NATIONAL PRIORITIES:
This work supports **NBSAP Implementation Plan Thematic Group 7 (Inland Waters), Strategy 5:** Improve public awareness of the threats to wetland species and ecosystems and options for management, **Objective 5.1:** By 2012, the public will have a broader understanding of the specific threats to wetlands and the values of wetland services to public health, livelihoods and climate change adaptation, **Action 5.1b:** Launch social marketing campaign to raise awareness to threats to species and ecosystem services.

Newsletters

Vatu-i-Ra Community Bulletin

STATUS: Ongoing

FUNDING: David and Lucile Packard Foundation (2010-35664), John D. and Catherine T. MacArthur Foundation (10-94985-000-GSS)

PARTNER ORGANISATIONS: N/A

OUTPUTS:
Vatu-i-Ra Community Bulletin: Newsletters with updates of WCS and community activities distributed to all 10 villages in Kubulau District and to adjacent districts of Wainunu, Nadi,

Solevu (Bua Province) and Wailevu (Cakaudrove Province). Because of the expansion to adjacent districts, the Bulletin is now produced quarterly.

HIGHLIGHTS:

In 2012, articles in the bulletin covered:

FIJI ECOSYSTEM BASED MANAGEMENT (EBM) ▪ HEALTHY PEOPLE PROCESSES AND SYSTEMS

VATU-I-RA COMMUNITY BULLETIN

VOL. 24, OKOSITA 2012

VAKA TATAO NI VEI TOSOYAKI NI IKA

NA UASITU NI TUKUTUKU MI BALETA NA EBM:

INSIDE THIS ISSUE:

- Volume 21: Management planning in Wailevu District; Kubulau scholarships in 2012 awarded from the Namena dive tag scheme; an update on the decisions made at Bose Vanua in terms of district MPA boundaries; mooring maintenance; reef resilience training held in Suva for FLMMA members; and the launch of the publication Ecotales from Kubulau.
- Volume 22: Launch of the comic book Adventures of Joji Goby and puppet shows; findings of water source surveys in Kubulau; cetacean training for WCS Fiji staff in Bangladesh; information on how to deal with poachers; outcomes of initial management planning workshops in Nadi and Solevu; and summary of an expedition to the Vatu-i-Ra Seascape.
- Volume 23: Progress on forming a Resource Management Committee for Wailevu District; Fiji's proposed shark sanctuary; fish warden training in Bua and Cakaudrove provinces; training on sustainable land management; the launch and blessing of Wainunu's new network of terrestrial and marine protected areas; and ecotourism in Bagata village, Wailevu.
- Volume 24: Surveys of hanging culverts in Bua and Cakaudrove provinces; management planning workshop in Koroalau district (Cakaudrove); collating maps of environmental threats for Bua Province; awareness-raising workshops in Nadi and Solevu; presentations by FLMMA partners at the International Coral Reef Symposium; and scoping for a project to establish cooperatives weaving round *kuta* mats.
- Volume 25: Story from Mrs Edith Whippy, a *kuta* weaving expert; report from an experimental harvest of a tabu area at Kiobo village; training in sea-cucumber surveys; introduction to upcoming reef resilience surveys; More eggs, more fish! – a campaign to protect grouper spawning aggregations in Fiji; outcomes of freshwater biodiversity surveys.

EBM Partnership Newsletter

STATUS: Ongoing

FUNDING: David and Lucile Packard Foundation (2010-35664), John D. and Catherine T. MacArthur Foundation (10-94985-000-GSS)

PARTNER ORGANISATIONS: WWF, Wetlands International-Oceania, USP, Coral Reef Alliance, BirdLife International, SeaWeb, various


Fiji Ecosystem Based Management (EBM) = Healthy People, Processes and Systems

Key Messages:

- Successful 'ridge-to-reef' management depends on broad stakeholder input
- Inland and coastal communities need to manage their actions and resources together
- 'Ridge-to-reef' management protects habitat for all stages of life
- The success of protected areas for conservation and livelihoods relies on combining bottom-up community engagement with top-down planning
- Public health and livelihoods depend on environmental health
- Healthy ecosystems are the best defense against climate change impacts to livelihoods

Inside this issue:

MPAs boost marine conservation work in Macuata	2
Fiji's framework for IBA monitoring	2
Conserving forests & streams in Vanua Levu	3
First Natural Resource Management Strategy	4
Moon Reef Oceans Festival 2012	4

EBM FIJI ISLANDS

EBM-FIJI NEWSLETTER

Volume 4, Issue 3 — September 2012

Grouper groupies get in the groove!

Onlookers at Suva's Hibiscus Festival in August received a surprise performance: a flash mob of more than 120 people danced to a modern version of the tune, *Stayin' Alive* by the Bee Gees. The dance, and the apt song, signified the launch of the Fiji Spawning Aggregations Campaign on the theme of *More Eggs, More Fish*.

Led by a diverse group of partners—from government agencies and non-governmental organizations to private sector companies and communities—the campaign aims to decrease fishing pressure on key grouper species from July through October, which is the time of year grouper or *kawakawa* reproduce in Fiji—the grouper spawning season. The ultimate goal of the campaign is to ensure that the fishery can continue to support communities and commerce in Fiji for the long-term.

The impetus behind the dance was to share a conservation message in a non-traditional format. "There are so many messages given to the public on a daily basis," said Sanivalati Navuku, manager of the SeaWeb Fiji program. "Instead of sharing another gloomy message that warned about our ocean's future, we wanted to reach out in a fun, engaging way that encourages others to join us in reaching our goal. We are people of the islands, made of music and dance, so this was a perfect way to kick off this campaign." You can watch the flash mob at: http://www.youtube.com/watch?v=XGE0raHzwUU

The flash mob was a follow-up to the official launching of the campaign the day before. Speaking at the launch, Fisheries Permanent Secretary Inoke Wainiqolo said, "This is the time when most of our fishermen go and catch them [grouper] and when you catch them at this time you do not allow them to spawn and improve their population".

By decreasing fishing pressure on key grouper species during the peak spawning season, and thereby increase the health of the fisheries, the campaign will improve the ability of communities to meet their dietary and income needs.

A suite of activities are planned for the coming months, from raising awareness with decision-makers and resource-owners about the importance of spawning aggregation sites, to partnering with the business sector to pave the way towards a sustainable seafood market in Fiji.

In addition, the campaign is designed to build on the conservation ethic in Fiji, through a combination of iconic branding and the cultivation of a diverse group of ocean champions. These campaign strategies are expected to increase interest and buy-in to other conservation actions, ultimately improving the health of groupers as well as other marine resources.

Anti-clockwise from top left: The flash mob gets started; grooving for groupers; Black saddle grouper, *Plectropomus laevis*, a valuable dalicacy; Brown marble grouper, *Epinephelus fuscoguttatus*, at its spawning grounds in Fiji's waters.

OUTPUTS:

- *EBM Newsletter*: Quarterly newsletters distributed to over 400 external stakeholders to promote projects within Fiji and regionally that are using ecosystem-based management principles

HIGHLIGHTS:

The EBM partnership newsletter was released at the end of 2008 with aspirations to advocate to our non-community based stakeholders the adoption and practice of the EBM approach in Fiji and the region. Editions this year included:

- Volume 4, Issue 1: Building resilience into reef management; impacts of harvesting Kia Island's tabu area; management planning in Wailevu District; avian matchmaking on Valentine's Day (submitted by BirdLife International); Ecotales from Kubulau launched; and diseases spreading after flooding.
- Volume 4, Issue 2: Launch of comic The Adventures of Joji Goby; hunting for insects on Viti Levu (submitted by University of California), Wainunu District launches network of protected areas; framework for responding to coral bleaching; local conservation group receives global award (submitted by BirdLife International); and integrated coastal management in Ra.
- Volume 4, Issue 3: Grouper groupies get in the groove! (submitted by SeaWeb); MPAs to boost marine conservation work in Macuata (submitted by WWF); Fiji's framework for IBA monitoring (submitted by BirdLife International); conserving forests and streams in Vanua Levu; first provincial-level natural resource management strategy (submitted by WWF); and Moon Reef Oceans Festival 2012 (submitted by USP-IAS).

This newsletter is aimed at external stakeholders, electronically sent to various government departments, NGOs, academic institutions, donors, and regional agencies such as SPREP and SPC.

Websites

WCS Fiji Blog

STATUS: Ongoing

FUNDING: WCS core funding

OUTPUTS:

- *Website:* http://www.wcsfiji.org.fj

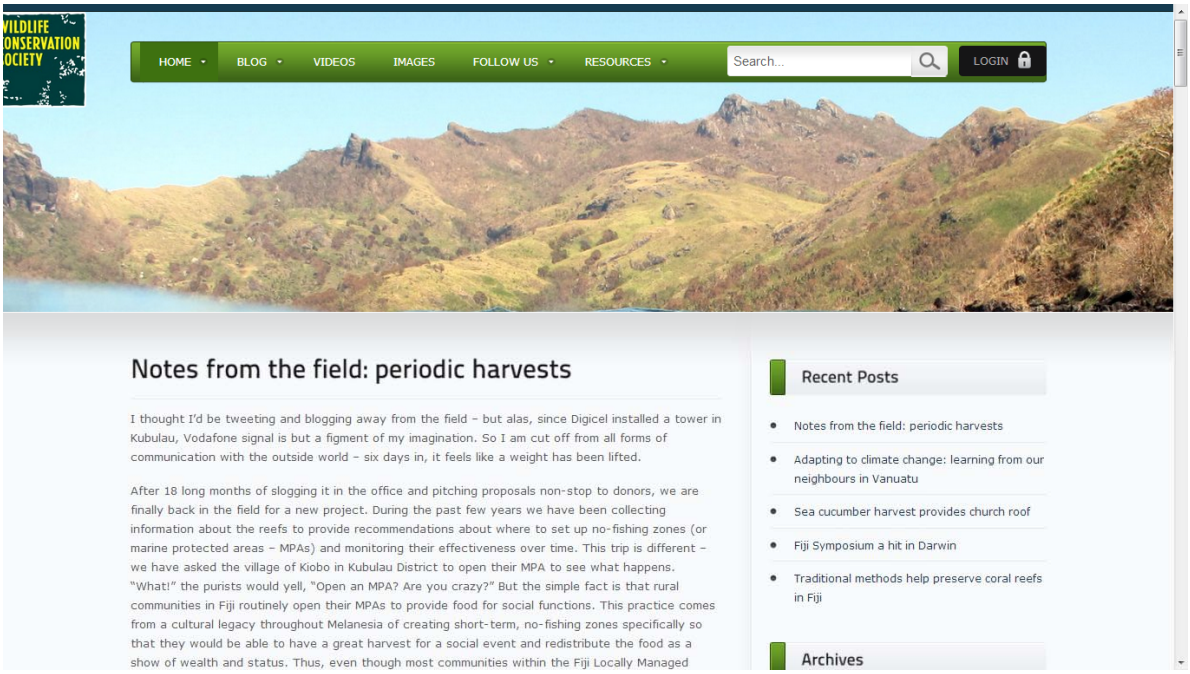

Figure 18. Homepage of WCS Fiji blogging website (www.wcsfiji.org.fj)

HIGHLIGHTS:

In 2011 WCS Fiji set up an additional website using the popular Content Management System WordPress (Figure 18). The purpose of this second website was for staff to easily be able to write updates about our work in a blogging format and also to be able to post video content which was previously not possible on the main WCS Fiji website (www.wcsfiji.org).

The blogging site now includes 53 stories written by 9 different authors at WCS Fiji, as well as 8 videos. It paints a real picture of what is going on in the office and in the field. The site is integrated with WCS Fiji's new media presence through Facebook (www.facebook.com/wcsfijiprogram), Twitter (www.twitter.com/wcsfiji), YouTube (www.youtube/wcsfijiprogram) and Flickr (www.flickr.com/photos/wcsfiji). With the exception of Facebook, WCS Fiji started using these new media channels in 2012 and we have found them

to be an excellent way to spread our message to new audiences – for example to our 400+ followers on Twitter.

Although the blogging site links back to the main WCS Fiji website and the resources that can be found there, now that the blog is established as a way of communicating our work, the next step is to fully integrate the blogging site as part of the main website.

ENGAGING WITH NATIONAL AND REGIONAL PROCESSES AND PLANNING

The following sub-sections present a synthesis of ways that WCS Fiji has participated in development of national and regional conservation and resource management planning and policies during 2012.

Protected Area Committee and PoWPA

In 2012, WCS provided valuable input to the PAC on legislative and institutional gaps for recognition and implementation of community conserved areas in Fiji. We collaborated on two reports that were prepared for the Convention on Biological Diversity's 12th Conference of Parties in Hyderabad, India.[6,7] WCS also called meetings with a sub-committee of the PAC to discuss options for development of protected area legislation in Fiji. This process will be funded under the GEF PAS award to Fiji, being administered by FAO. Secondly, WCS provided input to the terrestrial working group of the PAC for selection of priority areas for implementation of new protected areas. In support of this work and with partners from the University of Queensland's ARC Centre of Excellence for Environmental Decisions, we adapted our previously published land-sea prioritization model to include consideration of terrestrial targets for conservation (see *Land-Sea Prioritization to Maximize Coral Reef Health While Achieving Terrestrial Biodiversity Targets* above). Lastly, WCS acquired from Dr. Serge Andrefouet at the Institut de Recherche pour le Développement (IRD), Noumea, a complete set of Millennium Coral Reef Maps for Fiji which will enable us to update the national marine gap analysis once FLMMA has completed updating their inventory of LMMA sites and tabu areas.

Integrated Coastal Management Committee

WCS Fiji has maintained our status on the national Integrated Coastal Management Committee (ICMC), which has been revitalized through funding to the Department of Environment through

[6] Vukikomoala K, Jupiter S, Erasito E, Chand K (2012) An analysis of international law, national legislation, judgements, and institutions as they interrelate with territories and areas conserved by indigenous peoples and local communities. Report No. 19 Fiji, Natural Justice and Kalpavriksh, Bangalore and Delhi, 61 pp

[7] Govan H, Jupiter S, Comley J (2012) Recognition and Support of ICCAs in Fiji. In: Kothari, A. with Corrigan, C., Jonas, H., Neumann, A., and Shrumm, H. (eds) Recognising and Supporting Territories and Areas Conserved By Indigenous Peoples And Local Communities: Global Overview and National Case Studies. Secretariat of the Convention on Biological Diversity, ICCA Consortium, Kalpavriksh, and Natural Justice, Montreal, Canada. Technical Series no. 64, 32 pp

an ADB-GEF Coral Triangle Project. WCS Director Stacy Jupiter serves as an advisor to the ADB-GEF project, providing guidance on project activities being carried out in Ra which will lead to the development of a provincial-level ICM plan. At the same time, WCS Fiji has developed a roadmap of activities to be carried out in Bua Province starting in 2013 to develop a complementary ICM plan on the other side of the Vatu-i-Ra Passage. These activities include: stakeholder networking analysis to determine gaps in knowledge and information flow; capacity building with the Bua Provincial Office and Yaubula Management Support Team; developing district-level EBM plans for currently unmanaged districts; and integrating community-level plans with provincial-level development agendas.

Fiji Locally Managed Marine Area Network

WCS Fiji continues to strongly support the FLMMA network through our participation on the Executive Committee and multiple working groups (Biological Working Group, Communications Working Group, Design and Administration Working Group). In 2012, WCS Fiji assisted the broader LMMA network by conducting a literature review on the state of knowledge of the effectiveness of LMMAs for achieving multiple objectives. We aim to publish this in 2013. The review was completed to support a media briefing on LMMAs at the 12th International Coral Reef Symposium in Cairns and to provide information for presentations being delivered by other LMMA members.[8] Secondly, WCS provided support to the Peace Corps Response Volunteer currently serving as FLMMA coordinator in terms of guidance on activities for strengthening capacity of the Secretariat and financially to support several months of his rent. One of the activities included providing critical input into a review of FLMMA's Constitution and strategic plan implementation framework. Thirdly, WCS also provided financial and logistical support for a workshop to establish the Bua Yaubula Management Support Team, held in Nabouwalu in November, as well as financial support towards a YMST workshop coupled with the FLMMA Annual General Meeting in December in Savusavu.

[8] For example: The effectiveness of locally managed marine areas in Fiji. Tawake, Alifereti, Semisi Meo, Apisai Bogiva, *Ron Vave, James Comley, Sunia Waqainabete, Bill Aalbersberg, Lavenia Tawake, Stacy Jupiter, Helen R. Sykes

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Journal Articles

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Goetze JS, Fullwood LAF (2012) Fiji's largest marine reserve benefits reef sharks. Coral Reefs DOI 10.1007/s00338-00012-00970-00334 (WCS-Fiji sponsored research)

McClanahan TR, Donner SD, Maynard JE, MacNeil MA, Graham NAJ, Maina JM, Baker AC, Alemu J, Beger M, Campbell SJ, Darling ES, Eakin CM, Heron SF, **Jupiter SD**, Lundquist CJ, McLeod E, Mumby PJ, Paddack MJ, Selig ER, van Woesik R (2012) Evidence-based resilience assessments to support coral reef management in a changing climate. PLoS ONE 7:e42884. doi:42810.41371/journal.pone.0042884

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Jupiter SD, **Weeks R**, Jenkins AP, **Egli DP**, **Cakacaka A** (2012) Effects of a single intensive harvest event on fish populations inside a customary marine closure. Coral Reefs 31:321-334

Klein CJ, **Jupiter SD**, Selig ER, Watts M, Halpern B, Kamal M, Roelfsema C, Possingham HP (2012) Forest conservation delivers highly variable coral reef conservation outcomes. Ecological Applications 22:1246-1256

Book Chapters

Jupiter S, Roelfsema C, Phinn S (in press) Science and Management. In: Goodman JA, Phinn SR, Purkis SJ (eds), Coral Reef Remote Sensing: A Guide for Mapping, Monitoring and Management. Springer, pp. 386-408

Jupiter S, McClennen C, Matthews E (2012) Vatu-i-Ra Seascape, Fiji. In: Hilty JA, Chester CC, Cross MS (eds) Climate and Conservation: Landscape and Seascape Science, Planning and Action, Island Press, Washington DC, pp 148-161

Conference Proceedings

Fox M, **Naisilisili W**, Batibasaga A, **Jupiter S** (2012) Opportunities and challenges of managing spawning aggregations in Fiji. Proceedings of the 12th International Coral Reef Symposium, Cairns, Australia

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Jupiter S, Jenkins A, **Koto K**, Ah Tong J, Bwebe T, **Cakacaka A**, **Dulunaqio S**, **Fox M**, Kuritani L, Mario S, **Naisilisili W**, **Nand Y**, Tukana A, **Weeks R**, **Yakub N** (2012) Effects of alteration to catchments and streams on freshwater fish communities of Vanua Levu, Fiji. Wildlife Conservation Society, Suva, Fiji, 17 pp

Jupiter S, **Fox M**, **Cakacaka A**, **Caginitoba A**, **Askew N**, **Qauqau I**, **Weeks R**, Prasad S (2012) Building provincial-level integrated coastal management plans: Outcomes from the Vatu-i-Ra Seascape Stakeholders Workshop. Wildlife Conservation Society Fiji, Suva, Fiji, 46 pp.

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Comic Book

Ledua T (2012) The Adventures of Joji Goby. Wildlife Conservation Society, Suva, Fiji

PROJECTED ACTIVITES FOR 2013

The following sub-sections present a brief list of confirmed and pending projects for 2013 and their links to National Priorities. All dollar values inclusive of indirect cost recovery by the WCS Global Conservation Program headquarters in New York.

Improving community-based fishery and MPA management in Fiji and Indonesia

STATUS: Confirmed

NATIONAL PRIORITIES:
This project supports:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Objective 5.1:** By 2014, 50% increase in number of villages and management units that have undergone leadership training, **Action 5.1a:** Provide leadership training to managers of marine biodiversity and fisheries resources
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Objective 5.3**: By 2014, all inshore MMAs will have a management plan that is adaptively managed, **Action 5.3a:** Provide all MMA sites with a management plan template and assistance developing management actions
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Objective 5.4**: By 2010, resource managers at 50 selected sites are recording incidents of destructive fishing and by 2014, multi-sectoral enforcement plans developed for all MMA sites, **Action 5.4a:** Develop strategic, multi-sectoral enforcement plans.
- Draft **National Climate Change Policy Adaptation Strategy 5:** Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience;

2013 EXPECTED OUTPUTS:

- Draft EBM plans produced for Vuya, Dama, Lekutu, Navakasiga, Nadi and Solevu districts
- Spawning aggregation comic book produced
- Roadmap for Bua Integrated Coastal Management Plan developed
- GEF Small Grants Project approved to operationalize Bua YMST
- Community Educators Network Trainings conducted to strengthen district level awareness and communication skills

LOCATION: All districts of Bua Province; Wailevu District, Cakaudrove Province

PARTNERS: SeaWeb

DONOR: David and Lucile Packard Foundation (2012-37915)

TIMELINE: July 2012 - June 2014

INVESTMENT: USD$300,000 to WCS Fiji

Strengthening conservation and management across the Mt. Navotuvotu-Mt. Kasi forest corridor, Fiji

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 1 (Forest Conversion), Strategy 2:** Promote research and awareness on forests and terrestrial resources, **Objective 2.2:** By 2012, promote at least 2 case studies on the relationship between forests cover and ecosystem services, **Action 2.2h**: Undertake a survey on current status of biological resources, specifically those of subsistence and economic importance and those that are threatened or need attention for protection.
- **NBSAP Implementation Plan Thematic Group 7 (Inland Waters), Strategy 1:** Improve and update information on status of wetlands and wetland biodiversity, **Objective 1.1:** By end 2011, national wetland inventory of habitats (as well as their flora and fauna) produced as baseline for national planning, **Action 1.1b:** Collate and update information into spatially registered database.
- **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.1**: By end 2011, complete list of priority terrestrial and marine sites developed, **Actions 2.1a-c**

2013 EXPECTED OUTPUTS:

- Local agreement to protect 10 community forest parts with total areas of ~1825 ha and river buffer zones covering ~100 ha, whose management is nested within 5 district level EBM plans
- Kuta mat weaving cooperative established and profiting from regular sale of mats
- Development of management support networks to ensure monitoring and enforcement

LOCATION: Mt. Navotuvotu - Mt. Kasi corridor, Vanua Levu

PARTNERS: iTaukei Affairs Board, NatureFiji-MareqetiViti, Department of Forestry, iTaukei Lands Trust Board

DONOR: Critical Ecosystem Partnership Fund (60909)

TIMELINE: May 2012 - June 2013

INVESTMENT: USD$99,925

Impacts of periodic harvests from customary marine closures on achievement of short-term socio-cultural and long-term conservation objectives

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries;
- **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

2013 EXPECTED OUTPUTS:

- Surveys of fish communities and benthos before and after 4 tabu harvests of varying durations
- Surveys of changes in fish behavioural response to fishing (USP Masters student project)
- Household data collected of local motivations and expectations for harvests to be compared with data on actual benefits obtained through catch per unit effort surveys and repeat household surveys
- Workshop held to develop proposal for broader investigation across Melanesia

LOCATION: Kubulau District and other sites to be determined

PARTNERS: Institute of Applied Sciences – University of the South Pacific, FLMMA

DONOR: David and Lucile Packard Foundation (2012-38137)

TIMELINE: October 2012 – March 2014 (with likely extension for another 18 months)

INVESTMENT: USD$250,000

Advancing payments for ecosystem services and developing alternative livelihoods in Vatu-i-Ra Seascape, Fiji

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 9**: Reduce demand for marine natural resources and biodiversity products.

2013 EXPECTED OUTPUTS:

- Communities at four sites will establish tourism access fee schemes, as well as a fair redistribution system within local communities, to provide villagers with a significant investment in the protection of their natural resources.
- Production and marketing of a map of culturally and ecologically significant sites within the Vatu-i-Ra Seascape, focusing specifically on locally-managed ecotourism initiatives.
- Develop two alternative livelihood projects, including a kuta mat weaving cooperative.

LOCATION: Vatu-i-Ra Seascape

PARTNERS: N/A

DONOR: Flora Family Foundation

TIMELINE: July 2012 – June 2014

INVESTMENT: USD$80,000

Impact of periodic harvests of customary fishing closures on achievement of conservation and social objectives

STATUS: Pending

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries;
- **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

2013 EXPECTED OUTPUTS:

- Surveys of fish communities and benthos before and after 4 tabu harvests of varying durations
- Surveys of changes in fish behavioural response to fishing (USP Masters student project)
- Household data collected of local motivations and expectations for harvests to be compared with data on actual benefits obtained through catch per unit effort surveys and repeat household surveys

LOCATION: Sites to be determined for experimental tabu harvests

PARTNERS: Institute of Applied Sciences – University of the South Pacific, FLMMA

DONOR: Pew Marine Conservation Fellowship Program

TIMELINE: April 2013 – March 2016

INVESTMENT: USD$150,000

Globalizing research, strategy, and management for climate adaptation on coral reefs

STATUS: Pending

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries;
- **Fiji Climate Change Policy Objective 3 (Awareness Raising), Strategy 4:** Establish an effective communication and networking mechanism on climate change issues among government departments, NGOs, CBOs, faith-based organisations, municipal councils, the private sector, and professional and academic institutions.

2013 EXPECTED OUTPUTS:

- Social network analysis completed to facilitate expansion and coordination of Bua LMMAs into development of a draft provincial-level ICM plan
- Assessment of how periodic harvests may compromise achievement of biodiversity conservation objectives.

LOCATION: Bua Province and other sites to be determined for experimental tabu harvests

PARTNERS: Institute of Applied Sciences – University of the South Pacific, FLMMA

DONOR: John D and Catherine T MacArthur Foundation

TIMELINE: January 2013 – June 2013

INVESTMENT: USD$112,507 to WCS Fiji

Assessing mechanisms of transfer of waterborne bacterial disease in vulnerable communities in Fiji

STATUS: Pending

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **Fiji Ministry of Health Strategic Plan (2011 - 2015)**, Objective 2.3: Reduce confirmed cases of typhoid by 75% by 2015;
- **Fiji Ministry of Health Strategic Plan (2011 - 2015)**, Objective 2.7: Reduce incidence rates of leptospirosis by 50% by 2015; Objective 7.1: Increase the proportion of people with access to safe water;
- **Fiji Ministry of Health Strategic Plan (2011 - 2015)**, Objective 7.2: Increase the proportion of people with access to safe sanitation.
- **Fiji National Climate Change Policy Objective 5.9**: "Build the capacity of the health and agriculture sectors to respond effectively to climate sensitive diseases";
- Core visions of the **2011 Fiji Department of Environment National Coastal Plan Framework** to "Improve health and well-being of the people of Fiji."

2013 EXPECTED OUTPUTS:

- Establishment of cross-sectoral project steering committee
- Training of project nurses and rural health staff in Bua and Ba
- Data collected through case-controlled and longitudinal study to enable assessment of drivers of waterborne bacterial disease transmission

LOCATION: Vulnerable sites identified within Ba and Bua Provinces

PARTNERS: Ministry of Health, Environmental Health Unit, Fiji National University, Massachusetts Institute of Technology, James Cook University

DONOR: Australian Development Research Awards Scheme

TIMELINE: March 2013 – February 2016

INVESTMENT: AUD$1,099,694

Marine Conservation in Panama, Nicaragua, Madagascar, Fiji, and Congo/Gabon

STATUS: Pending

NATIONAL PRIORITIES:
The activities under this grant support **NBSAP Implementation Plan Thematic Group 5 (Threatened and Endangered Species), Strategy 5:** Improved communication amongst stakeholders (including communities) on threatened & endangered species, **Objective 5.3:** By 2014, empower communities through knowledge to protect and conserve endangered and threatened species, **Action 5.3b:** Consider the adoption of species into existing and new conservation initiatives.

2013 EXPECTED OUTPUTS:

- Increased local awareness of requirements for cetacean management;
- Development of networks of MPAs in western Bua Province over areas identified as important for cetaceans and coral reef fisheries;
- Commitments from Ra and Bua ICM committees to consider implementation of special cetacean management zones in their ICM plans; and
- Support from management partners for special measures (e.g. long-line fishing bans) to be implemented in the deep waters of the Vatu-i-Ra Seascape, outside traditional fisheries management areas.

LOCATION: Vatu-i-Ra Seascape

PARTNERS: Whale and Dolphin Conservation Society, Department of Fisheries, WCS Ocean Giants Program

DONOR: Marisla Foundation

TIMELINE: January 2013 – October 2013

INVESTMENT: USD$22,609 to WCS Fiji