

Conserving the Marine Biodiversity of Marovo Lagoon, Solomon Islands:

*Development of environmental management initiatives
that will conserve the marine biodiversity and
productivity of Marovo Lagoon, Solomon Islands*

Solomon Islands

The University of Queensland, Brisbane, Australia

A project funded by the
John D. and Catherine T. MacArthur Foundation
2004-2007

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Project Description

1. Purpose Statement

This proposal will provide the scientific basis to support sustainable management of the Marovo Lagoon in the Solomon Islands, while maximising use of local marine resources for the benefit of local communities. The health of coastal marine ecosystems in the Marovo lagoon, like many sites around the world, are at risk due to inappropriate land use adjacent to coastal rivers and the lagoon (FAO 1994; Umali *et al.* 1987; WWF 1999a & b; World Bank 2000). Mangrove, seagrass and coral habitats provide the basis of most food chains in tropical regions; hence any deterioration in the condition or health of these habitats will lead to significant losses in both physical and functional benefits derived from these coastal ecosystems. Both intentional (wetland reclamation, point source pollution discharge, destructive fishing practices) and unintentional (increased run-off due to clearing, non-point source pollutant release) anthropogenic activities can lead to serious degradation of these important habitats and lead to a reduction in productivity of the ecosystem.

IUCN in 1986 described the Marovo Lagoon as “one of the world’s best defined and largest double barrier enclosed lagoons”. The lagoon was placed on the Pacific “A” list of areas of outstanding universal value for marine biodiversity and is currently being considered for World Heritage listing.

Given the high biodiversity of the Marovo Lagoon (World Bank 2000), and our understanding of current and future threats from both intentional and unintentional anthropogenic degradation, it is urgent that the local community be supported in providing best management practices to preserve the current biodiversity and, if necessary, rehabilitate regions that have already been degraded. Our activities will contribute to the preservation of the biodiversity of the Marovo Lagoon by supporting better management of its natural resources through targeted scientific research into the ecological systems while also addressing the socio-economic needs of the community. Experience has shown that unregulated use of land and marine resources leads to their abuse, waste of natural capital, and unnecessary destruction of biodiversity. It is therefore imperative to find ways to better manage the Marovo Lagoon to maintain ecologically healthy marine systems that support the communities that rely on them for food and livelihoods. This integration of environmental and socio-economic management can be best developed and implemented at a local level with collaboration between the community, legislators and scientists and requires well informed discussion of the issues. The current proposal will provide appropriate scientific information, in a format that can be understood by the local community, to stimulate discussion and decision-making by informed community members and government officials.

2. Description

2.1 Goals and Objectives

The overall goal of this project is to provide an integrated approach to the environmental management of Marovo Lagoon that will support protection of the regions high biodiversity and allow for sustainable use of the lagoons resources to support the local communities. To achieve this we will undertake both an anthropological study of the indigenous culture to identify their current approach to environmental management and use of the lagoons resources, as well as an inventory of marine ecosystems in the Lagoon and various aspects of its current ecosystem health.

The provision of these tools for the protection of Marovo Lagoon are essential in the development of an integrated environmental management approach. Developing countries, such as the Solomon Islands, do not have the luxury of declaring large regions of the marine environment off limits to human use, as may be

possible in developed countries. Hence, environmental management in developing countries must work with the local communities through education to achieve a sustainable outcome for both the community and the environment. In many cases the highly productive marine ecosystems provide food and income for a large proportion of the population of coastal communities and unsustainable use of this resource can be modified if the community understands the need for change and the potential long term benefits. However, before we can discuss modifications to current practises that impact on Marovo Lagoon (both terrestrial and marine), we need to have a better inventory of the ecosystems that are present and the environmental pressures that may be threatening certain ecosystems.

The specific objectives that we will address to achieve the project goals are:

1. Initiate dialogue with the local community and complete a synthesis of current uses of Marovo Lagoon and environmental impacts;
2. Undertake an ecosystem assessment of the various habitats in Marovo Lagoon and their current ecosystem health. This will include identification of major environmental stresses currently impacting on the lagoon's ecosystems;
3. Provide a map of the south east Region of Marovo Lagoon that identifies major habitat types and identifies regions of the lagoon where the current habitats are "At Risk" due to anthropogenic or other environmental stresses;
4. Produce educational aids in the form of posters, leaflets and local trainers' guides to natural resource management issues to assist in communicating our findings to the community and provide a catalyst for change; and
5. Address the economic impacts of any recommendations to protect the marine ecosystem and attempt to design a solution that results in an improvement in the communities overall economy.

2.2 Project Activities

2.2.1 Involvement of local stakeholders

It is important to involve local stakeholders (community members and management organizations, both government and NGO's) in any project to assess the ecosystem health of the Marovo Lagoon as this will give local ownership of the results to the community as well as enabling visiting scientists to benefit from the considerable knowledge that the local community already knows about their environment. Interaction with the local stakeholders is also the only way to facilitate long term responses to environmental impacts that anthropogenic activities are having on the marine ecosystem of the Marovo Lagoon.

Effective interaction of local stakeholders involves the building of trust between different groups and a feeling that there are mutual benefits available through working together. The building of trust between scientists and various interest groups in the Marovo Lagoon region of the Solomon Islands will require time to develop. To facilitate interaction with the local communities The University of Queensland will work with the Rural Development Trust Board (RDTB), a Solomon Island registered NGO that has its headquarters on Tengomo Island in the central portion of the south eastern section of the lagoon, to develop an integrated approach to managing this natural resource. The RDTB has a formal research and collaboration agreement with UQ which places a high priority on equitable management of intellectual property of indigenous communities. The RDTB is working with the local communities near Duvaha on Marovo Lagoon in a reforestation project and has the support of the Western Province legislature in undertaking projects in the natural resource management area in New Georgia. We will involve as many local peoples as possible in our field work particularly people who have worked on earlier projects dealing with community management of natural resources of the Lagoon and its environs. The RDTB will oversee the local education component of the project with visits to schools,

community meetings and assist in the oral history/indigenous knowledge gathering. We will also meet with community groups and environmental managers as an integral part of all visits to the Solomon Islands.

Indigenous peoples' knowledge of natural resources and natural resources management (NRM) has generally survived colonisation and occupation by western nations (Berkes 1999, Igoe 2003, Ross and Pickering 2002) and has the ability to contribute to 'mainstream' land and water resource management (e.g. Baker et al 2001; Barker and Ross 2003; Peterson and Rigsby 1998; Prangnell *et al.* 1999; Williams and Baines 1993). Nevertheless there are significant bureaucratic and systemic barriers to the incorporation of indigenous knowledge into western management systems, due largely to epistemological barriers to the recognition of Indigenous knowledge as an equal partner with scientific knowledge (Ross 2003).

Dr Ann Ross, the anthropologist in our team, will ascertain the indigenous knowledge basis for the social and cultural context for NRM custom practiced by the traditional owners of the area. She will gather information on indigenous fishing practices, and the impacts of modern development on their yields to assist in developing programs for better management of marine ecosystems.

2.2.2 Baseline Ecosystem Assessment of Marovo Lagoon

A major output of this study will be to produce an integrated ecological assessment of the current ecosystem health of the Marovo Lagoon. This will be achieved by focusing on 5 different rivers or sources of pollutants to the lagoon (example shown in Fig.1). For each river we will estimate the pollutant input to the lagoon (Nutrients and sediment), potential flushing mechanisms for removing these pollutants from the lagoon and how various ecosystem health indicators vary along a transects from the pollutant source (river mouth) to a relatively pristine (oceanic influenced) section of the Marovo Lagoon (Fig. 2). The areal extent of our assessment of ecosystem health will be expanded by the use of remotely sensed images to link regions where we have field data with regions of the lagoon that were not sampled but have similar spectral properties.

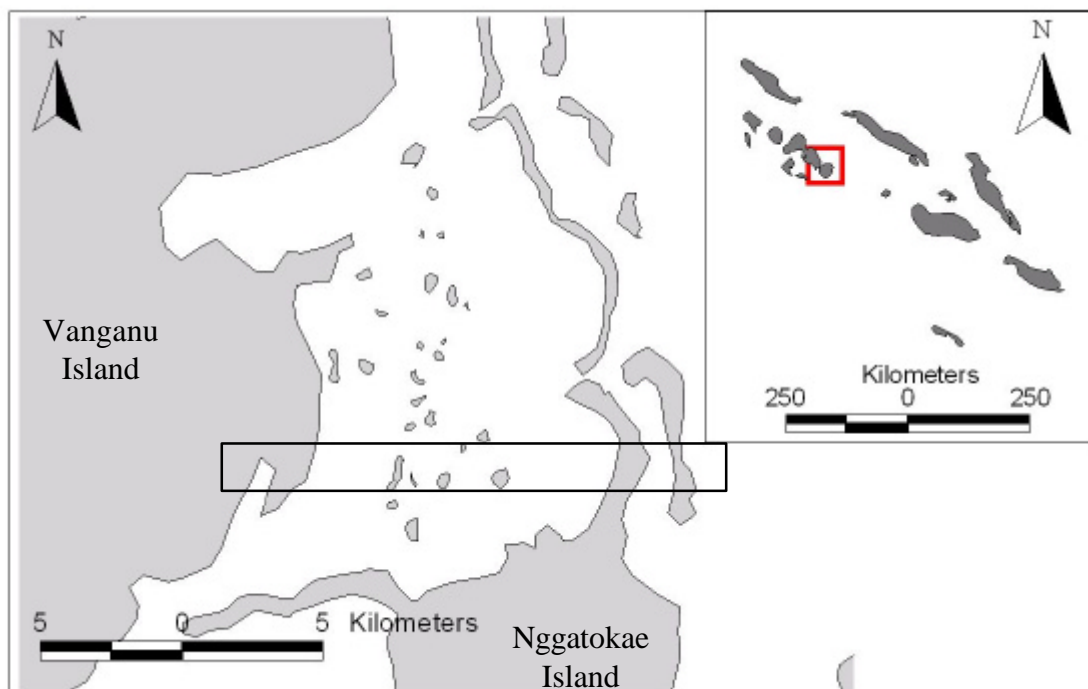


Fig. 1. Map of south east Marovo Lagoon, New Georgia, Solomon Islands. Note the example of proposed transect from Vanganu (site of greatest disturbance) across to the double barrier of Marovo Lagoon (also see Fig.2 profile view).

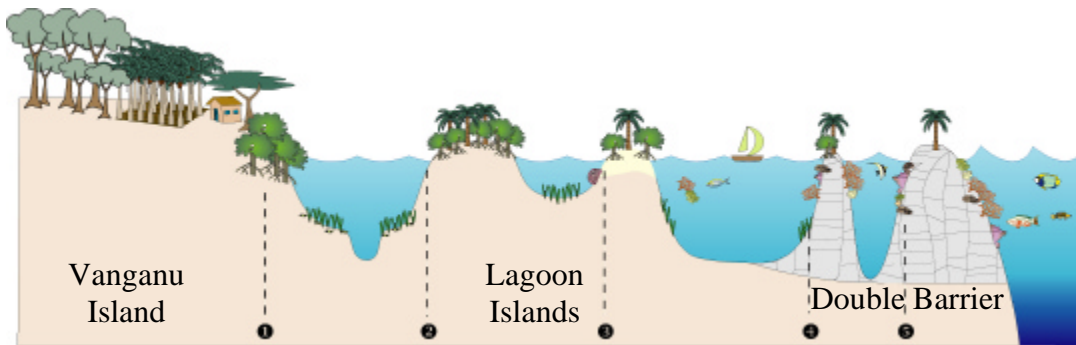


Fig. 2. Conceptual model of transect across the Marovo Lagoon (also see Fig. 1).

2.2.3 Habitat and Ecosystem Health Mapping

To facilitate the dissemination of the field sampling data and improve its usefulness and application for environmental managers and community groups, we will use GIS (Geographic Information Systems) and remotely sensed images of the Marovo Lagoon to extrapolate the measurements of ecosystem health made on a relatively small spatial scale to the entire south-east region of the lagoon. Remotely sensed images validated by field monitoring will also be used to identify areas of concern in other regions of the lagoon that environmental managers or community groups may wish to investigate further.

Geographical Information System

All data collected during the project will be directly linked to a world geodetic datum to ensure it can be compared spatially as well as for validation of remotely sensed imagery. Geographical Information Systems will be used to undertake the spatial analysis.

Remote Sensing

Field data, such as marine vegetation characteristics and optical water properties, will be used to validate remotely sensed images. The methods used will be repeatable and cost effective so that they can be implemented by local GIS/Remote Sensing officers who have been trained by SOPAC.

The suite of imagery used will focus on:

- ? Aerial photography to specifically look at change over long time periods, with aerial photography probably being available from before 1960.
- ? Archival and new "Landsat" imagery for habitat and water quality mapping on a broad scale using existing image archives starting in the mid 1980s.
- ? New high resolution "IKONOS" imagery if it has been collected over the area for SOPAC projects as it will result in more detailed/accurate habitat maps being produced.
- ? Monthly, weekly and daily "MODIS" imagery which has free downloadable products on the web. The products present chlorophyll, suspended solids and sea surface temperature.

2.2.4 Production of educational information and synthesis of results

As a way of interacting and communicating scientific concepts to community groups and environmental managers, the Marine Botany Group at The University of Queensland has been producing information brochures to synthesise their results for many years. The UQ personnel involved in this proposal will continue

to synthesise their findings using conceptual diagrams that highlight the most important aspects of an ecosystem and the environmental factors that impact on that ecosystem. The synthesised outcomes from the research can be produced into posters and handouts and will be used to communicate our findings and stimulate interactions with local community members. There will be regular visits to schools by the local project team organised by the Rural Development Trust Board to talk about Marovo Lagoon issues as well as meetings with local communities to discuss management of natural resources associated with the Lagoon.

Annual workshops will also be organised in the Solomon Islands to keep the local community informed and involved in the work that is being undertaken. In addition administrative workshops will be held every 6 months at The University of Queensland involving all participating academics to synthesise the data collected each year and discuss the most productive use of our field time for subsequent years.

2.2.5 Economic impact of recommended changes to current practise

Professor Campbell, a specialist in public finance, microeconomic theory, natural resource economics and applied econometrics, will provide an overview of the current economic base of communities in the Marovo Lagoon and suggest various future scenarios. He will use cost-benefit methods to advise on the potential economic costs of changes to current practise, that are recommended to protect the ecological health and biodiversity of Marovo Lagoon, as well as highlight the potential for economic gains due to long term preservation of biodiversity and the potential for less damaging industries to replace more destructive extractive industries. One of the alternative livelihood activities is ecotourism and Dr Bill Carter will advise on approaches to this. Dr Carter conducted a major study on cultural change and tourism in the Solomons involving Tetapare as one of the sites.

Project Personnel

The Study team includes academic staff and graduate students from The University of Queensland as well as residents of the Solomon Islands (RDTB):

Principal contact:



'Project Leader,
Mangrove ecosystems
and coastal changes'

Dr Norm Duke BSc (Hons) MSc PhD

Dr. Duke will lead the overall project and conduct ecological assessment of intertidal mangrove wetland condition and health, including related field and remote sensing components. He will co-supervise the 2 PhD students with Dr Udy. Dr Duke has 30 years in marine science research studying tropical coastal ecosystems around the world, particularly mangrove forests in Australia and Central America. He has worked with the Australian Institute of Marine Science (AIMS), the Smithsonian Tropical Research Institute (STRI) in Panama and the CRC Reef Research Centre in Townsville, Queensland. In recent years, at the University of Queensland, he has focused on 2 major research themes: (1) assessing change in tidal wetlands from human effects in conjunction with management issues, like habitat restoration and pollutant impacts; and (2) studies of genetic variation and botanical systematics of mangrove species worldwide.

Dr Duke is an internationally-recognised authority on mangrove forest ecosystems, with a special interest in floristics, biogeography, evolution, genetics, productivity, plant-animal relationships, restoration, as well as the effects of pollutant stress and change. He has produced over 100 peer-reviewed scientific publications, technical reports, and regularly presents new findings at international conferences and workshops.

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'Ecological assessment of water quality and subtidal marine habitat'

Dr James Udy BSc (Hons) PhD

Dr. Udy will conduct ecological assessment of water quality and subtidal marine habitat components of this project. He will co-supervise the 2 PhD students with Dr Duke. Dr Udy has been involved in the application of many different biological monitoring techniques and involved in developing both the Estuarine/Marine and Freshwater Ecosystem Health Monitoring Programs (EHMP) in S.E. Queensland, Australia. He is currently the coordinator of the Estuarine/Marine EHMP. Dr. Udy has an extensive background in scientific research in aquatic environments and has worked both in Australia and overseas. Recently James has been project coordinator for several large environmental consultancy contracts in Moreton Bay (Sediment Nutrient and Toxicant Dynamics, Benthic Flora Nutrient Dynamics) and a new program that will be investigating nutrient dynamics of the Great Barrier Reef (including both near shore and off-shore environments). James is on the "Scientific Expert Panel" for the Healthy Waterways Partnership in S.E. Queensland as well as several other scientific panels that act as scientific advisor groups to community and government.

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'Fish and fishery monitoring.'

Dr Ian R. Tibbetts BSc (Hons) PhD

Under certain conditions plants can grow very quickly and become a problem for sealife and people. Plant eating fishes and other animals can be important in controlling the scale of plant blooms. Our research component looks at whether there are enough plant eating fishes in the Marovo system to maintain a healthy reef (Ian Tibbetts will work on this with help from Julie Phillips). Dr Tibbetts research also looks at what plants are there so that we can find out if any might be a problem for the local people (Julie Phillips will work on this with help from Ian Tibbetts). We are also interested in whether plant eating fishes are important as food for local people, because if too many are taken this might cause problems for the reef (Ian Tibbetts and Annie Ross will work on this).

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'Sedimentary processes'

Dr David Neil BSc (Hons) PGDipGeoSe, MSocSc, PhD
Dip. Geoscience, MSocSc, PhD, G.Cert. Education

Dr. Neil will conduct assessments of sedimentary processes. Dr Neil is Senior Lecturer (Environmental Science) in the School of Geography, Planning & Architecture at the University of Queensland, and Director of the Geographical Sciences Program. He teaches in courses in Coastal Processes and Management, Marine Science, Coral Reefs, Environment & Society, Biogeography & Geomorphology, etc.. He has a track record of 47 refereed articles and 128 other contributions (conference papers, research reports, etc.). He has research interests in catchment processes and management and downstream effects of land use intensification; coastal geomorphology; coral cay/reef processes and management, climate variability and it's effect on geomorphic process rates; and marine mammals and their interactions with humans. Current research projects include: climate variability and aeolian processes in Antarctica; ecological implications of geomorphic change on reef islands; the environmental history of Venice and its implications for coastal management; and behavioural ecology of bottlenose dolphins. Dr Neil is a member of the Coastal Protection Advisory Council of Queensland.

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'Co-ordinate community
consultation'

Dr Annie Ross BSc (Hons) PhD

Annie Ross is an anthropologist and archaeologist. She works with traditional people and is interested in recording what indigenous people of Marovo Lagoon know about their resources and their environment and how to manage it.

Annie's role in this project is to help the scientists to see that traditional people have a lot of knowledge that could help the scientific researchers. She will also help the scientists to share their knowledge with traditional people so that there can be co-operative management of the Marovo Lagoon.

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'Macroalgae
identification and
assessment'

Dr Julie Phillips BSc (Hons) PhD

Seaweeds are important components of healthy coral reefs, contributing much food to the grazing animals on the reef. When coral reefs receive too much fertiliser and/or animal/human waste, the seaweeds that grow on healthy coral reefs are replaced by other seaweeds that overgrow the coral. By examining what seaweeds grow on the reef, I will be able to determine the health of Marovo Lagoon. The results of the 2005 seaweed survey will be compared to the surveys undertaken during the 1965 Royal Society of London Expedition to the Solomon Islands (the expedition visited Marovo Lagoon) to identify any changes to the coral reef seaweeds which may have occurred over the last 4 decades.

Seaweed-eating fish are important on coral reefs as they keep the growth of seaweeds under control. Ian Tibbetts and I will be investigating these fish and the seaweeds they eat.

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'Advisor on local legal
rights and community
consultation'

Dr Jennifer Corrin Care BSc (Hons) PhD

Dr. Corrin Care will advise on local legal rights and community consultation. Jennifer Corrin Care is a Senior Lecturer in South Pacific Comparative Law at UQ. She is also Director of Comparative Law in the Centre for Public, International and Comparative Law at UQ. She was formerly an Associate Professor in the School of Law at the University of the South Pacific, having joined the Faculty after nine years in her own legal firm in Solomon Islands. She is admitted to practice in Solomon Islands, Fiji Islands, England and Wales, and Queensland. Jennifer is the author of 'Contract Law in the South Pacific', 2001, Cavendish: London and 'Courts and Civil Procedure in the South Pacific', 2003, Cavendish: London. She is co-author of 'Introduction to South Pacific Law', 1999, Cavendish: London and 'Proving Customary Law in the Common Law Courts of the South Pacific', 2002, British Institute of International and Comparative Law: London.

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'Advisor on environmental
tourism and natural
resource management'

Dr Bill Carter PhD BSc (Forestry) Hons, BSc (Zoology)

Dr Carter lectures in environmental tourism and natural resource management at UQ. Dr Bill Carter is a Churchill Fellow and holds degrees in forestry and zoology. His doctoral studies were in the area of natural and rural systems management, cultural change and tourism. This work was based on studies of, and with, indigenous communities throughout the Asia-Pacific region considering conservation through tourism. Two of the main case studies used in his work were based on the Ararvon Islands and Tetapare Island in the Solomons. Bill worked with the Natural Parks and Wildlife Service and was the founding Director of Brisbane Forest Park, a 25000ha multi-tenure area on the 'door-step' of Queensland's capital. Bill is on the Scientific Advisory Committee for the Wet Tropics of Queensland World Heritage Area and a member of the World Commission for Protected Areas.

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'Advisor on local
community economic
components of this
project at UQ'

Professor Harry Campbell MA PhD

Professor Campbell will advise on local community economic components of this project. Professor Campbell specializes in public finance, microeconomic theory, natural resource economics and applied econometrics. Current research interests include cost-benefit methods in public finance, including research on the cost of public funds; fiscal federalism and taxation; sustainable exploitation of the World's major fisheries, including several in Australia's region; and productivity and land rehabilitation in the Australian mining industry. He is an Associate Fellow of the London Environmental Economics Centre and President of the International Institute of Fisheries Economics and Trade. He has served as a member of the Advisory Committee of CSIRO's Division of Fisheries, and as an Associate Editor of Marine Resource Economics. He is currently a member of the editorial boards of Economic Analysis and Policy and The Journal of Business Administration and Policy Analysis. He publishes in many of the major national and international economics journals as well as in specialized fisheries periodicals. He has served as a consultant on a wide variety of economic issues in Australia, New Zealand and Canada.

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Advisor on overall project management and particularly on the effects of land use at UQ.

Dr Peter Dart BScAgr (Hons) PhD

Peter Dart is a Principal Research Fellow with the School of Land and Food Sciences in the University of Queensland. Peter has extensive experience with agroforestry and forestry research and development in the Philippines and Vietnam. He is currently involved in developing agroforestry farming systems for the sloping uplands in the buffer zones of two major National Parks in Vietnam, and developing production of non timber forest products for income generation. He has been working with the Rural Development Trust Board to support reforestation activities by the community based at Duvaha in North New Georgia. The University of Queensland established a commercial tree nursery for the community and trained local staff to run the nursery and to undertake the reforestation plantings of a range of species. The community has done a wonderful job of maintaining the nursery and planting over 1000ha since 2000 with a range of species including teak, eucalypts, acacias and gmelina. The community maintains a rammet garden of gmelina for vegetative propagation of superior clones. The village also practices agroforestry with home gardens among the planted trees near the village. Cocoa is also underplanted in the plantation. These plantings are perhaps the best organized and most extensive undertaken by any community in the Solomons. Appropriate logging practices and reforestation in New Georgia will be an essential activity for maintenance of the integrity of the Marovo Lagoon.

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'Ecosystem health and water quality'

Simon Albert BSc (Hons)

Simon Albert (PhD student) will be assisting with the benthic surveys and ecological assessments in Marovo lagoon. Simon will also conduct field sampling of water quality and is interested in impacts of this on the marine ecosystems of the Marovo Lagoon. Simon is motivated to work with local communities in the Pacific region to help them improve the management of their marine resources.

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'Remote sensing and habitat mapping'

Chris Roelfsema BSc (PgDip) MSc

Chris Roelfsema (PhD student) will conduct an ecological assessment using an integration of effective low cost field and remote sensing monitoring techniques as part of his PhD work. The assessment will provide both resource imagery and engaging local community members. These members will be, assisting in basic field data gathering using Reef Check type methodologies to validate the imagery or trained in longer term monitoring of marine resources condition and health. Chris is working since 1999 as a Marine Remote Sensing officer, in a shared position between the Marine Botany Group (Centre for Marine Studies) and the Biophysical Remote Sensing group both part of the University of Queensland. He has been involved in several projects where a variety of remote sensing techniques were used as a tool to study the marine environment with a focus on: mangroves, seagrass, algal blooms, benthic micro algae and coral reefs. In 2003 he has been training delegates from SOPAC member countries in coral reef remote sensing techniques. He has a degree in Hydrographic surveying (BSc, 1986), Geodetic Engineering (MSc, 1992) and Marine Science (PgDip., 1999). Chris has been volunteer project coordinator of two community projects. In both projects volunteers divers were trained, in basic monitoring and mapping techniques and conducted ecological marine surveys.

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'Project co-ordinator'

Joelle Prange BSc (Hons) PhD

Joelle Prange is the co-ordinator for the Marovo Project, assisting with the day-to-day management. She is also interested in incorporating traditional and scientific knowledge of ecosystem health within the Marovo area. Joelle will work with Annie Ross to attain a two-way flow of ecological knowledge between scientists and local communities and visa versa. Developing and maintaining this flow of knowledge and information can help local communities to more effectively manage their coastal marine resources.

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'Coral coring and analysing'

Guy Marion PhD student

Guy Marion (Ph.D. student) is using coral cores to relate changes in the land use of Marovo catchments with the quality of nearshore waters over the past 20-50 years. This will provide baseline measures of reef growth and health, allowing a means of gauging how recent logging and land clearing operations in Marovo Lagoon are affecting water quality and coral growth. Guy is interested in working with governments and international bodies for the preservation and betterment of Pacific marine resources.

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'Co-ordinate social research'

Mark Lowe Honours student

Mark Love is an anthropology honours student who will be assisting Annie Ross in the social component aspect of the project. Mark's interest include local and indigenous knowledge systems, applied anthropology, inter-cultural knowledge transference and participatory development

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'Water quality and seagrass'

Dana Burfeind PhD student

Dana Burfeind (PhD student) will be assisting in water quality sampling and ecological assessments of Marovo Lagoon. Dana is interested in examining seagrass communities and investigating the balance between subsistence and commercial fishing.

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