

# **DANJUGAN ISLAND MARINE RESERVE AND SANCTUARY: A UNIQUE INTEGRATED APPROACH TO ESTABLISH A COMMUNITY-BASED PROTECTED AREA IN THE PHILIPPINES**

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## **Abstract**

The Danjungan Island Marine Reserve and Sanctuary (Negros Occidental, Philippines) was established via a collaborative project that aimed to pioneer a unique approach to marine resource management. The project combined reef assessment using international ‘volunteer’ divers, expert knowledge of a local NGO and continuous involvement and training of the local community. Lessons learnt include (a) the importance of addressing needs locally but with legislation up to provincial level; (b) the use of a habitat map and associated data in both reserve design and to describe the ecosystem to local stakeholders; (c) the cost-efficiency of using a volunteer programme for data collection; (d) that acquiring island ownership rights facilitates long-term stability; (e) the presence of a continuous research programme leads to steady alternative local income generation and highly effective community skills development and involvement; (f) that successful small-scale projects can act as an impetus for larger regional initiatives; (g) collaboration between Filipino and international organisations is crucial and (h) the provision of alternative livelihoods is vital for long-term sustainability of the reserve. This project would be further assisted by initiatives at a regional or national level which could include: a database of information on other programmes and their outputs, an expert network, an accreditation scheme for trained local people, regional scale research programmes, reserve design workshops and facilitating access to funding.

## **Introduction**

The Philippines is one of the leading countries in community based coastal zone management in South East Asia (Gomez *et al.*, 1994; Rivera and Newkirk, 1997, Uychiaoco *et al.*, 2000). The archipelago supports extensive coral reef, mangrove and coastal resources, which are under increasing threat from over-exploitation, damage and pollution (Courtney and White, 2000). Many coastal communities rely on the sea for income and food, and most coastal fisheries are conducted at subsistence level; thus declining resources combined with population growth cause increasing poverty. The need for resource management has been recognised by many government institutions, NGO’s, academic institutions and funding agencies, as well as local communities. Since the Philippines initiated its first community-based coastal resource management (CBCRM) project in 1974 on Sumilon Island (White, 1987), numerous other initiatives were implemented. They generally focus on some but not all of the following objectives: resource assessment and scientific monitoring, community preparation and organising, capacity building, alternative livelihood and conservation education (Rivera and Newkirk, 1997; Alcala, 1998; Uychiaoco *et al.*, 2000). A number of coastal management successes have been achieved in the Philippines. Lessons learned include evidence that CBCRM is advantaged in small island settings owing to difficulties in access, incentives and measurable effects of management tools (e.g. reserves) need to be obvious and easy to grasp to communities, scientific data illustrate resource condition to communities, education and involvement provides an understanding how management strategies will better a situation, community work and organisation is critical for self-reliance, all stakeholders must be involved in the process and there is a vulnerability to political leadership owing to the powerful position of local leaders (Agbayani *et al.*, 2000; White and Vogt, 2000). The majority

of CBCRM projects are run on a small scale, and are limited in or fail to incorporate national and regional views (Courtney and White, 2000 ). Co-ordination of efforts between organisations and communities, however, is still in the beginnings and regional efforts so far have shown little benefit to the communities concerned.

The Philippine Reef and Rainforest Project (PRRP) on Danjungan Island, Negros Occidental, is an alternative integrated approach to CBCRM, aiming to alleviate poverty and conserve reef and coastal resources (Ledesma *et al.*, 1999). It is implemented by the Philippine Reef and Rainforest Conservation Foundation Inc. (PRRCFI), an NGO dedicated to nature conservation, and focuses on a multitude of objectives concurrently. Outcomes of the project include the formal establishment of Danjungan Island Marine Reserve and Sanctuaries (DIMRS) in February 2000, the establishment of People's Organisations (PO's) in the adjacent community, a better understanding and awareness of coastal and reefal resources in the community and establishment of alternative livelihood projects, amongst others. Many community-related results are difficult to measure or quantify, however a variety of recognisable results and lessons learned are outlined in this paper. The project includes the following components:

- Land ownership,
- International fundraising,
- Collaboration with an international foreign organisation,
- Scientifically based resource assessment,
- Education and training,
- Community involvement and organisation,
- Legislation up to provincial level,
- Community based enforcement,
- Alternative livelihood.

### Site Description

DIMRS is located around Danjungan Island in Negros Occidental, Philippines, on the west coast of Southern Negros (Figure 1). The island is approximately three km from the mainland and belongs under the jurisdiction of Barangay<sup>1</sup> Bulata. About 4000 inhabitants live in Brgy. Bulata, belonging to X households. 7x% of those people rely on fishing or glean<sup>1</sup>ing from the sea as their main source of income or food. (info from TPD or Rose) The fishery is a small subsistence activity, the majority of boats are not powered.

**Figure 1.** Location of DIMRS within the Philippines.

Danjungan Island is a small 48 ha island with a length of two km and a width of 500 m maximum. It is uninhabited and covered by dense rainforest. There are five lagoons, two of which are open to the sea. The island and its reefs may be considered as a biodiversity hotspot where a multitude of species and habitats occur and can be protected in a small space (Table 1).

**Table 1.** Abundance of marine and terrestrial organisms on and around Danjungan Island.

### The first step: Land ownership and international fundraising

In 1995, Danjungan Island was on offer for sale. PRRCFI jumped at the opportunity to create a small, privately managed wildlife reserve and spare the island from harmful development. The island was bought with a bridging loan in 1996. With the help of the World Land Trust (WLT), and Coral Cay Conservation Ltd. (CCC), both international non-profit institutions based in the UK, an international

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<sup>1</sup> A Barangay is an administrative unit at village level. Brgy. Bulata comprises the village Bulata and coastline extending approximately 10 km south and 12 km north.

fundraising scheme was initiated. This included sale of shares and an 'adopt an island' initiative, raising funds to pay off the loan within three years. The PRRP was fully launched concurrently.

### **Collaboration with international organisations**

Collaboration with CCC, specialising in paying volunteer-assisted natural resource assessment, lead to the benefits listed below:

- An extensive survey of the reefs using a volunteer diver programme,
- Training of local counterparts in SCUBA diving,
- Training of volunteers and local counterparts in marine ecology and identification skills and
- Assistance with presentation of results to the local community, government and other stakeholders.

This collaboration resulted in the presence of a diving and research facility and operation on Danjungan Island for about 4 years. This approach provided a continuous presence of foreign expertise and workforce in the project site, thereby providing exposure to international life and widening the horizon of the local community. Exposure to English language and culture on a long-term basis provided grounding for a subsequent exposure to nature tourism. The project erected basic facilities and provided additional local income (for example via food purchases and boat hire).

### **Resource assessment through a volunteer programme**

A detailed sub-tidal survey of the marine resources has been recommended for optimal MPA design, yet it has been lacking in the majority of CBCRM projects around the Philippines, often owing to restricted funding, time or expertise. The PRRP was able to draw on the foreign expertise of CCC who was conduct a baseline reef assessment cost-free as it is self-funded by volunteer contributions.

International and local volunteer divers were trained in SCUBA diving and in marine identification and survey methods during an intensive eight-day course (Harborne *et al.*, fiji, 1996, Al, please add correct ref which we use for the training method, Beger and Harborne, 2000). The knowledge was tested prior to surveying, which followed a set method known to be sufficiently accurate for classification of remote imagery (Mumby *et al.*, 1996 Al, is this true?). Volunteer divers conducted approximately 50 plot-less transects around Danjungan Island and the adjacent reefs. Transects were placed across the reef perpendicular to the shore starting at 30 meters depth. Each transect consisted of up to 10 dives and usually crossed several distinct habitats. Volunteer data were complimented with surveys by visiting local and foreign experts (Table 2).

The data were clustered into benthic classes by multivariate analysis and used to classify an image generated by a RoxAnn<sup>®</sup> side scan sonar survey (Do we need to reference NCL uni for RoxAnn?). Habitat maps with a different resolution of benthic classes were created (White *et.al.*, 2001- in press? I want a reprint please!) and employed to assist with reserve selection and to lobby for the reserve with local stakeholders. They formed a highly effective tool to visualise the environment for decision makers and government representatives (Figure 2). After completed resource assessment the volunteer project on Danjungan Island closed down in 1999.

**Table 2.** Summary of collected data during the baseline assessment around Danjungan Island.  
\* expert species lists

\*add results for some data, habitat characteristics. Also can add impact summary data, and benthic cover from monitoring data. Or reference to Wills paper? (Al)

**Figure 2.** Example of a habitat map of Danjungan Island, showing ten benthic classes (modified from White *et al.*, 2000). Grey areas represent the land. Habitat classes were

determined by cluster analysis of volunteers data. This maps needs work to get the habs labels bigger. Do we have a copy of it which isn't \*.bmp but a sensible format? (dxf, cgm?)

### **Community work in adjacent villages**

Community organising (CO) work is a key aspect to achieve full community involvement and empowerment (Rivera and Newkirk, 1997). It is a long-term process, which requires co-ordination of all social, scientific and operational activities incorporated in the project. During the PRRP, the CO work has been conducted in three Barangays opposite Danjungan Island by resident community organisers (CO workers). CO work was proven more effective when entirely based in the communities as problems and conditions in the village are well understood by the CO workers and they are known to the community.

CO work included forming PO's, conservation education and alternative livelihood projects. An essential element of CBCRM is empowerment of local people and communities. Giving incentives and background for environmental conservation and sustainable resource use was a first step towards this goal. Educational efforts are mainly made in schools, where lectures are given, a large undersea mural was painted and practicals are held. A work shop for environmental teacher training was organised. PRRP aimed to raise the environmental awareness amongst local people and build both educational and practical capacities in order to implement the recommended resource management schemes. This includes practical participation and training in all activities. Workshops and activities could be divided into two main groups as detailed in Table 3 below.

**Table 3.** Activities, workshops and research conducted with, by and for the local community.

The modular approach used by PRRCFI was unique in that community involvement as well as research was volunteer driven. PRRCFI depended on voluntary participation of the community in the initial, preparatory stages of community work for alternative livelihood schemes as well as after establishment of such schemes. Thus, the process was extremely slow but sustainable beyond the availability of external funding. This contrasted from conventional approaches, where the continuous success can be compromised when financial support from partner organisations ceases after two or three years (Alcala, 1998).

### **Training and monitoring**

The presence of a permanent volunteer project with training and survey work schedules allowed the training of many former fishermen from the adjacent village of Bulata. They either joined the activities for a minimum of four weeks to acquire SCUBA diving and marine ecology skills, or participated in the learning process whenever their work allowed over a longer period of time. PRRCFI allocated grants to subsidise fishermen and their families while involved in the project. At present about 30 persons hold a SCUBA diving qualification under PADI, five of whom are Rescue Divers and two Divemasters (TPD: please double check). Five persons passed tests to qualify as volunteer hard coral recorder, 10 qualified for fish. Each of the qualified persons participated in survey activities. They were encouraged to keep practising when they could afford time on the project.

These people now formed a local survey team capable of conducting reef assessments on behalf of adjacent communities (e.g. for reserve planning); which is unique in the Philippines. They also participated in the annual DIMRS Monitoring Programme (Beger, 2000). This team was led by the PRRCFI Project Scientist and advised by CCC science personnel and external advisors.

### **Conservation education**

Conservation education was part of community work, with specific targets such as the local school. DIMRS now formed an ideal 'natural laboratory', where PRRCFI has been conducting training and workshops for teachers and pupils alike. At the same time there was interaction with CCC science staff and volunteers who guest-taught in the local school. Participation of the men in survey activities and the constant presence of the volunteer resource assessment project had a positive effect on overall attitudes towards the marine environment. PRRCFI staff designed and painted a underwater landscape as an educational school mural.

With the understanding that today's youth will be tomorrow's managers, fishers and conservationists, PRRCFI has been running Children's Marine and Wildlife Camps on Danjungan Island. These were four-day workshops held at least annually for mixed groups of children from cities and local villages. The curriculum included an introduction to marine and terrestrial ecology, forest walks, snorkelling training and reef observations. The camps aimed to introduce conservation awareness to children from diverse backgrounds and let them experience the various environments.

PRRCFI staff encourage the school and the community to participate in beach clean-ups, e.g. the international coastal clean-up day, join the mangrove re-plantation efforts with international volunteers and students, and get involved in turtle tagging and release.

### **Reserve establishment**

Experience from other CBCRM projects has highlighted the significance of incorporating all stakeholders in making decisions about reserve design and management (Newkirk and Rivera, 1997). The DIMRS was established based on the activities described above. The research results were used to work out recommendations for management and zonation based on natural resources and established MPA design criteria. These recommendations were then discussed with PO's, local fishermen and community groups. Plans were drawn up based on preferences of different user groups and Local Government Units (LGU). Previous CO work and education had laid a foundation for this process to be fully understood by community stakeholders. The relevant legislation was approved by the Barangay LGU, the Municipal government and was endorsed by the Province of Negros Occidental in February 2000. Thus all government levels passed the ordinance for DIMRS (Municipality of Cauayan, Municipal Ordinance 99-52- Dec. 99).

The reserve consists of three no-take sanctuaries (Special Management Areas – SMA) and a 500 m buffer zone (reserve), where traditional fishing methods were permitted (Figure 3). Only crossing, research and educational activities were allowed inside the SMA's.

**Figure 3.** Danjungan Island Marine Reserve and Sanctuaries zonation. Fishing and collecting has been regulated by permits inside the reserve area and prohibited in the SMAs; anchoring, destructive activities and extraction of minerals is prohibited throughout the reserve.

### **Alternative livelihood**

Alternative income generating activities have been considered necessary to provide substitute and supplementing income sources for fishing communities faced with resource decline (Rivera and Newkirk, 1997). In a PRRP context, alternative livelihood projects (ALPs) were initiated two years after community preparation had commenced. The presence of the volunteer research project, however, provided income away from fishing at the start of PRRP. Through purchase of groceries, fuel and boat hire, and employment of locals as boat drivers and cooks, the village economy received an initial boost. While these incomes were phased out with the completion of the survey activities,

the community was ready to receive more sustainable ALP ideas. They could be carried out through the PO's created as an outcome of CO work. ALPs were run on a voluntary basis, the PO's choose a preferred project after they had learned about advantages, work requirements, investment, revenues and the risk involved. This information was related by CO workers or external experts prior to making the decision.

The main ALPs were a mudcrab farming and a pig-raising project. The mudcrab pens were placed in between the roots of adult mangrove plants, thereby also promoting the need for restoration of mangrove habitats along the coast. The pig raising projects both focuses on swine fattening and breeding. Some other complimentary alternative income schemes were basket weaving, banana chips and a mangrove multi-species nursery.

### **Enforcement**

The enforcement of the reserve and sanctuaries relied entirely on voluntary enforcement and surveillance by community members. Several community volunteers underwent training to become "Bantay Dagat" (coast-watch) members. The municipal government provided funds for a patrol boat and fuel (TPD – did they?). The community were also encouraged to monitor the efficacy of the reserve and have an input into coastal resource management (CRM). PRRCFI ran a CRM training course to provide training in fish catch monitoring, coastal zone interactions and related subjects.

### **Expansion of the project and regional implications**

The success of the PRRP raised the awareness about environmental issues and sustainable coastal resource use and thus led to the establishment of the Southern Negros Coastal Development Programme (SNCDP). The SNCDP was a provincial government programme to accommodate coastal zone management and sustainable natural resource use in Southern Negros.

PRRCFI has established, and has been implementing the PACE programme (Poverty Alleviation and Conservation Education) as an expansion of the PRRP. Following the PRRP model, PACE facilitates a modular approach to coastal management and conservation, conservation education and community work towards alternative livelihoods. PACE built on experiences made in PRRP and attempted to expand these. Activities within PACE have been carried out in six participating municipalities, including Cauayan, where DIMRS is located.

The initial stages of the project were primarily baseline resource assessment and community organisation. As a direct result of the scientific investigations, coastal management recommendations were then presented to the community for implementation. The social preparation and skills acquired in previous stages of the project provided the enthusiasm and expertise to carry this through. It is hoped that it will establish the foundation for their sustainable use by local communities through research, education, organisation and skills development.

The PRRP as a small scale project was embedded in the Philippine CZM and reef science community. Information was shared in several occasions, including supplying data about the 1998 coral bleaching event and providing information for PhilReefs, a national information hub for reefal management and science. Collaboration with SEAFDEC, a research institution specialising in sustainable rearing and farming practises of marine species, assisted with the mud-crab project. Other regional collaborative efforts included collaboration with algae experts in San Carlos University, Cebu, invites for external facilitators for marine camps, collaboration with Museo Paseo, Manila, on conservation education and visits of university and NGO officials to view the project.

## Lessons learned

The outcomes of the PRRP suggested that the small scale project could be considered successful in managing the local marine and coastal resources, although it was difficult to measure success of social preparation. It was a NGO driven pilot project for CBCRM with a new international approach. The main lessons learned include the following:

- The CBCRM initiative must include all aspects of coastal resource use, and address all stakeholders in the process of establishing reserves and management plans.
- Prior to establishing CZM procedures, community preparation will provide understanding of related issues, awareness and resource stewardship. CBCRM, resource monitoring, enforcement and co-operative alternative livelihood schemes work only after a degree of community organisation has been achieved. Training and conservation education promote resource stewardship amongst the community.
- Reserve zonation recommendations based on extensive scientific data form an efficient tool for community consultation and lobbying for the reserve. A habitat map provides an excellent tool for aiding management decisions and to present those to stakeholders and decision makers.
- The international volunteer project provides suitable data free of cost, and by its establishment also provided alternative income, training opportunities, exposure to foreign cultures and foreign scientific expertise.
- Community based resource management must be enforced by law to be efficient and to enable the community to apprehend offenders, enforcement and surveillance should be conducted by the local community to be efficient. A local survey and monitoring SCUBA team supports resource monitoring requirements and provides a resource for other similar initiatives in adjacent communities.
- Property rights with a local NGO dedicated to conservation excludes harmful uses and allows development of the islands ecosystem as a whole. However, property rights and an ongoing CO project also demand to find sources of funds for maintenance of structures, patrolling, continuation of CO work, ALP's etc.
- CO workers should live with the community to achieve maximum involvement and understanding of local dynamics.
- Volunteer driven activities ensure sustainability of the project, as it is less reliant on funds. This means that the process is slower but will be supported by the community when external funding and guidance cease.
- Alternative livelihood schemes ensure sustainable income away from fishing and replace employment provided by the international volunteer scheme, ALP's can include co-operative ones such as alternative aquaculture (mangrove friendly mud-crab farming), poultry raising and natural tourism. Private livelihood schemes include basket making, banana chips and pig raising.
- For a successful CBCRM project, an external organisation is required as 'catalyst' and to guide the community in the initial stages. Small scale community organising and alternative livelihood projects are difficult to expand to larger regional projects as funding requirements for CO workers, start up costs for alternative livelihood schemes etc increase. Training facilities for volunteer based research and SCUBA diving are limited in numbers by logistics and funding. Hence, community work and provision of alternative livelihood will always be more effective in the Barangay or village cell.
- Small scale projects such as the PRRP can provide a seed for regional government programmes.
- Large scale co-ordinating programmes help to share experience and make local programmes known.

- Large scale national and regional level projects cannot be effective on the ground level, however help immensely as regulating and information body.

The integrated new approach for establishing DIMRS has combined local knowledge and skill with international input. The difference of dealing with an uninhabited island, which has been privately owned by a conservation organisation promised sustainability beyond cessation of projects funds. This was also supported by a solely voluntary approach, where incentives given to the community were values such as education and stewardship for their environment. Advise and education on options for alternative livelihood, community organisation and continuous presence of CO workers in the community provided a sound basis for community support and sustainability.

## Acknowledgements

For a multifaceted project of establishing and maintaining a marine reserve it is impossible to list all that have contributed to its success. Fundraising was supported by the World Land Trust, UK and the Philippine Landbank provided the bridging loan to buy Danjungan Island. CCC volunteers contributed funds for the research programme. DFID, UK, granted funding for the expansion of PRRP through PACE. The support of the local government, Hon. Governor Coscoellella and the provincial SNCDP initiative were invaluable. Research was possible due to countless hours provided by volunteers, staff and advisors of both CCC and PRRCFI. Support by PRRCFI staff and local scientists, educators and other NGOs has helped immensely along the way. Most importantly, the community of Bulata is the main benefactor but also driving force for a sustainable reserve.

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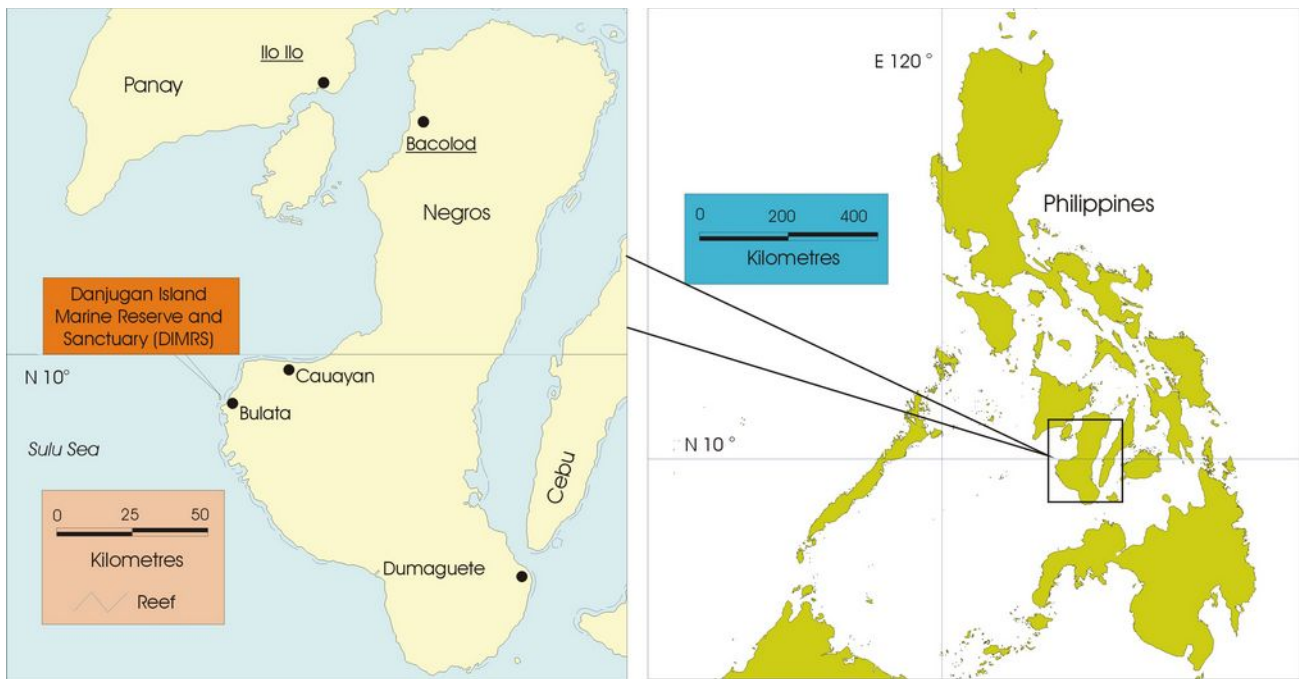


**Figure 2.** Location of DIMRS within the Philippines. Needs changing in B/W, larger letters.

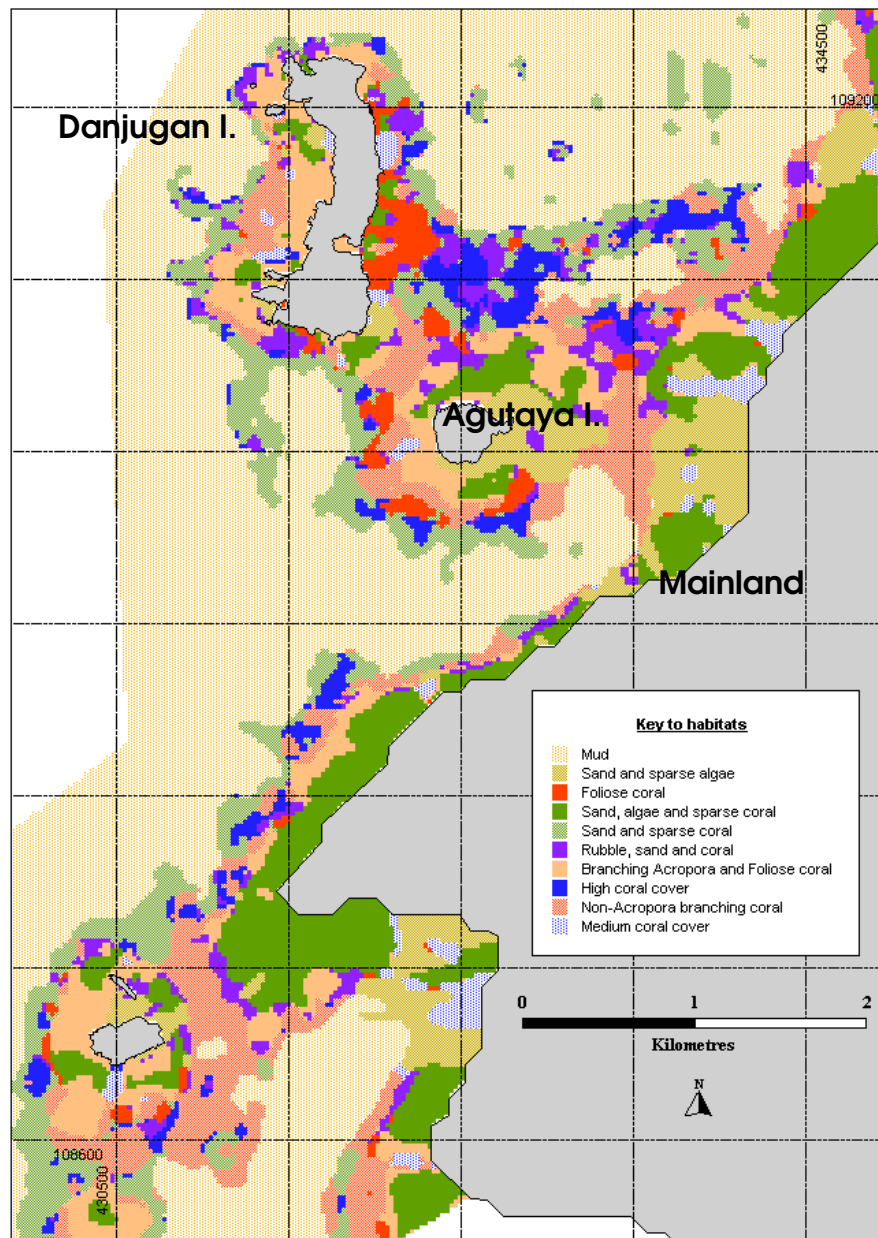


**Figure 2.** Example of a habitat map of Danjugan Island, showing ten benthic classes (modified from White *et al.*, 2000). Grey areas represent the land. Habitat classes were determined by cluster analysis of volunteers data. This maps needs work to get the habs labels bigger. Do we have a copy of it which isn't \*.bmp but a sensible format? (dxf, cgm?)

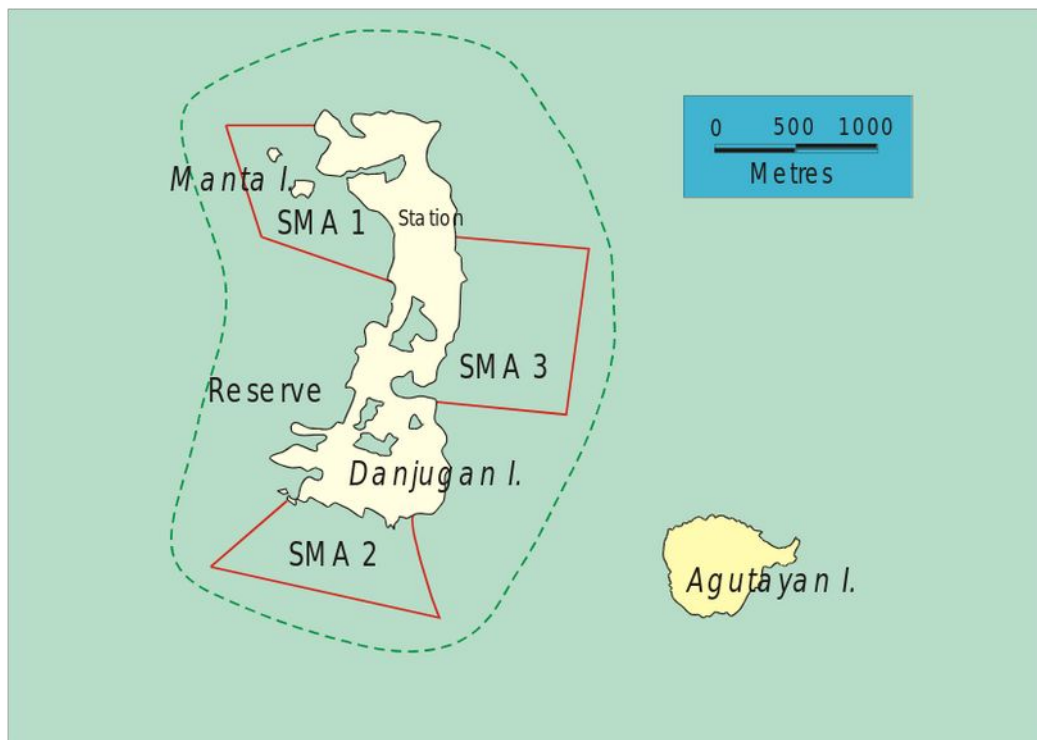


**Figure 3.** Danjugan Island Marine Reserve and Sanctuaries zonation. Fishing and collecting was regulated by permits inside the reserve area and prohibited in the SMAs; anchoring, destructive activities and extraction of minerals was prohibited throughout the reserve.

Table 2. **Abundance of marine and terrestrial organisms on and around Danjugan Island.**

| Group of organisms        | Number of species | Number of genera |
|---------------------------|-------------------|------------------|
| Hard Corals               | 240               | 72               |
| Fishes                    | 450               | XX               |
| Algae                     |                   | 43               |
| Blue-green algae          |                   | 4                |
| Seagrasses                |                   | 7                |
| Mangroves                 |                   |                  |
| Bats                      | 9                 |                  |
| Birds                     | 68                |                  |
| Trees, terrestrial plants |                   |                  |
| Turtles                   | 2                 |                  |

**Table 2.** Summary of collected data during the baseline assessment around Danjugan Island.  
\* expert species lists

| Data                                         | Volunteer programme                                       | Local scientists                                                              | Foreign scientists           |
|----------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------|
| Baseline: benthic organisms and habitat data | Substrata, macro-algae, soft corals, sponges, hard corals | Mangroves<br>Seagrass<br>Macro-algae*                                         | Hard corals*                 |
| Baseline: motile organisms data              | Fish, ascidians, echinoderms, molluscs                    |                                                                               | Fish*                        |
| Baseline: terrestrial data                   |                                                           | Plants<br>Bats                                                                |                              |
| Human impact data                            | fishing boats, underwater impacts                         | Land-based impacts                                                            |                              |
| Sedimentation                                |                                                           | Sediment traps                                                                |                              |
| Physical data                                | Currents, water, temperature, wind                        |                                                                               |                              |
| Monitoring                                   |                                                           | Benthic communities, commercial fish stocks, mangrove re-growth, test-fishing |                              |
| Coastal mapping                              |                                                           |                                                                               | DGPS survey<br>RoxAnn survey |
| Restoration                                  |                                                           | Multi-species mangrove seeding and replantation                               |                              |

**Table 3.** Activities, workshops and research conducted with, by and for the local community.

| Activities        | Workshops                 | Research                       |
|-------------------|---------------------------|--------------------------------|
| Coastal clean-up  | Swine raising course      | Socio-economic questionnaires  |
| Turtle tagging    | Poultry farm course       | CRM survey                     |
| Training          | Mud-crab farming course   | Catch monitoring               |
| Mangrove planting | Effect of marine reserves | Biological monitoring of DIMRS |
|                   | CRM course                |                                |