

Beyond data: The expanded role of a volunteer programme assisting resource assessment and management in the Bay Islands, Honduras

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ABSTRACT

The use of self-financing, non-professional researchers is an efficient means of generating data within marine science, particularly in remote locations. In addition, 'volunteer' programmes can significantly expand their role when located within coastal communities and can add value to internationally funded interventions. For example, work by Coral Cay Conservation (CCC) in the Bay Islands, Honduras, has benefited local communities by establishing a constant fieldwork programme which generates highly focused data for resource mapping and monitoring at no cost to the host country and providing technical assistance on reef management. In addition, training and environmental education opportunities for host country counterparts have been extensive because of the proximity to population centres. Collaborative links with a range of local, national and internationally funded initiatives has also demonstrated how volunteer programmes can significantly assist even large-scale projects. Finally, CCC's long-term commitment provides a conduit for additional funding to develop capacity for sustainable coastal management.

Keywords Bay Islands, Volunteers, Community-based, Coastal zone management, Mesoamerican.

Introduction

Non-professional researchers have been used within a range of scientific disciplines, including marine conservation, and are widely regarded as an efficient approach for generating extensive and cost-effective data sets (Hunter and Maragos 1992, Mumby et al. 1995, Wells 1995, Darwall and Dulvy 1996, Erdmann et al. 1997). The popularity of SCUBA diving provides a large number of potential, self-financing 'volunteers' who can be trained to provide data within either structured programmes or as a component of their own recreational diving. For example, interest from the sport diving community and the need for data to assist management of coral reefs has led to the establishment of projects in the Caribbean, East Africa, Indo-Pacific and South Pacific by UK-based nongovernmental organisations (NGO's) alone (summarised in Wells 1995). These programmes provide sufficient self-financing manpower to undertake large-scale temporal and spatial surveys and increase public awareness through participation in conservation work.

The use of volunteer divers to collect useful data for coastal zone management at little or no cost to the host country has been successfully applied by Coral Cay Conservation (CCC), a British NGO. Since 1986, CCC has provided short, medium and long-term technical assistance to host nations, including Belize, the Philippines and Indonesia. Data requirements vary between projects but have generally focused on collecting ground-truthing data for habitat mapping, health assessments and monitoring (e.g. Raines et al. 1992, Mumby et al. 1995). In addition to data collection, this assistance has included conservation education and technical skills training opportunities to local communities and national project counterparts.

Since they are often characterised by good logistical capabilities, volunteer programmes are typically tasked to work in relatively remote locations since these are often the most difficult places for host country agencies to

gather data. While programmes in such sites fulfil data requirements, they are by definition limited in their ability to participate in a wider coastal zone management role. For example, remote locations limit the accessibility of training opportunities to host-country nationals, generally support only low population densities that can be targeted for environmental education and regular communication between field science staff and national partner agencies is often difficult.



Fig. 1 CCC's project in the Bay Islands (Honduras; Fig. 1) is unusual since these limitations are not present because project sites are relatively accessible. Indeed in the case of Utila, where the project was based between June 1998-September 2000 and forming the focus of this paper, volunteers were living in the centre of the main town. In addition, the level of proposed and existing coastal development and active environmental agencies was much greater than at previous coastal project sites. All of these factors have allowed CCC to provide significantly more input into reef conservation of the area. Hence, CCC's work in the Bay Islands provides an example of the potential of volunteer programmes to assist host-countries through a wider role than simply data collection.

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The Bay Islands

The Bay Islands, consisting of four main groups of islands (Utila, Roatán, Guanaja and Cayos Cochinos; Fig. 1), stretch in an arc between 29 and 56 km off the coast of the mainland. All of the Bay Islands are surrounded by fringing reefs which are poorly studied but are described in UNEP/IUCN (1988). However, although there is a relative lack of research, the reef's importance to the economy of the islands is unequivocal (Luttinger 1997, Forest 1998). For example, as recently as 1992, Utila was a quiet island community which relied mainly on local industries such as fishing as its main source of income. While fishing is still important, a fledgling tourism industry, focused on the marine resources, has expanded into a major aspect of the island's economy. Many tourists visit Utila to get SCUBA certifications and it is now known as one of the cheapest places in the world to learn to dive. On Utila alone, approximately 15 dive shops annually supply training to thousands of international travellers.

Threats to the integrity of local reefs have increased dramatically in recent years (Forest 1998). Particular pressures on reefal resources in the Bay Islands include rapid development of coastal areas and subsequent increases in sedimentation and coastal erosion, mangrove deforestation, over-fishing, decreasing water quality from effluent and waste run-off and mechanical damage by divers and boat anchors. These threats are also acting synergistically with larger scale phenomena such as the major coral bleaching events in 1995 and 1998, Hurricane Mitch in 1998 and coral diseases (Kramer and Kramer 2000, Kramer et al. 2000). Although quantitative data are sparse, these threats have clearly decreased reef health and are impacting on the fishing and tourism industries. For example, a study by Kramer and Kramer (2000) indicated that the coral bleaching and hurricane in 1998 are likely to have long-term ecological consequences and that reefs in the Bay Islands are in a moderate to severely disturbed state.

Recognition of the ecological and economic importance of the islands' reefs, and the threats to their health, has led to a range of local, national and international coastal zone management initiatives. Within the Bay Islands, a key agency is the Bay Islands Conservation Association (BICA) which has offices on Utila, Roatán and Guanaja. For example, BICA-Utila has been able to virtually eliminate the impact of anchor damage to the fringing reefs via the installation of a series of mooring buoys and has organised a successful turtle awareness and nest monitoring project. BICA-Utila and BICA-Roatán are also important implementing agencies of the Turtle Harbour Wildlife Reserve and Sandy Bay-West End Marine Reserve respectively. BICA have been assisted in producing management plans for these reserves by the Wildlife Conservation Society.

In order to co-ordinate and expand local and national initiatives, the Ministry of Tourism has established the 'Bay Islands Environmental Management Project' (Programa Manejo Ambiental de las Islas de la Bahía; PMAIB). This multi-faceted project is funded by a

US\$19.1 million loan from the Inter-American Development Bank, along with further funding from national government, and aims to fully establish the marine parks either designated or proposed for the Bay Islands but which are currently 'paper parks'. Conservation in the Bay Islands will be further strengthened by the World Bank / Global Environment Facility project 'Conservation and sustainable use of the Mesoamerican Barrier Reef System'. This project's objective is to assist the countries of Belize, Guatemala, Honduras and Mexico to manage the Mesoamerican Barrier Reef System as a shared, regional ecosystem, safeguard its biodiversity values and functional integrity and create a framework for its sustainable use (Kramer et al. 2000).

CCC's project works with a range of agencies in the Bay Islands and is a collaborative Honduran / British partnership project with PMAIB, Corporación Hondureña de Desarrollo Forestal (COHDEFOR), the Universidad Nacional Autónoma de Honduras (UNAH) and BICA. Its aims are to support existing coastal zone management initiatives via a systematic and detailed survey of marine resources, monitoring of reef health, provide SCUBA and scientific training and research opportunities for Honduran project counterparts and provide conservation education opportunities for local communities. The work is a continuation of 'Project Utila', undertaken by teams of Honduran and British undergraduates between 1995 and 1998.

Data collection in Utila

Between June 1999 and September 2000, CCC staff and volunteers and Honduran counterparts collected data using a variety of techniques in order to generate an appropriate data set to facilitate providing management recommendations to PMAIB, national and local government and local communities. These techniques were baseline transects (Raines et al. 1992), Reef Check surveys (Hodgson 1999), long-term monitoring using line intercept transects (based on those described in English et al. 1997) and sediment traps (modified from those described in English et al. 1997). Analysis of these data and result dissemination are planned throughout 2001.

Although a description of these techniques and the actual results of the surveys are beyond the scope of this paper, it is important to note a number of characteristics of the science programme that were possible because of the close proximity of a large local community. Firstly, volunteer programmes typically have a few limited aims that are completed sequentially. In Utila, even initial discussions with local stakeholders indicated a wide range of urgent concerns (e.g. current reef status, trends in reef health and the effects of specific anthropogenic impacts) which could only be addressed by a range of data sets. Therefore, in the Bay Islands, it was necessary for CCC to utilise concurrently, rather than sequentially, many of the protocols that had been shown to be appropriate for volunteer divers. Hence, from very early during the project, there was a diverse series of surveys that were driven by a particularly clear awareness of the issues facing the local community.

Secondly, the greater than normal level of coastal development in the project area required a much more dynamic approach to survey planning. For example, during survey work on Utila, a large scale dredging operation was restarted and work began on an international airport. CCC was able to respond by quickly assessing existing reef health (via Reef Check) in the areas likely to be most affected by sedimentation and other pollutants and establishing further sediment traps. While these data would have been collected in a similar situation close to any volunteer programme, the nature of the project site in the Bay Islands led them to occur much more frequently than in the remote locations normally assigned to such research.

Finally, while there is a small but increasing body of literature on the use of volunteers to collect biological data there is little research on the use of volunteer programmes to collect socio-economic information (Wells 1995). Although socio-economic data are collected by volunteer programmes (Frontier Conservation Projects' work in East Africa is a notable case study; Stanwell-Smith, pers. comm.) it is limited by the research aims assigned to them and their location away from major populations. In contrast, the importance of the dive industry in Utila and the proximity of numerous dive schools allowed CCC to undertake detailed monitoring of the temporal and spatial patterns of diving pressure around the island. Linking these, and other data, with baseline biological information within a GIS provides a powerful tool to demonstrate the importance of, for example, marine protected areas to local stakeholders.

Provision of technical expertise

Although CCC's research programme in Utila was designed to address issues of development and resource use, local communities often require a more rapid initial response from scientists than can be provided by traditional data collection and analysis. This demand is generally correlated to the size and proximity of the local community, its lack of existing scientific capacity and the range of existing and future threats. All these factors were relatively high in the Bay Islands and, for example, the limited technical capabilities of relevant authorities is known to have affected their effectiveness in implementing coastal regulations (Forest 1998). Therefore, there was a continual need for CCC's field science staff (who supervise volunteer data collection) to take up an advisory role and respond in the short term to issues at the local level. In addition to direct assistance with mitigating reef impacts, the application of scientific data to current environmental issues raised by the community present some of the best opportunities for applying science to people's everyday lives. Providing answers and opinion within the scope of local issues creates a positive impression of science as a useful tool. The acceptance and support for wider coastal zone management efforts may depend on the attitude resource users have towards the scientific community.

During CCC's presence, Utila faced a wide range of environmentally sensitive issues including dredging,

mangrove clearance, land reclamation, pier building, cruise ships, airport construction and best dive practices. The scientific presence established by CCC provided an opportunity for the community to include technical opinions, which were previously not available, when considering action on environmental concerns.

Encouragingly, CCC scientists experienced a desire from conservationists, stakeholders and local authorities to draw on the information that they could provide from their research and experience. However, it was clear that building a relationship with the local community was necessary before advice was requested and accepted. Hence both key factors necessary for volunteer programmes to provide technical advice were present in Utila Town: (1) ability to rapidly build a working relationship with local stakeholders and (2) continual availability and proximity of field science staff.

Finally, if volunteer programmes are to assist public understanding of the role of scientific data, it is important to communicate not only the application of science practice but also its limitations. For example, separating the effects of synergistic threats to the reefs (e.g. dredging, over-fishing and coral bleaching) is a complex and long-term undertaking. Even with 16 months of CCC data, it was impossible for science staff to provide answers to all questions posed by the local community. However, full local integration of the project facilitates the greatest chance of collecting and disseminating relevant data and providing advice and recommendations which are of most use to stakeholders.

Training and education

Building host country capacity, providing environmental awareness training and involving local communities are widely regarded as vital for tropical coastal management (e.g. Olsen and Christie 2000, White and Vogt 2000 and see Luttinger 1997, Forest 1998 and Forest 2000 for a case study in the Bay Islands). Volunteer programmes are ideally placed to undertake this work because they are generally long-term, have a continual presence in-country and have the ability to integrate training within existing activities at low costs. In Utila, CCC was able to establish successful training scholarships, covering SCUBA and marine ecology, for university students (particularly those from UNAH). Such training was easily incorporated into that provided for volunteers and similarly additional training was provided to allow Honduran nationals to become field science staff.

While such opportunities are common to most volunteer programmes, CCC's project location in Utila allowed a number of additional training and education activities. For example, because SCUBA and marine ecology training by definition require a commitment of at least two weeks, such training is usually only accepted by nationals with an inherent interest in the subject. While this increases capacity, there is also a need to improve environmental awareness of all stakeholders, many of whom may be more sceptical of conservation initiatives than those accepting training scholarships.

CCC's location within Utila Town facilitated a range of relatively *ad-hoc* presentations on reef conservation to a wide variety of groups such as dive resorts, municipal meetings and tourists. The proximity of CCC's project site was vital, since a convenient and accessible meeting site has been shown to be important for including all the Bay Island's stakeholders in the conservation process (Forest 1998). Furthermore, within a small community such as Utila Town, the presence of relatively large numbers of volunteers obviously undertaking survey work also naturally generates interest in conservation issues. However, it should be noted that the routine presence of large numbers of tourist divers diluted CCC's impact on Utilans compared to the interest of local communities in less commercial towns.

The provision of environmental education programmes was also highly successful and larger-scale than on equivalent sized CCC projects because, for example, local schools were very close to the project base and field science staff and volunteers were able to visit more frequently. Hence, in Utila, a full five week programme was established which included theoretical and practical activities and was much more comprehensive than had been possible when based at more remote locations. School children could also easily use the project's facilities for practical classes such as reef snorkelling.

Collaborative links

Effective conservation of coral reefs and tropical forests requires a holistic and multi-sectorial approach that is usually beyond the scope of one national or international agency or NGO (e.g. Clark 1996, Dight and Scherl 1997). Therefore, volunteer programmes regularly work with a variety of partners and indeed working agreements with host-country agencies are generally essential. However, the urgent need for conservation in the Bay Islands and the significant international interest in the whole Mesoamerican Barrier Reef System has provided CCC with a range of opportunities for collaboration. The following examples illustrate how a volunteer programme can assist both small and large-scale initiatives via data collection, training of host-country nationals and providing environmental education.

Example 1: Wildlife Conservation Society (WCS)

During 1999 and 2000, WCS was contracted to work with BICA-Utila in establishing a Management and Operative Plan (MOP) for the Turtle Harbour Wildlife Refuge on northern Utila. Within the MOP, effective zonation of the marine component of the refuge, which has had only 'paper park' protection for many years, was inhibited by a lack of detailed biological data. Data such as habitat maps are known to be vital for management planning (Cendrero 1989) and, therefore, CCC were approached for assistance. In response, CCC were able to quickly focus their data collection on the area and rapidly produce a detailed description of the reefal resources. Furthermore, CCC field science staff had extensive knowledge of the area and, combined with their theoret-

ical knowledge, were able to provide technical expertise during preparation of the MOP.

CCC's work with WCS highlights how, even on very short timescales, volunteer programmes can work with other NGO's to provide necessary data and more qualitative observations. Through this type of co-operation, data generated by volunteers can allow informed decisions regarding the placement of user regulated zones. The current development of a habitat map for the whole of Utila will ensure that future plans include all representative habitats and areas of special interest.

Example 2: PMAIB

CCC has been made a project partner of PMAIB, the nationally funded initiative to improve resource management in the Bay Islands. This relationship has been mutually beneficial and expanded the scope of each project. For example, PMAIB has access to CCC's temporal and spatial data of reef status and health. The volunteer programme means that these databases are much more extensive than can be gathered by even a well funded initiative. Careful planning has also ensured that CCC's data are complimentary rather than overlapping those collected by PMAIB and its sub-contractors. Furthermore, CCC's location and role within local communities has been able to increase environmental awareness which should assist PMAIB implement its eventual outputs (e.g. marine protected areas).

In return for CCC's data, along with associated analyses and management recommendations, PMAIB is able to provide in kind support. For example, habitat mapping requires access to remotely sensed imagery, which is often too expensive for volunteer programmes, but PMAIB has been able to provide CCC with access to high quality aerial photographs. Since funding with PMAIB had been allocated before the start of the CCC project in the Bay Islands, the relationship has focused on in kind rather than financial support. However, it is clear that volunteer programmes could represent a cost-effective sub-contractor for project components such as provision of data and training. Finally, the timescale of PMAIB is inevitably limited by its funding (three years) and the long-term commitment of volunteer programmes provides a conduit for further funding from agencies such as the Global Environment Facility.

Example 3: Mesoamerican Barrier Reef System Project

While CCC's work with PMAIB has shown the advantages of national programmes linking with volunteer programmes, such a relationship can also benefit international projects. The Mesoamerican Barrier Reef System (MBRS) project is a long-term initiative to enhance protection of the marine ecosystems of Mexico, Belize, Guatemala and Honduras (Kramer and Kramer 2000). Even with significant funding from the World Bank / Global Environment Facility, cost-effectiveness is a key component of a project on this scale and volunteer programmes provide large returns for a modest financial

because of 'co-funding' from the volunteers. For example, the Turtle Harbour Wildlife Reserve is a priority area within the MBRS project (Hatzios, pers. comm.) and detailed data for this area have already been collected by CCC. Similarly, volunteer programmes throughout the MBRS have existing capacity, which could be utilised at minimal cost, for counterpart training and for visiting researchers to undertake detailed studies beyond the abilities of non-specialists. Furthermore, throughout the course of a long-term project, volunteer programmes have the ability to remain dynamic to changing data requirements and establish projects in newly defined priority areas.

Discussion

Volunteer programmes are increasingly being utilised within marine science and their value has led to large-scale projects such as 'Reef Check', which has allied non-professional divers with marine scientists to assess the global status of reefs (Hodgson 1999). However, such programmes are often viewed as being limited to an efficient mechanism of generating data from relatively remote locations that are beyond the scope of more traditional agencies. CCC's work in the Bay Islands has shown that volunteer programmes can also be successful when based within a town and indeed, if required, can have a much more significant influence on coastal zone management initiatives. It is also interesting to note that attracting self-financing volunteers to the Bay Islands project was not affected by it being based within a town. Potential volunteers have a range of criteria when choosing a programme to join and while some favour a remote or 'pioneering' site, many wish to interact more closely with a local community.

By living and working within a location such as Utila Town, fully integrated volunteer projects can establish a dynamic survey programme matching local concerns and altering when necessary to new threats. Furthermore, subsequent result dissemination and management recommendations can be viewed as objective while remaining sensitive to local issues. Such dissemination is also significantly aided by both the continual technical expertise, counterpart training and environmental education that can be offered to stakeholders by locally based field science staff. In addition, the close relationship with the community inevitably leads to interest from other population centres and, for example, following the success of the work in Utila, in 2000 CCC was able to expand its work to Roatán. Lessons learnt from the work on Utila are currently being applied in Roatán and this work could be even more successful since the local community has had less exposure to tourism and the concept of volunteer divers assisting reef management has already generated great interest and a willingness to learn.

The Bay Islands project has already provided CCC with a range of opportunities to collaborate with local, national and international agencies. Such links have been shown to be highly beneficial and cost-effective and, for example, even well funded initiatives can rapidly gain access to vital data sets for minimal in kind support.

Volunteer programmes can also expand the scope and success of internationally funded projects via provision of capacity for training of host country nationals, logistical support for visiting researchers, links to local stakeholders and a conduit for further funding. However, it is important to recognise that volunteer programmes are only one component of efforts to establish sustainable use of coral reef resources and have their own limitations, including limited financial resources. While volunteer projects can add significantly to coastal zone conservation initiatives, they do not replace the need for building the national capacity which is required for completing long-term management goals.

CCC's project in the Bay Islands shows that the role of volunteer projects within tropical coastal zone management can be multifaceted and the provision of data at little or no cost to the host country is only one element. These programmes will continue to expand with the increasing number of environmentally aware divers and further integration into a range of initiatives, along with additional funding, can increase their scope and effectiveness. Such collaboration will significantly assist the conservation of the world's coral reefs.

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