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ARTICLE

An Interpretive Approach to Developing Volunteer-based Coastal Monitoring Programmes

MICHAEL CUTHILL

ABSTRACT *The concept of sustainable development has highlighted the need to involve those who use a natural resource in helping to manage and maintain it. This has prompted the development of monitoring programmes involving volunteers who collect scientific data on the state of the natural environment. This paper argues that interpretation theory and practice provide a sound basis for the design and implementation of volunteer-based coastal monitoring programmes. Integration of multiple interrelated objectives in programmes relies on sound 'audience' research, including planned evaluation procedures. Three case-studies are presented which serve to identify and highlight the benefits of broadening the primary scientific focus of monitoring programmes to include greater consideration of participant motivations, skills and knowledge in the design and delivery of programmes. Discussion in this paper focuses on coastal monitoring programmes but the stated benefits might also be expected when applying this approach to other natural resource monitoring programmes.*

Introduction

The Australian National Strategy for Ecologically Sustainable Development defines ecologically sustainable development (ESD) as:

> … using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. (Commonwealth of Australia, 1992, p. 6)

The core objectives of the strategy seek to enhance social well-being, to provide for inter- and intra-generational equity and to protect biological diversity and maintain ecological processes. One requirement towards achieving these objectives is to identify and monitor impacts on the natural environment. With Australia comprising predominantly a coastal population, the health of the marine environment is of special significance for the economic, social and ecological values that it contributes to the nation (Resource Assessment

Michael Cuthill, Nerang Southport Road, Nerang, PO Box 5042, Gold Coast MC, Queensland 9729, Australia. Email:mcuthill@goldcoast.qld.gov.au

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Commission, 1993). Monitoring programmes are one tool that can be used by resource managers when implementing ESD strategies to protect those values. Norse (cited in Reef Environmental Education Foundation (REEF), 1995, p. 2) defines marine environmental monitoring as "the continuing observation of conditions over time" and describes the process as "a crucial tool in the conservation of marine biological diversity", providing managers with important data from which they can make informed decisions. Without accurate monitoring data it is difficult to determine either human or natural impacts on marine systems or specific sites, or how to respond accordingly. Australia is faced with the considerable task of monitoring over 30 000 km of coastline. World-wide this task is magnified, with too few marine scientists and limited funding to carry out necessary work.

On a global scale, Agenda 21 recommends that local communities be consulted and involved in decision-making processes concerning local natural resource issues (United Nations Conference on Environment and Development, 1993). The importance "of marshalling the capabilities of groups within the community" is also promoted strongly through Australia's ESD strategy (Commonwealth of Australia, 1992, p. 126), with guidelines recommending that "decisions and actions should provide for broad community involvement on issues which affect them" (p. 8).

Clearly, there is a strong emphasis in these documents on the inclusion of local communities in helping to find answers to local environmental problems. Since the early 1990s many local community groups in Australia have become involved in a broad range of ESD-related activities, including a number of projects which utilise local communities in the implementation of monitoring programmes assessing the ongoing environmental health of local areas (Campbell, 1994; Kahn & Johnstone, 1995; Lockhart River Community, 1995; Inglis & Musso, 1996; Letts, 1996).

Similar programmes emphasising community involvement are also being implemented in many developing countries, with international banks, governments and non-governmental organisations allocating increasing amounts of financial and logistical aid in order "to heighten public awareness about relationships between the environment and the quality of people's lives" (Ham *et al*., 1993, p. 232). Australia also provides considerable support in many international environmental management projects. In particular, the Great Barrier Reef Marine Park Authority (GBRMPA) and the Australian Institute of Marine Science (AIMS) are currently developing monitoring programmes to help local communities, from Pacific Island nations and South-east Asian countries, in the management of their local areas.

Participation in decisions and processes that affect their lives empowers people to have control over their lives (Freire, 1970). Benefits accruing without real involvement do not constitute participation. A sense of ownership is missing in this instance, whereas full involvement, including involvement in the planning, design and implementation stages of nature-based programmes, provides "knowledge and power to exercise increased control over resource management and development" (Brandon, 1993, p. 148).

While the immediate outcome envisaged from volunteer-based monitoring projects is the collection of scientific data, there are also other benefits for natural resource managers through the involvement of volunteers in programmes. Not the least of these benefits are the logistical and economic efficiencies achieved through the use of local facilities, labour and knowledge and also the acceptance of responsibility by volunteers in helping to look after their own area. As Gore (1992, p. 273) has eloquently argued. "free men and women who feel individual responsibility for a particular part of the Earth are, by and large, its most effective protectors, defenders and stewards".

An Interpretive Approach to the Design and Implementation of Volunteer-based Coastal Monitoring Programmes

Interpretation provides a process through which natural resource managers can educate and interact and communicate with volunteers, visitors or local communities (Ham *et al*., 1993). Interpretation is:

> An educational activity which aims to reveal meanings and relationships through the use of original objects, by first hand experience, and by illustrative media, rather than simply to communicate factual information. (Tilden, 1957, p. 8)

The use of nature-based interpretation is now widely accepted as an efficient and cost-effective tool in natural resource management (GBRMPA, 1994; Wet Tropics Management Authority, 1995). Interpretation also seeks to stimulate and provoke people by directly involving them in personal learning experiences.

Hall & McArthur (1993) state that effective heritage management requires the support of people who use those sites. They also argue that the key to gaining that support is through the provision of high-quality experiences to those people. Interpretation provides opportunities for people to realise those experiences, gain knowledge and participate in meaningful and enjoyable activities, while it acts as a medium for conservation messages designed to minimise impacts on the natural environment.

It has also been suggested that positive attitudes towards conservation objectives may develop through access to well designed interpretive messages (Ham *et al*., 1993). In a review of 54 studies which looked at intervention programmes encouraging environmentally responsible behaviour, Dwyer *et al.* (1993, p. 314) found that "With respect to antecedent conditions, commitment, modelling and goal setting strategies show promise as instigators of pro environmental behaviours". Therefore, it is argued that participation in volunteer-based monitoring programmes can encourage positive environmental attitudes and behaviour.

The use of an interpretive approach in the design and implementation of monitoring programmes provides a valuable communication link between the desired outcomes of management agencies and the needs and desires of participants (Brandon, 1993). Ham *et al.* (1993) suggest that, when implementing programmes, interpreters should be involved in two-way communication with volunteers. Rather than teaching what must be done, interpreters, scientific staff

and resource managers must be "open to learning from the local people and be willing to explore options *with* them, not *for* them" (Ham *et al*., 1993, p. 238). All participants will then gather new understandings and skills to help them manage their own 'back yards'.

An interpretive approach to volunteer-based coastal monitoring programmes seeks to draw together scientific objectives and participant motivations, skills and knowledge. Rather than having a single focus on scientific data collection, an interpretive approach considers multiple interrelated objectives in the design and implementation of programmes. These include:

- the development of appropriate communication strategies;
- the contribution to broad-scale and specific conservation objectives and management;
- the provision of personal learning opportunities;
- the promotion of long-term conservation commitment from those involved;
- adding quality and meaning to the volunteer experience;
- achieving scientific outcomes.

Linking Interpretive Theory to Programme Design and Implementation

Three case-studies of volunteer-based coastal monitoring programmes are discussed to help identify links between theoretical concepts of interpretation and their practical application in monitoring programmes. These include the following:

(1) *REEF project, Florida, USA*. Volunteers have been involved in marine science projects in the USA for some time. The Florida Sea Grant Program trains divers to monitor artificial reefs, the Marine Conservation Society SEASEARCH programme undertakes temperate marine habitat inventories, REEFWATCH gathers broad-scale information on the state of coral reefs and the REEF programme in the Florida Keys seeks to "provide all divers the opportunity to learn more about the underwater wilderness and to get actively involved in caring and preserving it" (REEF, 1995, p. 1).

The REEF project provides volunteers with the chance to pursue their scuba diving interests while providing them with the opportunity to be involved in meaningful activity. Volunteer divers receive "an educational, contributory experience in addition to a week of fun and great diving" (REEF, 1995, p. 4). The project initially invested 3 years (1990–93) in "refining the methodology and establishing the scientific validity of conducting reef fish biodiversity surveys with volunteer recreational scuba divers" (REEF, 1995, p. 2). Following this design and testing stage, reef fish surveys have been carried out at the Florida Keys National Marine Sanctuary.

(2) *Pacific nations project, Motupore Island, Papua New Guinea (PNG)*. The second case-study involves a programme developed for several Pacific Island nations by the AIMS and includes local indigenous community members as volunteers. The AIMS Long-term Monitoring Program is a 2-week course

teaching standard methods of monitoring coral reefs. The first training course was held in the Cook Islands in 1994. In 1995, a 'train the trainer' workshop was held in Saipan, northern Mariana Islands, where 12 participants from five Pacific Island nations were trained in monitoring techniques for the assessment of coral reef benthic communities (Bass, 1996). In February 1996, a further workshop was run in PNG by Thomas Maniwavie, one of the participants from the Saipan course, in conjunction with an AIMS trainer.

The PNG project used a system designed for experienced Australian scientists to carry out coastal monitoring programmes, and adapted it to a new cultural setting. The project seeks to empower Pacific nation local communities towards greater self-management of their marine resources. Using a field-orientated approach, relying heavily on the experience of the AIMS trainers, the programme has been refined over the series of three courses. The skills and field experience of the AIMS trainers have been seen to play a vital part in the success of this project. Their input to the project is what Ajzen (1992, p. 5) describes as delivery from "a highly credible source".

(3) *Great Barrier Reef (GBR) project, Australia.* A number of volunteer-based monitoring programmes are under way within the GBR, including the *Acropora Coral Health Monitoring and Reef Operator Logbook* Program (Kahn & Johnstone, 1995) and a study developing reliable reef monitoring programmes for community groups and tourist operators (Inglis & Musso, 1996). This second programme involves researchers from the Cooperative Research Centre (Reef Research) testing monitoring programme designs using dive volunteers from local community groups, and tourists (Cuthill, 1996).

This programme adopts an interpretive approach, with the emphasis given to effective communication strategies, conservation objectives and management, providing learning opportunities, promoting long-term commitment from those involved, adding quality and meaning to the volunteer experience and direction towards meaningful goal-related activities.

These three case-studies provide a diverse cultural and geographical basis for discussion, with participants in different programmes comprising local recreational divers (REEF project), local indigenous communities (PNG project) and tourists (GBR project). The following discussion is intended not to provide definitive answers with regard to all programmes, cultures or locations but rather to identify and highlight potential benefits from adopting an interpretive approach. A number of considerations become apparent when assessing the design and implementation of these three programmes from an interpretive perspective. First, to set the broader context, two immediate questions come to mind when designing volunteer-based monitoring programmes:

(1) What are the scientific requirements of the project?
(2) How do you get people involved?

It might be argued that neither question can be considered independently of the other. Obviously, the volunteers must be interested in and committed to the programme; they must be 'sold' on the value of the work. Additionally, the programme must provide reliable and valid data. An interpretive approach

facilitates a 'match' between desired scientific outcomes and the volunteers participating in the project.

Audience Research

Interpretation theory argues that, for programme managers to make a successful match between scientific objectives and volunteer motivations, skills and knowledge, they will need to develop some understanding of their 'audience' (Tilden, 1957; Screven, 1995). An investment of time spent determining who you are 'selling' your programme to, what volunteers already know about desired project outcomes, what their interests and needs are, what they are capable of undertaking (physical and educational constraints), what they are prepared to commit to your programme (time, effort and money) and what their attitudes and values are towards programme outcomes can be expected to reap ample longer-term rewards. These benefits relate to participant safety, data quality, long-term commitment and individual and community empowerment (Screven, 1995).

Three years were invested in the design and testing of the REEF programme, giving some indication of the level of difficulty in developing an understanding of your participants and then matching those participant characteristics with the programme objectives. The PNG project developed a more gradual understanding of its participants over three separate training courses in 1994, 1995 and 1996. Experience gained during the 1994 and 1995 courses directed the third training course at Motupore Island towards choosing local volunteers who met set criteria (Bass, 1996). Selection criteria included:

- being nominated by their employer;
- having citizenship of PNG or the Solomon Islands;
- working within the tourism, diving or hospitality industry or other organisations with a close involvement with the marine environment;
- having scuba diver qualifications with appropriate experience to undertake monitoring tasks;
- being under 40 years of age and in good health;
- having a good command of written and spoken English.

Rather than seeking information about its possible audience, the PNG project identified volunteers with the experience required to carry out the work. This pragmatic approach worked well in this case but relies on the availability of enough people who meet set criteria. This approach may exclude people who would otherwise be quite willing to become involved but are unable to meet one or more of the criteria. Within the GBR project an understanding of potential volunteers was obtained through recently collected research data which described recreational scuba divers. A research project exploring scuba diver experiences provided important participant information for the design of the project. Research established that recreational divers had very high conservation values, expressed a willingness to become more involved in looking after the resources they used and had appropriate underwater skills for undertaking basic data collection (Cooperative Research Centre, no date). A range of programme materials were developed based on these findings, including a *Recreational*

Divers Reef Monitoring Program Handbook (Cuthill & Musso, 1996), a coral identification guide and a formal participant evaluation survey.

Design and Use of Interpretive Materials

The handbook (Cuthill & Musso, 1996), which describes the GBR programme, is used to help standardise data collection on each trip, enabling dive operators and local community groups to deliver the programme independently of research staff. A coral life-forms identification folder provides clear photographs of the coral groups being monitored. The GBR identification key was not designed for use underwater, whereas the PNG project uses laminated diagrams of coral life forms to help its volunteers identify what is encountered on the dive.

Effective use of underwater identification charts is limited by physical differences (e.g. colour, shape and size) within each coral or fish group being monitored. Some of the more complicated identification aids had been developed for use by experienced marine scientists and this complexity caused some confusion to volunteers in PNG (Bass, 1996). Underwater identification materials do help volunteers in carrying out their work, although their design needs to be user-friendly, relating directly to the level of volunteer knowledge and ability. Data expectations will be determined by the ability of volunteers to identify corals, fish or other marine communities.

While the PNG and GBR projects focus on monitoring benthic communities, the REEF programme asks volunteers to record "those species {of fish} that they can positively identify" (REEF, 1995, p. 3). The REEF programme involves commitment to a week-long field survey where participants "receive instruction in reef fish identification and survey techniques based on a 300 slide course … and undertake at least 12 survey dives" (REEF, 1995, p. 4). This programme alleviates any problems regarding accurate fish identification by acknowledging the different ability levels of the divers. As experience is gained, the number of identifiable species will increase. With over 5500 members joining since 1990, there is now an experienced body of divers recording accurate data for this project and, importantly, passing their field experience on to new volunteers.

Once fish identification data have been collected by REEF volunteers, they are entered into "a user-friendly computer scansheet" (REEF, 1995, p. 3). Data entry was also undertaken in the PNG project on Motupore Island, where most volunteers on the course had never used a computer before. A database tutorial introduced students to basic computing and data entry procedures, allowing them to enter the information they had collected. Many of the volunteers stayed on after class to learn how to perform basic data calculations (Bass, 1996).

The opportunity for volunteers to do data entry and perform some basic analysis deserves consideration, as it provides a sense of finishing the task after collecting the data. Ajzen (1992) relates how actual evidence, providing justification for the work being undertaken, is a major component in persuading participants of the value of the objectives they are pursuing. Obviously, the provision of computers in coastal monitoring programmes may be difficult and expensive to organise for many programmes.

Design of the PNG project adopted a field-based approach which allowed the programme to evolve over a series of three courses. The third training course at Motupore Island emphasised potential community benefits from monitoring programmes. Class discussions revolved around examples of local problems and the potential impacts of humans on coral reef ecosystems in PNG (Bass, 1996). This helped volunteers to identify local benefits, such as the protection of coastal ecosystems for fish spawning or the economic value of natural areas for tourism, thereby strengthening the links between scientific and community outcomes (Ham *et al.*, 1993).

Participant Motivations

Participant motivations will vary from country to country and from project to project and depend on cultural contexts. Ham *et al.* (1993, p. 236) suggest that, when we step into a different culture, "much of what we assume about our audience back home no longer applies". The cultural context in which the programme is situated will determine how the programme is designed and delivered but a common prerequisite in both developed and developing countries is to establish an understanding of the people you are working with (Tilden, 1957; Ham *et al.*, 1993; Screven, 1995).

Consideration of participant motivations in these three case-studies suggests that volunteers may be putting a conservation ethic into practice, enjoying a fairly unique leisure activity or showing a willingness to help look after their own 'back yard'. Again, an interpretive approach emphasises the importance of identifying and addressing the motivations, skills and knowledge of volunteers (Tilden, 1957). One of the critical skills in all case-studies was scuba diving ability.

Diver Safety

Volunteers in all three programmes are required to scuba dive to collect data. Tilden (1957, p. 11) emphasises the importance of relating what is being undertaken "to something within the personality or experience of the {volunteer}". This includes consideration of the diving ability of volunteers and their safety. PNG volunteers have to meet specified levels of diving competence. Before field-work is undertaken, underwater skills are practised 'dry' in the laboratory using dead corals to represent living corals in the field. This method is very successful for explaining procedures clearly (Bass, 1996).

The REEF project allows divers to adopt a 'roving diver' method, where the volunteers are free to pursue their own dive routine collecting data as they proceed. The GBR programme outlines what is expected for safe operating procedures, with diving to be carried out in relatively shallow, protected waters with divers in 'buddy pairs' while collecting data. A match between the ability of the volunteer scuba diver and the difficulty of the task undertaken is required to provide for a safe and successful dive (Priest, 1992).

Evaluating Interpretive Design and Implementation

An interpretive approach integrates multiple objectives into volunteer-based monitoring programmes and argues the importance of evaluating each of these components (Ham, 1986; Beckman, 1992).

- Was the communication strategy effective?
- Were educational goals achieved?
- Were conservation outcomes realised?
- Were volunteers committed to the programme?
- Did the volunteers have a quality experience?
- Are the scientific data reliable and valid?

The GBR project provides an example of a planned evaluation process designed to assess all these criteria. Front-end evaluation of scuba divers (Cooperative Research Centre, no date) established who the audience were, where they came from and their attitudes towards and understanding of nature conservation, providing an understanding of this specific volunteer group. The level of commitment and effort divers would be prepared to invest in a volunteer programme represented an unknown factor to be tested during field-work.

Formative evaluation, a field testing of the interpretive materials and delivery methods, provides the next step in the evaluation process. This determines how interpretive design and implementation can be further developed to achieve project objectives. The final step in the process is a summative evaluation by way of a formal written response to be completed by all participants at the end of their involvement (Cuthill & Musso, 1996). The summative evaluation provides answers to three questions.

(1) Were the interpretive materials successful in communicating project objectives?
(2) Did the programme increase participant knowledge of monitoring programmes, marine conservation and management issues?
(3) Were the volunteers satisfied with their experiences?

Open-ended questions provide volunteers with an opportunity to describe how any of these areas could be improved.

Evaluation information can be collected in many different ways. This might be as simple as informal feedback from volunteers, formal interviews, structured observational records or written evaluation by participants. For example, evaluation processes for the PNG project relied heavily on staff knowledge, observations and input, including a series of reports written by AIMS trainers, as well as informal volunteer feedback. Evaluation in this project is an evolving process relying primarily on what Beckman (1992, p. 131) has described as "staff 'gut feeling'".

The REEF project report provides little information on evaluation processes used. A measure of success in this case may be the growing involvement of many thousands of members across the USA. Without the involvement of these volunteers, programme managers would not have the capacity to collect data from large numbers of locations. For example, 11-week-long REEF programmes

involving 125 volunteer divers completed more than 1750 dive hours of data collection. In a world-wide situation where there are too few scientists and limited funding for marine research and monitoring, the economic and logistic advantages of utilising volunteer divers become apparent (REEF, 1995).

Summary

An interpretive approach seeks to broaden the primary scientific focus of volunteer-based monitoring programmes to include greater consideration of participant motivations, skills and knowledge. It is argued that this approach facilitates effective communication, helps contribute to conservation objectives and management, provides personal learning opportunities for participants, helps promote long-term commitment from volunteers and adds quality and meaning to their experience while providing reliable and valid scientific data.

A key component of an interpretive approach is 'audience research': developing a good understanding of the participants and using that understanding as a basis for programme design (Screven, 1995). While the collection of scientific data is an immediate and important outcome from monitoring programmes, the success of volunteer-based monitoring programmes ultimately relies on the dedication of the participants. An interpretive approach allows programme managers to take both of these factors into consideration while also incorporating a planned evaluation programme providing ongoing quality assurance measures.

While this paper has largely emphasised considerations from a participant perspective, there are tangible benefits to resource managers from having volunteers participate in projects, including logistical and economic efficiencies through the use of local facilities, labour and knowledge. Involvement in projects relevant to their needs provides volunteers with "a vested interest in, and presumably greater commitment to, the achievement of project goals" (Brandon, 1993, p. 149).

Discussion of the three case-studies has focused on coral and fish monitoring programmes, but this should not be seen as a limiting consideration. An interpretive approach can be utilised to facilitate the involvement of concerned and committed individuals or groups in any environmental monitoring project. Again, the key requirement is an understanding of the participants' motivations, skills and knowledge matched to the desired scientific outcomes. Adoption of the interpretive considerations discussed in this paper provides a sound theoretical and practical basis for the design and implementation of monitoring programmes.

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