

Reef Check Global Survey Program

The first step in community-based management

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Coral Reef Monitoring and Management on a Global Scale

For thousands of years, humans have exploited coral reef organisms for use as curios, jewelry, and food. Coral reefs have been considered self-replenishing resource systems that could serve as a continuous source of wild stocks. In contrast, terrestrial systems such as forests and agricultural lands have long been managed to ensure sustainable production of resources, and more recently, to achieve biodiversity conservation goals. In 1997, the first Reef Check global survey of coral reefs was carried out (Hodgson, 1999), revealing the extent to which increasing populations of humans have been damaging coral reefs at an unprecedented rate. A major new finding of the Reef Check survey was that overfishing was much worse at far more locations than expected, and particularly bad at many reefs remote from cities. This survey, using standardized scientific methods, confirmed anecdotal reports from scientists, fishermen and recreational divers, of declining coral reef health. A second Reef Check global survey in 1998 confirmed the previous results, and demonstrated the importance of having a global network of monitoring stations in order to track the effects of an unprecedented global bleaching and mortality event that was particularly severe in the Indian Ocean (Wilkinson et al., 1999).

Starting in 1996, the Global Coral Reef Monitoring Network (GCRMN) carried out the critically important work of raising the awareness of governments around the world about the importance of coral reefs and encouraging government agencies to get involved in monitoring. Subsequently, a decision was made to formally link the two programs under the International Coral Reef Initiative (ICRI) umbrella, with GCRMN focusing on assisting government efforts and Reef Check addressing community-based work.

Governments and private groups regularly monitor many activities. Weather, stock and commodity prices, fresh water levels, and tides are all monitored and reported frequently. Although hundreds of millions of people depend on coral reefs for their daily food supply, it is only now that we are beginning to realize the importance of monitoring the quantity and status of such natural resources. Without monitoring natural capital assets, it is very difficult to determine how much “interest” can be used in a sustainable way. The

lack of monitoring has allowed damage to continue undetected at many coral reefs. Without monitoring data, it is also impossible to judge the effectiveness of management efforts such as the establishment and operation of marine parks. In the future, it is likely that people will look back at the late 20th century and wonder how humans could be so foolish as to not track the status of their natural resources.

Clearly, if coral reefs are going to continue to serve as economic as well as biodiversity resources, a major shift is needed in the activities of governments, private groups and individual citizens, towards actively monitoring and managing coral reefs. To do this, mechanisms are needed that will work primarily at the local and national levels, but also that will contribute to coral reef management at regional and global scales. To implement a global coral reef monitoring and management scheme, the following tasks must be completed:

- Establish a global network for information transfer and training,
- Provide a tool-box of methods for monitoring and management,
- Provide funds and trained staff for implementation,
- Ensure government and public support so that effects are not just temporary.

How does Reef Check help?

Reef Check has already accomplished much of the first task. There is now a network of national and regional coordinators with shared goals of coral reef monitoring and management in over 40 countries and territories in all tropical seas. Amazingly, this network has been established on a volunteer basis by NGOs, individual scientists, divers and others who simply care about reefs. Thus the network consists of people who are highly motivated to carry out reef monitoring and management and (in contrast to scientists) who are experienced community organizers. The network members interact both formally at meetings and regional training sessions, and informally over the internet. This network provides the core framework that will allow replication and expansion of Reef Check teams in new countries and in new areas of countries where Reef Check is already operating.

Methods

Equally good progress has been made towards creating a tool-box of methods for monitoring reefs. The Reef Check methods were designed to meet two goals: 1) to enable a non-scientist with a high school education to be trained in a short period to obtain accurate, valuable data that could be comparable on a global scale, and 2) the results should be extremely rich in information about human impacts on coral reefs. The methods were published on the web and improved following a review by many coral reef scientists. The use of the web allows anyone to access the methods and to view training materials including color photos of indicator organisms. The latest version is available at: www.ReefCheck.org.

Although an effort was made to ensure that Reef Check methods were compatible with others, particularly those used by GCRMN, they represent a major step forward in the

development of community-based monitoring methods and differ in major ways from any other previous methods. Reef Check methods differ from others because they:

1. require minimal training time (typically a few hours as compared with the several days required to train other methods),
2. are much faster than most methods (half day per reef),
3. are designed for non-scientists who are experienced divers with at least a high school education so the pool of potential data collectors is huge,
4. can easily be carried out in shallow water without scuba, because they depend on counting (no measuring),
5. are holistic and include algae, fish and invertebrates;
6. include organisms selected based on market value and ecological role,
7. include an assessment of fishing and other human activities;
8. produce a relatively small amount of accurate, extremely meaningful and statistically comparable data;
9. produce data that are directly relevant to reef management;
10. produce data that are nationally, regionally and globally comparable;
11. include separate packages for different biogeographic regions that allow intra-regional comparisons.

To achieve the goal of allowing non-scientists to gather accurate data, the methods were based upon counting easily recognized key indicator organisms using broad taxonomic categories – typically family level. Organisms with global distributions were selected to allow for comparability among sites anywhere in the world. Two sets of indicator organisms were chosen to allow intra-regional comparisons, one for the Indopacific and another for the Caribbean. Subsequently, additional sets were designed for other locations including: E. Pacific, Hawaii and the Red Sea. To achieve the goal of collecting valuable information about human effects on reefs, high priced organisms were selected that are at the top of the target list for fishermen such as lobsters, giant clams, grouper, snapper, parrotfish, humphead wrasse or butterfly fish.

Prior to 1997, many scientists believed that it would be difficult if not impossible to persuade other scientists to use one standard survey method. These fears were proved wrong later that year when over 350 coral reefs in 31 countries were surveyed by teams led by more than 100 marine scientists using the Reef Check core methods. There were also many voices initially, who suggested that the relatively low taxonomic specificity of the methods would render them less useful than others. Typically, however, once critics take the time to carefully study and use the methods, they begin to appreciate the care that has been taken to ensure the methods are robust with respect to well-defined, limited goals. This is partly because of the sample size is quite large given the number of parameters. Reef Check is meant to supplement academic scientific pursuits and more detailed monitoring work, not to replace them. As more results have been published, the critical voices have decreased in number.

A major challenge in 1998, was the growing demand to use Reef Check for more than just a one-time annual assessment. Most coral reefs are located in developing countries,

and few of these countries have the resources or capacity to implement highly technical, detailed monitoring programs. Such programs have, after all, only recently been implemented in developed countries. Many coral reef countries could benefit from establishing a relatively modest monitoring program first, using core Reef Check methods, adapted to local requirements, and then adding more detail as needed. Therefore additional guidelines were created for those teams wishing to use the core methods for long-term monitoring (Hodgson, in press), and an agreement was reached with GCRMN that all GCRMN training would start with Reef Check methods.

The next step in methods development will be in the area of interactive reef management. There has been little progress in this area. Active coral reef management is a relatively new topic and, outside of Australia, Florida and a few other locations, there is little experience. What is now needed is a set of management methods that can be included in an Action Plan menu for reef managers. This is not as complicated as it may sound, because in there are few options available to reef managers. A web-based interactive management system will provide managers anywhere with the tools to do their job.

Funding and Training

Since 1998, the Reef Check program has also actively carried out fund-raising activities, as well as seeking collaboration with other programs involved in coral reef monitoring. As a result Reef Check has been able to offer training of trainers workshops, often in collaboration with GCRMN, in many countries. So far, substantial funds have been raised by Reef Check to support training and monitoring activities in Asia, Melanesia and the Caribbean. In addition, cooperative training has been carried out with numerous regional and national programs and projects including UNEP (Indian Ocean and Asia), SPREP (Pacific), COREMAP (Indonesia), CRMP (Philippines) and CPACC (Caribbean). While Reef Check was based at the Hong Kong University of Science and Technology, most funds could be passed directly to field teams. With the independence of the program in mid-1999, a new challenge is to raise more funds for core operations in Hong Kong as well as for field teams.

Scientific results

The results are the first synoptic database available on coral reefs from all oceans using a single method. While ReefBase contains records of thousands of reefs, few are comparable because the methods used were so different. By using one method in all locations it is possible to compare reefs from anywhere. In addition, the abundance of the indicator organisms, along with the live/dead coral cover ratio provides one objective definition of coral reef health. Based on this definition, the results indicate that most reefs are suffering from overexploitation of high-value edible species, and that few sites, regardless of how remote or whether they are designated as a marine park, are in good condition. The few hundred sites available so far are adequate for broad brush assessment of regional and global reef health. In most countries, however, there are still insufficient numbers of sites to make scientific assessments about the status of reefs based on the Reef Check work alone. So far, only a small portion of the results have been investigated and published. The data are available to all from ReefBase and researchers are

encouraged to use them for further, more detailed investigations. As additional years of data are built up, and trends become apparent, the value of the data will increase.

Most scientists and managers are, and should be, focused on the condition of reefs in their local area. The 1998 global bleaching and mortality event, however, demonstrated the importance of having a global monitoring network to track global changes on reefs. The network produced results which suggested that coral reefs may act as the “canary-in-the coal mine” and are now being used to help pressure governments to reduce greenhouse gas emissions that cause global warming.

In the future, as more sites are added such that local and national level trends can be assessed, the scientific results will help managers to judge the success or failure of management efforts.

Developing Community Awareness and Stewardship for Reefs

Over the past twenty years, there have been many calls to conserve coral reefs from scientists and prominent environmentalists. These calls generally have not been heeded because they were typically made at meetings attended by other scientists, who already were supporters of this concept. Scientists were not doing a good job of communicating their message to the general public, and so governments were not listening. In contrast, when the public collaborate with scientists in fundraising, in organizing communities, and in training and surveys, their awareness is raised about the value of reefs, threats to their health and solutions to these problems. Press events serve to spread this message to a wider audience and cement the feelings of the core groups involved. Thus, the public relations aspect of Reef Check – PR for reefs – is an extremely important aspect of the program.

Another invaluable outcome of community group participation in the monitoring program is the development of a strong feeling of stewardship for coral reefs among individuals from diverse areas of society. As public support spreads for coral reef conservation and management, this puts pressure on government leaders to develop their own programs and to support private sector programs that share this goal. An extra benefit is that when scientists volunteer to serve as Reef Check trainers, this brings them into contact with the general public through community groups. Through this process, the general public gains a greater appreciation of basic and applied science and the role of marine scientists, which ultimately helps science to gain a bigger share of funding from government sources. It also helps to stimulate the interest of academic scientists in solving applied problems which they normally might prefer to ignore as universities often do not appreciate applied research.

Participation in Reef Check is the first step in community-based management of reefs. It provides communities (e.g. tourist divers, villagers, government officials) with the information and tools needed to make management decisions. When combined with an integrated coastal management plan and more detailed monitoring results from government programs, sufficient information will be available to effectively manage reefs.

Lessons Learned

A number of lessons have been learned over the past three years of developing the Reef Check program.

- 1) The concept and methods of Reef Check work well both to stimulate public awareness about coral reefs and to produce high quality scientific data that are useful for broad brush assessments of coral reef health at the local, national, regional and global scales. Reef Check monitoring serves as an early warning system such that if problems are detected, more detailed monitoring can be implemented.
- 2) The problems facing coral reefs are generally the same everywhere in the world; overfishing, sewage and industrial pollution and sedimentation. The solutions are similar, but need to be adapted to match the local conditions in each area.
- 3) Monitoring and management have costs, and neither developing nor developed countries are willing to commit resources to fund large monitoring networks using detailed methods typically employed in ecological research. In places where coral reef monitoring has been established and tested within an integrated coastal management framework, a model is emerging that works well in both developing and developed countries. This model involves two (or more) tiers of monitoring methods, with less detailed, community-based methods such as Reef Check used at many sites, and more detailed methods such as those promoted by GCRMN used at a smaller number of sites. Reef Check is a win-win solution to the problem of insufficient resources because the heavy volunteer component reduces the level of government funding required. Public participation produces many positive benefits, including increased public awareness, support for conservation and reef science. It also opens a much needed channel for reef scientists to communicate with the public.
- 4) Coral reef management involves managing both coral reefs and people. Very few developed and even fewer developing countries are in a position to design effective national coral reef monitoring and management plans. A great deal of assistance will need to be provided to most countries for these much-needed plans.
- 5) Monitoring programs have been and are still being designed by academic scientists, with little input from managers, and without respect to a management plan. There is a risk that such plans will produce a lot of data of great interest to scientists, but of little use to managers. Monitoring programs should be developed adaptively, in the context of serving management needs. Reef Check, by focusing on human effects on reefs, provides one definition of coral reef health that is holistic (includes invertebrates, fish and algae), allows comparison with other reefs around the world and is relevant to management of human activities on reefs.
- 6) The Reef Check methods should retain flexibility. While it is important that the core methods retain stability, users are encouraged to add indicator organisms and other parameters so that the methods can be matched to local management needs. This also ensures a proper balance between asking too much of volunteers, and allowing them to become bored due to typically low numbers of indicator organisms recorded.
- 7) There is no free lunch. In an ideal world, international and local funding agencies and governments would notice that groups of people are taking positive action to reverse the trend in declining reef health, and they would offer assistance and funds. In

reality, each Reef Check team and headquarters has had to work extremely hard and make many sacrifices in order to generate sufficient sponsorship to implement the program.

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