

■ TRANSFORMING CONSERVATION VOLUNTEERING
AND TOMORROW'S CITIZEN SCIENTISTS ■ IMMERSION LEARNING ■
EXPEDITIONS BY THE DOZEN ■ CITIZEN SCIENCE -
DOES IT WORK? ■ THE WAY TO BIOSPHERE ■ & MUCH MORE



CITIZEN SCIENCE

20
15
magazine



The following is a series of articles on volunteering / voluntourism / citizen science in wildlife conservation and research, which originally appeared in the annual Biosphere Expeditions magazine entitled “Citizen Science”.

The full magazine is available via www.biosphere-expeditions.org/magazine.



Transforming conservation volunteering and tomorrow's citizen scientists

Biosphere Expeditions' strategy director Kathy Gill
on the history and challenges of conservation volunteering

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*Much of today's conservation movement in
the UK grew out of concerns to protect the
English countryside idyll*

Picture © Christopher Dixon

There is a strong tradition of amateurs leading the way in conservation all over the world. The modern development of land areas protected for the purposes of conservation came about largely through the determination of people who were not paid to do it. As Gregor Hodgson observes in his article (from page 20 onwards), the same is true for weather forecasting. Volunteers also led the way in setting up societies and clubs to observe and help protect those areas and the fauna and flora within, in the process becoming some of the world's largest and most well-established conservation bodies.



A short history of conservation volunteering in the UK

In John Sheail's account of environmental history in the 20th century, he identifies the emergence of a rural economic 'Third Force' in addition to farming and forestry. He talks about how this Third Force provides "conscious stewardship of rural landscapes for their amenity and wildlife".

Following on from this, a 2012 paper by Cook and Inman in the Journal of Environmental Management, gives us a good overview of the development of conservation volunteering: "With its origins in 19th century state concerns over human welfare, the Third Force reflects a philanthropic and voluntary response from those in position of responsibility and influence. This particular drive for conservation furthermore represents a strand other than that from the emerging statutory planning process of the last century. The National Trust in the UK is a good example of an organisation that came about as part of this Third Force. The Trust was formed in 1895 with an Act of Parliament. The Royal Society for the Protection of Birds (RSPB) was also set up in the late 19th century. Later on came other nation-wide organisations such as the Wild Fowl and Wetland Trust, founded in 1946, and the Wildlife Trusts, founded in 1972 [the former being set up in Norfolk where Biosphere Expeditions is based]. During the inter-war period, concern over unplanned urbanisation led to an appeal to the counter-industrial 'English Rural Idyll' followed by the politicisation of countryside conservation forged in the formation of the Campaign to Protect Rural England (CPRE) that dates from 1926. Its founders, the Earl of Crawford and Balcarres (politician and art historian), Sir Guy Dawber (architect) and the pioneer town planner, Sir Patrick Abercrombie, represent not only a cultural elite, but also reflected concern, at the top level of the British establishment, and hostility towards large commercial and urban centres. Later, environmental pressure groups once more became manifest through the activities of Friends of the Earth from the 1970s and went hand-in-hand with a dramatic expansion of the RSPB later in the last century."

So the development of large conservation organisations grew out of the concerns of society over changes that were being seen in the countryside. Movements, although led by a few, actually came about due to the pressure of the many. The present in that sense reflects the past with the volunteering conservation holiday movement also growing due to demand from people to lend their support to conservation abroad via this relatively new pathway.

A short history of holiday volunteering and the 'market' today

Conservation volunteering as we understand it today started in the 1980s with a small group of organisations, such as Operation Raleigh in the UK and Earthwatch in the USA, taking untrained people away for varying periods of time to learn about and undertake conservation work abroad. The early organisations were largely from North American or Western Europe, as were the people that went with them, and they largely went to developing countries, often following the same geographical patterns that colonialism had done before, albeit with very different intentions. The body of organisations swelled from early in the 21st century (Biosphere Expeditions was founded in 1999, see info box on page 19 for a short history) until the current status quo was arrived at – a plethora of organisations of all shapes and sizes with a dazzling array of opportunities for those wanting to what become known as 'volunteer' abroad. Nowadays you can do just that for a day, a week, a month...up to several years. Projects are not confined to just conservation - you can do anything from looking after orphaned animals, to teaching English, building walls and undertaking diving surveys. The market is saturated. Today there are too many opportunities with too few people to fill them, and it is very difficult to decipher the words on the often

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There is a remarkable similarity between popular volunteering countries and the colonization map of 1945



impressive websites to understand what the organisations actually do on the ground.

Some organisations appear to care about the impact that they have and others seem only to care about taking people's money and giving the volunteers an experience (some also do not appear to care about the safety of the volunteers, but that is the very worst end of the scale).

Nature threats and ecosystem services

The need for volunteers is greater than it has ever been before. In all parts of the world, nature is being squeezed (see HIPPO threats to nature on page 16), sometimes all the way out and sometimes just into a tight spot, but everywhere there is an urgent need for people to ensure that protecting the nature that we have is balanced with our need for resources.

One interesting development is the growth in thinking about 'ecosystem services', now no longer a new concept, but still something that is largely only talked about by the people involved with it. This has been the development of ways of putting a monetary value on different things that nature provides for us, and by monetarising it, the idea is that it makes it easier for people to understand its importance and the importance of leaving different natural resources in place. The ecosystem service that a piece of land provides can be things such as what it provides in terms of flood protection, oxygen production or carbon storage, and it can therefore give people a monetary value of having to replicate this service were it to be lost through the removal of the natural asset. People get a direct measurable value to us as a species. There is an interesting development in the UK where one conservation organisation, Buglife, is working on a way that people

can value open spaces such as parks, and can establish an ecosystem services value for their local park or their own gardens, showing what they and their local area are contributing directly to nature and giving some ideas of how they can increase the value of their own land to nature.

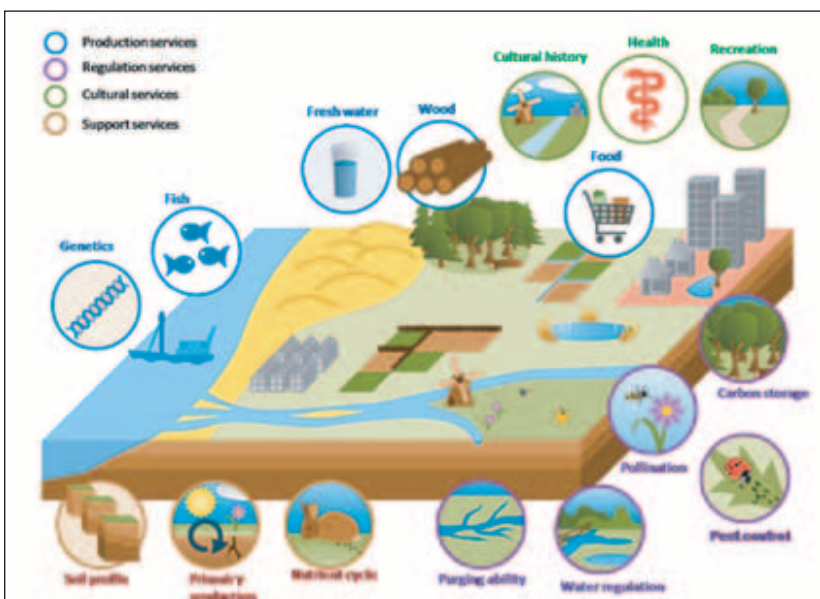
"The world is now dependent on people to manage it"

Resources for conservation have been cut in recent years. Part of the fall-out of tight economic times has been the reduction of funds for conservation and fewer people being paid to undertake science and habitat management. This reduction comes at a time when there is also an emerging acceptance of conservation dependence. Humans have intervened so much in nature, both intentionally and unintentionally, that we cannot just walk away and expect everything to work out in our absence. We have structurally altered landscapes and species assemblages to the point where, if we just left them alone now, the imbalance that we have created would turn them into very different places. The world is now dependent on people to manage it, and our integration and impact on it.

A very sophisticated set of criteria and levels of protection and management that are applied around the globe to protect areas and species have been developed (see info box on page 17). But how are we to protect even these areas without the resources to do so?

The rise of the citizen scientist

Citizen science is a relatively new term, but one that is rising in people's awareness very fast. It is the term applied to people who do not need (and usually do not have) any training in a scientific area to undertake some basic, but important work within it. This usually involves the sort of data collection that can be done with some basic skills and that needs to be done a lot. It is often not flashy or indeed particularly exciting, but it is something that is often highly absorbing, fascinating to undertake and critical if we are to learn more about how the living world functions. People can get involved in many ways from analysing photos whilst sat at their computer screens, to making observations in their gardens, to heading out into the field, at home or abroad, and working alongside scientists on the ground. I believe that this movement is an essential part of the future if we are to make conservation work.



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Examples of ecosystem services

Can conservation volunteering help?

A local case study on identifying the issues for transforming conservation volunteering

Can volunteering help more than it already is to plug the resources gap that conservation faces now and into the future? Biosphere Expeditions teamed up with the Cambridge Conservation Forum (CCF) to look at the issue.

CCF's purpose is to strengthen links and develop collaborations across the diverse community of conservation practitioners and researchers based in and around Cambridge in the UK, working at local, national and international levels. Over 50 organisations based in the Cambridge area, whose primary focus is the conservation of biodiversity, are currently members of CCF, including non-governmental conservation organisations, government agencies, university departments and consultancies. Within CCF the range of volunteers and the range of roles that they take on are varied. Many organisations have volunteers who meet once or twice a week and undertake habitat management work, some have thousands of volunteers to take observations weekly throughout the year, some volunteers are working as interns, some do the accounts, whilst others have paying volunteers who work on conservation projects during their holiday time.

A group from CCF met to discuss 'Transforming Conservation Volunteering'. This involved setting out issues that members had identified, both good and bad, and

looking at the barriers and opportunities. There were many questions and comments raised, but the three key issues for conservation volunteer organisers were:

1. Not enough of the 'right people' are volunteering in conservation

This was a debated issue where some felt there were not enough people whilst others felt that there was enough volume of people, but that they were often not the 'right people'.

The background to this in the UK is that the general level of formal volunteering appears to be pretty stable at around 40% of the population (according to the Institute for Volunteering Research), but that of these, the smallest area of volunteering is within the environmental area, with only 20% of those volunteering doing so and conservation being a only one sub-set of this. There has also been a lot of attention recently to the lack of engagement of young people with the natural world. There is concern that a general lack of interest in the young will lead to a generation with even less regard for the environment than the last, and at a time when we need to focus more attentively on the needs of nature and our place within it. There is a general lack of sympathy (see page 19) that needs to be addressed at many levels, but particularly with younger people who could, if engaged, be a powerful force for change.

"There is a general lack of sympathy"



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Are we losing young people to other, virtual pursuits?

2. Could the rise of citizen science within conservation be part of the answer?

Understanding the profile of volunteers is a crucial issue to address so that more volunteers can be engaged in citizen science in the future. This area of volunteering is often less strenuously physical, being

“Citizen science may just tip the balance to retain biodiversity”

more about learning and observation than manual work. Although people often still need to be active, it is more at the level of hiking than digging. It attracts those who have inquisitive minds and, in the holiday approach, it is something that can be done on an episodic basis - there is no

regular, long-term commitment required, people can join in for short or long periods whenever they want to. This is the model that Biosphere Expeditions operates and our role is to help people to engage with this type of volunteering more by making it as accessible as we can to as many people as possible. By working more and more with conservation bodies who are already operating on the ground in an area (WWF and NABU as two big examples), we are adding resource to the efforts of others, as well as providing a new angle on some old issues through our approach. By giving people an accessible, worthwhile, safe and fun way of engaging, we are hoping to support the development of citizen science as we move into a period of history where this resource may just tip the balance in our battle to retain biodiversity and slow the depletion of our natural resources.

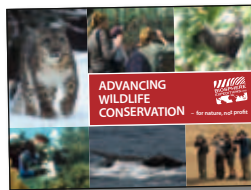
3. How to define and produce quality in both the volunteer experience and the conservation impact

There was general concern over how difficult it is and can be to know which organisations and projects are good ones to go on. This is where ‘good’ means that the experience for the volunteer will be satisfying and safe, and that the outcomes for conservation will be meaningful. There have been a plethora of opportunities set up for people to volunteer in conservation over recent years, some of which are the result of important projects being able to publicise themselves more, but some of which are more about people seeing an opportunity to make money and setting up projects of no or limited value and then marketing them to the unsuspecting world. Brokering organisations have been established with limited ability to monitor the projects that they advertise and which therefore have little control over the ‘quality’ of their ‘products’. Comments of CCF members highlighted that even when a volunteering experience was a good one, it was often far from being the one that was advertised. A number of people also posed the question of how honest marketing could compete with opportunities that advertised themselves as more than they truly were – offering more excitement through

direct contact with animals, feeding into the expectations that can be created through the consumption of wonderful wildlife documentaries and the general ‘disneyfication’ of wildlife.

There have been a number of attempts made to clarify things for the consumer: codes of practice have been produced, quality marks have been launched, awards ceremonies established. But the ultimate accredited standard so far eludes an industry that is so diverse as to make tick-box solutions impossible and complex solutions unworkable and unfunded. A number of people at the CCF meeting came up with the same idea as a possible solution – throw the problem over to the consumer and establish something that does what Tripadvisor has done for travel generally. By setting up a website that allows volunteers to write openly and fully about their experiences, people will truly be able to learn what projects are like. But who will establish something like this? We may find that the Cambridge group starts something up in the future that could lead the way for others.

An organisation-level response – what Biosphere Expeditions did



The message from Biosphere Expeditions is clear: Don’t get involved in any boondoggles masquerading as conservation volunteering projects (a boondoggle

is a project that is considered a useless waste of both time and money, yet is often continued due to extraneous policy motivations). Today, sadly, too many projects are set up only to get tourists to give the organisers money, rather than to achieve any true conservation aims.

This is why we have produced information in the form of a ‘Top Ten Tips’ to help people to choose a wildlife volunteering experience that is right for them (see page 31). In this way we are hoping that an increase in quality for conservation and for the volunteer will be driven by good, old market-led consumerism.

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The disneyfication of nature is unlikely to lead to real conservation

Where do we go from here?

The importance of citizen science is only likely to increase as government and other public funding streams are cut. It is crucial, therefore, that ethical standards are set now so that voluntourism and citizen science firmly stay in the philanthropic realm they emerged from. Biosphere Expeditions will continue to play its part by showcasing how it can be done. Do come and join us in this effort. ■



IMMERSION LEARNING

A scientist's view of citizen science

by Dr. Gregor Hodgson, Executive Director, Reef Check Foundation

Reef Check is both a non-profit environmental group and, as the name suggests, a reef research methodology. It is a dream come true for Biosphere Expeditions, because it is a methodology designed for laypeople to become citizen science divers. No wonder then that Biosphere Expeditions is using and has used Reef Check on all its coral reef expeditions in Honduras, Malaysia, Oman and the Maldives. Reef Check is the brainchild of Dr. Gregor Hodgson, a marine biologist. Here is his story.

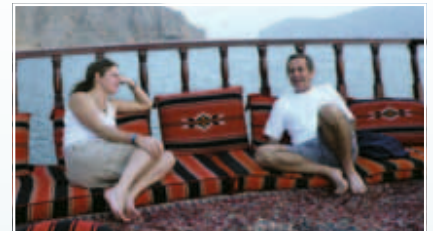
When we all turn on the radio, TV or computer in the morning and expect to get a weather report. What is not well known is that the computer models used to predict weather are partly based on historical observations by a little-known band of volunteers. In the United States, as early as 1849, about 150 volunteers were reporting weather observations from throughout the country to the Smithsonian Institution. By 1890, the 'Cooperative Observer Programme' was formally established by the National Weather Service as America's weather and climate observing network. Today over 11,000 volunteers record temperature, precipitation, wind speed/direction and other observations in cities and rural areas throughout the country. Americans rely on the data collected by volunteers. What if we could train a network of citizen scientists to monitor other natural systems such as forests or coral reefs?

Unfortunately, during the past 20 years, the love affair between humans and coral reefs has taken a dramatic toll on the health of the reefs. By the early 1990s anecdotal reports of anthropogenic impacts on reefs had reached an alarming level. Poison and dynamite fishing, diver damage, pollution, sedimentation and other impacts were widely reported by long-time divers and some marine biologists. But it was unclear how widespread or serious these effects were. A major turning point in coral reef science occurred in 1993 when a University of Miami geologist, Dr. Robert Ginsburg, organised the Colloquium on Global Aspects of

Coral Reefs and invited about 250 scientists to discuss the health of the world's reefs. The meeting successfully highlighted how sparse the available scientific database was on reefs worldwide. There was not enough information available from enough locations to form a picture of the status of the world's reefs. Science 'as usual' was failing to track the rapid changes some scientists believed were taking place on far-flung reefs around the world. The solution would be to design a special scientific survey protocol that could be carried out by non-scientists trained by scientists, and that would produce reliable, highly focused data on coral reef health. If enough volunteer groups could be recruited in this international survey effort, it should be possible to obtain a synoptic survey of the world's reefs.

In 1996, I designed a set of survey methods and, after peer review by many colleagues, these became the basis for a coral reef monitoring programme I named Reef Check. Reef Check has three goals: education, monitoring and management. For Reef Check, stakeholders include any community with an interest in coral reef conservation, not only those communities located near reefs. Therefore the implementation of community-based monitoring and management through Reef Check may involve diverse stakeholders such as

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Dr. Gregor Hodgson (right) in discussion with Biosphere Expeditions' strategy director Kathy Gill whilst setting up the Reef Check / Biosphere Expeditions project to the Musandam peninsula of Oman





Some key indicator species – relatively easy to identify and indicating something interesting.

- 1 **Moray eel:** Presence indicates a healthy reef. *Picture © Kelvin Aitken*
- 2 **Humphead wrasse:** Absence or low numbers indicates overfishing.
- 3 **Lobster:** Absence or low numbers indicates overfishing. *Picture © Dan Clemens*
- 4 **Butterflyfish:** Absence or low numbers indicates overfishing. *Picture © Kelvin Aitken*
- 5 **Flamingo tongue:** Absence or low numbers indicate aquarium trade collection.
- 6 **Hard corals:** Good coverage indicates a healthy reef. *Picture © Kelvin Aitken*



European or American recreational divers who travel to Oman or the Maldives or Malaysia with Biosphere Expeditions or even surfers who enjoy snorkelling on Fijian reefs, and dive resort owners who would like to provide high quality dives for their guests. In summary, the Reef Check network was designed to provide a two-way flow of information - data collected by teams around the world and sent to a central processing facility, and education and interpretation distributed to the teams, governments, managers, other scientists and the general public by Reef Check Headquarters.

How to define 'coral reef health?'

One of the problems with most coral reef monitoring protocols is that they are too complicated to be taught to recreational divers and require a long training period (measured in weeks). This is because they require taxonomic identification to the species level, a requirement that can only be met when teams of specialists collaborate (even most marine biologists can only identify one group of plants or animals such as fish). Secondly, existing reef survey methods were usually designed to measure a large number of parameters that may help to attain a more complete understanding of ecology and relationships among organisms, but that are not particularly helpful for gaining a rapid assessment of coral reef health. Like a thermometer we use to judge if we have a fever, Reef Check methods were designed to collect the minimum information needed to judge coral reef health. The methodology and identification skills can be mastered in a couple of days and reef health is defined by abundance of 'Key Indicator' organisms chosen for ecological roles, sensitivity to human impacts, desirability for human consumption, market value and ease of identification (e.g. distinctive shape and colour, see pictures). An instruction manual is provided along with a set of detailed training materials – Powerpoint presentations and videos. There is also a set of certification standards and tests to ensure that each trainee is truly proficient in the protocol.

Overfishing is the primary problem

In 1997 the first global survey of coral reefs was carried out by teams of recreational divers trained and led by marine scientists during the period between 14 June and 31 August at 315 reef sites in 31 countries and territories spread around the world without any funding. Each team was responsible for funding its own operations. This was the first biological global survey of any kind facilitated by the internet. The survey was repeated during an extended six month survey period in 1998. In 1999 the programme was opened to year-around activity and the number of countries increased to 50 while the survey sites exceeded 500. By 2014, over 90 countries and territories have participated in Reef Check and over 7,000 reefs have been surveyed by 20,000 volunteers and scientists.

The first year's results provided clear evidence that widespread overfishing was the major impact on coral reefs everywhere. Those initial findings were reconfirmed by subsequent surveys and by many other independent scientific investigations. On most reefs, most high value indicator organisms were simply missing: zero lobster, grouper, giant clams, etc. No reefs showed high numbers of most indicator organisms, suggesting that few, if any, reefs had been unaffected by fishing and gathering. None of the reefs could be considered pristine. Even reefs within Marine Protected Areas showed low numbers of indicators, suggesting that many of these were 'paper parks' with little effective management. This was a very controversial new finding in 1997.

1998 was an El Niño year and the hottest since 1860 when records were first kept. Coral bleaching began in the Indian Ocean and the South Pacific in January, and then followed the sun. By 1999, 30% of survey sites reported some bleaching, with high mortality in the Indian Ocean, and parts of Asia. Up to 90% of shallow water corals were killed in parts of the Indian Ocean and high mortalities were recorded down to 40 m. The severity of the event was shown by the death of corals up to 1,000 years old in several parts of the world including Vietnam and the Great Barrier Reef. The 1999 Reef Check survey results showed a 15% global loss of living coral cover as the final tally of destruction from this dramatic forecast of the effects of predicted increasing global warming. This demonstrated that coral reefs are a sensitive indicator of global warming.

In addition to producing useful scientific results, the programme has been successful in achieving its second goal of raising public awareness about coral reefs. In fact, for the minority of scientists who did not accept the fact that trained and tested citizen scientists can reliably survey reefs, this was the most valuable achievement.

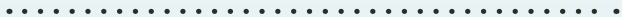
Providing tools for coral reef management

There is a fundamental need to give communities a complete set of tools and training so that they can manage their own reefs. Progress towards making Reef Check available through existing coastal management and coral reef programmes has been rapid, but far more work was needed to expand the network and provide the training needed to use the tools.

This process of institutionalisation of Reef Check has occurred with the help of the United Nations Environmental Programme, UN Development Programme, UNESCO, World Bank, US Agency for International Development, US National Oceanographic and Atmospheric Administration and numerous non-governmental organisations such as the World-wide Fund for Nature, the Coral Reef Alliance, Reef-keeper, CANARI and many others, including of course Biosphere Expeditions.

Shifting baseline syndrome

The scientific results of Reef Check surveys highlighted the importance of the 'shifting baseline syndrome' (see info box on page 24). There are few quantitative data describing what populations of reef organisms were like several hundred years ago, before widespread fishing. In general, changes that occur over a human life span are recognised, and reported at least anecdotally, by fishermen or divers. But when changes have occurred long ago, or slowly over several hundred years, it is difficult to guess what the 'pristine baseline' may have been like. Terrestrial examples of this phenomenon are common and familiar. Studies have documented how overfishing led to diminished fish populations in Jamaica over 100 years ago and suggest that this situation is common. Furthermore, the studies argue that no truly pristine reefs remain because, in addition to widespread fishing, populations of large herbivores such as turtles, dugongs and manatees, which would strongly influence coral reef ecology, were historically much higher than they are today. Many coral reef fish grow and mature slowly. This biological explanation for why it is so easy to 'fish out' coral reefs has led to suggestions by some scientists that no commercial harvesting be allowed on any reefs!



Massive, beautiful coral mounds like this one, many of them a thousand or more years old, were simply killed off during the 1998 bleaching event.

Picture: © Kelvin Aitken

Reef Check results have been provided freely to various organisations involved in documenting and assessing changes to coral reefs. These include the World Fish Center's ReefBase, which is the largest and best developed database on coral reefs. Reef Check results were also used to help build the 'Reefs at Risk' assessment of threats to coral reefs from various sources around the world. This model is now being refined to provide a regional assessment of risk in Southeast Asia.



A Biosphere Expeditions survey team in the Maldives

i SHIFTING BASELINES

A shifting baseline is a type of change to how a system is measured, usually against previous reference points (baselines), which themselves may represent significant changes from an even earlier state of the system. A conceptual metaphor for a shifting baseline is the price of coffee. A cup of coffee may have only cost a \$0.05 in the 1950s, but in the 1980s the cost shifted to \$1.00 (ignoring inflation). The current (21st century) coffee prices are based on the 1980s model, rather than the 1950s model. The point of reference moved.

The concept arose in landscape architect Ian McHarg's famous manifesto 'Design With Nature' in which the landscape as we know it is compared to that which ancient humans once lived on. The concept was then considered by the fisheries scientist Daniel Pauly in his paper "Anecdotes and the shifting baseline syndrome of fisheries". Pauly developed the concept in reference to fisheries management where fisheries scientists sometimes fail to identify the correct 'baseline' population size (e.g. how abundant a fish species population was before human exploitation) and thus work with a shifted baseline. He describes the way that radically depleted fisheries were evaluated by experts who used the state of the fishery at the start of their careers as the baseline, rather than the fishery in its untouched state. Areas that swarmed with a particular species hundreds of years ago may have experienced long-term decline, but it is the level of decades previously that is considered the appropriate reference point for current populations. In this way large declines in ecosystems or species over long periods of time were, and are, masked. There is a loss of perception of change that occurs when each generation redefines what is 'natural'.

Text adapted from Wikipedia.



📖 Further Reading

The Unnatural History of the Sea

by Callum Roberts



Humanity can make short work of the oceans' creatures. In 1741 hungry explorers discovered herds of Steller's sea cow in the Bering Strait and in fewer than thirty years, the amiable beast had been harpooned into extinction. It's a classic story, but a key fact is often omitted. Bering Island was the last redoubt of a species that had been decimated by hunting and habitat loss years before the explorers set sail.

As Callum M. Roberts reveals in "The Unnatural History of the Sea", the oceans' bounty did not disappear overnight. While today's fishing industry is ruthlessly efficient, intense exploitation began not in the modern era, or even with the dawn of industrialisation, but in the eleventh century in medieval Europe. Roberts explores this long and colorful history of commercial fishing, taking readers around the world and through the centuries to witness the transformation of the seas.

Drawing on firsthand accounts of early explorers, pirates, merchants, fishers and travellers, the book recreates the oceans of the past: waters teeming with whales, sea lions, sea otters, turtles and giant fish. The abundance of marine life described by fifteenth century seafarers is almost unimaginable today, but Roberts both brings it alive and artfully traces its depletion. Collapsing fisheries, he shows, are simply the latest chapter in a long history of unfettered commercialisation of the seas.

The story does not end with an empty ocean. Instead, Roberts describes how we might restore the splendour and prosperity of the seas through smarter management of our resources and some simple restraint. From the coasts of Florida to New Zealand, marine reserves have fostered spectacular recovery of plants and animals to levels not seen in a century. They prove that history need not repeat itself: we can leave the oceans richer than we found them.

The Sixth Extinction: An Unnatural History

by Elizabeth Kolbert



Over the last half a billion years, there have been five mass extinctions of life on earth. Scientists around the world are currently monitoring the sixth, predicted to be the most devastating extinction event since the asteroid impact that wiped out the dinosaurs.

Elizabeth Kolbert combines brilliant field reporting, the history of ideas and the work of geologists, botanists and marine biologists to tell the gripping stories of a dozen species – including the Panamanian golden frog and the Sumatran rhino – some already gone, others at the point of vanishing. The sixth extinction is likely to be mankind's most lasting legacy and Elizabeth Kolbert's book urgently compels us to rethink the fundamental question of what it means to be human.

Using volunteers to save coral reefs

There are motivated people who care about coral reefs throughout the world. They are willing to carry out a great deal of difficult volunteer work in fund-raising, organising, training and surveys if they feel it is fun, useful to them and helps coral reefs. Therefore the volunteer aspect of Reef Check appears to have been a key factor in its success. If the programme had been designed to pay people to survey reefs, the surveys would stop when the funds ran out. Participants in the programme become strong supporters of sustainable management of coral reefs. By developing a political constituency, the programme helps to build support for existing and future government management programmes.

As with any new idea, scepticism was initially expressed by some scientists regarding the value of a programme such as Reef Check that uses non-scientists to collect data. As time has passed, increasing numbers of doubters have joined the hundreds of volunteer scientists who have participated and given their time and expertise to support the work. Many scientists have discovered that they have gained a great deal from the experience of acting as team scientists. Through the process of leading the training and surveys, they can directly experience their value to the community just by answering questions on coral reef ecology posed by a diverse audience.

The quality of the data collected by volunteers has been compared formally with that collected by pure scientific teams and the differences are small. The data

have been used for major meta-analyses by independent scientists and published in top scientific journals. Reef Check data have been used to help assess and manage impacts from coral bleaching, a tsunami, and fishing impacts.

Monitoring and management have costs and neither developing, nor developed country governments will ever be willing to commit resources to fund large monitoring networks using detailed methods typically employed in academic ecological research. By using the existing Reef Check network of government and NGO coordinators, huge cost-savings can be achieved because most of the work is carried out by volunteers.

Since 1997 Reef Check has assisted many countries to establish national coral reef monitoring and management programmes. The best monitoring programmes are developed adaptively, in the context of serving management needs that will change with time as new threats arise including global warming and ocean acidification.

Lastly, as with all Reef Check/Biosphere Expeditions programmes, Reef Check provides a local and a global element. Local information and tools for governments to make decisions (such as the recent declaration of two marine protected areas in Oman based on Biosphere Expeditions survey work there), as well as the global component that comes with the gamut of applications that Reef Check has, as described above. Ultimately none of this could happen without the time, commitment and energy of people from all walks of life. People like you reading this Magazine. ■

Biosphere Expeditions' marine scientists on their projects

Alvin Chelliah, Reef Check Malaysia



"Reef Check Malaysia has been conducting coral reef surveys around the country since 2007. However, we have always found it difficult to survey islands that are not inhabited and distant. We lack manpower and funding to survey such areas and hence there were gaps in our data. Working with citizen scientists helps fill in these gaps. The research vessel that Biosphere Expeditions provides allows us to survey the smaller islands off Tioman and the volunteers will provide the added manpower we require. This is vital for scientists and managers that are working hard to protect coral reefs in our country."

Dr. Jean-Luc Solandt, Marine Conservation Society & Reef Check co-ordinator Maldives



"The collaboration between Biosphere Expeditions and the work of Reef Check in the Maldives is invaluable. In the past the Marine Conservation Society has taken part in ad hoc surveys with liveboards, but this collaboration with Biosphere Expeditions has very significantly widened our understanding about the health of Maldivian reefs. We look forward to further successful surveys next year."

Italo Bonilla, Cayos Cochinos Marine Natural Monument, Honduras



"We are always looking for help to do as much research as we can in order to increase our knowledge of our natural resources and how to manage them sustainably. Working with international volunteers gives us a great opportunity to do this on our coral reefs. On top of that there is intense cultural exchange leading to greater cross-cultural understanding, so there are multiple benefits for the archipelago of Cayos Cochinos."

Rita Bento, marine biologist, Emirates Diving Association, UAE



"The work of Biosphere Expeditions on the Musandam coral reefs has had a great impact in the region regarding the collection of scientific data and the creation of a marine protected area in a remote and little touched area of the sea. In addition there has also been a great increase in environmental awareness about this important underwater habitat - both locally through the creation of scholarships and educational programmes and influencing decision-makers, as well as internationally through the involvement of volunteers from all over the world. Biosphere Expeditions unite in an exemplary way in all their projects two important subjects - science and awareness."

Time and money, scientists and their citizens – what they can achieve

Dr. Matthias Hammer, Executive Director, Biosphere Expeditions

This Magazine is about showcasing (citizen) scientists and their projects. What have they achieved? Here is an overview.

Without a doubt the most recent and biggest feather in our cap is the protection of two marine areas in Musandam, Oman. Needless to say we were delighted, because we played a pivotal role. We are still the only organisation conducting reef research in the area and we had been badgering decision-makers in government for years; to have it all come to fruition was a brilliant reward for all the hard work done over many years. Thank you to all who were involved. This is a powerful demonstration of how volunteering expeditions can and should work. The funding and labour our citizen scientists provide enables us to keep chipping away at the block, year after year. This sets us apart from many other research projects, where very often (grant) funding is limited to a few years at best. Yet generally government decision-making takes many years, not just a few, so efforts ebb away, breaking themselves on the big rocks of slow-moving bureaucracies that often have the economy and growth, but not conservation, on their agendas.

Time is often the key ingredient. And we can buy time, because our citizen scientists provide a reliable and steady stream of hard cash and passionate effort. The Maldives are another case in point. There the government is slashing funding available for reef research and conservation. Incredibly, really, for a country whose economy, sustenance and very existence is built on the

bedrock of coral reefs. So we turn to civil society and establish community-based monitoring programmes.

Again, we can only do this because we have time. We may be in the country for only a week or two each year, but we are there year after year, training and empowering locals. Local placement Shaha Hashim has fulfilled her ambition, on page 47 of the 2014 Magazine (page 47), of becoming a Reef Check trainer, alongside her colleague Rafil Mohamed (see page 29). Both will now go on to establish community-based reef monitoring programmes, and Saha has also founded a reef conservation NGO. In the absence of much interest from the government, this bottom up approach is exactly what is needed.

These are just two examples to illustrate that citizen science does work, if done right. Other examples are on the following pages.

Prevention of wildlife and wilderness destruction

Poland

Biosphere Expeditions played an active role in saving 50 wolves from being declared legitimate hunting targets in the Bieszczady mountains in Poland. This was achieved by providing accurate information on the predator numbers and by influencing the local authorities who reversed their decision to cull wolves.

Peru Amazon

Together with our partners in Peru, Biosphere Expeditions was able to halt a dam construction project, which was threatening a biodiversity hotspot in the Peru Amazon region.



Wildlife and wilderness management & protection

Namibia

Biosphere Expeditions played a pivotal role in establishing the country's largest leopard research project, working with local ranchers and resolving human-wildlife conflict, which led to a significant reduction in big cats killed in the country.

Peru Amazon

Our guidelines for boat behaviour at clay licks in the Tambopata Reserve have been incorporated in local management plans. Guidelines are needed because unsustainable forms of farming, logging and tourism are threatening the natural habitat in the Peruvian Amazon.

Brazilian Atlantic rainforest

Our recommendations for the management and protection of jaguars have been incorporated into national and state-wide jaguar action plans in Brazil's Atlantic rainforest.

Caribbean marine protected area, Honduras

Our recommendations for the management and protection of the coral reefs of the Cayos Cochinos marine protected area in Honduras have been incorporated into the managing authorities' action plan.

Dubai Desert Conservation Reserve, United Arab Emirates

Our recommendations for the management of Arabian oryx and Gordon's wildcat have been incorporated into the action plan of the Dubai Desert Conservation Reserve.

Spanish Pyrenees

Together with our partners in Spain, we helped to reverse EU high altitude carcass removal regulation, which was designed to combat the spread of BSE, but was starving high mountain vultures and bears.



Protected area creation

Southern Africa

Data collected by our expeditions in Namibia have helped our local and international partners make arguments that have led to the declaration of the Kavango Zambezi Transfrontier Conservation Area, or KAZA TFCA. The KAZA TFCA is the world's largest conservation area, spanning five southern African countries; Angola, Botswana, Namibia, Zambia and Zimbabwe, centered around the Caprivi-Chobe-Victoria Falls area. Also in Namibia, fewer lions, leopards and cheetahs have been killed in farmer-predator conflict due to our data collection, awareness-building and educational work.

Oman

Data collected by our expeditions as well as our intensive work to influence decision-makers have led to the protection of two marine areas in the Musandam Peninsula of Oman, where all fishing except local handline fishing has been banned by a new ministerial decree.

Ukraine

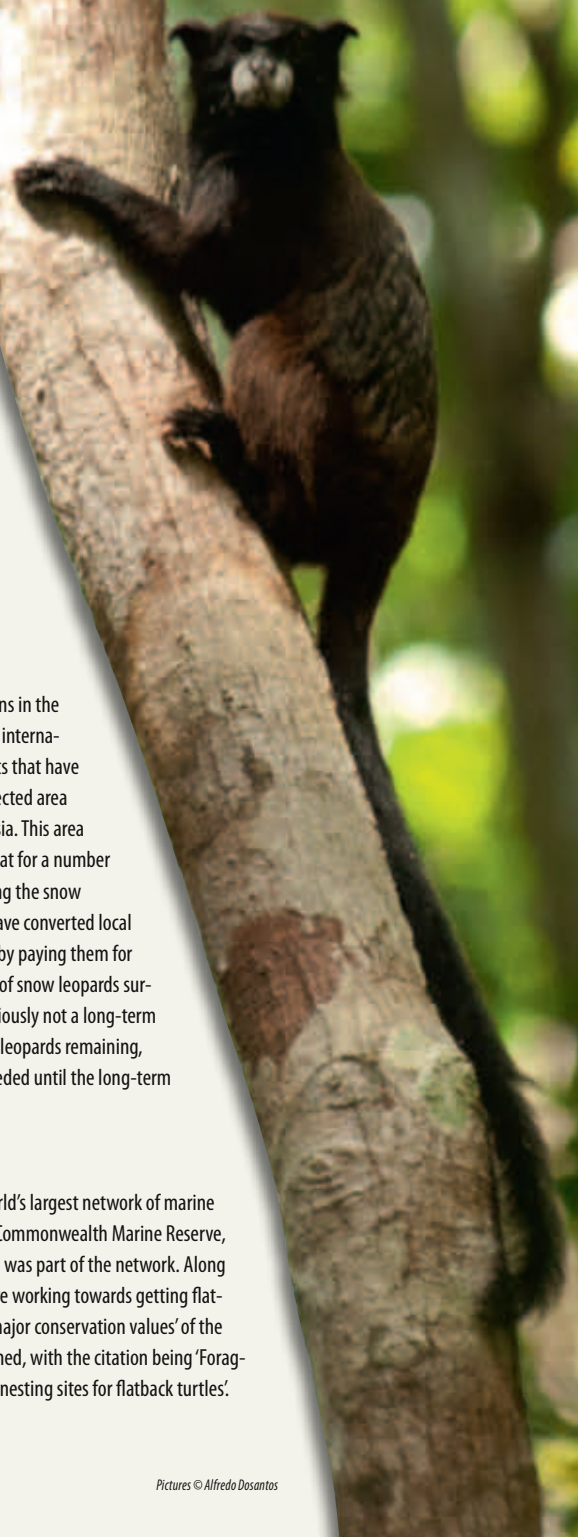
Data collected by our expeditions in the Ukraine have helped our local partners make arguments that have led to the declaration of a national park. This park now protects a unique steppe area jutting into the Black Sea, a stop-off point for many migratory birds, as well as a haven for fauna (e.g. birds & wolves) and flora (it boasts amongst other things Europe's biggest orchid field).

Altai Republic

Data collected by our expeditions in the Altai have helped our local and international partners make arguments that have led to the declaration of a protected area in the Altai Republic, Central Asia. This area now provides a protected habitat for a number of endangered species, including the snow leopard. Also in the Altai, we have converted local poachers into conservationists by paying them for verifiable camera trap pictures of snow leopards surviving year-on-year. This is obviously not a long-term strategy, but with so few snow leopards remaining, some stopgap solutions are needed until the long-term ones can be reached.

Australia

When Australia created the world's largest network of marine reserves in 2012, the Roebuck Commonwealth Marine Reserve, site of our flatback turtle study, was part of the network. Along with our local partners, we were working towards getting flatback turtles listed within the 'major conservation values' of the reserve and this is what happened, with the citation being 'Foraging area adjacent to important nesting sites for flatback turtles'.



Pictures © Alfredo Dosantos

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(press release 27 November 2013)

Biosphere Expeditions welcomes protection for unique marine ecosystem in Musandam, Oman



In two secluded bays in the coral-rich waters of the Musandam peninsula in Oman, all fishing bar the local handline fishing has been banned by a new ministerial decree. This significant step forward in the conservation of the beauty and resources of this relatively untouched marine area has been welcomed today by the research organisation that has spearheaded the underwater research effort and campaigned towards greater protection, Biosphere Expeditions. Dr. Matthias Hammer, the founder and executive director of the organisation, today talked about the work that Biosphere Expeditions has been doing in the area since 2008: "This area has a high coral coverage at nearly 60 per cent of the underwater surface. This is greater than that of most reefs around the world, and the Musandam reefs are certainly the best in the region. The Ministry of Agriculture and Fisheries's (MoAF) decision prohibits the use of all kinds of nets and cages, and any other fishing equipment, except handlines. This is a wise and important step in ensuring the survival of this unique marine ecosystem and natural jewel in Oman's crown."

A senior official at the Marine Sciences and Fisheries Centre, on whose recommendations such decisions are taken, said that both the Khor Najd and Khor Hablain bay areas are rich in corals, and fishing would end up destroying them. "The destruction of corals means severe damage to the marine life in the area. So this measure not only protects reefs, but also helps in sustainability of marine resources."

"We could not agree more", says Hammer, "and we are delighted that our voice has been heard, that our reports have been read and our recommendations have been heeded." But he also added a note of caution, saying that without further intervention, the low numbers of fish and invertebrate populations in the area could mean that any additional stress may lead to coral die-off. "The general fishing ban announced by MoAF is certainly a progressive and welcome step in the right direction", says Hammer. "Moving forward we recommend that a Marine Protected Area (MPA), or a network of MPAs, is created in north Musandam. We also urge rapid action before what is at the moment still a unique natural treasure for Oman is degraded and lost. If more habitat is lost or degraded before full MPA protection is implemented, there is a good chance that fish and invertebrate populations will not be able to recover from their current very low numbers and that the current high coral coverage will be lost. As a result, the decrease in some fish and invertebrate families is likely to have future negative impacts on substrate composition and the reef ecosystem as a whole. This in turn will threaten livelihoods and treasured lifestyles around Musandam", warns Dr. Hammer.

The next stage, said Dr. Hammer, is to obtain formal support to extend protection from fishing bans to a full MPA. Biosphere Expeditions will continue its research, now including studying the effects of the fishing ban. Ultimately, given funding and government support, Biosphere Expeditions plans to extend its efforts to comprehensive surveys (including for example, fisheries landings, stakeholder consultations, etc) and a roadmap towards an MPA. ■

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Establishing community-based monitoring programmes in the Maldives

"I really appreciate the effort Biosphere Expeditions makes to involve locals in their expeditions to the Maldives. Curious about the Reef Check course, I approached them in 2013. This year I have qualified as a Reef Check trainer, which qualifies me to conduct my own surveys and train my compatriots here in the Maldives. Together with Rafil we hope to monitor many sites now, feeding into Reef Check and national conservation efforts, which are needed urgently. I hope to get more people to see the reef as I do now."

Shaha Hashim

(Also see news on first-ever all-Maldivian survey on page 46.)



Via our local partner LaMer, the Rufford Foundation kindly supported these placements.



2014 local placements (left to right): Rafil Mohamed, board member of the Maldives Dive Association; Shaha Hashim from GEMANA NGO; Ibrahim Shameel from the Maldives Whale Shark Research Programme



CITIZEN SCIENCE - does it work ?

by Prof. Marcelo Mazzoli



It is quite common for a scientist unaware of the potential of citizen science to view participation of volunteers as a troublesome addition to their research and not as a positive part of the research itself: "I'll take them around while I do my research, or I'll take them around and do my research another time". This is a naïve perspective. Volunteers have added value to wildlife conservation and research since the 1960s. Starting in 1966, the so-called 'Breeding Survey', for instance, tracked the status and trends of North American bird populations. Even today, the U.S. Fish and Wildlife Service, Canadian Wildlife Service, and 'Partners in Flight' all use Breeding Survey trends along with other indicators to assess bird conservation priorities. Such large-scale monitoring is also employed in Europe, where the advantages of employing volunteers have been widely, and positively, evaluated in the scientific literature. In fact the role of volunteers in research in general has been widely recognised and it is growing. Volunteers are particularly crucial in large-scale monitoring programmes.

My own experience with citizen science began in 2006 when a group of about 20 volunteers from Biosphere Expeditions spent a month in the Atlantic Forest of

Prof. Marcelo Mazzolli started as the local scientist for Biosphere Expeditions' project in the Atlantic Rainforest of Brazil. Since then he has led or was involved in the science of Biosphere Expeditions projects



in Oman (Arabian leopard), Peru (Amazon biodiversity), Slovakia (lynx, wolves, bears) and the Tien Shan mountains of Kyrgyzstan (snow leopards). Together with fellow biologist and Biosphere Expeditions' executive director Dr. Matthias Hammer, he has also authored a manual for effective citizen science on elusive and cryptic terrestrial species.

southern Brazil. Since then I have worked with citizen scientists in the Brazilian and Peruvian Amazons, Middle East and Slovakia. One of the first things a scientist realises when working with volunteers for the first time is the large workforce available. The obvious advantage of a large team is that a lot of ground can be covered in short time spans, or the fact that long observations may continue with volunteers working in shifts. Second, after the first attempts of working with volunteers, comes the realisation that results depend on the quality of your study design, and, equally importantly, how clearly you are able to communicate the goals and procedures to your volunteers. This also means making available the analytical tools to identify and understand the evolution of the study during their stay, otherwise they will not be fully engaged in the task. Working with volunteers also brings a large dose of enthusiasm, enabling people to meet and share, collaborators from multiple backgrounds, new ideas and the thrill of sharing your own passion and calling with like-minded people from around the world.

Collaboration means that work is shared, so that the whole responsibility of the research does not fall on a single individual. This collaboration should be thought of during the planning of an expedition, but here we focus on the expedition itself. Collaboration is mainly needed during training, which includes the talks, training and such, but also the days spent practicing in the field

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Citizen science is always a collaborative team effort – Prof. Mazzolli with expedition teams in the Oman and Brazil



alongside the volunteers, and during the tabulation and analysis of data, as well as production of maps. Obviously it is also important to have supervision to make sure that skills learned are transferred and applied in the field. When data start coming in, the task of tabulating them right away and producing visual maps has a tremendous impact on those collecting the data, because it visualises effort and puts it into context – with the efforts of fellow citizen scientists and the bigger science picture. Because volunteers come from multiple backgrounds and will by and large have little training in biological field data collection, it is imperative that analytical tools are simple enough so that everybody can understand and participate as much as possible.

Over the years, I have found that the information available in the scientific literature on how data should be collected and analysed can be very fragmented and incomplete. This is a major source of problems for young scientists when designing field surveys and later analysing the data. As an example of half-truths found in the scientific literature, it is not uncommon for authors to recommend a single method such as camera traps to record species as if it was infallible, working with the rarest rare species, when in fact the target species may be so rare that other techniques should be employed too. In our multiple year study in the Atlantic Rainforest of Brazil, for instance, we have found jaguars only by tracks, and on the Arabian Peninsula we detected Arabian leopards only by using DNA scatology technique. We have also found that different techniques work best for different species. While many other authors have found the same and there is a consensus on that, fragmented and incomplete pieces of information often reach our libraries.

Other authors might insist that density estimates are required for a good study, disregarding information on distribution and habitat use. Again others disqualify

the use of tracks as a technique to identify individuals (and even if it was the case, ‘forget’ to mention that it can be used to map distribution and occupancy), and so on.

Such misguidance found in the literature has pushed me, in collaboration with Biosphere Expeditions’ executive director and fellow biologist Dr. Matthias Hammer, to develop our own manual. In this manual for terrestrial (and large) mammals, we have covered aspects of sampling, effort, data tabulation, GIS, amongst others, in such a way that it can be handled by multiple collaborators with little time spent in training.



Front page of the Mazzolli & Hammer manual

In the end it’s all about collecting the data and performing analyses. Good data will yield good analyses, which generate real results. The results of our own work with terrestrial mammals have generated new information on species ecology, having been incorporated into regional and national action plans (in Brazil, for example, our recommendations for puma and jaguar conservation are now part of state and country strategies). And more – in addition to the data collected and shared through reports and publications, we have provided capacity-building and training for local scientists and true research experiences for people worldwide. Those data would not have been collected without the help of citizen scientists. That alone disproves the notion that citizen science cannot work. ■

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Prof. Mazzolli setting a camera trap in the jungle and discussing a track with a local



Cover picture:
Expedition participants surveying
primates in the Peruvian Amazon

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