

Role of Science for Conservation— A Personal Reflection

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Abstract

The opinion article presented here argues that good science may contribute to a solid technical basis for management and conservation, although scientists are increasingly being criticized for not providing the needed facts. However, since management and conservation is a societal activity done by people for people, which happens outside the scientific domain of convergent problem solving, political and sectorial interest are often far more decisive for management outcomes than is the technical basis these decisions were supposedly based upon. This field of conflict is exemplified with the Galapagos archipelago.

Keywords

conservation, management, Galapagos, divergent problems, science

Relevant Science for Conservation

A decade ago (2009), when I was still working as the Marine Science Director of the Charles Darwin Station on the Galapagos Islands and when we had just conducted an International Symposium to celebrate the 200th birthday of Charles Darwin and the 50th anniversary of the Charles Darwin Foundation on the Galapagos, a heated debate arose on the island on the role of science for conservation. While we published a book on that topic 3 years later (Wolff & Gardner, 2012), the National Park Authority of the Galapagos archipelago (Parque Nacional Galápagos [PNG]) had already in the year 2009 expressed opinions about the limited value of results from natural science inquiries for the conservation and sustainable management of the Galapagos Archipelago.

Since Galapagos is in the focus of the international community of nature conservation and often considered a model example for a successful nature conservation of a tourism hot spot, the opinions expressed in the above-mentioned book are of general relevance and may be shaping ongoing discussions on the subject.

Nowadays, in the year 2019, these opinions about the limited value of natural science research for leading our management decisions are often reiterated, and some people even believe that scientific facts have no meaning and that there is no need to take them into account for any decision-making in nature conservation or resource

use and management. Some prominent advocates of this group even deny that climate change is occurring and driven by our species.

While some people thus do not accept obvious facts derived from scientific research, others (like some of the aforementioned advocates of the PNG) try to subdivide scientific inquiry into useful/applied and nonuseful and basic or fundamental. To be good and relevant, science should—according to this view—be instrumental to help solving the management problems on hand and should not be led by inquiries of individual natural scientists, which are blamed to only follow their very personal scientific interests.

We should think about this and ask ourselves, what it was that brought Charles Darwin to the Galapagos Islands and made him work almost all of his life to understand the principles of evolution that caused the radiation of Darwin finches, mocking birds, and

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tortoises on the Galapagos islands? Hasn't it always been extreme personal interest and dedication and strong individualism that has driven scientific discoveries? Was it any different when Alexander von Humboldt, George Perkins Marsh, John Muir, or Ernst Haeckel embarked to their scientific journeys?

The criticism expressed by the PNG is that much of the research conducted in the past 60 years on the Galapagos archipelago has not directly contributed to the betterment of the conservation status of the Galapagos Islands due to its predominant natural science ("bio centric") focus. The argument put forward is that, since human impact is increasingly altering the surface of the archipelago and the composition of its biota through massive invasions of new species, the sciences dealing with the behavior of our species—*homo sapiens*—such as ethology, sociology, anthropology, and economics should enter, or even better replace, the field of investigation on the archipelago and should provide the output needed for management decisions. Thus, a more holistic approach to the investigation of the socio-ecosystem of Galapagos should replace the former disciplinary and sectoral research and would contribute to a betterment of the situation. The assumption here is that the relevant information or meaningful indicators of the state of Galapagos and its stakeholders is not provided by the (natural) sciences impeding adequate management. It is stated that a replacement of the "old science approach" by a new one driven by management necessities and focusing on the socio-ecosystem instead on specific natural science issues would solve most of our problems. Is this really to expect?

Convergent and Divergent Problems

As early as in the year 1973, the famous British Economist E. F. Schumacher made a very meaningful distinction between "convergent" and "divergent" problems. The first—"convergent problems"—are solvable through logic or scientific research and have allowed mankind to understand that our earth is a planet, to use a space shuttle fly to the moon, to put Gigabytes of information on a small memory stick, or to understand and replicate the process of molecular evolution. By applying the scientific method, we are able to penetrate into the most complex natural phenomena in order to understand the mechanisms behind. In doing so, we come closer and closer to the understanding of Nature and the truth behind things. This is what science is all about.

"Divergent problems," on the other hand, are those that require accommodating our lives in ways that challenge our central convictions, traditions, beliefs, personal motivations, and skills. These "divergent" ones are according to Schumacher the "real" and persisting

problems mankind has as yet not managed to solve. Wars, environmental degradation, resource depletion, poverty, and starvation have challenged mankind ever since its beginnings. Why that? Is this a failure of our scientific method? Do we need better science to overcome these problems? Has a more modern, holistic science approach helped to overcome these problems? As easily demonstrated by the historical analysis, the answer is rather no!

What we really need is a common vision of what kind of global/local society we want to live in and we all need to work towards this common goal. So, if this is what makes the difference, does scientific advancement matter at all? Of course it does, if we want to solve convergent problems that can be tackled by the scientific method and logical thinking. If we want to sustainably manage the "Bacalao" or "Guajo" or "Spiny Lobster" of the Galapagos waters, we have to conduct sound stock assessment of these populations and should put these resources in an ecosystem context to understand how exploitation affects not only the resource but also the rest of the ecosystem. If we want to quantify the proportion of invasive species in any Galapagos habitat, we need to assess and monitor the biodiversity using state-of-the-art methods of science. If we want to understand why and how systems change due to climate or anthropogenic impact, we need to study and model system processes and identify their driving forces, including those from the outside world.

However, if we follow the reasoning of the critics of the Science in Galapagos as outlined earlier, the following assumption emerges: If we change the focus from natural science to social sciences, we would improve our situation and we would be able to draw better inferences from the research and do adequate management. For the reasons explained earlier, this does not seem probable, however. It is definitely good to diversify the scientific endeavor and to look at the Galapagos reality from as many angles and viewpoints as possible, and we should include methods of social science and economics to study the human dimension of Galapagos, but this is not going to solve our "divergent problems" we have to deal with.

The Importance of a Common Vision

A common vision on where to go with Galapagos (and other areas of great conservation value) cannot be built only on the results of a convergent science approach, and managers should not always blame the scientists if management decisions are difficult to implement because of the "divergent" nature of the problem.

As scientists we should aim to conduct good science and we should not follow the silly dichotomy of applied and basic science. If science is well done—be it natural or

social—results will be relevant, as they will help to understand the world around us. Good science may contribute to a solid technical basis for management, but management is a societal activity done by people for (or against) people and happens outside the scientific domain of convergent problem solving. As shown by the past decades of participatory management practices implemented with the Special Law of Galapagos in 1998, political and sectorial interest were often far more decisive for management outcomes than is the technical basis these decisions were supposedly based upon. A striking example is the Sea cucumber fishery, which, despite sound studies and management recommendations from the science sector, has continued to decline steadily over the years.

Good science in Galapagos and elsewhere needs certain conditions, however, and the scientists should do their best to assure that these conditions are met. It requires an above-critical number of well-trained scientists, a working atmosphere that stimulates personal interest and intellectual creativity as much as cooperation among local scientists and foreign groups, as well as a review system, which allows maintaining the excellence level needed. Good science has to be done on all organizational levels of the ecosystem including the organism, the community, the ecosystem, and the human system level and we scientists should aim to integrate

and communicate our research findings to our partners and local stakeholders as efficiently as possible.

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