Environmental Conservation **34** (2): 90–91 © 2007 Foundation for Environmental Conservation doi:10.1017/S0376892907003906

COMMENT

Environmental science, environmentalism and governance

First published online: 11 June 2007

Most environmental scientists care about the state of nature. They are concerned about loss of biodiversity, degradation of ecosystems services and threats to sustainability. Do such concerns and the values they reflect make an environmental scientist an environmentalist? Should they be environmentalists?

In recent years, there have been several scientific papers, published in prestigious journals, describing degradation of coastal and ocean ecosystems, and calling for more conservation, often including marine protected areas (MPAs). Typically these papers receive a great deal of attention, even when scientists with first-hand knowledge of the issues addressed by the papers disagree with the analyses and conclusions. Several rebuttals have been published pointing out flaws in the original papers. However, the rebuttals are usually published much later, in journals that receive less attention. Even after the rebuttals are published, the original papers continue to be cited by scientists and referred to by policy makers as if they are fact. I have not cited specific papers I consider flawed because I do not want to personalize this sensitive issue any more than necessary, but I expect that most marine environmental scientists are aware of the papers. Hilborn (2006) describes the situation very well.

The problem of misleading environmental science is exacerbated when flawed ideas are cited by subsequent papers, or when scientifically sound papers are selectively or inaccurately cited. For example, Aronson and Precht (2006) described shortcomings in a series of papers that argued that Caribbean coral reefs were primarily threatened by overfishing which releases macroalgae that overgrow and kill corals. These papers often advocate MPAs as an important element of the solution. Aronson and Precht (2006) concluded that climate change related phenomena and diseases are a more serious threat, and that MPAs will not solve the problem.

While Hilborn (2006) mostly addressed shortcomings in some published papers and related weaknesses in journal editorial policies, he highlighted a broader issue when he stated 'faith based ideas are not scientific and they have no role in a scientific course.' He was making his point by referring to a recent US Court ruling that 'intelligent design' cannot be included in public school science courses because it is not a legitimate alternative scientific theory to evolution. My guess is most environmental scientists agree regardless of their religious beliefs. However, I fear that many environmental scientists are less able to separate their environmental beliefs and values from their role as scientists. Indeed, one of the most influential environmental scientists of our times, Wilson (2003), encouraged us to abandon the distinction between environmental science and environmentalism when he said: 'Perhaps the time has come to cease calling it the 'environmentalist' view, as though it were a lobbying effort outside the mainstream of human activity, and to start calling it the real-world view.'

No one knows how much influence environmental values of individual scientists are having on their research. Certainly, the flawed papers alluded to above are having an influence. I am concerned that environmentalism influenced the production of some of these papers and the subsequent messages communicated to the public.

Let me be clear that I believe that environmentalists play an important role in society and I very much respect people that openly advocate their values. I have advised environmental advocacy organizations on scientific aspects of the issues that concern them. I also recall a brainstorming session a decade ago when scientists and environmentalists discussed a strategy to use science to more aggressively advocate for the environment. The strategy went something like this. Fund research that is likely to highlight environmental problems. Get it published in high profile journals to attract media attention. Use the media to influence public opinion. It is a legitimate strategy provided the funded research is rigorous, journals are objective in their acceptance of papers and scientists accurately communicate their scientific results to the media and the public. I do not think this is always the case. Polacheck's (2006) rebuttal to one of the high profile papers alluded to above demonstrates my concern in detail.

With respect to the objectivity of journals, I do not have any direct evidence one way or the other. However, it is common for presumably objective news media to favour one ideology over another. They say so in editorials. One might wonder about the boundary between some commercialized scientific journals and the news media. Also, the difficulty that some scientists have had getting rebuttals published in the same high profile journals where flawed papers were published leads to suspicion and speculation about objectivity and balance in the coverage of controversial issues.

I think it is clear that some scientists overstep the bounds of the science that 'passed peer review' in their statements to the media. For example, the *New York Times*' (Stevens 1998) coverage of a well known paper on 'fishing down the food chain' quoted the author as saying '. . . now Americans are eating bait.' The author of the high profile scientific paper was using the increasing popularity of calamari as evidence of the negative effect of fishing down the food chain. However, the increased popularity of calamari reflects Americans' more diverse taste in seafood, not fishing down the food chain. It also

https://doi.org/10.1017/S0376892907003906 Published online by Cambridge University Press

appears that some authors include sensational conclusions in their papers to get media attention. The *Seattle Times* (Bernton 2006) reported on a recent well known journal paper that, in my opinion, improperly used extrapolation to project the collapse of most fisheries by 2048. According to the *Seattle Times*, the author of the journal paper sent a note to colleagues saying '. . . that the projection could act as a 'news hook' to get people's attention. . ..'

Some argue that it is unreasonable to expect scientists to separate themselves from their own beliefs and values (for example Ludwig *et al.* 2001). I agree, but does this mean that environmental scientists should not strive for objectivity? Does it mean that they should be environmentalists in the sense of advocating their environmental values and beliefs? I think this is up to each of us as individuals, but whatever the choice, the people we influence deserve to know if they are reading and hearing objective science or advocacy.

The problem faced by the lay-person in judging the qualifications and motives of environmental scientists reflects the maturation of environmental science. It has evolved from a discipline of primarily curiosity-driven naturalists and ecologists communicating among themselves. It is now an extremely socially-relevant profession that lay-people and policy makers need in their daily lives. With this maturation, and heightened social importance, come additional responsibilities. There are many other disciplines that provide advice or service to lay-people that cannot judge for themselves the qualifications or motives of the advice of service providers. Medical doctors, engineers, lawyers, certified public accountants and even beauticians are examples of professionals that advise or service lay-people. What distinguishes these professionals from environmental scientists is that they are all governed by codes of conduct, standard practices and certification and licensing that goes well beyond the awarding of academic degrees and journal peer review. The governance usually comes from within the professions, with government oversight or affirmation. I reject the notion that the certification processes of some environmental science related professional societies are comparable.

The idea of governance, particularly involving government, offends many scientists. A valid argument is that restricting research will impede the generation of new knowledge. However governance of research is not the issue. Researchers can judge quality and qualifications for themselves. My concern is activities of environmental scientists that are aimed at the interface between environmental science, public opinion and government policies. In this arena, a first step toward governance would be to let lay-people know if they are talking to objective scientists or environmental advocates. Today, they usually have to guess, which is a prescription for discrediting environmental science, engendering distrust of environmentalism and confusing public opinion and government policies.

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https://doi.org/10.1017/S0376892907003906 Published online by Cambridge University Press