

Forum

Monitoring of biological diversity – a response to Danielsen *et al.*

Nigel G. Yoccoz, James D. Nichols and Thierry Boulinier

In their commentary on Yoccoz *et al.* 2001, Danielsen *et al.* (2003) make a number of important points about monitoring in developing countries. Our only major disagreement is with their belief that our recommendations are only likely to be useful in developed countries. We claim that devoting proper attention to the 'why', 'what' and 'how' of biological monitoring is important irrespective of available resources. Before discussing this, we stress that we fully realize that questions related to biodiversity monitoring and management involve political issues that go beyond the scientific questions.

Danielsen *et al.* (2003) make the following points regarding the design and implementation of monitoring programmes: (1) costs may be too high and therefore the programme is unlikely to continue for more than a few years, (2) designs are too complicated, which makes implementation unreliable, (3) programmes are not integrated into the management process, and (4) local communities are not involved in the programmes and local knowledge is not recognized as being useful.

These points are important in both developed and developing countries. Even if resources are greater in some developed countries, simplicity and participation of local communities appear to be essential if monitoring programmes are to successfully influence management decisions. Emphasizing the different context in developing countries may lead some to think that monitoring programmes there are necessarily of a poor quality, clearly not the conclusion Danielsen *et al.* (2003) would like one to draw. The reverse is not true either: large and costly monitoring programmes are not necessarily able to answer management-related questions (Paulsen *et al.*, 1998).

Most importantly, our focus on the three steps involved in designing a monitoring programme ('why', 'what' and 'how') is even more relevant when funding is limited and insecure. Defining clear objectives ('why') is crucial both for justifying support and involving local communities and stakeholders. The same is true of the

process leading to the choice of variables to be monitored ('what'). Finally, achieving a simple link between data from monitoring and management-relevant information is easiest if the design ('how') takes care of potential confounding issues such as non-representativeness or biased sampling. We agree that simple and practical methods are to be preferred over complicated ones (Karanth & Nichols, 2002), and relevant variables such as patch occupancy and species richness are based on simple measurements such as presence-absence data and species lists. We did not argue for standardization, but for inclusion in the sampling procedures of field methods that can correct for differences in the way data are acquired. This is particularly true of local knowledge, where methods are needed to make it comparable with other sources of knowledge. Finally, trend statistics are often inadequate, as management decisions require assessment of current system state rather than long-term change.

One misunderstanding is the perception that using statistical methods in a monitoring programme is inherently complex. Hence Danielsen *et al.* (2003) saw our paper as devoted mainly to sources of data uncertainty, and not as we intended to the whole process of designing a programme, from the objectives to the use of the information in the management process. This process will be simpler if sufficient attention is paid to the initial decisions regarding 'why', 'what' and 'how', not more complicated. It is our experience that extracting relevant information for managers is made more difficult when data come from programmes that ignored or neglected these questions at the beginning.

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Nigel G. Yoccoz (Corresponding author) Norwegian Institute for Nature Research, Polar Environmental Centre, N-9296 Tromsø, Norway.
E-mail: nigel.yoccoz@nina.no

James D. Nichols U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, Maryland 20708, USA. E-mail: jim_nichols@usgs.gov

Thierry Boulinier Laboratoire d'Ecologie, CNRS-UMR 7625, Université Pierre et Marie Curie, 7 Quai St Bernard, 75252 Paris, France.
E-mail: tboulini@snv.jussieu.fr

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