Lessons Learned – developing a biodiversity monitoring scheme for a protected area

The challenge

A Biodiversity Monitoring Scheme (BMS) is a long-term array of complementary surveys, censuses, surveillance and monitoring referring to a well-defined and ecologically meaningful area, the analysis of the results of which allows at least a basic understanding of trends in the values of some important elements and the causes of change.

Monitoring is the systematic measurement of variables for a specific reason (Spellerberg 1991): the term *census* refers to population counts, while *surveillance* is the systematic measurement of certain parameters, aiming to establish a data series, and a *survey* identifies the habitats and/or species that exist within an area. We carry out monitoring for three main reasons (Goldsmith 1991): a. to assess the effectiveness of a policy or legislation, b. as a statutory requirement, and c. to detect developing changes.

The SPP faced two main challenges related to setting up a BMS:

How to choose the parameters that should be monitored?

In natural systems there are numerous measurable parameters and factors, which are nested into each other and closely interdependent. Which of them should be monitored to ensure a meaningful, representative and integrated picture of biodiversity trends in an area, and to what degree?

How to distribute often limited resources in order to achieve a useful result?

The basic challenge is to match necessity to capacity. Since we cannot monitor every parameter of a complex system, we have to choose what to monitor – deciding what gives us the best value for money, effort and time – and this may vary between organisations and over time.

The solution

Taking knowledge and experience into account, the populations of large waterbirds – especially pelicans – and endemic fish were judged the two outstanding values of the Prespa wetlands. Other very important values such as the distinctive landscape, habitat mosaic and diversity, and high plant and mammal diversity, were considered to require much less intensive monitoring. Available literature, expert opinion and local knowledge were used to identify the main ecological matrix around these values; for example, breeding waterbirds need safe nesting sites and prolific feeding sites, while endemic fish mainly feed on benthos and plankton, which are strongly affected by water quality. In a closed basin these attributes are also heavily impacted by human activities – grazing intensity and distribution, fishing pressure, deposition of agricultural nutrients and sediments in the lakes – which also require monitoring. In addition, everything is affected by the climate, especially in a period of rapid climate change; precipitation patterns affect the fluctuation of lake water levels, a key factor for biodiversity.

In accordance with the SPP's mission as a conservation NGO, a conservation-oriented BMS was prepared, targeting the biotic and abiotic factors considered to be most important for informing the direction of the SPP's work, as well as human demographics, activities and economics, while water quality data were acquired from other monitoring schemes. An integrated plan was set up to help fill crucial data gaps with focused 1- to 3-year research projects.

The basic steps taken in preparing the BMS were:

- It was decided to monitor only within the Greek part of the catchment, due to limited resources, with the limitations of this approach being clearly acknowledged.
- The main operating patterns of the ecosystem/s were understood and the basic matrix of inter-relationships was described.
- The basic biodiversity values to be conserved were listed and prioritised (to the degree possible as they are all parts of an interdependent network of elements in a system).
- The main threats to the most significant values were identified.
- To ensure the viability and continuity of the BMS, it was confirmed that the SPP budget and personnel could suffice cover the necessary financial, administrative and logistical support.

- The monitoring objectives were carefully defined, and the data collection methods, variables and indices, as well as the timing and frequency of data collection, were decided upon.
- The analysis, presentation, reporting, evaluation and revision processes were defined.
- A pilot scheme was carried out, in order to fine-tune and confirm objectives, feasibility and localities, etc., and baseline-surveys were undertaken where necessary.

Lessons learned

- Firstly, and most importantly, it is crucial to know why monitoring is being carried out – to be very clear about what is the specific reason for the monitoring programme.
- Always use the correct terminology – there are important differences between censuses, surveys, surveillance and monitoring.
- Think twice before acting! It is better to devote ample time for decision making during planning than later
- Having gained a basic understanding of how a system works, start by clearly assessing the resources (human, financial, tools, time) available for carrying out the plan on an annual basis. Do not start anything without this. Additional resources may become available later and then more parameters can be included.
- Always take into account the resources and time required for database entry, as well as analysis and report preparation. Often they are more laborious and time consuming than the actual data collection.
- Avoid just collecting data without analysing it. Even if only at an elementary level, data should be analysed at least once a year to gain some insight and allow revision. An annual report containing this basic analysis, some conclusions and any necessary adaptations should be prepared.
- It is not possible to monitor all the factors involved in an ecosystem. Ensure that any gaps are of as low an importance as possible, and strive to fill basic gaps with targeted research.
- Beforehand, try to locate all other operational monitoring schemes and take advantage of their data to avoid doubling efforts.
- Due to unforeseen changes – at sampling sites, in environmental conditions, with legislation, resource availability or technology, for example – modifications to the methodology will often be necessary. A transitional period, when the two methods will be applied simultaneously, may be needed to ensure a smooth changeover.
- Likewise, ensure that the monitoring is re-assessed after a period of years, in order to be certain that it still fulfils its purpose – no monitoring programme should be continued indefinitely, evaluation is essential and may result in the programme being stopped, re-defined or re-scheduled.
- When deciding on methods, indices and variables seek the advice of experts right from the start. Analysis and presentation methods should be also decided together with statisticians before implementation and not afterwards.
- In an area like Prespa, the monitoring of human activities (temporal and spatial distribution, intensity, duration) is equally important to the monitoring of biotic and abiotic variables, as they are connected to threats and stresses to wildlife.
- Prepare some kind of monitoring for extreme weather, or other, events – deluges, floods, very low or high temperatures, fires, earthquakes, avalanches, droughts, cyclones, for example – which may impact habitats and organisms disproportionately to their duration and frequency.

In addition to the above, it is important to acknowledge that the Prespa basin is shared between three countries, so the values on the Greek side may interact with ecosystem elements situated outside Greece, the best example being water quality, which affects many of the other ecosystem variables. In this respect, efforts to co-ordinate monitoring work at transboundary level, sharing data and results, and co-ordinating management approaches, are also vitally important and have been extensively promoted in the SPP's work, with many transboundary activities included in its programme.

Spellerberg, I. F. 1991. Monitoring Ecological Change. Cambridge University Press, Cambridge UK.
Goldsmith, F.B (ed.). 1991. Monitoring for Conservation and Ecology. Chapman and Hall, London, UK