Educative and participative amphibian monitoring for a wider and more effective conservation

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Sierra Norte Natural Park in the Biosphere Reserve “Dehesas de Sierra Morena” in Southwestern Spain (respectively 177,484 ha and 424,200 ha), has a diverse amphibian community with metapopulations of 12 species (1). Since 2005 data was recorded on ecology, phenology and habitats, while an overall decline of biodiversity was indicated by naturalists and land users in the region. In 2011 an educative amphibian monitoring program was developed and initiated to define and hold the scale of loss of biodiversity and to improve and direct conservation actions. In the region of Sierra Norte Natural Park (80 km north of Seville) few people have affection with nature and there are no finances for monitoring by professionals. As in other regions with an actual high conservation value there is a low accessibility and (local) volunteers will not easily commit to a longer term monitoring. However there is a large pool of interested students and herpetologists for whom it is a pleasure and adventure to participate a weekend in sampling amphibians together with local naturalists, managers and landowners and users in a nature reserve. In Sierra Norte Natural Park the commitment for the monitoring is made by the local NGO AMBOR while every year experienced and other interested persons, including local naturalists, land users and owners are involved. An important element of the educative and participative monitoring is that the organizers are based in the region and have a continuous close relation and exchange with both naturalists and land owners. These persons are actually the ones who influence most on the conservation of the amphibian community and metapopulations via their local acting. The monitoring weekends create an environment in which there is an important exchange between the locals that understand about land management and the functioning of the ecosystems, and scientists and other herpetologists with their knowledge on amphibian recognition, ecology and conservation requirements.

Objectives
The main goal of the educative monitoring in Sierra Norte Natural Park is to reach an overall improvement of the conservation status of amphibians. The objectives include monitoring of both populations and habitats throughout the region with a quality guarantee of the results. The methods were developed such that part of the data can be directly incorporated in the Spanish National Amphibians Monitoring Program (SARE). At the same time the monitoring allows participants to learn on species recognition, detection methods and increase awareness on ecology and conservation.

Methods
Out of 400 aquatic sites with data on amphibians from the period 2005 to 2010 (W. de Vries and Association AMBOR), 121 sites

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were selected for monitoring throughout the park so that the species distribution can be mapped over the entire park territory (24 UTM 10 x 10 km squares). Depending on the conservation status a minimum number of sites were included for each species (40 sites for Vulnerable species: 1 species; 20 sites for Near Threatened and European Habitat Directive Annex VI/HD—VI species: three species; Near Threatened or HD—VI 10 sites: six species). Moreover there were included 20 sites of each of the five more common or more valuable amphibian habitat types (cattle ponds, ponds with vegetation, temporary ponds, temporary streams and concrete water basins). All sites are sampled twice in the breeding period, including two detection possibilities per species per year with one weekend in winter and one in spring. Sites were grouped into areas that are sampled during both day and night. Each group consists of several participants including an experienced herpetologist, a local volunteer and others and is equipped with field materials (nets, wading—suits, lamps, field guide in color, photo-aquaria, etc.). The sampling methods are standardized and combine audio and visual survey, lifting and sampling by net. Authorization is obtained from the regional government (Consejería de Medio Ambiente de la Junta de Andalucía). Data is collected on standard forms and pictures and videos are taken to validate the determination and sampled site. After sampling, data is directly evaluated and validated: confirmed—probable—possible—improbable—confirmed incorrect (reliability 1-5). Data is stored in a database together with the images. “Confirmed” (picture or video) or “probable” (lifestyle can be distinguished by expert) data is accepted for further analyses.

RESULTS

In 2011 and 2012 63 persons were directly involved in the monitoring, among which 6 professional herpetologists, 25 locals, 7 volunteers of the Red de Voluntarios de la Sierra Norte, 3 nature managers, 15 students, 5 landowners and 8 foreigners. Since several persons participated in both years, the efficiency of the field work and data collection increased and determination of the species in the larval stages improved. One hundred and ten preselected sites were sampled in both 2011 and 2012, including 20 sites of each habitat with exception of temporary ponds (n=14). Participants could observe all 12 species in the weekends in the first year for it was a wet year and the meteorological conditions were optimal. In 2012, on the contrary, was an extremely dry year with low temperatures during the sampling and 11 species were recorded during each weekend. In 2011 and 2012 there were recorded respectively 11,484 and 2,858 larvae and 2,312 and 775 adult amphibians. Already in 2011, each of the target species was detected in the minimum number of required sites and the distribution of most species was mapped for the entire natural park territory within the monitoring sites (Fig. 1). Participants learned to recognize amphibians in the distinctive developmental stages and to recognize valuable amphibian habitats. The results from 2011 were available during the sampling in 2012, allowing participants to observe amphibians in the field and, on paper, the population that used the site in the previous season. The less favorable conditions in 2012 had as a result that much less amphibians were observed and none of the species was recorded in more sites than the previous year. From eight out of 10 target species on the average 12.0 % (±10.9) additional sites
Detection of species previously to and during the monitoring. Percentage of sites with recordings of each species in 110 preselected sites previous to the monitoring (2005-2010) and accumulated previous+monitoring (2005-2012), during the sampling in both monitoring years (2011+2012) and percentage of sites in which the species was previously recorded (2005-2010), but not so in the 2011+2012 monitoring (abbreviations of species, see Fig. 1).

were recorded in 2012. After two years, there is a high proportion of sites in which the species were recorded in 2005-2010 period but not in 2011 or 2012 (Fig. 2). This is partly caused by conservation problems, but also a consequence of difficulties to detect or determine some of the species and strong currents in stream habitats in 2011.

The results from 2011 and 2012 stress the needs for conservation actions even without evaluating breeding success. Habitat had been destroyed in 17.3 % (14.5 % in 2011, plus 2.8 % in 2012) of the preselected and sampled sites with valuable habitat for one or several of the target species in 2005-2010. They were altered so much that the populations of target species cannot reproduce anymore: active filling in and dumping, introduction of fish, presence of American crayfish (Procambarus clarkia), broken concrete water basins and eutrophication. In 2011 an additional 13 % of sites had unsuitable conditions that might be temporary or belonging to the local conditions; filling due to erosion, active cleaning of basins and fish population in natural habitat. The drought of 2012 caused that 55.4 % of sites were dry or just filled with rain the days before sampling and stimulated land users to clean in winter concrete water basins that are normally washed in summer or had been without use for years. In 2012 several of the ponds that were filled up due to erosion had been cleaned by the land users and fish disappeared naturally from several stream stretches, demonstrating that temporary unavailability forms part of the dynamic in the area. Apart from obvious conservation problems, other less conspicuous problems were observed such as road kills, drowning of amphibians in constructions, leeches on amphibians at eutrophic sites or areas with intensive livestock. Analyses in the laboratory of the National Museum of Natural Sciences (CSIC) on a dead Pelophylax perezi confirmed the suspicion that the Chytrid fungus Batrachochytrium dendrobatidis is present in the Natural Park territory, though, during the monitoring, no large mortalities were recorded.

Since the need for conservation actions is demonstrated by the first results, the regional authorities have expressed their interest to support conservation actions in the Natural Park territory and various small scale projects were designed. The positive feedback of landowners, users and local naturalists form a good basis for conservation on the long run and already various locals will remove fish from their sites or otherwise improve conditions for amphibians. Without exception the involved persons have obtained a wider understanding of the conservation needs and ecological requirements of amphibians and participants have started amphibian research and monitoring outside the Natural Park region. We hope the educative amphibian monitoring will reach amphibian populations in other regions with few conservationists and a high amphibian conservation value and needs.

Summary

The educative and participative amphibian monitoring combines education and awareness rising on different levels to reach an improvement of nature conservation on a landscape scale while the amphibian community, habitats and natural dynamics are monitored by a mixed group with locals and experts. The method incorporates species distribution, relative abundance of the species, development of habitat, education of naturalists, students, nature managers, scientists, land owners and users as well as nature managers. Moreover, it gives a frame work for directing and evaluating nature conservation actions and scientific research. By combining the monitoring with education a wider audience is reached and involved than in conventional monitoring by individual volunteers or professionals, while at the same time the impact on the valuable protected area is limited. The involvement of professionals and the international character combined with inhabitants of the region allow exchange and initiatives. The large set of habitats and changing conditions over the years, make the monitoring an interesting event to participate in for many years. To lower the effect of the monitoring on the amphibian community, monitoring is done annually during two weekends and disinfected (local) materials are used. The monitoring weekends in 2011 and 2012 gave valuable information for conservation and will form the basis for a conservation plan.

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References