Policy Support Statements of the

Large Carnivore Initiative for Europe (LCIE).

Policy support statements are intended to provide a short indication of what the LCIE regards as being good management practice with respect to certain aspects of large carnivore conservation.

Monitoring of large carnivores

Monitoring of large carnivore populations is a crucial activity. It is needed to guarantee their survival, to adapt management practices to changing situations, and for EU countries to fulfil obligations to the Habitats Directive. It is also a very demanding exercise because of the large scales over which it must be conducted, often stretching across international borders, and because of the low densities and elusive behaviour of large carnivores. These species occur under a diversity of situations across Europe and their monitoring hence represents a variety of challenges – this statement therefore only outlines some of the general principles,although it also mentions some of the species specific methods that have proven successful under different circumstances.

Parameters and basic principles

It is very important to realise that many different aspects of a population's status can be monitored, and that different methods are needed for each. The most normal parameters are:

Distribution: The area occupied by the species – the distribution area – is the most common parameter that is monitored. The repeated detection of sites occupied by a species is relevant to aspects such as habitat requirements, inter-specific relationships, range and metapopulation dynamics. For large carnivores, it is crucial to separate between areas of constant and occasional presence, and within the permanently occupied range, between areas of reproduction and areas without. A variety of types of observations such as dead animals, camera trap pictures, tracks, excrements, prey animals killed, and sightings can be used to describe the distribution, but we recommend that all observations should be classified into (1) hard evidence (e.g. dead animals, pictures, genetic records), (2) confirmed observations of tracks and kills (approved by a trained person) and (3) unconfirmed records. To gain a more differentiated picture of distribution and habitat use, but still tolerating imperfect detection of these elusive species, we recommend using the recently developed occupancy analysis models. These methods allow fine-scale adjustment and can be used to estimate abundance, especially in combination with additional data sets.

Population trend: Indices reflecting increases or decreases in population size are important to show the trend of the population. They can base on a variety of parameters (e.g. dead animals, wild and domestic kills, direct sightings per year, track counts per kilometre, etc.) and need not directly measure or estimate population size. It is imperative that these parameters must be collected in a consistent manner (same method, same area, same effort) over multiple years. Because of random fluctuations of parameters or sampling, population development can generally be seen only over several years, and are more reliable if several independent parameters indicate the same trends.

Population size: To come up with a reliable measure of the number of individuals in a population is very demanding. Simple count methods provide some idea of a minimum number of individuals that are present without any statistical estimate of uncertainty. Trustworthy estimation methods calculate a mean and an error, giving some idea of the statistical precision in the measure. Such estimations are generally based on "capture-recapture" statistics and require a method allowing individuals to be distinguished. For large

carnivores, these can be genetic identification of hairs or excrements, or camera trapping for species such as the Eurasian lynx with their individual pelt pattern.

Health and population structure: Monitoring the disease situation, genetic health and demographic structure is especially important for small populations and populations that have passed through a historic bottleneck. Pathological and clinical examination requires handling of a (narcotised) animal or a carcass; we strongly recommend the establishment of programmes for the collection and examination of all animals killed or found dead. Tissue samples should always be stored for future study. Dead animals should be sexed and aged as information on trends in age and sex structure can provide some indications of population development and status. For genetic analyses, samples from live or dead animals are good, but some examinations can also be done using material taken from hairs or excrements.

All parameters are important, and it is likely that a monitoring programme will include several different approaches and combinations of methods. It is very unlikely that many monitoring programmes will seek to repeatedly count or estimate the total number of animals in a population. Most programmes will involve some degree of extrapolation. This can be either from a more easily documented demographic segment of the population (such as reproductive units) to the whole population or from small representative sample areas to the wider area of distribution.

Monitoring methods should be coordinated and standardised across the entire area of a population, or preferably the meta-population, to allow holistic assessment of the conservation status of the unit. This often requires coordination of monitoring efforts across international borders. If several independent institutions are involved in a monitoring programme, it is important to agree not only on the methods used and the analyses of data, but also on interpretation and reporting. Data from large carnivore monitoring are often used to take controversial management decisions, and it is therefore important to produce consistent and incontestable results. This includes professional training of all staff involved, from the person collecting data in the field to the statistician responsible for the analyses.

The most important aspect of monitoring is that the activities are repeated over time in the same way. This implies that it is important to carefully plan the programme from the start, because making changes underway can make comparisons difficult.

Data collection and storage

It is crucial that field data is validated by trained and critical observers. This concerns all data whatever its nature. Raw observational data should also be stored in a manner such that irrespective of the manner in which it is analysed the underlying data can be easily accessed for reassessment. It is crucial to store raw, validated, data free from interpretation in addition to the processed results. It is a good idea to also record and store unvalidated data as it may help focus future sampling efforts. It is highly desirable that such databases should be as centralised as possible – at least on a national basis. Modern computer systems easily allow multiple users at dispersed locations to enter data into a central database. Regarding clinical and genetic research, it is not only important to store pathological or genetic information in databases, but to retain collections of original samples for future analyses.

Examples of good practice

The following list is not exhaustive, but refers to some monitoring programmes in use in some countries that may serve as good models. The increasing use of genetic methods should be noted. There are constant improvements in methods here, and they are increasingly being applied on very large spatial scales.

Wolverines:

- Annual monitoring of known natal denning localities (Norway and Sweden).
- Collection of faeces for DNA-based capture-mark-recapture (Norway).

Bears:

- Collection of faeces and hairs for DNA-based capture-mark-recapture (Sweden, Spain, Norway, Croatia, Slovenia).
- Observations of females with cubs of the year (Spain, Norway, Sweden, Estonia).

Eurasian lynx:

- Camera trapping for small (500-1000 km_2) reference areas (Switzerland).
- Collection of faeces and hairs for DNA-based capture-mark-recapture (Poland, France)
- Intensive snow-tracking (Norway, Sweden, Finland, Estonia, Latvia, Poland).

Iberian lynx:

- Camera trapping (Spain).

Wolf:

- Intensive snow-tracking (Norway, Sweden, Finland, Poland, Estonia, Latvia, Lithuania, Italian Alps, Croatia).
- Collection of faeces for DNA-based capture-mark-recapture (Italian Alps, France, Switzerland).
- Howling surveys to detect family groups (Spain, Italian Apennines)

All species:

- Collection of any validated observations of presence = photographs, tracks, dead animals, kills of wild and domestic prey (Scandinavia, the Alps).
- Intensive radio-tracking studies (Mainly useful as a research and calibration method rather than a monitoring method).
- Collection of all animals shot or found dead for age determination, sexing, monitoring of reproductive status and tissue storage (Norway, Sweden, Latvia, Estonia, Switzerland, Italy etc.)