**3.6 SCRIPT – Which direct monitoring methods are adapted to monitoring large mammals?**

E – Direct mammal monitoring relies on the study of the state and the evolution of animal populations, as well as the influence of pressures on said populations through direct observation of individuals or groups of animals.

G – In practice, it consists in monitoring the trends of certain key ecological attributes of this population. The most common ones are the density or abundance, the distribution and the shifting trends of this population as well as the interaction it can have with its habitat.

E – The choice of assessment methods of these parameters is key to direct animal population monitoring. The type of method chosen depends on simple questions such as: “Which ecological attributes should I monitor?”, “Which indicators should I follow for each of these ecological attributes?” etc.

G – We can take the example of ecological attributes related to the population size: average density, group sizes, distribution per habitat… We can also look at attributes describing the structure and the population dynamics: gender and age ratio, data related to the health condition etc.

E – But it is also important to see what the minimum data needed to monitor the population is. This will help define the collection cycle or periodicity as well as its duration.

G – Many inventory techniques can be used. Among them, as seen in unit 2, total count methods can be carried out, as well as methods based on sampling.

E – In the case of a total count, the entire studied zone is inspected, and statistical calculations, if any, only concern the estimation of bias. Total counting on foot for example, is based on the individual recognition of all animals seen by the observer. This technique can be applied to a great number of species such as elephants, giraffes, rhino, most predators and some antelopes that are easy to spot.

G – As said earlier, sampling should be carried out at random, for the numbers to be representative of the entire animal population. In practice, the sample units can take on multiple forms: the most commonly used are quadrats and transects.

E – Quadrats are based on the idea of visually counting the number of individuals inside a predefined plot set at random in the studied zone. All individuals observed outside this plot aren’t counted.

G – The estimation of the population consists in calculating the density of the sample which is the ratio between the number of counted individuals in the quadrat and its surface area, and to extend this number to the total surface of the studied zone, to obtain an estimate of the global population of the monitored species.

E – For inventories by line transect, the method consists in searching animals along a line of undetermined width. The animal’s perpendicular distance to this transect line is noted. In practice, three measurements are taken per observation: the viewing or radial distance, the viewing angle, and the perpendicular distance. The transect lines can be travelled on foot, on horseback, by car etc.

G – The density estimate is then obtained by a formula that considers the number of observations (contacts), the total transect length, the width of the line observation strip which is determined by the distance at which animals are seen and the detection probability function.

E – There are several estimators of this function that are widely documented on in literature. DISTANCE is a specialised software that can help you estimate this function.

G – The mark and recapture technique is another method often used when data on mobile species need to be collected. It is a special technique where a known number of animals of a species is marked and released.

E – Based on the hypothesis that the population of marked individuals compared to non-marked individuals is the same in the sample as in the entire population, the share of marked and non-marked animals that will be captured next will be used to estimate the total number of animals within the studied population.

There are different mark and recapture methods - the choice depends on whether you work on a closed population, in other words one that is not in contact with populations outside the PA (e.g. Petersen Method), or on an open population, when PA individuals migrate outside the PA (e.g. Jolly-Seber method).

G – Quite often, another method is also used: the Kilometer Abundance Index (KAI) – it is based on observations made during walking surveillance patrols, corrected depending on the effort made, for instance the walking time… This essentially helps to detect population variations over time. One technique especially consists in looking for nocturnal animals with a lamp. But KAI is not suited to censing species with a low density or wide action range.

E – The punctual abundance index is a technique consisting in counting animals at certain fixed points (waterholes for example) to monitor the population fluctuations over time. This technique is usually carried out from a hideout, at set times and durations, and the measurements should be repeated to have enough data.

G –Measuring the group size is also a technique that is used sometimes.

E – For some herbivores the group size depends on the abundance of species in the environment. Scheduled monitoring of this indicator helps to detect fluctuations in species density. For example, group sizes of mountain goats tend to increase when the density increases. Monitoring a sample will then allow to estimate abundance variations without having to count the entire population.

G – In all cases, monitoring techniques require a good capacity to identify species and to be able to estimate numbers upon brief visual contacts. Biological knowledge of the species is also key to predict their behaviour in the presence of observers.

E – Finally, observation conditions should be good. One should avoid windy, dusty, too hot or rainy conditions. Observers should move quietly and consider animal reactivity, especially in areas prone to poaching. Direct monitoring has the perk of giving information on the condition of park animals, but is not applicable to hard to spot or secretive species.