**WILDLIFE DATA COLLECTION**

* 1. **Introduction**

Knowledge of the size or density of a population is often a vital prerequisite to managing it effectively. Is the population too small? Is it too large? Is the size changing and if so in what direction? To answer these questions we may have to count the animals, or we may obtain adequate information by way of an indirect indication of abundance. In any event we need to know when a census is necessary and how it might be done.

* 1. **The need for counting**

Reasons for deciding to carry out a census may vary depending up on our objectives. Among them are the following.

* To determine the importance of a site
* To determine the population size of a species
* To determine the habitat requirement of a species
* To determine reasons for species’ decline
* To understand the population dynamics
* To determine whether habitat management has been a success

Although **census** is strictly the total enumeration of the animals in an area, we use the word in its less restrictive sense of an estimate of population size or density. That estimate may come from a total count, from a sampled count, or by way of an indirect method such as indices and mark–recapture techniques.

Almost all decisions on how a population might best be managed require information on density, on trend in density, or on both. There are many methods to choose from and these differ by orders of magnitude in their accuracy and expense. Hence before any censusing is attempted the wildlife manager should ask a number of questions.

* + Do I need any indication of density and what question will that information answer?
  + Is absolute density required or will an index of density suffice?
  + Will a rough estimate answer the question or is an accurate estimate required?
  + What is the most appropriate method biologically and statistically?
  + How much will it cost?
  + Do we have that kind of money?
  + Would that money be better spent on answering another question?

This section outlines briefly some of available methods and their applications.

* 1. **Total count**

The idea of counting every animal in a population, or on a given area, has an attractive simplicity to it. It is the method used by farmers to keep track of the size of their flocks. It is easy and the results are easily interpreted which out much analysis.That is why total counting was once very popular in wildlife management and why it is still the most popular method for censusing people.

Total counts have two serious drawbacks: they tend to be inaccurate and expensive. Nonetheless they have a place. Let us see the following scenarios.

The number of large mammals in a 1 km2 fenced reserve can be determined to a reasonable level of accuracy by a drive count. It takes much organization and many volunteers, but it can be done. Every nesting bird can be counted in an adélie penguin (*Pygoscelis adeliae*) rookery, either from the ground or from an aerial photograph. This time the result of the “total count” is rather an index of the population size because more than half the birds will be at sea on any given occasion.

* 1. **Sample counts**

There are two important areas in which scientific thinking differs from everyday thinking: the selection of a random or unbiased sample and the choosing of an appropriate experimental control. Knowing how to sample, and knowing how to design an experiment that gives an unambiguous answer, are the two attributes distinguishing science from ideology. Sampling is the technique of drawing a subset of sampling units from the complete set and then making deductions about the whole from the part. It is used all the time in wildlife research and management

Before an area is surveyed to estimate the number of animals on it, that area must be divided into **sampling units** that cover the whole area and are non-overlapping. The sampling units may comprise areas of land if we count deer, or trees if we count nests, or stretches of river if we count beavers or crocodiles. To allow us to sample from this **frame list** of sampling units, the list must be complete for the whole area. Hence the frame of units contains all the animals whose numbers we wish to estimate.

Representative samples are obtained by rigid standardization of survey methods, by sampling in the most efficient manner, and by taking a large sample.

* 1. **Index**

Index isa number that is not itself an estimate of population size or density but which has a proportional relationship to it. An index of density, for example, is an attribute that change in a predictable manner with changes in density.

For example:

* the number of whales seen per cruising hour is an index of whale density
* the pellet or fecal dropping count of deer
* the density of bird nests is an index of breeding populations
* the density of tracks of brown bears is index of brown bear density
* the number of droppings of a rabbit in a sampling area serves as an index of the number of habitats

However, index of density does not tell us the true density but it allows comparison of density between areas and between years. Indices provide measures of relative density and are used only in comparisons. They are particularly useful in tracking changes in rates of increase and decrease.

* 1. **Basic field techniques**

The first step of any research or monitoring program is to define one’s objectives. The definition of objectives is important, because it determines:

1. whether a total cont is best suited the study or sample or index of the population is satisfactory
2. the extent to which a population should be divided by sex, age, or size in one’s study.
3. one’s choice of method for example in case of or when the objective is surveillance (observing changes over time)

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Once the objective was determined, the appropriate methods to apply will be determined by the species you are studying. It is therefore important to know as much as one can about the species and its ecology before planning one’s work in detail from literature, by talking to experts or from preliminary observations. There are many field techniques that are employed in census of wildlife populations, among them the most common ones; The Mark-recapture method, point transect and line transect methods are described in the following section.

* + 1. **The Mark-Recapture methods**

***Fundamentals of mark-recapture methods***

The basic idea: suppose that one catches a sample of animals from a population, marks and release them. After allowing the marked animals time to become thoroughly mixed in to the rest of the population, one take another sample. It is reasonable to assume that the proportion of marked animals in the second sample is the same as that in the population at large. This idea can be mathematically expressed as follows.

=  then = 

n1= the number of animals first marked and released

n2 = the number of animals in the second sample

m2 = the number of animals in n2 that are marked

N = total population size

There are various mark-recapture methods. All based on this basic assumption. Other assumptions include

1. All methods assume that marks are not lost marks can be done in many several ways for different species. E.g. numbered rings on birds, cutting hair in furred animals, cutting fingers (eg rodents), and applying ink. However marks could be lost or overlooked, if no correction is made loss of marks result overestimation of results.
2. Marks also should not affect the behavior of animals. If marks affect mortality and behavior, it leads to a biased population estimate. E.g. conspicuous marks expose animals to predators.
3. All methods assume that all the animals in the population can be trapped. Catchability of an animal depends on a variety of circumstances. For example, weather, season, trapping effort (the number of traps and time to which they are set). Such variation in catchability could produce a huge bias in the estimate of population size. It is important to recognize source of that variation.

***Effects of trap responses***

Once caught animals may become trap-shy, avoiding its location or even leaving the area. Therefore trap shyness results in overestimates of population size. Sometimes animals become trap-happy especially if traps are baited. Therefore trap-happiness result in underestimation of population sizes.

**The Peterson Method (=lincoln index)**

The Peterson method involves one session of catching and marking and one recapture session. The assumption is the proportion of marked animals in the second session is the same as the population at large.

=  then = 

the number marked and released on the first occasion

 total number caught on the second session

 number of marked animals found on the second occasion

 total population size

To eliminate bias for statistical reasons the above equation modified as

*N*=

* + 1. **Point and line transects**

Both methods are suitable, especially for birds and large animals. Transect methods provide direct estimates of density.

*Assumption*

* All animal at the observation point or on the line are detected. (if not, the estimates are sensitive to the exact statistical model used for analysis).
* Population density is constant around the observation point or line
* Detection of different animals is independent.

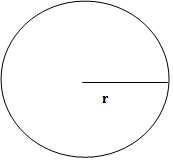
**E.g. 1**. if neighboring birds tend to sing at the same time, this increases the variability of the results.

**E.g. 2**. when animals occur in flocks, here one can treat the flock rather than the individual as sampling unit. i.e., estimate density of flocks and multiply by average flock size to estimate the density of population.

The methods require that the distances from the observation point or line to each animal are recorded for density estimation. In reality the distances have to be estimated. But it is difficult and has less accuracy. For this reasons it is better to estimate one fixed distance than to estimate all the distances. The distance fixed depends on detectability of the animal. i.e., the size of the animal, the habitat type etc.

* + - 1. **Point transects**

A point transects entails the observer remaining at one point for a fixed time and recording the animals he/she detects

Distances may be recorded in terms of concentric zones around the point. Eg. 50 m, 100m, 200m etc up to some limit beyond which the animal are not detectable. An alternative limit is one that excludes about 5% of the animals seen.

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***Assumptions***

* No immigration in to the area during the observation period
* Detectability decreases exponentially with distances

The estimation of density for point transect with only two recording zone is:

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r = radius of the first zone (the second extends from r to infinity)

n1= number of animals counted within r

n2= number of animals counted beyond r

m = number of replicate points in the set

**4.6.2.2. Line transects**

Line transect is a method by which animals are recorded while moving. Animals are not waited until detected like point transect.

It is appropriate for

-birds in open habitat

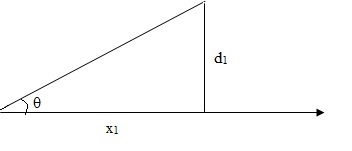
-aerial survey of big game animals

-ship survey of whales

The principles’ assumptions are the same as those of point transects. But line transects are less sensitive to errors in distance estimate since the calculations depend on the distances themselves rather than their squares.

The animals may be recorded on a serious of bands on each side of the transect line or exact distances may be measured (distance perpendicular to the transect line)

If the animals flee as the observer approaches, one should estimate both the distances from the observer to the animals position before it flee and the angle between the animal and the transect line so that the perpendicular distance may be estimated as follows.



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When animals are counted in a serious of bands in the two sides of the transects, the density can be calculated as follows.

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r1= distances from the transect line to the boundary between the two zones (the

second (r2 ) extends to the infinity)

n1= number of animals counted within r1

n2= number of animals counted beyond r1 x1

l = length of transect

E.g. Sky larks (*Alawda arvensis*) counted on a 2- km transect of arable farmland in Norfolk, England, yields 10 birds with in 100 m of the transect line and 14 beyond Calculate the density of sky larks.

NB. In this example birds were recorded on both sides of the line, for one-sided transects, do not divide by 2 in estimation of the density. The formula there for is modified as

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