How and why count animals?

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Why count?

Counting each individual you see can be a challenge, but it can also become valuable information for scientific research.

As populations of e.g. birds change, those fluctuations may indicate shifts in pollution levels, habitat loss, migration timing etc...

Techniques for Counting Birds

- There are many ways to count birds depending on the birds present, the size of the flock and how it is behaving. Easy bird counting techniques include:
- **Individual Counts**: When just a few, recognizable birds are present, each individual bird can be easily counted without fear of gross miscalculations. This basic one-two-three technique works best when the birds are clearly seen and slow moving so individual birds will not be counted multiple times.
- **Grouping**: Counting birds in numeric groups is an easy technique for tallying small or medium-sized flocks. With practice, birders can easily learn to count birds not one by one, but five by five or ten by ten. This allows for a faster count while still keeping the increments small enough for precise numbers.

- **Grids**: Also called blocking, this counting technique is most often used with larger, single species flocks where the birds are relatively stationary. The field of view is divided into a grid of even sections, and the birds in one section are counted as close to individually as possible. Multiplying this count by the number of grid sections in the flock can give a reasonable estimate of the total number of birds.

- **Timing**: When a flock is moving quickly, it can be impossible to create a grid or to count birds individually, since the movement will obscure other birds and make any estimate less accurate. A timing count can be used by focusing on a fixed point the flock is passing, and counting the number of birds to pass that point in a certain period of time, such as a few minutes. Then the entire amount of time it takes for the whole flock to pass is noted, and the count is multiplied by the number of increments in that overall time to gauge its full size.

- **Photographs**: A digital photograph can be used for an accurate count if the entire flock can be photographed. The photo is then manipulated on a computer or printed out and individual birds are marked off as they are counted. This is a time-consuming method but can be very precise for a reliable count when high levels of accuracy are necessary. A remote camera and a timer to take the photographs can also be used to gather data, and the birds can be counted at a later time.

- **Bird Counting Tips**
  Practice is essential to make the most of your bird counting skills. The more frequently you count birds, the more comfortable you will be with each count you make, knowing the data you collect is accurate and therefore more valuable.

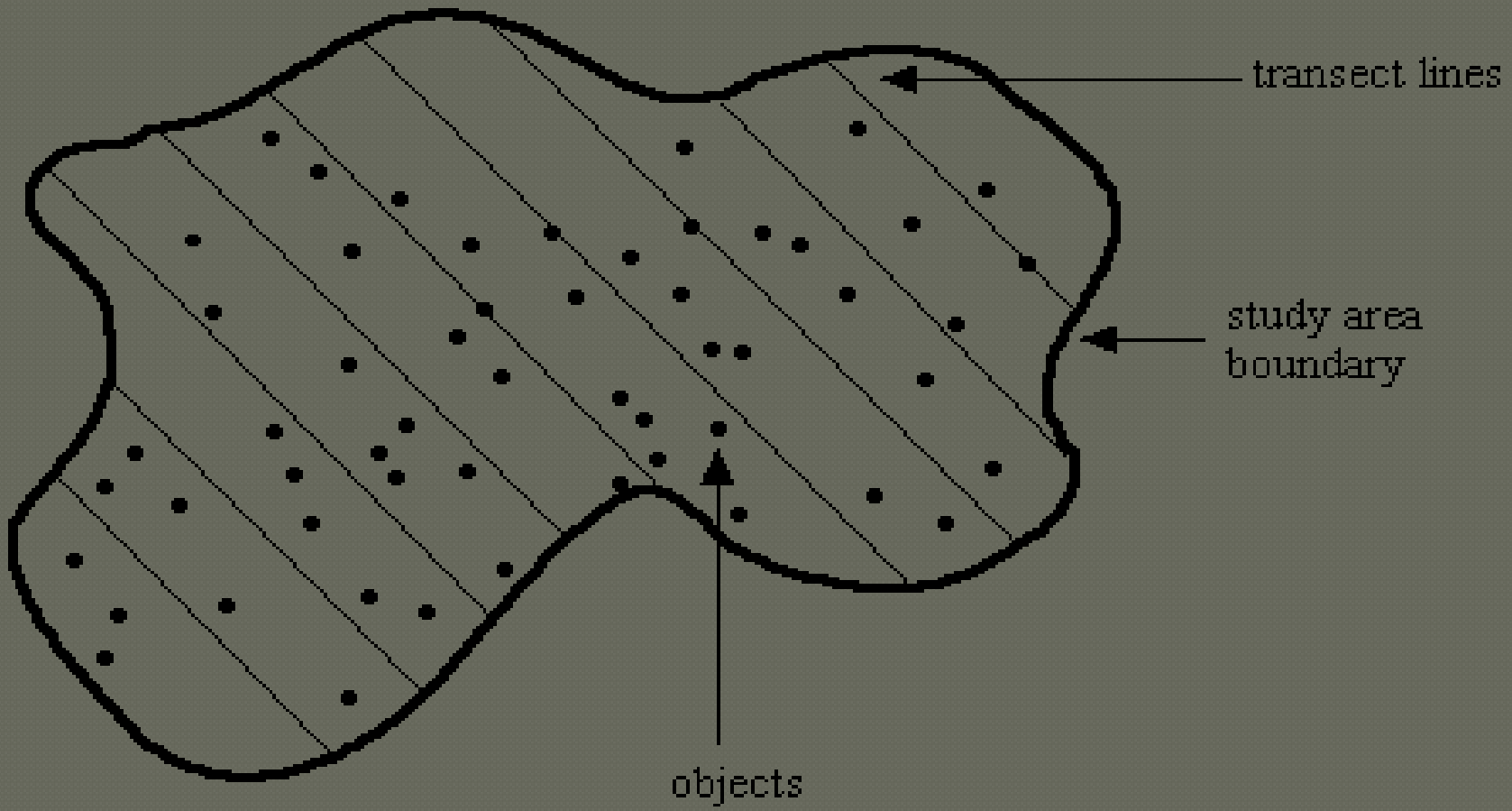
Bird census technique

Point counts

- The simplest method of counting birds is called a "point count", in which observer records all the birds seen and heard from a point count station for a set period of time. A series of point counts completed over a fixed route can then be compared to the results of the same point counts in other seasons or years.

- In terms of monitoring birds, the **transect method** is used in all types of bird projects. Transect surveys are used to record birds in various habitats.
- It is a simple method that provides a uniform way of counting birds over time or across locations. Transects are walking surveys, so you can cover large areas. If there is a clear route through a property, such as a road through a neighborhood, transects are utilized. It is a good way to survey birds because you can cover a lot of ground by walking along a route.
- Transects are visited over a period of several days or longer to assess how many and what types of birds are in an area. To increase accuracy, you increase the quantity of transect surveys and the number of days a transect survey is repeated.
- **Transect method is suitable also for some other animals**, like reptiles, mammals,…

Transect lines are laid out in some systematic fashion across an area large enough to detect "objects" (animals, plants). Observer walks the transect lines noting distance and angle to objects detected.



Capture-recapture –the best method?

- Capture-mark-release-recapture

is typically used when individuals are difficult to see.

Frequency of capture method involves making multiple capture over a short period in which there will be negligible births or deaths. Individuals are either individually marked or marked each capture and the number of times each is caught is recorded.

Population estimates from CMR by e.g. Petersen index or Jolly-Seber method which involves catching on at least three occasions which quite a large data set.

Jolly-Seber method extend the mark and recapture method to open populations. The biggest change in the sampling procedures over the Schnabel method is the inclusion of the information of when a marked individual was last captured.

Advantages:

Both Peterson and Schnabel assume closed populations, Jolly-Seber uses an open population (permits for birth, death, immigration, and emigration).

The time interval between samples need not be constant, any number of samples (at least three!) can be accommodated so that series of data extending over many years can be used in the method.

Assumptions: Every individual has the same probability (a_t) of being caught in the ***t***th sample, whether it is marked or unmarked.

Every marked individual has the same probability (f_t) of surviving from the ***t***th to the (***t*** +1)st sample.

Individuals do not lose their marks, and marks are not overlooked at capture.

Sampling time is negligible in relation to the intervals between samples.

m_t = Number of marked animals caught in sample t.

u_t = Number of unmarked animals caught in sample t.

n_t = Total number of animals caught in sample t = $m_t + u_t$.

s_t = Total number of animals released after sample t = (n_t - accidental deaths or removals)

m_{tt} = Number of marked animals caught in sample t last caught in t.

R_t = Number of s_t individuals released at sample t and caught again in some later sample.

Z_t = Number of individuals marked before sample t, not caught in sample t, but caught in some sample after sample t.

$$\hat{\alpha}_t = \frac{m_t + 1}{n_t + 1} \qquad \hat{M}_t = \frac{(s_t + 1)Z_t}{R_t + 1} + m_t \qquad \hat{N}_t = \frac{\hat{M}_t}{\hat{\alpha}_t}$$