

CHARACTERISTICS OF POPULATIONS

Population Size and Density

- the number of organisms in the population is the population size.
- the population density (D) is equal to the number of individuals (N) divided by the unit area or volume (S)
- $D = \frac{N}{S}$
- Ex/ the density of 480 moose living in a 600 ha (hectare) region
- $D = 480 / 600$
= 0.8 moose/ha
- crude density is the number of individuals of the same species per total unit area or volume
- Ex/ same as 0.8 moose/ha
- ecological density is the number of individuals of the same species per unit area or volume actually used.
- Ex/ if the 600 ha of total habitat include 70 ha of open lake water the ecological density would be:
- $D = 480 \text{ moose} / (600 - 70) \text{ ha}$
= 0.9 moose/ha
- Population dispersion is the pattern of distribution of individuals in an area. There are three types:
 1. clumped dispersion the organisms are densely grouped in areas that have favourable conditions. (Ex/ Cattails that grow along the edge of ponds and lakes, and fish that swim in large schools.)
 2. uniform dispersion the organisms are evenly distributed; could be due to the set up of territories for feeding, breeding or nesting. (Ex/ Penguins and orchards.)
 3. random dispersion organisms are spread out in an unpredictable pattern; as they are not influenced by other individuals. (Ex/ Trees in tropical rain forests)

Measuring Population Characteristics

- It is difficult to count all the organisms in a population so biologists count a sample of the population then they estimate the total size.
- A quadrat can be used to estimate stationary or small organisms like plants and insects.

$$\text{Average sample density} = \frac{\text{total number of individuals in quadrat}}{\text{total sample area}}$$

$$\text{Estimated population size} = (\text{estimated population density}) \times (\text{total size of study area})$$

- To measure mobile populations like fish, mark-recapture method is used.

- This process involves capturing a sample of the animals, marking them in some way, releasing them, then after some time another sample is captured and the proportion of marked animals to unmarked animals will help to give an estimate of the population.
- The assumptions that must be met to validate this technique include:
 1. every organism has an equal opportunity to be captured.
 2. the proportion of marked to unmarked animals needs to remain constant between the marking and recapture period.
 3. population size remains the same during the sampling study.

- $$\frac{\text{Total \# marked (M)}}{\text{Total population (N)}} = \frac{\text{\# of recaptures (m)}}{\text{size of second sample (n)}}$$

- Ex/ If 80 ducks are captured and marked, then in two weeks 110 are recaptured with 12 being marked the total size of the population in the area is:

$$\begin{aligned}
 N &= \frac{Mn}{m} \\
 &= \frac{(80)(110)}{12} \\
 &= 733 \text{ ducks}
 \end{aligned}$$

Read pg. 657 - 658 and make notes.

Seatwork

Pg. 659 # 1 - 6