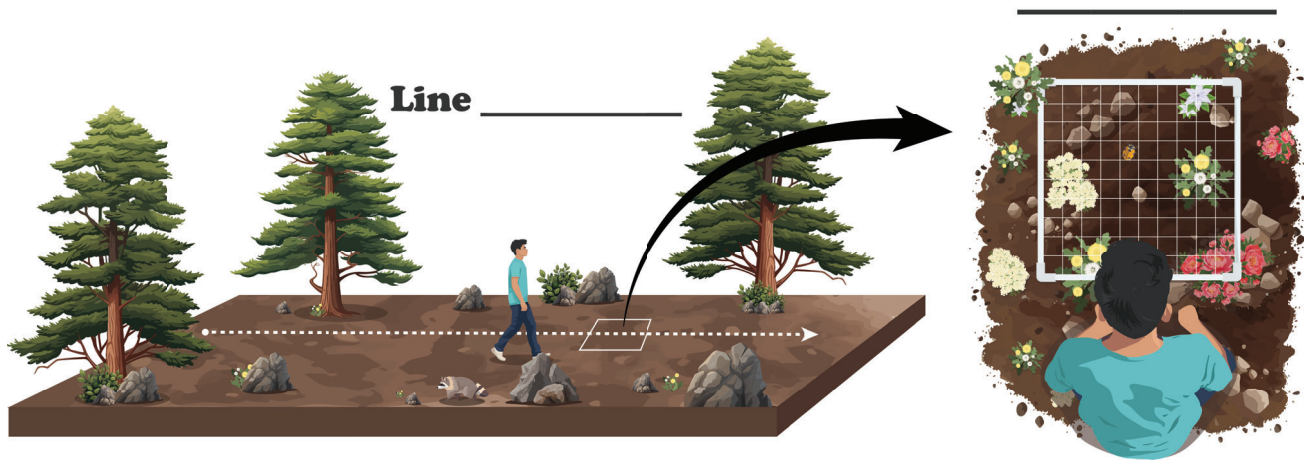


TOPIC: POPULATION SAMPLING METHODS

Sampling Stationary Organisms: Transects & Quadrats

- ◆ Populations are often too large to study, so ecologists examine them by _____ smaller parts.
- ◆ _____ or *slow*-moving organisms can be sampled using transects or quadrats.
 - **Transects:** _____ of known position & length extending through a habitat.
 - **Quadrats:** _____ plots set up at random locations or regular intervals along a transect.
- ◆ Organisms along a transect or within a quadrat are counted & data extrapolated to estimate total population size.



EXAMPLE

A group of ecology students is studying the population size of dandelions (a species of flowering plants) in a meadow with a total area of 1000 square meters. Using quadrats measuring 1 meter by 1 meter, they randomly place 10 quadrats in different areas in the meadow and count the number of dandelions in each quadrat, which yields the following data: 12, 15, 9, 10, 14, 13, 11, 16, 8, and 14. Using the average number of dandelions per quadrat, what is the estimated total population size of dandelions in the meadow?

- a) 12,000 dandelions.
- b) 12,200 dandelions.
- c) 13,000 dandelions.
- d) 14,000 dandelions

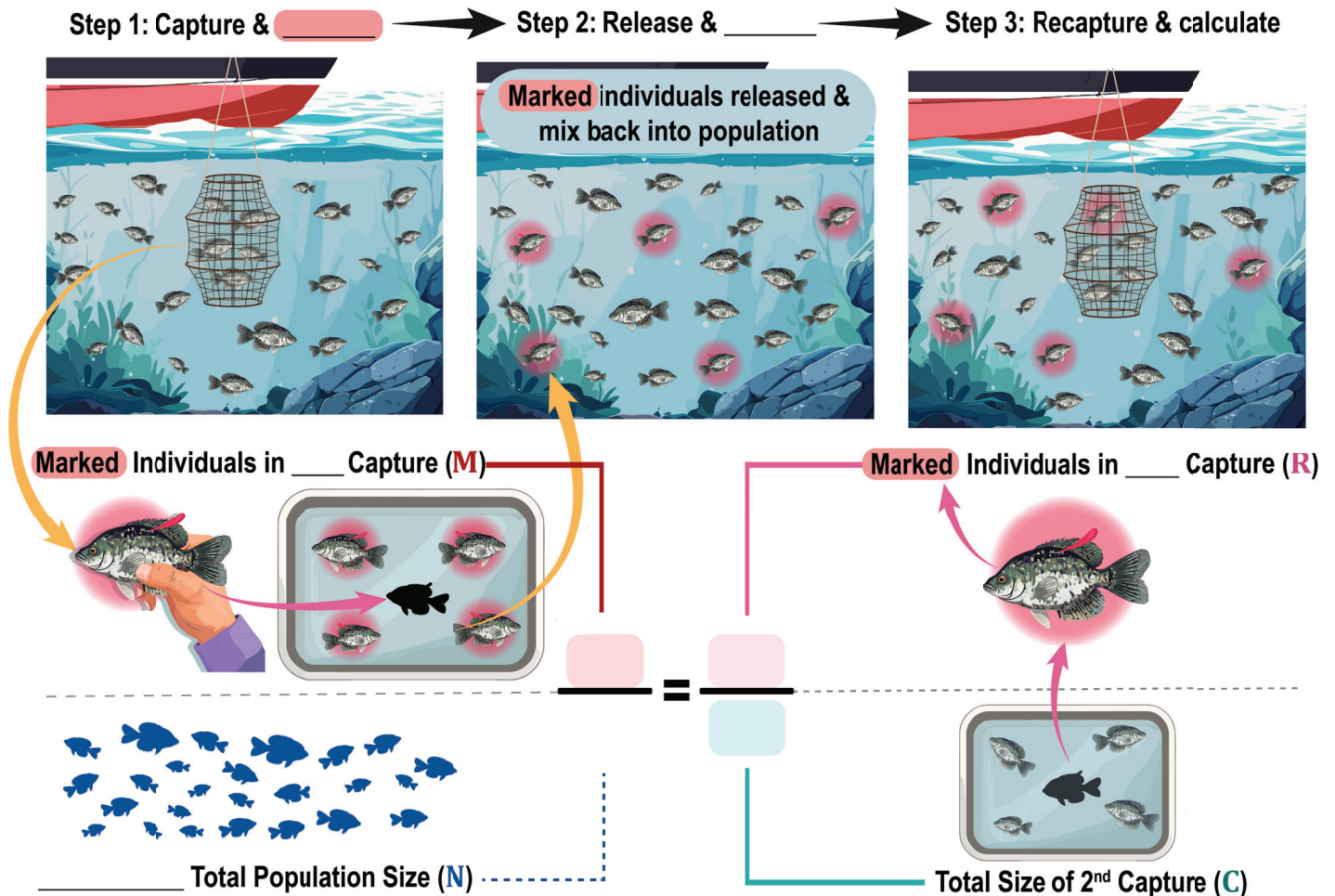


TOPIC: POPULATION SAMPLING METHODS

Sampling Mobile Organisms: Mark & Recapture

◆ For highly _____ organisms, the mark & recapture method is often used.

◆ Mark & Recapture method can be broken up into _____ steps:



Mark & Recapture: Calculations & Assumptions

Estimate the total population size after mark & recapture:

$$\frac{M}{N} = \frac{R}{C}$$

Mark & Recapture Method Assumptions:

1. Marked individuals fully mix between captures.
2. Marked & unmarked individuals are equally as likely to be captured.
3. Population size is stable during sampling (no births, deaths, immigration, emigration).

TOPIC: POPULATION SAMPLING METHODS

EXAMPLE

You & a group of population ecologists have been tasked with finding the population size of prairie dogs in a plot of land in Texas. You and your team capture 31 prairie dogs & mark them, before releasing them back where you found them. One week later, you return to the same area & capture 47 prairie dogs and 12 of them were marked by your team the previous week. Estimate the total population of prairie dogs in the area.

- a) 80
- b) 104
- c) 121
- d) 152



PRACTICE

A group of population ecologists capture & mark 8 starlings in a grassland, then a few days later they capture 15 starlings but none of them are marked. What is the estimated starling population size in the grassland?

- a) 120
- b) 60
- c) Impossible to estimate – a smaller sample is required.
- d) Impossible to estimate – a larger sample is required.



PRACTICE

You & your team of population ecologists capture 16 turtles in Lake Springfield, mark each of them with a dot of waterproof paint on their shell & release them back into the lake. One week later you go back to Lake Springfield & capture 4 turtles that have been marked with paint, & 22 that are unmarked. Estimate the total population size of turtles in Lake Springfield.

- a) 124
- b) 88
- c) 62
- d) 104



TOPIC: POPULATION SAMPLING METHODS

PRACTICE

When calculating population size with the mark and recapture method, which of these assumptions must be made?

- a) Marked individuals are more likely to migrate out of the habitat than unmarked individuals.
- b) Marked individuals have the same probability of being captured as unmarked individuals.
- c) Some individuals will immigrate into the population between the first & second capture.
- d) All of the above.

PRACTICE

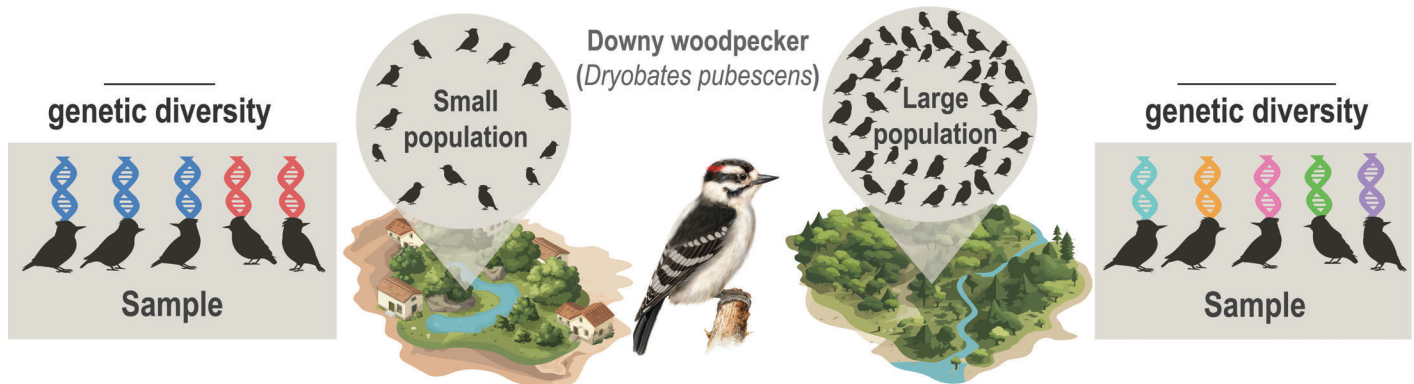
Which of the following is an appropriate method for sampling an ostrich population?

- | | |
|---------------|--|
| a) Transects. | c) Mark & recapture. |
| b) Quadrats. | d) All of these methods are appropriate. |

TOPIC: POPULATION SAMPLING METHODS

Molecular Tools to Determine Population Size

- ◆ Population sampling strategies involving molecular genetics can be used to estimate population size.
 - DNA samples are acquired and sequenced from many individuals in the population.
 - If sampled individuals are *closely* related, the population size is likely _____.
 - If sampled individuals are *distantly* related, the population size is likely _____.



PRACTICE

Ecologists are using molecular tools to analyze DNA samples from a population of endangered wolves to estimate their population size. They collected DNA samples from 20 individual wolves and found that most of the sampled wolves were closely related to each other. What can be inferred about the population size of these wolves based on this data?

- a) The population size is likely large since closely related individuals indicate a high level of genetic diversity.
- b) The population size is likely small since closely related individuals indicate a lack of genetic diversity.
- c) Nothing about the population size can be inferred from the genetic relatedness of individuals.
- d) The population size is likely large since closely related individuals indicate high reproductive success.