Name _____

Insect Tracking & Marking Methods

I. Tracking Insects

1. **Scientifically, why do individual insects need to be tracked?**

   - To study flight behavior, habitat use, natural densities, and ecological interactions

2. **List 3 reasons why tracking insects can be a difficult task compared to other animals.**

   1. Small size 2. Short lives 3. Great mobility

3. **Define the term mark-capture method.**

   Mark-Capture Method - in the field a researcher applies a marker to insects (inexpensive/easily applied)

4. **Give an example of how the mark-capture method can be used to track insects.**

   - Grasshoppers

5. **Define the term mark-release-recapture method.**

   (MRR) Mark-Release-Recapture Method - insects collected (lab or field), marked, released into the field, and recaptured (at given time + distance intervals)

6. **Give an example of how the mark-release-recapture method can be used to track insects.**

   - Beetles, Butterflies (widely applied + used)

II. Insect Marking Methods

1. **Marking methods depend on the type and population of insects being studied.**

   Circle One : (True) False

2. **Identify how Tags & Related Markers can be used to track animals.**

   - Tags, labels, or bands externally affixed to individual animals (mammals, reptiles, amphibians, fish, birds)

   List advantages and disadvantages of using Tags & Related Markers on insects.

   Advantages : Inexpensive, Identify individuals

   Disadvantages : Too large, Too heavy, Tedious, Time-consuming

   List two types of insects marked using Tags and Related Markers.

   1. Honeybees 2. Ants (Butterflies)

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3. **Identify how <u>Mutilation Marking</u> can be used to track animals.**

- Animal is clipped, punched, notched, or etched a distinctive mark (fish, amphibians, reptiles, cattle, birds)

List advantages and disadvantages of using Mutilation Markers on insects.

<u>Advantages</u> : Easily recognized,

<u>Disadvantages</u> : Tedious, Time-consuming, Harmful to insects

List two types of insects marked using Mutilation Markers.

1. Beetles 2. Butterflies (Dragonflies, Grasshoppers)

4. **Identify how <u>Paint & Ink Markers</u> can be used to track animals.**

- Paint or ink applied to animals using toothpicks, insect pins, fine-tipped pens, or fine-haired brushes (durable, non-toxic, easy application, quick drying, lightweight, visible)

List advantages and disadvantages of using Paint & Ink Markers on insects.

<u>Advantages</u> : Inexpensive, Durable, Easy to apply

<u>Disadvantages</u> : Tedious, Time-consuming, Lost in molting

List two types of insects marked using Paint & Ink Markers.

1. Ants 2. Crickets (Beetles)

5. **Identify how <u>Dust Markers</u> can be used to track animals.** "Powders"

- Dusts applied to insects by putting them in a container with dust and container shaken (Invisible green fluorescent dust - visible under UV light)

List advantages and disadvantages of using Dust Markers on insects.

<u>Advantages</u> : Inexpensive, Readily Available, Environmentally Safe, Easily Applied & Detected

<u>Disadvantages</u> : Too much = Lethal, Inhibit Dispersal, Decrease Longevity

List two types of insects marked using Dust Markers.

1. Boll Weevils 2. Fruit Fly Pupae

3. Bark Beetles 4. Honeybees

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6. Identify how <u>Dye Markers</u> can be used to track animals.

- Insects eat oil-soluble dyes which accumulate in insect body fluids or tissues

List advantages and disadvantages of using Dye Markers on insects.

<u>Advantages</u> : Inexpensive, Easy to apply (oil mixed with food), Easily detected

<u>Disadvantages</u> : Low Effectiveness, Too short retention, Harmful

List two types of insects marked using Dye Markers.

1. Fruit Flies 2. Moths (Termites, Wasps, Ants)

7. Identify how <u>Pollen Markers</u> can be used to track animals.

- Pollen attached to insects surface (evidence of migration)

(To be effective → pollen source must be remote from tagged/marked individuals)

List advantages and disadvantages of using Pollen Markers on insects.

<u>Advantages</u> : Self-marking eliminates handling/application

<u>Disadvantages</u> : Pollen - not always geographically remote, Time of year

Pollen Analysis - costly, time-consuming, tedious

List two types of insects marked using Pollen Markers.

1. Boll Weevils 2. Moths

8. Identify how <u>Genetic Markers</u> can be used to track animals.

Body shape, eye colors, spots, bands, hairs, spines

- Genetic mutations visibly recorded + tracked

(Sometimes induced by ionizing radiation or chemicals)

List advantages and disadvantages of using Genetic Markers on insects.

<u>Advantages</u> : Little cost, Nondestructive observation, Persisting traits

<u>Disadvantages</u> : Rare mutations, Lowered fitness, Radiation + chemical = negative consequences

List two types of insects marked using Genetic Markers.

1. Mosquitoes 2. Fruit Flies

Name _____

9. Identify how <u>Elemental Markers</u> can be used to track animals.

- Animals dipped into or sprayed with rare or trace elements (dysprosium, cerium, rubidium, strontium, cesium, manganese, hafnium, iridium, lanthanium, samarium, europium)

List advantages and disadvantages of using Elemental Markers on insects.

Advantages : Not radioactive, Retained over generations/stages

Disadvantages : Difficult to detect, Expensive, Time-consuming

List two types of insects marked using Elemental Markers.

1. Mosquitoes, Midges 2. Ticks, Spiders

10. Identify how <u>Protein Markers</u> can be used to track animals.

- Protein is dissolved in water and sprayed on animals (perfume atomizers or nebulizer → mist forms)

(Thus radioactive isotopes)

List advantages and disadvantages of using Protein Markers on insects.

Advantages : Less costly, Less time-consuming, More sensitive, Safer

Disadvantages : High costs, Variable retention between stages (compared to some methods)

List two types of insects marked using Protein Markers.

1. Bees 2. Parasitoids (Moths)

III. Lincoln-Petersen Mark-Recapture Equation

1. Write the Lincoln-Petersen equation used to estimate animal populations.

$$\textit{Estimated Population} = \frac{(\text{First Sample}) \times (\text{Second Sample})}{(\text{Number Recaptured})}$$

2. List five requirements needed for the Lincoln-Petersen estimator to be accurate.

(Two visits to study area)

1. No mortality (deaths)
2. No natality (births)
3. No immigration (moving in)
4. No emigration (moving out)
5. No marks fall off