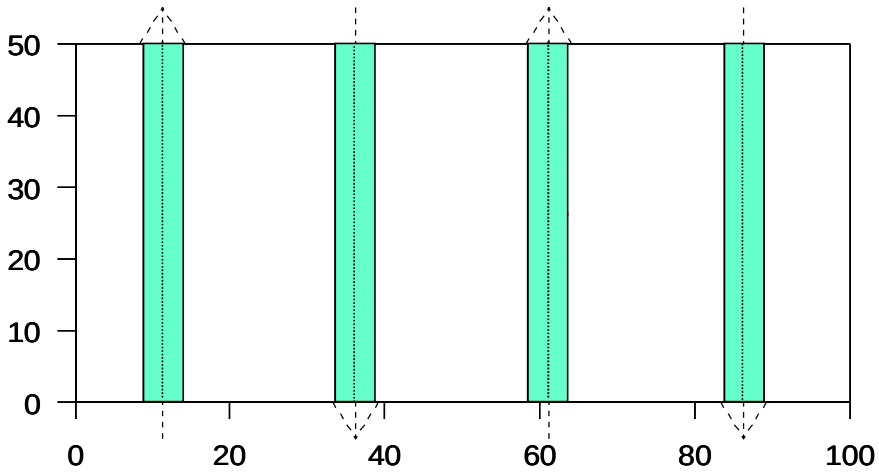
Types of distance sampling

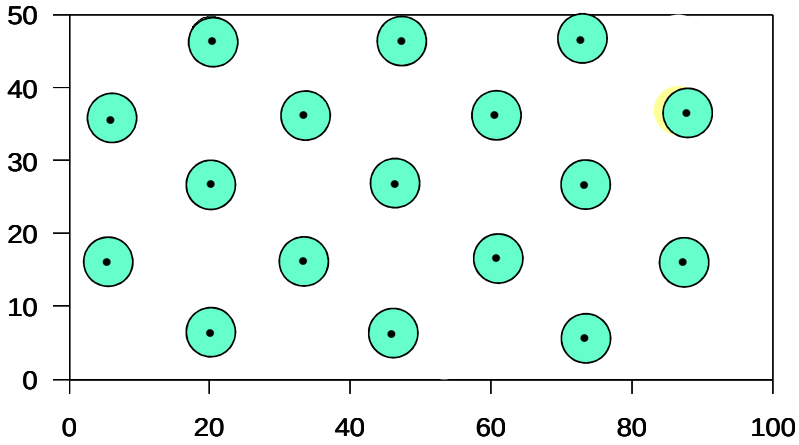
(not exhaustive!)

Type of sample Line vs. Point

Line transect



Point transect
(Variable circular plot)



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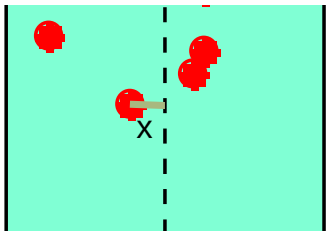
Type of distance measurement
1. Radial vs perpendicular

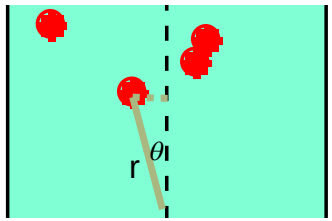
For line transects, can either measure

perpendicular distance from line to object



radial distance and angle

$$x = r\sin(\theta)$$



For point transects

measure radial distance from point to object

Type of distance measurement
2. Exact vs Grouped

Exact distance recorded to each object detected

Distances recorded in intervals

Photo: Rich Guenzel

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Type of object

1. Individuals vs Clusters

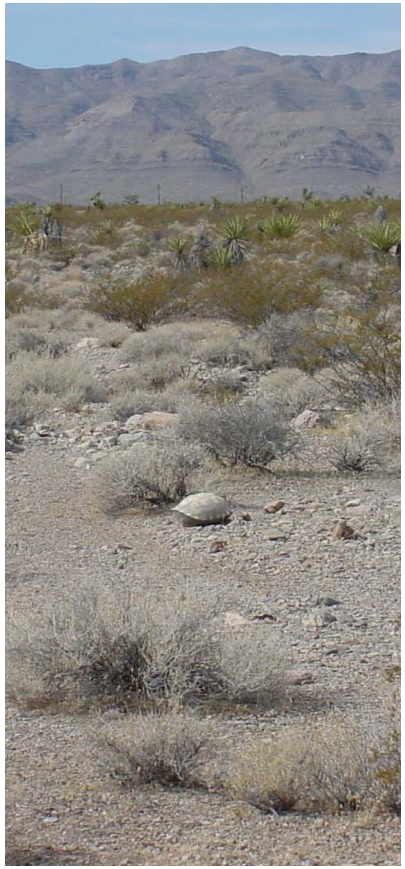

Photo: Ron Marlow

Each object detected is a <u>single individual</u>

Each object detected is a <u>cluster of individuals</u>

- will need to estimate expected cluster size

Photo: Thomas Norris

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Type of Object
2. Direct vs Indirect

Objects are animals (or plants) of interest ...

... or something they produce
(an “indirect survey”)

Another example is a cue count

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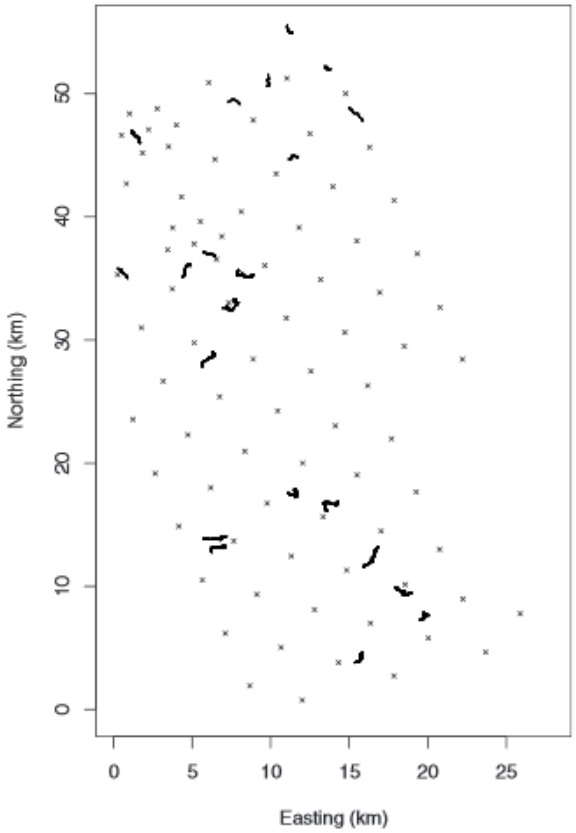
Method of detection

Active vs Passive



84 hydrophones on sea floor of Atlantic Undersea Test and Evaluation Center in Bahamas. From Marques et al. (2009).

Observers actively search for animals and record distances

Photo: Ullas Karanth

Animals are trapped and generate their own distances ("passive distance sampling")

Photo: Steve Dawson

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Recap of main ideas so far

Distance sampling is an extension of plot sampling

In plot sampling, we see everything in the covered region

$$\hat{N} = \frac{n}{a/A} = \frac{nA}{a} = \frac{nA}{2wL} \qquad \hat{D} = \frac{\hat{N}}{A} = \frac{n}{2wL}$$

strip transects

In distance sampling, we do not see everything, and we estimate the proportion detected, $\hat{P}_a$

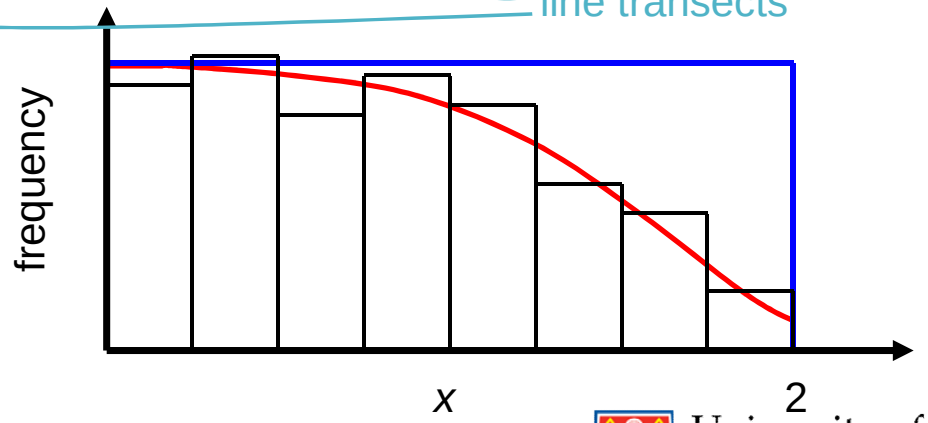
$$\hat{N} = \frac{n/\hat{P}_a}{a/A} = \frac{nA}{a\hat{P}_a} = \frac{nA}{2wL\hat{P}_a} \qquad \hat{D} = \frac{\hat{N}}{A} = \frac{n}{2wL\hat{P}_a}$$

line transects

- How do we estimate P_a?

$$\hat{P}_a = \frac{\text{area under curve}}{\text{area under rectangle}}$$

line transects



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Which method when?

Strip transects

- Populations that occur in large, loose clusters (e.g. walruses)
- Stationary objects, at high density, and easily detected

Line transects

- Sparsely distributed populations for which sampling needs to be efficient (e.g. whales, deer)
- Populations that occur in well-defined clusters, and at low or medium cluster density (e.g. dolphin or fish schools)
- Populations that are detected through a flushing response (e.g. grouse, hares)

Point transects

- Populations at high density, especially if surveys are multi-species (e.g. songbirds)
- Populations that occur in patchy habitat
- Populations that occur in difficult terrain, or on land where access to walk predetermined lines is problematic (e.g. bird populations in rain forest or on arable farmland)