Field Methods:
(given an adequate survey design has been used)

- Objectives of adequate field methods
  - g(0)=1
  - Reduce / avoid effect of movement
  - Get accurate and precise distances
- General recommendations
- A few special circumstances

References

- Chapter 7 of Buckland et al. (2001) Introduction to Distance Sampling
- Chapters 4, 10 and 12 of Buckland et al. (2015) Distance Sampling: Methods and Applications

"Considerable potential exists for poor field procedures to ruin an otherwise good survey"

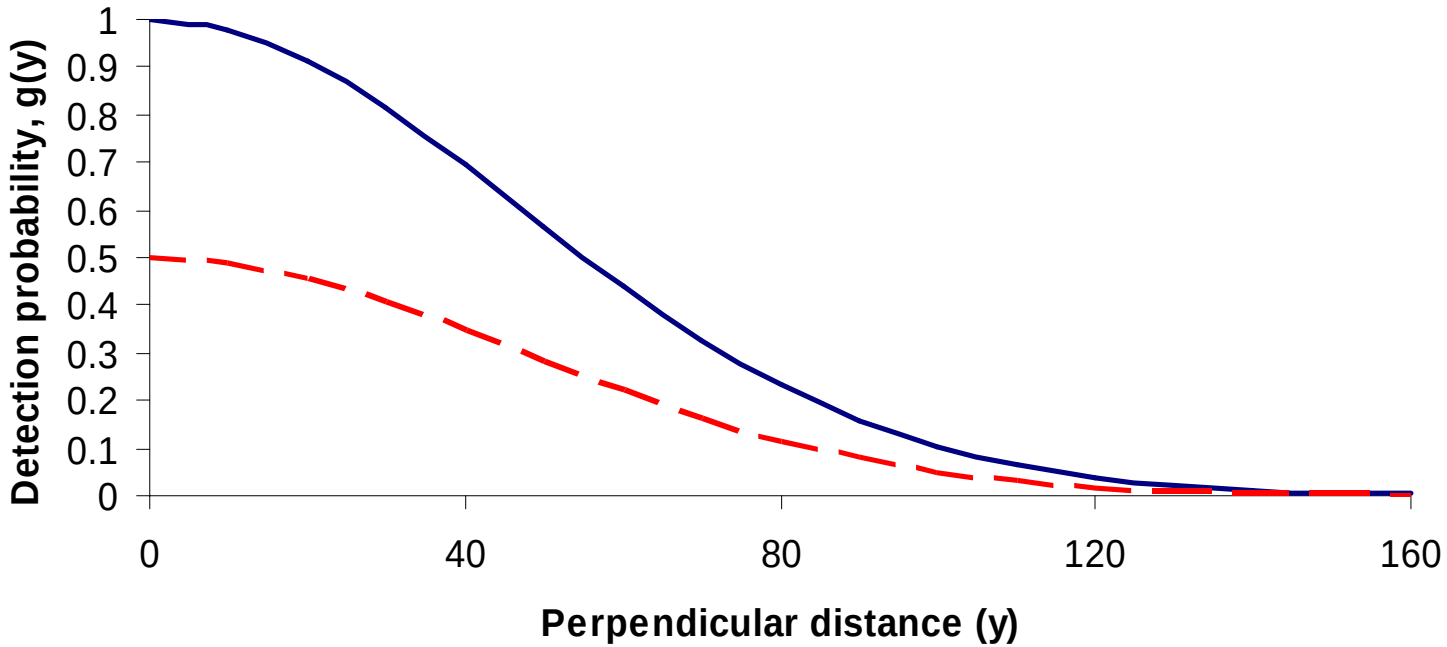
Goal: ensure key assumptions met

- $g(0)=1$
- no responsive movement prior to detection
- distances measured without error
- detection function has a wide shoulder

Make sure that g(0) is 1

Traditional data tells you nothing about g(0)

Good field methods and common sense help to achieve it



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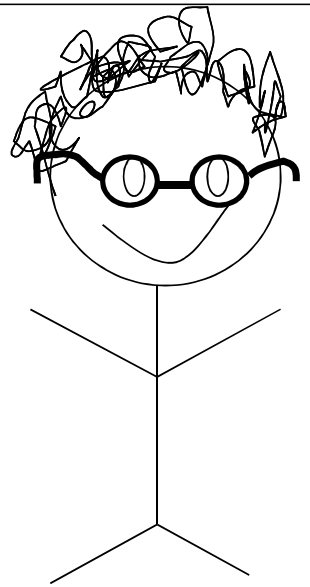
Make sure that g(0) is 1

- Do not try to see everything
- But try to see everything on the line
- *More detections do not necessarily equate to better data*

Wooden Stake Surveys $N = 150$



$$n = 55$$

$$\hat{N} = 138$$

$$n = 72$$

$$\hat{N} = 106$$

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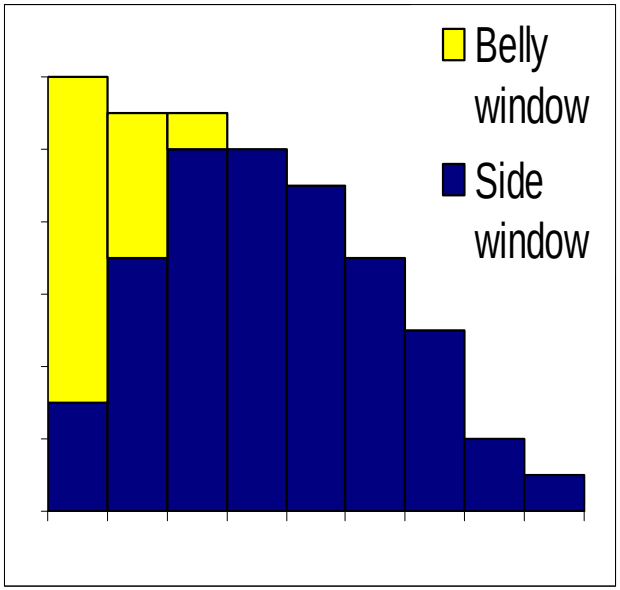
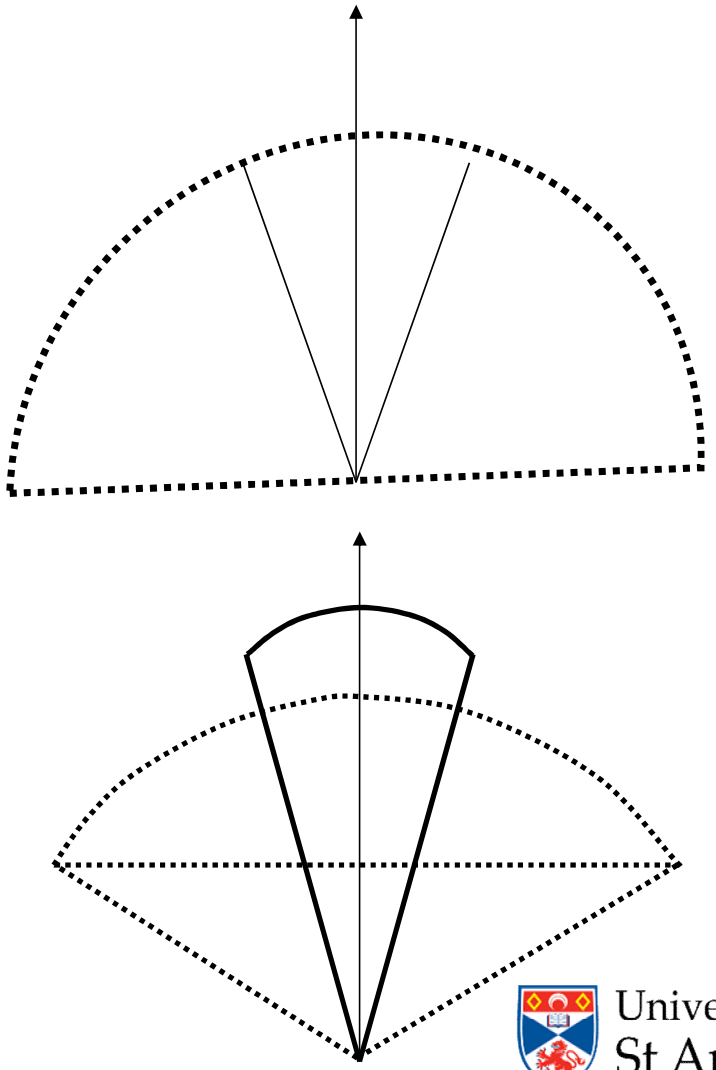
Make sure that g(0) is 1

- Use multiple observers
- But avoid spiked data…





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Warning – $g(0)$ is probably < 1 !

Situation

- Even with a well-defined search protocol and good observers, animals near the line may be missed

Problems

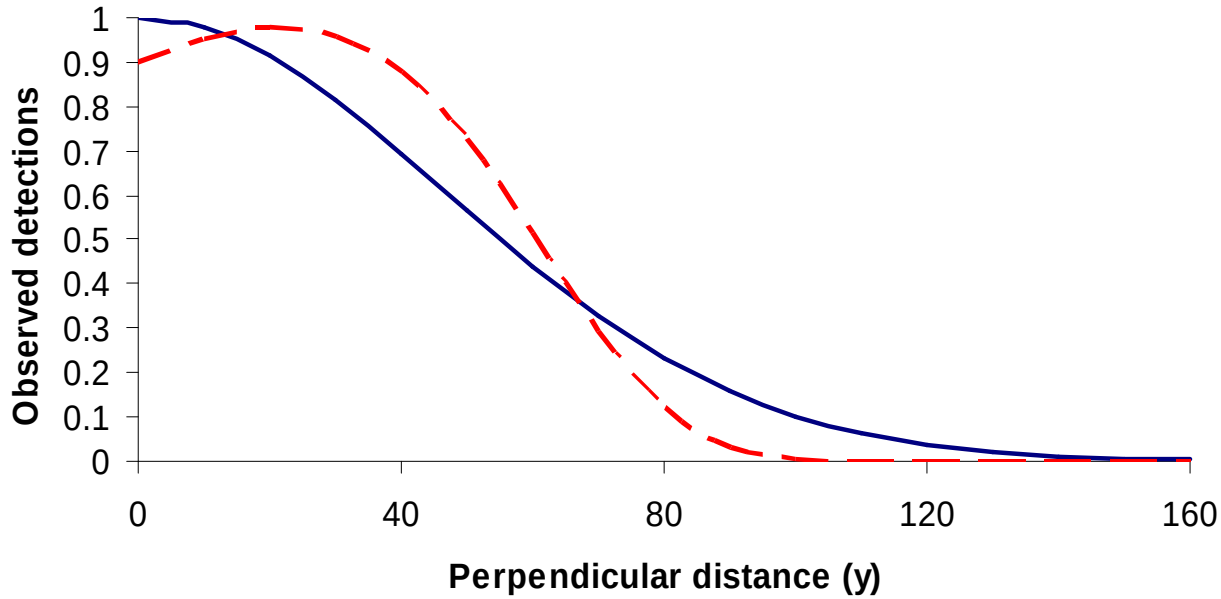
- Underestimation in density/abundance
- Added variability (if g(0) changes with survey period) reduces power

Solutions

- Independent observers to estimate $g(0)$
- Technology (Video Camera, Infrared)
- Change methods (go slower, lower)
- Independent estimates of g(0)
- trials on animals of known location

Avoid the effect of movement

detect animals prior to responsive movement



- effect on data is not always obvious

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Avoid the effect of movement

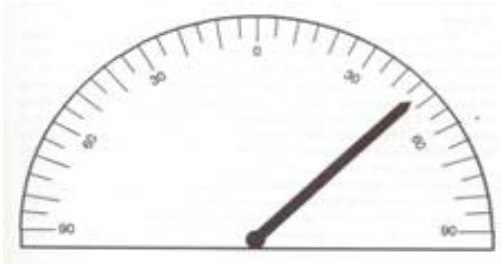
For points:

- Snapshot method, waiting periods (before and after)
- Use cues rather than individuals?

For lines:

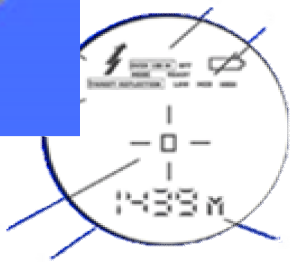
- Look ahead
- Move slowly, carefully, quietly
- *but if observer speed < 2-3 times average animal speed, see Section 6.5 of introduction to distance sampling book*

Get accurate and precise distances



Technological aids can be invaluable - use whenever possible

Avoid introducing more uncertainty by guessing



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Get accurate and precise distances

If possible, mark the transect line

A clear definition of what you are measuring distance to helps to guard against spiked data and bias

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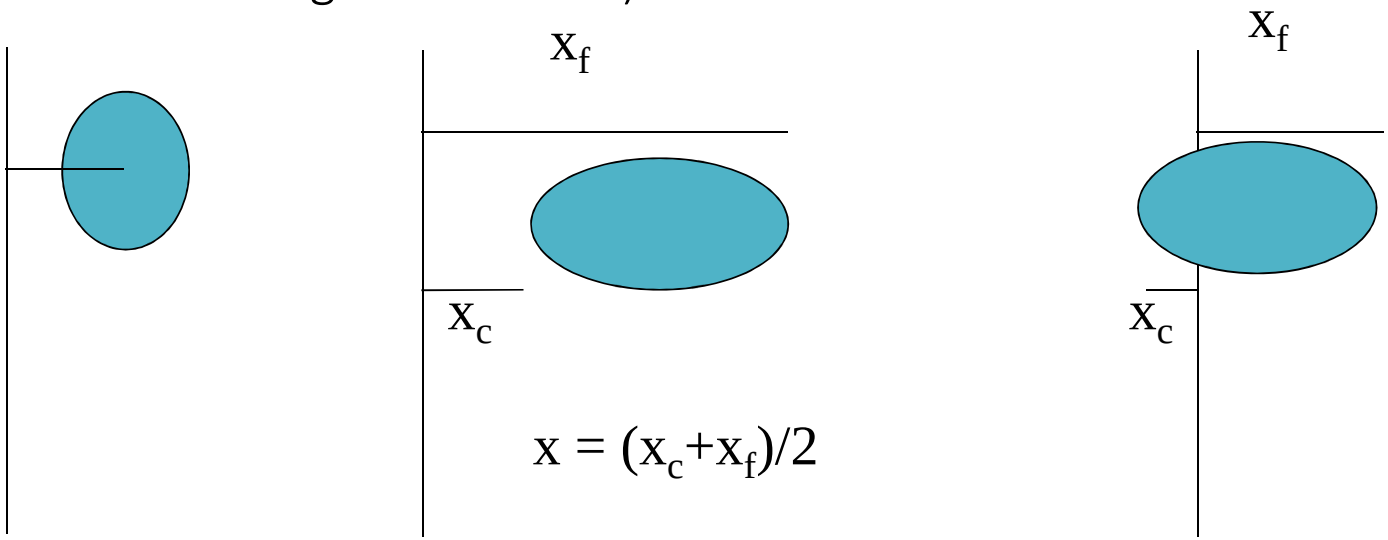
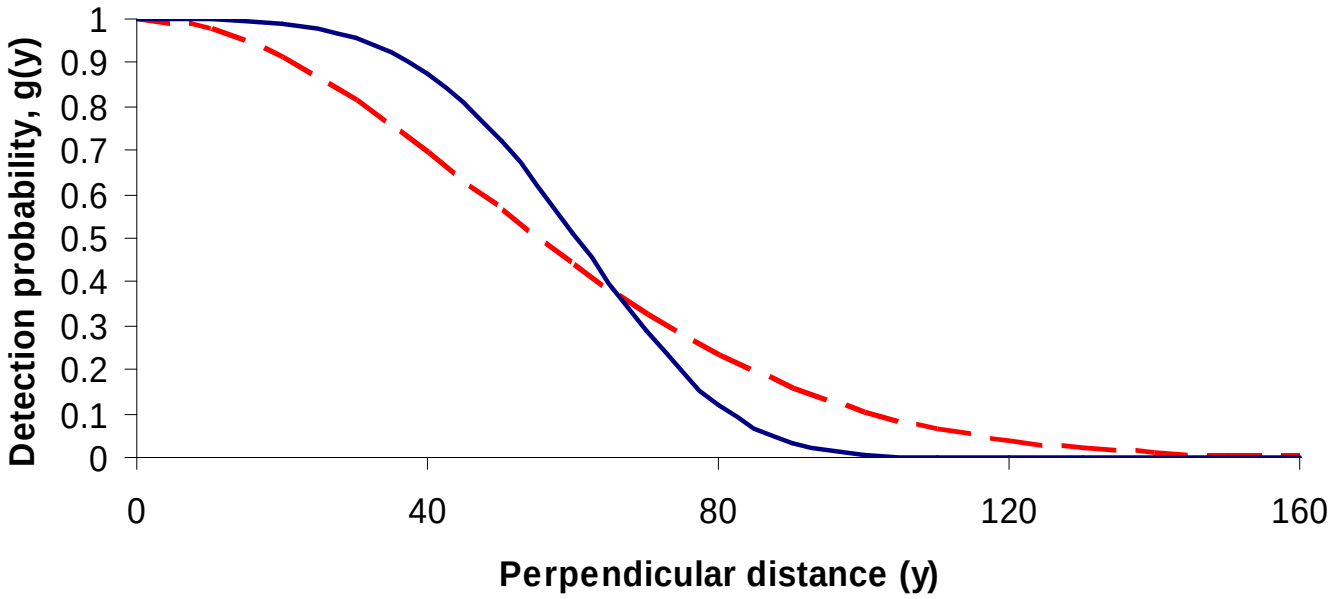
Get accurate and precise distances

- If size of animal/object is large compared to scale of measurements, define what measurement is to be made (e.g. from line to centre, tallest part, flower, etc)
- If measuring distances to clusters, get the distance to the “centre of the cluster”
- In practice, the mean between closest and furthest away distance might be enough (remember to collect signed distance)



General recommendations

- Strive for wide shoulder in detection function



- Think about optimal effort allocation (ensure g(0) while distributing effort)
- More than one observer?

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General recommendations

- If possible, review data during survey

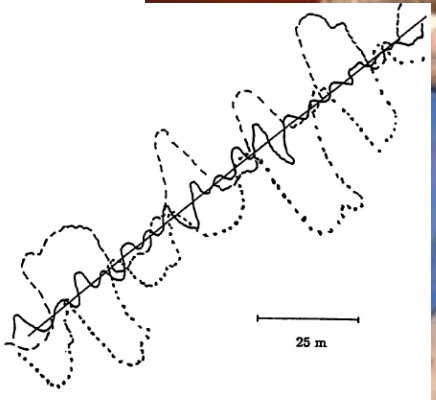

Fig. 6. Search strategy suggested by the distance data collected where a 3-person team is used to detect desert tortoise. This is only 1 part of the field protocol.

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General recommendations

- Recording data should be easy, accurate and reliable

- Collect only relevant data
  - Perpendicular distance or distance and angle? (Angles for point transects?)
  - Cluster size
  - Effort (line length; no. of points); line or point ID

  - Observer name, survey block, date, start time, end time, weather, environmental conditions, habitat, sex, species, age, etc…

General recommendations

Make data collection as easy as possible e.g.:

- dedicated field sheets
- distance intervals for aerial surveys
- tape recorder + voice activated microphone
- separate person to record data
- automated data entry (ship's GPS, etc.)
- video

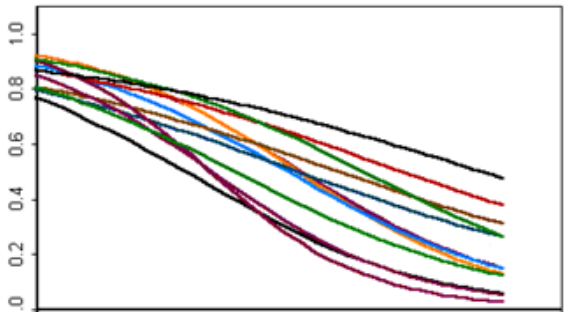
Have a backup

- backup recording method
- backup of field data

General recommendations

(most…) OBSERVERS ARE HUMAN…

- Observing for long hours can be boring – plan breaks /rotations
- Want to count what you see
- have a “>w” category
- for one-sided transects, have a category for negative values
- Teach observers how to search
- Emphasize effort on and near line
- Look ahead
- Look back if necessary
- Do not assume observers know what to do
- Go with observers to the field
- Test and train observers – reward good observers?



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Special circumstances: Multi-species surveys

Problems

- Species differences in detection
- Identification of similar species
- High density situations

Solutions

- Multiple observers
- Training
- Focus on key species

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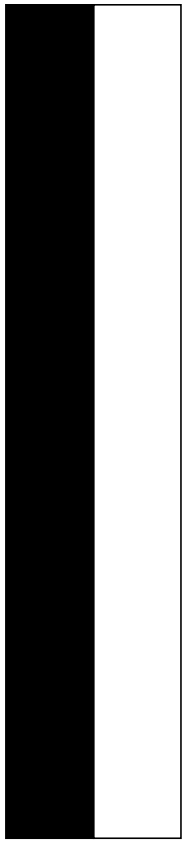
Animals at high density

- Consider strip transects
- Reduce truncation width
- Increase observation time (move more slowly)
- Multiple observers
- Streamline data collection

One-sided transects

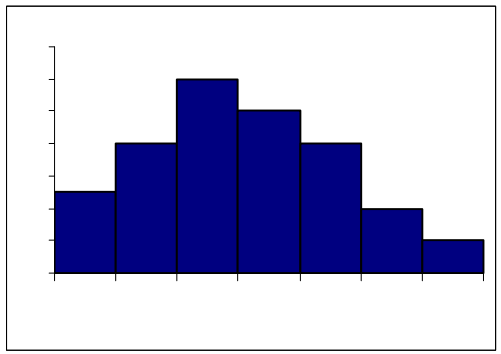
- Avoid!
- Problems:
  - *accurate line determination*
  - *movement into or out of survey strip*
- Leads to heaping at zero distance



Some of what can go wrong, will likely go wrong

I spent all my money and have no data!

What do I do with this?



Situation

- Hi tech breakdown
- No planning
- Haven't thought about assumptions

Problems

- Data are lost
- Poor quality data

Solutions

- Sometimes low-tech is better
- Backups
- Conduct a pilot survey
- Train observers
- Examine data during survey