

# Quantifying and Correcting Measurement Error in Point Transect Counts

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# Key Assumptions of Distance Sampling

- All individuals are detected on line or point
- No responsive movement by individuals prior to detection
- Distances or distance categories are measured without error

# Measurement Error

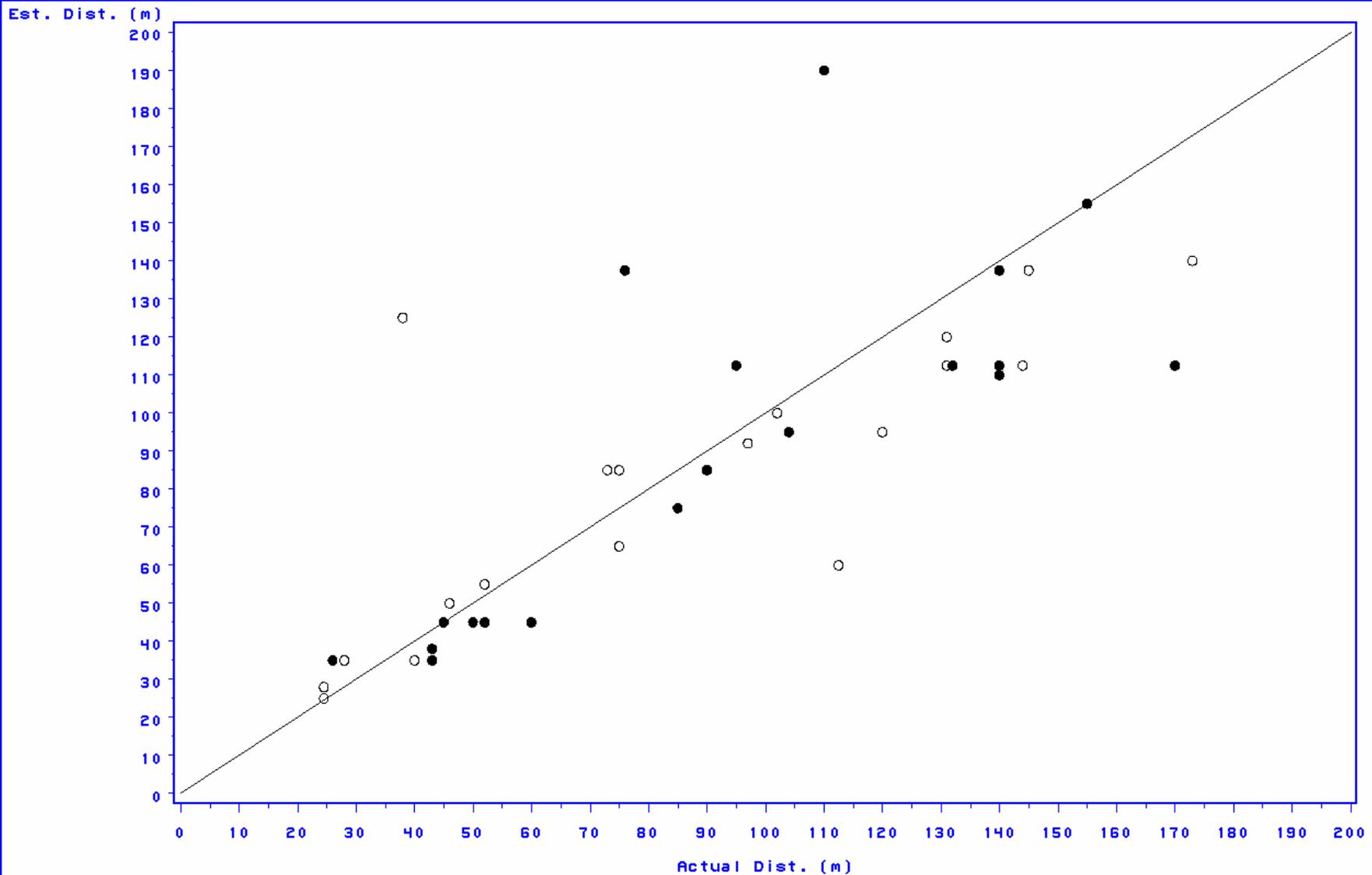
- biased density estimator
  - magnitude of bias depends on magnitude of measurement error
  - *may* be overcome with use of distance intervals
  - especially problematic closer to point
- correction requires knowledge of error distribution (actual vs. estimated distances), e.g., Marques (2004; Biometrics 60:757-763)

# Some Possible Sources of Measurement Error in Bird Surveys (Aural Detections)

- Habitat structure/composition
- Weather conditions
- Song/call acoustical characteristics (pitch and volume)
- Song/call frequency
- Bird position (distance, height, direction of vocalization)
- Measurement method (rangefinder, vis. estim.)
- Observer

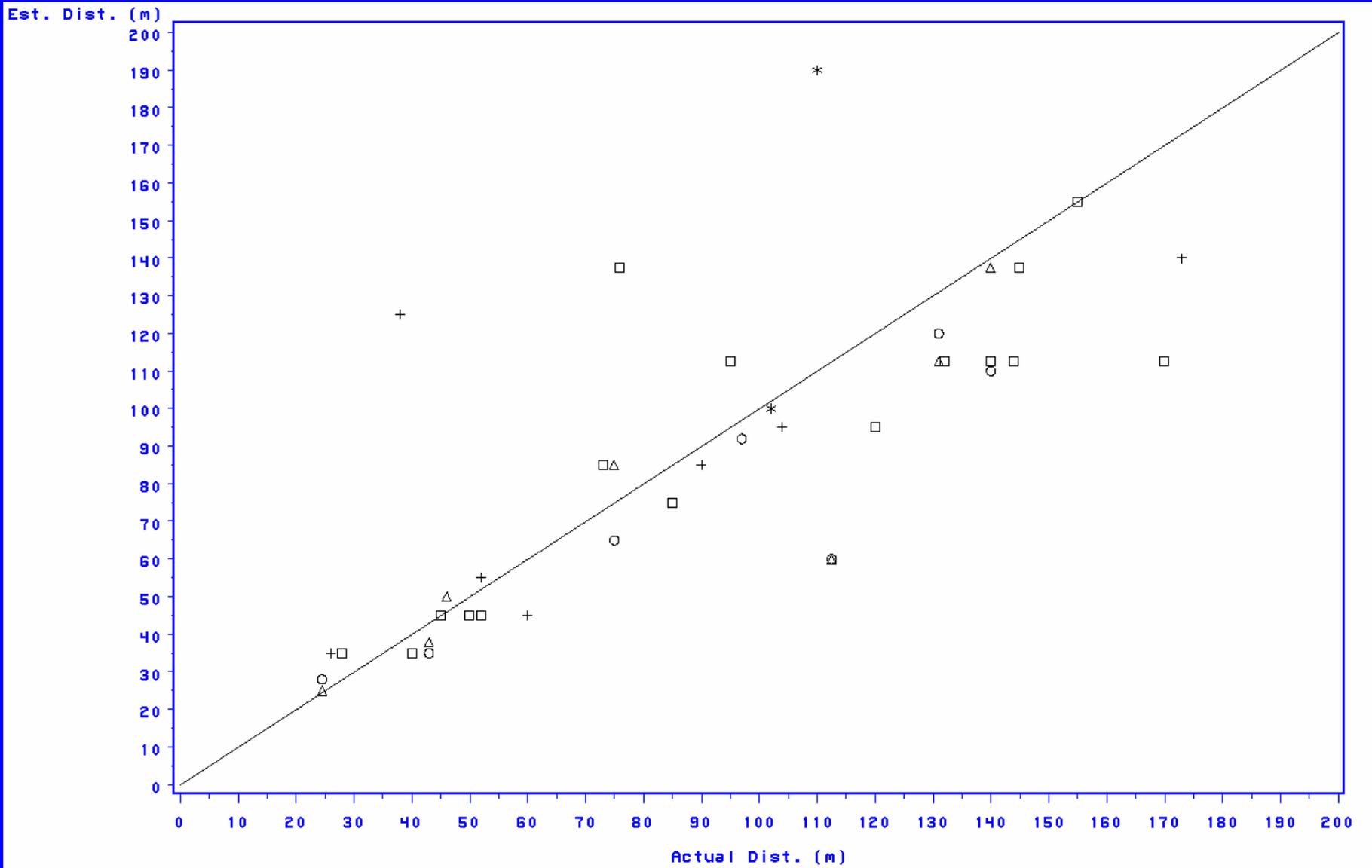
# Preliminary Field Evaluation of Measurement Error (Illustrative Purposes Only)

- Observers: Handel, Drew, Baluss, Tibbetts, and Ruthrauf
- Plots of actual vs. estimated distances from points
  - only used actual distances  $< 200\text{m}$
  - breeding songbirds categorized as easy and moderately hard/hard to detect



Easy to detect (filled circle)

Mod./Hard to detect (empty circle)



Different Observers

# Estimating Measurement Error - Preliminary Design

- Bird Trials
  - 2-person teams with radios, 1 at the point to estimate distance and the other near selected bird(s) to obtain actual distance
  - bird selected from randomly chosen quadrant around each point
  - classify dominant habitat type along line of detection (Viereck et al. [1992] - Level 3)
  - includes uncontrollable effects as “noise”

# Estimating Measurement Error – Preliminary Design (cont'd)

- Playback Trials
  - use tape or CD players at various heights, directions, habitats, and distances from points
  - controls for more effects, i.e., less “noise”
  - decibel meter to quantify acoustics?

# Potential Benefits

- quantify magnitude of measurement error under different conditions, spp., etc.
- if necessary...
  - develop field protocol to collect measurement error data
    - incorporate into pre-season training of observers
  - work with Tiago Marques and colleagues to incorporate analysis capability into program  
DISTANCE

# Call for Assistance to Supplement Our Efforts...

- Volunteers (e.g., on-going projects) to help collect data for bird trials
  - could incorporate into your training program
- Prefer relatively few observers who collect lots of data
- Other points of discussion, e.g., how to categorize detectability of species?

SPECIES Easy\_ModHard

AMRO	1
FOSP	1
GCSP	1
HETH	1
LISP	1
RCKI	1
SOSP	1
SWTH	1
VATH	1
WCSP	1
ALFL	2
CBCH	2
DEJU	2
LALO	2
OCWA	2
SAVS	2
TEWA	2
TOWA	2
WIWA	2
YRWA	2