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CAPTURE-REMOVAL SAMPLING

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BIOL 366, Fall 2009

Learning Objectives

At the end of today's laboratory, you should be able to:


- Estimate the size of a population using the capture-removal technique.
- Describe the assumptions of this technique
- Describe the conditions under which the capture-removal technique would be appropriate.

Capture-Removal Technique

Goal: Estimate population size

Steps:

- Collect sample
- Count target individuals – don't return them to the population
- rinse, lather, repeat.
- Plot (#captured per trial) vs. (cumulative # captured)
- Fit linear regression to the data
 - the y-intercept provides the population estimate



Assumptions

- Each individual has an equal and independent chance of being captured (i.e., random sample)
- Capture probability remains the same for each sample
 - Decrease in population size does not make it easier or harder to find individuals.
- During sampling, the population size is only affected by sampling
 - i.e. it is unaffected by births, deaths, immigration, or emigration


Methods

Q: How many white beads are in our population?

- Capture n individuals (close eyes, one bead at a time)
- Count white beads in sample – record in data table in lab notebook
- Return non-white beads to the container
- Rinse, lather, repeat for a total of 5 trials
- Use MS Excel to plot (# captured per trial) vs. (Cumulative # captured)
- Use Excel to fit a linear regression to the plot; y-intercept is the population estimate

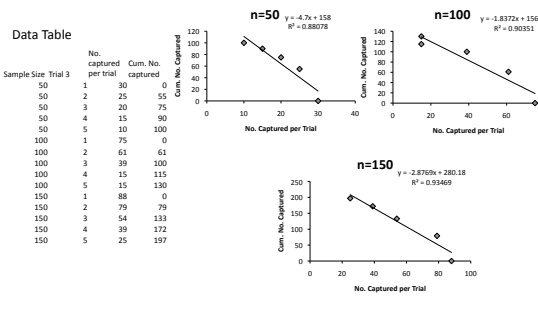
Q: How does sample size affect the accuracy of the population estimate?

- Perform experiment with $n = \{50, 100, 150\}$
- Count total number of white beads in your container
- Compare the accuracy of your estimate to the true value
 - Error = actual – predicted
 - Plot error vs. sample size



Example Data with Analysis

Sample Size	Trial	No. captured per trial	Cum. No. captured
50	1	30	0
50	2	25	55
50	3	20	75
50	4	15	90
50	5	10	100
100	1	75	0
100	2	61	61
100	3	39	100
100	4	15	115
100	5	15	130
150	1	88	0
150	2	79	79
150	3	54	133
150	4	39	172
150	5	25	197



$n=50$ $y = -4.7x + 158$ $R^2 = 0.88078$
 $n=100$ $y = -1.8372x + 156.53$ $R^2 = 0.90351$
 $n=150$ $y = -2.8765x + 280.18$ $R^2 = 0.93469$

Assignment

Turn in a copy of your graphs and the answers to the 3 questions at the end of the lab manual



Methods (again)

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