Population Sampling Lab

Introduction:

Populations of any kind can be sampled by counting. The sample will contain a small representation of the whole population if each sample contains enough individuals, and if individuals are randomly distributed within the whole.

Tagging animals (such as deer, bears, fish, birds, etc.) has long been used by biologists to help estimate the total population size.

Purpose:

This activity will demonstrate how it is possible, by sampling, to estimate a total population that is unknown.

Method:

If the total number of a large population is unknown, it is possible to estimate this number. A group of individuals are captured, marked in such a way that they can be identified again, and they are distributed randomly and evenly back into the total population again. A second group, called the sample, is taken and the number of marked individuals is compared to the total number of all individuals collected in the sample. A *proportion* is used that compares this ratio to the ratio of total marked individuals to the number of all the individuals of the total population. Let's use an ideal example.

A forest contains deer - more deer than we want to count. We capture a group and count them. We count 100 deer. We "tag" these deer with a numbered ear tag. Now we put them back into the forest and wait several days so the deer are distributed evenly throughout the whole population in the forest. We take a sample. We count 120 deer. Of this 120, 20 of them have ear tags.

If the sample is comparable to the total population, then the 20 out of 120 (or 20/120) is comparable to the original 100 tagged deer out of the unknown total. In other words:

$$\frac{20}{120} = \frac{100}{T}$$

Solving for T, we get:

$$T = \frac{100 \times 120}{20}$$ (So our estimate is 600 deer.)

More formally, we get:

Estimated TOTAL Population = Total Tagged X sample size / tagged in sample

Now this is an ideal situation. A very large population would require a larger number of tagged individuals. Otherwise a tagged individual would rarely be found in later samples.

Also it is highly unlikely that each sample of 120 deer will have exactly 20 tagged deer. The results will vary. The most reliable prediction of the total population can only be made after totaling the results of many repeated samplings. Each time the samples must be returned to the population or the total population will be changed.

Procedure:

"Capture, tag, & release" a group of goldfish. Take a sample, count sample tagged and total. Estimate the TOTAL Population. Calculate class results.

Statistics: You will calculate percent error for three of the estimates.

Percent error = Actual - Estimate / Actual X 100%

Population Sampling: "Goldfish Lab"

Period_____

Name_____

Partners:

Data Table:

Circle your Group #	Number of tagged individuals in the sample	Total number in the sample	Total number of tagged individuals in the population	Total Estimated Population
1				
2				
3				
4				
5				
6				
7				
8				

Average estimated Population:

ACTUAL Population size:

Manufacturer estimate:

Questions:

1. What does each one of the numbers represent from the example? $\frac{20}{120} = \frac{100}{T}$

2. (Show work) What was the percent error on:
   YOUR estimate?

   The AVERAGE estimate?

   The Manufacturer estimate?

3. Does this method seem reliable for wildlife? Explain.

Conclusion:

(What did you learn / reinforce? What could be improved? Was this lab worth doing?)