

**Activity #4**  
**Estimating the Size of a Population**  
**Capture-Tag-Recapture Sampling**  
(Estimating the Number of Goldfish in a Lake)

**Introduction**

A lake contains an unknown number of fish. In order to estimate the size of the fish population in the lake, the capture–tag–recapture method is used. The nature of this sampling technique involves capturing a sample of size  $M$  and tagging the fish. The sample is then released and the fish redistribute themselves throughout the lake. A new sample of size  $n$  is then recaptured and the number of tagged fish,  $t$ , is recorded. These numbers are then used to estimate the population size.

**Description**

The goal of this activity is to come up with a good estimate for a population size using the capture–tag–recapture sampling technique described above. We will simulate this sampling method as follows. A bowl containing an unknown number of goldfish crackers will be fish in the lake. We take out 100 (this will be  $M$ ) of the crackers and replace them with fish crackers of a different color (for example, pretzel fish crackers). This simulates capturing and tagging the fish. Each person/team will recapture a handful and record the sample size  $n$  and the number of tagged fish  $t$ . Then record this data for each trial.

**Discussion**

- How would you use the numbers you collected to estimate the size of the population?
- What estimates do the class data yield?
- What assumptions are you making in the process of coming up with an estimate of the fish population size?
- Can you come up with an interval estimate, as opposed to a point estimate, for the population size?
- How confident are you on this interval estimate?