SOMETHING'S FISHY LAB

Date: 2 - 13 - 15
Grade: 93

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Introduction and Problem: The question being addressed by this lab is how accurate is tagging in determining the population of species in a certain area. Tagging is a method of determining populations of a variety of species, including fish and butterflies, used by biologists. Also, scientists can track migration patterns, health of a species, and their range by using this method. The overall goal of catch and release may be to accurately hypothesize the population of a species, but the information can then be used to understand the factors that affect the size of a population. Additionally, tagging can be used by scientists to study more complex relationships among species within nature. For example, "biologists may need to find out the movements of striped bass after spawning in the Nanticoke River, a tributary of the Chesapeake. To help find out, they would set nets in the river after spawning and then capture, tag, and release 1000 striped bass, and track returns of these fish during the rest of the season into late fall." Furthermore, "scientists are hoping the tagging study...can show the relationship between habitat health and fish populations" (Fodri, Joel F.). Therefore, the significance of this topic and this lab as a whole lies in understanding how tagging can contribute to a better understanding of different species.

Hypothesis: If a random sample of organisms of a species is captured and tagged, then a combination of both a large number of tagged organisms and a large number of catches will yield the most accurate estimate of the size of that species' population.

Materials:

Fish bowl (ziploc bag)

Tagged fish (white)

Untagged fish (orange)

Paper plate

Pencil

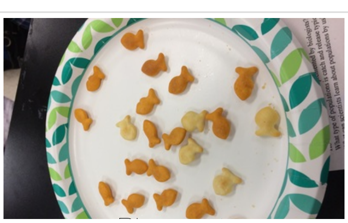
Methods and Procedure:

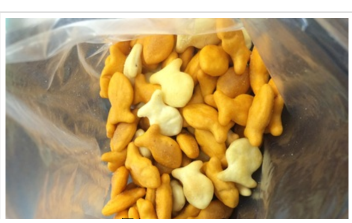
1. Obtain a bowl with your fish.
2. Do NOT count the number of fish in your pond yet!
3. Have one member of your group remove a large handful of fish.
4. Count the number of fish you just removed and write it in the table below.
5. Replace these fish with "tagged" fish (in this case, colored "fish")
6. Mix your pond well to redistribute the tagged fish among the other fish.
7. One member at a time (and without looking), remove a handful of fish and record the number of total fish in the sample, the number of tagged fish, and figure out the percentage of tagged fish. (see chart)
8. Return your handful to the bowl!!
9. Continue with this until you have taken 20 samples.

Data Analysis:

Data Table

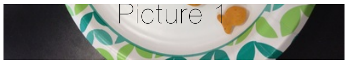
Original Number Tagged:			25
Sample #	**# of Tagged Fish in Sample**	**Total Sample Size**	**Percent Tagged in Sample**
1	3	8	37.5%
2	3	9	33.3%
3	4	12	33.3%
4	4	9	44.4%
5	5	17	29.4%
6	4	12	33.3%
7	2	11	18.2%
8	1	14	7.14%
9	5	22	22.7%
10	5	20	25%
11	4	5	80%
12	3	9	33.3%
13	4	18	22.2%
14	2	8	25%
15	2	8	25%
16	4	11	36.36%
17	2	11	18.18%
18	4	9	44.4%
19	2	10	20%
20	0	7	0%
Mean percentage tagged			29.434%





Picture 1: This is an example of a sample of fish caught. Shown are 17 untagged fish and only 5 tagged fish. This sample is on the larger side of most of our group's catches.

Picture 2: Total number of tagged fish (white) and untagged fish


Picture 1


Picture 2

(orange) in the fish bowl, or ziploc bag.

Analysis:

Our methods used in this lab began to look more unnecessary as our group took sample after sample. By simply looking at the inconsistencies in our data, it is clear that no correlation exists between the number of species tagged and the percent of tagged species recaptured. For example, our sample #8 had 7.14% of the total sample tagged while sample #11 had 80% tagged. This demonstrates that despite the fact that the number of tagged species remains the same (25 in this case), it is highly unlikely for two different samples to have the same percentage of tagged fish. Therefore, the accuracy of the estimate gained through this method depends more on probability than on the independent variable, which is the original number of goldfish tagged. This observation brings up the question of whether or not this trend would apply if the number of tagged species were increased. The data we recorded proves that having a constant number of tagged species in a certain location yields different percentages of tagged species found in each sample. However, what would happen if the original number of tagged species were increased? Would there be less discrepancies in our data collection, and thus yield a more accurate and precise approximation of the size of the population? I believe that this would be the case. Therefore, a completely different trend exists. The data would have less outliers if the number of tagged species were larger. In other words, a larger number of tagged organisms would yield the most accurate predictions of population size in this lab. The reason that our data had such a wide rage of percentages for the recaptured tagged species is that there were many tagged and untagged species in our pond. As a result, samples produced very distinct and outright percentages, which helps explain why our data did not generate an accurate estimate of the size of the fish population.

Conclusions:

Questions-

1. What is the mean (average) of your percent tagged fish from your 20 samples? **29.434%**
2. Using the following formula, determine an estimated population for your pond:
Population Size = (Number originally tagged/mean of the sample %'s) **84.963**
3. Now, actually count the number of fish in your bowl: **115 fish**
4. Find your percentage error by using the following formula: **26.1% error**
5. Does this method appear to be an effective way to assess population size? Why or why not?

This method does not appear to be an effective way to assess population size. Even on the smaller scale that this lab was performed at, out estimate still produced a large percent error. If biologists were to use this method to assess population size on a larger scale, such as in the ocean, then the results would probably be even more inaccurate. The reason for this is that this method of tagging is based on probability in order to test population size. Since the probability of recapturing tagged organisms in a large area is very low, then the percentage of tagged species in the samples would be much more deceptive when it comes to estimating the population size. In short, there appears to be no correlation between the number of tagged animals and the estimated population size. Therefore, the results will change even if the number of tagged species was kept the same.

6. What concerns should a biologist have about a species' habits before (s)he uses this method to approximate the size of a population?

A biologist should understand that animals in nature rarely stay in one place, but instead migrate based on their discernment of push and pull factors in a certain habitat. For this reason, a biologist should be concerned about how the migration patterns of certain species affect the reliability of tagging in approximating the size of a population. This information is important for biologists to understand because it would allow them to avoid tagging in an area where very few of the tagged species are expected to reside. Some scientists use tagging as a way to study migration patterns only. I believe that this is a more useful application of tagging, and it should be a bigger concern than estimating the size of a population. In addition, biologists should be concerned with how certain species interact with their habitats, and how they respond to issues in their environment.

Conclusion:

Even though the results of this lab do not directly prove the hypothesis to be true, they do support it in a way. The hypothesis states that a larger number of tagged organisms should give higher percentages of tagged species in each sample as well as more accurate predictions of population size. However, having only twenty-five tagged goldfish, the estimation that was produced was very inaccurate. There were not many things which could account for this inaccuracy, except for the variations in catch size. Even so, the total sample size was not shown to affect the number of tagged fish recaptured. For example, in sample #16 and #17, the total sample size was the same and yet one yielded the yielded a different percent of tagged species in the sample. Overall, the results of this experiment seem to be determined by probability.

Although this experiment demonstrates that there is no correlation between the independent and dependent variable, I continue to question how the results would have changed if the number of tagged species were increased. It only makes sense that by increasing the number of tagged species in our bag there would be different outcomes each sample. This would allow for a more accurate estimate of the size of the population. Yet, is this even a practical answer to finding the size of a population in a larger area? It is not practical, and that is why biologists have other ways of approximating the size of a population besides this tagging method. Even if tagging did not prove to be a useful method when it comes to finding the size of a population, it can still be applied by scientists in order to study other characteristics of a habitat.

Overall, tagging organisms to determine the population size of a species in an area is not very effective; there is always a possibility for a skew in the data collected due to inconsistent sample sizes, migration, and hibernation. In order for results to be precise, scientists must not only tag a larger number of organisms, but also take into account these factors (State University of New York System).

Citation(s):

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