



Coqui Frogs

Concepts

Coqui frogs require certain types of environmental features in order to successfully reproduce and create large populations.

HCPS III Benchmarks

SC 4.5.3

MA 4.12.1

MA 4.13.1

Duration

1 hour

Source Material

Biology Corner:

<http://www.biologycorner.com/worksheets/estimatepop.html>

Vocabulary

Mark-recapture method

Population Densities

Summary

Students will do an activity to estimate population densities of coqui frogs at different forest types. They will learn the significance of suitable habitat and explore the density (total number) differences in coqui frog populations around the island.

Objectives

- Students will understand how an environment can affect the coqui population.

Materials

- 8 jars or resealable bags
- 3-4 bags of river rocks (found at arts and crafts stores)
If river rocks are not available, another type of large rock like gravel could be used.
- Masking tape or another type of “marking” tool
- “Population Data Sheet” Worksheet.

Making Connections

This is the third lesson on the invasive coqui frog. Although the population data is not real, the suggested data is ranked at a number similar to what we may find in those types of environments. Student will be able to make a personal connection with their own experiences with varying levels of sound created by coqui frogs in different areas of the Big Island.

Teacher Prep for Activity

Photocopy “Population Data Sheet” worksheet. You will also be using the “Coqui Map” and “Coqui Map Data” worksheets from the previous lesson.

Separate the bags of river rocks into the 8 different sites from the previous lesson. Label each bag with the site name. You can sort out the number of rocks per site as you wish, however it is best to have no less than 40 rocks per given site. Here are suggested numbers: Pahoia (175), Kailua (40), Kapa’au(60), Pahala(100), Mountain View(140), Hilo(150), Honoka’a (95), Manuka (85). Separate each site into different bags and mark the bag with the site name.

Background

In order to understand invasive species, researchers study the species ecology. One method used is called “**mark-recapture**” because a scientist can capture the animals they are interested in and then mark them with a tag so they can be identified the following nights when they recapture them. The process is repeated over a number of days,



and by using the number of captured and recaptured (marked) frogs a scientist can make estimates of the population size. This method provides scientists with a means to understand which areas on the island the species does best in and by looking at the unique attributes (forest type, rainfall, disturbance patterns), the scientist will be better able to control the spread of these invasive species.

Procedure

1. Begin with a brief explanation about the importance of researching invasive species because the more you know about a species, the better you will be able to make the judgments and decisions necessary to control their invasion.
2. Ask the students to pretend that they are scientists and it is their job to find out how many frogs are in their site. It is important that they know how many frogs there are because it will allow them to understand the best type of environment for coqui frogs to live and survive in.
3. Divide the students into 8 groups and explain that each group will represent a specific site from the “Coqui Map” worksheet.
4. Hand out one bag of rocks to each group. The bag they receive is the site they represent. Each bag represents a “population” of frogs and each rock represents a coqui frog. The students can take turns with the different jobs needed to estimate the population size.
5. Use the following method to estimate the population size:
 - a. One student should mix the population by shaking the bag between each turn.
 - b. Then, a different student should close his/her eyes and pull out 10 rocks, one at a time.
 - c. The first 10 rocks should not have any marks on them. Use tape (or some other method – white out pen) to mark these 10 rocks. Record the number of rocks on the “Population Data Sheet”.
 - d. Replace the 10 rocks in the bag and mix the population again.
 - e. Pull another 10 rock from the bag. Record the number of rocks that DO NOT (New) and DO (MARKED) have marks on them.
 - f. Repeat these steps a total of 10 times to fill up the entire “Population Data Sheet”.
 - g. Once all the trials are done, have your students count up all the “New” frogs and all the “Marked” frogs they captured.
 - h. The totals should be recorded on the blackboard in the front of the class.
 - i. Once all the numbers are written on the blackboard from all the groups, use the formula below to estimate coqui populations for each group:

$$\frac{(\text{Total number of frogs captured}) \times (\text{Total number of Marked})}{\text{Total number of Marked}}$$

- j. Have the students record the estimated population size on the “Coqui Map Data Sheet” from the previous class.
 - k. If time permits, you can have your students count the actual number of frogs in their population and compare it to their estimated number.
6. Initiate a group discussion about the differences in the number of frogs in different areas. Ask probing questions to gauge the students learning and understanding:
Question: Why did the bags have different numbers of rock?
Answer: The rocks represent the # of frogs at that site. Different sites have different densities of frogs due to differences in environmental conditions such as



rainfall and temperature.

Question: Which sites had the most frogs? Why?

Answer: The east Hawaii sites should have higher population densities due to increased rainfall and higher temperatures/humidity.

7. Each student should finish by answering the Thought Questions on the bottom of the "Population Work Sheet"

NOTE: By sheer chance, you may end up with population sizes that are not realistic. This can happen in real research too; this is why scientists will do the same study over and over again- it is a way to reduce the risk of making a mistake.

Assessments

Completion of worksheets and "Thought Questions".

Resources

Mark and Recapture adapted from: <http://www.biologycorner.com/worksheets/estimatepop.html>

Extension Activity

Challenge your students to do a different site and compare the new estimate with the previous one. Will they get the same results as the previous group?

Math Connection

If your students are familiar with word problems and multiplication and division, have your students estimate a different population on their own using the formula! Or incorporate the concept of probability by discussing "What is the probability of recapturing a marked frog?" after each repetition when new marked frogs are added to the population (HCPS III Benchmark MA 4.14.1)



Name: _____

Date: _____

Population Data Sheet

Site Name: _____

	Frogs	Marked	# Captured	Actual Number of Frogs
1			10	
2			10	
3			10	
4			10	
5			10	
6			10	
7			10	
8			10	
9			10	
10			10	
Total			100	

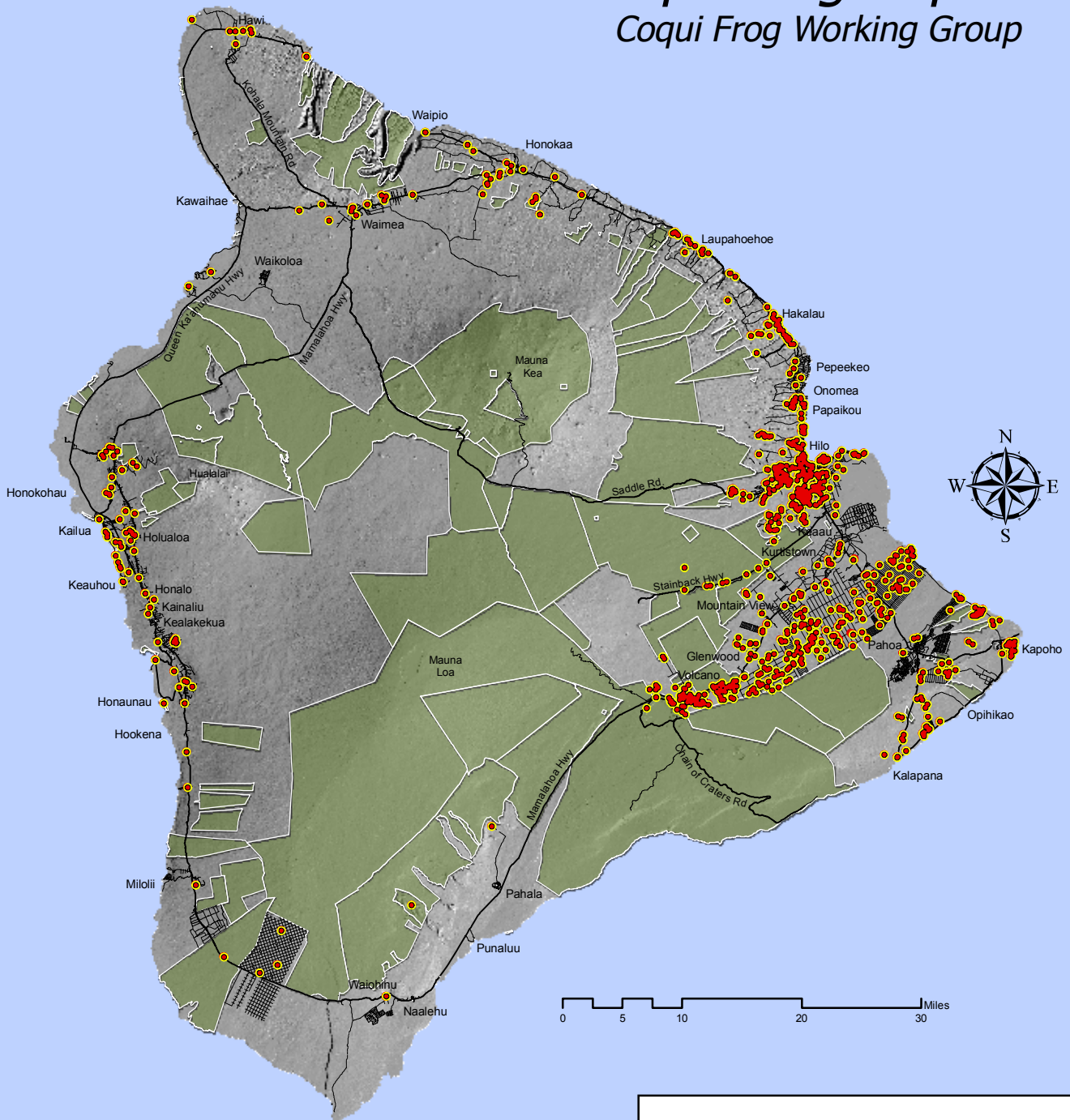
Thought Questions:

1. Why do you think your estimated population size differs from other sites? Do you think the forest type affects your coqui population? How?
2. Do you think this is a good method of understanding how many frogs are found in the different forests?

To report new Coqui infestations,
or request information on control
options & resources, please call:

County of Hawaii: 961-8065
Big Island Invasive Species Committee: 961-3299
USDA Wildlife Services: 933-6955


Hawaii Island Coqui Frog Reports Coqui Frog Working Group



Coqui Frog - *Eleutherodactylus Coqui*



Photo by Arnold Hara, UH CTAHR

 Coqui Frog Locations (Confirmed & Unconfirmed)

 State & Federal Land Reserves

Point density may not be indicative of actual Coqui Frog population densities. Natural areas and Coqui tolerant communities are likely to be under represented, while more densely populated areas and those with active community Coqui control programs may be over represented

Distribution data based primarily on Coqui Hotline calls to CFWG agencies, as well as survey/control work by public agencies and community groups.

Source: Coqui Frog Working Group, 2007
Data: Hotline calls to CFWG cooperating agencies & surveys (1998-2007)
Datum/Projection: NAD 83, UTM Zone 5N
Map prepared by P. Graves 9/2007, adapted from C. Rygh, 2005

