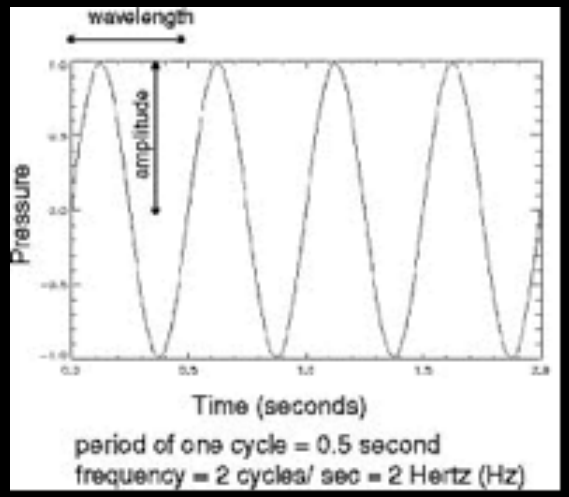
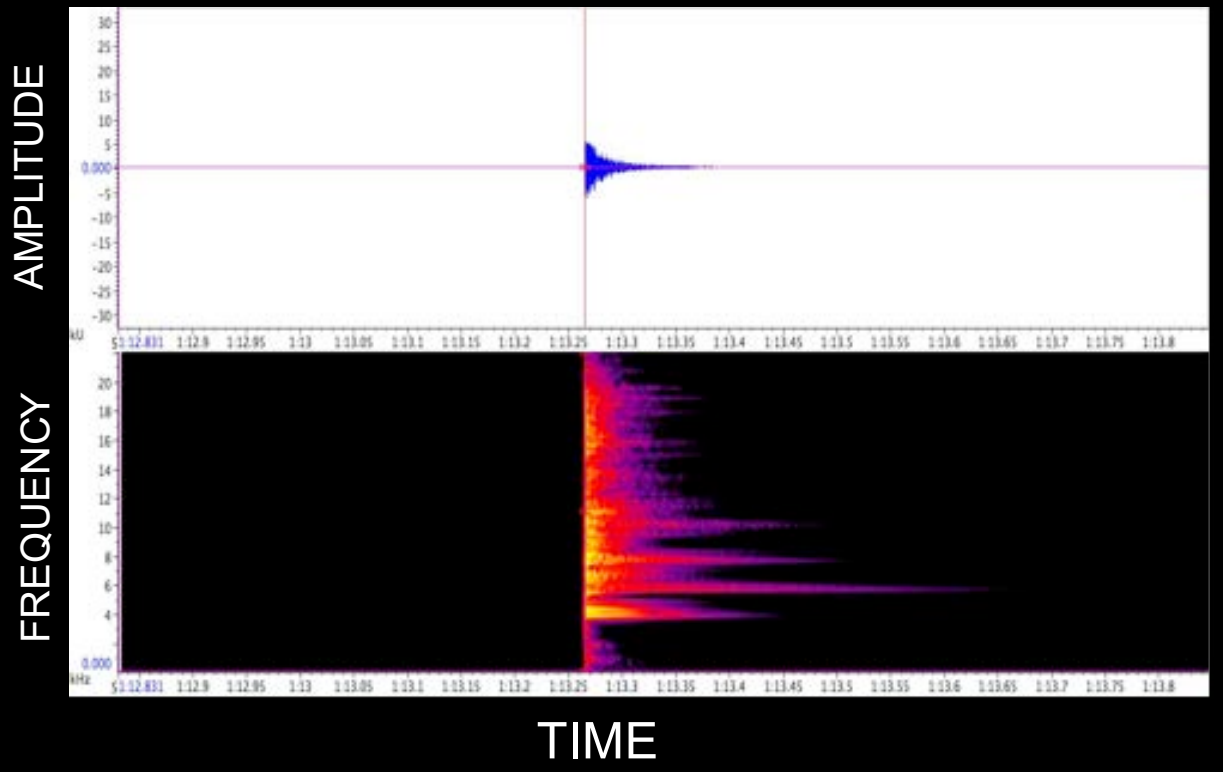
WHAT IS SOUND?

When an object vibrates it produces a pressure wave which compresses and decompresses molecules

WHAT IS SOUND?

-Amplitude
-Wavelength
-Frequency





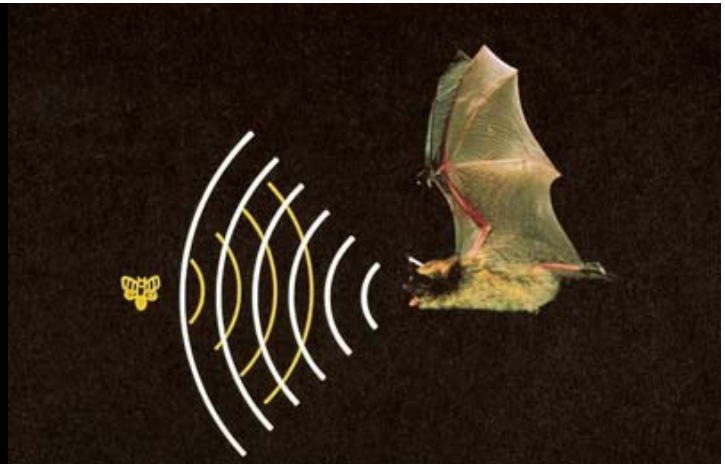
- **Why use graphs?**
- - Visualize sounds in terms of their amplitude and frequency
- - More accurate than guessing changes in sound by ear
- - RavenLite is NOT specific to snapping shrimp data

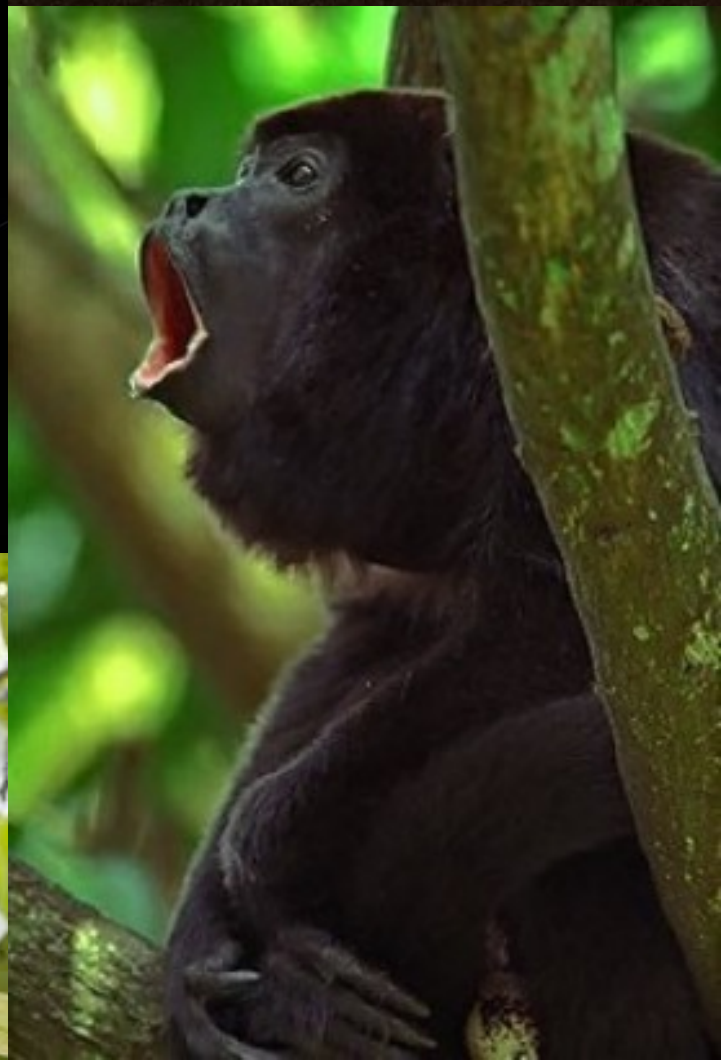
QUIET!

- Hydrophones are sensitive to sounds in the water and air
- Shrimp may be reacting to background noise
- Background noise will make your data messier

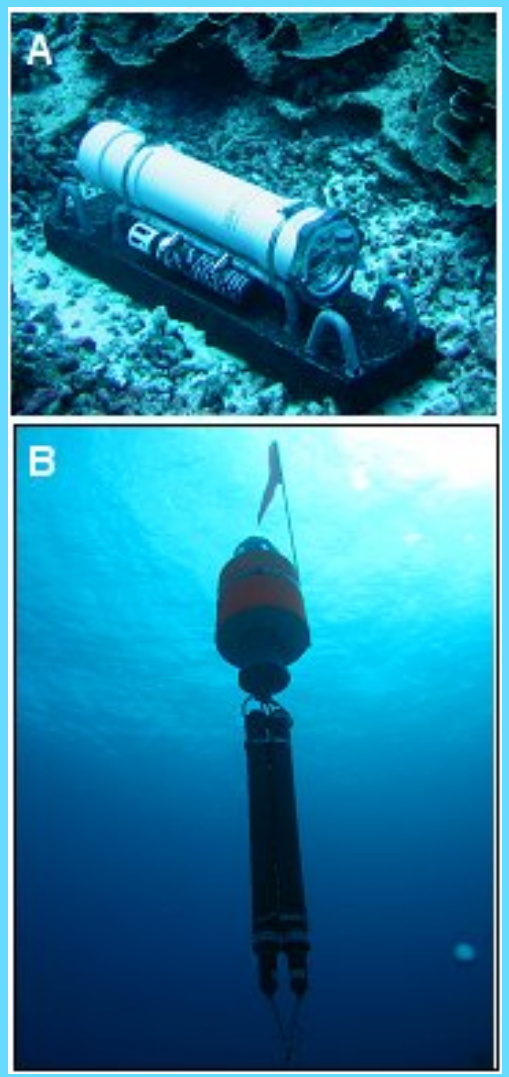
Purposes of animal sounds

- Finding mates
- Marking territory
- Communication
- Echolocation
- Predation





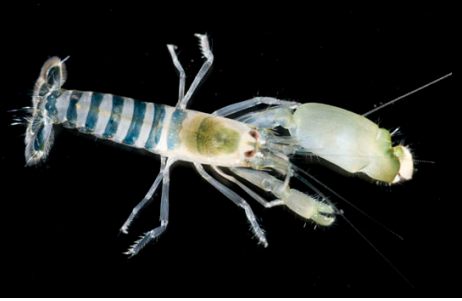
BIOACOUSTIC RESEARCH ON COCONUT ISLAND



BIOACOUSTIC RESEARCH

SNAPPING SHRIMP

- The SOUND
- One of the most pervasive sources of biological noise in shallow tropical waters
- Kāneʻohe Bay has some of the loudest snapping shrimp noise in the world
- HOW do they make sound?



HYPOTHESIS-TESTING

What is a scientific hypothesis?

- A proposed explanation (i.e., an educated guess) for something you can **observe** and is **testable**.

How do you make a hypothesis?

- Make an "If… then…" sentence.
- If I change VARIABLE X, then I expect RESULT Y.

EXAMPLE OF A GOOD HYPOTHESIS: If you increase the water temperature in an aquarium, then the fish will start spawning.

EXAMPLE OF A BAD HYPOTHESIS: If a fish spawns, then it is protecting its territory.

How do you test a hypothesis?

- Test experiment: Only change one variable.
- Control experiment: Don't change any variables.

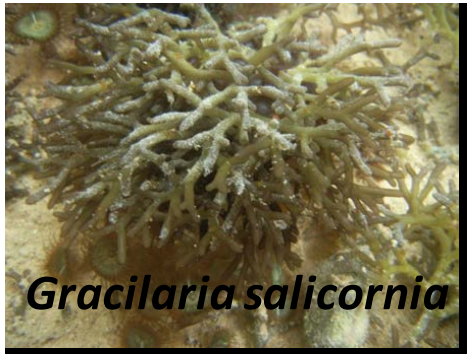
How would you test to see if two different species of snapping shrimp produce different sounds?

Record the sounds produced by each species of shrimp separately, but in the same environmental conditions


Gracilaria salicornia

CLASS ACTIVITIES

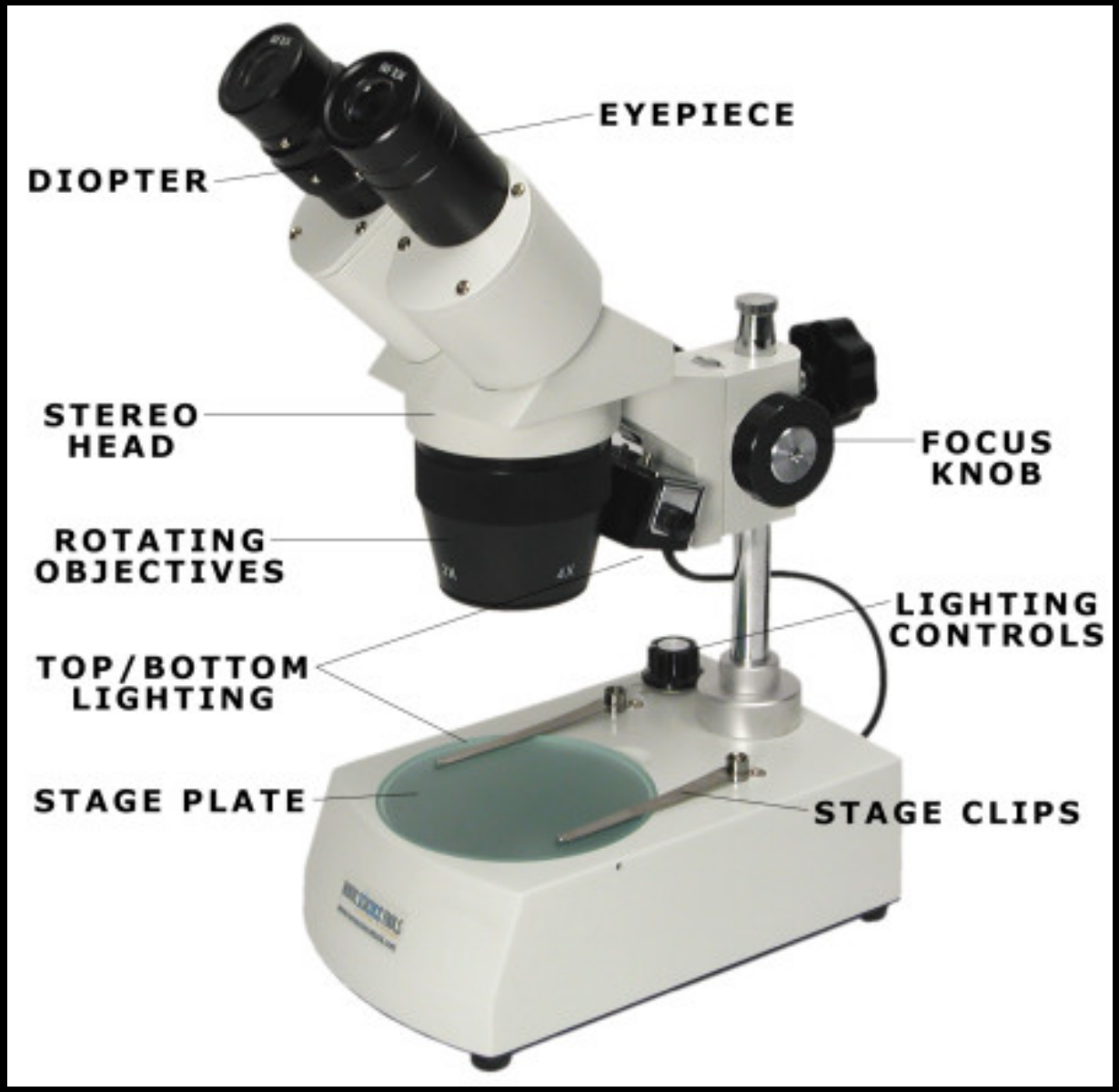
- Collect seaweed
- GENTLY sort through algae and separate organisms. Wear gloves. There are fireworms!
- Make hypothesis


Gracilaria salicornia

CLASS ACTIVITIES

- Do your experiment
  - Divide up the tasks
  - 2 minutes recording time (QUIET!)
  - Take good notes (e.g. Note the times when you hear a snap and when you start/stop your different experiments)
- Clean up your area
- Analyze data on laptops

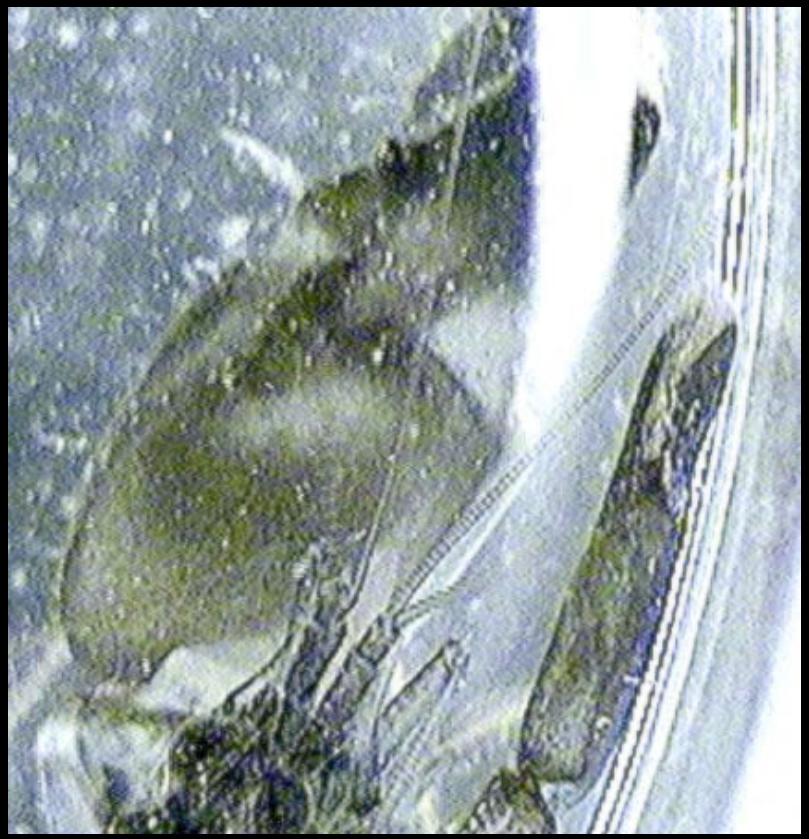
DISSECTING MICROSCOPE



Identifying male versus female

FEMALE

MALE



Various invertebrates found in the 2 microhabitats

Iridescent fireworm
(*Eurythoe complanata*)

Small crab #1
(*Liomera spp*)

Feeble shrimp
(*Palaemon debilis*)

Brittle starfish
(*Ophiocoma brevipes*)

Hawaiian blood-spotted crab
(*Portunus sanguinolentus hawaiiaensis*)

Various invertebrates found in the 2 microhabitats

Gracilaria salicornia

Mycale armata

Synalpheus heeia

Synalpheus paraneomeris

Guiding questions

- Do you expect each creature to make distinct, recordable sounds in captivity?
- Will snapping shrimp make sounds without any external stimuli?
- What are the biological reasons for being able to create a powerful snap underwater?
- Do similar sized snapping shrimp of the same species make snaps of similar intensity? What about similar sized snapping shrimp of different species?
- Do snapping shrimp make sounds when they feed?
- Will snapping shrimp make different sounds in response to different types of food?
- Which other species of invertebrate found in the microhabitats (i.e., crab, fire worm, feeble shrimp, etc.) will elicit a snap from the snapping shrimp? Do you think the snap will be a "predatory" or "defensive" snap?

CLEAN UP

- Combine all seaweed and critters into a few buckets
- Use the outside hose to rinse out the remaining trays, buckets, nets, and aquariums. Leave outside to dry
- Wash all other lab materials in the sinks
- First use sink sponges to wipe down tables, then use blue rags and cleaner spray
- Sweep floors
- Shut down all laptops
- Place chairs on top of tables