Science Lesson 10: Rugosity Measurement of the Reef Profile

Hawaii DOE Content Standards:
Science standards: 1, 2, 3, 4

Key concepts:
Coral reef biology, scientific investigation and data collection, statistical and graphical analyses of data

Performance indicators: After completing this lesson, students will . . .

- identify and describe coral reef organisms and their environment
- conduct a random sampling to collect quantitative data

Note to the Student:
"When you have completed this lesson you will be able sample the reef habitat using a rugosity chain for the quantitative survey"

Activity at a glance:
Students will set up and survey a coral reef transect using a rugosity chain to describe the profile of the benthic environment.

Time: Two-hour ocean lab

Prerequisite skills: Swimming, snorkeling

Skills to be introduced: Ecological surveying

Assessment:
Data sheets with good data and data evaluation, journal, reflections and reports for final portfolio

Vocabulary:
Benthic, survey, random sample, coral reef ecology, rugosity, habitat

Materials:
Diving mask and snorkel, sun screen and towel, 20 meter metric tape, rugosity chain, waterproof data sheets and clipboards, safety equipment, dive buoys

Introduction:

Coral reef communities represent a diverse, robust, highly interdependent, and environmentally sensitive ecological system. The goal of this activity is to survey a living coral community and document the composition of the transect area. Sites can be chosen with historic and current monitoring activities to compare data collection and analysis.

A rugosity chain measures the variation of the profile of a coral reef habitat. The goal is to describe the habitat using a qualitative method that shows the variation of the vertical reef profile. The rugosity of the ten meter transect will be between 1 and 2 rugosity. The higher the number the more the vertical variation of the transect area,

The protocol was inspired by the Coral Reef Assessment and Monitoring Program CRAMP.

Activity Overview

1. Students will board boats with safety equipment, snorkels and masks, transect lines, clipboards and data sheets, and rugosity chain. At the survey site students will split into teams to carry out the reef survey protocol. Two students will lay the transect line. The transect line should follow the reef parallel to the shore at a depth of one to two meters. The hundred meter transect will be investigated by pairs of students in 10 meter sections.
2. Each pair of snorkelers will lie the rugosity chain over the coral along the transect line allowing the weight of the chain to fill in the contours of the reef.
3. The length of the rugosity chain at the end of the ten meter transect will be measured to determine the rugosity value of the transect area. The length of the chain divided by the length of the transect yields the rugosity. Therefore if fifteen meters of chain lays out over a ten meter transect the rugosity is 1.5 for that segment and so on.
4. Flagging tape can be used to pre-mark the meters of the rugosity chain.
5. An effort should be made to ensure the chain is touching the substrate at all points along the transect without doubling back on it's self.

Cultural Values

Pono

Understanding the value, beauty, and sensitivity of coral reef ecology

Malama

Learning about and caring for the ocean life

Laulima

Working together as a team to get to the site and collect data.

Kokua

Taking initiative, doing service, clean up, maintenance

Lokahi

Unity, harmony, leadership skills

Adaptations/ Extensions

Connections to other curricula or lessons: Water quality, Mapping, Governance, Rugosity, Photoquadrat, Point intercept survey, Science lectures 4 & 5, Math lessons 1-6

Safety

Always check weather and surf conditions before going out on the ocean. Winds should be below 15 knots and surf below the advisory level for the relevant shore.

It is important to mark the dive area with orange floats at each pair of divers. This is to alert other boaters to the presence of divers. Also training in CPR is recommended for at least one of the staff if not everyone. A cell phone or radio should be carried on board in case there is a need for emergency support. A first aid kit with tourniquet materials is needed on board the boat. All divers should pass a swim test before the activity and divers should work in pairs in order to aid a buddy in trouble. The orange dive marker should double as a floating safety device. Staff on the boat needs to monitor the divers while in the water in case anyone needs assistance.

Resources

Druehl, Louis. (2000). *Pacific Seaweeds.* Madeira Park, BC: Harbour Publishing.

Gulko, David. (1998). *Hawaiian Coral Reef Ecology.* Honolulu: Mutual Publishing.

Hawaii Coral Reef Assessment and Monitoring Program (CRAMP). http://cramp.wcc.hawaii.edu/

Hodgson, G., Kiene, W., Mihaly, J., Liebeler, J., Shuman, C., and Maun, L. (2004). *Reef Check Instruction Manual: A Guide to Reef Check Coral Reef Monitoring.* UCLA: Reef Check, Institute of the Environment.

Jokiel, Paul. http://www.hawaii.edu/HIMB/Faculty/jokiel.html

Krupp, David. http://www.hawaii.edu/HIMB/Faculty/krupp.html