LESSON 2: PARASITES, YUM!
AN EXAMPLE OF MUTUALISM AND ITS EFFECTS ON CORAL REEFS

INTRODUCTION
This lesson is created to stress the idea of interrelationships among organisms and how this can effect the surrounding environment. This lesson also goes step by step through the scientific approach to developing and implementing a scientific research study. Students are expected to write their own ideas about the best way to investigate the scientific questions provided, and compare their ideas to those of the actual researcher.

OBJECTIVES
• Students will be exposed to ongoing scientific research.
• Students will utilize inquiry to explore the scientific approach to experimentation.
• Students will expand their scientific knowledge in the general ecology of coral reef organisms.
• Students will be introduced to scientific tools.
• Students will become more familiar with scientific terminology.

HAWAII STATE DEPARTMENT OF EDUCATION BENCHMARKS
7.1.1 Scientific Inquiry: Design a scientific investigation to answer a question or test a hypothesis.
7.1.2 Scientific Inquiry: Explain the importance of replicable traits.
7.1.3 Scientific Knowledge: Explain the need to revise conclusions and explanations based on new scientific evidence.
7.3.2 Interdependence: Explain the interaction and dependence of organisms on one another.

NATIONAL SCIENCE EDUCATION STANDARDS
Grades 5 – 8
A. Understanding about scientific inquiry
C. Life Science
• Regulation and behavior
• Populations and ecosystems
E. Understanding about science and technology
G. History and Nature of Science
• Science as a human endeavor
• Nature of science

BACKGROUND
“Cleaner fish” remove and eat parasites found on the scales, fins, or mouths of other fish. They are said to eat about 1,200 parasites a day². The parasites are mostly small crustaceans called gnathiid isopods. Many different kinds of fish visit the “cleaner station” to have parasites removed. The station is usually located in front of a reef that an individual “cleaner fish” rarely leaves. The different kinds of fish that visit a “cleaner fish” are called “client fish” because they get cleaned.

This lesson discusses research being conducted on the symbiotic relationships among these organisms because it may have effects on the surrounding environment. The symbiotic

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relationships include *Parasitism*, a relationship between two organisms in which one organism benefits at the other organism's expense. Another relationship is *Mutualism*, which occurs between two organisms that both benefit from the interaction. In this lesson, the mutualistic relationship between cleaner wrasses and their client fish is a result of parasitism from gnathiids (a crustacean) that live on the client fish. Client fish may be attracted to the reef to visit cleaners and get rid of their parasites, but may also feed at the same reef, which may have positive or detrimental effects depending on their food preference.

**MATERIALS**
- Powerpoint presentation (downloadable from the Coral Reefs of Moorea website)
- Paper
- Pencils

**PREPARATION**
- Secure PowerPoint and projector capabilities in your classroom.
- Review the downloadable PowerPoint presentation and become familiar with the pace and vocabulary.

**ACTIVITY**
- Please allow 1-2 class periods to complete this lesson.
  - Work your way through the PowerPoint lesson presentation.
  - Students may work in groups or individually when brainstorming hypotheses and research methods.
  - Vocabulary words are in italics. Please have students copy the word and come up with their OWN definition of what they feel fits best. Be sure to review the vocabulary at the end of each slide, and have them make adjustments to their definitions if needed. The more they think about how to use the word, the more it will be stored in their memory. Repetition is another way to promote vocabulary enhancement, so you may see some of the same vocabulary words repeated throughout the lessons.

**EXTENSIONS**
Perform this lesson in conjunction with the other lessons in this unit.

**REFERENCES**

Text
1. Adam, Thomas. Researcher, University of California, Santa Barbara. Personal contact.

Photos
3. Pelc, Robin. University of California, Santa Barbara (slides 1, 2, 3, 6, 7, 11, 28).

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