Coral Morphometrics and the Missing Paleontologist
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Objectives

Paleontological Principles
* What is a species?
* How do paleontologists recognize species?
* Genetic vs. ecophenotypic morphologic variation
* What is a coral and what are the basic skeletal structures of a coral?

Student Skill Development
* Quantification of morphologic shape
  - landmark vs. traditional measurements
* Confidence organizing and manipulating paleontological datasets
* Analysis and interpretation of morphometric data
  - Analysis using PRelentological Statistics software (PAST)
* Write a scientific research report describing and interpreting results from a complex dataset

Background

The goal of the lesson was to present a geological field experience in a classroom setting. Provide students a feeling of ownership in a research project.

This was completed by presenting the students with an outcrop on a fictitious island. They were given field notes from a paleontologist who mysteriously went missing on the outcrop.

The challenge to the students was to analyze fossil corals of the genus Montastrea from the dated sections in the outcrop (Miocene, Pliocene and Holocene) to answer the missing paleontologist’s question... "Are these the same species?"

Students collected data from photomicrographs of corals from each time period to determine how unique they are from each other.

Data Collection

As part of a cooperative effort, students plotted 15 landmarks on a total of 200 coral thin section photomicrographs from specimens of the coral genus Montastrea. Corals were sampled from the Miocene, Pliocene and Holocene. Thus with minimal effort, the students were able to generate a large dataset of morphologic data. (A) Living colony of Montastrea faveolata (B) Calical surface of aragonite skeleton showing ~45 corals. (C) Student collecting morphologic data. (D) Image of coralite showing the 15 landmarks identified by students.

Data Analysis

Conclusions

* Students completed their final reports and gave short presentations to the class discussing their interpretations.

* Interpretations describing the possible reasons for the divergence within the Montastrea samples found along the outcrop were varied. It was generally agreed upon that the Miocene Montastrea had a unique morphology which may support it being a different species from the others. However, interpreting the Pliocene and Modern samples proved more difficult.

* Physical and biological factors (temperature, wave action, symbiosis and competition with other organisms) were discussed by the students in their efforts to determine links between morphology and function in the marine environment.

Write Up

Students were asked to write their results in a scientific report including an abstract, introduction, methods, results and discussion. The following are a few of the questions the students were asked to address in their discussion.

a) Are they the same species? If not how many species do you think there are?

b) Provide evidence that supports your answer above. Use your analyses to support your interpretation.

c) Provide some possible interpretations or hypotheses that could explain your results.

References
