

What is a Paleontological Species?

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Introduction

A group of organisms which are morphologically distinct from any other such group is one definition for a paleontological species. I have found that students will take this definition and memorize it, failing to see the inherent problems with its practical application. Instead of *telling* the students what the problems are, I engage them in an activity to discover for themselves the challenges of applying the species definition.

Goals:

1. Develop an understanding of the species concept as it applies to fossil specimens using a constructivist approach.
2. Interest students in systematic paleontology via measuring and describing fossil specimens.
3. Engage students in data collection, statistical analysis, and interpretation using a real-world example.

Activity

Part II: How many species? Data analysis and interpretation.

- Students use Minitab to calculate basic descriptive statistics for the combined class data.
- Scatterplots of length vs. width and molar area v.s number of specimens are generated.
- Specimens are classified (Fig. 2) and these results are discussed as a class in addition to their answers to the end of lab questions.
 - a. What made the species identification difficult?
 - b. Which data helped you make an identification to species?
 - c. How much variation did you find among your specimens?
 - d. How is the morphological species concept useful?
 - e. What did you learn about recognizing paleontological species?

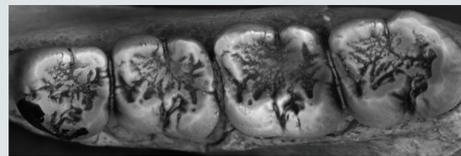
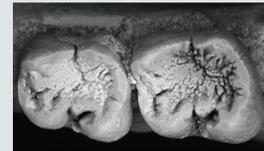


Figure 2. Three different specimens of *Thisbemys*.

Activity

Part I: Collecting qualitative and quantitative data.

- Students begin by making clay models of the molar crown pattern to learn basic molar morphology (Fig. 1).
- A qualitative description, focusing on molar crown pattern, is written for each specimen.
- Molar length and width are measured using an optical micrometer. Data is entered into a spreadsheet.

Specimen #	p/4 AP	p/4 WML	p/4 WHL	m/1 AP	m/1 WML	m/1 WHL
34356	4.16	3.05	3.41	3.9	3.28	3.37
25064	3.68	3.00	3.49	3.77	3.18	3.68
25059	4.04	2.95	3.61	3.77	3.19	3.48

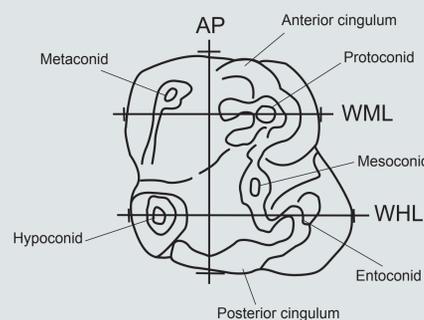


Figure 1. Molar cusp terminology for the first lower molar of a generalized ischryomyid rodent. AP = length; WML = anterior width; WHL = posterior width.

Discussion: Why this activity works.

Every student brings a unique perspective and potential set of misconceptions to each new topic. Their filters and prior knowledge impact the learning process. Real learning, knowledge that can be applied or acted upon, occurs when the student uses familiar ideas/concepts to mentally process new, incoming stimuli. This is a process of learning called constructivism. The learning experience may be unique for each individual despite studying a common topic.

Actively engaging students in a lab exercise such as this one promotes "real learning."