



TEACHER GUIDE

TEETH TELLING TALES

DESCRIPTION

Join us as we replicate a day of research inspired by Dr. Darin Croft, Paleontologist with Case Western Reserve University and the Cleveland Museum of Natural History. Specializing in mammals that went extinct millions of years ago, Dr. Croft studies how careful measurements of fossil teeth can help scientists build a picture of entire ancient ecosystems. Using calipers and casts of specimens found during recent South American fieldwork, your amateur Paleobiologists will learn how ancient teeth tell tales!

OBJECTIVES

- Practice the proper use of lab equipment, including digital calipers & museum specimens.
- Compare and contrast extinct mammals to modern species.
- Explain how this information can help improve conservation efforts focused on saving species and ecological communities today.
- Investigate how animal populations are affected by food supply.

OHIO'S LEARNING STANDARDS

Grade 3

Life Science: Behavior and Growth Changes

- Individuals of the same kind of organism differ in their inherited traits. These differences give some individuals an advantage in surviving and/or reproducing.

Grade 4

Life Science: Earth's Living History

- Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.
- Fossils can be compared to one another and to present-day organisms according to their similarities and differences.

Mathematics: Measurements and Data

- Know relative sizes of the metric measurement units within one system of units.



Grade 5

Life Science: Interconnections within Ecosystems

- Organisms perform a variety of roles in an ecosystem.
- All of the processes that take place within organisms require energy.

Grade 8

Life Science: Species and Reproduction

- Diversity of species, a result of variation of traits, occurs through the process of evolution and extinction over many generations. The fossil records provide evidence that changes have occurred in number and types of species.
- Every organism alive today comes from a long line of ancestors who reproduced successfully every generation.

Standards for Mathematical Practice

- Diversity of species, a result of variation of traits, occurs through the process of evolution and extinction over many generations. The fossil records provide evidence that changes have occurred in number and types of species.
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BEFORE YOUR PROGRAM & HOW TO SET UP YOUR ROOM

- Please have student desks clear before the program begins.
- Please provide an empty desk or small table for the museum educator to set up display items.
- Your educator will need access to an outlet and a blank wall or screen to project a power point presentation. We are also able to use existing classroom equipment if available.
- If booking multiple programs, transitions will be easier if museum staff sets up in only one location.
- Introduce the vocabulary and additional resources provided below.



VOCABULARY

bivariate plot – a graph of the relationship between two variables that have been measured on a single sample of subjects

buccal – (in tooth placement) directed toward the cheek

calipers – device used to measure the distance between two points on an object

carnivore – an animal that eats only meat

cast – a precise physical copy of a fossil specimen that captures small details

cementum – the bonelike connective tissue covering the root of a tooth and assisting in tooth support. In some animals, like horses, cementum can also cover the sides of the tooth crown.

cusp – pointed structure on the chewing surface of a tooth

distal – (in tooth placement) farthest from the middle and front of the jaw; toward the molars

enamel – layer of material that surrounds and protects the dentin of the crown of a tooth. It is the hardest substance in the body and does not need to be fossilized to last for millions of years! Enamel can be chemically analyzed to see what an animal ate during its life.

ecosystem – the members of an ecological community and their interactions with each other and the environment

food chain – a single-line example of how nutrients and energy flow from one organism to another

food web – a web-like illustration of how nutrients and energy can flow through an ecosystem


habitat – the place in which plants and animals get their resources (water, shelter, sunlight, nutrients, etc.) in order to live

herbivore – an animal that eats only plant material

hypsodonty – the relative measure of how tall an animal's teeth are; a hypsodont animal has teeth with crowns that are taller than they are wide

lingual – (in tooth placement) directed towards the tongue

litoptern – member of an extinct group of South American hoofed mammals that lived from about 60 mya to 10,000 years ago. Many litopterns had fewer than five toes. Three-toed and even a one-toed horse-like form lived in South America.



mesial – (in tooth placement) Situated toward the middle of the front of the jaw along the curve of the dental arch; toward the incisors

mesowear – the form a tooth cusp takes after many months of eating a particular food item. It records an animal's diet on a time scale intermediate between that of hypsodonty (many generations, thousands to millions of years) and microwear (days to weeks).

microwear – Very small pits and scratches on a tooth that indicate what an animal ate during the past few days or weeks. In a fossil, it indicates what an animal ate just before it died.

mya – million years ago

notoungulate – member of a diverse order of extinct South American hoofed mammals that lived from 65 mya to 10,000 years ago. There were many species of notoungulates, some as small as a rabbit and others as large as a rhino. They displayed a wide range of lifestyles.

omnivore – an animal that will eat both plants and animals

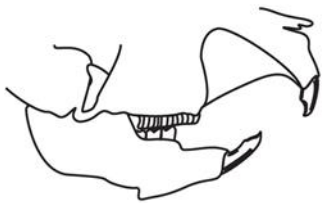
population – all of the individuals of one type of organism living in a particular location at a particular time

predator – animals that actively hunt other animals for food (prey)

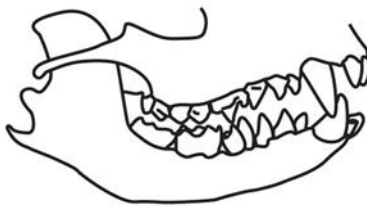
ungulate – an animal with hoofed feet

EXTENSION ACTIVITIES

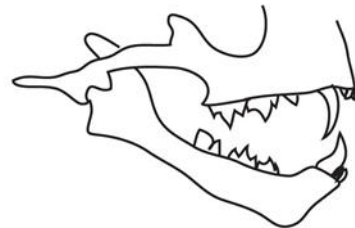
Ask your students if they can figure out what an animal eats by the shape of its teeth. Try looking at the three diagrams below and discussing the different tooth shapes your students can describe. Mesowear studies look at physical changes on herbivore teeth, so this comparison can be a good “warm-up” exercise



Beaver - Herbivore



Raccoon - Omnivore



Cat - Carnivore

EDUCATOR RESOURCE CENTER (ERC)



Educator Resource Center
CLEVELAND MUSEUM OF NATURAL HISTORY
Celebrating 30 years of supporting science education

The Educator Resource Center is dedicated to providing teachers with the classroom resources and professional development they need to create dynamic, enriching, and inquiry-based experiences for their students.

Contact the ERC at 216-231-2075 for information on individual or school membership.

Visit the Museum's ERC website for more information
<https://www.cmnh.org/ERC>

MATERIALS FOR LOAN

With close to 100 dioramas and over 130 thematic teaching kits, our lending library has the materials you need to make science come alive for your students.

If you're interested in additional resources be sure to check out the following ERC materials or browse ERC materials online at
<https://cmnherc.myturn.com/library/>

EDUCATOR PROFESSIONAL DEVELOPMENT

Get connected to trending teaching methods, best practices in science education, and hot topics in current scientific research.

To learn more visit
<https://www.cmnh.org/learn/educator-resource-center/educator-workshops>

Email inquiries to erc@cmnh.org.

