

The Testudines Shell Shape-A True Test of Time

Stephanie Killingsworth, Jennifer Manner, Paul Kester, and David Lindberg



UF UNIVERSITY OF FLORIDA

myFOSSIL



Lesson Objective

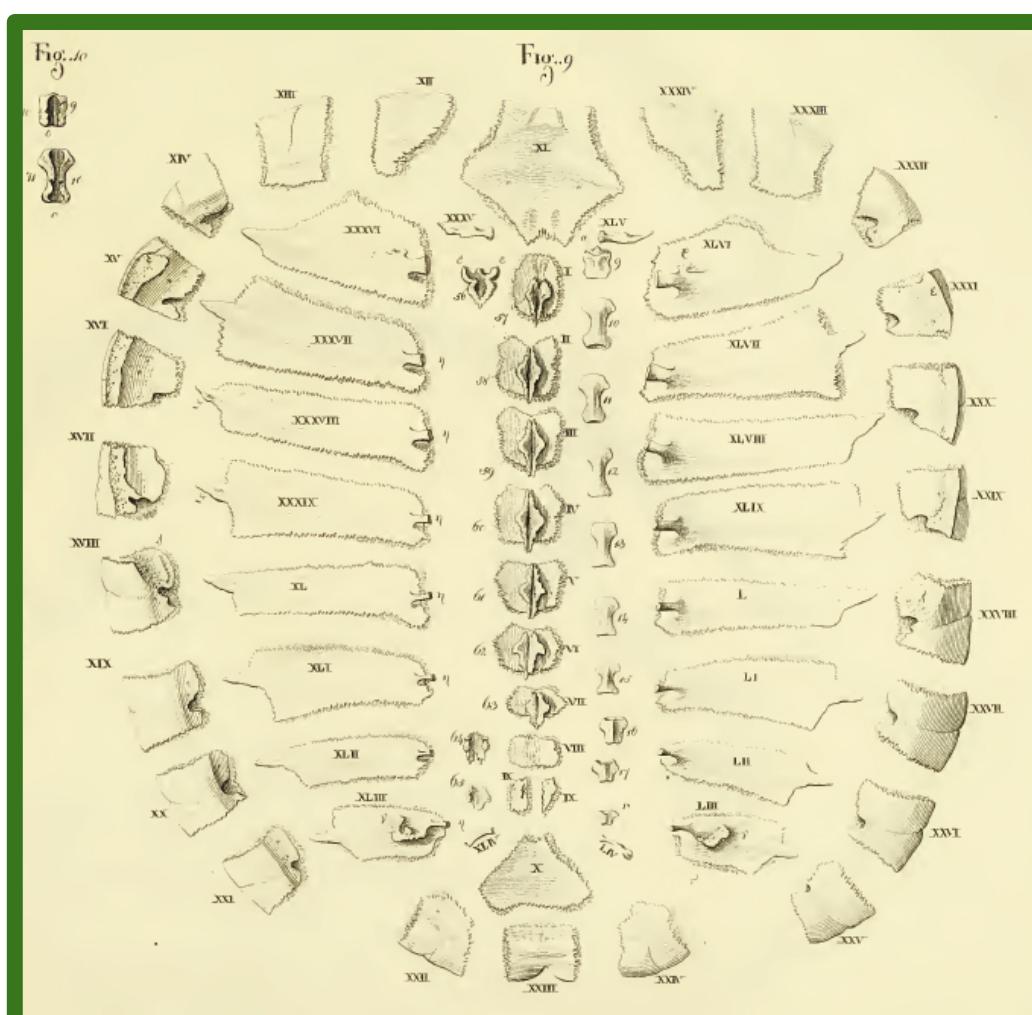
Why did turtles develop shells in the first place? The answer is more complex than most would think. In fact, much is still unknown about turtles and their origin.

The purpose of this lesson is to expose students to the concept of certain morphological structures enduring the test of time. The order, testudines, which includes turtles and tortoises contain a shell. The shell is an exemplary structure to analyze both longevity as a structure, as well as variation into the different modern turtle species shells we recognize today.

Fossilized testudines will act as the gateway to learning more about this diverse, yet unique group.

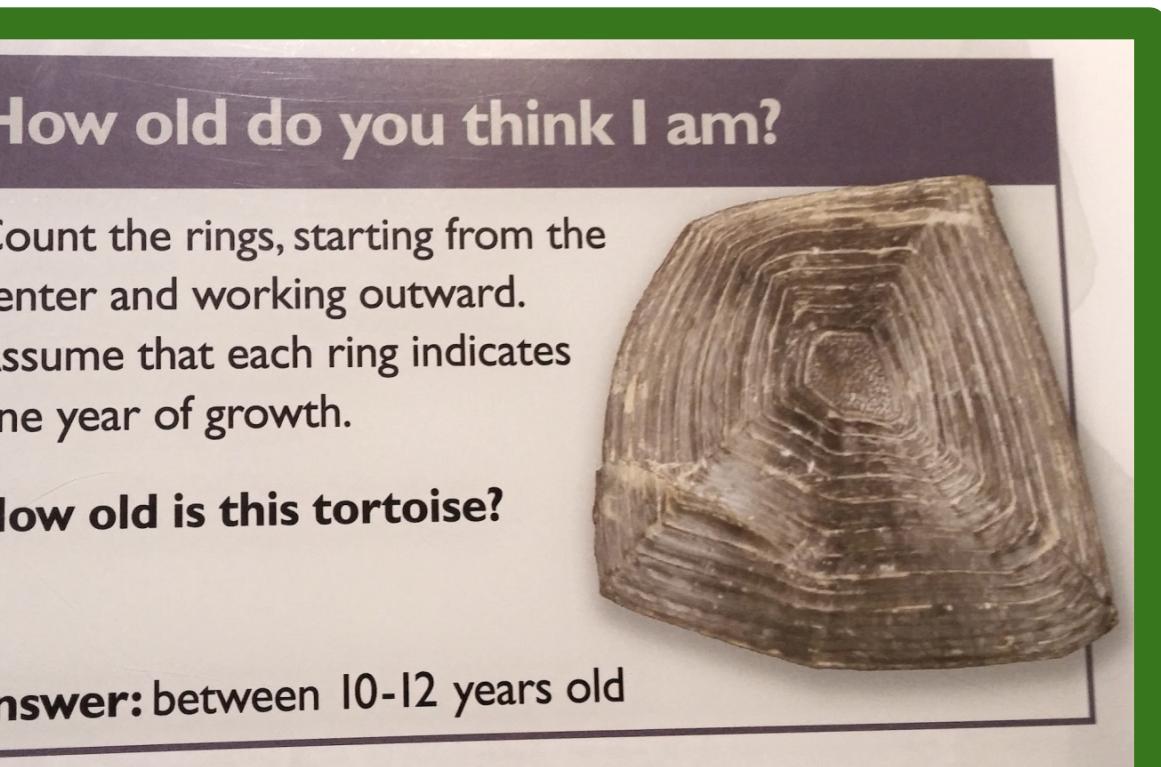
Materials and Methods

- Fossilized turtle shell
- Chromebooks
- Anatomical chart
- Articles
- Video
- Sketch paper/field notebook
- Colored pencils



Did you know?

- * Turtles first show up in the fossil record in the late Triassic around 215 million years ago.
- * Current scientific data indicates that the shell originated for the purpose of burrowing.
- * While under water for long periods of time, the shell assists with gas exchange of carbonate and lactic acid.
- * It is possible that without this gas exchange, a turtle can actually drown.
- * Some species of testudines can be aged based on the number of rings found on their scutes.
- * Turtles use their shells for protection and for temperature regulation.
- * Turtles can repair damage on their shells.



5E Lesson Design

Engage:

Fossil hook activity: Groups of students reference an anatomical chart of turtle shell osteoderms and attempt to reassemble the either the plastron or carapace. The activity is purposely designed so that most groups will be unable to finish in the allotted time. Several small scale 3D printed turtle shells of varying species will then be placed at each group to stimulate discussion and prior species knowledge. (20 minutes total)

***The feasibility of possessing enough fossil components to rebuild a shell is an issue, but ideal. In the event, that enough mixed fragments cannot be found to accommodate this aspect of the project, we will look to 3D scanned images of individualized pieces and have several fossil pieces for visual and tactile reference.*

Explore:

Students are asked why and how did the testudine turtle shell form? After a turn and talk, they will watch a quick video on the original formation of the testudine shell- <http://bit.ly/shellevolutionvideo> (45 seconds video, total 5 minutes)

Students will listen to a short podcast that discusses a gap in the fossil record and how turtles got their shells - <http://bit.ly/nprturtleshellorigin> (2 minutes)

Explain:

Groups will review a couple articles that outline what scientists currently understand about structure and function of testudine shells based upon research.

<http://bit.ly/pankoarticle>
<http://bit.ly/yongarticle>

Socratic seminar discussion on the two articles will take place to tease out content and foster inquiry, higher order questions and inferences, and an overall general synthesis of ideas.

Elaborate:

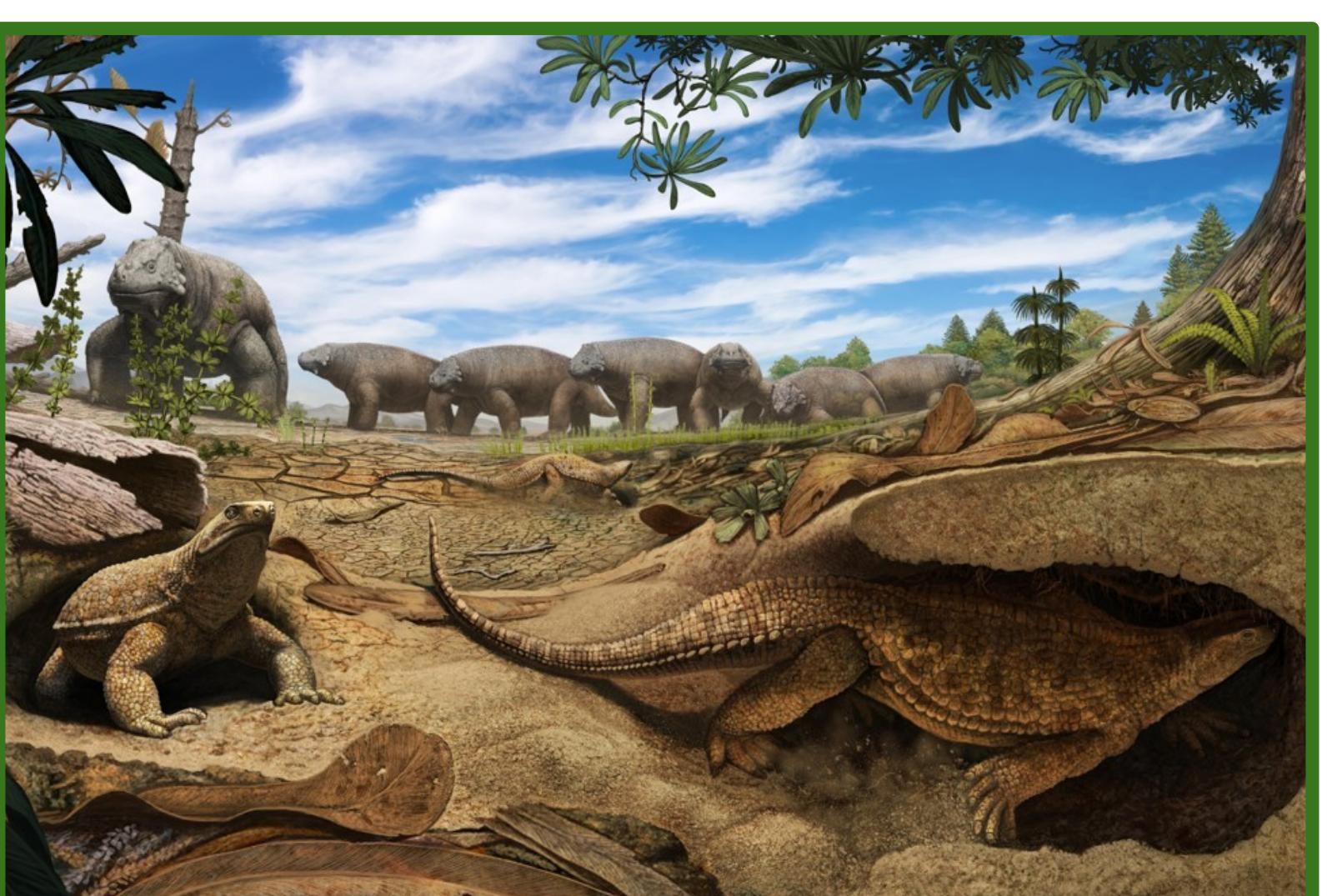
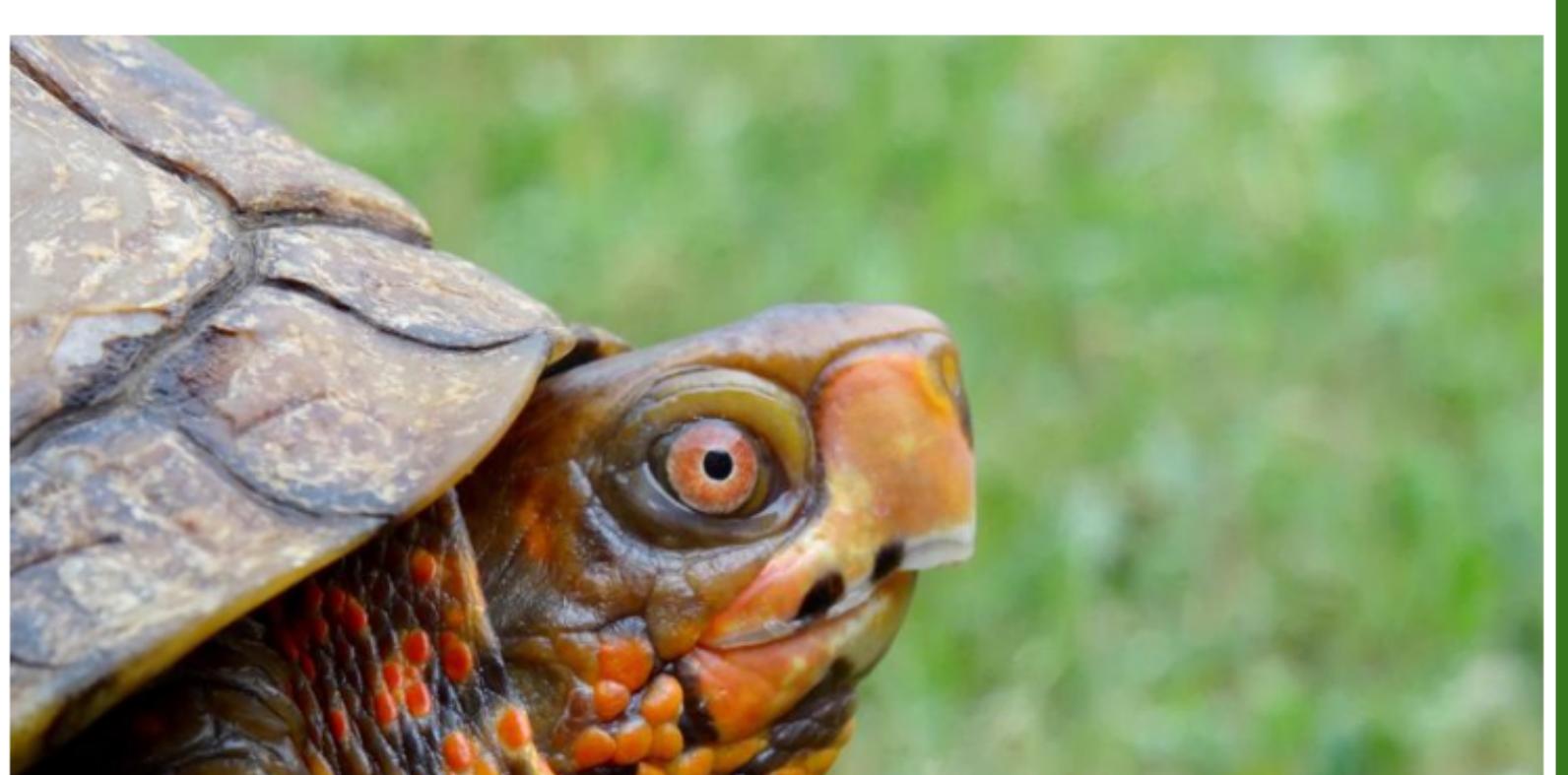
Groups will be given a “new” set of environmental conditions and will be asked to make modifications (big or small) to a turtle shell, to adapt to the changes presented. Groups should either through a digital platform or mechanically drawn imaging, the evolution of their shell. Furthermore, they will defend their changes by explaining why and how those changes will continue to allow testudine shells to stand the test of time.

Evaluate:

A gallery walk of shell prototypes and designs will be teacher and peer reviewed. (A rubric for this assessment will be forthcoming)

The Real Reason the Turtle Learned to Hide its Head Will Surprise You

Turtles retract their heads for protection, but new research suggests that ability evolved for an entirely different reason



Acknowledgments

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NGSS Standards

MS-LS4-1: Natural Selection and Adaptations: Analyzing and Interpreting Data

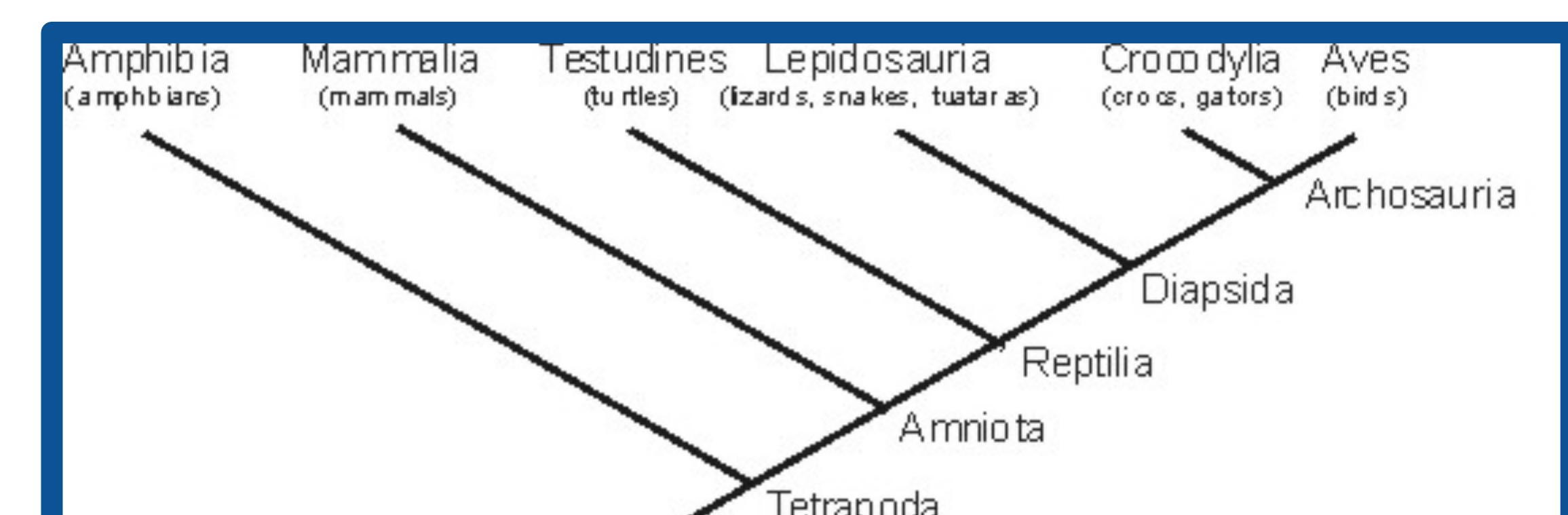
Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

Disciplinary Core Ideas:

- Evidence and Common Ancestry and Diversity

Cross-Cutting Concepts:

- Patterns



Academic Language

Morphology, structure, function, evolution, natural selection, testudines, taxonomy, classification, carapace, plastron, extant, extinct, exaptation, predation, ecosystem, flora, fauna, terrestrial, lacustrine, marine, burrowers, paleoclimatology, scutes, keratin, osteoderms, dermal plates, clade

