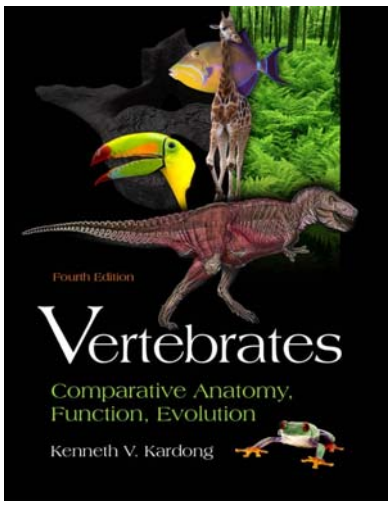


Dino Dynamics

Follow up in Textbook: pp. 312-318; 347-351

A. Objective:

Analyze the skeletal design of a hadrosaur dinosaur to identify adaptations that address the physical demands imposed by posture and locomotor activity.

B. Textbook Reference:

No textbooks are to be used during this exercise.

C. Introduction:

This dinosaur (*Prosaurolophus sp.*)* belonged to the hadrosaur group of dinosaurs. This group was common in the late Cretaceous of North America and Eurasia, with one species known from South America. These dinosaurs are commonly called "duckbilled" dinosaurs in recognition of their broad snout but with grinding teeth. The lifestyle and habitat of hadrosaurs is still debated. Some evidence suggests that they would have been comfortable in water. Skin impressions show that the hands were webbed and the laterally compressed tail would have proved effective during swimming. However, the joint surfaces are highly ossified to support the body on land, grinding teeth might be more suited to fibrous terrestrial plants than to aquatic vegetation, and the tail is rigid, suggesting to some that it is too stiff to act as an effective paddle. In some species, the nasal passages are expanded into great bony crests thought to be involved in sound production or modulation. Nesting sites have been found in Montana next to the banks of rivers.

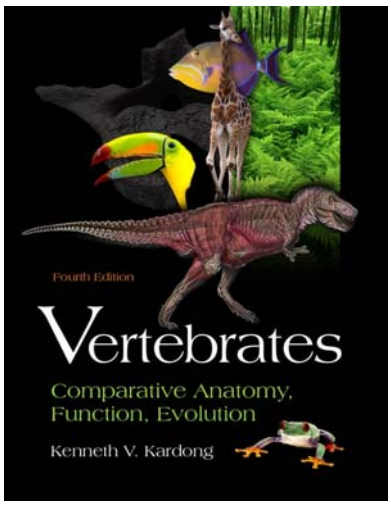
D. Preparation & Procedures:

Examine a mounted hadrosaur skeleton (or photograph or drawing of one). Work as a team to prepare your responses to the following questions.

E. Synthesis:

a) What skeletal features help address problems of body support?
b) What skeletal features help this animal run fast (cursorial locomotion)?

*Or use alternative dinosaur



Instructor's Guide

Dino Dynamics

Follow up in Textbook: pp. 312-318; 347-351

A. Background:

This analysis applies the principles of biomechanics presented in chapters 4, 7, 8, and 9. Restricting students' access to textbooks while working in groups promotes group interactions and conceptual development.

B. Materials Preparation:

This analysis relies upon the examination of a good mounted skeleton of a hadrosaur (or other dinosaur). If no mounted skeleton is available, one or more figures of a mounted skeleton will provide an adequate alternative. Be sure not to include figures with extensive legends noting form and function relationships.

C. Facilitating Tips:

Direct students to distinguish between features that aid support and those that aid cursorial locomotion. Thus they a) identify the morphological feature, then b) state the functional significance to explain how the adaptation assists in support or cursorial locomotion.

If computers are available, be sure that students do not look up web sites that reveal other analyses of these form function relationships.

D. Assessment:

Advice for Evaluating Responses

a) Make sure that each group follows a general format, such as:
- Title
- Topic sentence
- Arguments and evidence
- Conclusion

b) Note that the question has two parts. Students must supply an answer that addresses BOTH parts of the question.

- For part a) -- support:
  - Limbs under body mass, not sprawled, directly support body weight.
  - Weight of head/trunk cantilevered by tail, balancing the body across hips.
  - Pelvic girdle is firmly attached to the vertebral column.
  - Other.

- For part b) -- cursorial locomotion:
  - Hindlimbs under body: ease of limb oscillation and recovery.
  - Loss of some digits, consolidation of some distal hindlimb elements which reduces the mass at the end of hindlimbs for faster oscillation.
  - Hindlimbs are relatively lengthened which increases stride length.
  - Other.

E. Additional Considerations:

This analysis may be applied to other dinosaurs or may be expanded to include comparisons between dinosaurs adapted to distinctly different lifestyles (e.g. hadrosaurs or *T. rex* vs. sauropods). A quick Google image search using "dinosaur skeleton" as search words will likely reveal many images suitable for analysis.