Skeletal Adaptations for an Aquatic Lifestyle in the Tail of Reptiles

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Introduction

Many reptiles are adapted for aquatic habitats. Crocodilians (such as the American alligator *Alligator mississippiensis*), the marine iguana (*Amblyrhynchus cristatus*) and Philippine Sailfin lizard (*Hydrosaurus pustulatus*) are all examples of reptiles that can be found in aquatic environments. We hypothesize that organisms adapted for an aquatic lifestyle should have anatomical adaptations related to that lifestyle.

The aquatic reptiles named above will be compared to the green iguana (*Iguana iguana*) that primarily inhabits terrestrial environments. We will examine the skeletal and muscular anatomy of these organisms to determine the anatomical adaptations, if any, that are present in relation to an aquatic lifestyle. Although these adaptations may be found throughout the body, our research will focus on the tail, as the tail is the primary structure used for locomotion in many aquatic organisms.

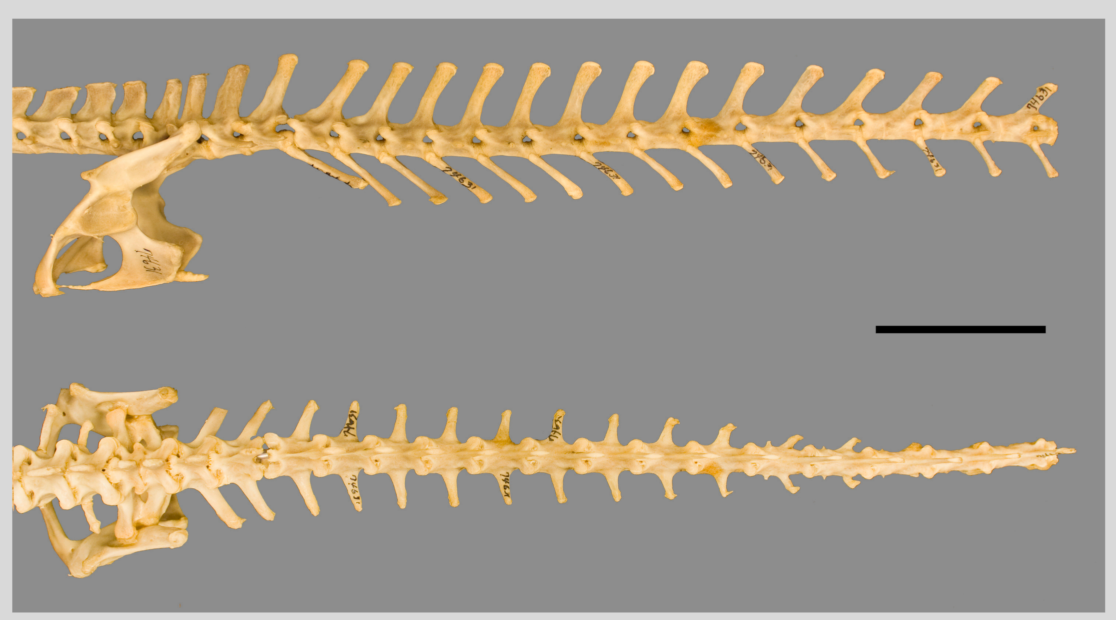
Materials and Methods

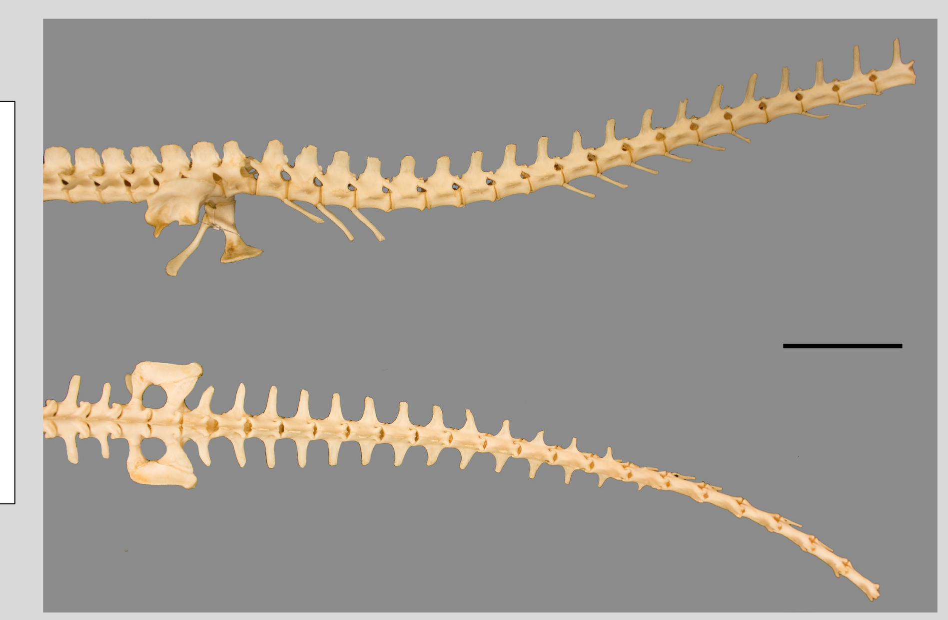
We examined the caudal skeletons of specimens from the following genera: *Iguana* (n=11), *Alligator* (n=3), *Caiman* (n=3), *Paleosuchus* (n=1), *Hydrosaurus* (n=3), and *Amblyrhynchus* (n=10). All skeletal specimens were housed in the collections of the American Museum of Natural History (AMNH) in New York, NY. In addition, we dissected preserved specimens of *Iguana* (n=3) from Ward's Science.

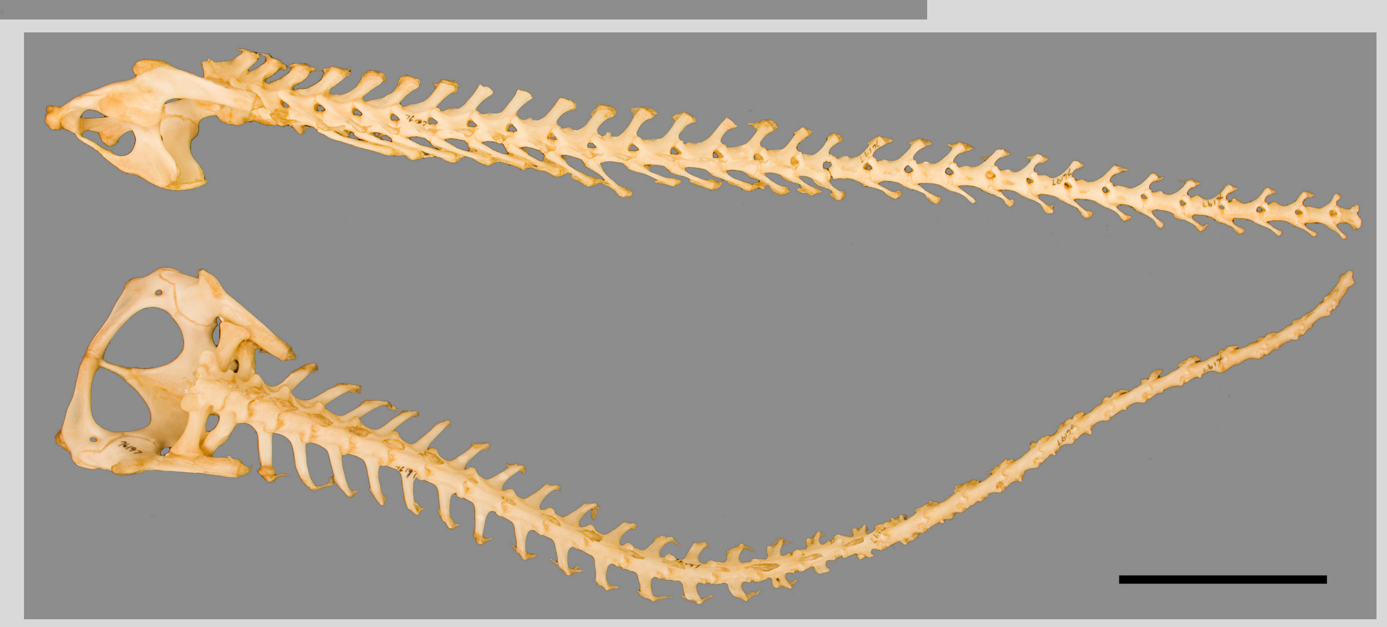
Results

- Centra and zygapophyses don't differ greatly between the species studied.
- Moving down the tail, transverse processes and chevrons taper until they disappear.
- Neural spines at the base of tail in Crocodilians are longer in the anterior-posterior direction as compared to the other species studied.

Figure 1: Organisms examined in this study, pictured above from left to right: Green Iguana (*Iguana iguana*), American Alligator (*Alligator mississippiensis*), Marine Iguana (*Amblyrhynchus cristatus*) and Philippine Sailfin Lizard (*Hydrosaurus pustulatus*).







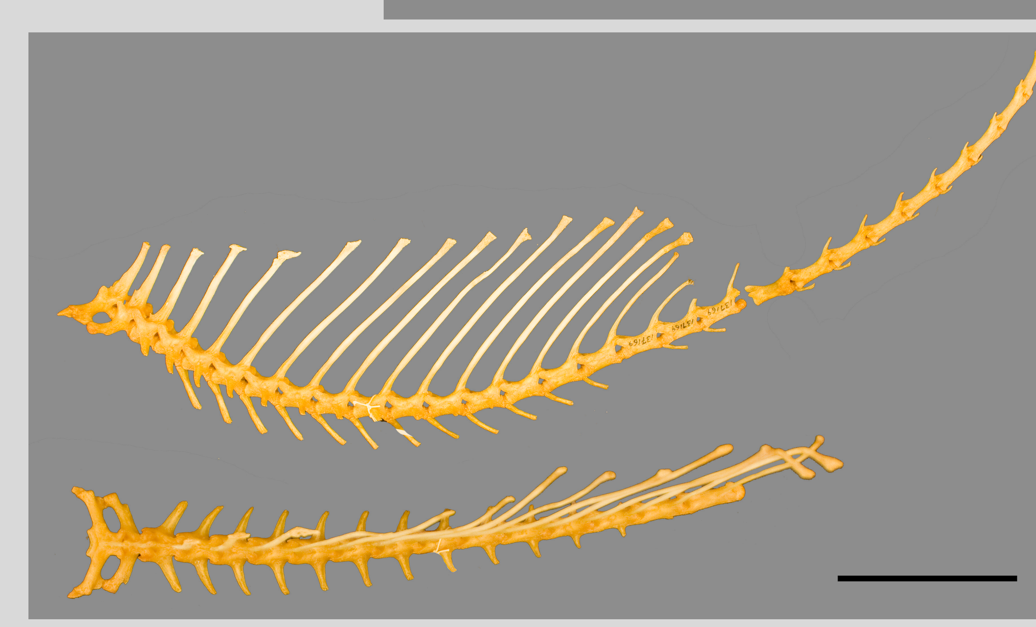


Figure 2: Skeletal Anatomy of *Iguana iguana* (left), *Alligator mississippiensis* (right), *Amblyrhynchus cristatus* (below left) and *Hydrosaurus pustulatus* (below right). All scale bars 5 cm.

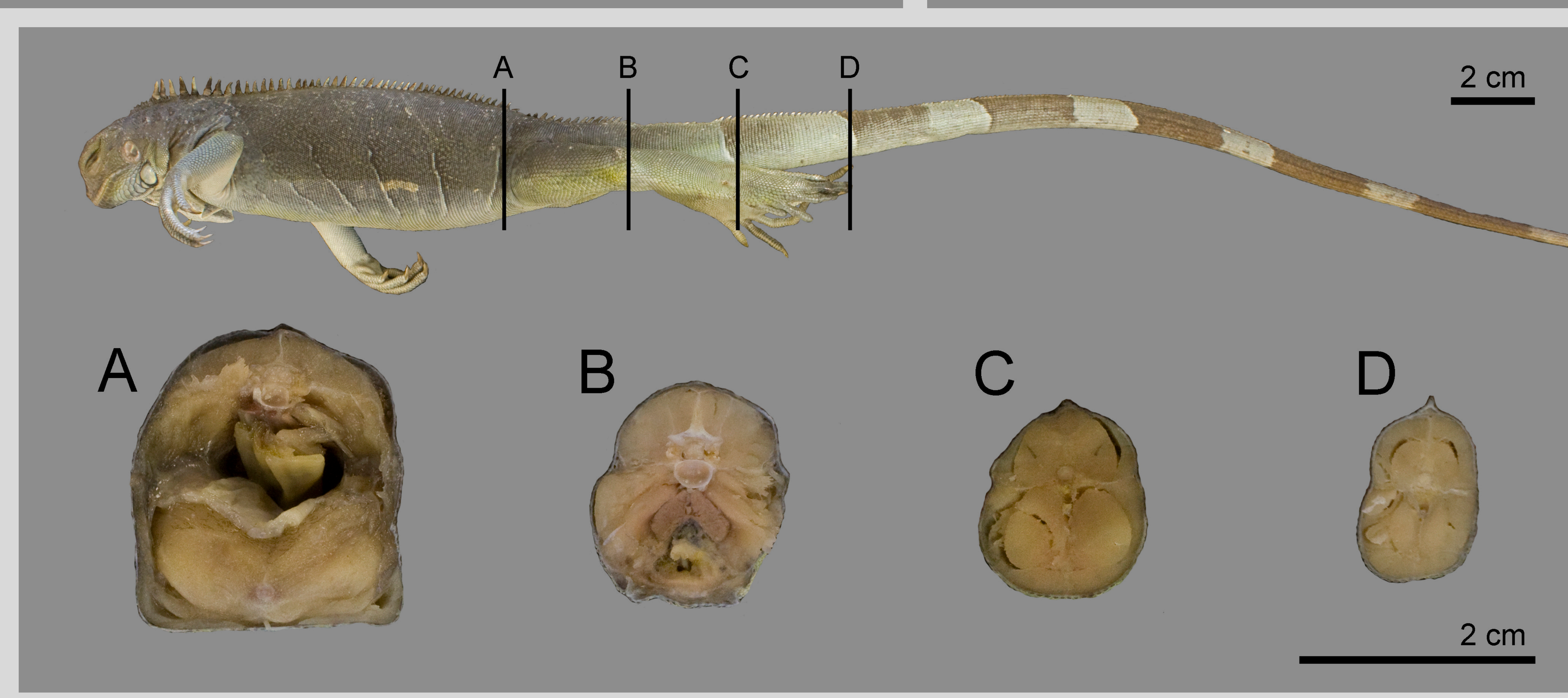


Figure 3: Cross-sections of the iguana torso and tail showing musculature

Results (continued)

- Neural spines in *Hydrosaurus* are longer in the dorso-ventral direction as compared to the other species studied.
- The distal end of the elongate neural spines in *Hydrosaurus* get longer in the anterior-posterior direction rather than tapering to a point.
- The muscles in the dissected specimens of *Iguana iguana* appear very similar to descriptions from other reptiles.

Conclusions

- The longer neural spines in Crocodilians are hypothesized to provide greater surface area for attachment of muscles or tendons moving the tail laterally.
- The elongate neural spines in *Hydrosaurus* support the caudal fin and may also provide greater surface area for muscle or tendon attachment. The distal ends may also support other soft-tissues and should be investigated further.
- Despite an aquatic lifestyle, the tails of marine iguanas look similar to terrestrial iguanas.

Acknowledgements

We would like to thank David Kizirian and Margaret Arnold of the American Museum of Natural History for arranging access to specimens. We would also like to thank The Loyal Order of the Moose (Lodge 1379) for their generous funding of this project.

Attributions