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Growth dynamics and body size evolution of South American long-necked chelid turtles: A bone histology approach

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Among turtles, cases of “gigantism” occur mostly in pleurodiran Pelomedusoides and cryptodirans, but are infrequent among pleurodiran chelids, which are mostly small-medium sized turtles. *Yaminuechelys* spp. are extinct South American long-necked chelids (from the Late Cretaceous–early Paleocene of Patagonia, Argentina) with caparaces almost three times larger than their extant sister taxon, *Hydromedusa tectifera*. Since evolutionary changes in size can be analyzed based on growth dynamics, we studied growth strategies from an osteohistological point of view. We sampled both extinct (*Yaminuechelys maior*) and extant (*H. tectifera*) species, in order to test hypotheses related to the mechanisms involved in the macroevolution of size within this clade. For this purpose, thin sections of long bone (humerus and femur) shafts of specimens of different ontogenetic stages for these species were prepared. The osteohistological study reveals a similar growth dynamic in both taxa, with a poorly vascularized cortex dominated by parallel- fibered bone and interrupted by lines of arrested growth (LAGs). The huge body size of *Y. maior* appears to be a consequence of the prolongation of the growth phase, suggesting that it had a longer lifespan than *H. tectifera*, allowing to reach greater sizes. In this way, and assuming that there is no displacement at the beginning of development (e.g., a delay in the earliest stages of growth) in *H. tectifera*, the acquisition of a large size in *Yaminuechelys* would be explained by hypomorphosis of the former or hypermorphosis of the latter, depending on the reconstruction of the ancestral condition of this clade.

Key words: Testudines, Chelidae, growth rate, body size, paleohistology, ontogeny, Paleocene, Argentina

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