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HOW TO BUILD A HECKIN' CHONKER: BODY INFLATION IN THE ONTOGENY OF CARCINOSOMATID EURYPTERIDS

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Understanding how the mechanisms that result in the development of new morphologies act is fundamental to exploring how evolution operates. Carcinosomatids are an unusual group of eurypterids which are characterized by the possession of a greatly expanded, disc-like preabdomen along with relatively short prosomal appendages bearing well-developed spines. The ontogeny of this highly distinctive group is revealed by a species from the Silurian of Lesmahagow, Scotland. Specimens of *Carcinosoma scorpioides*, originally considered to be three separate species, are here shown to represent at least three different ontogenetic stages ranging from early juveniles to adults. The earliest instars are markedly different from the adults, with a narrow preabdomen and elongated prosomal appendages bearing moderately-sized spines, resulting in an overall appearance more reminiscent of the closely related mixopterids. The species first undergoes an expansion of the preabdomen while a relative reduction in the length of the prosomal appendages occurs in later instars. Other eurypterids exhibit a relative reduction in prosomal appendage length over ontogeny, with juveniles having exceptionally long appendages, and also have a reduced prosomal armature which increases progressively during growth. Eurypterids also show a positive allometric trend in preabdominal width early in their ontogeny. As such, *Carcinosoma scorpioides* exhibits the same general developmental trends seen in other eurypterids, indicating that the ontogenetic trajectory of eurypterids is generally conserved even amongst highly aberrant members of the clade. Furthermore, the preserved ontogeny of *Carcinosoma scorpioides* suggests that the unusual morphology of carcinosomatids developed due to peramorphic heterochronic processes whereby species develop exaggerated characteristics along the ontogenetic trajectory beyond the ancestral condition. Interestingly, despite these traits all being derived through peramorphy, mosaicism is evident in these heterochronic changes with the body width increase occurring due to an increase in the rate of allometric change early on in ontogeny, while the reduced appendage length and enlarged armature appears to be associated with an increase in body size and may be due to either a delay in reaching maturity or an increase in the rate of growth later in ontogeny.

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