3 Phylogeny and fossil record of marine squat lobsters

Shane T. Ahyong, Kareen E. Schnabel and Enrique Macpherson

ABSTRACT

The phylogeny and fossil record of the marine squat lobsters, Chirostyloidea and Galatheoidea, are reviewed. Until recently, marine squat lobsters, porcelain crabs (Porcellanidae), freshwater squat lobsters (Aeglidae) and the recently discovered 'yeti crab' (Kiwaidae) were thought to have a monophyletic origin because of their similar overall body form, and were grouped together as the Galatheoidea. Recent decades, however, have seen major advances in our understanding of squat lobster phylogeny. These have come through shifts in the methodological paradigm, from phenetics to cladistics, in addition to new and expanded datasets. The most recent major development recognises squat lobster polyphyly, indicating that separate clades of squat lobsters evolved from within the hermit crabs, warranting two independent marine superfamilies, Galatheoidea and Chirostyloidea. The squat lobster body form originated independently at least twice, once in the stem lineage of the Galatheoidea and once in the stem of the clade containing Chirostyloidea and Aegloidea. Moreover, the two marine superfamilies are each associated with a strongly carcinised group, and each is closely related to a separate clade of symmetrical hermit crabs (Pylochelidae). Galatheoidea, which include the crab-like porcelain crabs (Porcellanidae), are closest to a clade of pylochelid hermit crabs of the subfamily Pylochelinae. The Chirostyloidea and Aegloidea are closest to the crab-like Lomisoidea and, together with the asymmetrical Parapaguridae, are sister to the pylochelid subfamily Trizochelinae. Hence, the transition from a long-tailed symmetrical hermit crab to a crab-like form appears to have proceeded via an intermediate squat lobster-like form. The fossil record of the Chirostyloidea is currently restricted to a probable stem-lineage kiwaid, *Pristinaspina gelasina,* from the Cretaceous of Alaska. Given the palaeo- and modern distribution of kiwaids, Kiwaidae probably evolved along the eastern Pacific margin. The palaeo-localities of *P. gelasina* and the few known aeglid fossils support a Palaeo-Pacific rather than Tethyan origin for Chirostyloidea. The fossil record of Galatheoidea indicates a Jurassic Tethyan origin followed by broad expansion into the northern hemisphere by the Late Cretaceous, and a near-cosmopolitan distribution by the middle Tertiary. Most controversies in anomuran phylogeny have focused on hermit crabs, with the squat lobsters regarded as an uncontroversial, monophyletic group. However, the polyphyly revealed by cladistic analyses with clades rooted among other major anomuran taxa shows that, far from being peripheral to paguroid