Exceptionally Preserved Fossils of Minute Infective Larvae – 90 Million Years Old Window Into the Evolution of the Parasitism of Epicaridean Isopods

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Isopoda is an ingroup of Peracarida and must be considered an overall evolutionary successful group. Isopods have conquered numerous habitats from the deep sea to dry desert and exhibit various feeding strategies. In most isopods the early post-embryonic stages strongly re semble the adults. The obligate parasitic epicarideans form an exception. Their life cycle is complex and includes a host switch and extreme sexual dimorphism. This requires two highly mobile stages. One of them is the cryptoniscus larva. After detaching from its copepod larval host, it becomes plan ktic and searches for its definitive host. Within Epi caridea there are different strategies to feed on the definitive hosts right up to endoparasitism. The most specialised form is the inhabitation of the gill chamber which can be indirectly traced back to the Jurassic period, i.e. 200-142 million years ago, based on specific deformations of the hosts. Here, we present the so far oldest record of epicaridean body fossils from a rare sample of French Cretaceous amber of about 90 million years in age. This represents a rare kind of preservation where marine organisms were trapped in resin in a coastal environment. With the help of high-resolution composite fluorescence microscopy, we shed light on their highly specialised morphology that was already present in the Cretaceous and discuss implications of this find on the evolution of the synecological relationship between parasites and their hosts

You Are What You Eat, You Are Where You Live - Caime Part 1 - Trace Metals in Crustacea, Biomonitoring of the Marine Environment

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The state and health of our marine environment is paramount to our societal and economic wellbeing. One approach towards assessing and preserving the uniqueness of our marine estate is understanding the chemistry of the organisms occupying it. The uptake of elements from the environment into their tissues and particularly into their exoskeleton makes them recorders of their chemical environment. This, in turn, allows for the monitoring of events that might occur over time, such as changes in levels of trace metals resulting from offshore mining activities, urban development, or ocean acidification. Here, we present the first part of the CAIME (Crustacea As Indicators for the Marine Environment) study which includes preliminary trace element baseline data for shallow marine Decapoda from around New Zealand. Thirty trace elements have been analysed from two decapod species, the coastal crayfish (Jasus edwardsii) and deep-sea squat lobster (Munida gracilis) using acid digestion techniques combined with inductively coupled plasma mass spectrometry, and preliminary results are compared with those for Amphipoda (CAIME I). The results show distinct patterns between species and locality and indicate a potential for evaluating natural variations and consequently unusual changes across a range of geographic localities. Further, the results provide the potential to compare across two orders of crustaceans that occupy very different habitats and trophic niches. These two presentations will cover the hypotheses and implications of the first results of this 3-year programme and how any changes in the marine environment can be assessed in the future.

Unknown Unknowns: What Would We Not Know About Pancrustacea Without Fossils

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Everyone recognizes that fossils do tell us a lot about evolution within Arthropoda. But if we had no fossil record, what would we have missed amongst the Pancrustacea? We would never know – so they could not be missed. Nevertheless, it is interesting to play the game of “unknown unknowns.” First of all, our understanding of biodiversity would be depleted. Exact numbers remain vague, but as an example, in the Class Oligostraca the ostracods have around 14,500 living species and subspecies, and estimates indicate that another 56,000 ostracods are extinct species residing only in the fossil record. That is a great deal of missing diversity. Second, our understanding of body plan disparity would suffer. For instance, we would not know about several members of Class Multicrustacea such as: Cyclida (an infraclass of the Subclass Hexanauplia), Pygocephalomorpha (an extinct peracaridan order of Infraclass Eumalacostraca), and Thylacocephala (an enigmatic infraclass, probably of Multicrustacea). Gaps in understanding the evolution of living crustaceomorphs have also fallen prey to the effects of unknowns. Before World War II, branchiopods served as a kind of ancestral type. That is until 1943 when Mystacocarida were discovered. Before 1955, Cephalocarida were unknown. Not until 1981, were Remipedia unveiled. Each of these groups in turn served as a succession of avatars for ancestral types of crustaceans. Then between 2010-2013, DNA sequence data overturned all our old ideas: Hexapoda united with the paraphyletic crustaceomorphs to present us with a new reality, class Pancrustacea, which included the merger of three of the “old ancestors” of the crustaceans—branchiopods, cephalocarids, and remipedes—into a new subclass Xenocarida. How are we now to make sense of the evolution of hexapods from crustaceans? Can new “unknowns” provide insight? Such is indeed, and continues to be, the case. We not only have new insights about the radiations of crustaceans based on real fossils (Briggs et al., this meeting), but also from newly recognized crustaceomorphs we can now perceive what crustaceans evolved into (insects) and how they might have done it (via xenocaridans).

Paleoecology of Podotrematous Crabs and Galatheoid Anomurans

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Paleoecology of fossil podotrematous crabs is only beginning to be studied. Preliminary analysis of members of podotrematous families indicates that families preferentially inhabited specific types of environments as defined by rock type. Many dromiacean families are predominantly recovered from carbonate environments, whereas homoloids and raninoids exhibit a broader environmental preference. Extant families, in general, exhibit broader environmental preferences than extinct groups. Within families, genera in Dromiacea and Homoloidea as well as the anomuran Galatheoidea demonstrated niche partitioning during the Late Jurassic. Correspondence analysis of 29 Late Jurassic decapod collecting localities in Europe demonstrated sponge-microbial versus coral bioherms exhibited distinct podotrematous and galatheoid decapod faunas. Of 50 genera examined, 30 never were recorded from sponge-microbial environments, whereas all taxa occurred at least once in coral dominated environments. Genera within six families were only collected from coral facies, and genera within only two families were predominantly collected from sponge-dominated facies. Among members of Raninoida, some families are predominantly associated with siliciclastic environments, whereas others are dominantly collected from carbonates. Niche partitioning among podotrematous brachyurans and galatheoids parallels that seen at the infraorder level in Decapoda, wherein specific groups of decapods generally inhabit specific types of environments, which remains consistent through time.