Part 9
Friend or Foe
The Crustaceans continued

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This article aims to finish our look at the crustacean families we may encounter in reef aquaria, either as hitch-hikers on live rock or in association with the specimen invertebrates imported from many regions of the world. In the previous two crustacean articles we have concentrated on large species whose presence is obvious even if they are glimpsed only fleetingly. This time we will look at the small species, usually less than 1cm, which can be present in surprisingly large numbers in reef, and sometimes, fish-only aquaria.

Before we begin to look at the individual families it is worth reminding ourselves some of the distinguishing features of crustaceans. Namely that they are segmented, bilaterally-symmetrical animals with two pairs of antennae and articulated legs. With the possible exception of the sea-spiders (Pyenogonidae) any insect-like animal you encounter in your reef aquarium is almost certainly a crustacean.

The last article centred on the true crabs from the order Decapoda. Before we go on to looking at species from different orders I need to tie up a loose end although this group does qualify for inclusion by size alone.

Order: Decapoda
Infraorder: Anomura
Puguritta spp.

Many people purchase pieces of plume rock which is also known as Christmas tree worms or *Porites*. The specimen consists of a colony or *Porites* hard coral that has been bored into by colourful tubeworms. However, it can also be home to other animals. Barnacles are particularly common in *Porites* but so too is a decapod crustacean – the *Porites* hermit crab (***Fig 1***). Identified by its long antennae and striped pincers this hermit has given up the roaming life typical of most hermits. Instead it occupies vacant tube-worm tunnels. How does it find its food? Well

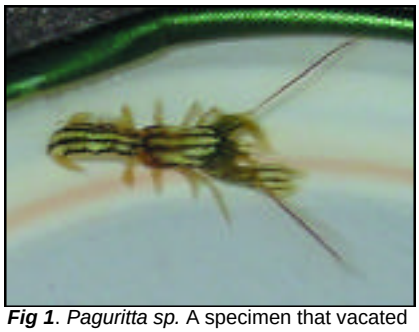

Fig 1. *Paguritta sp.* A specimen that vacated its tube voluntarily but is much more at home in *Porites sp.* hard coral

those long antennae have a use – their surface area is enlarged by hair-like projections which, when waved in the water column, trap particles of detritus and plankton which the crab then removes and eats. The waving motion of the antennae is often the first thing that draws the aquarist's eye to these remarkable little crabs.

Sub-order Gammaridea

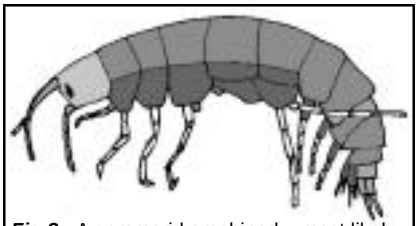

Fig 2. A gammarid amphipod – most likely to be encountered at night or in association with mechanical filtration e.g. filter sponges

The largest group of amphipods comprising well over 4000 species are the Gammarids (***Fig. 2***). Most gammarid amphipods can be recognised by their hump-backs which gives the body a crescent shape when viewed from the side. Turn over a stone on the high tide line of rocky shores in the U.K. and you are likely to be greeted by a mass of jumping amphipods with a shiny brown appearance commonly known as sand hoppers. The body form of these temperate animals is fundamentally the same as those we almost certainly will experience in marine aquaria.

Although capable of swimming the amphipods we are likely to see scurrying for cover as the lights go on use their elongated legs called Pereopods to scuttle across the substrate. They feed primarily on detritus and consequently are often washed from the surfaces of mechanical filters during routine maintenance. Amphipods provide an important food source for many of our aquarium fish particularly the Mandarins (*Synchiropus splendidus* and *S. picturatus*) which is why the introduction of such fish is recommended for mature aquaria with a self-sustaining population of these small crustaceans. However, it has to be argued that adding such fish is of detriment to the reef system as they will reduce the numbers of a beneficial organism thus threatening the establishment of a "balanced" ecosystem. I fully understand why hobbyists want to keep such beautiful fish but before they stock them they must be aware of their impact on the reef.

Sub-order Caprellidae

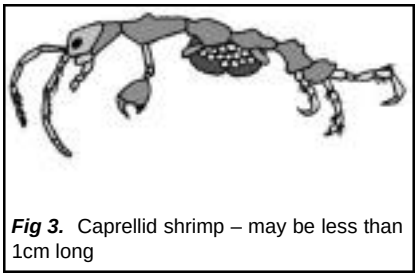

Fig 3. Caprellid shrimp – may be less than 1cm long

Although I have attempted to describe the most common amphipod species found in marine aquaria the order has an incredible amount of diversity in terms of shape and

other characteristics. One such group is the Sub-order Caprelldae. Caprellids (***Fig. 3***) are small shrimp-like amphipods with an elongated body form resembling tiny stick-insects. Like the latter their body form is adapted from climbing and they possess grasping pincers at the ends of their legs which they use to hold onto algae and hydrozoans which are home to these enigmatic little creatures. Very often it is their mode of locomotion which attracts the eye rather than spotting the animal itself. Caprellids move with a looping action seen in some caterpillars. Some caprellids are carnivorous but they are too small to be a threat to fish or larger crustacean species. Most remove detritus and algae from the surfaces of their host animal or "plant".

Superorder Peracarida

Order Isopoda

Fig 4. **Left**: The body form of a typical marine isopod – very similar to its close relative the woodlouse.

Below: Actual free-living isopod

We are all familiar with the largest group of terrestrial crustaceans – the woodlice – even if we didn't appreciate that they are more closely related to crabs and shrimp than the much larger group of terrestrial arthropods – the insects. (I believe that if you boil a number of woodlice in a little salted water you can make a passable shrimp-flavoured broth – I must emphasise that my curiosity has never got the better of me to try this one for myself!). Woodlice are isopods (***Fig. 4***) and provide a helpful model for the rest of the order. Most obviously segmented crustaceans are likely to be either amphipods or isopods. It may be helpful to think of sand hopper-like crustaceans as amphipods and woodlouse-like animals as isopods. There are over 4000 species of isopod currently known to science – most are flattened in appearance and most, like the amphipods, are less than 2cm in length. Giants exist within this order too with another deepwater behemoth reaching almost 18" in length – currently the largest described species. Imagine an 18" long woodlouse!

Isopods are primarily adapted for a crawling existence and are thus found on aquarium substrates such as live rock and sand where they may feed on algae and detritus. Such species are to be welcomed in marine aquaria. However, many isopods are parasitic and one group represented by *Rocinela spp* (***Fig. 5***) is particularly alarming for the aquarist. My first experience with this creature occurred some years ago with a Clarki clownfish (*Amphiprion clarki*). This was a beautiful female specimen that I had had for some time in an invertebrate system. Suddenly, as if from nowhere, she seemed to be carrying a hitch-hiker on the top of her head just behind the eye. The unwanted guest was an isopod – resembling the humble woodlouse in almost every way – including size. What could I do? Well, in the tradition of many scientists (and more terminal procrastinators) I did nothing in order to see what would happen. The parasite was in situ for almost a week. The bizarre thing was that the anemone fish seemed totally unconcerned by its occupation. When it eventually left its host, presumably after having its fill of body/blood fluids it left no clue as to its presence – the Clarki was completely unmarked and unphased by the experience. Since then I have seen several photographs of this isopod, often in residence on clownfish, although they are not specific to this group of fish. There is little information about them in the literature but about 18 months later the same parasite returned in the same aquarium. Whether it was the same individual I cannot say but it did exactly the same thing – remaining in situ for a week or so then disappearing without a trace. It is likely that freshwater dips would encourage the isopod to drop off its host but as, in my experience, the parasite seems to cause little or no harm in either the short or long term, discretion may be the better part of valour – leave it alone and it will soon be gone.

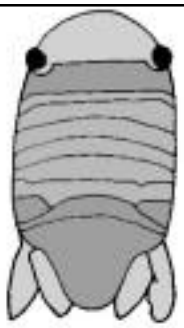

Fig 5. A marine isopod similar in form to one of the species which parasitises marine fish

Other parasitic isopods may exist in our aquaria but unseen from our ever-watchful eyes. Some species inhabit the gills of crabs. Others are adapted to share the dwellings of hermit crabs. We are unlikely to be able to do anything about such occupations even if we are lucky enough to spot them.

Order Mysidacea
Mysid shrimp

Fig 6. A mysid shrimp. Typically reef specimens measure around 5-10mm and are semi-transparent.

We covered the true shrimp of the order Decapoda in the first crustacean focus two issues ago. Mysids (***Fig. 6***) resemble true shrimp and most aquarists are familiar with them because they are commonly fed in frozen form to a variety of fish and invertebrate species. Almost 800 species are known to exist with the majority inhabiting marine environments. The species we are most likely to encounter is usually no more than 10mm in length and can be located in shaded areas of the aquarium where it will often be swimming in a looping manner describing a relatively smooth figure of 8 path. Because these small shrimp-like crustaceans have prominent eyes and a usually shallow "v" shaped tail region they are often mistaken for larval fish. Detritus is likely to form a large part of their diet in marine aquaria and they should be welcomed by aquarists. They will be consumed by fish wherever they can be caught – dottybacks prove particular adept at this. I know of a hobbyist who did not witness his newly introduced pair of Blue streak dottybacks feed for over three weeks yet they grew substantially in this time and always looked well fed. This phenomenon coincided with a distinct reduction in the numbers of free-swimming mysids in his aquarium!

Class Copepoda

Copepods are usually small crustaceans with cylindrical bodies represented by over 9000 species of which most are marine.

Just as the herbivorous land animals are extremely important in the food chain so too are the copepods in saltwater. They feed on phytoplankton and diatoms which represent the main primary producers in marine environments. The copepods are then consumed by many planktonic animals including larval and adult fish. Thus a link is formed between the producers of nourishment and the larger species that benefit from this process further down the food chain. Many copepod species are free-swimming and planktonic although those encountered in reef aquaria are generally substrate-dwellers.

Copepods exhibit a variety of dietary preferences. Most are, as previously stated, herbivorous but some are parasitic, such as the anchor worms (*Lernea spp*) – also the largest known copepods at up to 30cm, some omnivorous and others predatory. *Tisbe spp*. are known to swarm over fish consuming their fins until the victim is immobilised. It is then consumed at leisure. We are very unlikely to encounter these in marine aquaria – fortunately!

Copepods are another important food source for Mandarinfish and their removal by these fish species is significant enough for me to suggest that numbers of them should not be stocked unless the system can handle the extra copepod predation such is the latter's ability to consume detritus and uneaten food. This brings us back to the point about establishing an ecosystem rather than a mere display in reef aquaria – the more organisms we have doing beneficial jobs in a closed system the more likely it is to succeed. Thus predators of beneficial crustaceans should be stocked thoughtfully – preferably after the aquarium has had a chance to develop reasonable population densities.

Harpacticoid Copepods

There is one group of copepods that is likely to be in everyone's reef aquarium. Harpacticoid copepods are so small that they make a fine existence from living between grains of sand. Creatures which live in these spaces are called interstitial animals and may exist from a range of phyla including annelids, crustaceans and nematodes. The two main benefits of such animals are quite different but potentially quite significant for the reef aquarium. Firstly, and perhaps most obviously, they have an important role in the scavenging of particulate matter such as fish waste and other detritus that makes its way into the sand bed. Their second role is to do with a characteristic of most living creatures – the production of carbon dioxide gas through respiration. Carbon dioxide is, like many gases, acidic when dissolved in water. Couple the production of this gas with the habitat of interstitial organisms – namely calcium carbonate based sand and you have what could be termed as a mini calcium reactor. I won't go into the chemical formulae for the reactions that take place between calcium carbonate and carbonic acid but the result is an available form of calcium suitable for uptake by corals and certain algae.

It would be unwise for me to suggest this as an alternative to a manufactured calcium reactor or, indeed, any other method of calcium addition but it is important to realise the beneficial effects such animals can have on reef aquaria. For this reason I do not like to siphon sand in reef aquaria to clean it. Instead I rely on sand-shifting starfish, which may consume some of the beneficial organisms, but are unlikely to remove them completely. Many people I'm sure will disagree with this approach but I am firmly of the opinion that the more diverse the ecosystem in terms of different species present the more balanced it will become.

Class Tanidacea

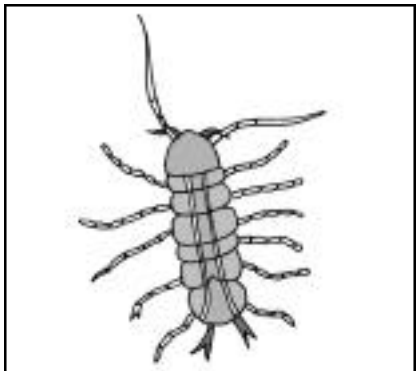

Fig 7. This species of tanidacean will be recognised by those who have wondered what the small, insect-like things are that swarm over the glass of newly established aquaria

Tanidaceans are usually small crustaceans (2-3mm) that make an appearance during the early stages of reef aquarium maturation. These small, white, insect-like creatures are particularly obvious to aquarists because they crawl all over the aquarium glass (see ***Fig. 7***) sometimes in very large numbers. Although always likely to be present in the aquarium in association with algae and some encrusting corals the initial population boom generally peters out after a few weeks. It could be that the rise and subsequent crash in numbers of this crustacean is dependent on the cycling of algae as the aquarium matures. Usually we see a cycle of algae forms – from brown diatoms to green film-like algae which are easy to remove to the harder green species which form hard plates on the glass. Usually by the time the harder-to-remove species have begun to colonise the glass the tanidacean population is already in serious decline.

Fig. 8a

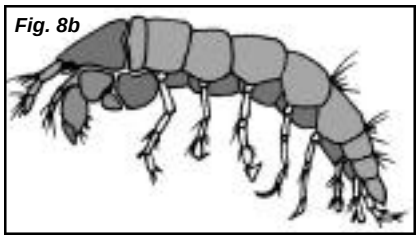

Fig. 8b

Another group I suspect to be tanidacans occurs in reef aquaria. Figure 8a shows a photograph of a living specimen from the side. Compare it to the line drawing of a temperate species in Figure 8b. The former is a relatively common tube-dwelling species which are often seen by aquarists when the crustacean's tube intersects with the aquarium glass. These hardy little beasts measure only 2-4mm in length and are excellent detritus feeders although they will also feed readily on uneaten fish food such as brine shrimp and mysis. I don't know too much about their life history but they must be capable of reproducing readily as the colonies I have in my coral sand have grown despite regular harvesting to "seed" other people's aquaria.

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Acknowledgements

Chris Higinbotham (TMC Manchester) for specimen acquisition
Matthew Gage, University of East Anglia
Lisa Birchall – Illustrations