

Part 10

Friend or Foe

The Echinoderms - Part 1

The phylum Echinodermata contains several species familiar to many people – how many children don't know what a starfish looks like? However, there are many members of this assemblage that are not so well known and some may be encountered by marine aquarists. Before we go on to look at individual species we will cover some of the unique attributes of echinoderms.

Echinoderm Classes

Asterozoa – True starfish
 Ophiurozoa – Brittle starfish
 Holothurozoa – Sea cucumbers
 Crinozoa – Feather starfish / Crinoids
 Echinozoa – Sea urchins/ Sand dollars/ Sea potato etc.

Echinoderm means literally "spiny skin". This characteristic is due to the unique internal skeletal structure found in all echinoderms, consisting of calcareous ossicles, which are articulated in sea stars and rigid in sea urchins and contains a type of tissue termed mutable connective tissue. This can determine the rigidity of the echinoderms' body and is especially useful for animals that utilise its versatility. For example some starfish need to be manoeuvrable and flexible but then when preying on hard shelled animals they may need a degree of rigidity when attempting to prise the bivalve open. As aquarists we can experience the incredible nature of mutable connective tissue by observing sea cucumbers – a group of echinoderms. Sea apples in particular can inflate themselves up to relatively huge sizes (from tennis ball to football) in no time at all. It is reported that vigorous rubbing of a sea cucumber causes the tissue to become almost liquid – literally flowing through your fingers. Of course, this begs the question – why on earth would you want to do this but it is an interesting phenomenon nonetheless. Brittle starfish also exploit the properties of such tissue by shedding their arms when threatened – a phenomenon termed autotomy.

Another important feature of echinoderms is their water-vascular system used in locomotion and food acquisition. We can see the tube feet of starfish on their underside and often all over the surface of sea urchins – both are governed by the water-vascular system. Brittle stars lack tube feet but their highly mobile arms are powered by the same system as other echinoderms. Damage to this specialised system has been blamed for lack of success with some starfish in captivity.

Echinoderms are said to show pentamerous symmetry – that is they are essentially made up of five similar segments. Humans, insects, crustaceans, flatworms etc are bilaterally symmetrical. That is, the left side of our body is almost identical to the right. I say almost because we are not totally symmetrical – there are several studies going on around the world which hope to gain support for the theory that animals find symmetry attractive – the more symmetrical your appearance, whether it be wing length, facial proportions or patterning, the more attractive to the opposite sex you are. Irrelevant here but interesting nonetheless!

Echinoderms number some 6000 described species divided into 5 further classes as listed above. Of these the brittle stars have the most living species although the fossil record demonstrates that crinoids were extremely numerous and diverse many millions of years ago. Comatulid sea stars or "feather starfish" are sometimes purchased by aquarists due to their beautiful colouration. However, they are not suitable for the vast majority of marine aquaria and should be avoided. Crinoids are perhaps the only echinoderms we might not



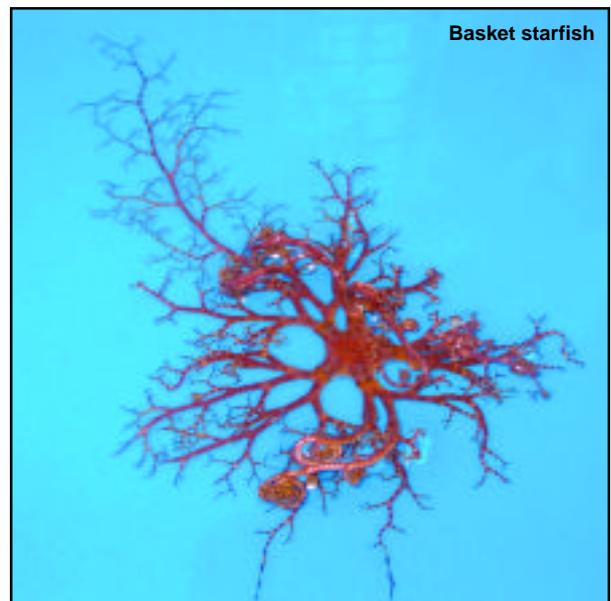
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expect to encounter in a live rock based reef aquarium although accidental introduction is not out of the question.

Class Asterozoa – True Starfish

True starfish have a variety of forms with the average number of arms being five but up to fifty are possessed by some species. In other species arms have become so shortened that the animal resembles a pentagon shaped pillow. Correct identification of closely related species is not straightforward and the taxonomist may have to resort to dissection to be absolutely sure of what they have.

One of the problems with starfish, however small, is that prey doesn't have to fit inside their mouths to be consumed. Starfish are capable of everting their



Basket starfish

stomachs and digesting whatever they are resting on. Thus large corals can be stripped of tissue with relative ease.

Fortunately, few asteroid starfish make their way into reef aquaria as accidental introductions. Those that do are likely to be from the following genus.

Genus: *Asterina*

These small starfish are termed "cushion stars" due to their chunky appearance and quite short arms. Colours vary and are not a reliable means of identification but the unifying feature of the species we encounter regularly in our aquaria is the slightly "chewed" look – almost as if something has been nibbling their legs! The numbers of legs vary although five appears to be average. In the U.K. we have an *Asterina* species called the common cushion starfish. This species is unusual in that it is not a broadcast spawner like most of the rest of the true starfish; instead eggs are laid under stones and rocks. If this is true of the reef specimens then this could explain why this species seems to thrive in aquarium situations although they are also said to reproduce through fission i.e. the splitting of the body into two.

There are reported to be three species of *Asterina* that are commonly imported with live rock. The 0.5cm, whitish ones appear to be pure algal feeders. This is the species we are most likely to experience in our reef aquaria. There are two other species that I have only seen in reference books. One is vivid green and the other 1cm+ across the arms at maximum size. Both of these species are reported to predate hard and soft corals. Thus only prolonged observation of any suspicious-looking specimens will determine what you have. Indiscriminate removal will ease your fears but have you just dumped something quite useful?

Control of harmful species

Given the potential for reproduction that *Asterina* shows in reef aquaria it is unlikely that the aquarist will ever control nuisance or harmful species of starfish by manually removing them, although this may be a valid technique if you can identify a potential problem early enough.

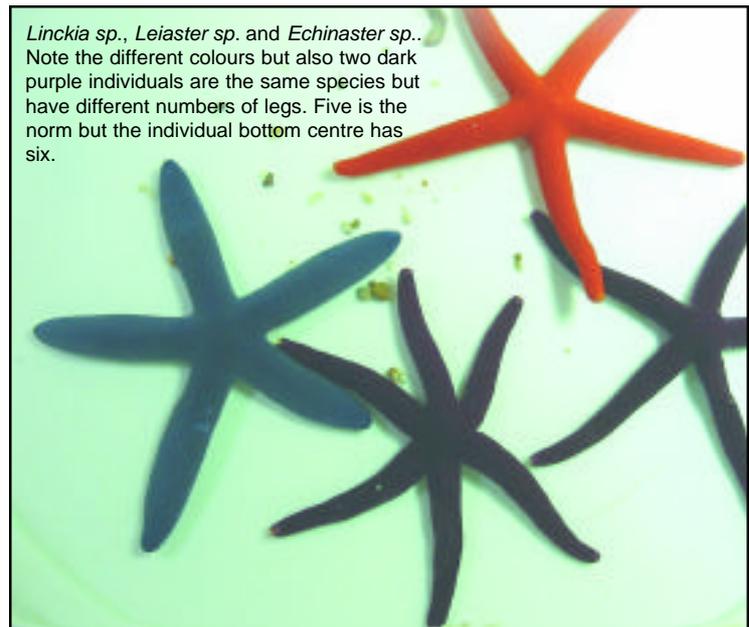
One technique of biological control has been suggested involving the use of the Harlequin shrimp (*Hymenocera elegans*). These beautiful crustaceans are obligate starfish eaters and so will ignore other foods. *Asterina* spp. are on the list of suitable foodstuffs for this shrimp but simply adding this species to your reef and expecting problems to disappear is naive. Biological control can work very well in a variety of situations but always relies on a

pest population being *controlled* rather than eradicated – thus the pest species must always be present albeit in small numbers – ok if you don't mind a few of your corals being scoffed rather than all of them. We have seen this situation before with

the nudibranch *Chelidoneura varia* that predate flatworms such as *Convolutriloba retrogemma*. Once the pest population is drastically reduced the predator population starves to death. Then the risk is that the pest population recovers or further pests are reintroduced. I believe that in this scenario such a control technique is unethical but there could be scope for perhaps sharing predators amongst aquarists (good luck in catching the shrimp!). The other alternative is to culture *Asterina* elsewhere and feed your shrimp with them.

Of course, it almost goes without saying that there must be no other starfish species present as these are likely to be attacked also!

Starfish have remarkable powers of regeneration. Most species are capable of regrowing an arm; some detached arms are capable of regrowing a complete animal. Sometimes we experience individuals from a species that usually has only five arms – but they have six, or four or more or less!

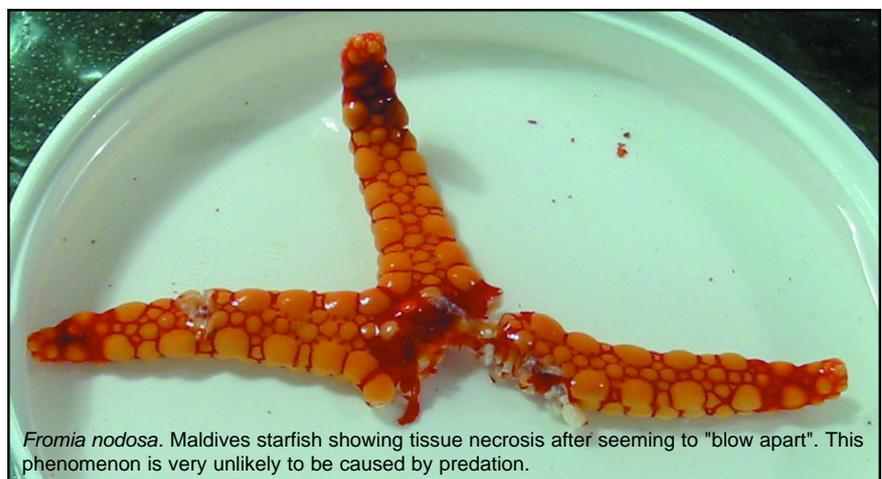


Linckia sp., *Leiaster* sp. and *Echinaster* sp.. Note the different colours but also two dark purple individuals are the same species but have different numbers of legs. Five is the norm but the individual bottom centre has six.

Thus counting legs is an unreliable identification technique.

Many aquarists experience problems with starfish within a relatively short time. Many specimens seem to disintegrate, sometimes very rapidly, sometimes over a period of weeks. Reasons for this are unclear. Many aquarists first believe that this is the result of an attack by a crustacean or bristleworm but this is extremely unlikely to be the cause, although such animals could scavenge partially damaged specimens. Some sources state that it is due to poor handling and shipping, others that it is due to diet. It is possible that both causes produce similar symptoms but the experiences with these animals lead many aquarists to believe that all starfish are sensitive.

Apart from the different *Asterina* species another type almost guaranteed to do well is a species of sand-shifting starfish probably a member of the genus *Astropecten*. These animals have become



Fromia nodosa. Maldives starfish showing tissue necrosis after seeming to "blow apart". This phenomenon is very unlikely to be caused by predation.



Figure 1. Assorted brittlestars from the rock to which a soft coral was attached

separation of legs from the body. As an escape response this mirrors the tactic used by several lizard species and the snail *Stomatella varia* and leaves the potential predator with a twitching morsel while the victim makes off rapidly and relatively unscathed. The brittle star then regrows a new arm. Brittle stars are perhaps the most abundant of all echinoderms that arrive by accident in reef aquaria. **Figure 1** Shows several individuals that arrived on a single

in the aquarium. There's not a lot you can say about comments like that is there? The class, Ophiuroidea does contain a group which are the exceptions to the rule – the basket starfish. These filter-feeding animals have arms which are branched to the extent that they resemble fine lace when extended. Sometimes available in the hobby they are not suitable for most aquaria unless specific attention and daily feeds are given.

Most of the species we encounter are very small, however, we are often tempted to purchase larger specimens as they have a useful role in detritus consumption. I prefer the sand shifters for this, as some species of brittle star are not as innocuous as they first appear. For example the Green brittle star, *Ophiarachna incrassata*, is a commonly kept species that can breed readily in home aquaria. It performs a useful role in many aquaria, as it will take uneaten food from the substrate and becomes very tame with time. However, this species has a sinister side too. Each arm is lined with elongated spines, similar to those in other species. However, used in the right way the starfish is in possession of an excellent trapping mechanism. Lifting its circular body clear

increasingly available over the past few years and many aquarists are using them to control detritus build up in their sand which can, if ignored, lead to cyanobacterial blooms (slime algae).

It is worth checking any newly acquired starfish specimens for other organisms. They can be home to several commensal and parasitic organisms including copepods, bristleworms and molluscs such as *Thyca spp.*, which we mentioned in the mollusc section of the *Friend or Foe* series.

Class Ophiuroidea – The Brittle stars

This, the largest class of echinoderms, numbering over 2000 species, gets its common name from the fact that careless handling or threat of predation causes the

piece of soft coral – and these were only the ones that left the rock, more may have been lurking inside. The good news is that the vast majority of such specimens are totally harmless and can be encouraged. Some species, such as *Amphioplus*, reproduce asexually and reach great numbers if conditions suit. More about this species later.

Identifying a brittle star as such is relatively easy as they usually have a circular body with thin arms that taper towards their end. However, I have heard some references by the less interested visitors to our premises to "the octopus"



Sand shifting starfish



Green brittle star – watch your gobies don't become ensnared

from the substrate the brittle star forms a shaded area which seems to appeal to fish which move innocently underneath. The brittle star detects this and springs its trap, moving quickly downwards and bringing the legs together. The spines form a cage and the fish, if it has not been alert enough, is doomed. It's interesting to note here that older books don't mention the undesirable habits of this species and it is recommended unreservedly by some.

Genus *Amphioplus*

Perhaps the most common of the accidentally imported brittle stars belong to the genus *Amphioplus*. These are often

Genera *Ophioderma* and *Ophiolepis*

misidentified as bristleworms as only their black and white banded arms are usually visible as they extend them in the hope of trapping detritus from the water column. The arms are usually no more than a centimetre or so in length and the body is rarely seen, tucked away in holes and crevices in live rock or coral base rock. This species is almost certainly capable of asexual reproduction as in favourable conditions its numbers explode. It should be considered totally harmless and beneficial in the trapping of suspended detritus.

Genus *Ophiothrix*

The sponge and soft coral dwelling brittle stars are relatively common imports but are unlikely to be encountered by large numbers of marine aquarists as the hosts of this echinoderm are not favoured by many aquarists due to their demands. Gorgonians, *Dendronephthya* soft coral and sponges are the commonest hosts and those that are home to this species generally do not photosynthesise and rely on their nourishment from feeding on phyto- and zooplankton or marine snow. This gives a clue to the dietary preferences of the Brittle star – it is believed that it removes particulate matter from the surface of its host rather than preying on the host itself.

These starfish have a beautiful colouration and their upkeep could be attempted in the absence of their hosts provided suitable food is offered.

Genera *Ophiocoma* and *Ophionereis*

Although unlikely to be encountered by most aquarists as accidental acquisitions it

is not inconceivable that members of these genera might arrive associated with coral base rock. They are certainly commonly imported with live rock but unfortunately do not survive the shipping process. Legs are very bristly and colour is variable from black to white and many colours of the rainbow. They are beneficial creatures which feed on fish faeces, uneaten fish food and detritus.

The serpent starfish are so called because their plain, unbristled arms snake along the substrate in search of food. The jury appears to be out with regard to their usefulness in reef aquaria. Some authorities state they are among the best scavengers

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you can have, others say that they represent a potential hazard to fish. The vast majority of specimens I have experienced, including some very large Red serpent starfish (*Ophioderma squamosissimus*) have proved safe. The individual in the image above was only quite small and almost certainly will prove a lucky acquisition for whoever purchased the coral it arrived with.

This is the end of our first look at the echinoderms. In the next article we will look at the other classes in this phylum – the sea urchins and sea cucumbers.

Brittlestar *Ophiocoma* sp.