Friend or Foe

Part 6

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DIGITAL IMAGES BY THE AUTHOR

The segmented worms of the Phylum Annelida are some of the most frequently imported accidental additions to reef aquaria. Even "fish only" aquaria can harbour certain species and most, given adequate conditions, will thrive and even reproduce. Unfortunately, in some instances, this is the last thing you want!

General Biology

Segmentation is an important evolutionary characteristic and the term is applied to animals where the body is divided longitudinally into a number of repeated similar units termed segments. This has probably arisen independently three times in the animal kingdom: other animals showing segmentation are the arthropods (Insects, crustaceans etc) and indeed, most chordates (vertebrates).

Segmentation can be clearly seen when the whole animal is visible, however, as with many of the animals mentioned in this series, sometimes only one body part is visible and therefore we must use this as the identification clue. Usually the feeding appendages can be used to identify the type of worm we are looking at.

It is important to realise that if you have an unidentified worm-like specimen that does not show segmentation it is probably not an annelid but one of the other groups that occur. These will be discussed in a later *Friend or Foe* article entitled "miscellaneous"!

The Phylum Annelida contains three further subdivisions termed Classes – all have marine representatives, but only one group, the Polychaetes, are of concern to marine aquarists. The other two, Oligochaeta and Hirudinea include the earthworms and leeches.

There are over 10000 described species of polychaete worms – most are marine and such is the diversity of form within the Class, they have been allocated to 80 plus further Families. Sizes range from almost microscopic to over a metre long. Many anglers and visitors to the seaside will be familiar with some temperate species of polychaete such as the lugworm (*Arenicola marina*) and the Ragworm (*Nereis virens*). The latter species has several similar relatives that inhabit reef aquaria.

Polychaetes are given the common name bristleworm due to many species having hair-like projections from their body segments. These are located on extensions of the body segments called parapodia and are used primarily as an aid to locomotion. Some species have refined these hairs to contain toxins, for example the coral-eating fireworms. Many people refer to bristleworms as centipede-like animals and in many ways they are – but they do not possess true limbs.

Errant (Mobile) and Sedentary (Immobile) polychaetes

Many polychaetes are classified according to their mode of existence and diet. For example, tube dwelling selective deposit feeders. This can be a little confusing and is undoubtedly too much information as far as this article is concerned. Instead we will refer to errant and sedentary forms. However, because a worm lives in a tube does not mean that it is a permanent resident there. Many common bristleworms are found in tubes by day only leaving them at night to search for food. Other species, for example the filter-feeding worms such as feather duster worms (*Sebellastarte sp*) (**Figure 1**) are capable of moving around but can still be classed as sedentary as they will remain in much the same position in the aquarium when settled.

Perhaps the most sedentary worms are those that secrete a calcareous tube such as the koko worms of the genus *Protula.* (**Figure 2**).

One of the most remarkable characteristics of polychaetes is their ability to take

Fig 1. *Seballastarte sp*. tubeworm – the widely available "feather duster" worm

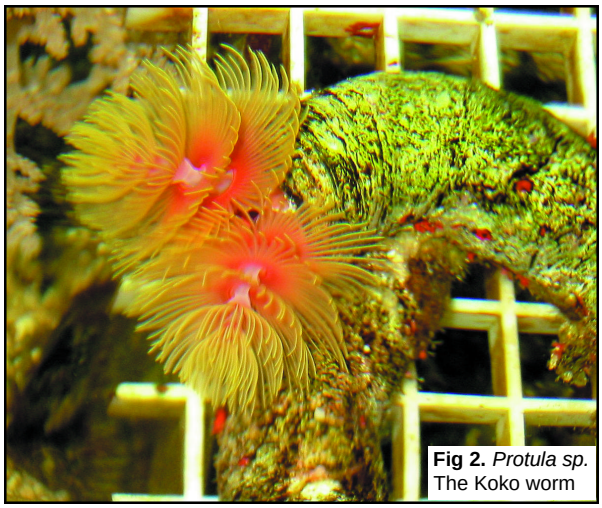


Fig 2. *Protula sp.* The Koko worm

advantage of a particular environment. This is partly due to the ability of certain species to reproduce asexually thus very quickly forming large populations to exploit available resources. A study of one square metre of reef substrate undertaken in 1997 found only15 individual fish present, but over 23,000 polychaete worms. Other studies have shown densities of over 13000 per square metre belonging to over 35 individual species. Equate this to a large reef aquarium and we can see that even if we think we have a large number of bristleworms in our aquarium, it is unlikely to be anywhere near the natural population! It also shows how difficult it can be to achieve a good balance in the reef aquarium.

Errant Polychaetes

Fig 3. A common species of bristleworm (*Eunice sp.*) found in reef aquaria – probably totally harmless when small but specimens like this one measuring over 75cm can be a real problem. This was trapped using the method outlined later in the article.

Before I go on to focus on the commonly found species I would like to point out the problems that we, as dealers or professionals, have when we are asked about bristleworms. Firstly, we recognise that in *most* instances, errant bristleworms represent no threat to any of the fish or corals contained in a reef aquarium. However, given that harmful species do exist it would be irresponsible for us to say *all* bristleworms are harmless and leave them in the aquarium. The dietary preferences of the worm may change as it becomes larger and is able to tackle larger prey items. The individual may be one of the small number of harmful species that do attack corals, fish and molluscs in the aquarium. So if you can safely remove the beast without decimating your reef – remove it. But a word of warning – I have seen many instances of bristleworms being blamed for seemingly inexplicable deaths when really an inadequate system or poor husbandry is to blame. There are very few animals on the reef that will not take advantage of a good source of protein such as that provided by a dead fish. If an aquarist visits his or her aquarium and witnesses a bristleworm munching on the corpse of a fish it is perfectly natural that they will assume that the worm is the aggressor and has killed the fish. This is possible although unlikely, particularly in the case of larger fish like Dwarf Angel and Surgeons unless the worm concerned is a real whopper. Some fish are more vulnerable to large bristleworms than others, however. Firefish (*Nemateleotris spp.*) will wedge themselves in tunnels in the rock so firmly that a bristleworm can eat them from the tail upwards! Is this aggression? Probably not, more likely opportunism – but I would still want a worm capable of this out of my aquarium!

Taxonomy

The classification of a bristleworm to species level can be extremely difficult and centre on the ability of the investigator to count and distinguish differences between appendages such as antennae on the head and link them to position of the eyes, chaetae etc. This is made even more difficult if there is no taxonomic key available for all species, as is the case for many found in reef aquaria. It is quite sobering to realise that your aquarium may contain species as yet undescribed by science! It can be difficult for inexperienced investigators to classify even well-documented temperate species such as *Nereis virens* and *Nereis diversicolor*. I will attempt to give identification clues wherever possible but as with all the animals contained in this series unless you are 100% sure as to the identity of your mystery beast, be vigilant!

Families Phyllodocidae, Nereididae, Syllidae , Eunicidae and Polynoidae

The classification of these families of bristleworms can usually be done by scrutinising the head and proboscis structure and appendages. Unfortunately the proboscis is eversible, that is, it is usually held inside the body "inside out" and by pumping fluid into it it can then be extended. Encouraging a worm to do this on cue can be a very frustrating experience! The proboscis can carry a number of appendages which are used for feeding such as the large pincers typical of the Nereididae.

Phyllodocidae

One of the commonest of all mobile bristleworm families they are commonly imported with live rock and are superb scavengers. They do not possess jaws and produce copious amounts of mucus when disturbed. Although they will take injured or dying small fish they are generally believed to be harmless.

Nereidae

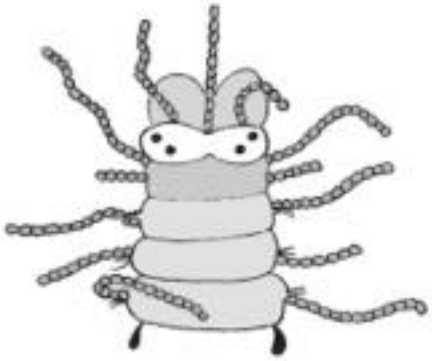
Head structure of Nereidae

Four eyes present, two antennae and many pairs of feelers. A single pair of jaws is present when the proboscis is everted.

This family together with the Eunicidae includes some of the larger specimens of bristleworms likely to be found in reef aquaria. The temperate Ragworm is a good example of this species and they all have very defined segments and strong jaws which can be used in defence – as any sea angler will tell you! However, their most common usage is in the procurement of food such as algae and small crustaceans. They will also scavenge for uneaten food in the aquarium. Large specimens could present a problem to small fish and can be removed using the trap detailed in figure 8.

Syllidae

Head structure of Family Syllidae

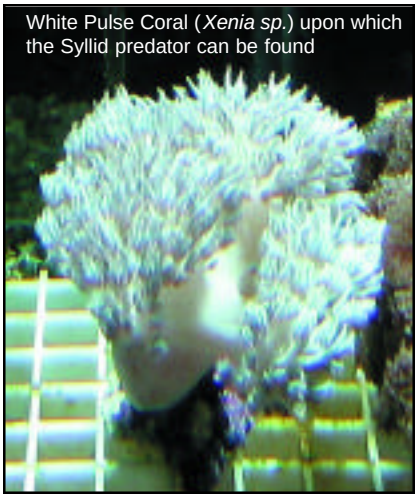


Usually delicate appearance with three anetennae

The syllids are a group of polychaetes that commonly occur in reef aquaria. As with

most other errant families they are often completely harmless and several species that may occur are too small to threaten anything substantial in the aquarium. However, I have recently discovered a species that predates *Xenia sp*. coral.


Fig. 4b A Syllid worm found predating *Xenia sp*. The tissue of the coral is clearly visible inside the worm

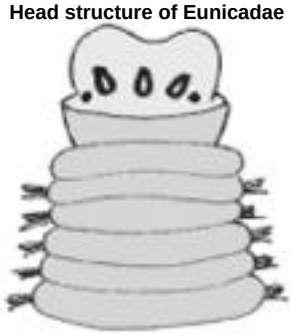

White Pulse Coral (*Xenia sp.*) upon which the Syllid predator can be found

I apologise for the quality of the images but this is a very thin, fragile-looking worm about 5-8cm long often exactly matching the colouration of its prey. It has very long, hair-like cirri typical of syllids. I first noticed this worm when I was admiring some very nice toadstool pulse coral (*Xenia sp.*) I had recently acquired. Although the coral appeared healthy I noticed some thin channels in the flesh just below the polyps. I had seen *Xenia spp*. alter their trunk form to facilitate budding of daughter colonies and assumed this was part of that process. However, within two days the coral was looking very much the worse for wear and it eventually died. The next piece of *Xenia sp.* I obtained was fine for a couple of weeks and then again began to develop the thin grooves in the flesh. This time I was able to spot the culprit – the Syllid worm shown in **Figures 4a and 4b**. Removal was relatively easy. A gentle rocking motion of the coral was enough to dislodge the worm and closer scrutiny showed that it was semi-transparent – you could make out the consumed flesh of the *Xenia* in its digestive tract. If removed in time the *Xenia* appears to recover fully from the predation. After only a couple of weeks it was impossible to locate any of the previous damage.

Similar species of Syllid worm exist with this basic body plan and are known to consume a variety of soft coral species.

Eunicidae

Head structure of Eunicadae



First two segments usually without bristles. Multiple jaws present when proboscis everted

This family contains some of the largest of all the bristleworms including the infamous Palolo worms (*Palola spp.*), some of which can attain a length of 3 metres with a body width of 30mm! Introduction of specimens of this size are extremely rare but have occurred. Palola worms feed upon a variety of invertebrates and algae including sponges, anemones and if deprived of sufficient feed will also consume soft corals. Eunicidae can be distinguished from the Nereidae by the fact they they possess more than one pair of jaws. One species commonly imported is *Eunice tubifex* that is found during daylight hours in a tube, the lowermost section of which is lined with a parchment-like material (**Figure 5** – see also Figure 6)


Fig 5. The parchment-like tube of *Eunice tubifex*

These are often overgrown in the wild by *Acrozoanthus spp*. polyps and are found for sale in shops as "Polyp Trees". Large


Figure 6 Parchment-like tube of some errant bristleworms. This one was firmly attached to a tunnel in live rock

Eunice specimens are potentially a problem in marine aquaria due to their large size and omnivorous diet. Remove them whenever possible.

The specimen in **Figure 3** was removed from an aquarium where there had been some seemingly inexplicable fish deaths and damage to soft corals. The aquarist noticed the worm feeding upon the fish and when he removed the carcases noticed that they had copious amounts of jelly-like mucous surrounding them. He also had experienced many snail deaths. I must admit to being sceptical when he presented me with this specimen, favouring the species *Oenone fulgida* – (see below), as the culprit. However, since removing this beast he has experienced no further problems with fish or corals. It is unlikely that this specimen was introduced to the aquarium at the size it was captured at. My personal opinion is that it arrived small and its appetite grew with increased size until eventually it was powerful and hungry enough to capture fish, snails etc.

Another Eunicid worm that appears is the bright orange *Oenone fulgida* – a predator of molluscs. I have only ever encountered one such example of this species but only after I had lost plenty of Astrea snails from the reef. This worm is capable of producing masses of mucus and it uses this as a means of suffocating its prey. By secreting copious amounts around the opening of snails it effectively cuts-off their oxygen supply and they die. The protective shield or operculum then loosens allowing the worm inside the shell to consume the snail. If you find any *Turbo sp., Trochus sp.* or *Astrea sp.* snails with blobs of mucus around them then the chances are you have this worm. To make matters worse it can also bore into clams and consume their tissue! It does this by drilling a hole into the shell near the hinge and will return to the same hole again and again to feed. Eventually, unless the aquarist intervenes, the clam will develop secondary bacterial infections about the damaged tissue and die. Removal is a must and can only be facilitated by close observation of the aquarium and removal of

the rock that acts as the retreat for this worm.

The final Eunicid worm worthy of a mention is the so-called Bobbit worm. I won't elaborate on the reasons it has been given this name suffice it to say that it has 30mm wide jaws that it uses to catch fish. The jaws are extended like those of the barbaric spring loaded animal traps now outlawed. When a fish passes too near the jaws snap shut and the fish is caught. These are feisty creatures reaching up to 3 metres in length and have been known to use their jaws on divers! They do not appear in reef aquaria.

Polynoidae-Scaleworms

This is a group in which the species possess large plate-like scales over their body hence their common name. Of the 700 or so species, most are quite small – less than 20mm. Some scaleworm species live commensally with echinoderms (starfish and sea cucumbers etc) and it is only in this context that I have seen one. It was actually pointed out to me by Trevor Wild from **Oasis Aquarium** when we were selecting livestock. The worm was located in the ambulacral groove of a red starfish (*Fromia sp.*). The groove houses the tube-feet of the starfish and it was unclear what business the worm had there. It could have been living commensally and there was no visible damage to the area where the worm was discovered but the starfish didn't make the trip to **Oasis** or **Cheshire WaterLife**. It's best to err on the side of caution in these cases!

Polynoid Scaleworm

A typical scaleworm, *Harmathoe sp.* with 15 pairs of scales. One of the most common genera found on reefs measuring 2.5cm+ is *Lepidonotus sp.* which possesses 12 pairs of scales

Other errant bristleworms

One species of small pink polychaete is extremely abundant in reef aquaria where it appears to inhabit sand and rock tubes (**Figure 7**). It has relatively long bristles for its size and will often appear when food is added to the aquarium even when the tank is fully lit. This is a very useful species for the control of uneaten food and detritus. It is capable of asexual reproduction which means that it can rapidly reproduce to take advantage of the available food.

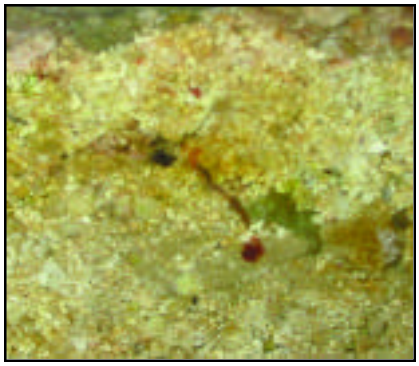


Fig. 7. A small sand-dwelling bristleworm capable of asexual reproduction. This species can achieve huge numbers under suitable conditions but seems to leave invertebrates alone favouring detritus and uneaten food intended for fish.

Fireworms (Family Amphinomidae)

Fireworms are terrible yet strangely alluring creatures. They eat coral and anemones and can cause great pain to the unaware as they have poisonous bristles which are shed willingly. They are rather like glass fibres that puncture the skin and cause symptoms from itching to rashes to fierce pain. They advertise this fact with bright colouration which serves to warn potential aggressors that there is more to them than meets the eye. One such species is *Hermodice carunculata*. Fortunately such species are rare – I have encountered very few of them over the years. Removal should be facilitated with fine tweezers or forceps in a gloved hand.

Removal of Bristleworms

There are many devices cited in the literature for removing bristleworms from stockings packed with whole shrimp to film cases with slots in them plus the off-the-shelf varieties which are invariably unsuccessful. There are biological control methods mentioned too. The problem is that most people want to remove large and wily individuals that are the biggest potential threat to their stocks. These worms are capable of feeding in a trap maybe 60cm away without leaving the sanctuary of their tube! The most effective way I have seen thus far is a trap developed by Mike Pugh – a customer of **Cheshire WaterLife** who was suspicious of the number of worms in his 5 year old aquarium. He had tried a commercial trap and quickly realised the worms he was trying to catch could have swallowed such a thing whole! A version of the trap is shown in **Figure 8** and consists of a baby bottle with a long length of pipe attached of between 1/2cm and 1.5cm diameter depending on the size of worms to be trapped. The idea is that the worms enter via the tube and make their way down it to get at the bait that lies at the bottom of the bottle.

Fig 8. Bristleworm trap. The tube can be increased in length and or reduced in diameter depending on the size of worm to be removed. Tube lengths of 24" will still work well!

When the worm has consumed the bait it is then too fat to get out again and can be removed easily. A word of warning here – try to use baits that fish will not be interested in as slim-line fish such as dottybacks can become trapped too! Mike caught many worms this way – some very large specimens up to 1.5cm diameter and 75cm long. Of course, the basic plan of this trap can be refined to suit individual needs.

Red Sea Dottybacks (*Pseudochromis spp.*) are said to be good predators of small bristleworms. I love these little fish and would have them in my aquarium anyway but the chance that they will reduce populations of potentially harmful worms justifies their inclusion even more.

Arrowhead crabs are also widely held to be good predators of bristleworms but I have found them to be somewhat cosmopolitan in their tastes and have witnessed one individual systematically winkling hermit crabs and turbo snails from their shells before scoffing them! Introduce them with caution!

Epitoky

Epitoke of *Nereis sp.*

As well as being full of male or female gametes the epitoke also has modified paddle-like bristles to improve its swimming ability

We have already looked at the fact that many polychaete species are capable of asexual reproduction. Sabellid fanworms and syllids can reproduce in this way. But what of the ones that reproduce sexually? Some families produce a sperm or egg bearing reproductive animal that is either the result of physical changing of the "normal" worm or budding from the body itself. The Epitoke, as it is called, has evolved to swim to surface waters, where it will release sperm or eggs synchronously with other members of the same species in a phenomenon known as swarming. This is usually controlled by hormone production probably triggered in most cases by phases of the lunar cycle.

The reason that this is mentioned here is that Epitokes are not uncommon in reef aquaria but can cause some alarm to aquarists. The epitokes may be up to 10cm long and swim very quickly in a seemingly random manner all over the aquarium. I have witnessed this on a number of occasions but have not seen any gamete release occur.

Autotomy

This is a process whereby an animal can intentionally break-off a section of it's body leaving a potential attacker with a mere morsel instead of a full meal. We saw this with the snail *Stomatella varia* which can shed the rear portion of its tail. Many bristleworms can separate at many points along the body but they have a refinement to the usual "twitching tail" strategy: they are able to regenerate any portion of the body removed. For example if the head end is lost or consumed, the tail can grow another head and vice versa. This is why it is not a good idea to cut these worms in half without removing both sections!

Sedentary Polychaetes

Fortunately, not all commonly found polychaetes are potentially hazardous. Some of the most abundant species found in marine aquaria are totally harmless and actually have a beneficial role to play. These are the sedentary fanworms, Chaetopterids Spionids and Terebellids.

Fanworms are represented by three families within the class Polychaeta although there are similar suspension-feeding species within other families. True fanworms have specialised anteriorly where they have developed chimney brush-like extensions called radioles. It is not immediately obvious that they are related to the errant polychaetes because the body is generally hidden by a tube. These can be bored into solid rock, or consist of fine silt, parchment-like protein, sand grains, calcium carbonate etc. However, when a worm is removed from the tube, or in the case of **Figure 9** it is possible to see into the tube, we see a body structure following the same basic pattern of the errant polychaetes.

The two families of true fanworm present in marine aquaria are the Sabellidae and Serpulidae. They collect food on the ciliated pinnules lining each radiole. They have current producing hair-like cilia on

Fig 9. A commonly kept species of fan worm – the feather duster *Sebellastarte sp*. Not the segmented body where the tube has not formed. This specimen formed its tube on the front aquarium glass.

them which channel food particles to a groove running down the centre of each radiole. Only suitably sized particles are passed into the mouth but some inedible particles are retained for use in tube construction.

It is relatively easy to determine whether you have a Sabellid or Serpulid worm in your aquarium as the former produce a soft tube sometimes covered with silt or sand grains. Serpulids produce a calcareous tube and are also referred to as hard tube worms.

Fanworms are a good indicator species for discovering the type of conditions the coral was collected from. There must have been available food in the form of suspended organic material and therefore the coral may benefit from a supplement such as live phytoplankton or marine snow.

Sabellidae

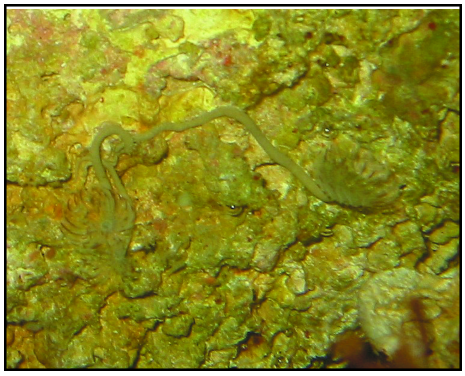
Fig 10a. *Bispira sp.*

Fig 10b. *Bispira sp.*

This family consists of approximately 34 genera and most are not associated with tropical marine aquaria. We are, of course, familiar with the feather dusters of the genera *Sabellastarte* and *Bispira* (**Figures 9, 10a & 10b**) and these can be commonly purchased as individuals or are sometimes encountered in situ of a piece of coral-base.

Other genera do occur in reef systems most notable the 1-2cm diameter (feeding apparatus) *Notaulax sp*. and *Branchiomma sp*.. *Notaulax sp*. is most likely to be encountered in positions that make it appear as though it has bored into a live rock or coral base. It is, however, living in a soft tube lining within the protection of the rock. The pinnules are much longer when compared to radiole length than the Seballastarte worms, although not coloured as attractively.

Branchiomma sp.is a more delicate looking species than *Notaulax sp*. but similarly it has long pinnules. This species is capable of rapid asexual reproduction and will colonise many hard surfaces. Look for both these species in association with live rock, base rock and "algae rock" particularly. The latter is rock that is imported for the algal growth on it. This is usually a species of *Caulerpa*. It is worth purchasing rocks like this even if the algae doesn't look too good as the rock beneath is usually very rich in fauna and some interesting specimens can be acquired this way.



Small unidentified tubeworms of the type commonly imported on live rock

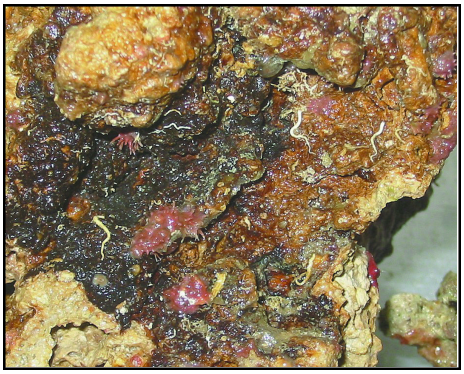
A small "feather duster" worm

Serpulidae

I doubt there is a reef aquarist alive that doesn't have a good colony of these worms in their aquarium. Some species are found for sale as specimen pieces such as the Koko worm (*Protula bispiralis*) and Christmas tree worms (*Spirobranchus sp*). The latter are purchased with *Porites sp*. hard coral into which they bore as larvae.

However, several species can simply "turn up" and form very large colonies in home aquaria.

Serpulids have a role in the processing of detritus in the aquarium and significant amounts must be removed by large colonies, but they are unlikely to ever reach



The white "squiggles" in this image are small serpulid worms.They are located on the underside of some live rock together with forameniferans such as *Homotrema sp*.

such numbers that mechanical filters become redundant.

The Spirorbinae are a sub-family of small spiral tubed worms represented in temperate waters by the genus *Spirorbis*. The tropical species could be *Neodexospira sp.*. These are the small white circles you see in any of the shaded areas of the aquarium from pumps to glass to live rock these little chaps will colonise the lot. They have to be regarded as useful detritivores and when populations are high it follows that they have a significant impact on the control of fine particulate material in the water column.

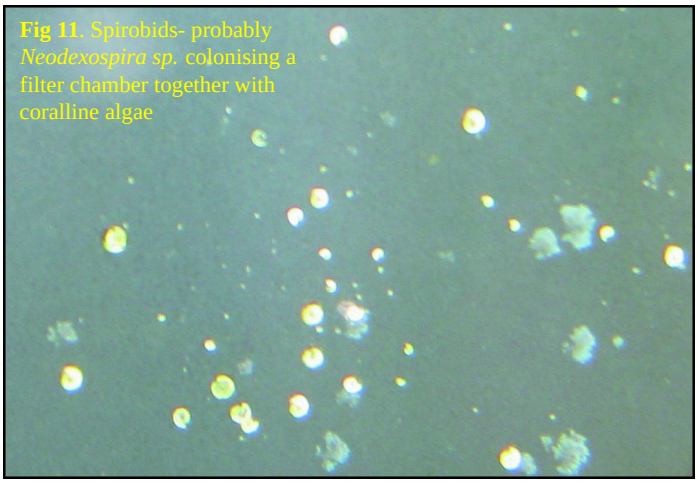


Fig 11. Spirobids- probably *Neodexospira sp.* colonising a filter chamber together with coralline algae

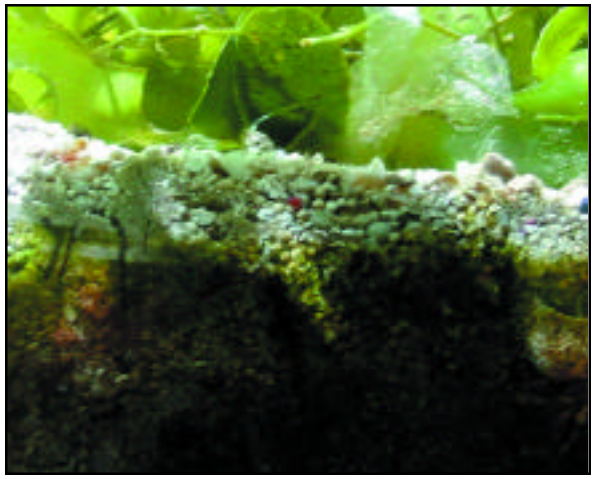
Often found in the same sort of areas as the Spirobinae are *Vermilliopsis* and *Microprotula* the latter having more elongate and delicate tube structure. In both cases the tube is not spiral but rather serpent-like. Again these animals have a great capacity for asexual reproduction and can rapidly colonise suitable areas.

Terebellidae

This family of polychaetes is the cause of much consternation for marine aquarists who are alarmed by the creeping feeding apparatus of these worms. Known commonly as Spaghetti worms they have a number of grooved and sticky tentacles which they stretch out over the substrate in the search for food. They are handy detritivores for reef aquaria. Length and number of tentacles can vary according to the species concerned but 30cm is not an exaggeration for large specimens.

Spionidae

The spionid worms are very common imports on the bases of corals. When they are abundant it is often an indication that water they were collected from is quite turbid at least for some of the time. They, like the Terebellidae, have sticky feeding tentacles but they only have two which point straight out of the top of their tube. The most commonly encountered specimens are at most 1cm tall but there may be a large number present on a single rock. They are capable of reproducing in the aquarium and can form large colonies.



Chaetopterid worm in deep sand substrate – note the long feeding tentacles. They are much longer than those possessed by spionid worms

Chaetopteridae

Externally these worms are superficially similar to the Spionidae but once the worm has been removed from its tube the similarities end. The body of these worms is divided into three very distinct regions that I won't bore you with here. You are most likely to encounter this family in soft substrates – at least in a reef environment – as they excavate a U-shaped burrow. When feeding they move to the end of the tube and let their tentacles waft in the flow. The family can be distinguished from spionids without the need to remove the animal from its tube because they have much longer tentacles – sometimes 4 or 5cm in length, whereas most spionids only have 1cm long tentacles (in commonly encountered reef specimens). These worms probably play a useful role in the cleaning of the aquarium, particularly in the substrate where they will intercept detritus before it settles.

Of course, there are likely to be more species than I have outlined here that you may encounter in your reef aquarium. At least you should be able to make an informed decision as to their future based on what you have read in this article. I always prefer to give animals, even bristleworms, the benefit of the doubt unless I can identify them as pest or predators.You may not choose to do the same but remember that many of the species outlined here are actually of *benefit* to the aquarium so have a good think before you decide their fate.

The next article in this series will be part one of perhaps the largest marine group of concern to aquarists – the crustaceans.