Part 12
Friend or Foe
The Tunicates

PHOTOS BY THE AUTHOR UNLESS OTHERWISE STATED

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If you read the last article in this series you may recall that I alluded to the fact that this article would centre on a group of invertebrates that represent our closest relatives in the non-back-boned world. Why is this? Well, this months subjects are the sea squirts of the sub-phylum Urochordata. The latter is a sub-division of a larger phylum called the Chordata of which the predominant number of species are encapsulated in the sub-phylum Vertebrata – the vertebrates – of which, the human, *Homo sapiens* is but one example. Some of you, probably those who are familiar with the form of salps, sea squirts and larvaceans, may find it hard to believe these creatures have anything in common with the vertebrates. The criteria for admittance into the esteemed company of vertebrates are as follows:

A notochord (essentially a "backbone" – though not necessarily made of bone)
A post anal tail – vestigial in many vertebrates including man but there all the same.
A dorsal hollow nerve cord.
Gill slits – obviously refined in higher vertebrates, lost in embryonic development.

The urochordates demonstrate all these characteristics but not in the adult form. Larval urochordates resemble miniature tadpoles and have all the prerequisites for classification as Chordates, but they are short-lived. Most species settle within a few hours of release and undergo their metamorphosis into the sessile encrusting or vase-like animal.

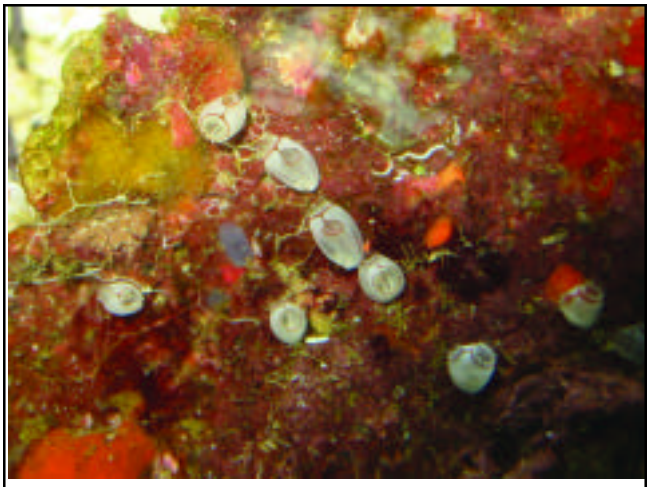
The sub-phylum Urochordata is sub-divided into three classes.

Class Ascidea: The tunicates or sea squirts.
Class Larvacea: Usually very small (<5mm) Free-swimming forms resemble ascidean tadpole larvae.
Class Thaliacea: Salps. Often colonial, planktonic urochordates usually forming chains of individuals.

As the only class of urochordates we are likely to encounter in marine aquaria are the ascidean sea squirts we shall concentrate on them here.

A large tunicate with siphons open. This is a commonly encountered species and although not the brightest its size makes it very obvious. Note also that the surface of this squirt is smooth unlike the granular texture of sponges.

Here is the same tunicate out of water with the siphons closed. I include my fingers for scale.



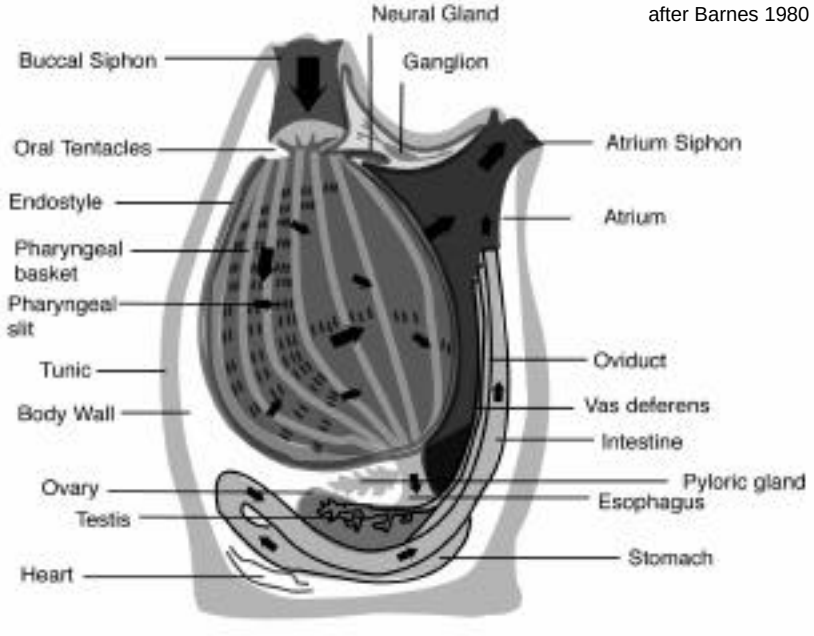
These beautiful tunicates appeared on some base rock that was home to some button polyps. Here we can see the tunicates in the company of encrusting algae and sponges. A closer examination of the two larger specimens reveals the structure of the pharyngeal basket through the semi-transparent tunic. Each specimen measured less than 10mm and they reproduced asexually over a number of weeks to form a colony of twenty or so individuals.

GRAHAM ROBINSON

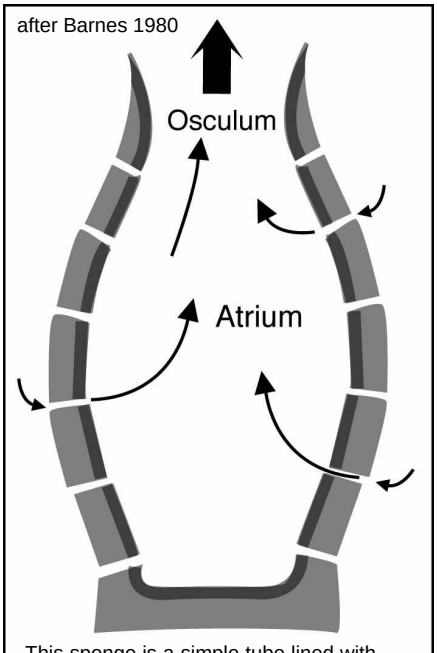
The scarlet blobs in this image are a tunicate species probably belonging to the genus *Diademnum*. This image was taken in the Red Sea but the genus is common throughout the tropical Indo-Pacific.

There are approximately 1300 urochordate species currently classified of which the vast majority are ascidians. We tend to refer to such animals as sea squirts due to the fact that when removed from water they quickly contract and expel water from their body cavity. The commonly used term tunicate is derived from the fleshy surround to the animal which protects internal organs and also provides support for the animal. When you know what you are looking for sea-squirts are unlikely to be confused with any other animals in the aquarium, with the exception of sponges and if the aquarist searches for the key identification points even these should not result in any confusion. Ascidians are filter-feeding organisms. They have an inhalant (buccal) and exhalent (atrial) siphon aperture through which water enters and leaves. The inhalant siphon is usually larger than the exhalent and in free-living forms the former is usually situated at the top of the animal with the latter usually to one side and lower than this. The fact that free-living forms possess two obvious siphons of differing diameter is an important feature, which enables the casual observer to separate this organism from similar looking animals such as sponges. In colonial tunicates the inhalant aperture is shared with each separate zooid ("individual") possessing its own exhalent siphon.

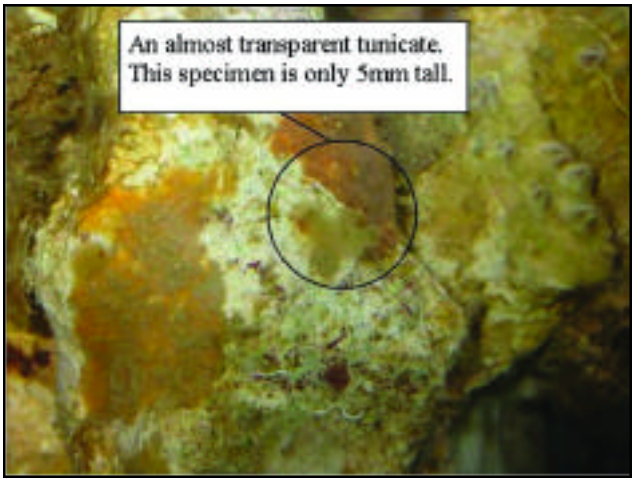
As previously stated, perhaps the only animals that may be mistaken for tunicates are the sponges as they too are commonly found in tubular or encrusting forms. However, the feeding apparatus of sponges is extremely primitive in comparison to tunicates. As I briefly mentioned in the introduction to this article, one of the prerequisites for inclusion in the phylum Chordata is gill slits. These are obvious in animals like fish but not so apparent in the

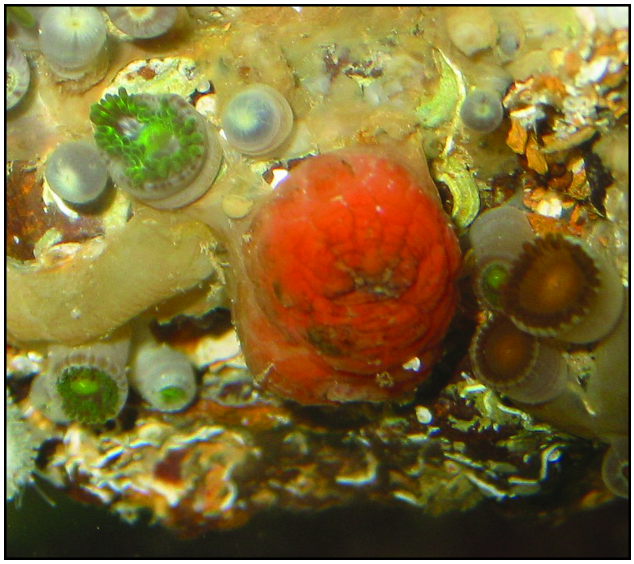


The tunicate, superficially similar to the asconoid sponge from the outside, shows a much greater specialisation with tissue arranged into organs



This sponge is a simple tube lined with specialised cells. Compare this relatively simple design with the Ascidian tunicate





This tunicate resembles some of the small orange sponges we find associated with coral base rock

ascidians. Ascidians have a specialised feeding apparatus called the pharyngeal basket contained inside the body ball (known as the tunic – hence the common name for the group). Water enters the pharyngeal basket via the inhalant siphon and leaves through the pharyngeal slits (=gill slits) leaving behind sieved planktonic organisms, detritus etc which is fed into the stomach. Water does not enter the animal passively, instead being driven by cilia that line the pharyngeal slits. The pharyngeal basket is able to capture very small prey items (one micron or so) due to the secretion of a specialised mucus which, when examined with a microscope, resembles a very fine mesh net. This is continually secreted by a specialised organ called the endostyle and is eventually "spun" into a strand and channelled into the stomach.

Some species found on tropical reefs supplement their filter feeding with the products of photosynthesis, facilitated by symbiotic algae in much the same way as the more familiar corals. In a reef aquarium you can increase your chances of success with these fascinating animals by supplementing with iodine and trace elements – tunicates have been shown to store such compounds in their tissues – but do not be too downhearted if the sudden appearance of a colony is followed some months later by their equally abrupt demise. Many species have short life-cycle phases lasting only a few months although certain species are longer lived and may survive for years.

For the purposes of this article we will sub-divide the Ascidians into two further groups – those that appear to be individual specimens and those that are definitely colonial.

Free-living Ascidians

Free-living ascidians are separate entities in their own right resembling, in many cases, vase-like structures that may be less than 10mm to several centimetres tall. Although not truly colonial, like the tunicates we will look at later in this article, they may occur in groups of many individuals. In other situations we may notice what appear to be groups of separate individuals that are actually connected at their base. Where these seem to spontaneously appear asexual reproduction is likely to have taken place. Certain species actually have different phases to their reproduction where one generation multiplies asexually and the next sexually and so on. For the purposes of this article we will centre on all tunicates that can be perceived to be complete animals, connected or not, as free-living.

Some individuals may be difficult to spot, particularly if they become covered with other encrusting organisms or algae, but there are several, highly coloured species that are equally difficult to miss. Many various species are common accidental arrivals and are particularly associated with mushroom rock, button polyps and on the bases of soft corals, although they can conceivably turn up almost anywhere. They should be considered harmless and even welcomed by marine aquarists. Unlike sponges which can also be highly colourful tunicates are seldom offered for sale so the aquarists best chance of keeping such creatures is to be vigilant and alert to their presence on coral base rock.

There are several genera of ascidian that may appear in reef aquaria. These include *Polycarpa*, *Didemnum*, *Ciona* and *Ascidia*. However, the aquarist is unlikely to separate these. Even assigning a specimen to the three orders, Phlebobranchia, Aplousobranchia and Stolidobranchia, is not easy without internal examination of the organisation of the tissues.

So far we have centred on those species showing a pair of siphons, one usually being larger than the other. I have previously mentioned the possibility of confusion with sponges and this is certainly the case with *Diademnum spp*. This genus has a single exhalent siphon but water enters via a number of "pores" scattered over the tunicates surface. Several species may occur but if you encounter a green specimen it is very likely to be home to symbiotic algae and therefore it requires strong lighting. The tunic of this genus is able to be perforated without losing its rigidity because it is hardened by calcareous spicules.

***Botrylloides sp*. The genus *Botrylloides* is typified by large inhalant siphon surrounded by double rows of individual animals. If you look into the inhalant siphon in this image you can catch a glimpse of the pharyngeal basket.**

Colonial Tunicates

Although some of the vase-shaped tunicates may be colonial in nature the species we will centre on here are colonial in the sense that they share an inhalant siphon and have individual buccal siphons. Species that conform to this description are commonly found associated with all manner of corals – hard or soft – and various polyps. Their ability to reproduce asexually is incredible and several species can cover many square centimetres in a matter of weeks. Colonies are highly variable in colouration and patterning. I have seen green, turquoise, orange, red and white species and sometimes combinations of these. If you are lucky enough to have some of these varieties already in your aquarium, or are observant enough to spot them nestling in and amongst some polyps they can prove very rewarding to keep. However, in my experience they have very short life-spans, possibly due to a lack of suitable trace element addition or, and this is more likely, their natural life-cycles mean that colonies will go into a sexual phase after the initial burst of asexual reproduction.

The image of *Botrylloides* shows a white colony but you might encounter green, orange or, indeed, many different colour variations in specimens of this genus. The specimen shown grew from the base of a *Platygyra sp*. hard coral and within only a couple of weeks, three further colonies had sprung up of equal size (approximately 2cm square). Previous experiences with this genus have resulted in colonies of 20-30 square centimetres on rocks and even aquarium glass. They don't suffer physical damage very well and can collapse if disturbed. Taking "cuttings" from a colony may be very risky and result in the death of the parent and daughter colonies. The best way to obtain a specimen like these is to purchase the substrate upon which it is growing. Of course this is impossible in the case of glass-growing colonies but good colonies can be found, even on live rock.

This brings our look at the tunicates to an end. I hope that I have encouraged you to seek out these fascinating animals on any specimens that you buy. Presence of a tunicate can certainly make my mind up whether to purchase or coral or not. In the next article in this series we will look at some unrelated groups of animals that can be referred to as the unsegmented worms.

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