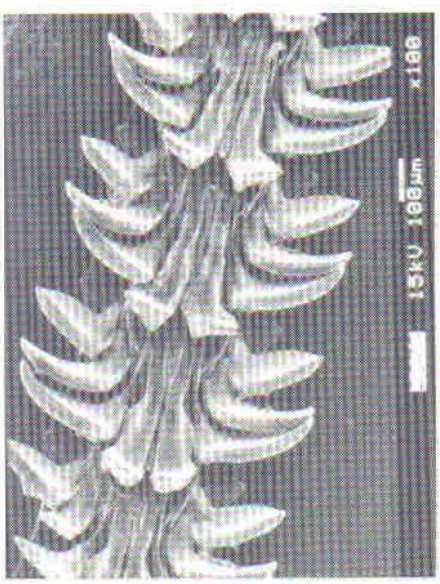
The Strandloper
BULLETIN OF THE CONCHOLOGICAL SOCIETY OF SOUTHERN AFRICA

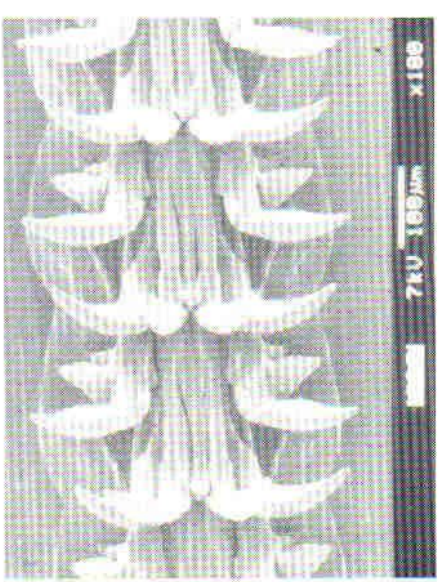
IMPORTANCE OF THE RADULA WHEN IDENTIFYING MOLLUSCS

Stephan Veldsman

Hoörskool Waterkloof



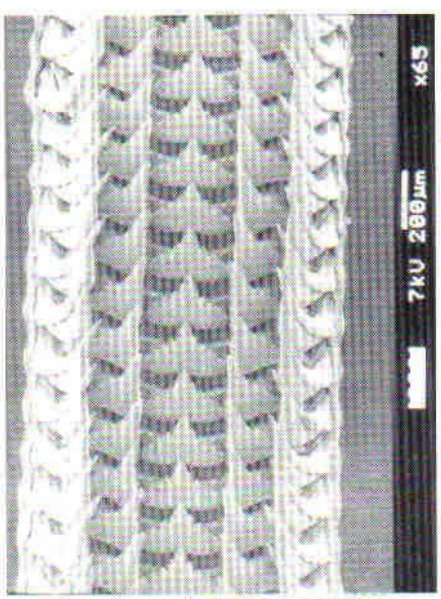
Patella oculus



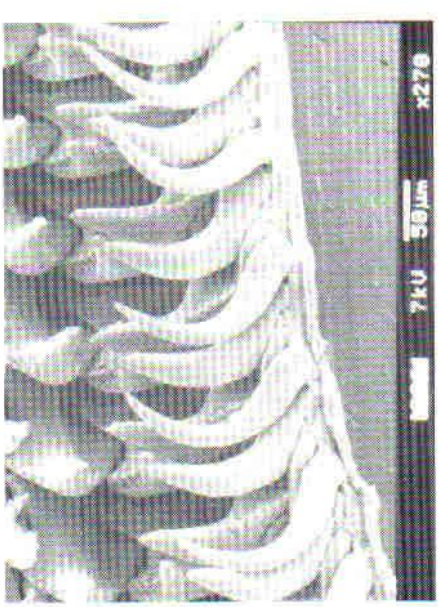
Patella granularis

It is sometimes difficult to identify Mollusca or snail species from each other by visual methods. DNA tests are useful but expensive and not easily available. However, it is possible to use an optical microscope or an electron microscope to study their radulae, and the radula of the snail can be used to differentiate species from each other.

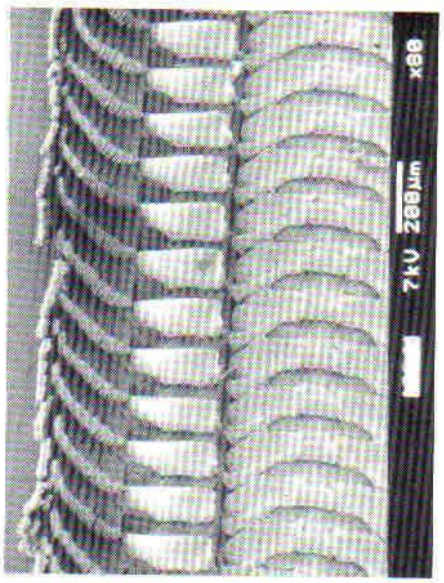
The radula or rasping tongue is a characteristic structure of most of the divisions of the Mollusca. The only exception is those with two valves namely the Bivalvia. The radula is composed of a chitin-like substance. It is formed in a special organ and is continually growing from behind forwards. In this way it can be replenished as it wears out. It is like a ribbon, varying in width and length in different molluscs, and beset with rows of recurved teeth that can by clearly recognized at enlargements of between 50 and 2 000 times. The object of my research was to investigate the radulae of different Mollusca species. The results were obtained from a scanning electron microscope study on 16 different Mollusca species collected in the intertidal zone. The study showed that there is a remarkable resemblance in species of the same family. It was however still possible to distinguish between the different species. Element determinations in-



Ranella australasia gemmifera

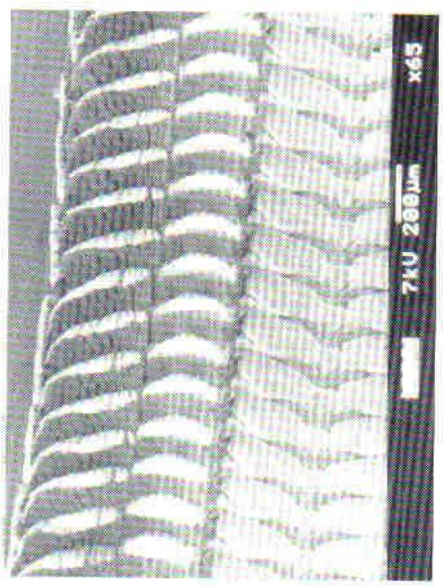


Cymatium dolarium



Nerita albicilla

Nerita plicata



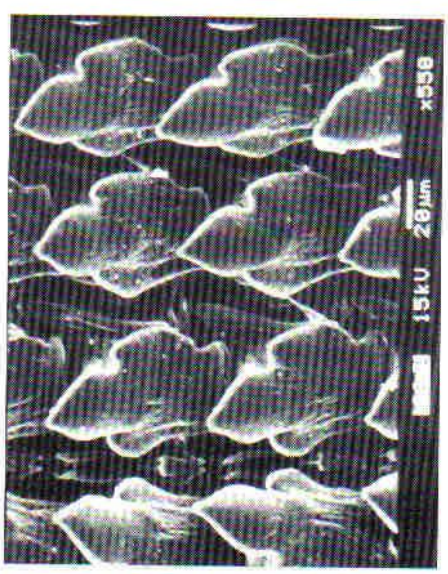
Nerita polita

dicated that there is also a recognisable difference in composition in some cases. Iron and silicon were found in the lower order species like the Patellidae as well in the chiton species. Oxygen, carbon and aluminium were present in all the species.

The wearing down of the teeth can be seen by comparing the photograph of the radula of the *Patella oculus* on the front page with that on page 3.

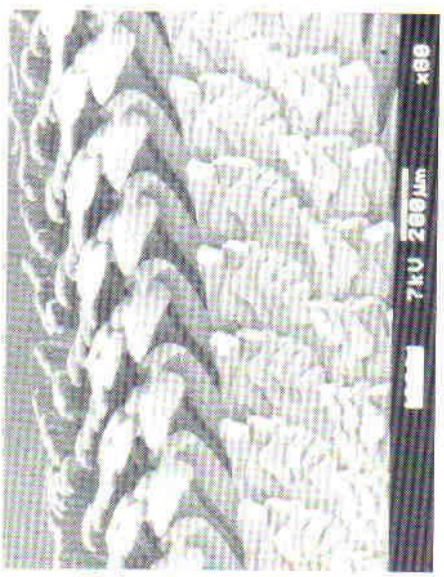
Remember to be very careful not to eat snails if the radula has not been removed. A literature study indicated that doctors were puzzled when a patients was submitted to a hospital at Plymouth England with internal bleeding. The doctors removed a tangle of long ribbon-like substance out of the stomach of the patient. It was identified as the radulae of dozens of limpets.

Editor's note. This is a highly abbreviated version of Stephan Veldsman's high school science project. A fuller account will be published later this year in the magazine *Spectrum*. Stephan also has had the unusual honour of presenting this work at the annual conference of the Electron Microscopy Society of Southern Africa at Cape Town in December 1997.



Helix aspersa

Conus lividus



Turbo cidaris natalensis

Bullia callosa

SYSTEMATICS AND TAXONOMY

by Nancy Tietz

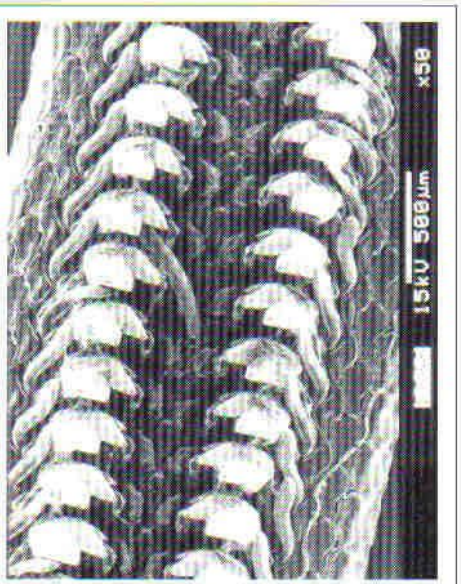
I discovered during the preparation of a talk on nomenclature to the Border Shell Club that we happily regard the words taxonomy and systematics as interchangeable but there is a difference.

Systematics is the scientific study of the variation of living organisms and comprises two distinct phases:

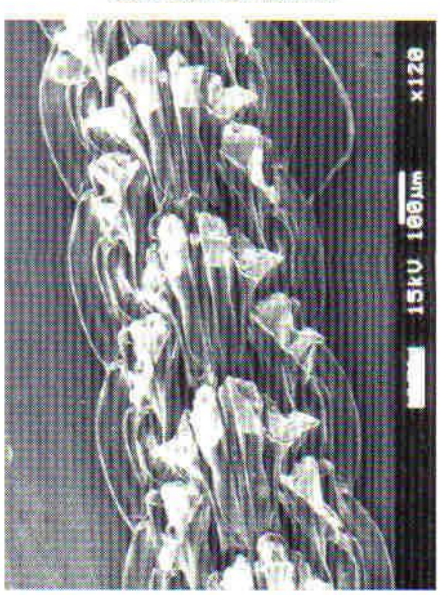
1. Classification. Arrangement of the thousands of living organisms in such a way that those with strongly similar characteristics are grouped together and separated in a logical manner from dissimilar groups. In other words, establishing the groups or taxa of different rank.
2. Nomenclature; or allocating a name to each group or taxon. [A taxon is a taxonomic group of any rank]

Strictly speaking, Taxonomy is the study of the principles and practice of classification so is only one aspect of systematics. An example of a principle of division is the basic separation of the animal kingdom into animals comprising one cell, the Protozoa, and the rest comprising many cells, the Metazoa. A taxonomist, however, could well decide on principle to divide the animal kingdom into Animals with Shells (Snails, Chitons, Sea Urchins and Pansy shells, Lampshells, Corals, Crustacea, Turtles and Armadillos) and Naked Animals without shells (*Homo sapiens* and the rest of Noah's Ark). In which case the classification structure would look very different but would still end up with the same biological units with similar features at species level. From this we can see that a classification is highly, theoretical and somewhat abstract and that it is only the taxa of individual organisms that have concrete basis, also that it is probably more correct to refer to our experts as systematists since they deal both in taxonomy and nomenclature.

Ischnochiton textilis



Dinoplax gigas



Worn end of a *Patella oculus* radula (enlargement at right)

The Latin and the name changes tend to discourage some members from using the scientific names. One of the first shells I learned to identify was *Megatebennus scutellum* in Dr. Barnard's *Beginner's Guide* in the 1950's. It then became *Amblychilepas scutella* in Prof Day's *Guide to Marine Life* (1969) and Brian Kensley's *Shells of Southern Africa* (1973) and appeared as *Amblychilepas scutellum* in Kilburn and Rippey, *Sea Shells of Southern Africa* (1982) and Deirdre Richards' *Shells of Southern Africa* in 1987. Now in *Two Oceans* by George Branch et al (1994) it is referred to as *Dendrofisurella scutellum*.

Grammar and other changes notwithstanding, the huge advantage of the Latin names is that if the text is in Spanish, Japanese, Urdi or Xhosa they will stand out boldly in italics and we will know what species are under discussion. One final point; remember that a species name consists of two parts. Professional zoologists disapprove of the use of just the second part, at least in written affairs. So identify the shell fully, as in "*Cypraea annulus*" rather than just "annulus".

Some Thoughts on Storing and Displaying a Shell Collection

by David Freeman

This article is NOT going to cover the cleaning and cosmetic treatment of shells, but only some aspects of storage and display.

Generations of collectors have argued over the pro's and con's of the different ways of setting out their shells, and I think that by now we have to agree that there just isn't one perfect system that will satisfy everybody. The fact is that different people have different priorities for their collections, and even for different parts of their collections: For instance, a large, general semi-scientific collection covering many families will obviously need different treatment from a display collection of spectacular decorative specimens. The latter might be easier to deal with, either in a glass-fronted cabinet in the living room, or under the glass top of a coffee table where they would be on show all the time.

As long as the display isn't facing a window that lets in direct sunlight, there will be little or no fading of colours, even after many years.

For the so-called "serious" collector who wants to classify a collection into families/genera/species, with a record of scientific names and localities, other options have to be considered.

A closed cabinet or cupboard, to keep out the dust and excessive light, is the obvious starting point. These can be as big or as expensive as space and finance will allow.

If you have the means and facilities to have custom-built cabinets made, you may find it best to start with the inside and work outwards from there. First decide what would be the most comfortable and convenient size of tray or drawer for you to handle, and then have the outer casings made to hold as many of those as you need. My own experience has shown that trays with internal dimensions of 70 X 45cms and a rim 2.5cms high, are comfortable to handle and will hold a useful range of specimens. Anything much larger than that can be heavy and awkward to handle, and if it is very much smaller, you might find that you don't have a big enough range of specimens on view at one time. As for the height of the cabinets, I personally prefer a cabinet low enough to use as a working surface on which I can put a tray of shells, or some reference books, or a cup of tea.

City dwellers will rightly maintain that there is no longer such a thing as reasonably priced custom-made furniture, but one can still get adaptable second-hand items on auction sales if one takes the time to look around.

For a small collection or a collection of small shells, a typist's stationery cabinet with shallow drawers works well, doesn't take up much space, and is a standard item of office furniture which is fairly readily available. Other adaptable ready-made office furniture might include map and plan cabinets used by architects, or dentists' instrument cabinets. A small wardrobe could be adapted by fitting shelves or sliding trays into the hanging space. These days, many businesses are computerising their record systems and getting rid of filing cabinets that once held card index systems. Some of these can be adapted very well, although the examples mentioned in this paragraph are not what one might call "living room furniture", and are best reserved for a separate "shell room".

I think that a good maxim to start with is:

TRY AND USE WHAT IS AVAILABLE. At the same time, remember to plan for possible future expansion of the collection and don't lock yourself into a system that you might have to abandon later, with unnecessary waste of money.

A word or two of warning:

AVOID CABINETS MADE OF OAK. This wood exudes a vapour that can damage shells in the long term. For the same reason, be careful of cabinets that have been recently finished with some brands of **POLYURETHANE VARNISH,** at least until the varnish has had some months to dry out thoroughly in dry fresh air.

In this connection, please refer to the article on the so-called **Byne's Disease** in *Strandloper* No 219 (page 4). This appears as a powdery encrustation on the surface of shells. It is caused by acidic vapour which reacts with and destroys the surface layer of the shells. It can be given off by oak used for the cabinets, as mentioned above, and also by a high acid content in any paper or cardboard or even cotton wool used for storage or mounting of specimens. It is probably made worse by humidity, by improper cleaning of specimens, and inadequate ventilation.

For anyone living in a very warm and humid climate, ventilation is essential to prevent mildew. This can be achieved by having louvred doors, or else opening the back of the cabinet and fitting mosquito gauze there. Some kind of screen is advisable to control dust and, one has to say it, insect pests about which more later. The other way of ensuring adequate ventilation, of course, is to open the cupboards often and enjoy your shells every day.

My own preference is for cupboards with plain or louvred doors containing open-fronted shallow trays. I just don't like the look of chests of drawers where you would be faced with many rows of very utilitarian drawer handles. Apart from the appearance, which is admittedly a matter of personal taste, closed drawers inhibit ventilation, whereas, when you open the doors of a cupboard, even to deal with only one tray of specimens, the entire cabinet gets a change of air.

Once you have the outer casing to house the collection, you have to decide on the internal arrangements.

You will need some kind of trays or shallow drawers that you can slide out. If you have a cupboard with shelves, you can make or get someone to make trays of wood or cardboard that you could stack one on top of the other.

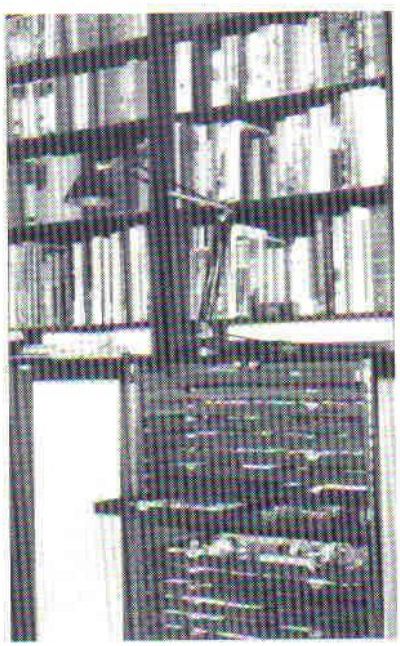
Department stores are a possible source of shallow lidded boxes that they might be only too happy to give you. Although these might be regarded as a makeshift arrangement, you could ensure a very neat appearance by having the whole cupboard filled with identical boxes, and maybe covering the lids with some uniformly coloured material/paper/plastic.

This is in any case a good and relatively inexpensive way to start, so that if and when you go on to something more permanent and "professional", you can get rid of the cardboard boxes without feeling that you are throwing away a lot of money.

Once you have decided on the kind of cabinets, boxes, drawers, trays, or whatever, you can get down to the fascinating job of setting out the specimens. Before we consider this, however, I would just like to mention a couple of problems that will inevitably crop up at some time or other, so that you can prepare for them and perhaps lessen or prevent them from becoming a nuisance in your collection:

I have already referred to **Byne's Disease.** The other nuisance is damage caused by insect pests. Depending on where you are, the kind of insects that you may have to deal with could vary. The treatment, however, is not significantly different. I have heard that, in the tropics, cockroaches tend to invade cupboards and devour labels, glue, organic matter such as operculums, etc. Spray the insides of your cupboards! Elsewhere, fishmoths will chew labels and obliterate data if you don't discourage them. It helps to spray the trays and drawers BEFORE you put the shells in, and you might consider using the specially prepared insect-repellent paper made for lining kitchen and other drawers. Try and find it in patterns that won't clash with your aesthetic sentiments!

The other, and very persistent, insect pest is known as the **Museum Mite.** This small- (2 to 3mm long) bristly beastie lives on organic matter such as the residue of animal tissue often left inside a shell after imperfect cleaning. If you trade shells with other collectors, you are bound to bring some of these mites into your house. They hide deep inside the recesses of shells and are easily transferred from



Combination cabinet with drawers and book shelves

one collection to another. If not carefully controlled, they can spread rapidly and may extensively damage specimens by devouring operculums and periostracum. The best precaution is to make sure that all shells admitted to your collection are scrupulously cleaned, inside and out, rinsed with spirits or acetone, and regularly inspected for signs of infestation. Ordinary household insecticide sprays are only partly effective against these mites because they are so small and hide so well. The worst thing you can do is to neglect parts of your collection and let the *nunus* chew away undisturbed for long periods.

The best general prevention and treatment for all these plagues, insect and otherwise, is cleanliness and frequent attention. In other words, look after your shells by looking at them often.

Having aired some opinions on cabinets and storage, it's time to say something about setting out the shells themselves. There are probably as many opinions on this as there are collectors, so let me say right now that what you decide to do with your collection is your business, and if you are happy with it, that is the main consideration.

As an alternative to the "scientific" classification which groups shell families into genera and species, you might like to keep all the shells from one locality or one country together.

If you specialise in a particular family, you will probably group them according to the way they are set out in the latest available reference manual. This would very likely be into subgenera, or maybe also into regions of the world.

For a generalised collection, you might follow the grouping to be found in most of the good shell manuals. This is based on the form and structure of the animals, and usually begins with the most biologically primitive animals and progresses to the more advanced animals.

You ought also to remember, if you are going to associate with other shell collectors and do a significant amount of exchanging with them, that there are certain generally recognised minimum standards regarding the sort of information that you will need to keep, about your shells.

Also, collectors ought perhaps to consider the potential value of their collections to other people when the time comes to dispose of such assets. A moderately sized collection with at least some reliable data is likely to be more valued and more appreciated than a large number of shells without data.

The most important thing is not, surprisingly, the correct scientific names, but rather the when-and-where of the places where the shells came from. This is not to say that names are unimportant but they can be usually looked up in reference manuals. Also, they do change from time to time when research produces more up-to-date information.

The basic information that should accompany an exchange specimen (and therefore ought to be with every specimen in your collection if you are aiming at an intelligent as opposed to a frivolous approach to shells) is:-

Genus; species; author (and date); locality (including a note of whether beach or live collected and, if dived or dredged, at what depth).

Hence you would have, for example:-

Genus	*Primovula*
Species	*singularis*
Author	Cate, 1973
Locality	off Scottburgh, Natal scuba, 30 metres.
Date	Dec. 1988

If you keep a notebook or diving log you might add a reference such as "see notes, volume 3, page 47". It is also useful to record what source you used to make the identification: for example "id from Kilburn & Rippey", or "id from Joe Bloggs, shell club".

Let me be outrageous and add that I personally would not be scandalised by a label that read, instead:-

" Jamtart"
Scottburgh
scuba dive -30 m
Xmas holidays 1988

The next question is, how to set out the shells in your collection and link the specimens with the information.

One way of sorting your specimens in their trays, is by putting them into matchboxes or cigarette boxes. Just remember that this can be a bit risky unless you stick them down, because they can get knocked out of place and become separated from their data.

Shells are so beautiful that most of us would like to set them out in a way that would make the most of their colours, shapes and patterns. It has become almost a convention to display two specimens of each species, one with the aperture upwards and the operculum in place, and the other with the dorsum uppermost to show pattern and sculpture.

This concept implies that you stick the specimens onto some sort of card, one "up" and one "down", with the data written either immediately below or beside the shells, or hidden on the underside of the card.

A variation of this would be to attach a small number to the shells and have the data stored separately in a catalogue or card index or computer system.

The next question is, what sort of card and what sort of adhesive should you use:

For the sake of the shells' long-term preservation, try to find acid-free paper. Heavy drawing paper used by artists should be "safe" and can be found in various colours. Pale green goes well with most shell colours and makes a pleasing background to specimens. Black paper also shows up shells dramatically.

I think it is the adhesive that causes most of the arguments. Try and find something that can be removed without damaging the shells. Modern miracle glue is a definite NO! Once you have put that stuff onto a shell, you are stuck with it forever.

I have used Prestik plastic putty and rubber cement, and they are not perfect. Each has its special good points, however.

The putty sometimes works well for a long time, but it can dry out unpredictably and let the shells drop off the cards; and sometimes it goes tacky and sticks to everything in long nasty dribbles. One thing it is good for, is to hold really large shells onto cards, but be careful not to use it for shells with loose or flaky periostracum.

Rubber cement likewise is not indefinitely stable although it is clean and easy to use for very small shells, and can be cleaned off in the short term merely by rubbing it with your finger. If you do use either of these two products, you will have to accept the need to re-mount at least some of your shells every year or two with fresh adhesive. Maybe that's not such a bad idea anyway!

Recently I unpacked and sorted some specimens from an old collection dating back to the 1950's. They had been stuck onto small cards and wrapped with old-fashioned cellophane. The cellophane was splitting with age, but the glue was still intact after 40 years and I found that it could be washed off easily with lukewarm soapy water. It seemed to me to have been the same glue that we all used for wood and paper in those far-off days, that is, animal glue, manufactured from hooves and horns. You might still be able to find it in hardware shops that cater for woodworkers and cabinetmakers. Its drawback is that it is a bit messy to use by today's standards.

The plastic age has produced one product that many collectors have welcomed, especially if one is primarily interested in building up a reference collection, rather than one mainly for display. I am referring to small transparent plastic packets with a ridge closure. These come in various convenient sizes and will safely contain, not only the specimens, but also the labels with data. Moreover, the specimens will remain dust-free and vermin-free, and can be inspected at will.

Whatever method you decide on, have fun with your shells!

A shelling trip of note !

by Ivan Hartwell

Recently, D.J. Hodgkinson, Maya Vincent and myself went to the Natal South Coast on a five day shelling trip. Shelling proved to be surprisingly fruitful with each of us finding a number of new species. A special thanks to Val van der Walt who provided us with accommodation and assistance in identifying all the shells found. A list of some of the more unusual to rare shells follows.

(Editor's note. I have added family groupings as given in Dance,S.P., *The Encyclopedia of Shells*, Blandford Press, London 1974, as an aid to 'placing ' the various shells)

Mr Hartwell, seen here during a visit by the Editor in December 1996, is also a keen marine aquariast.

Haliotidae
Haliotis pustulata (Reeve 1846)

Trochidae
Trochus cariniferus (Beck in Reeve 1842) (fair specimen)

Cymatiidae
Cymatium (Ranularia) cynocephalum
Cymatium (Monoplex) nicobaricum (Röding 1798)

Cerithiidae
Cerithium egenum (Gould 1844)

Coralliophilidae
Coralliophila costularis (Lamarck 1816)
Coralliophila madreporara (Sowerby 1820-24)

Conidae
Conus lischkeanus (Weinkauff 1875)

Nassariidae
Nassarius (Niotha) albescens (A. Adams 1852)

Miters
Vexillum vexillum (Gmelin 1791)
Vexillum pacificum (Reeve 1845)
Imbricaria punctata (Swainson 1821)
Scabricola (Swainsonia) bicolor (Swainson 1824)

Muricids
Morula squamilirata (E.A. Smith)
Thais tissoti (Petit 1852)
Favartia salmonea (Melville & Stander 1899)

Chitons
Octopleura mitralis (A. Adams 1853)

opisthobranchs
Pyramidella maculosa (Lamarck 1822)
Pyramidella turrita (A. Adams 1854)
Acera soluta (Gmelin 1791)

Chamidae
Pseudochama cristella (Lamarck 1819)
Chama limbula (Lamarck 1819)
Chama asperella (Lamarck 1819)

Malleidae
Malleus regula (Forskal 1775)

Nassarius (Niotha) albescens (A. Adams 1852). Illustration from Kilburn & Rippey

Pyramidella maculosa (Lamarck 1822). Illustration from Kilburn & Rippey

Strandloper

The editor welcomes original articles, news, shelling reports, feedback, advertisements (rates on application) and any other material likely to be of interest to members of the Society. Illustrations are especially welcome. Please send to

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C. Pye

Flotsam

23RD MAY

Announcing the Society's Biennial Conchological Colloquium and Annual General Meeting

Book Saturday 23rd May for a day of shelly interest. These two-yearly conchological colloquia have been a great success ever since their introduction several years ago by the Durban group. It is well worth out-of town members finding some excuse to visit Pretoria for the day since a number of excellent talks have been lined up for you. The event will be held at a venue within the grounds of Pretoria's zoo. After lunch the official business of the Society will be addressed. Further details concerning the day will be available on a separate leaflet. Alternatively, please contact the Society Secretary, Laurie Smith, at 012-567-5543.

Collective names

What shall we call a gathering of live gastropods? Suggestions made recently on the Internet included a **gaggle** of gastropods, a **slime** or **pest** of slugs, a **crawl** of snails, and a **snerd** of snails [1] ! Some purists stated that the question is irrelevant because they were not aware of any evidence that snails ever lived or fed in collectives. However, counter-examples to disprove this unsocial position materialized in cyberspace before anybody could even say "cybersnail". Some conchologists reported having seen Muricidae hunting over the sand flats in packs. I myself have noticed that the young of *Achatina immaculata* tend to stay together until they have grown to a safer size (a **nursery** of baby snails?)

[1] Thanks to Dwayne Lepitzki, USA, for the above suggestions

Flotsam : *Mitra dovpeledi vs Mitra fraga*

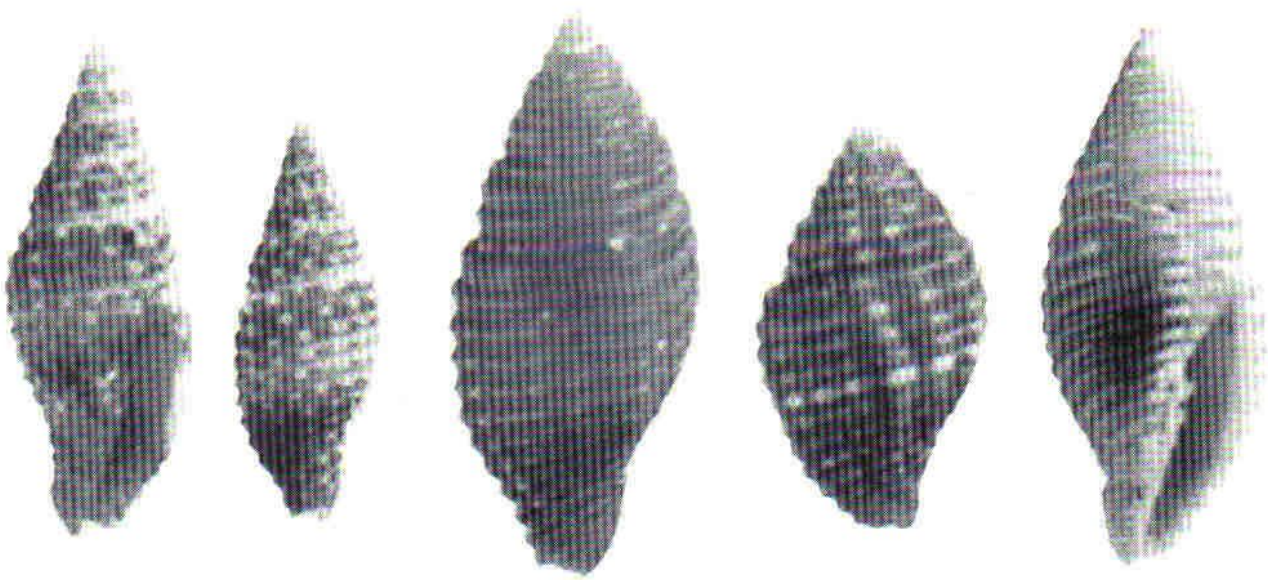
Mitres are amongst the most varied, interesting and attractive little molluscs. Most species dwell in pockets of sand in and around coral reefs but there are a few species that inhabit specific niches along the rocky shores of sub-tropical coastlines. South Africa, for example, has at least nine species, distributed between the families Mitridae and Costellariidae. However, the tropical east African coastline to the north of us has several dozen species. Although comparatively well-studied, this group of molluscs occasionally turns up a surprise, for example, *Mitra dovpeledi* Turner 1996, a striking new species, reported recently from the Red Sea[1]. The illustration provided here is from the journal *Argonauta*, a quality publication available from the Associazione Malacologica Internazionale (AMI), P.O. Box 322, 00187 Roma, ITALY.

Is this a genuine species? Mitre aficionados may note that its shell is certainly similar to that of the relatively common species *Mitra fraga* Quoy & Gaimard 1833 (which Dance[2] considered to be synonymous with *Mitra chrysalis*), and which is found in the central Indo-Pacific[3]. So what would be needed to make sure that *Mitre dovpeledi* deserves its own species name? This is a somewhat debatable point (see a previous *Strandloper*[4]). However, the most important criterion seems to be that the population of *Mitra dovpeledi* in the Red Sea should not currently be part of the same gene pool as that of *Mitra fraga/Mitra chrysalis* in the central Indo-Pacific. Direct genetic studies of the various populations could, in principle, be undertaken to investigate this point. However, a more immediately useful practical guide is whether or not the ranges of these species ever overlap, and whether or not the various forms can always be readily differentiated on the basis of conchological and malacological differences. If the answer to the first question is no, and to the second is yes, then we certainly have a new species.

References

1. Turner,H. Three new species of mitriform gastropods with an illustrated checklist of the species living in the Red Sea, *Argonauta*, vol. 10(1-6), 1996, pp.3-31.
2. Dance, S.P. *The Encyclopedia of Shells*, Blandford Press, London 1974.
3. Pechar,P., Prior,C. and Parkinson,B. *Mitre Shells from the Pacific and Indian Oceans*, Robert Brown & Associates, Bathurst, NSW, Australia, date uncertain but mid 70s.
4. Cortie,M.B. Who was William of Ockam, and what has his razor got to do with us? *Strandloper*, 240, Dec 1994, p.5

Illustrations of *Mitra dovpeledi* taken from paper by Turner[1]



Illustrations of *Mitra fraga* taken from the book by Pechar, Prior and Parkinson[3]

Fester, Carbuncle and Fred

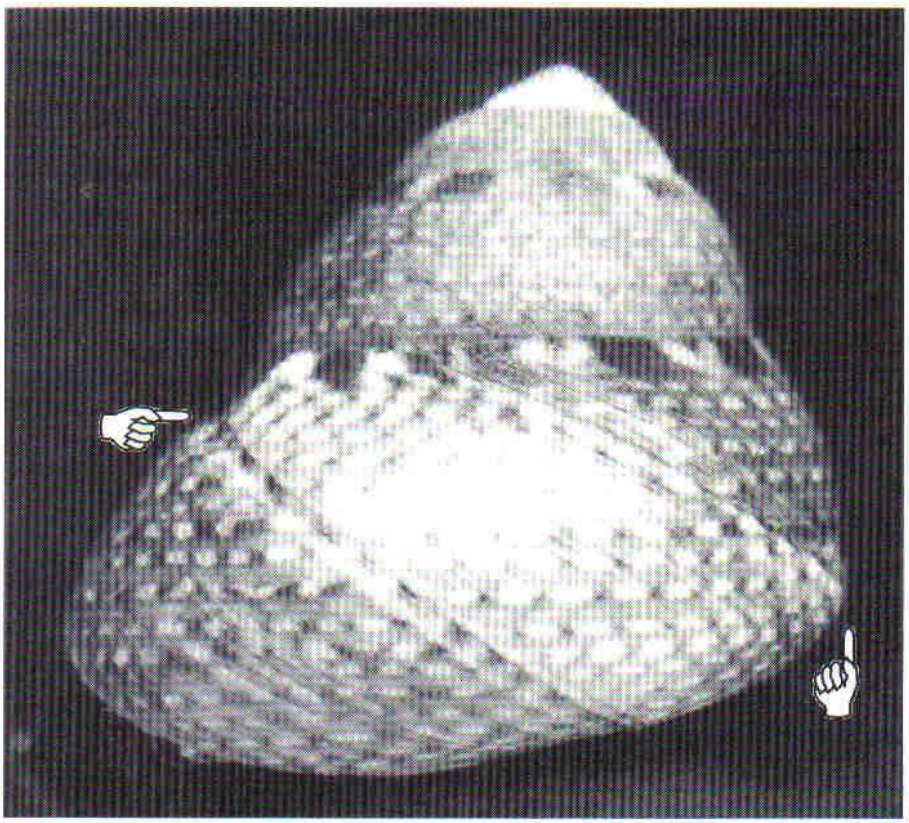
by Mike Cortie

I have noticed that quite a few members of the Society have tried their hands at a marine aquarium at some stage. Although not as easy to sustain as a fresh water tank, a well-kept marine tank is a joy to the eye. Most people only keep fish however, not only because marine tropicals are almost unbelievably colourful and active, but also because they are somewhat easier to keep alive than most marine invertebrates.

I was introduced to the idea of keeping a marine tank for molluscs many years ago by member Bobby Adam, who had regaled us with accounts and colour slides of her inhabitants at meetings of the Johannesburg Group. (In those days we parked along Smit Street in Braamfontein on Friday evenings and had our meetings in Shell House - somehow I can't see many members now willing to risk life, let alone limb and property doing *that* any more!).

It was not long before I too set up a small tank of my own. Its first inhabitant was 'Fred', an *Oxystele variegata* from Pondoland. This hardy individual survived quite a few ordeals before his living conditions settled down. However, once a fair bit of algae had grown in the tank, I started to yearn for more exotic occupants.

Help was soon at hand in the form of former member Jessica Jacks, who had decided to decommission her own marine tank. As a consequence, she needed a home for its two remaining molluscan tenants, Fester and Carbuncle, two *Cypraea annulus* that she had bought some months previously from a pet shop that specialized in marine life. Fester and Carbuncle settled right in, and proceeded to munch their way through the thick algal growth. They also took fresh hake fish when offered it, and generally proved no trouble at all to keep. Some months later I was excited to observe them engaged in some sort of close encounter of the intimate kind, and a little later I was rewarded with the sight of one of the pair laying patches of eggs. Alas, nothing came of it and I have no idea if they even hatched.



Shell of of 'Fred' showing the effect of different conditions in the aquarium on the growth of its shell.

As the years have passed I have had a marine tank on and off, and have tried all kinds of molluscs in them. Unfortunately, rather few adapt well to tank conditions, and most die after a month or two. However, *Cypraea annulus* has always been a great success in my reasonably 'natural' tanks, and a pair will usually survive up to two years, even in a tank with fish. They are well worth keeping for the interest they offer, and their inadvertent porcelain and gold gleam becomes something to look out for. Some other species of cowrie are even longer-lived. Bob Lipe, of The Shell Store in the USA (email: shellstr@gte.net) reported[1] that he had a *Cypraea arabica* that lived for 21 years in his aquarium! Lipe found that his cowries were quite partial to the flesh of small marine bivalves such as *Donax variabilis*.

Any idea I had of cowries as peaceful pastoralists grazing on algae and whatever titbits came their way was dispelled in Bob's post (his message to the discussion group). According to him the cowries "would compete for food by biting each other until one or the other would give way. The radula would lash out. It would come quite a distance from the proboscis. I had a four inch tulip that would kill and eat almost any other shell, but it kept out of the way of the cowries". Interestingly, he reports that a *Cypraea arabica* killed and ate one of his local North American *Cypraea zebra* (about comparable sizes I should think). Another contributer on the Internet reported that while her *Cypraea arabica* initially grazed on algae, it began to nibble on the foot of a white anemone in her tank as soon as she added it[2]. Another cowrie, *Cypraea spadicea* seemed to her to have been responsible for capturing and devouring a small crab in her tank. Evidently, as far as some species of cowrie are

concerned, a meal is a meal is a meal. How appropriate that these roly-poly molluscs should be called 'little pigs' by some European collectors !

Another interesting inhabitant is *Conus lividus*, a very common Indo-Pacific species. This animal normally lurks below the surface of the gravel of an aquarium and appears to dine on whatever small worms it can find therein. However, for a treat you can try feeding it live earthworms. To do this first find the cone and place it on the surface of the gravel. (Hold the shell by the broad end - although *C. lividus* does not have a particularly potent sting you might as well get into the habit of doing this for all live cones.) Then drop in a live earthworm. This will wriggle furiously as it sinks down to the bottom of the tank. Somewhat surprisingly, *Conus lividus* usually responds positively to what must surely be a rather unfamiliar odour and flavour. Most times I tried this manoeuvre I was rewarded by the sight of the cone stalking up to the worm and then - zuip - followed by it being slowly swallowed whole ! On the other hand, don't even think of putting one of the more potent fish-eating cones into your tank unless you want to live very dangerously !

References

1. Bob Lipe, Contribution to CONCH-L discussion group on the Internet, 3 Feb 1998.

2. Theresa Marche, Contribution to CONCH-L discussion group on the Internet, 3 Feb 1998.

A long-lived aquarium specimen of *Cypraea annulus*