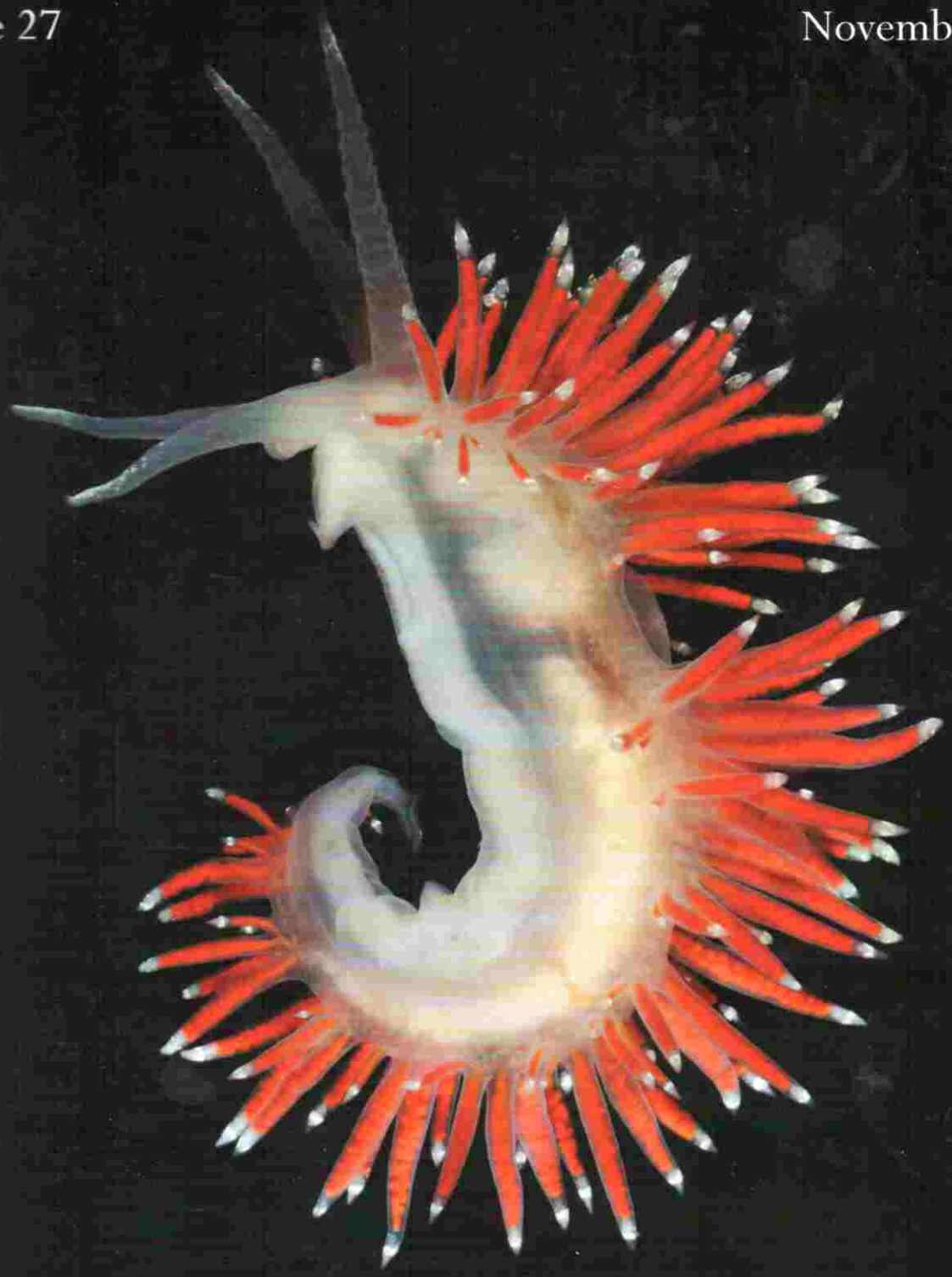
Mollusc World

Issue 27 November 2011



Coryphella browni

is a winner

THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

From the Hon. Editor

A very big thank you is due to all those who sent in pictures for the Mollusc World cover competition! The standard was very high. At the October indoor meeting in London members were able to vote from a choice of ten final images, any of which may be used for the cover of future issues.

The winning picture, on the cover of this issue, is of a 35 mm *Coryphella browni* or "Scarlet Lady" seaslug from the Menai Strait, North Wales, taken by Ian Smith (who has an article about *Lamellaria* on page 6). *C. browni* ingests the nematocysts (defensive stinging cells) of the hydroid on which it feeds and deposits them in the cerata tips, via the digestive gland, for defence against predators. Ian received an NHBS book token.

A "runner up" prize of some back issues of Mollusc World was awarded to new member Clive Craik for his image of a swimming *Akera bullata* at Oban, Scotland (below). An article by Clive about this species will appear in a future issue of Mollusc World.

In the picture above I am standing next to an impressive 2007 sculpture by Graeme Mitchinson on the quayside at Conwy, North Wales, which we came across whilst on holiday this summer. Entitled (accurately) 'Mytilus edulis' and made of Kilkeny limestone, most of the work was done with angle grinders, firstly to cut and shape the stone and then to polish it – yet another aspect of the surprisingly wide field of conchology!

Peter Topley

Mollusc World

This magazine is intended as a medium for communication between members on all aspects of molluscs. We include articles, field meeting reports, research news, results from the mapping schemes and identification aids. We welcome all contributions in whatever form they arrive (see back cover for further details).

Contents

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All photographs and drawings featured in articles are by the author unless otherwise indicated.
No representation is made about the accuracy of information included in any articles, which solely constitute the authors' personal views on the subjects covered, and are not necessarily those of the Hon. Editor or the Conchological Society.

Thanks go to Vicki Harley for help with proof reading and Janet Ridout Sharpe for editorial assistance.

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Front cover: Coryphella browni, Menai Strait, North Wales (photo: Ian Smith)

Changes in membership structure and subscription rates.

At the Annual General Meeting of the Conchological Society on 2 April 2011, we decided to introduce two changes with effect from 1 January 2012.

One (Agenda Item 3b) was to introduce an additional postal charge for overseas members. We did this with reluctance, but postal charges, and especially overseas postal charges for printed matter, have been increasing for some years. Until now, we have kept the same subscription rates for UK and overseas members regardless of where they live; but we have now decided to charge European members an additional postal charge of £8, and those in the rest of the world an additional £17. This seems like a lot, but is, unfortunately, the extra postal costs that we have to pay. We considered bringing this additional charge in more gradually, but this would have involved more frequent changes (which create a lot more administrative work), and would have required us to increase the basic subscription rate very soon; with the new charges we do not expect to have to increase subscriptions for at least another three years.

At the same time (Agenda Item 3a), we decided to simplify the membership structure for institutions. This has become complex, time-consuming and a little confusing – institutions could opt to be members, subscribers, or "subscribers extra". We have decided to simplify matters by ending the Institutional Member category and the Institutional Subscriber Extra category, and by sending both our publications (Mollusc World and Journal of Conchology) to all Institutional Subscribers. Institutions which have been Institutional Members will, from January 2012, no longer be entitled to vote at meetings or to receive AGM agendas and other notices and papers for members; their members will, however, still be very welcome to attend meetings.

Subscription rates for UK individual, family and student members remain the same; all overseas and institutional rates will change.

These changes will take effect from January 2012. If these changes affect you, we hope that you will continue to be a member or subscriber, and would be very grateful if you could change your payment arrangements so that the correct new amount is paid in January 2012, as this will save a lot of administrative work dealing with underpayments and overpayments.

With very best wishes,

Bas Payne,
Hon. President

The new structure and subscriptions are summarised below:

	UK		**Rest of Europe (including Eire)**		**Rest of World**	
	old rate	**new rate**	*old rate*	**new rate**	*old rate*	**new rate**
Individual member	*£33*	**£33**	*£33*	**£33+8 = £41**	*£33*	**£33+17 = £50**
Family/joint member	*£35*	**£35**	*£35*	**£35+8 = £43**	*£35*	**£35+17 = £52**
Full-time student member	*£15*	**£15**	*£15*	**£15+8 = £23**	*£15*	**£15+17 = £32**
Institutional subscriber	*£47 or £57*	**£47**	*£50 or £60*	**£47+7*= £54**	*£50 or £60*	**£47+15* = £62**

* = lower because institutional subscribers receive no membership mailings.

Monitoring the Cheese Snail, *Helicodonta obvoluta*

John Glasgow

During the afternoon of 26th July 2011 I made another visit to West Wood , a Forestry Commission managed woodland to the west of Winchester to see how this species was faring. After a period of variable weather with some prolonged dry spells there was substantial rainfall very early that morning which hadn't penetrated the beech canopy as much as I might have expected.

Searching in the same compartment previously visited (see *Mollusc World*, Issue 22, March 2010 and Issue 25, March 2011), no mollusc activity was observed on the tree trunks. The immediate top surface of the leaf litter was fairly dry with reasonable dampness to c. 10 cms deep. Harder work was required! This was rolling fallen logs from c. 10 to 30 cm diameter.

One hour and forty minutes of this returned a satisfying 40 live *H. obvoluta* including some juveniles and one with a well-sealed epiphragm. Other species recorded were: *Pomatia elegans, Oxychilus cellarius,Oxychilus alliarius Cochlodina laminata, Discus rotundatus* and *Arion ater agg.* together with a very handsome Violet Ground Beetle, *Carabus violaceus* .

Time did not permit of any further work that day but I found it rewarding to know that this population is still very healthy. It is my intention to have a look at Well Copse and other likely looking compartments of adjacent woodland to see if there is a wider distribution.

Field meeting in south Devon in search of *Malacolimax tenellus*

Keith Alexander

Malacolimax tenellus, the Slender Slug, has only ever been found in the South West in the Sidmouth area of East Devon. The next localities up-country are the New Forest and the Cotswolds, so the local Devon population appears to be very isolated from the main British range. In his *British Snails*, A. E. Ellis (1926) notes 'Blackberry Castle near Branscombe in Devon' as one of the few known localities for this elusive slug. Since then it has only been found in Roncombe Goyle, Sidmouth, as a result of the extensive Devon recording project led by Dave Bolton and Michel Hughes during 1989-95 (M. Hughes, pers. comm.). The aim of this field meeting, which took place over two days (23rd and 24th October 2010), was therefore to revisit both of the known sites and to explore further afield.

Blackbury Camp area

figure 1: Blackbury Camp general view.

The first stop was Blackbury Camp (SY1892), Southleigh, which is an Iron Age hill fort now owned by English Heritage (figure 1). The earthwork is situated on an east–west ridge at a height of about 185 m and is covered by mature beech and oak trees. To the north lies the ancient woodland site of Wiscombe Wood (now conifer plantations) and along the south side is an area of former wood pasture called Castle Down. Exactly where the slug was originally found is unclear. We started with the wooded earthworks. Despite heavy showers, the ground was actually quite dry and there was little sign of fruiting fungi. After an hour or so of searching only a few widespread species had been found so we followed a public bridleway into the western section of Castle Down. Grazing has long ago ceased here and the area is now dominated by closed canopy woodland of open-grown oak standards with much birch and holly in-fill. A *Limax cinereoniger* was quickly found in a cavity under loose bark on a hanging dead oak branch, and another was found further into the wood beneath a decaying log on the ground. The ground layer was also very dry here and again few fruiting fungi could be found other than on decaying wood, of which there was plenty. *L. cinereoniger* is often present at *M. tenellus* sites so perhaps this is the original locality. If so it appears to still be suitable. Wiscombe Wood has no public access and so was not entered.

Roncombe Goyle

After lunch the group moved to Roncombe Goyle (SY1694), courtesy of the owner, Mr E Smith of North Mincombe Farm. This is a very rich wooded stream gully which was

figure 2: View of Roncombe Goyle, a wooded stream valley.

visited by the Society in the spring last year to successfully confirm the presence of *Phenacolimax major*. While the 2009 visit concentrated on the stream-sides deep in the Goyle, the *M. tenellus* search concentrated on the southern wooded valley sides. Interestingly this appears also to be a former wood pasture area, with scattered open-grown oak trees – some pollards – with in-fill of dense holly along the drier areas together with patches of wet alder woodland associated with wet seepage areas. The flinty slopes were again very dry and with very few fungi visible. A single juvenile *Zenobiella subrufescens* from one of the wet seepage areas was the only highlight. After some time scrambling through the holly thickets to no avail, continued heavy showers convinced us that a strategic retreat was the best course of action.

Holne Chase, Dartmoor

Sunday proved to be a much nicer day, with warm autumnal sunshine throughout. After gathering near Buckland Bridge, the group moved to Chase Wood (SX7271), Holne, where permission had been given by the owner, Richard Simpson, for the leader to take a party into this famous area of ancient woodland. The River Dart here cuts through a steep-sided valley extensively clothed in ancient oak woodland. As one of Devon's largest areas of ancient woodland it was thought a feasible site for *M. tenellus*, albeit speculative, given a lack of any past records from the Dartmoor area. Having parked by the river bank at the base of the eastern slopes, the party explored northwards in the morning and southwards after lunch. The soils are mostly acid here but with more base-rich conditions locally, associated with wet seepages – fine for slugs but poor for snails. After two hours of exploration the list was horribly short but eventually both *Zenobiella subrufescens* (figures 3 and 4) and *Limax cinereoniger* were found, but no *M. tenellus*. *Arion silvaticus* was also a useful record and *Balea heydeni* was found close by the vehicles at the end of the day. *L. cinereoniger* was found in two separate areas, a very typical black specimen in the northern area investigated and a remarkably pale one in the south. This pale specimen caused much discussion of the key identification features (figures 5 and 6). With so little coloration even the sole appeared completely whitish, with no hint of dark stripes along the sides. But the keel was typically long and the tentacles spotted with black, so it was definitely *L. cinereoniger* and not *L. maximus*. The slime was colourless but not sticky. Specimens like this are very

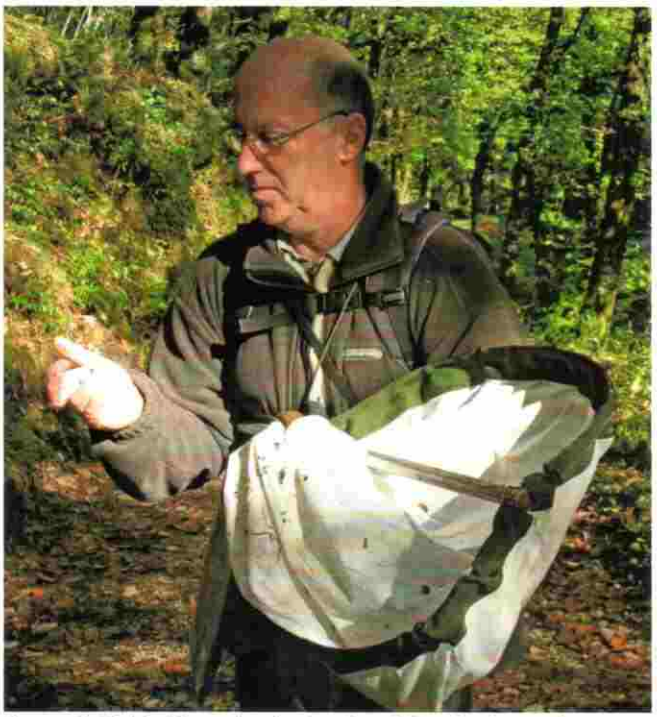

figure 3: Keith Alexander, having found *Z. subrufescens* by sweep-netting in Holne Chase; the snail is on his finger.

figure 4: *Z. subrufescens* on Keith's finger.

figure 5: Pale *L. cinereoniger* from Holne Chase.

figure 6: Close up of ocular tentacle of pale *L. cinereoniger* showing the characteristic dark spots.

useful at focusing the mind on the key features. The 'jizz' was very much *L. cinereoniger*, which was encouraging. The southern riverbanks were the best areas seen all weekend for fruiting fungi, although not impressive. Many of the toadstools had been well chewed by slugs but few of the slugs concerned could be found close by. The damage to the groups of *Hydnum rufescens* was especially frustrating as this fungus is very edible to humans as well as slugs!

The full list for the weekend was only 18 species but these included 11 species of slug, so the slug theme was achieved even if the target species eluded us.

Acknowledgements

I am grateful to Michel Hughes for information from the Devon invertebrate survey, and to Mr E Smith and Richard Simpson for permitting access to their private land. Norman Baldock of the Dartmoor National Park Authority advised on suitable sites for speculative surveys.

Photos by Ron Boyce

Species list

Species name	Blackbury Camp	Castle Down	Roncombe Goyle	Chase Wood, Holne
Aegopinella nitidula	*			
Arion ater agg		*		*
Arion circumscriptus	*			
Arion distinctus	*			
Arion flagellus		*	*	
Arion intermedius				*
Arion owenii	*	*	*	
Arion silvaticus				*
Arion subfuscus	*	*	*	*
Balea heydeni				*
Cepaea nemoralis	*			*
Deroceras panormitanum			*	
Discus rotundatus	*	*	*	*
Euconulus fulvus				*
Lehmannia marginata	*			*
Limax cinereoniger		*		*
Oxychilus alliarius			*	*
Zenobiella subrufescens			*	*

Sloughing by *Lamellaria perspicua*

Ian Smith

In March 2011, I collected five specimens of *Lamellaria perspicua* from the Menai Strait for photography. To keep the water fresh and slow down their metabolism until they could be released, they were kept in a refrigerator. After two days, a slough of the outer epithelium of one of them was found in their container (fig. 1).

figure 1: Sloughed epithelium of *Lamellaria perspicua.*

I am unsure which specimen it came from, but suspect it was the lilac coloured individual in figure 2. The slough clearly shows a long indentation at the anterior, representing the uncurled siphon, and an indentation that corresponds with a tubercle on the live animal.

figure 2: Lilac specimen of *Lamellaria perspicua* with unusually few tubercles.

The lilac specimen has far fewer tubercles and is consequently more translucent than is usual in the species. The internal shell and its spire can be discerned through the mantle.

Has any reader observed sloughing in this species? It might be a regular event associated with growth or a reaction to adverse conditions. I incline towards the former suggestion as, if it were due to external conditions, I would have expected the other specimens to slough also. All five lived in apparent good health until release three weeks later.

figure 3: *Lamellaria perspicua* with normal number of tubercles.

Field meeting to Kew, Surrey, 9th July 2011

Adrian Rundle

Ten Conchological Society members assembled at Kew Gardens Railway Station at midday. Those who arrived early had time to study the handout and acquaint themselves with the programme for the day.

The main purpose of the meeting was to examine two known sites for the rare and local British snail *Balea biplicata*. This species is common on the continent and is believed to have been accidentally introduced into Britain in about Roman times. The species was originally described from Easton Grey, Wiltshire by Montagu in 1803, a locality where it has not been re-found. It is also known from Hyde Park, Cambridge, Somerset, and various localities next to the River Thames in the London area. Sadly, the species no longer occurs at most of these due to development work over the years. The Kew area is fortunate in that there are four sites where it still occurs. The two that were not visited during this trip were in vegetated ground next to the River Thames at Chiswick just downstream of Barnes Railway Bridge (map reference TQ 213764) (see Boycott, 1929) and amongst nettles on Isleworth Ait (TQ167758).

figure 1: *B. biplicata* at Kew. (Photo: Rosemary Hill)

The first of the sites visited was Occupation Road, Kew (TQ195773), only a short walk from the station. The site consists of a rather untidy nettle patch with common Cow Parsley (*Anthriscus sylvestris*) and Mugwort (*Artemisia vulgaris*) on either side of a footpath leading to the River Thames towpath. The site was discovered over 40 years ago when living specimens were abundant. They were most obvious after rain when they could be found crawling beyond the edges of the patch. They are not as common here now because the footpath has been widened several times to allow lorries access to the towpath for defence works and this has damaged the habitat. Careful searching by members revealed empty shells but no living animals. The Public Records Office grounds are on the south side of the path where a triangular area of lightly wooded nettle patch is managed as a protected area for the species. Permission to visit this part of the site wasn't sought on this occasion. After spending some time in Occupation Road the party searched the area on the north-east of the reserve, next to the towpath. Many live specimens were found here. The mollusc fauna of this area is much reduced from what it used to be. Nine other species were found. The only one of any note were a few shells of *Hygromia cinctella*. This species spread to the Kew area about ten years ago and became quite common. Since then it seems to have died out and only empty shells are found.

figure 2: Kew Meadows Path site for *B. biplicata.* (Photo: Ron Boyce)

Our second site was Kew Meadows Path (TQ198765). This is one of the classic sites for *B. biplicata* where it has been known for about a hundred years. The habitat is an unstable vegetated bank roughly held in place by a low concrete wall on the south-west side of the path. The flora is dominated by nettles and brambles. The soil dries quite rapidly due to the steepness of the slope but damp areas can be found under pieces of wood, bricks, etc. Live specimens were found by all members of the party, together with many empty shells. The instability of the bank makes this a rather precarious habitat for the species but it has managed to survive here regardless. Ten other species were found including a specimen of the slug *Lehmannia valentiana* and several shells of *Hygromia cinctella*.

Our next site was on the Thames foreshore about 55 metres upstream of Chiswick Bridge (TQ201763) to see what freshwater molluscs are present and to try to locate the Holocene alluvium that occurs just below the surface gravels. The dominant living species was *Radix balthica* but only a few other species occurred. It is said that the Thames is much cleaner now but the molluscs don't seem to back this up! Unfortunately, the tide didn't go out as far as it should have done and it wasn't possible to locate any alluvium on this occasion. Samples of this deposit were collected last year on 25th August and used for the November workshop in Woking. The deposit can be dated to about 300 years old on the basis of included clay smoking pipes. The mollusc fauna is very diverse and includes many freshwater species. Of most note is the ramshorn *Gyraulus acronicus* which now only occurs in this country in weedy backwaters of the upper Thames tributaries. This shows that this area of the lower Thames was much cleaner and weedier only 300 years ago. This conclusion is supported by the presence of plant seeds and fruits, for example, Horned Pondweed (*Zannichellia palustris*).

The party then walked along the towpath back to the top of Occupation Road and descended to the foreshore. I first discovered *Corbicula fluminea* here in August 2010. It occurs at low tide mark on the foreshore just upstream of

Kew Railway Bridge (TQ195775) (figure 3). Surprisingly the species seemed to be restricted to only a small area. Many empty shells occurred together with common live specimens. There were many specimens which were smaller than average, very rounded in outline and very thick-shelled. I thought these could be a 'ponderosa' form of the species but see Theo Tamblyn's article following this report. *Radix balthica* was abundant here and a few other species were found live in small numbers, eg. *Dreissena polymorpha*. Everyone found a good range of shells of *Corbicula*, although small juveniles seemed to be absent.

After a brief summary of the day's finds the party made their way back to Kew Gardens Station at about 5.00 p.m.

figure 3: Group on the foreshore just upstream of Kew Railway Bridge. (Photo: Ron Boyce)

References

Boycott, A.E. (1929). The habitat of *Clausilia biplicata* Mont. *J. Conch.*, vol. 18, pp. 340-342.

Montagu, G. (1803). *Testacea Britannica*. London.

Pathological causes for deformation in *Corbicula fluminea?*

Theo Tamblyn

Recently I attended the field meeting described in the previous article, which included the shore of the Thames. The river at this is point muddy, tidal, mildly saline and fairly polluted, supporting a rather small number of extant mollusc species (and not much else). The introduced Corbiculid *Corbicula fluminea* is very common in this area (just upstream of Kew Railway Bridge), living in high concentrations on the mud surfaces exposed at low tide.

Adrian Rundle, who was leading the meeting, drew my attention to an abnormal form present among the normal *Corbicula*. This form is rather unusual so I will describe it here as it may be of interest to members:-

The shells of the aberrant form are generally small, rarely more than 25 mm in length, and rather globose in cross-section (as opposed to normal specimens, which tend to have a more heart-shaped cross-section). The posterior margin is generally more rounded than that of a typical example, and the ventral margins are turned inwards toward each other and often substantially deformed, leading to irregularities in the shape of the whole shell. The growth lines towards the shells' margins are crowded and usually irregular. Internally, the growth margins are built up with a very distinctive, greenish or greyish callus*, usually extending from the pallial line to the margin itself, which sometimes spreads to the hinge plate rendering the teeth unrecognisable. According to Spann, Harper, and Aldridge (2010), the callus is made up of a form of calcium carbonate (vaterite) not usually found in the structure of Corbiculid shells (which are typically aragonitic) [*see also note from Adrian Rundle on the next page – Ed.*].

A close examination of the shells shows that the callus is only laid down *after* a period of normal growth - the shell grows to a size of 10 to 20 mm in a normal fashion before the margins begin to turn inwards and the first layers of callus are laid down (once this begins to happen the shell does not increase appreciably in size, probably because growth is concentrated in the deformation structures). This is interesting as it points to a pathological origin of the abnormalities, not an environmental cause, as this would clearly affect the mollusc throughout its life and not just at a certain point in the growth sequence.

Now for some statistics: at the Kew Bridge site, I collected a total of 198 specimens of dead *C. fluminea*, of which 68 showed some degree of callosity – 34% of the sample, or one in 2.91 specimens showing the abnormality. Deformed specimens from the site had an average width (anterior to posterior) of 20.8 mm, a height (top of umbone to lowest point on ventral edge) of 20.8 mm, and a breadth (side to side, both valves) of 16.1 mm. By comparison, typical, adult** specimens of *C. fluminea* taken in the sample had an average width of 26 mm, a height of 26 mm, and a breadth of 19.5 mm, making an average, normal specimen exactly 20% larger than the average deformed specimen (this is hardly surprising, given that, in abnormal shells, growth in terms of dimensions appears to slow down once the deformities begin to develop). More remarkable is the percentage of the specimens affected within my sample (provided it is taken as representative of this population, which it may not be) – the fact that the majority of specimens displayed no deformities *seems* to rule out purely 'ecotypic' variation (variation as a result of environmental factors), at the very least making it unlikely. Also, remarkably few specimens were found showing characteristics intermediate between the typical and abnormal forms.

When presented with this one must be careful not to jump to conclusions – all that can be said is that deformation in *C. fluminea* is not caused solely by environmental factors (if this was the case, the entire population would display it to some degree). In view of this, it seems likely that the deformity of the shell margins is pathological in nature and is probably caused by a pathogen, perhaps a protozoan, which affects the molluscs' growth-processes. It could potentially be caused by some genetic abnormality, but this seems less likely as if this was the case either the majority of my sample or a very small proportion would probably have been affected. In the same way we can rule out purely ecotypic variation, although environmental factors *may* contribute in some way.

C. fluminea was first recorded in the UK in 1998. At present it is found in the River Thames and throughout the Broads system, and also on the River Barrow in Ireland. Similarly deformed specimens have been found in the Rivers Yare, Waveney, Thames and New Bedford, the different populations being affected to various degrees, those in the Yare showing deformities throughout (Spann *et. al.*, 2010). I for one cannot find an explanation of these deformities in the literature, although they have been studied fairly extensively. If anyone can explain them, perhaps they could contact *Mollusc World* to make the matter clear.

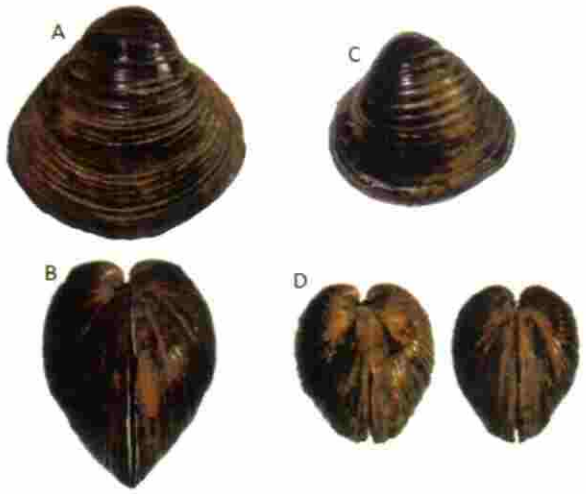

figure 1: Typical and abnormal specimens of *Corbicula fluminea* A. – Typical specimen, right valve B. – Typical spec., view of anterior C. - Abnormal spec., left valve D. – Abnormal spec., view of anteriors (all specimens collected under Kew rail Bridge (TQ[51]195775), Kew, London, 9.7.2011).

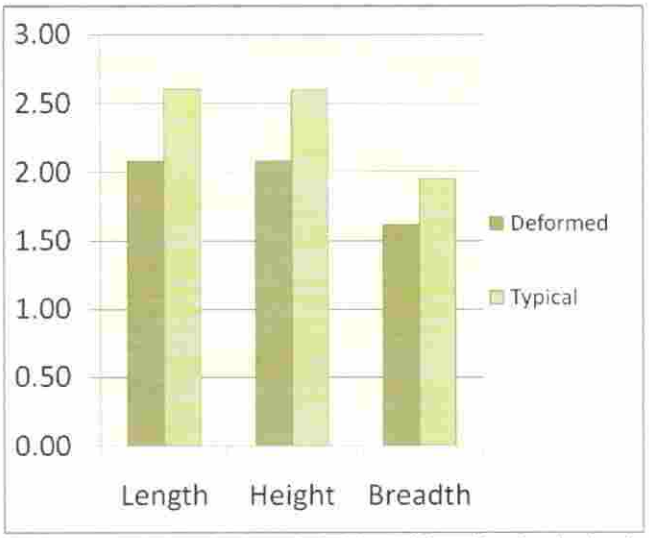

figure 3: Graph showing length, height and breadth of typical and aberrant specimens in my sample (all values represent centimetres).

References

Killeen, I., Aldridge, D.C., & Oliver, G. (2004) Freshwater Bivalves of Britain and Ireland. FSC (*contains general description of* C. fluminea*)*

Spann, N., Harper, E.M. & Aldridge D.C. (2010) The unusual mineral vaterite in shells of the freshwater bivalve *Corbicula fluminea* from the UK. *Naturwissenschaften*, **97**, 743-751.- *(chemical makeup of deformation structures in* C. fluminea*)*

http://www.zoo.cam.ac.uk/zoostaff/aldridge/nicole.htm - *N. Spann (freshwater mussels as biomonitors)*

http://caisie.ie/?p=233 *(*Corbicula fluminea *in the River Barrow, Ireland)*

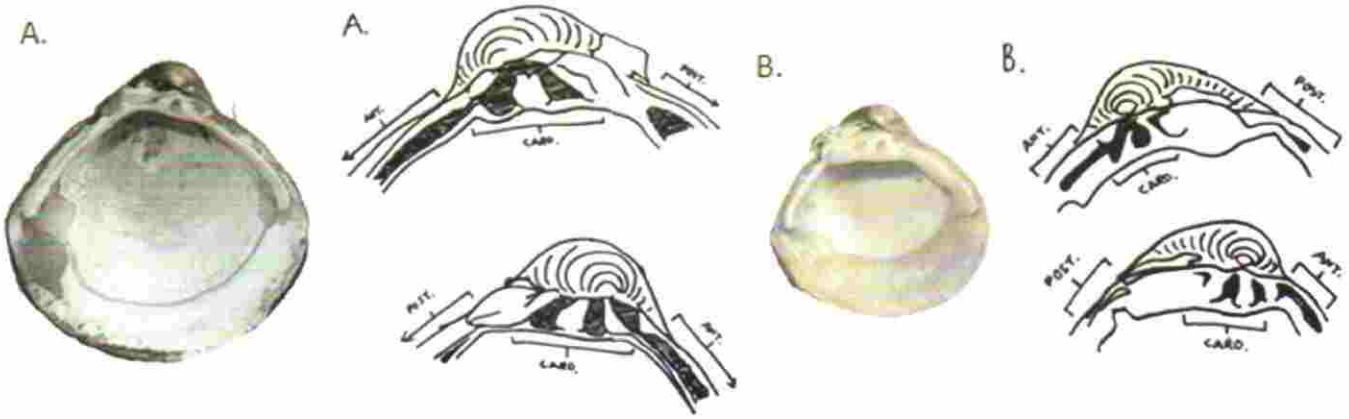

figure 2: Internal structure of typical and aberrant *C. fluminea* A. – Typical left valve, diagram of typical tooth structure B. – Left valve of aberrant spec., diagram of tooth structure in severely deformed spec. Abbreviations used:- ANT: antero-lateral teeth, POST: posterior lateral teeth, CARD: cardinal teeth. (Locality data as for Fig. 1).

*very large, adult specimens of the typical form often show a degree of callosity along the ventral margin. However this is distinct from the callus I describe, being generally dark slatey-grey in colour and running only along the shell edge, never extending up to the pallial line as in the deformed specimens. It results from the slowing-down of growth and can be seen in many bivalve species.

**not many juvenile specimens were found. All those in the sample below two centimetres in length (only 14 specimens in total) were ignored when calculating the averages, as they were clearly juvenile and had the potential to develop into examples of either form.

Note from Adrian Rundle: "Vaterite also occurs in malformed and diseased bony fish otoliths (ear stones). Nolf (1985) refers to pathological teleost otoliths where part of the aragonitic otolith becomes irregular in shape, is transparent and consists of vaterite. This is called otocony."

Reference: Nolf, D. 1985. *Handbook of paleoichthyology. Vol. 10. Otolithi piscium.* Stuttgart (Gustav Fischer Verlag).

Northern Gulf of Aqaba – some notes!

Graham Saunder

Have you ever sought advice and been given several sets of conflicting or spurious information? I guess it has happened to me before but never on this scale. Reports of restrictions on the export of marine specimens from Egypt, prompted me to contact their London Embassy. They said questions should be routed via the Tourist Office who would then be responsible for finding the right department in the Egyptian Government to answer them. I wrote, stating what I hoped to do, how and where, and the procedures I intended to follow. I asked for a response, setting out in Arabic the constraints they would impose on my activities. I still await the written reply. The verbal response was that it was important to prevent the commercial exploitation of coral. The reason for this was not the usual one. Shells were of little interest. There is an agenda to limit the activities of Bedouin, who are trying to supplement their almost non-existent income and limited diet by fishing, on the premise that this might encourage inconvenient concentrations of population in coastal areas earmarked for tourist industry development.

I suggest that regardless of the reality of the law, you detail what you hope to find and bring back then apply several months beforehand to the Egyptian Embassy in London for an export permit IN ARABIC. It may or may not be legally necessary but it limits the scope for hassle and will enable you to have specimens in your hand luggage on the plane without inviting trouble. There was damage to luggage and contents in the hold. Several well-packed and robust containers got crushed and specimens reduced from Gem to Fine.

We stayed at the Taba Hilton, which is in a kind of administrative "no man's land" for we were told that if we were to remain in the area of the hotel, we would not need a visa. On one side is the Israeli frontier and the full Egyptian control starts further down the road. Think twice if you should you feel inclined to visit Jordan via Israel. The Israelis seem to resent anyone who might spend money in an Arab country, making the crossing as slow and expensive as possible, even going to the extent of destroying all food and liquid carried by travellers. This is an inconvenience for the tourist but a real hardship for local Arabs. Incidentally, three weeks after we left, the hotel hosted a Jewish theological convention and was visited by suicide bombers. Several of the Egyptian staff also died. We knew some of them. They were all friendly, harmless, unprejudiced people.

When we took a taxi from Taba to Nuweiba, there was a guard riding "shot gun" as normal police and army cover did not seem to apply there. The taxi driver seemed to have a death wish, with foot to the floor, overtaking on the wrong side on blind bends. He ignored all requests to drive at a reasonable speed even though some passengers were being physically sick from fear in the back seat!

Diving schools and some hotels claim that the whole of the Red Sea is a Nature Conservancy Area or a National Park. This is not true. They are just trying to protect their own interests. Existing development is certainly a genuine threat and there are areas where the environment is becoming progressively polluted by the debris of civilisation. In the enclaves of the better hotels, pollution is more or less under control because they recycle all water and collect up rubbish continually, but, within an enclosed gulf, there is serious cause for concern for the rest of the coastline. The inshore water is starting to get dirty anywhere there are people.

On the positive side, it is obvious that some species of coral are growing a lot faster than experts would have us believe. New coral is building on all kinds of debris from old tyres and discarded cutlery to living shells. Judging by that on living shells, I suggest the growth rate is at least 4 mm a year.

The Red Sea is essentially a flooded extension of a rift valley. Water is >2000 m deep in the centre with vertical sides and a shallow shelf round most of the margins. Corals grow where the light can penetrate and the light here is particularly good. From the shore you tend to have rubble with gravel, mud phasing to sand then stones on rock shelf then coral on stone and coral to the drop off which the coral will tend to overhang. The reef shelves appear solid but are laminates of coral with layers of water between, with the occasional hole, as successive upper layers have killed lowe shelves of coral by depriving them of light. There are minor reefs and coral heads on the sub-tidal shelf. The general impression is of a very large amount of predatory life devouring an inadequate food supply. Vast numbers of brilliantly coloured fish are chewing the coral and any algae growing on dead areas. Turtles munch hunks of coral from the reef edge and the coral heads. There are few crustaceans and even large shells such as big *Trochus* and *Turbo* are crunched up and consumed. Vegetation is very limited. No mollusca are abundant with the notable exception of *Coralliophila neritiodea* (Lamarck, 1816) (figure 3), though there is probably a lot of nocturnal life. There is not a lot left for the hermit crabs but even they get crunched. When you lift a stone you may need to push the fish away or they will crunch anything there before you can grab it! Shallow water has more shells than the reefs because there are fewer big fish. *Conus* plug themselves into reef cavities presenting the solid base to any predator. The larger of the two local *Haliotis* species has the facility to shed one third of its body mass as a decoy when under attack. This is a drastic sacrifice for any organism. Doreen Sharabati (in *Red Sea Shells*, Kegan Paul, 1984), compared this species with *Sanhaliotis pustulosa* (Reeve) but it may not be a correct identification. Severance is instantaneous and there is no bleeding. Some of the *Haliotis* at Nuweiba lacked the normal outer layer and a few appeared as total pristine mother-of-pearl (figure 1).

The area needs some top predators such as sharks to thin out the fish, which are cropping the coral and inhibiting growth of the reef. I saw no sharks or barracuda. The odd moray eel was doing his best!

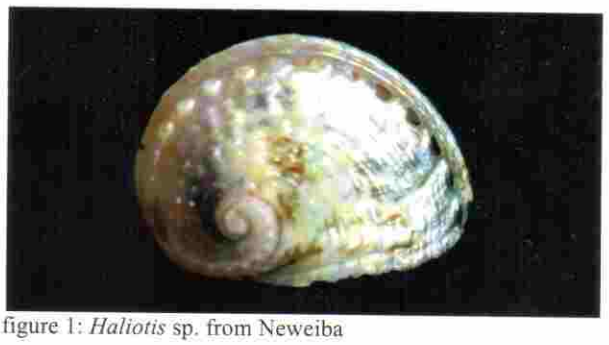

figure 1: *Haliotis* sp. from Neweiba

I collected a very large number of individual species but many of them existed as one or two actual specimens (seen as opposed to collected, that is!). In retrospect I may have taken conservation too seriously and only kept a single proof specimen of several things that were not actually rare.

So many families that I would have expected to be abundant, appeared as a single shell. It was intensely exciting as every time in the water produced something new and often not listed in Doreen Sharabati's book. I was able to observe the living *Bursa rhodastoma* (G. B. Sowerby II, 1835) and confirm to my own complete satisfaction that the living animal is totally unlike that of *Bursa thomae* (d'Orbigny, 1842), even though the two have been confidently and routinely synonymised by numbers of "experts" in recent years.

figure 2: *Trochus maculatus* (L., 1758)

Although it remains early days for identification, I can recognise four or five Pteropoda species and a couple of Heteropods. There is a *Dentalium*, a *Cadulus*, a single Nerite, a *Neritina*, a *Scissurella*, four *Trochus* sp. (e.g. figure 2), including a pair of the largest *T. erythraeus* Brocchi, 1821 I have ever seen, three *Turbo*'s, two *Clanculus*, three *Stomatella*, four *Cerithidae*, one *Terebra*, one *Stilifer*, and several *Eleumidae*. *NO Littorina* s.s. were found but the offshore sand samples yielded a single *Peasiella* sp. (These are abundant in shell sand at Yanbu al Bahr over the water in Saudi). Three *Epitonidae* (including one c.f. *gazae*), two *Hipponix*, three *Strombus*, a single *Cypraea* plus fragments of two others, two *Naticidae*, one *Pseudosimnea*, two *Bursa*, at least three *Triphora*, several *Morula* and *Drupa*, two *Coralliophila* (figure 3), a *Mitrella*, several *Nassariidae*, single *Ancilla* and *Harpa*, several *Mitra* and *Vexillum*, and eight *Conidae*. The only frequent *Conus* of these was *C. parvatus* Walls, 1997 (figure 4). Lots of different tiny bubble shells and micro bivalves were found. There were very few large bivalves. There were *Chama*, but you can't get them without damaging the reef, and a very small number of live *Tridacna* though there were lots of small dead ones; fish had probably extracted these. I saved fish crunched fragments for the distribution statistics.

Diving instructors were persuaded to assist in obtaining off shore sand samples. I suspect that the material in shell sand will have passed through the digestive tracts of fish several times but there are a lot of small species (below 3 mm). I am hoping to liase with other workers in the field to produce an agreed species list for the web site but this will be a longer-term project. There are too many things that either may, or may not have been previously recorded from the Red Sea, recorded only in original description papers or, maybe not even described. Whilst I can put specific names to a lot of the material, at the Generic and Sub-Generic level there is such little consensus that I would not expect you to accept my unsupported opinions when better people than me cannot agree! I suppose the final tally could be >30 bivalves and >200 others including the Heteropods and Chitons.

figure 3: *Coralliophila neritoidea* (Lamarck, 1816)

The sand samples were put through a 1.5 mm mesh and the result sorted to reveal a large number of micro species but there were still some traces of white in the residual sand. I then rocked the residue in water in a shallow tray to bring the lighter material to the top of the sand and lifted off a couple of hundred or so of the more obvious items, (1 mm to 0.3 mm), with a sable hair brush. The normal average size of a Red Sea micro-shell is about one third of its Atlantic equivalent. No doubt it is necessary to reach breeding maturity before they get big enough to interest a predator. I then rocked it again to bring calcareous material to the surface and skimmed that with a spoon to a smaller container for study at a later date. While there are a number of juveniles, I am finding specimens that appear to be mature at less than 0.3 mm. Some of them are incredibly beautiful. Oh for an electron microscope! Some examples:

Spiratella cf *inflata* (d'Orbigny, 1840)
Diacria sp.
Creseis cf *aciculata* (Rang, 1828)
Styliola subula (Quoy & Gaimard, 1827)
Atlanta sp.

This is a fascinating area, outside my normal area of operations. The hotel was fantastic but did leave me feeling uneasy at the difference between our standard of living and that of the locals.

figure 4: *Conus parvatus* Walls, 1997

Dumfriesshire field meeting 21st – 22nd May 2011

Adrian Sumner

The suggestion of a Conchological Society field meeting in Dumfries & Galloway had been around for some time, but finally, with encouragement from Mark Pollitt of the Dumfries & Galloway Environmental Record Centre, it happened on a late May weekend. Choosing sites to visit was a major problem, because the area is so under-recorded (Snailing in Dumfries and Galloway, *Mollusc World* no. 25, March 2011), and there are so many potentially interesting places to go to. Eventually three SSSIs (Sites of Special Scientific Interest) were chosen, notable, so far as the region is concerned, for being on neutral or basic soils. The fourth site was a wooded area on the outskirts of the small town of Langholm. To minimise travelling, but at the same time still covering a wide area, all the sites were in Dumfries-shire.

figure 1: Stenhouse Wood SSSI. (photo: Rosemary Hill)

The first site visited was the Stenhouse Wood SSSI (Grid ref. NX795931; figure 1), which is an upland ash woodland on base-rich soil. Although it had rained overnight, the rain largely held off during the morning, and a group of eight enthusiasts (see back cover), some of whom had travelled hundreds of miles to be there, duly arrived. With so many recorders present, it was easy to split into different groups and tackle different parts of the wood. The damp conditions meant it was easy to find slugs and snails, and we were soon finding a good lot of interesting stuff: ancient woodland species such as *Leiostyla anglica* (figure 2), *Limax cinereoniger* and *Spermodea lamellata* (figure 3) were present in good numbers, and *Vertigo substriata* was also there. Barry Colville subsequently found *Acicula fusca* and *Punctum pygmaeum*, among others, in leaf litter, from this site as well as from the other woods, that he took home with him and subsequently analysed. *A. fusca* is notable as it is absent from most of Scotland. Stenhouse Wood was not in a pristine condition, however, as we also discovered a specimen of the introduced slug *Boettgerilla pallens*. Altogether the wood yielded 38 species of molluscs.

figure 2: A specimen of *Leiostyla anglica* from Stenhouse Wood (height c. 3.5 mm). (photo: Ron Boyce

figure 3: A crawling specimen of *Spermodea lamellata* from Stenhouse Wood (width c. 2.0 mm). (photo: Ron Boyce

In the afternoon we moved a few miles further east (as the crow flies – much further by road along the narrow country lanes) to Chanlockfoot SSSI (NX803990; figure 4), a mixed wood on base–rich soils. Again we divided our forces, but neither end of the wood turned out to be particularly good, and we all finished up in a nice really moist area somewhere in the middle. We were rained off earlier than we should have liked, but not before we had found 34 species. The feeling was that we had probably found most of the interesting species there. The fauna was quite similar to that of Stenhouse Wood, with a good mix of ancient woodland species, but at Chanlockfoot we also found *Clausilia bidentata, Columella aspera, Lehmannia marginata* and *Zenobiella subrufescens*, not found in Stenhouse Wood.

figure 4: Chanlockfoot SSSI. (photo: Adrian T. Sumner)

figure 5: Penton Linns SSSI. (photo: Rosemary Hill)

figure 6: *Cochlodina lamellata,* Penton Linns.
(photo: Tony Wardhaugh)

The heavy rain continued for most of the night, but fortunately had cleared away by the time we reached Penton Linns SSSI (NY433773; figure 5) near Canonbie, in the east of the county and right on the border with England. The site is designated as a SSSI for geological reasons, being notable for its fossils; however, it was the presence of limestone that attracted us. In fact, most of our observations were probably not in the SSSI, but a little further up the hillside; the overnight rain meant that it would have been too slippery to work nearer the river, the Liddel Water, which was in spate.

We very soon found evidence of the limey nature of the site in the form of *Cochlodina lamellata* (figure 6), otherwise extremely local in Scotland. The site also turned up many specimens of both *Columella* species, as well as *Ashfordia granulata*; most of the species recorded were similar to those found the previous day, though Penton Linns had the record total for the weekend of 39 species of molluscs.

After our picnic lunch, some members of the party with long journeys ahead of them had to leave, but the rest of us visited the small town of Langholm nearby, and investigated a wooded bank rising from the flood plain of the nearby River Esk (NY360852). This was obviously going to be a very different site from those visited earlier, having been subject to centuries of human intervention (but nevertheless worth recording in this seldom–visited area). Ancient woodland species were clearly absent, and species characteristic of more disturbed sites were present; for example, Langholm provided our only record of *Deroceras panormitanum*, and indeed Stenhouse Wood was the only other site to have *Deroceras reticulatum*. Altogether, Langholm produced only 21 species, still a respectable total, but nowhere near the richness of the woodland SSSIs visited. Nevertheless, several of the species seem to be new records for the area.

Altogether, the weekend must be regarded as a great success, with 50 species recorded altogether (see list), of which a high proportion were new to their respective areas. This is entirely due to the keen and expert conchologists who were prepared to travel long distances to visit these sites; it seems safe to say that a single recorder would not have found anything like so much. As well as providing a much greater recording effort and expertise, each recorder had specialised skills which resulted in more species being identified and enabled others to learn more about the various species we found. It was especially valuable to be able to discuss specimens with other recorders (figure 8). In addition, our thanks are due to Beth Wilson and Jonathan Warren of the Dumfries office of Scottish Natural Heritage, and Lorna Reeder of the Buccleuch Estates, who did so much to facilitate and encourage our visit.

figure 7: Rosemary Hill and Barry Colville discuss an interesting specimen. (photo: Ron Boyce)

Dumfriesshire field meeting species list

Species	Location
Acanthinula aculeata	S, C, P
Acicula fusca	S, C, P
Aegopinella nitidula	S, C, P, L
Aegopinella pura	S, C, P, L
Arianta arbustorum	S, C, P, L
Arion ater agg.	S, C, P, L
Arion ater s.s.	S, C, P
Arion circumscriptus s.s.	S, C, P
Arion distinctus	S, C, P, L
Arion intermedius	S, C
Arion owenii	S, P, L
Arion silvaticus s.s.	S
Arion subfuscus	S, C, P, L
Ashfordia granulata	P
Boettgerilla pallens	S
Carychium minimum	S, C, P, L
Carychium tridentatum	S, C, P, L
Cepaea hortensis	S, C, P, L
Cepaea nemoralis	S, C, P, L
Clausilia bidentata	C, P
Cochlicopa lubrica	S, C, P
Cochlicopa lubricella	S
Cochlodina laminata	P
Columella aspera	C, P
Columella edentula	S, P, L

Species	Location
Deroceras laeve	C
Deroceras panormitanum	L
Deroceras reticulatum	S, L
Discus rotundatus	S, C, P, L
Euconulus fulvus	S, C, P
Lauria cylindracea	S, C
Lehmannia marginata	C, P, L
Leiostyla anglica	S, C, P
Limax cinereoniger	S, C, P
Limax maximus	S, P
Nesovitrea hammonis	S, C, P
Oxychilus alliarius	S, C, P, L
Oxychilus cellarius	S, C, P, L
Oxychilus draparnaudi	P
Perforatella subrufescens	C, P
Pisidium personatum	S, P
Punctum pygmaeum	S, P, L
Spermodea lamellata	S, C
Succinea putris	L
Trochulus hispidus	P
Trochulus striolatus	S, P
Vertigo substriata	S, C
Vitrea contracta	C, P
Vitrea crystallina	S, C, P, L
Vitrina pellucida	S, C, P

S = Stenhouse Wood SSSI, C = Chanlockfoot SSSI, P = Penton Linns, L = Langholm

Flitwick Moor revisited: field meeting 26th April 2011

Peter Topley

A Conchological Society field trip to Flitwick Moor, an important wetland and Wildlife Trust reserve in Bedfordshire , in June 2010, yielded some interesting records (Topley, 2010). But it was an earlier record (1968) from this site of the greater pellucid glass snail, *Phenacolimax major*, that prompted a return visit at a time of year when this species, if present, might be active. Six of us met on a fine day in April and proceeded to look in some likely habitats, including under logs and leaves on the edge of Alder carr (figure 1). *P. major* is a difficult species to find and Flitwick Moor is outside its main area of U.K. distribution in the west and south of England, so it is perhaps not surprising that this species was not found on the day (although in itself this does not rule out its existence at the site). Several other species were found on this occasion that were not observed in 2010, including both British species of *Zonitoides* living within a few metres of each other: *Z. nitidus* on the edge of the carr and *Z. excavatus* under logs in a dryer area nearby. Other species not recorded on the previous trip were *Arion distinctus*, *Carychium tridentatum* (figure 2), *Deroceras laeve* (figure 3) and *Punctum pygmaeum*.

figure 1: Brian Eversham, Alan Outen and David Long, near Alder carr area at Flitwick Moor.

figure 2: *C. tridentatum*, Flitwick Moor.

figure 3: *D. laeve*, Flitwick Moor. (photo: Ron Boyce)

Reference

Topley, P.(2010) Field meeting to Flitwick Moor, Bedfordshire, 12th June 2010. *Mollusc World* **24,** 18.

The moral dangers of finding and naming new species

S. Peter Dance

It was the last day of April 2011 and I was attending a meeting of the British Shell Collectors' Club. Suddenly, without warning, a small plastic box containing a couple of shells was thrust into my hand. I was told these were personal gifts from some well wishers in the Club. The shells, moderately large turrids, looked strangely familiar. The accompanying label told me they had come from the collection of the Bosch family and had been dredged off Muscat. I was certain I had handled similar shells when working on *Seashells of Eastern Arabia*. That book, published in 1995, had been the joint effort of Don Bosch, Robert Moolenbeek, Graham Oliver and me. As editor I had given it my undivided attention for almost six years. The label also made it clear that the shells had been incorrectly identified in the book as *Ptychobela opisthochetos* Kilburn, 1989, and should now be known as *Ptychobela dancei* Kilburn & Dekker, 2008. In view of my close association with the seashells of the Sultanate of Oman, it is not surprising I was delighted to be honoured in this way. At the same time, it caused me to reflect on the peculiar nature of this kind of honour.

My delight, far from being diminished by the knowledge that I had been similarly honoured several times before, was actually enhanced. I may also hazard a guess that the delight I experienced would have been a delight for the majority in a similar situation. Anyone professing to be unmoved when their name has been appropriated for a species is probably lying! I say 'probably' because I have personal knowledge of someone who certainly did not want his name immortalised in this way. Many years ago, while studying the species of *Pisidium* collected by members of the 1924 Mount Everest Expedition, I intended to name one of the two new species I had identified after the man who had taught me everything I knew about this difficult genus: Arthur Wilson Stelfox (1883-1972). When I wrote to tell him I wanted to name a species of *Pisidium* after him his swift reply made it abundantly clear he wanted none of it! Undoubtedly his response represented the exception, not the rule.

Identifying and naming a new species may also be very satisfying. I know because I have experienced that satisfaction, too. Perhaps, at this point I should have made some critical observations, pondering, understanding, condoning or more likely deploring such practices. Fortunately, I am saved the trouble of doing so. More than 150 years ago, Charles Kingsley, a considerable naturalist in his own right, had this to say: 'The truth is, the pleasure of finding new species is too great; it is morally dangerous; for it brings with it the temptation to look on the thing found as your own possession, all but your own creation; to pride yourself on it as if God had not known it for ages since; even to squabble jealously for the right of having it named after you, and of being recorded in the Transactions of I-know-not-what Society as its first discoverer:- as if all the angels in heaven had not been admiring it, long before you were born or thought of.' (*Glaucus; or the Wonders of the Shore*, 1855). A few years later Leo Tolstoy hit the nail more firmly on the head with these few telling words: 'Life without vanity', he wrote, 'is almost impossible.' (*The Kreutzer Sonata*, 1886). How right he was!

Re: Radula markings in Kew

Dear Editor,

In Mollusc World Issue 25, March 2011, a letter was published from Peter Mason describing some radula markings on a white painted cast iron column coated with algae in the fern house at Kew Gardens. He also supplied an excellent picture of the trail.

Recently I noticed that radula trails were appearing on the lid of our black recycling bin. I therefore spent a night or two running in and out to see what species was making them. I soon found out that it was our common garden snail *Cornu aspersum* . The next day I took some photographs of the marks one of which is shown here.

Comparing the two photographs I think that Peter Mason's radula trail was probably that of a *C. aspersum* living in the fern house. After all the fern house in Kew is not a hot house and so *C. aspersum* would find it a very comfortable place to live and would find little trouble in getting inside one way or another !

Yours sincerely,

John Llewellyn–Jones

C. aspersum radula marks

An encounter with South African non-marine molluscs

Peter Topley

A natural history tour with my son Sam in South Africa and Swaziland last year gave me an opportunity to see at first hand the habitats of some iconic land molluscs such as the "giant African land snails" of the family Achatinidae.

We visited at the end of the dry winter season and so did not expect to easily see living snails and this proved to be the case, especially in the subtropical North East. Our first stop was the southern end of the famous Kruger National Park. Here, large shells were visible on the ground amongst the scrub. Where it was possible to examine these (for example at the edge of camp), they were all specimens of *Achatina immaculata* (Lamarck, 1822), the pink-lipped agate snail, a common East African species. Several of the shells I found had large holes (or gashes) in the body whorl (figure 1) and the animals had probably been predated upon.

figure 1: Predated *A. immaculata*, (height 132 mm) Lower Sabie, Kruger National Park, South Africa.

There was some discussion about this with our guide, who suggested several possible suspects, one of which is the Southern Ground Hornbill, *Bucorvus leadbeateri* (Vigors, 1825) (figure 2). These are large (90-129cm), mostly carnivorous, birds eating a range of diet from insects to snakes and rats. But during the dry season, their diet is known to include snails. The birds use their powerful dagger-like bills to cut and tear their prey, hunting on the ground in groups by walking, probing, pecking, and digging. In this way they could quite easily dig out aestivating snails; alternatively the snails could have been eaten as carrion after one of the frequent "controlled burn" fires intended to regenerate areas of scrub.

figure2: Southern Ground Hornbill, Kruger National Park.

We visited Malolotja nature reserve, a mountain highveld area extending over 18 000 hectares in north-west Swaziland and including Ngwenya, Swaziland's second highest mountain (1829 m). Molluscs from this area have been little studied, however amongst emerging plants on burnt high grassland at 1540 m (figure 3) amongst rock outcrops, also grazed by Blesbok and Rhebok, were some shells of the Achatinid *Cochlitoma cinnamomea* Melvill & Ponsonby,1894 (figure 4).

figure 3: Malolotja nature reserve, Swaziland.

figure 4: *C. cinnamomea* , (height 62 to 74 mm) Malolotja, Swaziland.

Whilst staying in Mbabne, Swaziland, the hotel garden held some examples of the familiar garden snail, *Cornu aspersum*. Large snails of the South African carnivorous genus *Natalina* in the family Rhytididae, are known to feed on this introduced species in preference to indigenous species which have evolved various escape mechanisms such as rapid crawling and jumping! I found the shell of the related dwarf cannibal snail, *Nata vernicosa* (Krauss, 1848) in the garden of a restaurant in Mkuze (figure 5).

figure 5: *Nata vernicosa,* Ghost Mountain Inn, Mkuze, Kwa Zulu Natal (width 14.5 mm).

The coastal sand forest of Eastern South Africa is home to the largest and heaviest South African snail, *Metachatina kraussi* (L. Pfeiffer, 1846). Apart from its size, this species is distinguished by the lack of a definite cut–off point at the base of the inner lip. At the end of the dry winter in Kwa Zulu Natal, we saw large empty shells of this species lying in the coastal sand forest at Tembi and Rocktail Bay, just south of the South African border with Mozambique (figures 6 and 7).

figure 6: Habitat of *M. kraussi* , Rocktail Bay, Kwa Zulu Natal.

figure 7: *M. kraussi* , Tembi Elephant Reserve (left, height 132 mm) and Rocktail Bay (right, height 145 mm), Kwa Zulu Natal.

Whilst staying at Rocktail Bay, we took the opportunity to don wet suits and go out on one of the inflatable dive boats over the reef which brought us up close to some amazing views of Humpback Whales on migration which were "breaching" high out of the water around us. On our return to the shore (figure 8), we had our lunch amongst dunes at the edge of the forest that were covered in *Carpobrotus edulis* (L.) (Hottentot Fig). It was then that I noticed a number of snail shells on the sand around and under the plants. Collecting snail shells whilst wearing a wet suit is not to be recommended (no tubes or even pockets!). I had to hold the shells in my hand until we had driven back in the jeep to the dive centre. I found that I had the shells of two locally common but interesting species. The first species was the terrestrial prosobranch *Tropidophora ligata* (Müller, 1774) (figure 9) a common and widespread member of this genus, (which has its centre of diversity in the island of Madagascar) found in a wide range of habitats. These snails are more susceptible to dessication than land pulmonates due to anatomical differences, but are able to seal themselves behind a tight fitting operculum in a similar way to the British land prosobranch, *Pomatias elegans*.

figure 8: Coastal habitat of Kwa Zulu Natal near Rocktail Bay.

figure 9: *T. ligata* (height 18-19 mm), Rocktail Bay, Kwa Zulu Natal.

The second species here was of the genus *Gittenedouardia*, or bark snails (figure 10) of the family Cerastidae. Shells of most *Gittenedouardia* species in life are normally covered with either dust or bark particles, which provide effective camouflage against the surface upon which they crawl (compare this with the European *Merdigera obscura*, of the family Buliminidae, see Mollusc World issue 24).

figure 10: A juvenile *G. arenicola* (Benson 1856) (height 16 mm), Rocktail Bay, Kwa Zulu Natal.

The leaf litter of the sand forest was very dry but a quick look under a couple of small stones used to mark a path in the sand forest revealed a shell of the Subulinid *Opeas florentiae* Melvill & Ponsonby,1901 (figure 10), which is distinguished by having a notched lip and a distinct spiral thread below the suture.

The second species at this site (figure 12) was *Trachysystis burnupi* (Melvill & Ponsonby, 1892), a pinwheel snail, one

of approximately 34 species of this genus found in Kwa Zulu Natal and belonging to the Charopidae, a southern family with species present in Australia, and South America as well as southern Africa.

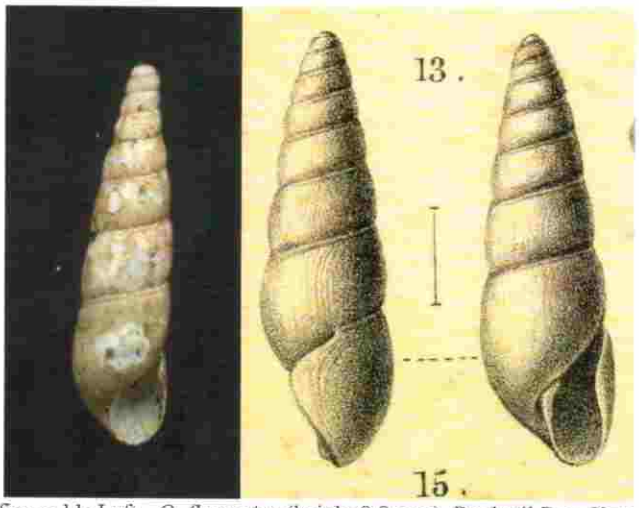

figure 11: Left - *O. florentiae* (height 8.9 mm), Rocktail Bay, Kwa Zulu Natal; Right – lithograph by J. Green (Melvill & Ponsonby, 1903).

figure 12: *T. burnupi* (width 7.8 mm), Rocktail Bay, Kwa Zulu Natal.

Once large areas of "sterile" forest of introduced *Eucalyptus* and pine trees are penetrated, the area of the Mabibi community behind the native coastal forest consists of flower-rich open grassland with clumps of trees (figure 13).

figure 13: Area of grassland and scrub, Mabibi Community area, Kwa Zulu Natal. (photo: Sam Topley)

Scattered on the very dry ground we found shells of the fragile *Archachatina churchilliana* (Melvill & Ponsonby, 1895) (figure 14), named, not after the famous politician, but in honour of the British collector G.C. Churchill. This is a variable species in shape and presence or absence of stripes and was originally split into three separate species. We also found this species in the Palm Veldt area of Tembi Elephant Reserve, together with another species of *Tropidophora,* this time the spirally ridged *T. insularis* (Pfeiffer, 1851).

figure 14: *A. churchilliana*, Mabibi Community area, Kwa Zulu Natal, South Africa.

Lake Sibaya, the largest freshwater lake in South Africa, is a drowned river valley, formerly connected to the sea, with a surface area of 77 km² and an average depth of 13 m. Walking along the edge of the eastern shore, we saw many thousands of freshwater mollusc shells (figure 15).

figure 15: Shore of lake Sibaya with accumulations of freshwater shells amongst the reeds.

The vast majority of the shells were of the Thiarid *Melanoides tuberculata* Müller, 1774. Also present in large numbers were shells of the freshwater clam *Corbicula fluminalis africana* (Krauss, 1848) (figure 16), now regarded as conspecific with the invasive Asian Clam *Corbicula fluminalis* (Müller, 1774). The feasibility of exploiting this species' ability to accumulate metals such as copper, lead, zinc and manganese has been suggested as a method of monitoring water quality in South African freshwater biotopes (de Kock and Wolmarans, 2007).

figure 16: *C. fluminalis africana* Lake Sibaya (width 9-11 mm).

Our trip continued to a very different area of South Africa, the Western Cape. The natural history of this province is famous for the Fynbos, the smallest of the world's six Floral Kingdoms, a shrub and heathland mainly in winter rainfall coastal and mountainous areas with a Mediterranean climate and over 9000 species of plants. Under low shrubs behind the shore at Platboom , just north of the Cape of Good Hope (figure 17), there were a number of small shells of the variable *Fauxulus capensis* (Küster, 1841) (figure 18), the type species of a genus, in the family Orculidae, which is found in South Africa and Madagascar, with a single species in Malawi. For anatomical reasons Gittenberger (1979) transferred them to the Orculidae from the Chondrinidae. According to Herbert & Kilburn (2004), the Cape species of *Fauxulus* dwell in more open habitats (such as the Fynbos) than the forests occupied by the eastern species.

Finally, we spent a few nights further up the west coast at Lambert's Bay, where we stayed in a hotel opposite a chip factory (!) which was formerly a fish processing plant prior to the collapse of local fish stocks. We were there primarily to look for birds and to visit the amazing local colony of Cape Gannets. However, always on the lookout for snails, there were several places on the coast (e.g. figure 19) where I found the shells of perhaps more than one species of *Trigonephrus* (figure 20) beneath vegetation. This genus, together with the closely related *Dorcasia*, was previously (Connolly, 1939) placed in the Acavidae, a family with a distribution which includes Madagascar, Sri Lanka and Australia. However they are now both placed in the family Dorcasiidae, part of the superfamily Strophocheiloidea, with other representatives in South America, another part of the ancient supercontinent of Gondwana.

Although on this visit I did not see other species, for example any members of the large Streptaxid genus *Gulella*, nor did I see many live snails due to the dry conditions, the trip was enough to give a glimpse of the interesting non-marine molluscs of this region. The marine molluscs are another story!

Acknowledgements

Thanks are due to Dai Herbert of the Natal Museum, Pietermaritzburg, South Africa and Ben Rowson of Amgueddfa Cymru (National Museum of Wales) for advice and help with identification.

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figure 17: Habitat of *F. capensis* (foreground) above the upper shore at Platboom, Table Mountain National Park, Cape Province.

figure 18: *F. capensis* from Platboom, Cape Province (height 7.6-8.2 mm).

figure 19: Coastal habitat of *Trigonephrus* near Lambert's Bay, Cape Province.

figure 20: *Trigonephrus* sp. from near Lambert's Bay, Cape Province (height c.35 mm).

Gastropod Ghazal

What is man, that thou art mindful of him
and the son of man, that thou visitest him?
For thou hast made him a little lower than the angels
and hast crowned him with glory and honour.
Thou madest him to have domain over the works of thy hands;
thou hast put all things under his feet... (Psalm 8:4–6)
...for dust thou art, and to dust shalt thou return. (Genesis 3:19)

Gastropods arise!
Winkles from the wrinkled sea
Under nimbus–clouded skies
Looking down from Winchelsea.

Carnivorous whelks singsing bring
Tonic solfa diphthong song
Make the vaulted welkin ring
Glissando Götterdämmerung.

From Atlantic sundering sea,
From Al Hambra Moorish Spain
Join us at our jamboree
Volk'wanderung down Slugwash Lane*.

Gastropods arise!
Spifflicate vain–glorious homo rapiens,
Numerous as dung–hill flies.
Circumvent their lions' dens,
Their stagnant beer in sunken vats.
Tunnel under chimney–soot,
Or, as pogo–vorsprung acrobats,
Flip to a tender tendril shoot
Of red–bud bean or clematis –
Cosmic–slime by moonlight ooze,
Issue of sussurated bliss –
By pulsing emerald glow–worm's glow
Elastoplastic muscled cruise
Nine bean rows. (Y9? Ask Mr. Yeats, he might know.)
Beware caltropic leaves of holly;
Egg–shells camouflaged loblolly;
Pellets, grape–shot on the soil,
You'd think they'd fallen off a lorry,
Enough to make your gonads boil.

Beware the wellingtonian stamp,
The weekend–caver's Petzl light;
The hissing of a Tilly lamp;
The kiss of shears at dead of night.
The rachet click of forceps' jaws
The rat–tat–tat on a rusty tin,
The mouldy mucous rimed within,
The sudden pin–drop, cross–hairs pause,
Drawn breath, lips Cameronian thin,

A snaffled dribble down the chin,
Portending ichor–draining death –
Disembowelling scissor–cut,
Tally tot–up under breath
Of dasypygal cullion mutt.

Arions arise!
Gangoolians of the podghast night:
Gleet, gleam,guggle, gong, gormandise.
Put man's Flower Show dreams to flight.
Marmalise their brassicas; rasp at ease
Their raspberries. Be predators on their taters.
Gnash those golden delicious of Hesperides.
As graters, macerators, breed alligators.
Beer–batter their hearts like bars of Mars.
Virus their blogs 'gin slugs, E–mails 'gin snails.
Be of Shiva the Destroyer multifarious avatars.
Hieronymus Bosch their nosh in cuckoo–spitten pails;
Go genital into that dark night in Wales.

Yea, most of all, appal Hugh Fearnley–Whittingstall
With wormwood and the gall, for getting his tith
Into our kin and kith, ill–willy him, yea, the reptile in us all
To deform and kill the things from which we suck the death.

Not for oozaceous mollusca, "To be, or not to be?"
Unshrived, denied abluvion's eschatological fleme –
Rendered down to a ghee in a Chilean snailery
Encarnadined for human kind into namby pamby cream.

Escargos arise!
Apple snails Helicidae
Chassez down Les Champs Elysées;
Banshee La Marseillaise;
Kerfluffle soufflerie
Liberté! Egalité! Fraternité!
Escapees escargotiére.

Gastronomes they gorge on us.
Marinate them in a jacusi:
Mince Giselle, Jean–Jaque, juicy,
Vol–au–vent in puff–pastry.
Bloop them with a guzunderbuss –
To arms! Storm La Bastille!

Prick up your ears! All over France
Boiling conch–pots Le Creuset
Rockle in a cockle dance –
Our disgorging souciance;
Stuffed, sauced, baptised in vin brûlé.
(Jean Baptiste for Salomé.)

To arms helicids!
Sapiens think they've got it made.
Be as Rodrigo brave El Cids
Making human kind afraid.
(Anthem that anathema Rouget de Lisle.)

Circumcise the foreskins of Man's Identity
Their stiff necks are an abomination unto me.
(Look it up in Deuteronomy)

Cockles gourgandine arise!
Oar your Botticelli shells:
Delphic cleft of Venus' thighs,
Oyster–juiced engorging swells.

Sea–seize me in your columella,
Aeon–amoured whorls of bliss
Unceasing tantric tarantella,
Urania's sea–foamed genesis.

500 million years you've been,
Before the Saps were ever seen:
Now the world reverberates
Sapped by high–muck–amuck vertebrates.

Hanging on a mucous–skein
Love–darting torquemain
Riding on a dew–train
Mollusca germinal germain
The old are young again
Getting it up in Slugwash Lane.

A bird has whispered, "Come again,
It's iron–smelters Tubal–cain
Who gave the name to Slugwash Lane,
Founding canons for the Main
Plundering the ships of Spain."

So, is my tale all in vain,
Kindled McGonagall murrain –
Think you, "Hieronymo's mad againe?"

Gastropods predate King Iron's reign:
In witness still their trails remain
Reflections of the Milky Way down Slugwash Lane.

Ivan Ewya

*Slugwash Lane is authentic: it lies north off North Common Road at Wivelsfield Green, East Sussex.

The gastropod fauna of the Goa coastline

Anuradha David

Introduction

In terms of biodiversity, India is one of the richest and most highly endangered regions of the world. It is perhaps the only Asian country with a long record of coastal and marine biodiversity dating back at least two centuries. In terms of the marine environment, India has a coastline of about 8000 km including offshore islands and a very wide range of coastal ecosystems, such as estuaries, lagoons, mangroves, backwaters, salt marshes, rocky coasts, sandy beaches and coral reefs (Venkataraman and Wafar, 2005).

Goa, the smallest state of India, is located on the western coast of the Indian peninsula between the Arabian Sea and the mountain range of the Western Ghats. It shares its borders with Maharashtra to the north and Karnataka to the south. Most of Goa forms part of the coastal region known as the Konkan. Goa experiences tropical weather for most of the year; temperatures do not vary greatly and range between 19 and 32°C. Summer is hottest in May while the winter months of January and February are pleasantly cool. The southwest monsoon hits the state between the months of June and September, and July receives the highest rainfall (98 mm) while February is the driest month (Mascarenhas, 1999).

Accelerated loss of coastal and marine biodiversity components over the last few decades has been of great concern, with environmental changes, overexploitation and habitat loss among the major causes of species loss. Marine molluscs have been shown to be an appropriate indicator group for local invertebrate biodiversity. They can be used to test the suitability of methods for rapid biodiversity assessment because they encompass the full range of survival strategies, including a variety of dispersal mechanisms (Smith, 2005). Molluscs have been favoured in previous studies on rocky shores and intertidal zones because they are numerous, relatively slow moving and easy to identify. They form an important component of the intertidal biota, with a unique combination of traits that make them easy to study. First, molluscan shells persist relatively intact for some time after the death of the animal, increasing the chances of sampling seasonal and rare species. Second, species identification is usually possible at any growth stage. And third, they are readily visible with the naked eye (Benkendorff and Przeslawski, 2008).

Of the 80,000 to 100,000 species of molluscs recorded from various parts of the world, 3271 species are known to occur in India belonging to 220 families and 591 genera. These comprise 1900 gastropods, 1100 bivalves, 210 cephalopods, 41 polyplacophorans and 20 scaphopods (Venkataraman and Wafar, 2005). However, there is virtually no information available on the current status of the molluscan fauna along the Karnataka-Goa coastline, which forms a major geographical belt of the Western Ghats. The intertidal and sub-tidal zones are known to provide habitats for marine fauna whose patterns are subject to seasonal changes (Defeo *et al.*, 2009). Therefore, the present study was undertaken to (1) prepare a checklist of the gastropod species that inhabit the intertidal and subtidal zones of rocky and sandy beaches in Goa, (2) measure species diversity and richness using diversity indices, and (3) estimate seasonal variation of gastropod diversity.

figure 1: Map showing approximate location of sampling sites along the coast of Goa. Rocky shores are underlined.
(mapping: Peter Topley)

Study area, sampling procedure and data analysis

Intertidal and subtidal zones were included in both regions along a coastline covering a distance of 100 km. Of the 16 selected sampling sites (figure 1), eight were located in north Goa (Vagator, Anjuna, Baga, Calangute, Candolim, Sinquerim, Miramar and Dona Paula) and eight were in south Goa (Velsao, Majorda, Betalbatim, Colva, Vacra, Betul, Palolem and Galjibaga). The sampling sites comprised six rocky shores (figure 2) (Sinquerim, Candolim and Anjuna in north Goa, and Vacra, Betul and Palolem in south Goa) and the remaining ten sites were sandy beaches. When selecting the sampling sites, their proximity to industry, harbours and human habitation was considered. Sites more than 30 km away from urban areas were also included in this investigation in order to ensure the representation of gastropod fauna in a range of habitats.

figure 2: Intertidal zone of a typical rocky shore in Goa.

Surveys were conducted in the intertidal and subtidal zones during the pre-monsoon and post-monsoon seasons at all 16

sampling sites. The surveys were undertaken at low tide in clear weather and relatively calm sea conditions between January 2008 and September 2009. Each site was visited once in January, February, March and April during the pre-monsoon season and once again in June, July, August and September during the post-monsoon season. A timed 2-4 h search was conducted during each visit and a species list of molluscs was generated for each site. Molluscan species were collected (handpicked by the author with the assistance of local fishermen) across the entire range of habitats at all levels of the shore. Particular attention was paid to the undersides of boulders (figure 3), vertical rock faces, caves and crevices, and tidal pools on rock platforms. In all surveys live specimens were not disturbed but their images were captured for identification using a Nikon D60 digital SLR camera.

The collected shells were transported in large plastic bags that were numbered sequentially with a code name for each sampling site. Soon after arrival in the laboratory, the shells were soaked for 30 minutes in warm water mixed with a mild detergent to get rid of any mucus, debris and odour. They were then rinsed several times in tap water, dried in the shade for a week, and sorted and stored in plastic sachets. The shells were identified according to keys of Apte (1998) and Dance (2002). Where the names of species differed, the nomenclature of Dance (2002) was used.

Biodiversity can be quantified in many different ways. The two main factors taken into account when measuring diversity are species richness and evenness. The following biodiversity indices were calculated: the Shannon-Wiener index to characterise gastropod diversity; the Margalef index

figure 3: Live *Turbo (Marmarostoma) bruneus*

to estimate species richness; and Pielou's index of non-randomness to determine species evenness. Data were then subjected to statistical analysis using SPSS version 13.0 software to compare mean diversity indices and seasonal variation for each individual species (Zar, 1984; Forthhofer *et al.*, 2007).

Spatial distribution and gastropod diversity

An overall total of 2493 individuals representing 85 species, 51 genera and 24 families was recorded from the 16 sampling sites in northern and southern regions Goa (Table 1). Cumulative records revealed that 51 species occurred exclusively in the intertidal zone of rocky shores, whereas 34 species were found in the subtidal zone of sandy shores and of these 15 species occurred in both zones. The numbers of both species and individuals were highest at Vacra (63 and 218, respectively) and lowest at Miramar (13 and 74). Most individual shells represented just two families: Turritellidae and Trochidae.

During the pre-monsoon months, the Shannon-Wiener diversity index ranged from 2.1749 (Miramar, a sandy beac = S) to 5.436 (Betul, a rocky beach = R). The Margalef index of species richness was highest in Vacra (R) and lowest in Velsao (S), while Peilou's evenness index was least at Sinquerim (R) and highest at Betalbatim (S) and Betul (R). In the post-monsoon season, the Shannon-Wiener values ranged from 2.558 (Dona Paula, S) to 5.765 (Majorda, S), Margalef's index was highest in Vacra (R) ar lowest in Velsao (S), and Dona Paula (S), Velsao (S), Colv (S) and Majorda (S) showed maximum evenness.

Seasonal variation

The numbers of species collected at each site during the pr and post-monsoon seasons are shown in figure 4. In the pre monsoon season, the number of species recorded at five sites was less than or equal to five with maxima of 20 and 21 at two sites. After the monsoon season, the number of species recorded at all the sites increased and only five site had fewer than 15 species, six sites had more than 35 and two had more than 40.

A significant ($P<0.01$) increase was observed in the total number of individuals of all species during the post-monsoon months compared to the pre-monsoon season. Monthly data from January to April showed a gradual decrease ($P<0.01$) in the total number of individuals during the four pre-monsoon months, and a significant ($P<0.01$) increase was observed in June and July, the first two month of the post-monsoon season followed by a significant ($P<0.01$) decrease in the total number of individuals in August and September.

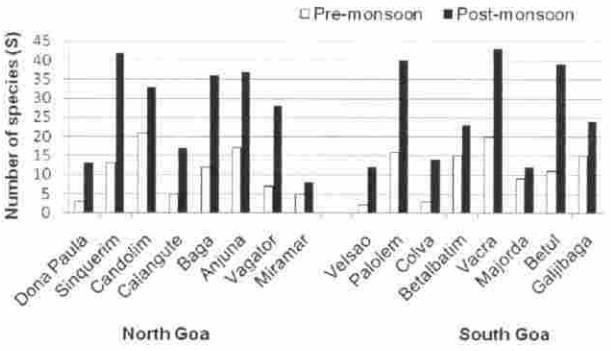

figure 4: Seasonal variation in species occurrence

Discussion

The study revealed that more than 80 species of gastropods inhabit the coastal belt of Goa, India. Species richness was greatest in rocky intertidal or littoral zones, as reported for similar zones in south-eastern Australia (Benkendorff and Davis, 2002). The richest sites were Vacra, Sinquerim, Palolem and Candolim during the pre- and post-monsoon seasons. This may be due to the rough terrain of these sites where steep cliffs and creeks prevent anthropogenic disturbance. Subtidal zones of all the sandy beaches were low both in species richness and total number of individual owing to the extensive exploitation of these beaches for tourism. Dona Paula and Velsao showed especially poor species richness and low numbers of individuals since thes two sites lie close to Mormugao harbor, where large amounts of toxic waste materials from shipping activities are released (Sarkar *et al.*, 2008).

A striking result of this investigation was the significant increase in the total number of species and individuals in the post-monsoon season. The reason for this variation, whether related to temperature change or other environmental factors, remains to be studied.

The coastal zone of Goa has traditionally been used for agriculture, farming, shell fishing, fishing and low key recreation (Mascarenhas, 1999). The rapid increase in urbanisation and tourism appears to have adversely affected the biodiversity and distribution of the gastropod fauna in this region.

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table 1: List of species identified from rocky intertidal and sandy subtidal zones.

Species	Rocky Shore	Sandy Shore
Cerithium morus Lamarck, 1822	+	
Cerithium obeliscus Bruguière, 1792	+	
Cerithium rubus Deshayes, 1843	+	
Cerithidea scalariformis (Say, 1825)	+	
Planaxis acutus Menke, 1851		+
Planaxis lineatus (da Costa, 1778)	+	
Planaxis similis Smith, 1872		+
Planaxis sulcatus Born, 1780	+	
Potamides cingulatus Gmelin, 1791	+	
Telescopium telescopium (Linnaeus, 1758)	+	
Turritella duplicata (Linnaeus, 1758)	+	
Turritella terebra (Linnaeus, 1758)	+	+
Littorina intermedia Philippi, 1846	+	
Littorina lineolata D'Orbigny, 1840	+	
Littorina scabra (Linnaeus, 1758)	+	
Eunaticina papilla (Gmelin, 1791)		+
Natica maculosa Lamarck, 1822		+
Natica picta Récluz, 1843		+
Natica tigrina (Röding, 1798)		+
Nerita albicilla Linnaeus, 1758	+	+
Nerita crepidularia Lamarck, 1822		+
Nerita oryzarum Récluz, 1841	+	+
Cellana radiata (Born, 1778)	+	
Clypidina notata (Linnaeus, 1758)	+	
Calliostoma euglyptum (A. Adams, 1855)	+	
Clanculus ceylonicus Nevill, 1869	+	+
Euchelus asper (Gmelin, 1791)	+	+
Euchelus tricarinata (Lamarck, 1758)		+
Isanda crenulifera A. Adams, 1854		+
Trochus radiatus Gmelin, 1791	+	+
Trochus tentorium Gmelin, 1791	+	+
Trochus maculatus Linnaeus, 1758	+	+
Tegula eiseni Jordan, 1936	+	+
Umbonium vestiarium (Linnaeus, 1758)	+	+
Astraea semicostata Fischer, 1875		+
Astraea stellata Gmelin, 1791		+
Lithopoma sp.	+	
Margarites costalis (Gould, 1841)	+	+
Margarites groenlandicus (Gmelin, 1791)	+	
Turbo bruneus (Röding, 1798)		+
Turbo coronatus Gmelin, 1791		+
Calpurnus lacteus (Lamarck, 1810)	+	
Erosaria ocellata (Linnaeus, 1758)	+	
Erosaria inocellata (Gray, 1825)	+	
Erosaria lamarcki (Gray, 1825)	+	
Paulonaria fimbriata (Gmelin, 1791)	+	
Staphylaea staphylaea (Linnaeus, 1758)	+	
Collisella leucopleura (Gmelin, 1791)	+	
Collisella strigatella (Carpenter, 1864)	+	
Notoacmaea antillarum (Sowerby, 1831)	+	
Pyramidella dolabrata (Linnaeus, 1758)	+	
Gyrineum pusillum (Broderip, 1833)		+
Conus textile Linnaeus, 1758	+	
Conus piperatus Dillwyn, 1817	+	
Conus tessulatus Born, 1778	+	
Clarus crassa (Smith, 1853)	+	
Surcula amicta (Smith, 1877)	+	+
Surcula fulminata (Kiener, 1839)		+
Surcula javana (Linnaeus, 1758)	+	
Acrilla acuminata Tomlin, 1923	+	
Babylonia spirata (Linnaeus, 1758)	+	+
Babylonia zeylanica (Bruguière, 1789)	+	+
Cantharus undosus (Linnaeus, 1758)	+	
Engina zea Melvill, 1893	+	
Turris indica Röding, 1798	+	
Pyrene terpsichore (Sowerby, 1822)	+	
Cryptospira strigata (Dillwyn, 1817)	+	
Marginella angustata Sowerby, 1846	+	
Mitra obeliscus Reeve, 1844	+	
Mitra scutulata (Gmelin, 1791)	+	
Drupa konkanensis Melvill, 1893	+	
Drupa sp.	+	
Nassa francolina (Bruguière, 1789)	+	
Ocinebra bombayana Mevill, 1893	+	
Thais carinifera Lamarck, 1822		+
Thais rudolphi Lamarck, 1822		+
Thais sacellum (Gmelin, 1791)		+
Thais tissoti (Petit, 1852)		+
Bullia mauritiana Gray, 1839	+	
Ilyanassa obsoleta (Say, 1822)	+	
Nassarius mendicus (Gould, 1850)	+	
Nassarius distortus (A. Adams, 1852)	+	
Nassarius vibex (Say, 1822)	+	
Oliva caerulea (Röding, 1798)	+	
Oliva ispidula (Linnaeus, 1758)	+	

History from a shell object (the Taj Mahal – India)

John Llewellyn–Jones

"The morning was heavy with mist as we set off from Agra by bus for the Taj Mahal. What a disappointment that would be if the great monument remained only dimly visible against a grey sky. But as we neared the site the sun came out and there it was 213 ft (71 m) of shining white marble from plinth to dome". This was Janet Sawyer's first impression on seeing the Taj Mahal (figure 1) for the first time.

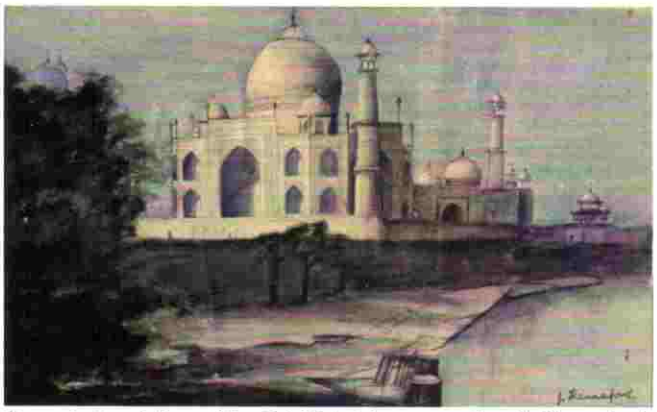

figure 1: A painting of the Taj Mahal by my mother (J. Hannaford before she was married) on a visit to India.

The Mughal Empire, which encompassed most of the Indian continent, was established 100 years earlier than the building of the Taj Mahal by Babur when he defeated the Sultan of Delhi in 1526. Babur was a Timurid prince from Central Asia and a descendant of Genghis Kan. By the time Shah Jahan had become Emperor, the Empire had become fabulously wealthy. Mumtaz Mahal, Shah Jahan's 3rd wife, was said to be a woman of great beauty and virtue and became the Shah's constant companion and adviser as he travelled around his Empire. On her travels she was adorned with what has become immediately recognisable as Mughal jewellery (figure 2).

figure 2: Copy of Mughal jewellery. Earrings and brooch made of gold, red enamel and pearls.

So you may ask why I became interested in the Taj Mahal. It was one day a couple of years ago that I noticed behind a number of antiques in a cabinet, a small black marble box with a beautiful depiction of the Taj Mahal in mother–of–pearl inlaid into the lid, the mother–of–pearl coming from the Gold–lipped pearl oyster, *Pinctada maxima* Jameson 1901. The mother of pearl from which it was made had been carved, etched and engraved very delicately and was probably made in the early 1900's (figure 3).

figure 3: Black marble box with inlaid mother of pearl.

The Taj Mahal is one of the world's greatest monuments, a World Heritage site visited by 8 million pilgrims and tourists every year. It sits on the banks of the Jamuna river near Agra, the capital of the Mughal Empire. It was built of white marble using 20,000 labourers, stone masons, architects and 1000 elephants over a 21 year period from 1632 to 1653 as a mausoleum for Shah Jahan's wife Mumtaz who died at 31 giving birth to her 14th child, Gauhara Begum. In order to console himself, Shah Jahan built the Taj Mahal in a design to symbolise their love. The main tomb is set in a traditional Islamic garden, a Charbagh with formally laid out water features, and is flanked by a mosque and guest house. The Taj Mahal stands on a square podium with a minaret on each corner and has a central guava shaped dome with a gold crescent moon on top of the finial. The outer marble surfaces are covered with traditiona Islamic decoration; swirling calligraphy of passages from the Qur'an. Inside is again white marble decorated with geometric patterns, motifs of plants and arabesques of intertwining leaves and vines. All is inlaid with semi–precious stones.

Life is extraordinary sometimes! For twenty years I never saw nor found a Taj Mahal souvenir, but in the last few months I have seen and found several Taj Mahal souvenirs, hence the reason for this article. All have a mother–of –pear Taj Mahal inlaid into so called "marble". The first was a white dish owned by Eleanor Fogan (figure 4); a pity that the engraving was less well executed.

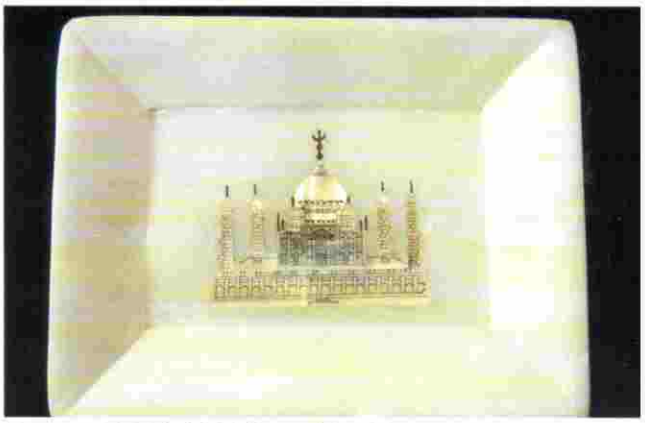

figure 4: Taj Mahal inlaid into white alabaster.

figure 5: Taj Mahal inlaid into painted slate.

figure 6: Taj Mahal inlaid into soapstone

Then I found a black plaque with again the Taj Mahal inlaid into it (figure 5). On closer examination I found that the plaque was made of a piece of slate painted black. And a week before writing this I found a brown soapstone dish with an extremely poor mother of pearl Taj Mahal inlaid into it and the finials simply dyed in red instead of painted in gold (figure 6). I suppose we should be pleased that stone masons in Agra are still using real stone and mother–of–pearl rather than selling plastic substitutes which have replaced so many of the handcrafted souvenirs from the past.

References

For further information on the Taj Mahal, see http://en.wikipedia.org/wiki/Taj_Mahal

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Acknowledgements

I would like to thank Janet Sawyer for allowing me to use unpublished notes of her visit to the Taj Mahal, which included information on the history and architecture of this wonderful monument.

Titchfield Haven Shore, Hampshire

June Chatfield

figure 1: Titchfield beach, looking west.

My apologies for cancelling the field meeting planned for April 2011 due to illness when field work was definitely not on the agenda and no reserve leader could be found. One Hampshire member approached was also out of action with 'flu and sadly Terry Wimbleton, who knew the Titchfield shore (figure 1) so well, died last year. The special feature of this Solent shore is the living population of Quahogs, *Mercenaria mercenaria* as well as a general abundance of shells making it a rewarding place for beginners to work.

There is also a Visitors' Centre with facilities and refreshments to escape to if the weather is bad. It is hoped to run the field meeting next year.

From the results of previous visits I have been able to compile this article with photographs mostly from a seaweed meeting that I led for Camberley Natural History Society in September 2008. April is usually a good time to go to Titchfield for fresh shells washed up on the shore, including the upper part if it is not possible to wait for the lowest state of the tide. Because of the Isle of Wight just offshore, the Solent experiences curious double tides that are capricious if you are not familiar with them and they involve a longer wait for tides to go out.

The Habitats

Titchfield is on the south coast between Portsmouth and Southampton. The beach is about two miles south of the village of Titchfield. The River Meon, a chalk stream that powered a corn mill, was once navigable. The church dates back to Saxon times and old maps indicate that Titchfield was a port. A sluice on the shore by the Visitors' Centre today marks the entry of the river into the harbour, now used

for leisure sailing boats instead of the cargo and fishing vessels of earlier times. In the 17th century a canal was made to connect the sea with the village, blocking up the earlier estuary of the River Meon to give a marsh and grazing land. A sea lock, by the narrow road along the canal, was completed by 1610 under the 3rd Earl of Southampton but the canal was redundant a hundred years later and a road bridge was built across the sea lock. Vessels had to wait until high tide to float into the canal. The old canal now provides two miles of freshwater habitat with public footpath access. The first part of the planned field meeting in April was to work the canal for freshwater molluscs whilst waiting for the beach to be exposed.

figure 2: Sea wall, groynes and boulders at Titchfield.

The shore at Titchfield is protected by a sea wall (figure 2), on top of which is car parking and the shore road. The sea wall was, in the 1970s, made of Bembridge Limestone from the Isle of Wight that had plenty of crevices from fossil holes where the cast had dropped out and these used to be colonised by the Dwarf Winkle *Melaraphe neritoides*. More recently the sea wall has been rebuilt with smooth curved surfaces that offer very little scope for upper shore crevice dwellers as well as being virtually impossible to scale when colonised with slippery green seaweed. It is possible that the Dwarf Winkles might still be on the harbour wall.

The top of the shore is steeply shelving flint shingle with muddy sand flats beyond with some bound shingle exposed as the tide goes out. The strand line on the top of the shore is worth examining in April, regardless of the type of tide, as much fresh material is then washed up.

Below the sea wall near the harbour are wooden groynes built on the upper shore to control the longshore west–east drift of shingle as waves of the prevailing south–west winds hit the shore at an angle. The groynes are well colonised by seaweeds and are home to upper shore molluscs like Rough and Flat Winkles (*Littorina saxatilis* agg. and *L. littoralis* agg.) and some Common Limpets (*Patella vulgata*) as well as Edible Mussels (*Mytilus edulis*) anchored by byssus in t crevices. The groynes do not extend far down the shore.

The muddy sand exposed at low tide is inhabited by Edibl Cockles (*Cerastoderma edule*) and their paired freshly dea shells are commonly exposed, while live ones can be foun at low tide where the wading birds like Oystercatchers wil be looking for them. Titchfield is a good place for birds w waders, waterfowl and birds of the reed beds in the Haven Edible Winkles (*Littorina littorea*) browse on bottom detritus and seaweed on the mud and bound shingle. Here, although there are no rockpools, tufts of red algae attach t the bound shingle at low shore and it is worth washing thi as well as red weed cast up for small shells and also holdfasts of Oarweeds (*Laminaria* spp.) that often host Blue–rayed Limpets (*Helcion pellucidus*).

Although there are winkles, *Littorina* spp.), top–shells (*Gibbula umbilicalis* and *G. cineraria*), American Slipper Limpets (*Crepidula fornicata*), Netted Dog–whelks (*Hinn reticulata*), Edible Whelks (*Buccinum undatum*) and Sting Winkles (*Ocenebra erinacea*), it is the bivalves that dominate in numbers of shells found on this shore of mud sand.

Carpet Shells

figure 3: Internal and external views of *Ruditapes philippinarun*

Traditionally there were two species commonly found her the Pullet Carpet Shell (*Venerupis senegalensis*) and the Cross–cut Carpet Shell (*Tapes decussata*) distinguished by the prominence of radial ribbing and the form of the pallia sinus and pallial line muscle scars that relates to the length of siphons and depth of burrows. However in recent years there has been a colourful new arrival in the form of the Japanese Carpet Shell (*Ruditapes philippinarum*) that a fe years ago (2008) were especially abundant (figure 3). Brit seashell books do not cover them. Where had they come from? For some years there has been aquaculture of molluscs on the Isle of Wight, not far offshore, so perhaps that was a source via pelagic larvae. Internet sites on aquaculture refer to its introduction to Poole in Dorset in 1988 where it proceeded to naturalise, so pelagic veliger larvae might have come from there on the south–west prevailing waves. They have a particularly colourful and patterned shell and very strong radial ribbing giving a decussate appearance. Their similarity to *Tapes decussata* emphasised by a synonym *semidecussata*.

The Quahog

This introduced species from North America is abundant on the Solent shore at Titchfield both as fresh empty shells and living animals at low tide. The Quahog or Hard–shell Clam (*Mercenaria mercenaria*) is a large thick–shelled bivalve of 5–10 cms belonging to the Venus family or Veneridae.. The outside of the shell is pale brown with the typical heart–shaped mark showing up very well (figure 4), the inside is white but often it is purple at one end, as in the case of Pullet Carpet Shells (figure 5). The Quahog differs from them, not only in the thicker shell and different shape but by having a toothed ventral margin instead of a smooth one.

figure 4: External shell of *M. mercenaria*, showing the annual growth lines. It is a very long–lived species and this one is probably 20 years old.

figure 5: External shell of *M. mercenaria* showing the crenulated ventral margin.

The late David Heppell, a Conchological Society member who once lived in Gosport, found the first live population of Quahogs at Lee–on–Solent, a beach not far to the east of Titchfield harbour and Hillhead. He reported this in the *Journal of Conchology* (Heppell, 1961) and undertook some literature research into introductions of this bivalve into Britain and France. There were several recorded attempts at deliberate introduction to the Liverpool area from 1869 and the one that succeeded best was in the brackish water of the Dee estuary, but none of these were self–sustaining. The source of supply was a Captain Mortimer from the Atlantic liner *America*. On the east coast of North America the Hard–shell Clam is very popular seafood being used to make a soup (clam chowder) which I have sampled when in the USA during the 1970s and there are several variations of the recipe according to region. In his literature search David Heppell could find no reference to an intentional introduction of *M. mercenaria* to the Solent. Whilst liner traffic to America went out of Liverpool in the 19th century, during the 20th century there was much transatlantic liner traffic from Southampton, just west of Titchfield including the *Titanic* launched from Southampton a century ago. On occasion, when the liners were running in the 1960s, I have seen vast quantities of fresh vegetables washed up on the beach at Hayling Island near Portsmouth. Clam chowder would almost certainly have been on the menu on these American liners, the clams transported live in sacks. A likely source of this population near Southampton Water seem would seem to be from surplus live clams being thrown overboard approaching port. They thrive best in the somewhat brackish waters of estuaries. Investigations also need to be made on their possible culture on the Isle of Wight. In North America the source of clams is from harvesting wild populations. Unlike the very prolific American Slipper Limpet (*Crepidula fornicata*) (figure 6) accidentally introduced to England with oysters, *Mercenaria mercenaria* does not appear to do any harm.

figure 6: *C. fornicata* from Titchfield.

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HEPPELL, D.,1961. The naturalization in Europe of the Quahog, *Mercenaria mercenaria* (L.), *J. Conch., London:* **25** (1), 21–34.

British Shell Collectors' Club

28th April 2012, 9am to 5pm:
Shell Convention
Theydon Bois Village Hall,
Essex, CM16 7ER

Admission is free. Bring a friend. It is an opportunity to meet other members and seek advice from experienced collectors. Many shell and shell related items are for sale, in the afternoon a shell auction takes place.

For a map of how to get there and further information see: www.britishshellclub.org.uk/

Also in 2012:–
27th October: Shell Show, Theydon Bois Village Hall

Hon Conservation Officer: Annual Report 2010

Martin Willing

A selection of some key items of interest from 2010 are described below:

Advice and help

This has been given to many individuals and organisations including identification of specimens, conservation advice and habitat management. Specific examples include:

(a) Identification of specimens for Pond Conservation, various branches of the Environment Agency, the Warwickshire Wildlife Trust and for a number of private individuals.

(b) In 2009 suggestions were made to include *Margaritifera margaritifera, Vertigo geyeri* and *Atrina fragilis* into the Argyll and Bute Local Biodiversity Action Plan (Mollusc World 24: 22). Considerable further information and comment was provided on drafts of this plan circulated in early 2010. (http://www.argyll-bute.gov.uk/sites/default/files/planning-and-environment/AandB%20BAP%20Draft.pdf).

(c) Survey and conservation advice was given to a company undertaking road sign work on a stretch of the M25 motorway where populations of Roman snails *Helix pomatia* had been discovered living on road embankments.

(d) Buglife were given assistance (with content and images) in the production of a Defra sponsored 'Species Management Sheet' dealing with the Shining ram's-horn snail *Segmentina nitida.* The sheets were planned to assist farmers and land managers entering different tiers of environmental stewardship (ELS and HLS schemes). The Conchological Society logo and web contact details were included on the sheet (the sheet can be accessed on the web at www.buglife.org.uk).

(e) Royal Haskoning were supplied with detailed molluscan information for Pevensey Levels. This organisation was conducting experiments on behalf of the Environment Agency and Natural England on the chemical control of the invasive freshwater weed, floating pennywort *Hydrocotyle ranunculoides,* which is choking many ditches on these grazing marshes (figure 1). The control programme was keen to know of ditches occupied by rare freshwater Mollusca, particularly of *Anisus vorticulus,* so that they could be avoided.

figure 1: Ditch covered with floating pennywort, *H. ranunculoides*.

(f) The Environment Agency were provided with advice relating to proposals to monitor important populations of *Pseudanodonta complanata* in the River Arun, West Sussex (figure 2). This related to monitoring work being undertaken to assess the possible long-term impact of increased water abstraction from the river by Southern Water.

figure 2: *Pseudanodonta complanata* and habitat on the River Arun near Pulborough, West Sussex.

(g) The Conservation Officer and various other members o Council assisted Chris Cathrine of Buglife in the production and refinement of a non-marine molluscan 'Species Knowledge Dossier' for Scotland. This was or of 15 invertebrate dossiers which were published online in August 2010 (http://www.buglife.org.uk/conservatio /Scotland/Scottish+Species+Checklists).

(h) Towards the end of 2010 the Conservation Officer mad contact with the Steyning Downland Scheme. This charitable organisation was set up to restore, improve and maintain areas of South Downs chalk grassland on the Wiston Estate near to Steyning. The scheme is anxious to gather biological survey data from the site so that appropriate management can be planned. This area is of considerable importance for chalk grassland Mollusca. In the early 1990s, some areas of the estate were found to support *Helicella itala* in association wit the carthusian snail *Monacha carthusiana,* one of only few sites on the South Downs where these species are living together. Work to establish links will continue in 2011.

British Wildlife

Molluscan 'wildlife reports' continued in 2010 with entries in February, June and October. The February issue discussed the 2008 non-marine recorder's report (*Mollusc World* **20**, pp. 20–22, July 2009), with its predominance o Irish records. A further observation noted that, of the 397 new vice-county records reported, 50% were for slugs and 12% comprised recently introduced species. Highlights fro the Marine Recorder's report of the same year (*Mollusc World* **20**, pp. 15–16, July 2009) were also reported. June' report included details of the successful campaign to conserve rare gastropods at St Aubin's Harbour, Jersey

(further details – this report below). The unusual mass copulation of common sea hares *Aplysia punctata,* observed on the shores of the outer Hebrides, was also reported and illustrated with images of chains of copulating individuals together with their pink spawn 'strings' (figure 3). October's report discussed the recognition that *Balea* living in the UK, had recently been recognised as the two species *B. heydeni* and *B. perversa*. News of Barry Colville's discovery of *Granaria frumentum illyrica* from the Isles of Scilly was also included, together with further records of the ghost slug *Selenochlamys ysbryda* at its first reported English site near Bristol.

figure 3: Sea hare (*Aplysia punctata*) – chain of mating adults (left) and spawn chain (right). (photos: Lee Thickett)

Futurescapes ('Space for Nature, Land for Life')

On 7th June 2010 the Conservation Officer attended the launch of the new RSPB 'Futurescape' initiative. The conference, which was held in Westminster, was attended by about 140 delegates representing a wide range of governmental and non–governmental organisations. Futurescapes is the RSPB's contribution to landscape scale conservation and this idea was introduced and explained with speeches delivered by Lord Henley (the Under Secretary of State at DEFRA with responsibility for Climate Change and Sustainability), Professor Chris Thomas, University of York and Dr Mike Clarke, RSPB Chief Executive. It is recognised that despite legislation designed to protect wildlife, biodiversity losses have continued and that, at present, many of the UK's most threatened and vulnerable species are often largely restricted to habitat fragments, the majority of these lying within nature reserves or other protected areas. In addition to increasing the size of areas managed specifically for conservation, Futurescapes aims to find much more space for wildlife (especially vulnerable species) in the wider countryside, to allow it to coexist with other land uses such as agriculture, forestry, water–management, recreation and housing. It was emphasised that many habitats have become fragmented resulting in isolated, genetically vulnerable populations particularly those (like many Mollusca) with poor powers of dispersal. The creation of larger habitat units might also help species adapt to climate change by assisting in species migration.

For Futurescapes to succeed, partnerships need to be established with other environmental groups, local communities, the private sector and relevant government authorities. Two partnership examples were described: the Forest of Bowland, Lancashire and the Wiltshire Chalk Grasslands. The initial 34 Futurescape areas include:

1. In Scotland: (5 areas) The Flows (Caithness); Caledonian Forest (Cairngorms); Loch Leven; the Inner Forth; the machair areas of the Inner and Outer Hebrides.
2. In Wales: (2 areas) the North Wales Moors; the Gwent Levels.
3. In Northern Ireland: (2 areas) Lough Beg and the Loch Neagh Basin; Sliabh Beagh and the Loch Erne Basin.
4. In England: (25 areas) the Solway wetlands; the Lakeland High Fells; Morecambe Bay; The Forest of Bowland; the Vale of Pickering; the Ribble Estuary; the Humberhead Levels; the Dearne Valley Green Heart; the Dark Peak; the Shropshire Wetlands; Sherwood Forest; the Trent and Tame river valleys; the Fens; the Broads; the upper Nene valley; the Suffolk coast; the upper Thames river valleys; the Ray Valley; the Greater Thames Estuary; the Cornwall coast; the Somerset Levels and Moors; the Purbeck Heathlands; the Wiltshire Chalk grassland, the East Solent Harbours.

For further details on Futurescapes see www.rspb.org.uk.

Rare molluscs and harbour renovations at St Aubin's Harbour, Jersey – a happy resolution!

In my Conservation Officer report for 2009 I wrote of threats to the rare molluscs *Truncatella subcylindrica* and *Paludinella littorina,* inhabiting joints between the granite blocks of Aubin's Harbour pier, Jersey. It was feared that essential maintenance involving infilling would destroy the snails. News of the threats to these molluscs reached the local Jersey press in late 2009 and the issue was still unresolved at the end of the year. Matters developed surprisingly rapidly and within less than three months of receipt of the initial representations, Jersey's fiscal stimulus fund made £80,000 available for pier repairs. The announcement of this funding was accompanied by the good news that the pier's molluscan importance had been acknowledged by the government. The Assistant Economic Development Minister, Senator Paul Routier, said, "Now the harbours team has worked out a way to complete the project within a period that meets the 'timely' objective of the fiscal stimulus fund, while also keeping the resident molluscs safe, I am pleased to be able to allocate this money to allow Jersey Harbours to bring the work forward".

Ray Hine, Technical Services Manager for Jersey Harbours also said, "by using an alternative repair method called 'stitching', we can avoid disruption to the pier and minimise disturbance to the marine life, including the molluscs which are causing particular concern. ..... The stitching method involves drilling small diameter holes along the pier and infilling with steel rods and grout, providing a series of solid reinforcement anchors". It is understood that the work on the pier was completed by then end of August 2010. The St Aubin's mollusc campaign received a lot of praise on Jersey because it was considered to have been handled by all parties in a constructive and non–aggressive manner. It was a welcome surprise that the Jersey government took the plight of these two molluscs seriously and then acted in such a short time to find a (hopefully!) satisfactory solution for both the pier structure and the molluscan conservation; Jersey is to be congratulated!

Biodiversity Action Plan – a request for lead partners for invertebrates in England:
In my last report (Mollusc World 24: 23 – 24) I explained that the administration of the BAP system had changed, with most BAP responsibilities delegated to country level and with species conservation mostly being achieved by country 'biotope' groups (e.g. 'coastal', 'upland', 'wetland'). In May 2010 the England Biodiversity Strategy Invertebrate Group put out a call for Lead Partners in England. Responses were being coordinated by Buglife. The Conchological Society expressed an interest in becoming involved with the scheme, perhaps not as a sole lead partner, but as part of a team of interested parties. It was pointed out that the Terrestrial Mollusc Steering Group (covering the UK and Eire) covered some of the lead partner role for the seven terrestrial BAP species (*Vertigo moulinsiana, V. geyeri, V. genesii, V. angustior, Quickella arenaria, Vertigo modesta* and *Truncatellina cylindrica*). It was suggested that the main BAP requirement was for representation for the freshwater BAP species (excluding the pearl mussel *Margaritifera margaritifera* which has its own steering group). These species include *Pseudanodonta complanata, Pisidium tenuilineatum, Sphaerium solidum, Mercuria similis, Heleobia stagnorum, Gyraulus acronicus, Segmentina nitida, Valvata macrostoma, Anisus vorticulus, Omphiscola glabra* and *Myxas glutinosa*. Most of these were previously covered by the now disbanded Freshwater BAP Molluscan Steering Group. It was suggested that the Conchological Society might therefore adopt some shared lead partner role for at least some of these species. This lead partner initiative will be further considered in 2011.

***Anisus vorticulus* – possible Special Areas of Conservation (Natural England Consultation 2010)**
The little whirlpool ram's–horn snail *Anisus vorticulus* (figure 4) is the most protected non–marine species living in the UK! This species lives in the unpolluted waters in grazing marshes ditches. In addition to being a UK BAP priority species, in 2004 the snail was added to the EU Habitats Directive under Annex IIa and IV in recognition of its vulnerable or endangered status in many European countries. Placement on Annex IIa requires member states to designate Special Areas of Conservation (SACs) for species, whilst Annex IV entails strictest protection. This means that licences are needed to collect and possess specimens whilst a range of obligations are required of landowners with the species living on their land.

In autumn 2010 Natural England (NE) launched a consultation process to consider SAC options for the snail. The Conservation Officer worked closely with other Society members and Buglife and many other individuals (including Dr Roy Baker and Prof. Steve Ormerod) to consider NE's proposals. During the consultation process the SAC areas proposed by NE were carefully studied. These included most of the Arun Valley in West Sussex, many areas in the Broads area of Norfolk and the Pevensey Levels, East Sussex. In response to these proposals all recent *A. vorticulus* records were considered. As a result it was suggested that a few further sites be added from both the Arun Valley and Norfolk. Encouragingly all of the Pevensey Levels SSSI was included in the initial NE proposals. As only about 20% of this area has been surveyed in detail (Willing 2010) for *A. vorticulus*, it is highly likely that further populations exist. The precautionary measure of including the whole Pevensey area is therefore to be welcomed.

It was also suggested that a former *A. vorticulus* site located near Staines, the only one for the Thames Valley, should also revisited to check if this isolated population remains. Prof. Steve Ormerod stressed the importance of trying to ensure that large contiguous areas of habitat be maintained as the snail has poor powers of natural dispersal (Niggerbrugge *et al* 2007). He also stressed the importance of maintaining as many populations of the snail as possible because significant genetic differences exist in *A. vorticulus* populations both between different areas of the country but also within some regional blocks (Mensch *et la* 2010).

A joint Buglife – Conchological Society response document was submitted in mid–November; the outcome of the SAC consultation is expected in early 2011.


figure 4: *A. vorticulus*. (photo: Paul Sterry / Nature Photographers)

***Anisus vorticulus* – the development of a monitoring protocol**
In addition to the SAC consultation, Natural England also required assistance in the development of a management protocol for landowners, managers and others with *A. vorticulus* populations present on their land. Work led by Buglife is ongoing with detailed inputs from the Conservation Officer and other Society members. Work is ongoing and the protocol will be completed in 2011.

Associations with other organisations:
The Conservation Officer continues to attend conservation committee meetings of The Sussex Wildlife Trust. Links with a wide variety of other governmental and NGO organisations are maintained through membership of Invertebrate Link. Throughout 2010 the Society undertook several joint initiatives with The Invertebrate Conservation Trust (Buglife); links with the Trust have been of considerable mutual benefit to both organisations.

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