FIELD - *Saturday 15 March 2008*
West Kent area.
Phenacolimax major search.
Leader: Ron Carr (01622 765047) (home)

Meet at the car park on the north side of the A25 road, north of Ightham Common, grid ref. TQ 578558, at 10:30 h. For those travelling by rail the nearest station is Borough Green, 2 miles distant on the main Victoria to Maidstone line. The first site to be surveyed is on Ightham Common TQ 577547, the second at Downe TQ 438607 and the third at Knatts Valley TQ 562612.

NHM – *Saturday 12 April* 14:00h in the Dorothea Bate Room [Palaeontology Demonstration Room], preceded by Council meeting.

Annual General Meeting

Presidential Address by Dr Julia Nunn on the subject of 'Mapping marine Mollusca in Ireland'.

Abstract
Since 1992 a project has been underway to map the marine molluscs of the island of Ireland. This talk will update progress since my presentation on this topic to the Society at the meeting in Cardiff in 2002. The results from the project will be discussed and recent interesting records described. The checklist, distribution atlas and bibliography will now be made available through a web site, hosted by the Ulster Museum.

FIELD - *Sunday 20 April 2008*
Isle of Wight.Fossil meeting.
Joint meeting with Newbury Geology Society.

Leader: Mike Weideli (01635 42190) (home)

For details of the time and meeting point please contact Mike <mike@lfield.co.uk> or visit the Web Site.

2-6 September 2008
5th Congress of the European Malacological Societies (CEMS)

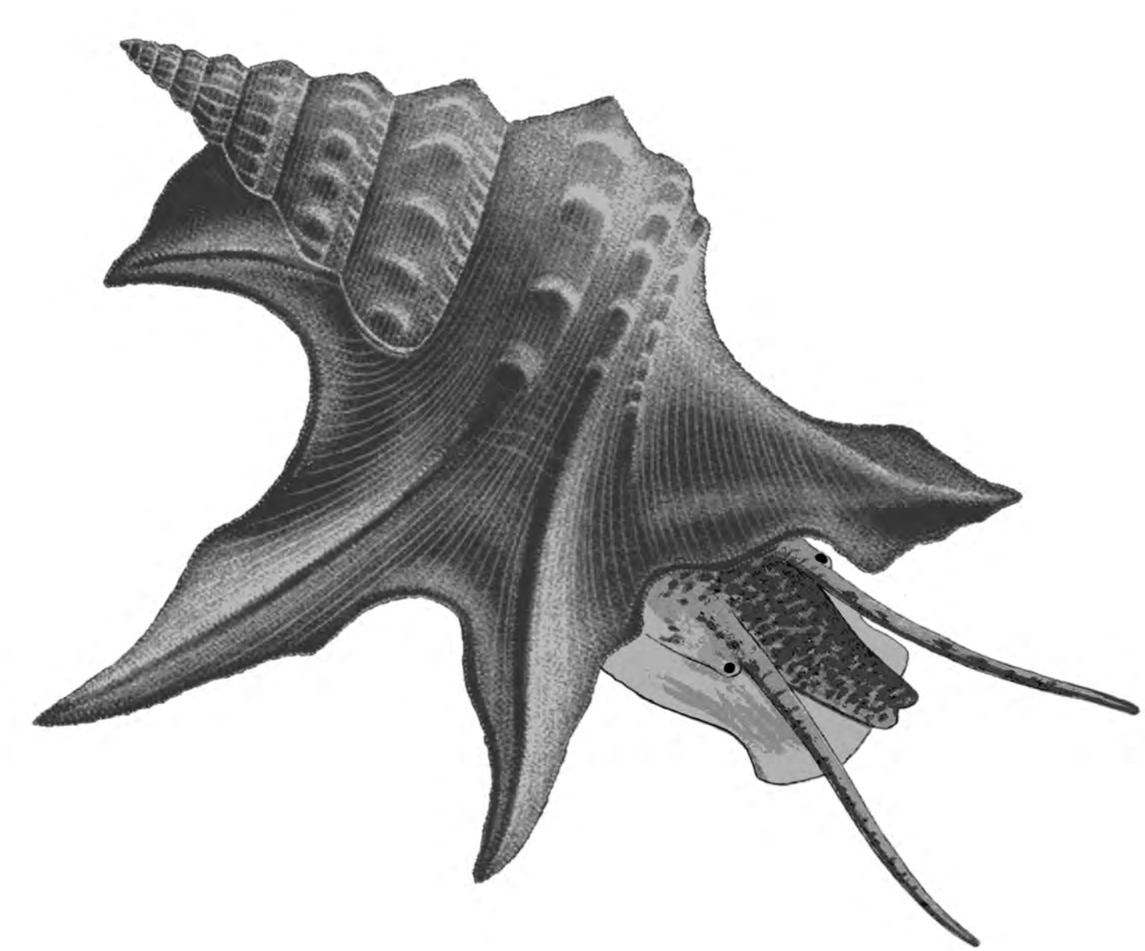
Venue: University of the Azores, Ponta Delgada, São Miguel, Azores.

The Instituto Português de Malacologia (IPM) and the Marine PalaeoBiogeography Working Group (MPB) are happy to announce the joint organization of the 5th Congress of the European Malacological Societies (CEMS) and the 2nd Atlantic Islands Neogene, International Comgress (AINIC). The 5th Congress of the European Malacological Societies will be held on 'Aula Magna', nearby the 'Complexo Científico' of the University of the Azores, at Ponta Delgada (São Miguel Island) and will also host the 2nd AINIC (Atlantic Islands Neogene, International Congress).
Various themes of interest including biogeography, the role of collections and conservation of freshwater molluscs.
http://www.uac.pt/~cicia/5thcongr/index.html

contents

Mollusc World

ISSUE No.15
NOVEMBER 2007



ISSN 1740-1070

THE MAGAZINE OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN & IRELAND

Editorial

I am very grateful again to Mary Seddon who has put together most of this issue of Mollusc World. Hopefully, it will not be too late arriving and we expect to be back on schedule with the next issue at the end of March. I have used all of the articles in hand, so please send plenty of material for inclusion in *Mollusc World 16.*

I'm sure members will be sorry to hear of the death of Derek Rands, an Honorary Member who joined the Society in 1971. Many will remember Derek as an outstanding photographer who took a marvellous collection of photographs of the British non-marine fauna. In an era way before digital cameras, Derek constructed many gadgets to enable him to take clear close-ups of his subjects. He was also very generous with use of his photographs. He very kindly allowed me to use over 30 of his slides for my Suffolk mollusc atlas and I am pleased to be able to reproduce 2 of them here: *Segmentina nitida* and *Acanthinula aculeata*.

A merry Christmas and a Happy New Year to all our readers!

Ian Killeen

Mollusc World

This magazine is intended as a medium for communication between members on all aspects of Molluscs from archaeology to life in the sea, field collecting at home and abroad and even eating molluscs. If you look back on the content over the last three years we include articles, field meeting reports, research news, results from the mapping schemes and identification keys. We welcome all contributions in whatever form they arrive.

How to submit articles:

Copy (handwritten, typed or electronic) should be sent to the Editor at the address below. If sending electronic copy using e-mail please include a subject line "*Mollusc World* submission" and send a separate mail without any attachments advising that the e-mail was sent. Electronic submission is preferred in Microsoft Word, but if other programmes (e.g. Works) are used, please indicate the programme used with the accompanying e-mail.

Images and Artwork may be digitised, but we recommend that a digital image size no larger than 8" x 6" and 300 dpi be sent with your submission. For line art we recommend that you send hard copy, all originals will be treated with care and returned by "snail-mail".

Please send articles to:

Ian Killeen, 53 Charleville Square, Rathfarnham,

Dublin 14, Ireland.

E-mail: iankilleen@eircom.net

About the Society

The Conchological Society of Great Britain and Ireland is one of the oldest societies devoted to the study of Molluscs. It was founded in 1876 and has over 300 members worldwide. Members receive two publications *Journal of Conchology* which specialises in Molluscan Biogeography, Taxonomy and Conservation and *Mollusc World*, our newsletter for members. New members are always welcome to attend field meetings and indoor meetings before joining.

How to become a member

Subscriptions are payable in January each year, and run for the period 1st January to 31st December.

Ordinary membership	£33.00
Family/Joint membership	£35.00
Institutional membership (UK & Ireland)	£47.00
Institutional membership (Overseas)	£50.00
Student membership	£15.00

Payments in sterling only, to membership secretary at address below. £1 discount given to payments before March 31st each year. For UK residents we suggest payment by standing order, and if a UK tax payer at standard rate we encourage you to sign a Gift Aid form.

Overseas members can pay by IBAN transfer to the following account:

The Conchological Society, National Westminster Bank, Bolton, BL1 1BN

IBAN GB12 NWBK 0130 9906 5238 46 BIC NWBK GB2L

Contact: Mike Weideli, 35 Bartlemy Road, Newbury, Berks, RG14 6LD

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New arrangements for Conchological Society meetings for 2008

Ron Boyce

Hon. Programme Secretary

To enliven indoor meetings Council has decided to change their format so as to give more time for informal interaction and for discussion and comment on the exhibits. This will mean earlier start times, 11:00 h in January and October [longer meetings] and 14:00 h in February, December and March/April [shorter meetings including the AGM]. The long meetings will give members the opportunity to bring plenty of exhibits and hold small workshops or informal talks. There will now be only five indoor meetings each year in London, but it is also hoped to hold at least one all-day locally organised regional meeting outside of London, possibly combined with some field work.

Members willing to organise regional meetings, or give short talks or demonstrations at the London meetings please contact Ron Boyce the Programme Secretary.

Council will meet in February, March/April and December preceding the indoor meetings, with an additional all-day Council meeting in September separate from the usual indoor meeting arrangements.

We would also like to encourage members keen on holding or attending field meetings to consult with other members interested in their locality and with the Programme Secretary about mutually agreeable dates for holding such meetings.

Details of meetings will be publicised in *Mollusc World* and on the Society's web site. The annual programme card is being replaced by a membership card which will not contain the meetings details.

LETTERS

Disappearing snails?

Adrian T. Sumner

David Long (*Mollusc World* **14**, p. 21, July 2007) asks if anyone else has noticed a decrease in snails sieved from leaf litter this year. As I have never been an enthusiastic siever (in my hands it turns out to be a lot of work for very little reward), I can't answer this directly. However, I have got the impression that certain species do seem to be adversely affected by weather conditions. Back in 2005, on one of the field excursions organised by the Lothian Wildlife Information Centre, I was asked to show a newcomer "that snail that smells of garlic". Easy enough, I thought, but in fact I was completely unable to find a single specimen of *Oxychilus alliarius* that day, and in my part of Scotland it seems to have remained quite scarce ever since. The same applies to *Vitrina pellucida*, which again I thought was common enough, but recently has been difficult to find.

2003 was a very hot and particularly dry year, and my guess is that this could have been detrimental for many species of snails, perhaps the small ones especially. It might be interesting to compare pre- and post-2003 records to see if there are any other species that do feature less frequently post-2003. However, as David implies, it would be important to monitor the same sites year after year to establish if there are any significant changes. Even then, as we know, the weather at the time of the survey can have a profound effect on what we might find, regardless of any long-term changes.

Interestingly, just a few days before writing this, I was recording molluscs in Edinburgh, and found both *Vitrina pellucida* and *Oxychilus alliarius* without any difficulty. It looks as if the wet summer had revived both species.

Dr Adrian T. Sumner:7 Smileyknowes Court, North Berwick, East Lothian EH39 4RG

IN THE NEWS

Ancestral recipes for food

In the last issue there was an article discussing the use of perforated beads in Morocco. The latest news suggests that over 164,000 years ago our early ancestors went out collecting mussels from the shore at Pinnacle Point overlooking the Indian Ocean near South Africa's Mossel Bay. Professor Curtis Marean believes that these humans were eating seafood about 40,000 years earlier than previously thought. He also suggests that this is the earliest record of humans eating something other than what they had caught or gathered on the land. The sea would have been about 2 to 3 miles from the cave, so Professor Marean suggests that they put the seafood over hot rocks to cook. Marean and colleagues tried out this ancient cooking technique to see what the meal would have tasted like: "We've prepped them the same way, ...and they're a little less moist" than modern steamed mussels. The seafood bake was mainly brown mussels, but he also found black mussels, small saltwater clams, sea snails and even a barnacle suggesting that whale blubber or skin might have been brought into the cave. Shellfish may have been crucial to the survival of these early humans as they expanded their home ranges to include coastlines and followed the shifting position of the coast when sea level lowered. This was at a time when the world was going through a cool, dry spell, and Africa was mostly desert. Perhaps this environmental stress drove small bands of hunter-gatherers down to the sea in search of new food sources and lifestyles.

Nature 449, 905-908 (18 October 2007) | doi:10.1038/nature06204.

World Malacological Congress at Antwerp

Mary Seddon

The World Malacological Congress must be the largest meeting of malacologists; this year Thierry Backeljau and his excellent conference team organised a wonderful meeting in Antwerp. Not only were there four days of lectures, talks and posters, but there were many social events, such as the Icebreaker at Antwerp Zoo; poster session with cheese and wine reception (plus the local Belgian beers); the American Malacological Society Auction through to the Congress Dinner at the Grand Café Horta. This enabled people to wander around the venue and sit talking to their colleagues, rather than exchanging e-mails, as they do for the intervening three years. There were 421 malacologists from 45 countries and the top 3 countries were USA (n=75), Germany (n=60) and Spain (n=37), yet proportionally, the best attended nation was Barbados with about 0.75 delegates per 100,000 inhabitants! The congress started on a high, as the venue could be found by looking for the elephants near the Railway Station. Then you found the Zoo entrance, and the long queue of registrants. It was fantastic seeing some many old friends; beer and wine flowed, helping the party along. There were some absent friends, as delays to trains meant that some UK participants didn't arrive until later. There were lots of students and it was really exciting to see young people just starting research on molluscs mingling with the golden oldies, who been researching molluscs for years.

Many of the UK participants were based in the student accommodation, discovering pastoral life next to the meeting hall, or walking to the venue across the park. We all discovered the mosquitos that lived near the students halls. The following morning you could identify those unfortunate people who left their windows open in the sultry stormy weather in Antwerp during July; mosquito bites on faces and arms!

In terms of conference highlights, we will all have different memories! The standard of talks is now so high, as technology evolves constantly, so video and slides can be incorporated in talks with little cost. For those based in the UK, here are some talks that might have interested you at the congress.

Active camoflage

One of Robert Cameron's highlights on the first day was the video of an Enid from Canary islands; we are all aware of the difficulty finding *Merdigera obscura*, as their shells are often coated with dust and mud. But is this accidental or deliberate? Christoph Allgaier investigated one species from the Canary Islands. He found that the snail actively places strips of lichen on the shell; it grazes a piece off the substrate, uses it's mouth to place the moist material onto the shell, extending it's body far beyond the shell margin to reach the top of the shell. His video of this snail replaced many words, and this talk was awarded the best student presentation by *Unitas Malacologia.*

Interesting techniques

One talk I will remember, as it created some fun images in my mind, was a student from Hawaii, Kevin Hall, who was working on Achatinellid tree snails. He is investigating natural dispersal rates, so that conservation programmes using translocation can be started. These snails are obviously difficult to find, as they can move horizontally and vertically. He applied tags that he could refind his snails for mark-recapture experiments using radar tracking.

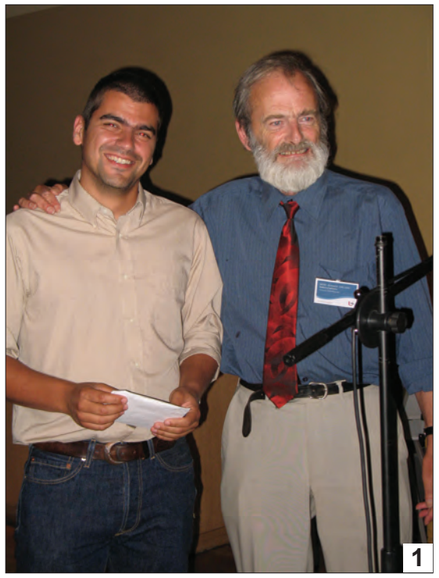
The other technique that caused some discussion at the coffee bar later, was Hiroshi Fukuda's description of 'Niku-nuki', extraction of body from shells; this method was being used for microshells. I seem to recall Barry Colville telling me how he cleaned his *Vertigo* shells, and it sounds very similar to Niku-nuki'.

1. When live animal in beaker crawls on bottom, pour in boiling water over the animal, which kills it instantly.
2. Take out of water after few seconds, take shell between two fingers on one hand and forceps in other hand.
3. Viewing animal under microscope, grab foot with forceps and pull carefully to separate the columella muscle from the shell, then
4. In a Petri dish filled with cold water, pull the foot again, and if a gastropod, then twist the shell, so that the body starts to unscrew; if there is resistance, use a syringe to inject water into the apex. Repeat several times if it's difficult to move the soft parts.
5. Apparently, the body can be placed straight in alcohol and used for DNA studies, without any significant impact from the heating (boiling water) and magnesium (from washing in freshwater).

Digital imaging was another topic of discussion, and James Turner presented his latest work on how to get good images of micromolluscs. Jim has improved the techniques, including lighting and image manipulation since he did the article in Mollusc World 6 (6-17).

Conchological Society Award for Best Poster (Student or Amateur) on Conservation

Robert Cameron presented the winner, Joaquim Reis, a PhD student



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at the University of Lisbon, Portugal, with Conchological Society Award for his poster (presented jointly with Rafael Araujo from Spain). There are now very few malacologists in Portugal, and it is heartening to see the enthusiasm displayed by Joaquim, in terms of conservation attempts to protect this newly recognised species.
A slightly edited for of his abstract is reproduced here:

***Unio tumidiformis* Castro 1885: A highly endangered endemic species (Bivalvia: Unionidae) from the south-western Iberian Peninsula.**

3

There are several endangered species of unionid mussels in Europe, notably *Margaritifera margaritifera, M. auricularia, Unio crassus* and *U. mancus*, but our poor knowledge of the systematics and taxonomy of the group jeopardises the efficiency of our conservation efforts.

Following our recognition, using molecular phylogenetic analysis, that Portuguese *Unio crassus* (*sensu* Haas) was an endemic form, we redescribed this species that was first designated as *Unio tumidiformis* Castro, 1885. We revised the collections in the Natural History Museums in Lisbon, Coimbra and Porto (Portugal), Madrid (Spain) and Paris (France). It shares some morphological characters with central and northern European populations of *U. crassus,* its genetic sister species, but it is clearly distinct from all other European *Unio*.

We made many samples throughout the Iberian Peninsula, and analysed distribution, morphology and anatomy and life cycle in *U. tumidiformis* populations, where it was found.

U. tumidiformis is restricted to the southern Atlantic basins of the Iberian Peninsula, mainly in the Guadiana basin. It is a small species, rarely more than 5 cm long, and it is very uncommon; many populations seem to be represented by only a few individuals. It lives in small streams, buried in fine sediment near the banks. Females with glochidia can be found between March and July. The glochidia are 200_m in length, and they are released as a loose conglutinate. Five fish species in the genus *Squalius* were good hosts for the species. Metamorphosis takes place over 10 days at an average temperature of 22o C.

Neither habitat nor the distributions of the fish hosts explain its restricted distribution, which must have its origin in a long history of isolation.

U. tumidiformis will keep the legal conservation status accorded to *U. crassus* in the EU Habitats Directive, but its very restricted distribution, its rarity, and the sensitivity of its habitat to more frequent and extreme droughts require that special attention be paid to it.

1. Joaquim Reis receiving his award from Robert Cameron.
2. Joaquim measuring water chemistry at one of his sites.
3. Shells of *U. tumidiformis.* Photograph

Slugs and snails in Iceland

Adrian T. Sumner

A couple of years ago, my wife and I decided to take a holiday in Iceland. The minibus tour that we chose was primarily designed to show the natural beauty of the country, and particularly the birds and the geothermal activity. It didn't seem likely that there would be much time to look for slugs and snails, but nevertheless, it seemed worthwhile to be prepared for anything that might turn up. Google wasn't helpful in finding a list of Icelandic species, so I did it the hard way: going through the relevant books, and abstracting what information I could (Table 1) In addition, *Arion vulgaris* (= *A. lusitanicus*) has recently been recognised as an introduced species. There may be some species that I have inadvertently overlooked, but it is nevertheless clear that the Icelandic non-marine molluscan fauna is quite limited: about 30 species of terrestrial molluscs, and seven freshwater species.

The reasons for this limited fauna are fairly obvious. Firstly, Iceland is a relatively remote island, which was not settled permanently until the 9th century. No doubt a few species would have colonised without human intervention, but many would only have arrived from Scandinavia with the Viking colonists. Secondly, it is a long way north (just below the Arctic Circle), with long winters and a short cool summer, so that tender species would not be able to survive. There are several permanent ice caps in the interior, and much of the land is covered with snow and ice for a large part of the year. Finally, because of the volcanic nature of the island – the whole of Iceland has been formed from lava spewing out of the floor of the Atlantic Ocean – much of the land is unsuitable for molluscs. Large areas are covered with lava flows, rocks and ash from volcanic eruptions (Figure 1), and areas with soil of reasonable quality are limited. The soil seems to be very free draining, and even early in the season is very dry, again not very attractive to molluscs.

If Google didn't provide a ready-made list of Icelandic non-marine molluscs, it did give a warning against investigating freshwater snails. Cases of 'swimmers' itch' in Iceland have been attributed to a schistosome, *Trichobilharzia* sp., carried by *Radix balthica* (Skírnisson K, Kolarova L, 2002 Are nasal Trichobilharzia cercariae potential threat to human health? *Læknabla_i_* **88**, pp 739-44). Schistosomes are often associated with warmer climates, but of course, Iceland has many bodies of freshwater that are geothermally heated. Dabbling in ponds and lakes for snails was therefore to be avoided.

Our holiday began with a flight from Glasgow to Iceland, and then a flight from Reykjavik up to Akureyri, the second town of Iceland, in the north (see the map, Figure 2). From here we were driven to our hotel by Myvatn, the 'Fly Lake' famous for its numerous breeding ducks and other water birds (Figure 3). Fortunately the flies were not much in evidence in late May! Near the lake shore I found *Arion circumscriptus* agg., and some very small slugs that were probably *Deroceras laeve*, under some stones. After three nights here we moved to Akureyri, and managed to fit in a visit to the most northerly botanic garden in the world. As it was May 31st, and the garden didn't open officially until 1st June, we were advised to enter by a side gate. It was still early spring, and not a lot was growing; however, there were some very small specimens of *Radix balthica* in a water tank.

From Akureyri we headed south, to the area inland from Reykjavik, to see more of the birds and geothermal activity. This was a long drive, but we stopped for a picnic lunch in a wood near Blonduos, where there was a *Euconulus fulvus*, and some small snail or slug eggs. Icelandic woods consist mainly of small birch trees, and although there are a few logs to turn over, there is often nothing underneath, and the soil remains quite poor.

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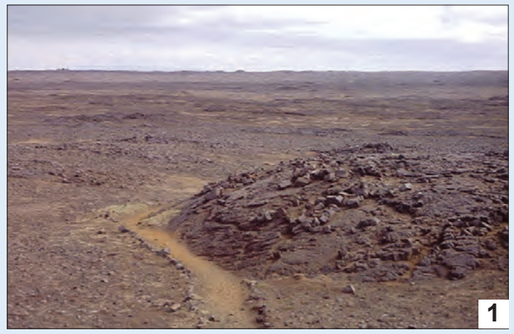
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Our destination that night was Geysir, famed for its geysers, of course. We had a couple of nights here, using it as a base to visit various places of interest in the area. Although Geysir (the eponymous geyser) itself rarely performs these days, there are other geysers that go off regularly, and one can sit in the dining room of the hotel and watch them while enjoying one's meal. The area immediately around the geysers is completely sterile: not only is the water very hot, it is also very rich in minerals, and has a strongly sulphurous smell (Figure 4). Away from this area, round the back of the hotel, however, there were some areas beside a track that proved to be quite profitable, at least by Icelandic standards. Here I discovered *Arion distinctus, Arion silvaticus* (both confirmed by subsequent dissection), *Vitrina pellucida*, and *Deroceras reticulatum*. I have not been able to discover if this is the first identification of *A. distinctus*, as opposed to *A. hortensis* agg., in Iceland.

Not far from Geysir is one of Iceland's greatest waterfalls, Gullfoss (Figure 5). Even by Icelandic standards it is very impressive, and it seems incredible that some years ago there was a scheme, happily defeated, to obliterate it with a hydro-electric scheme. Here there were an immature *Cochlicopa* sp., and what was looked like another *Arion distinctus*. Another excursion from Geysir took us to the south coast, where a village called Stokkseyri yielded something a bit different. Although the coast here was very rocky, there was a bit of sand between the rocks, possibly with some limey material derived from marine molluscs in it. At any rate, there were snails here, or rather snail shells, instead of the slugs generally found hitherto. Two species were present, in some numbers: *Pupilla muscorum* and *Vitrina pellucida.*


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And so, in a week's holiday, I found nine species of non-marine molluscs. I had not been trying hard, and there had been rather few opportunities, but even so, this number of species would be regarded as a poor total just for a day's outing in the British Isles. On the other hand, this represents almost a quarter of the Icelandic species, which sounds more impressive! Some areas we visited yielded no molluscs at all. Thorsmork, a well-wooded area near the south coast, produced nothing, while on our final, wet day in Reykjavik, which should have induced slugs and snails to come out, nothing turned up even in the leafy suburbs. Nowhere were molluscs common. It was, of course, early in the season, but it did seem that Iceland is far from being a rich place for slugs and snails. It is, however, a beautiful and fascinating place, and with a tiny population of about 300,000, most of whom live in or around the Reykjavik area, there is a lot of wild untouched space that has never been farmed or developed. It is well worth a visit, whether or not you find any snails.

Table 1. Slugs and snails recorded in Iceland (names updated according to Anderson, 2005, *Journal of Conchology* **38**, pp 607–637)

Land molluscs (from Kerney & Cameron, 1979 *A Field Guide to the Land Snails of Britain and North-west Europe*)

Oxyloma elegans	All round Iceland
Cochlicopa lubrica	All round Iceland
Cochlicopa lubricella	SW Iceland
Columella edentula	SE Iceland
Columella aspera	SE Iceland
Vertigo modesta	N and SE Iceland
Pupilla muscorum	N and E Iceland
Punctum pygmaeum	SW and E Iceland
Arion ater	All round Iceland
Arion vulgaris (=*A. lusitanicus*)*	
Arion subfuscus	All round Iceland
Arion fasciatus	S Iceland
Arion circumscriptus	SW and E Iceland
Arion silvaticus	SW and E Iceland
Arion hortensis agg.	N and SW Iceland
Arion intermedius	S Iceland
Vitrina pellucida	All round Iceland
Vitrea crystallina	S Iceland
Vitrea contracta	S Iceland
Nesovitrea hammonis	All round Iceland
Oxychilus alliarius	All round Iceland
Zonitoides nitidus	SW Iceland
Lehmannia marginata	All round Iceland
Deroceras laeve	All round Iceland
Deroceras agreste	All round Iceland
Deroceras reticulatum	All round Iceland
Euconulus fulvus	All round Iceland
Balea perversa	SE Iceland
Arianta arbustorum	NW and E Iceland
Cepaea hortensis	SW Iceland

Freshwater Snails
(from Glöer, P. 2002 *Die Süsswassergastropoden Nord- und Mitteleuropas*)

Hydrobia neglecta	*Galba truncatula*
Radix balthica	*Anisus spirorbis*
Anisus leucostoma	*Gyraulus laevis*

* Weidema, I. (2006): NOBANIS – Invasive Alien Species Fact Sheet –***Arion lusitanicus***. – From: Online Database of the North European and Baltic Network on Invasive Alien Species – NOBANIS www.nobanis.org, Date of access 12/7/2007.

1 A laval landscape, Hafnarberg, Iceland, completely unsuitable for molluscs
2 Sketch map of Iceland, showing the approximate location of the sites mentioned in the text where slugs and snails were found
3 Myvatn, the "Fly Lake" of Iceland, famous for its breeding water birds
4 Hot springs, Geysir, Iceland
5 Gullfoss, Iceland

Using a battery operated vacuum cleaner for sampling small invertebrates

Ron Boyce

In April 2006 my attention was drawn to a survey conducted in 1999 by the National Trust on invertebrate populations in coastal Co. Durham (vice-county 66). Sampling was carried out using a large vacuum blower of the type used commercially for tidying away autumn leaves, modified by fastening an insect net to the mouth of the leaf blower to collect the invertebrates. During this survey live specimens of the tiny vertiginid snail *Truncatellina cylindrica* were found. This snail had not been seen in this area for over 150 years (Alder 1848), but that may be none too surprising since it is small enough to be easily overlooked.

Since I had planned to visit the area concerned, I went with a colleague to the locality in early June 2006 to investigate what this animal's habitat looked like and discover how findable it was. We spent a couple of hours hand searching the site for snails, and found nothing.

I had been wondering for some time whether vacuum sampling might be the solution to finding such elusive animals; but leaf blowers are something like five feet long, heavy, expensive, and since they run on petrol, noisy and a fire hazard.

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Southwood (1975) states that you need a nozzle velocity of over sixty miles an hour for adequate vacuum sampling; portable equipment such as a battery operated car vacuum will not achieve that ... or will it?

A trip to the local DIY store revealed that some of the newer designs of battery operated vacuum cleaners come with crevice nozzles. I purchased one costing less than £10 which was small enough to fit into my usual field bag, and after charging the batteries took it along to the field meeting at Stanford Reservoir on the Leicestershire/Northamptonshire border on 8 July.

The first habitat I tested it on was the side of a deep drainage ditch with long grass. The catch contained no snails but did have a varied assemblage of leaf hoppers and springtails many of which were of species that I had not seen before.

The next habitat was of waterlogged sedges next to the reservoir where there would have been a constant water table. This sample contained eight *Vertigo substriata* and one *Vertigo antivertigo*. It worked!

Samples from short grassland turf on Bredon Hill on 30 September contained *Trochulus hispidus* a.k.a. *Trichia hispida* and nothing else.

We made a rapid visit to the Co. Durham site in early July 2007, where a single vacuum sample produced one *T. cylindrica*, 2 *Vertigo pygmaea*, a dead shell of *Vitrea contracta* and 9 juvenile *Candidula intersecta*.

The vacuum was most recently tested on the Middle Marsh at Dinton Pastures on 14 July 2007 when *Cochlicopa lubrica* and *Vertigo antivertigo* were found.

My conclusion is that small battery operated vacuum cleaners are a useful adjunct to hand searching for finding small molluscs and other invertebrates in vegetation. The machine I am using is a Dust Devil DD038 which is 13.9 in/36 cm long, but other makes may prove equally suitable. The dust filter in this machine is of brushed cotton and needs to be turned inside-out so that the brushed surfaces do not face the sample. The crevice nozzle may occasionally become blocked so some means of cleaning it needs to be carried or improvised.

References

Alder, J (1848) A catalogue of the Mollusca of Northumberland and Durham. *Transactions of the Tyneside Naturalists' Field Club* 1: 97-209 [on p. 134].

Southwood, TRE (1975) *Ecological methods with particular reference to the study of insect populations.* London: Chapman and Hall

Fig.1. Commercial leaf blower being used for snail sampling
Photo: Ron Boyce

Fig. 2. Battery operated vacuum cleaner being used for snail sampling
Photo: Rosemary Hill

Shell collecting Ants in Romania

Peter Topley

Ants have evolved into many specialisations from the primitive solitary hunters to the leaf cutter and soldier ants of the tropics. The ant genus *Messor* includes over one hundred species, all of which are known as harvester ants (the generic name comes from that of *Messor*, the Roman god of grain and the harvest). Azcarate *et. al*. (2005) state that *Messor* harvester ants are "the main seed predators in therophyte grassland and certain types of scrubland in the Mediterranean basin" and that the gathering of seeds that are taken to ant colony stores for eating constitute a severe source of seed mortality for many plant species in such habitats. Of more interest to those of us concerned with molluscs is the fact that although 91% of the *Messor* "harvest" consists of fruits or seeds, the remainder was found to include "animal fragments", particularly "insects and excrement" as well as "mineral particles".

On a recent trip to the Black Sea coast of Romania, in a limestone area near Enisala, I came across some harvester ant workers carrying the membranous fruit of a small perennial *Paronychia* herb into an opening to their underground storage chambers. More interestingly I then noticed that one or two ants were moving small Helicid snail shells as well. Instead of carrying them, they were pushing them up on their side and then down again onto their flattened whorls (see photos). I also noticed that a second ant would sometimes comes along and offer assistance to the first, gradually moving the shell until it was within reach of the entrance to the ants' underground passageway.

There have been reports of snail shells being found in the nests of the "mud ant" *Basicerus singularis* in Ecuador (Moffat, 2007) and the striated ant *Huberia striata* in New Zealand[1] . In both these cases (and apparently confirmed in the former case) it is thought that these species of ants capture live snails and bring them into the nest, where they feed on them. I think this is unlikely to be the case for the *Messor* ants since they are primarily herbivores (but possibly also scavengers). In addition, none of the shells that the ants were carrying appeared to have living occupants, although they may have contained desiccated snail remains. Another reason for these ants predilection for snail shells may be purely that they provide an abundant source of accessible calcium close the nest site.

Not being a myrmecologist, it would be interesting to hear of other reports of this type of ant behaviour and/or the reasons behind it. I am sure there must be many references out there that I have not managed to find.

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[1] Encyclopaedia of New Zealand http://www.teara.gov.nz/TheBush/InsectsAndOtherInvertebrates/Ants/2/en.

The Chalkface

Celia Pain

For the past three years I have been collecting molluscs on Kent shores and have made some observations on how molluscs adapt to this difficult habitat: the Chalk.

Chalk is a very pure limestone made up of the plates of very small algae called coccoliths. It was laid down in the Cretaceous age from 100 to 46 million years ago. About 200 metres of chalk remain in Kent. There are harder bands of marlstone and of flints; these may be in layers, tabular, elongate and blocky or scattered generally through the rock. Erosion has resulted in the formation of vertical cliffs and gently sloping shore and sub-tidal platforms in Kent and Sussex. These create a range of microhabitats. Splash-zone sea-caves support algal communities unique to the substrate. The generally soft nature of chalk results in the presence of a characteristic flora and fauna, notably rock-boring invertebrates such as the Spionid worm *Polydora* sp. and piddocks. Littoral chalk also usually lacks species common on hard rocky shores for example *Pelvetia canaliculata* and *Ascophyllum nodosum*, but otherwise supports the usual zones of algae and animals such as *Fucus* spp, kelps - *Laminaria* spp and red algal turfs, or barnacles and mussels on wave-exposed shores. Sub-littoral communities are confined to shallow water by high turbidity.

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Chalk habitats in south-east England are low in species-richness due to the friable and easily eroded nature of chalk and the prevailing harsh environment, characterised by relatively high water temperatures, high turbidity, siltation and scouring. Due to extensive sea defences (in Thanet 74%) of the upper shore has been concreted over and so there are no splash zone communities. There is human disturbance of shore communities by trampling, stone-turning, small-scale fishery, and damage to rocks through removal of piddocks. In Kent there has been an incursion of several alien species: Portuguese oyster *Crassostrea gigas*, Japweed *Sargassum muticum* and others.

You will be surprised that anything lives there, but it does!

The Chalk platform is eroded into gullies, which run out to the sea. On exposed shores the top surface of the platform is more or less clear of weeds, shallow pools are inhabited by large numbers of winkles *Littorina littorea.* Less exposed areas become covered by sheets of mussels *Mytilus edulis,* which are preyed upon by dog whelks *Nucella lapillus,* Margate has a huge range of large, colourful and stripy forms. Below the *Mytilus* zone there are extensive covering of red rags *Dilsea carnosa* and *Calliblepharis ciliata* and small reds including *Mastocarpus stellatus* and *Gelidium* spp. *Fucus serratus* is the dominant brown weed on chalk in Kent; it mostly attaches itself to flints and to cracks in the chalk. Embedded and loose flints are thus an important microhabitat. Adhering directly to them are common limpets *Patella vulgata* and Portuguese oysters *Crassostrea gigas*. Living amongst the serrated wrack on the flints are periwinkles *Littorina littoralis*, flat winkles *L. mariae*, rough winkle *L. saxatilis,* and the grey and purple tops *Gibbula cinerea* and *G. umbilicalis. Gibbula umbilicalis* and *Acanthochitona crinitus* are recent arrivals to Kent; they have been extending their range from the Channel coast facilitated by a 2^{0}C warming over the last 10 years. Kent ShoreSearch and Lyn Thyer have been recording these changes recently. *Crassostrea gigas,* which attaches to lower shore flints, is also an invader, having spread from Whitstable where it is farmed.

There is a sparse covering of small brown, green and red weeds that live on the sides of gullies, where it is less turbulent. Most of the macro shore fauna is to be found in the gullies: large numbers of common chitins *Lepidochitona cinereus*, limpets, periwinkles, rough winkles, grey tops and netted dog whelks *Hinia reticulata* live there. The micro-fauna living in the weeds comprises: *Tricolia pullus, Dikoleps cutleriana, Lacuna vincta, L. pallidula, Rissoa parva, R. interrupta, Onoba semicostata, Alvania beani, A. punctura, A. semistriata, Odostomia unidentata, Brachystomia eulimoides,*

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Modiolula phaseolinus, Mysella bidentata, Turtonia minuta and *Hiatella arctica.* The bottoms of the gullies contain fine black mud in which annelids live who are preyed upon by microscopic pyramidellids: *Odostomia plicata, O. turrita, Brachystomia scalaris* and *Partulida spiralis*. At the lower edge of the platform there are extensive reefs of *Sabellaria spinulosa* and the associated pyramidellid, *Noemiaea dolioliformis* and *Graphis albida* have been found.

Below low tide there is an interesting association of pholads and *Polydora* worms. I believe that the only places where this is found in UK are Kent, Sussex and Devon. *Pholas dactylus, Barnea parva, B. candida, Zirfaea crispata, Hiatella arctica* and *Polydora ciliata* actively bore into the rock. On the surface of the borings are *Osmundea pinnatifida* and sponges, small red weeds and *Botryllus* spp. This rich habitat supports Painted tops *Calliostoma zizyphinum*, cowries *Trivia* spp, sting winkles *Ocenebra erinacea*, wentletraps *Epitonium clathrus* and *E. clathratulum.* In the holes vacated by the pholads two non-boring bivalves live: rugose carpet shell *Venerupis senegalensis var saxatilis* and American piddock *Petricola pholadiformis*.

There are strong tidal currents through the Straits of Dover past Dover, Folkestone and Thanet. Many of the shells that end up on Sandwich Flats lived in the pholad community at Foreness Point. This area of Margate and Sandwich Bay has been awarded Special Area of Conservation (SAC) status under the UK Biodiversity Action Plan for its pholad community, chalk caves and of course birds on Sandwich Bay.

Refs:

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UK Biodiversty Action Plan.
www.ukbap.org.uk/habitats

1 Chalk platform and cliff at Foreness Point, Margate, Kent, covered by *Dilsea carnosa* and *Calliblepharis ciliata* .
Photo. J.Llewellyn-Jones

2 *Patella vulgata* living on a flint at Foreness Point, Margate, Kent.
Photo. J.Llewellyn-Jones

3 *Crassostrea gigas* at Foreness Point, Margate, Kent.
Photo. J.Llewellyn-Jones

4 Eroded chalk block with pholad holes at Foreness Point, Margate, Kent.
Photo. J.Llewellyn-Jones

An albino snail in my pond

Adrian T. Sumner

Ten years ago, when we moved into a new house, one of the priorities was to dig a garden pond. By the following spring this was ready, stocked with suitable plants. Within a few months, specimens of *Radix balthica* (formerly *Lymnaea peregra*) had appeared, apparently introduced with the pond plants. Later, *Lymnaea stagnalis, Physa fontinalis,* and a Planorbid, probably *Planorbis carinatus,* established themselves. The *R. balthica* became very numerous, but always remained quite small. The *L. stagnalis,* on the other hand, grew large, but often had thin shells; on one occasion, as many as 13 were counted.

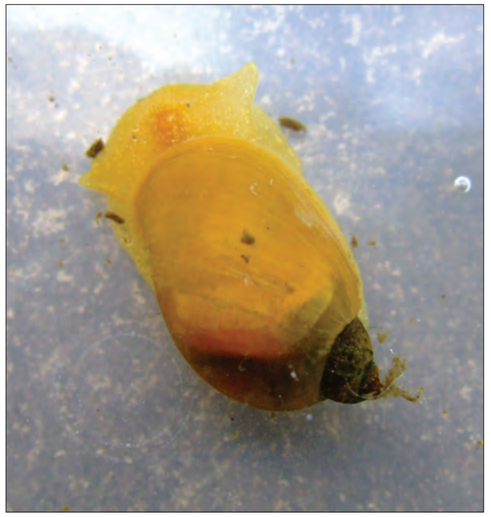
In recent years the pond was invaded by blanket weed, which seemed impossible to get rid of. Last year the numbers of snails were down, and the water was foul, and a dirty black colour. There was nothing for it but to empty the pond and clean it out; the vegetation was cut back substantially at the same time. This was done last autumn, and by the time the pond had been emptied, no snails could be seen, although some could have been hidden among the remaining vegetation.

Over the winter, the pond filled up again, and the first *Radix balthica* was seen in March. This was a good-sized specimen, significantly larger than those that occupied the pond in such large numbers before it was emptied. A few more have been seen since then, but numbers are far lower than previously. Specimens of *L. stagnalis* and *Physa fontinalis* have also returned. It seems reasonable to suppose that all these could have been hiding in the pondside vegetation, and have emerged as the pond filled up and the weather got warmer. Nevertheless, as Boycott (1936, *Journal of Animal Ecology*, 5, pp 116–186) pointed out over 70 years ago, molluscs can colonise isolated ponds remarkably easily.

One day, however, a snail appeared that was apparently a newcomer: an albino *R. balthica*, the like of which I had never seen before in the pond. This was the same size as the normal specimens, but had a yellowish colour, apart from some darkish pigmentation in places (Figure 1). Most of the pigment is in the apical part of the body, and this would be lipofuscin-like pigment which accumulates in the digestive gland (Dimitriadis, 2001, in *The Biology of Terrestrial Molluscs* ed. G.M. Barker, CABI Publishing, pp 237–257). The buccal mass is visible as a reddish-brown mass at the front of the animal, and there is a pair of dark dots, one on either side of the buccal mass. These latter are not at the base of the tentacles, where the eyes would be, and my guess is that they represent pigment, again probably of a lipofuscin type, in the cerebral ganglia. This snail therefore seems to be devoid of the black pigment melanin, production of which is under genetic control, but still has lipofuscins, which are essentially waste products of metabolism.

Albino snails, particularly freshwater ones, are not particularly uncommon, though one imagines that in the wild they might be eliminated more quickly, because they are so much more obvious than normally pigmented ones. So far, I have been unable to locate a definitive account of albinism in snails, but they seem to be popular for aquariums, and have been used a good deal in scientific studies. In many cases, albinism has been used simply as a marker in breeding experiments. The genetics of albinism seems to be fairly well worked out, and in many cases normal pigmentation is simply dominant to albinism. In *Physa heterostropha*, however, two recessive alleles are involved in albinism (Dillon & Wethington, 1992).

None of this explains the origin of the albino snail in my pond, however. Could it be the result of a new mutation – unlikely, considering the rarity of such events. Or might it have arrived from elsewhere – a discarded aquarium snail that somehow had been transported into my garden?



The albino *Radix balthica*

A Bloody surprise

S. Peter Dance

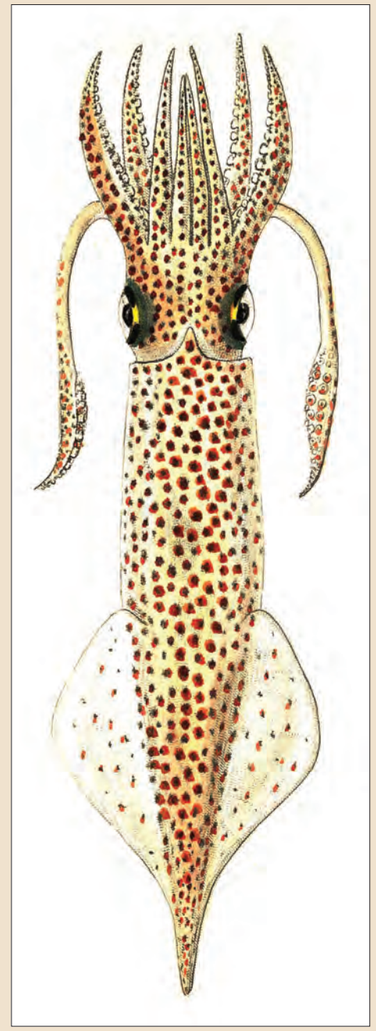
On a pleasantly warm day in August 1977 I found myself at Ilfracombe, a watering place on the north coast of Devonshire popular with holidaymakers. I had arrived there, hoping to satisfy a long-cherished ambition, to visit Barricane, situated some four miles to the south west, at one end of the long curved shore known as Woolacombe Sands. I had read about the delights of Barricane and its beach in a book written by the distinguished author of popular books on natural history, Philip Henry Gosse, well known for his ground-breaking studies of sea anemones, perhaps better known for his fierce opposition to Darwin's ideas on evolution.

Gosse visited Barricane in 1852 and described what he saw in *A Naturalist's Rambles on the Devonshire Coast,* published the following year. 'Its peculiarity', he said, 'is that it has a beach entirely composed of shells, some of which are rare, or at least are not found anywhere else in this vicinity.' That statement had enticed me there, 125 years later. The 'peculiarity' of this beach was an open secret. Gosse mentioned some of its interesting species, but made it clear he was not satisfied with their empty shells alone. 'I wished to procure some of these species in a living state', he said, 'and hoped that I might be able to find them about the rocks at extreme low water, as it was now spring-tide. Therefore, leaving the shell-collectors, I strolled down the long narrow inlet, of which the shell-beach was the head, towards the tide-pools at the water's edge.' Wanting to examine some of the deep pools closely, he 'stripped and jumped in, the weather being warm'. Unfortunately, it was all to no avail. 'I could find not a single individual of any of the rarer species of shells alive', he said, although he did discover some sea slugs 'of exquisite beauty'.

As I stepped onto the beach at Barricane I recognised it from Gosse's description. Shell collectors there were none, but shells there were in plenty. In a few minutes I made a substantial collection of them, many imperfect, none rare. They gave me some satisfaction, but, like Gosse, I was more interested in the living creatures and began searching tide pools for their occupants, as he did. Finding a large pool, I scoured its pellucid waters for living molluscs. I was about to pick up a brightly coloured winkle when I noticed something moving on the surface, something resembling a transparent torpedo. No more than three inches long, at a guess, it was a small squid, golden yellow and speckled with light-red dots.

Having never seen a squid in its natural habitat, I wanted to capture it, for the same reason Gosse would have wanted to capture it - to examine it more closely. Grabbing it in my right hand, I placed it on the back of my left. It clung fast, at the same time rapidly changing colour to a livid red. My reaction to this malevolent being, seemingly gorged with my blood, was to pull it off and hurl it from me. Anxiously I surveyed the back of my hand, looking for a nasty wound and a flow of blood. To my surprise and relief, I found neither. The squid, meanwhile, was nowhere to be seen. By changing colour, chameleon-like, it had fooled me and made its escape. Squids do that kind of thing all the time, but seldom, I should have thought, to escape the clutches of an inquisitive shell collector.

I cannot be sure of its identity, so brief and so traumatic was my acquaintance with it, but it may have been an example of *Alloteuthis subulata*, described by Lamarck in 1798. If Gosse had had a similar encounter with this small squid, when exploring the tide pools at Barricane in 1852, I doubt he have would been fooled by it as I was and would have watched it with calm detachment. I wonder, though, if he would have been tempted to make something more dramatic of it in *A Naturalist's Rambles on the Devon Coast?* Sea slugs, after all, may be 'exquisitely beautiful' but they are not very exciting.



***Alloteuthis subulata* Lamarck, 1798. Hand-coloured engraving by J. de C. Sowerby from Vol. 1 (pl. QQQ, fig. 1a) of *A History of British Mollusca and their Shells* by E. Forbes & S. Hanley (1848-53). This engraving (named *Loligo media* on the plate) was published within a year or two of Gosse's 1852 visit to Barricane.**

Conserving Scotland's Invertebrates – a fresh approach

Craig Macadam

No-one can doubt the importance of invertebrates for the environment whether it is for their contributions to ecological services like pollination and waste disposal or for the simple pleasures of seeing butterflies and bumblebees in gardens and countryside alike. Yet many invertebrates in Scotland are threatened and need conserving.

The Initiative for Scottish Invertebrates is at present a non-constituted alliance of individuals and organisations working on Scottish invertebrates. The group is currently consulting with as wide a range of interested parties as possible to gather opinions and data towards developing a conservation strategy for Scottish invertebrates.

The Conserving Scottish Invertebrates project, funded by Scottish Natural Heritage and coordinated by Buglife – The Invertebrate Conservation Trust, will seek a broad consensus among entomologists and conservationists around the actions detailed in the strategy. In addition, it aims to raise awareness of Scotland's important and distinctive invertebrate fauna amongst the public, conservation organisations and decision makers.

This is a timely and unique opportunity to make a difference for invertebrates in Scotland. For the project to succeed we need to engage with as many individuals as possible with an interest in Scottish invertebrates.

We hope you will respond positively to this opportunity and contribute to the development of the conservation strategy. In the meantime, if you would like to learn more about the project or join the Scottish Invertebrate discussion forum then please contact Craig Macadam at the address below.

Craig Macadam, Conservation Officer (Scotland), Buglife – the Invertebrate Conservation Trust, Balallan House, 24 Allan Park, Stirling, FK8 2QG. Tel: 01786 447504. Email: craig.macadam@buglife.org.uk

Conservation officers report 2006 *Martin Willing*

Advice and help:

The Society is often approached by the Media, local trusts, member's of the public, who all require advice on the conservation of molluscs. The Conservation Officer, with the help of the Society's conservation and recording committee, provides advice, for example identifications of specimens for members of the public, assistance with identification and interpretion for Essex Wildlife Trust for a *Segmentina nitida* and guidance on the management of roman snail populations in the Cotswold. The latter case demonstrates the dilemma's of conservation in an age that desires open access to information, as details of the location of the colony were published on the INTERNET, but fortunately when the sensitivity of the information was explained the exact location details were removed.

Publicising conservation activity

The Society contribute a molluscan wildlife report to British Wildlife, in order to promote activities to a wider audience interested in natural history. In 2006, three reports were in February, June and October 2006 drawing attention to Roy Anderson's revised list of the non-marine Mollusca of Britain and Ireland (*Journal of Conchology*, **38**: 607 – 637), new distributional information from our recording schemes and details of pearl mussel recovery work being undertaken in Wales.

Who will watch the small things that run the world? **Invertebrate Link and Buglife (The Invertebrate Conservation Trust):**

In November 2006 the Conservation and Marine Recording Officers attended a conference titled '*Who will watch the small things that run the world?*' This event held at the Natural History Museum, was attended by 120 representatives from over thirty organisations and focussed on the recruitment of the next generation of invertebrate specialists.

The Conchological Society, in common with many other invertebrate and natural history societies, now has few young members and this lack of enthusiastic 'new blood' poses a worrying prospect for coming years. The conference brought together seven speakers from the media, education sector, publishers, specialist societies, conservation societies and others to explore underlying problems as well as possible solutions including Nick Baker.

The relative rarity of young people with an active interest in invertebrates was attributed to a combination of many factors including:

(1) the lack of taxonomy on the National Curriculum and 'A' level syllabuses,

(2) an increasing concern with health and safety issues reducing young people's opportunities to explore wild places or be taken on organised trips,

(3) the 'patchy' availability of suitable identification guides,

(4) competion with computer games,

(5) a negative image associated with 'uncool' activities such as 'nature study',

(6) the increasingly urbanised lives of many young people and

(7) problems faced by adults assuming a 'mentoring' role with young people.

Possible solutions were presented including changes to school curricula, the development of improved identification guides (including novel new electronic 'palm-top' devices), the use of outdoor trips planned specifically to introduce young people to the variety of invertebrate life and encouragement to make natural history collections.

The issues raised by the conference are ones that the Conchological Socierty will need to address in the coming years.

Biodiversity Matters:

In earlier *Mollusc Worlds* (no **6**: p. 10; no **8**: p. 22) the UK BAP (Biodiversity Action Plan) review process was described. A preliminary list of the new BAP priority species was published by the Invertebrate Link BAP Working Group in summer 2006, but this omitted a number of molluscan BAP species that the Society felt were deserving cases (including from the original BAP list *Vertigo geyeri, V. genesii, V. moulinsiana* and *Segmentina nitida*). Following a short period of further 'appeals' (with revised proposal forms submitted by Martin Willing and Ian Killeen together with active support from Matt Shardlow of Buglife) a revised 'final' list emerged in late October 2006. This included all of the original BAP priority molluscs together with a further eight species, including the freshwater snails *Omphiscola (=Lymnaea) glabra, Valvata macrostoma* and *Gyraulus acronicus*; the freshwater bivalve *Sphaerium solidum*;. the land snails *Truncatellina cylindrica* and *Vertigo modesta* and the brackish lagoon snail *Heleobia stagnorum.* These species, together with all of the other BAP proposals, now go to the Priority Species and Habitats Review Working Group for further consideration. A more detailed resume of the BAP review outcomes will appear in the next issue of *Mollusc World* (March 2008).

Going, Going, Gone…

In 1996 The Independent newspaper published a small book titled 'Going, Going, Gone' (Schoon, N. 1996), which documented the story of Britain's vanishing natural history. The publication included some molluscan details based upon the then newly produced BAP priority species list. In 2006 another identically titled book* appeared, but with a very different content. To produce this publication 100 conservation groups from around the world were each asked to nominate one animal or plant giving them most concern. The two page spread given to each species included a key facts box including the main threats faced by the chosen species and the what the reader could do to contribute towards the species recovery. Luckily the Conchological Society were approached and we nominated the little whirlpool ram's-horn snail *Anisus vorticulus* (fig 1). Inclusion in this book is quite a coup allowing the Society not only to highlight the plight of a single species but also publicise its conservation work. (*Tait, M. 2006. *Going, Going, Gone?*. Think Books, London).

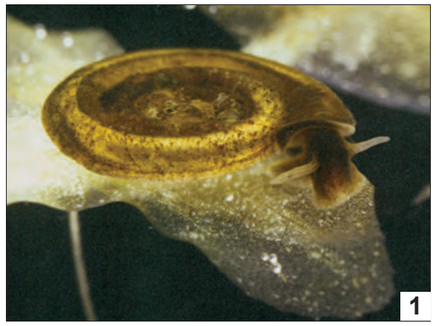


Fig 1 *Anisus vorticulus* as figured in book 'Going, Going, Gone' (© Paul Sterry)

CONSERVATION NEWS

Opposite Coils Attract For Asian Tree Snails

Paul Craze

Sinistral and dextral specimens of *Amphidromus martensi* collected from Kinabatangan, Borneo

When John Gurdon, the Nobel prize-winning developmental cell biologist, was asked to choose his favourite scientific study as the subject of an essay for the journal *Cell*, he surprised many by choosing a work about snails (Gurdon, 2005). The study in question (largely the work of amateur scientists, as if happens) was Boycott and Diver's insightful description of shell-coiling dimorphism in the fresh-water species *Lymnaea peregra* (Diver, Boycott & Garstang, 1925; Boycott & Diver, 1927; Boycott et al.,1931). As almost every malacologist learns at their mother's knee, most species of snail have shells that coil resolutely and invariably to the right (they are dextral), while a much smaller number of species favour the left (they are sinistral). A tiny handful of species, *Lymnaea peregra* amongst them, express both forms in large enough numbers for them to be called dimorphic. This otherwise obscure piece of snail natural history captured the imagination of John Gurdon because of what it tells us about the fundamental basis of animal development. Boycott and Diver's breakthrough was to show that the coil direction of *Lymnaea* was under the control of a single gene with its main activity during the formation of the egg in the mother before fertilisation (Boycott & Diver, 1927). This same gene is active in the early development of all animals helping to establish the left-right axis along which the organs of the body develop and as such it is one of the handful of most fundamental developmental genes so far discovered (Hierck et al. 2005).

Scientific interest in Boycott and Diver's discovery extends far beyond developmental biology. In a series of theoretical studies in the 1980s and '90s, the evolutionary biologist and malacologist Edmund Gittenberger predicted two things about sinistral and dextral snails (Gittenberger, 1988; VanBattenburg & Gittenberger, 1996). Firstly, the switch of a few individuals to sinistral in an otherwise dextral species (or *vice versa*) could result in the origin of a new species. This is because mating between sinistral and dextral individuals is often impossible or at least difficult (Asami, Cowie & Ohbayashi, 1998). The reason for this lies in the positioning of the external connection to the genitalia on one side of the body close to the respiratory pore. Two snails with the same coil are able to align their genital pores correctly so that gametes can be exchanged. Two snails of opposite coil, on the other hand, can align themselves at best with difficulty. To Gittenberger this immediately suggested a mechanism for forming a new species. If coil direction could prevent parts of the same species reproducing with each other they would, using the generally accepted definition, instantly be separate species and be set on the path to becoming recognisably different. Not only would this origin be instantaneous, it would, as Boycott and Diver had shown, result from the expression of a single gene; something considered unlikely if not impossible in the scientific cannon of the time. Nearly two decades of investigation has shown Gittenberger's idea of single-gene speciation to be a clear theoretical possibility but with some restrictions that make it less likely in reality (Orr, 1991; Stone & Björklund, 2002). But despite these complications, in 2003 Rei Ueshima and Hiro Asami finally published proof of speciation by shell-coil switching in the Japanese genus *Euhadra* (Ueshima & Asami, 2003).

Gittenberger's other idea concerned the maintenance of shell-coil dimorphism: his theoretical models showed it should not exist. Any population with both forms should become two species if sinistrals and dextrals cannot mate or revert to just dextrals or just sinistrals if they can. The one thing the models said definitely could not occur was long-term stability of the dimorphism. But *Lymaea peregra* and the other dimorphic species, though small in number, are incontrovertible proof that sinistral and dextral morphs can quite happily co-exist in the same species indefinitely. Something was clearly missing from the understanding of shell-coiling.

In 2003, with a research grant from The Conchological Society, my colleague Menno Schilthuizen and I set about trying to find this missing factor in the shell-coil dimorphism story. We first needed a convenient group of study species. The South-East Asian tree snail subgenus *Amphidromus s. str.* (Camaemindae), with 28 dimorphic species out of a total of 36, was an obvious choice, not least because a number of those species were present in Borneo where Menno was then working at the Institute for Tropical Biology and Conservation in Kota Kinabalu (Sutcharit & Panha, 2006; Sutcharit, Asami & Panha, 2007). We focussed our efforts initially on *Amphidromus martensi*, a large, conspicuous and above all relatively common species of the rainforest canopy, and travelled to the Kinabtangan basin in the eastern part of Sabah, northern Borneo, to begin our fieldwork.

We reasoned there might be two explanations for dimorphism. Up until that time, all collections of *A.martensi* had followed standard practice and recorded the sample location. But *A.martensi* is a tree-dwelling species; it is quite possible for individual trees or small groups of trees to harbour separate populations of the snail. If these populations had done what Edmund Gittenberger's equations predicted and contained only sinistral or only dextral forms, we may see very different things depending on the scale of sampling. At a small, tree-by-tree scale we may see separate populations of just sinistral or just dextral snails. At a broader scale (the scale at which conchological samples are generally taken) this mosaic of small populations may merge into one with, apparently, a mix of sinistral and dextral forms giving the appearance of general dimorphism. For our second explanation we suggested there may be some process acting on the snails that changes as the relative frequency of sinistrals and dextrals changes. As sinistrals become more common in a population, this process favours the minority dextrals until they themselves become more common. Now the process favours the rarer sinsitrals so that they, in turn, become more common. By always favouring the rarer form, this process (referred to as frequency-dependent selection) prevents a population from being taken over by one or other of the two forms and can maintain dimorphism indefinitely. The most likely agent of this process was a predator. Some predators of snails are themselves asymmetric and so could act in the way described. For example, Southeast Asian snakes of the family Pareatinae are asymmetric in their dentition so as to make it easier to remove a dextral snail from its shell. Sinistral shells are dropped more often and so have more chance of surviving a snake attack (Hoso, Asami & Hori, 2007). If a predator such as a snake was responsible for maintaining the dimorphism we would expect to see this reflected in the spatial pattern of sinstrality and dextrality observed in *A.martensi.*

To test whether either of these processes was involved, we needed a precise spatial map of where individual *A.martensi* were in the forest. Unlike some of the botanists of old who used trained monkeys to sample plants from the forest canopy, we were forced to sample shells of *Amphidromus* collected from the forest floor. But, with the help of Berjaya bin Elahan of the Kinabatangan Orangutan Conservation Project, by the end of our time in the field we had the exact location of enough shells to answer our question. The answer we got, however, was not one we were expecting. There was no structure in the distribution of sinistral and dextral morphs at any spatial scale; wherever you looked the ratio of sinistral to dextral snails was around 50:50 (Craze, bin Elahan & Schilthuizen 2006).

Puzzled by our findings I returned to the UK to continue analysing the results while Menno took a well deserved holiday on the Malaysian island of Pulau Kapas. Almost as soon as he got there he found it covered with large numbers of another *Amphidromus* species, *A.inversus*. Unlike *A.martensi*, these snails were not in the forest canopy but closer to ground level on the tree trunks at a height were they could be observed directly. Menno set about recording the location of sinistral and dextral snails as well as noting the numbers of mating pairs of each type: sinistral-sinistral, dextral-dextral and sinistral-dextral (Schilthuizen et al. 2005). When we analysed the results we found there were more sinistral-dextral pairs than we would have expected by chance. It seemed an individual *A.inversus* preferred to mate with a snail coiled in the opposite direction to itself, a behaviour that was considered disadvantageous in most species due to the problem of aligning genital pores. If this was the case we had accidentally found the process needed for our second explanation of frequency-dependent selection. An individual of the less frequent morph would always be sought out for mating and would be likely to produce more offspring on average than an individual of the more common morph. The tables would turn as soon as the morph that was originally rare became more common – it might very well miss out in favour of the rarer form. We even had evidence for why sinistral-dextral might be the preferred pairing. Using a technique of snap-freezing I developed with Andrew Barr (Craze & Barr, 2002), Menno had collected mating pairs. His dissections of these showed that the spermatophore produced by an individual *A.inversus* is coiled in the same way as its shell. There is also an asymmetry in the female genitalia at the point where the oviduct attaches to the sperm receiving organ (SRO). In a sinistral individual the oviduct branches to the left, in a dextral individual it branches to the right. When two *A.inversus* of opposite coil mate, the tip of the spermatophore lines up directly with the oviduct whereas if both snails are of the same coil, the tip points out into the SRO. As the SRO has evolved to digest sperm, a snail mating with an individual of opposite coil is likely to fertilise more of its partner's eggs rather than lose sperm to digestion. Incorporating these new findings into computer models showed that dimorphism is quite easy to achieve and is stable in the long term (Schilthuizen *et al.* 2007).

Thanks to the Society's research grant we may have uncovered at least one of the reasons why this

Left picture: Berjaya bin Elahan by the Kinabatangan River during a break in fieldwork
Right picture: Menno Schilthuizen examining rock-dwelling snails

conspicuous and intriguing polymorphism persists against the expectations of theory. While the techniques of computer simulation and spatial statistics may not have been available to Boycott and Diver, we hope they would have been pleased to see the prime role played by careful fieldwork in our study. We also hope they would have been heartened that the spirit of scientific curiosity that motivated them and so impressed John Gurdon was still very much alive.

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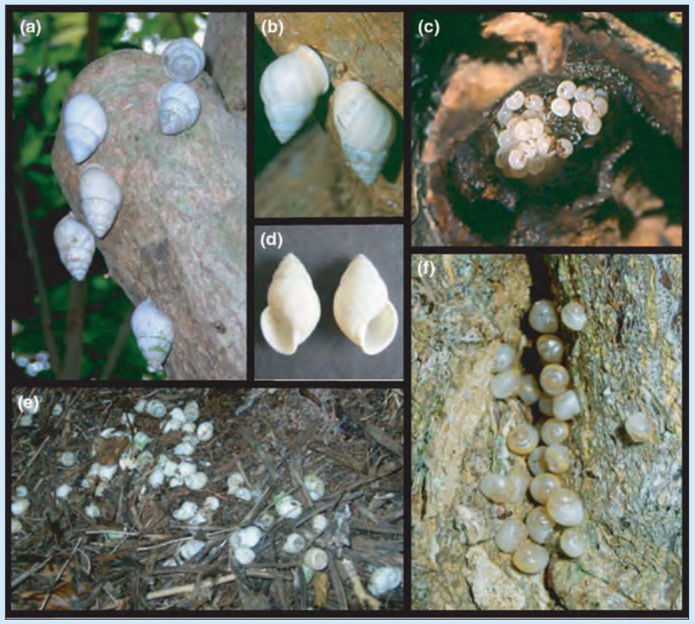
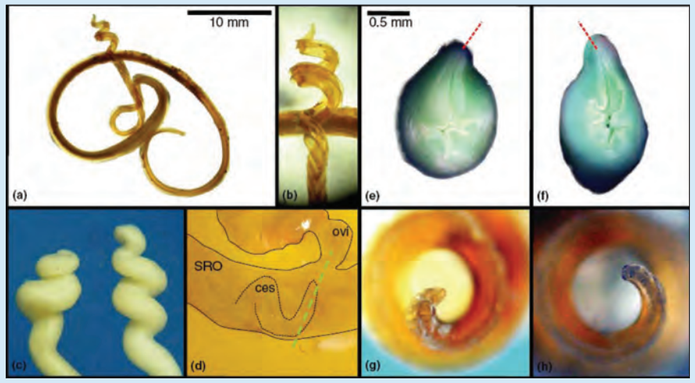


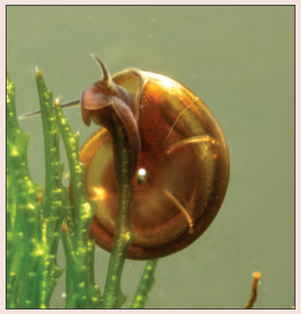
Amphidromus inversus on Kapas island, Malaysia. (a) One dextral (top) and five sinistral adults (approximate shell height: 40 mm); (b) inter-chiral copulation between a dextral (left) and a sinistral (right) individual; (c) a freshly laid clutch of eggs; (d) a sinistral (left) and a dextral (right) adult shell; (e) a large number of apically crushed shells in a rat midden; (f) a recently hatched egg clutch, all sinistral (mean shell diameter: 3 mm). [Reproduced from Schilthuizen et al. 2007, with permission from M. Schilthuizen and Blackwell Publishing].



Bottom left image:
Amphidromus inversus reproductive anatomy. (a) An entire sinistral spermatophore; (b) the coiled expanded section (CES) of a sinistral spermatophore; (c) the epiphallic caeca (which produce the CES) of a sinistral (left) and a dextral (right) individual; (d) the CES of a recently deposited sinistral spermatophore at the junction of the spermatophore receiving organ (SRO) and the free oviduct (ovi) of a dextral individual (outlines added for clarity; the green line indicates the plane of the sections in e and f); (e, f) vaginal view of the entrance of the free oviduct in a dextral (e) and a sinistral (f) individual; the red arrows indicate the direction of attachment of the oviduct, which corresponds with the coil of the spermatophore tips (g, h) in an inter-chiral mating; (g, h) apical view of the CES in a sinistral (g) and a dextral (h) spermatophore. [Reproduced from Schilthuizen *et al*. 2007 with permission from M. Schilthuizen and Blackwell Publishing].

REGIONAL NEWS

The Re-discovery of *Segmentina nitida* (O.F.Müller, 1774) in Hornsea Mere, Yorkshire



Adrian Norris & David Lindley

Hornsea Mere is the largest natural lake in Yorkshire, covering some 467 acres and is situated just one mile from the Yorkshire coast on the landward side of the village of Hornsea. The Mere is fringed by reeds-wamp which has many similarities to the East Anglian Fens. An examination of the fossil record indicates that the coastal strip from Flamborough in the north to the Wash in the south contained a number of similar Meres which have all been lost due to coastal erosion.

S. nitida was first reported from Hornsea Mere in 1881, on the occasion of the Yorkshire Naturalists' Union excursion held on 6th of June of that year. Mr J. Darker Butterell, in the company of W. Denison Roebuck collected a series, stating that it was common but local and had a predilection for the shallow water on the grassy margins of the Mere. (Roebuck, 1883).

Tom Petch, in 1904 states that "this species seems to prefer the shelter of the reeds, and may best be found along the first plantation on the Seaton Road or near the snipe ground on the south". (Petch, 1904). Both of these areas have been systematically searched on various occasions over the past 50 years, with no result.

On Saturday the 7th July 2007, the Yorkshire Naturalists' Union had arranged access to an area of the Mere not usually available to the public and so three of our members, David Lindley, Terry Crawford and Adrian Norris, took the opportunity to re-visit the Mere and examine an area previously out-of-bounds. The recent prolonged heavy rains had caused the Mere to overflow, thereby flooding nearby fields, as well as some houses on the northern shore. The flooding thus restricted the areas we could access with safety, resulting in the owners placing a health and safety bar on access to the wet woodland to the west of the Mere. Due to the

flooding situation, two areas were indicated as being safe for access to the lake shore itself. These were at the eastern end near the village of Hornsea, an area noted as the cemetery due to the large numbers of dead shells washed ashore, and the area of the old duck decoy on the south-western edge. This area is to the west of the 'snipe ground' mentioned by Petch. It was this area that we had never been able to access, so we trekked across the wet fields and, to our delight discovered a thriving colony of *Segmentina nitida* amongst submerged vegetation at the entrance to the inlet at grid reference TA1832346566. Unfortunately, the evidence on the ground indicated that this area is also heavily used by the large numbers of waterfowl that inhabit the Mere. The conditions on the day precluded a very thorough examination of the site and it is intended that this will be conducted at a later date. A fuller account of the distribution, and decline, of this rare species in Yorkshire, including its extinction at Askham Bog, York, is being researched for a further paper to be published at a later date.

Segmentina nitida is classified as RDB 1, Endangered in the UK Red Data Book and is a BAP priority species. A survey of this species undertaken in 1996 indicated good populations in Norfolk, Sussex and east Kent. However, it has seriously declined in most other areas of the country. Kerney (1999), stated that it is now extinct over most of England.

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Picture caption:
Shining ram'shorn *Segmentina nitida*
Photo Derek Rands
(Reproduced from *The Land & freshwater Molluscs of Suffolk*)

FIELD MEETING

Beckingham, Nottinghamshire 15 September 2007

Chris de Feu

The visit to Nottinghamshire was planned for September in the hope of enjoying better conditions for finding slugs in the damper autumn weather. Previous field visits in the area, during the summer have been plagued by hot, dry summer weather. Naturally, after a very wet summer, the three weeks prior to this event were very dry. This resulted in very dry, cracked soil and molluscs distinctly hard to find.

We had hoped to examine several habitats in the parish including areas on the Trent flood plain but, as usual, mollusc hunters tend to move at a pace comparable to their quarry. By the end of the day we had examined an area of river side flood plain, the disturbed area at an old willow works a garden and two patches of woodland. The meadow land patches, sadly, being left unexamined.
A measure of the difficulty of finding molluscs was the slug count in the garden - only 5 species of slug compared to the total of 20 I had recorded over the last decade. My special piece of plywood, placed in the shade under a hedge rarely has fewer than 6 species resting under it. On this occasion, not a single slug was present. In spite of this the event seemed to be enjoyed by the team. I cannot think why.

Of the 44 species found, 13 represented 10km records new to the 1999 atlas. Two more were the listed in the atlas only as fossils - *Acanthinula aculeata* (O.F.Müller, 1774) and *Carychium (Saraphia) tridentatum* (Risso, 1826). Looking at the known distributions of the species found, it seemed that we were filling gaps in a much under-recorded area, with most species having been found in adjacent, better recorded squares.

Most interesting finds, perhaps, were the large black slug and the tiny Prickly Snail, *Acanthinula aculeata*. The slug gave a spectacular rocking performance. Ron captured this on video - what a pity video clips cannot be included in a printed magazine. This slug was clearly a king of rock, a veritable Elvis impersonator. The Prickly Snail was a most interesting creature for those of us unfamiliar with it.

The apparent relative richness of the Willow Works is, perhaps, explained by the two habitats represented there - the nearby land drainage ditch and surrounds of the building, much influenced by human activity including extensive use of limestone hardcore in the past. Beckingham Wood, which is ancient woodland, was rather less productive than hoped or expected. Dogs Hole Wood, a much smaller area and not subject to management for pheasant shooting was more relatively more productive.

The most surprising find was a collection of shells. We considered that the heap, which included a few large tropical land snail and and a number of tropical coral reef species, was a child's discarded shell collection rather than evidence of a former coral reef in the Trent flood plain in former times. These records, of course, will not be included in the national map; not even as records of 'shells only'.

Leaders of field meetings will be familiar with the joys of completing risk assessment forms. but how can you be sure that you have considered every risk? With hindsight I feel we should have added the risk of small rodents running up my trouser legs. Perhaps adequate risk-amelioration measures should include the mandatory wearing of bicycle clips. Adrian scored all five wasp stings of the day. (Serves him right for laughing at my contortions - a direct consequence of the mouse and trouser incident.)

Typically, after the long, dry spell the autumn rain began falling the next week.

Acknowledgements
I would like to various landowners for permission to visit the sites: Paul Hemsley (Beckingham Wood), Mrs Tomlinson (Dogs Hole Wood), Andy Crawford of Environment Agency (Morton Tongue), Beckingham History Group (Willow Works): Thanks also to Ron Boyce, Terry Crawford, Rosemary Hill, David Lindley and Adrian Norris for making the day so enjoyable and worthwhile.

Prickly snail *Acanthinula aculeata*
Photo Derek Rands
(Reproduced from *The Land & freshwater Molluscs of Suffolk*)

SPECIES NAME	SK78 DHW SK7588	SK78 DHW SK7688	SK78 BW SK7589	SK79 WW SK795900	SK79 BHS SK777902	SK89 MT SK8091	SK89 NMT SK800915	No of sites with Species
Valvata (Cincinna) piscinalis (O.F.Müller, 1774)				P			P	2
Potamopyrgus antipodarum (J.E.Grey, 1843)				P				1
Bithynia (Bithynia) tentaculata (Linnaeus, 1758)							P	1
Carychium (Carychium) minimum O.F.Müller, 1774							N	1
Carychium (Saraphia) tridentatum (Risso, 1826)			F					1
Galba (Galba) truncatula (O.F.Müller, 1774)						N		1
Radix balthica (Linnaeus, 1758)				P			P	2
Anisus (Disculifer) vortex (Linnaeus, 1758)				P			N	2
Gyraulus (Gyraulus) albus (O.F.Müller, 1774)				P				1
Succinea putris (Linnaeus, 1758)			N	P		N		3
Oxyloma (Oxyloma) elegans elegans (Risso, 1826)				P				1
Cochlicopa lubrica (O.F.Müller, 1774)	P	P	P	P		P		5
Columella edentula (Draparnaud, 1805)		N						1
Lauria (Lauria) cylindracea (Da Costa, 1778)		N	P					2
Vallonia costata (O.F.Müller, 1774)						P		1
Vallonia excentrica Sterki, 1893				P				1
Acanthinula aculeata (O.F.Müller, 1774)	F							1
Discus (Gonyodiscus) rotundatus rotundatus (O.F.Müller, 1774)	P	P	P	P	P	P		6
Arion (Arion) ater agg.				P		P		2
Arion (Kobeltia) distinctus Mabille, 1868			P		P			2
Arion (Kobeltia) intermedius Normand, 1852		P	P			P		3
Vitrina pellucida (O.F.Müller, 1774)	P							1
Vitrea contracta (Westerlund, 1871)				P		P		2
Aegopinella nitidula (Draparnaud, 1805)	P	P	P	P		P		5
Oxychilus (Oxychilus) cellarius (O.F.Müller, 1774)				P		P		2
Oxychilus (Oxychilus) alliarius (Miller, 1822)		P	P	P	P	P		5
Oxychilus (Ortizius) navarricus helveticus (Blum, 1881)			N					1
Zonitoides (Zonitoides) nitidus (O.F.Müller, 1774)						N		1
Tandonia budapestensis (Hazay, 1881)					P			1
Limax maximus Linnaeus, 1758				P				1
Limacus flavus (Linnaeus, 1758)					P			1
Deroceras reticulatum (O.F.Müller, 1774)			P	P	P	P		4
Deroceras panormitanum (Lessona & Pollonera, 1882)					P			1
Clausilia (Clausilia) bidentata bidentata (Ström, 1765)	P	P						2
Candidula intersecta (Poiret, 1801)				N				1
Monacha (Monacha) cantiana (Montagu, 1803)				P		P		2
Ashfordia granulata (Alder, 1830)	N							1
Trochulus (Trochulus) hispidus (Linnaeus, 1758)			P	P		P		3
Arianta arbustorum arbustorum (Linnaeus, 1758)				P		P		2
Cepaea (Cepaea) nemoralis nemoralis (Linnaeus, 1758)	P		P		P		P	4
Cepaea (Cepaea) hortensis (O.F.Müller, 1774)	N	P	P	P				4
Cornu aspersum (O.F.Müller, 1774)				P	P			2
Total species for site	9	9	14	23	9	17	5	

Species list.

Key

P already known from 1999 Atlas
F only fossil records in 1999 Atlas
N new 10km square record

Sites:

DHW Dogs Hole Wood
BW Beckingham Wood
WW Willow Works
BHS Beckingham, garden
MT Morton Tongue
NMT near Morton Tongue

BOOK REVIEW

The Shell: A world of Decoration and Ornament

Author, Ingrid Thomas. Publisher Thames and. Hudson 2007,

ISBN 978-O-500-51357-.6. A4 Hardback 256 pages £35

The aesthetic appeal of shells is such that few people can resist picking them up off a beach. This appeal transcends cultural, racial, religious and age differences world-wide. Shells have been used for millennia both as artifacts in themselves and in decorative work, and have inspired artists working in many different materials; precious metals, ceramics, wood, glass, textiles, paint, and even plastic. The result is a rich legacy of artifacts, some weird some wonderful, some simple some ornate, some beautiful some grotesque, but all made from or inspired by shells.

In this book the author, a member of the Conchological Society, has brought together a selection of these objects drawn from public and private collections around the world and produced by many different cultures. These include objects from the Americas, Oceania, India, China, Korea, Japan, Africa and Europe, dating from between 28,000 BC to 2,005 AD, all showing how universal the influence of shells has been.

The book is lavishly illustrated with over 500 high quality full colour photographs. Some of the items shown may be too stylized to appeal to pure shell collectors, though these show how designers have taken basic ideas or motifs and 'run with them'. While a few items may seem over familiar (it would be almost impossible to cover the subject without mentioning Boticelli's *"The birth of Venus"* or Rembrandt's reversed *Conus marmoreus*) the vast majority will be unfamiliar or even revelatory.

It would be a mistake thou to regard this as just a picture book, for woven around the illustrations, and closely relating to them, is a clear informative yet readable text which has obviously been well researched over a long period. Main chapters cover; Carved Shells, Shell Jewelry, Shells in Art, Ornamental Shellwork, Shells in Architecture and Shells in the Decorative Arts, but the book covers far more, and. I'm sure that, like me, even hardened shell buffs will learn from and be inspired by this book.

The book has an illustrated glossary showing the shells mentioned in their natural state, useful to those coming to this from the art world but unfamiliar with shells. Also aimed at the non-collector are brief sections on the classification and naming of shells, conchology - the collection and study of shells, and shell collecting and conservation today. There is a good bibliography and list of recommended websites, also details of museums worldwide with shell collections and of shell houses and grottoes open to the public.

My main criticism of the book would be that it almost entirely deals with marine shells, though I believe this was the publishers remit. Even with that limitation the author must have had a difficult task in deciding what to include and what to exclude while maintaining a balance between different cultures, different mediums of artwork and different periods of history.

This book is destined to be a classic in the conchological ouvre, and will appeal to people in many fields outside conchology. It is highly recommended, and at £35 is very modestly priced.

Kevin Brown

Editors note: Those of you with access to the web will find that this book is available from £22 - £35 (plus packing and postage) from different online bookshops advertising through Amazon.

Diary of Meetings **- Conchological Society**

Programme Secretary: *Ron Boyce, 447c Wokingham Road, Earley, Reading, Berkshire RG6 7EL*

IMPORTANT: *Please remember to inform the leader if you are attending a field meeting. If you are held up in traffic or your public transport is delayed, it may be possible to ring the Programme Secretary on 0794 109 4395 on the day of the meeting for information on the location of the field site being surveyed.*

Indoor meetings at the Natural History Museum will take place in the Dorothea Bate Room [Palaeontology Demonstration Room] at the end of Gallery 30. Please note the earlier start times.

The Programme Secretary will be happy to receive any offers to lead field meetings or suggestions for speakers for indoor meetings.

Key to meetings:

NHM	=	Natural History Museum, London, indoor meeting
FIELD	=	Field Meeting at outdoor location
WKSHP	=	Workshop on Molluscan topic
YCS	=	Yorkshire Conch. Soc. events

WKSHP – *Saturday 24 November*

Annual Molluscan Workshop

This meeting is being held by kind invitation of Judith Nelson at Hilbre House, Pembroke Road, Woking, Surrey GU22 7ED (01483 761210) from 10:00h prompt until approximately 17:00h *Please note Hilbre is a non-smoking property*

Those attending should please bring a microscope and lamps (a few microscopes are available if booked in advance), Petri dishes or other dishes for sorting purposes, a fine water colour paint brush (00), tweezers/forceps, dissecting tools, if possible an extension lead and/or double electric plug, books to help identification, and a packed lunch. Coffee, tea and biscuits are provided. As numbers for the workshop are limited, please confirm any booking made by 1 November so that it can be checked whether there are any places vacant. Those NOT confirming by 1 November will be taken as not wishing to attend and their place will go to someone else. No reminders will be given. A fee of £5 will be charged to cover expenses. PLEASE BOOK EARLY. The programme for November 2007 is as follows but subject to change: Identification of Lymnaeidae, Planorbidae and small bivalves

NHM – *Saturday 8 December*

14:30h in the Dorothea Bate Room [Palaeontology Demonstration Room]. We welcome as Guest Speaker Tom Walker from Reading on the subject of 'Shells on stamps'.

NHM – *Saturday 26 January 2008*

11:00h in the Dorothea Bate Room [Palaeontology ation Room].

Note the revised earlier start time. No Council meeting. Please bring plenty of exhibits and demonstration material. Lecture to start at 14:30h.

We welcome as Guest Speaker Paul Butler from the University College of North Wales Bangor on the subject of 'The use of Arctica islandica shells as an annually resolved archive of the marine environment'.

Abstract

Counts of the annual growth bands in the shell of the benthic bivalve *Arctica islandica* (Linnaeus 1767) have shown that, with ages sometimes in excess of 300 years, *A. islandica* is the longest lived non-colonial animal known to science. The similarities between these growth patterns and tree rings suggest that *A. islandica* might be used, like tree rings, as an archive of changes in its environment. By using shells from long dead animals it might be possible to create such archives for periods of hundreds or even thousands of years back in time.

The work presented here will describe the first attempt to construct a 1,000-year chronology, in this case using A. islandica from waters around the Isle of Man. This is genuinely groundbreaking research, with immense potential in many quite distinct fields, including climate science, marine archaeology and palaeoceanography.

NHM – *Saturday 23 February 2008*

14:00h in the Dorothea Bate Room [Palaeontology Demonstration Room], preceded by Council meeting. We welcome as Guest Speaker Adrian Sumner from North Berwick on the subject of 'Slugs and snails spreading in Scotland'.

Abstract

As probably occurs elsewhere, the non-marine molluscan fauna of Scotland appears to be in a constant state of flux. Geographical and climatic factors, such as lower temperatures and lack of lime, that affect the distribution and biodiversity of molluscs in Scotland will be described. Examples will be given, from the speaker's personal observations, of how many species of slugs and snails now seem to be appearing in places where they have not formerly been recorded. Several species of slugs, such as *Arion flagellus, A. owenii, Limax maculatus* and *Boettgerilla pallens* have become widespread in recent years. Some snails, on the other hand, are turning up in new sites throughout Scotland, but show a more scattered distribution. Factors that might contribute to this spread will be considered.