ISSN 1759-1406

The Malacologist

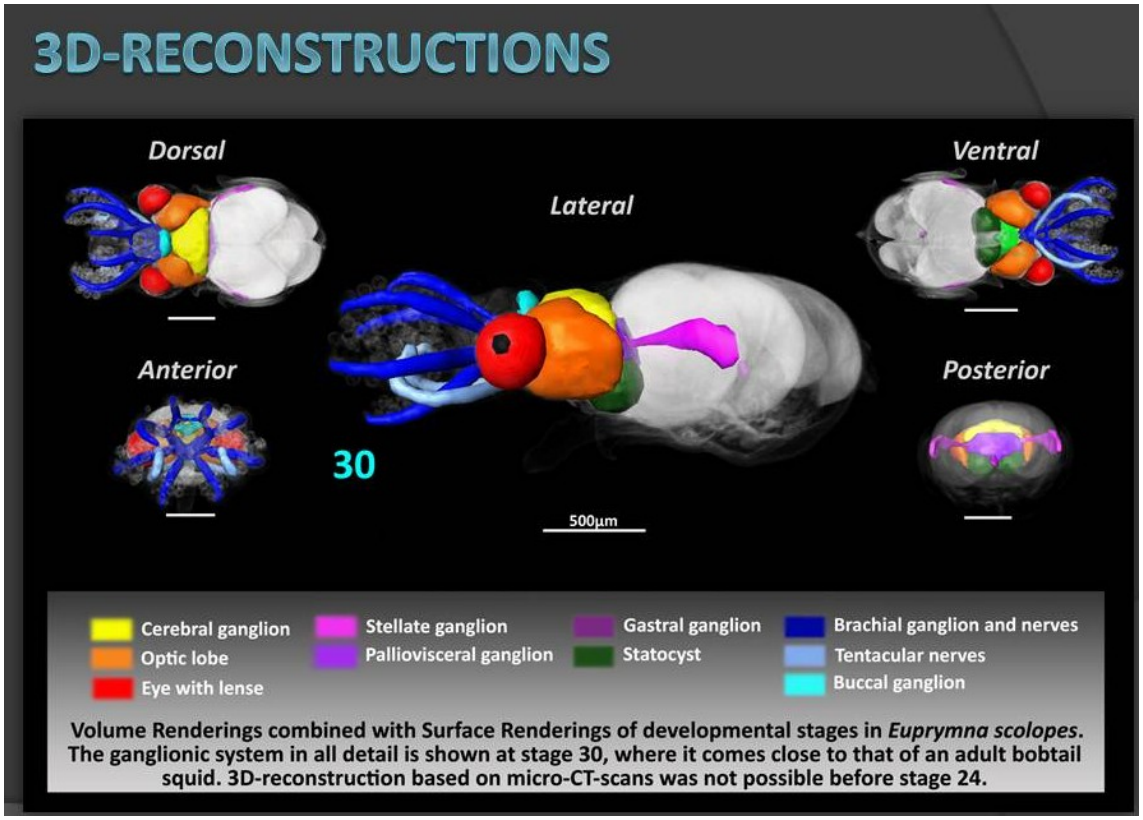
The Bulletin of The Malacological Society of London

NUMBER 58 FEBRUARY 2012

Contents

Molluscan Forum 2011

Last November young malacologists from across Europe took part in the Malacological Forum at the Natural History Museum. The abstracts of the thirty three presentations start inside on page 3. As in the case of last year's Forum, it immediately preceded the meeting of the Systematics Association. The pictures below are from the presentation entitled "New possibilities in anatomical studies Micro-CT-protocols and their use for investigations in soft-bodied organisms" by Alexandra Kerbl, Stephan Handschuh, Marie-Therese Nödl, Brian Metscher, Manfred Walzl & Andreas Wanninger . The Abstract is presented on page 9.



The Malacological Society of London was founded in 1893 and registered as a charity in 1978
(Charity Number 275980)

EDITORIAL

This is the first issue of *The Malacologist* under my Editorship, though I did circulate updates last October and December. My thanks go to Stuart 'Bill' Bailey for his excellent work on the Bulletin over many years. With issue 21 in August 1993, Bill took over the production of the Bulletin from June Chatfield who had done a sterling editorial job since its inception in September 1983. Colour was introduced in 2004 (Issue 42) and the Bulletin was renamed *The Malacologist* in 2005 (Issue 45). With Issue 55 in August 2010, it became a primarily electronic publication. I hope I am able to maintain the high standard set by Bill up to his last issue in August 2011 (Issue 57). Following a suggestion from Bill, this is the first issue to be presented in a single column format, to make it easier to read on the computer screen.

A substantial part of this issue concerns George Crawford, a long–standing member of the Society and past President who died in April 2011. George Crawford was particularly important in the development of the Malacological Society of London, and it is therefore justifiable to devote several pages to his memory. Both John Peake and Jon Arne Sneli have written reminiscences (page 27). I have resisted transforming these into a formal obituary because, as they stand, they give a strong flavour of the man. Jan Arne has lost contact with George Crawford's family. If anyone knows the whereabouts of his daughters Jocelyn and Sarah or his son-in-law Jon Gilpin, please contact me and I will pass on the information to Professor Sneli.

It is important also to flag up the Annual General meeting of the Society. There is usually a conference associated with this meeting and in this case, the conference is entitled *Molluscan Life Histories,* hosted by the Institute of Marine Sciences at the University of Portsmouth.

It is usual to supply the Society accounts in the February issue of *The Malacologist.* For organisational reasons, this has not been possible this year and the accounts will be circulated electronically before the AGM in Portsmouth.

TAXONOMIC/NOMENCLATURAL DISCLAIMER
This publication is not deemed to be valid for taxonomic/nomenclatural purposes [see Article 8b in the International Code of Zoological Nomenclature 3rd Edition (1985), edited by W.D. Ride *et al.*].

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News of publications

Sophie Ryser, Nicole Rindlisbacher, Martin U. Grüebler, Eva Knop (2011) Differential survival rates in a declining and an invasive farmland gastropod species *Agriculture, Ecosystems & Environment*, 144, (1) 302-307

Individual marking by using transponders may be useful to investigate population trends of farmland invertebrates. Once common in agricultural fields, the slug *Arion rufus* is now restricted to forests, whereas the closely related and similar *Arion lusitanicus* recently built up high populations. Here, it was tested whether (1) transponder tagging combined with artificial shelters for recapturing is a suitable approach for quantifying adult survival of farmland gastropods under real field conditions, (2) whether captive bred and wild *A. lusitanicus* differ in survival, and (3) whether in agricultural fields the declining slug *A. rufus* shows reduced survival rates compared to the invasive slug *A. lusitanicus.* One hundred and thirty transponder-tagged slugs were released and individual-based mark–recapture models were performed. Individual transponders proved to be a successful method for quantifying survival rates. There were no differences in survival or encounter rates between captive bred and wild *A. lusitanicus*. *A. rufus* showed significantly reduced survival rates compared to *A. lusitanicus*. This might be due to differential susceptibility to habitat degradation, differential predation rates or promotion of the invasive competitor species. A further decrease of *A. rufus* in agricultural landscapes is expected.

Navaneethaiyer Umasuthan, Kasthuri Saranya Revathy, Youngdeuk Lee, Ilson Whang, Jehee Lee (2012) Mitochondrial thioredoxin-2 from Manila clam (*Ruditapes philippinarum*) is a potent antioxidant enzyme involved in antibacterial response *Fish & Shellfish Immunology* 32 (4), 513-523

Thioredoxin (TRx) is a ubiquitous protein involved in the regulation of multiple biological processes. The TRx-2 isoform is exclusively expressed in mitochondria, where it contributes to mitochondrial redox state maintenance. In the present study, a novel thioredoxin-2 gene was identified in the Manila clam, *Ruditapes philippinarum.* The full-length sequence of RpTRx-2 (1561 bp) consists of a 498 bp coding region encoding a 166 amino acid protein. The N-terminal region of RpTRx-2 harbors a mitochondrial localization signal (56 amino acids), while the C-terminal portion contains the characteristic 89WCGPC93 catalytic active site. Phylogenetic analysis revealed that RpTRx-2 is closest to its ortholog from abalone. The broad distribution pattern of RpTRx-2 mRNA in healthy animal tissues implicates a generally significant function in normal clam physiology. The transcription level of RpTRx-2, however, is highest in hemocytes. Lipopolysaccharide and *Vibrio tapetis* bacterium caused up-regulation of the RpTrx-2 transcript levels in gill and hemocytes. Interestingly, clam manganese superoxide dismutase (MnSOD) mRNA levels in hemocytes elicited a corresponding response to these immune challenges. RpTRx-2 was recombinantly expressed in *Escherichia coli* BL21 (DE3) and used in insulin disulfide reduction assay as well as metal-catalyzed oxidation assay to elucidate its antioxidant property by reducing substrate and protecting supercoiled DNA from oxidative damage through free radical scavenging, respectively. Collectively, our data indicated that RpTRx-2, a mitochondrial TRx-2 family member, is an antioxidant enzyme that may be involved in antibacterial defense of clams.

Continued on page 16

Molluscan Forum 2011

Natural History Museum, London 30 November 2011

Schedule

10.00 – 10.15 Registration & Coffee

10.15 – 12.40 **Session I : Ecology & Environment** *abstract*

10.15 MARK DAVIES: Welcome and intoduction to the day
10.20 VERONIKA SZALONTAYOVA: Genetical and Morphological Diversity in Genus Cochlodina (Gastropoda: Clausiliidae) page 17
10.40 MARÍA BAGUR: Rock boring by the bivalve *Petricola dactylus* increases invertebrate richness in a wave-swept Patagonian intertidal environment page 5
11.00 JULIO MAGAÑA CUBILLO: Relocation and monitoring of the purple dye snail *Plicopurpura pansa* (Gould 1853), located in the Tepalcates Channel breakwaters, Manzanillo Colima, México page 12

11.20 Coffee and Poster Session

11.40 SUZANNE JENNIONS: Historical effects of ocean acidification on Antarctic bivalves. page 10
12.00 SALOMÉ GRANAI: Palaeoenvironmental reconstructions in the Seine valley: first attempt of a malacological reference succession for the Late Holocene. page 8
12.20 SONJA REICH: How to identify fossil molluscan communities associated to seagrass? An example from the Miocene of Banjung Ante, Java, Indonesia page 14

12.40 – 13.40 Lunch Break

13.40 – 15.00 **Session II : Phylogeny & Geography**

13.40 JOHN M. PFEIFFER III: Evolution of Asymmetrical Glochidia in the Unionidae (Mollusca: Bivalvia) See reverse
14.00 MARI HEGGERNES EILERTSEN: Systematics and evolution of the genus *Scaphander* (Gastropoda, Cephalaspidea) in the Atlantic Ocean, with observations on the trophic interaction of species – preliminary results page 7
14.20 PARM VIKTOR VON OHEIMB: Evaluating the role of the Himalayas as a biogeographical barrier for freshwater gastropod species (*Gyraulus spp.*) page 19
14.40 LAURA ZOPP: Geographic variation in the reproductive mode of *Cylindrus obtusus* (Draparnaud, 1805) (Gastropoda: Helicidae). page 22

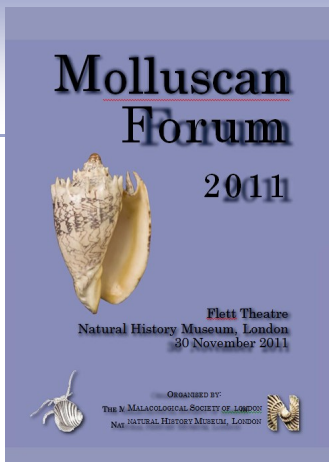
15.00 – 15.20 Tea Break and Poster Session

15.20 – 17.00 **Session III: Life History & Structure**

15.20 SARA HINTZ SALTIN: Indiscriminate Males: Mating Behaviour of a Marine Snail Compromised by a Sexual Conflict? page 15
15.40 ŠTĚPÁNKA ŠEVČÍKOVÁ: Food preferences of land snails from river floodplains affected by invasive plants page 15
16.00 TIMOTHY WHITTON: Colonisation patterns of cockle *Cerastoderma edule* Linnaeus (1758) post-larvae page 21
16.20 BROCAS W. M: The dog cockle, *Glycymeris glycymeris* (L.), a new annually-resolved sclerochronological archive for the Irish Sea. page 6
16.40 Alexandra Kerbl: New possibilities in anatomical studies Micro-CT-protocols and their use for investigations in soft-bodied organisms page 11

17.00 – 18.00 Wine Social and Final Poster Session

Molluscan Forum 2011



Organised for **The Malacological Society of London** and the **Natural History Museum**, London by
Professor **Mark Davies**, University of Sunderland
(email: mark.davies@sunderland.ac.uk) &
Jonathan Ablett, Natural History Museum
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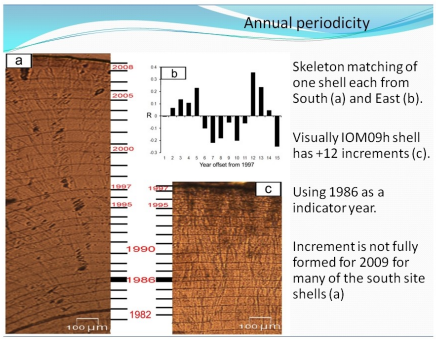
The dog cockle, *Glycymeris glycymeris* (L.), a new annually--resolved sclerochronological archive for the Irish Sea.



Brocas W. M.[1], Reynolds D. J.[1], Butler P.G.[1], Richardson c.A.[1], Scourse J.D.[1], Ridgway D.[1] and Ramsay K.[2]
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Cross-matched chronologies derived from internal growth increments in the shells of the long-lived bivalve, the dog cockle *Glycymeris glycymeris* (Linnaeus 1758), live-collected from two different sites off the East (1997) and South (2009) coast of the Isle of Man respectively, are described. The chronologies developed from ten individuals from each site were found to be statistically robust (Expressed Population signal (EPs) = 0.87 and 0.94 respectively) with a strong common growth signal despite their location 27km apart (mean 15 year running correlation $r^2 = 0.18$; N=49). The period of common growth between the two chronologies is consistent with the 12-year difference in their collection dates, thus providing evidence of an annual periodicity of growth line formation. Significant positive correlations were identified between the chronology indices from the South site and mean January to September sea surface temperatures ($r^2= 0.30$, N=58). A significant positive correlation was also found between the South site and the winter North Atlantic Oscillation index ($r^2=0.18$; N=49). These data indicate that annual growth increments in the shells of *G.glycymeris* have the potential to be used as a scleroclimatological archive. (ORAL PRESENTATION)

Relocation and monitoring of the purple dye snail *Plicopurpura pansa* (Gould 1853), located in the Tepalcates Channel breakwaters,Manzanillo Colima, México

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The purple-dye snail, *Plicopurpura pansa* is a conspicuous rocky-shore specie of the Tropical Eastern Pacific. The dye it produces has been used as a valuable resource since pre-Columbian times by most of the indigenous cultures in America. During the 1980's the snail underwent exploitation in Mexico by a Japanese company that used the dye in the manufacture of traditional kimonos. That fact caused a high mortality due to the unsustainable methods used to extract the dye. Since 1988, the snail has been specially protected under Mexican law. During the expansion works for the Tepalcates canal developed by the Mexican electricity company Comisión Federal de Electricidad, on the Manzanillo II Power station, the staff of its Environmental Studies Department located and moved a total of 1539 specimens of *P.pansa* from breakwaters being demolished to others under construction. Population parameters of the snails established in the new breakwater were then monitored, including the counting of egg masses, recruits and individuals in copulation.. The population density of the species that constitute the diet of *P.pansa* was also calculated. Data on food habits and seasons of their different stages in its life cycle were also obtained. (ORAL PRESENTATION)

Climatic disturbances and their effect on the evolution of Southern Ocean Gastropods

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This PhD intends to elucidate the long-term effects of climate change on the evolution of gastropods, with a particular focus on species from the southern Ocean. The family Buccinidae is a globally widespread and highly speciose group (1500+ species) of carnivorous marine molluscs. Fossil evidence suggests that the buccinids may represent an early branch of Neogastropods which originated in the early Cretaceous. Most current taxonomic investigations of this family have been morphological. Molecular data for the buccinids is limited, with most obtained as part of higher taxonomic studies of the Neogastropoda. Due to the diverse nature of the group, a detailed phylogenetic investigation into the higher taxonomy of the Buccinidae has not yet been performed and there is still disagreement as to the familial placement and subfamilial structure of the Buccinidae. We aim to address the following questions. Is it possible to establish the time of origin and evolutionary radiation of the Antarctic buccinids? Can ages obtained from the fossil record be used to calibrate molecular trees? Might a number of modern groups have originated in the Paleocene, or earlier? Are the Antarctic genera monophyletic? When were the major buccinid radiations and do they correlate with major climatic disturbances? Phylogenetic approaches, including maximum likelihood, maximum parsimony and Bayesian methods, will be used to answer these questions. We will use morphological characteristics and multiple genetic loci sequenced from both Antarctic and non-Antarctic taxa. Additionally, fossil taxa will be chosen to constrain the molecular phylogeny so that species divergence times and diversification rates can be estimated. If these fossil taxa can be used to calibrate molecular trees of modern whelks, it should be possible to indicate when major radiations of Antarctic marine taxa occurred. These dates can then be considered in the wider context of past global climate change. This will allow hypotheses regarding the evolution of Antarctic buccinids to be assessed. (POSTER)

What makes bivalves aggregate? Experimental study of clustering behaviour in zebra mussels

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Aggregation is a typical behaviour of many bivalves. Aggregated mussels are better protected against predators and hydrodynamic forces, and live in the vicinity of mating partners. Moreover, the presence of adult conspecifics at a settlement site guarantees suitable living conditions for new recruits. However, factors affecting the intensity of aggregation and druses forming are poorly understood. Therefore, we carried out field and laboratory experiments to study the aggregation behaviour of zebra mussels (*Dreissena polymorpha*) exposed to selected environmental factors. We tested the impact of depth, light, temperature, substratum type, initial distances among individuals, flow and predation threat on forming druses (mussels attached to one another's shells) and contact aggregations (animals touching one another's shells but attached to other substrata). We evaluated results after 24 and 48 h of exposure (after one week in the field experiment). Small mussels (<10mm) tended to form more aggregations in shallow and flowing water, at medium temperatures (15-25°c). They formed more druses on sand than on solid substratum (glass). Aggregation level was independent of the initial distances between them (within the range of 14-29mm) but considerably decreased when they became too large (>40mm). This suggested that both active movement towards conspecifics and casual encounters during random crawling might be involved in aggregation forming. Clumping level was also higher in the presence of potential predators such as roach. On the contrary, an indirect sign of the presence of a foraging predator (crushed mussels) had a negative effect on mussel aggregation intensity. When both predator-related cues were simultaneously presented to mussels, the effluvia of crushed conspecifics turned out to be a stronger stimulus. Large mussels (>20mm) responded similarly to the tested factors except depth (at both studied depths they had similar aggregation intensities) and predation (their reaction to predator cues was much weaker). However, the responses of large mussels to the studied factors were generally weaker than those of small individuals. (POSTER)

Dr David Reid (Journal Editor) and J. Cubillo (presenter)

Tom White (Secretary) & V. Taylor (Presenter)

Prof. Tony Walker (Awards Secretary)

Forum participants, including presenters and members of Council

Cephalaspidea) in the Atlantic Ocean, with observations on the trophic interaction of species – preliminary results

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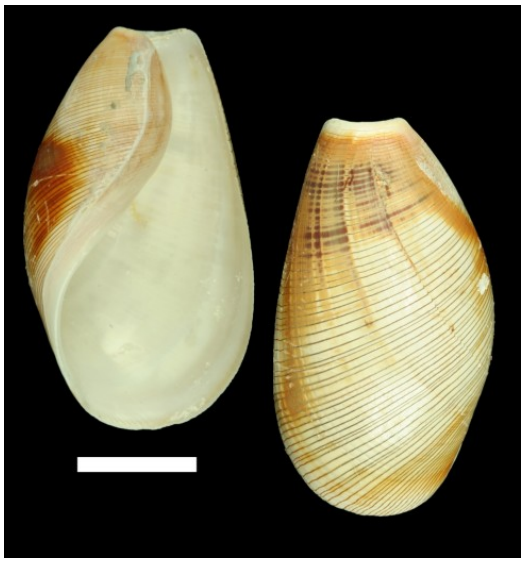

Scaphander lignarius, Hardangerfjord, Norway (ZMBN 62008). Scalebar = 10mm

Scaphander is a genus of shelled opisthobranchs in the order Cephalaspidea. They have external shells that vary in length between 1–50mm and the animal is too large to completely retract inside the shell. *Scaphander* is a deep-sea group (500- 5000m) with some species found at more shallow depths (from 30m). Twenty-five species of *Scaphander* have been reported in the Atlantic Ocean but only approximately ten are recognized as valid in modern literature. Systematics of the genus is largely shell-based, and more recent studies including anatomical features have synonymized several nominal names resulting in an unstable taxonomy. Two prevalent hypotheses are often debated to explain deep-sea biological diversification: the stability-time and the disturbance hypotheses. There is a lack of sound phylogenies of deep-sea groups that can be used to test these hypotheses. The main goal of this project is to improve our understanding about diversification patterns, tempo, processes, and geography of speciation of deep-sea fauna in the Atlantic Ocean. The systematics of the Atlantic species of *Scaphander* will be revised and the geographical distribution of each species established. An integrative approach combining shell, anatomical, and DNA characters within a phylogenetic framework will be used to characterize species and clarify the systematics of the genus. Phylogenetic hypotheses will be generated and correlated with the systematics of *Scaphander* tectonic events, ocean-circulation, ecology, and the fossil record of the group. Preliminary results are here presented, including a discussion of the valid taxonomically informative characters, geographical distributions, and a preliminary phylogenetic hypothesis. All species of *Scaphander* seem to have a similar diet consisting mainly of foraminiferans and occasionally bivalves, scaphopods, gastropods and sipunculids species. (ORAL PRESENTATION)

Palaeoenvironmental reconstructions in the Seine valley : first attempt at a malacological reference succession for the Late Holocene.

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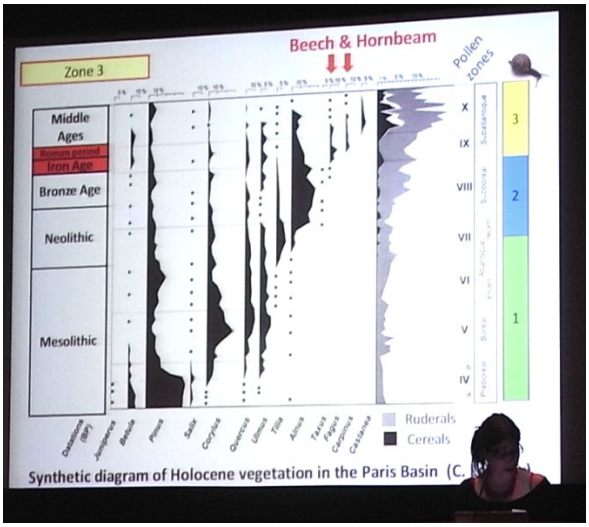

Late Holocene malacological data have been recovered in Northern France over the last twenty years following development of archaeological rescue excavations. This important set of information is currently included in a data base developed in the Laboratory of Physical Geography at Meudon (France) but has not been the subject of a regional synthesis up to now. Recently, new malacological studies have been carried out on archaeological sites in the Paris Basin. This presentation is part of a PhD which aims to provide a malacological reference succession for this area from the Neolithic to Roman Times, reporting on environmental changes related to climatic variations and human activities. It is currently possible to set out the first results obtained for the Paris region and more widely for the Seine valley. The main features of the malacological assemblages used to define palaeoenvironmental reconstructions are explained and discussed at different spatial scales, from the site up to the valley, in order to distinguish general characteristics from local variations. Malacological spectra based on ecological groups, species abundance diagrams and diversity index are used to highlight changes in the malacocenosic composition. Malacological results are discussed with regard to human occupations and compared with the regional pollen data synthesis. (ORAL PRESENTATION)

Pagodulinae: a new subfamily of Muricidae and its evolution in Antarctic waters

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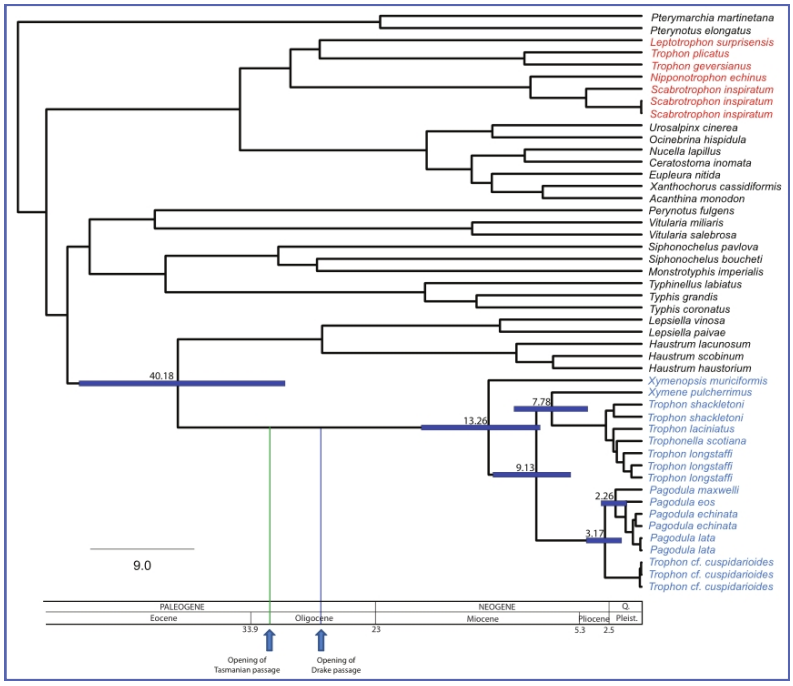

Part of the muricid ultrametric tree showing the phylogenetic relationships and the divergence times for the Trophoninae (in red) and the new subfamily Pagodulinae (in blue). Molecular data include 12S, 16S, COI and 28S. According to the estimates and to the fossil record, the new subfamily appeared before the isolation of Antarctica from Australia and South America. A subsequent colonization of Antarctic continental shelf by the genus *Trophonella* was possible for thermohaline circulation

The family Muricidae is a large group of marine snails known for their abundance, species richness and morphological diversification. Muricids are particularly common in warm and temperate latitudes, but many species inhabit the southern Ocean where they are among the most species-rich groups of mollusks. All the known Antarctic and sub-Antarctic muricids are currently classified in the subfamily Trophoninae Montfort, 1810, an assemblage still used among malacologists despite the evidences of morphological heterogeneity. We recently demonstrated Trophoninae polyphyly for an Antarctic species of *Trophon* being more closely related to the Neozelanic and Australian subfamily Haustrinae Tan, 2003. Our finding was supported by the introduction of the new genus *Trophonella* by Harasewych and Pastorino (2010), which allowed the accommodation of some Antarctic species bearing notable morphological differences with respect to the type species of *Trophon*. We expanded our dataset with species from Argentina, New Zealand, Mediterranean and Antarctica, in order to resolve Trophoninae classification within the ongoing project on muricid phylogeny. We found a previously undetected clade supported by molecular and anatomical data including the genera *Pagodula* Monterosato, 1884, *Boreotrophon* P. Fischer, 1884, *Trophonopsis* Bucquoy and Dautzenberg, 1882, *Paratrophon* Finlay, 1926, *Xymene* Iredale, 1915, *Xymenopsis* Powell, 1951 and the Antarctic *Trophonella*. We here propose a new subfamily to arrange these genera and we attempt a revised classification for the Trophoninae. We also calibrated a molecular clock with fossil data to estimate the origin of this group, which appeared to originate in the Late Eocene. In this work we propose an evolutionary scenario for this new subfamily, correlating our results with data from other taxa and major climatic events in Antarctica and surrounding waters. **(POSTER)**

Clausilia dubia (Draparnaud, 1805) in the Eastern Alps: phylogeography and subspecies classification(Gastropoda: Pulmonata: Clausiliidae)

Katharina Jaksch [3], Helmut sattmann[1], Luise Kruckenhauser[2], Michael Duda[1], Josef Harl[2], Elisabeth Haring [2, 3]
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The clausilids are turreted and sinistral land snails characterized by the aperture and the eponymous clausilium. The different lamellae and the clausilium itself are important for taxonomic conclusions. Due to a patchy distribution and complex morphology, many subspecies have been described for several clausilid species. For *Clausilia dubia* (Draparnaud, 1805) 16 subspecies are listed solely for Austria and 12 are expected to occur in Lower Austria, where this investigation took place. The distribution ranges of these subspecies are geographically close and some subspecies show sympatric or even syntopic occurrence. Our aim was to evaluate whether these described subspecies are valid. Therefore, we started an extensive morphological investigation. 235 individuals from 71 sample sites in Lower Austria were photographed and quantitative characters measured. Because the determination of the subspecies is based on tiny differences, we assigned them into four morphogroups according to their similarities. Additionally we combined the morphological investigation for the first time with a molecular analysis. The phylogenetic analysis was based on a ~900 bp fragment of the COI gene. In the NJ-tree calculated from the sequence data, five highly supported clades become apparent and the genetic distances between these clades are relatively high. However, neither of these clades corresponds solely to any of the described subspecies or morphogroups nor to a geographic region. These results are still preliminary, and therefore final taxonomic and nomenclatorial consequences will be compiled when the data set is complete. (POSTER)

What goes around comes around: fierce competition for the zebra mussel, one of the world's 100 worst invasive species

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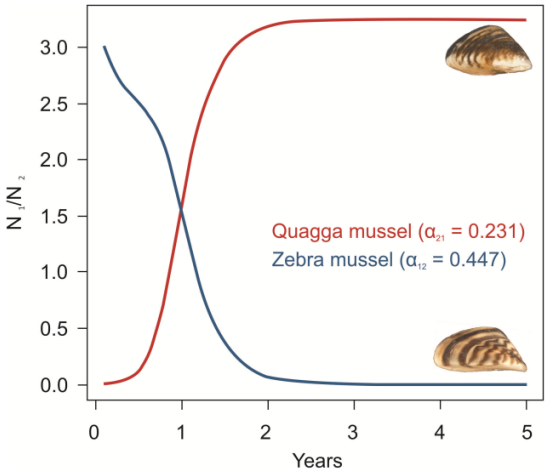

The zebra mussel (*Dreissena polymorpha*) is recognized by the International Union for Conservatin of Nature and Natural Resources (IUCN) as one of the "world's worst invasive species". While the zebra mussel is known from Western Europe since the first half of the 19th century, its congener, the quagga mussel (*Drostriformis bugensis*) has arrived in this region only recently. In areas where both taxa co-occur, the quagga mussel seems to replace the zebra mussel within a few years. To understand the competition dynamics between the two invasive species, a combination of experimental studies and modelling techniques was used. The growth rate of *Dreissena* individuals was calculated under five levels of competition including three different population densities under inter- and intraspecific conditions. A Lotka-Volterra model was programmed by using data on specific growth rates and competition factors obtained from the experiments and run for 50 iterations. The growth rate of both taxa was strongly influenced by level of competition, while quagga mussels showed stronger responses than zebra mussels. However, the growth rate of the quagga mussels was still more than twice the growth rate of the zebra mussels under the highest level of competition tested. The model reflects this behaviour and shows rapid replacement of the zebra mussel by the quagga mussel in less than five years. This pattern accords with preliminary observations of the population development of the quagga mussel in Western Europe. An understanding of the competition dynamics between the quagga and the zebra mussel is obligatory for applying appropriate management strategies. Current studies focus on the growth rate under different environmental temperatures, as this factor is thought to play an important role in shaping the competition dynamics of the two invaders. (POSTER)

Historical effects of ocean acidification on Antarctic bivalves.

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Ocean acidification is caused by the absorption of anthropogenic CO_2 by the ocean, reducing seawater pH. Globally, surface ocean pH has decreased by 0.1 units since pre-industrialisation, equating to a 30% increase in hydrogen ion concentrations (Caldeira and Wickett 2003). As pH decreases, carbonate ion concentrations decrease and bicarbonate ions increase, altering the carbonate saturation state of seawater. According to global ocean models employing IPCC scenarios, a further decrease of 0.3-0.5 pH units is predicted to occur by 2100 (Caldeira and Wickett 2003). High latitude regions with a naturally low carbonate saturation state are particularly vulnerable. Winter-time aragonite undersaturation is predicted to occur by 2030 in the Antarctic region in particular (McNeil and Matear 2008), and hence a growing concern is that such extreme environmental change may influence the ability of marine calcifying organisms to precipitate shells or skeletons. Antarctic bivalves are ideal species for examining the effects of ocean acidification due to their long life, good preservation potential and importance in the benthic ecosystem of high latitude, and thus high risk, habitats (Fabry, Mcclintock *et al.* 2009). Initially, this project will assess the structural and geochemical variability of carbonate production and mineralogy within a population. Techniques such as Growth Increment Analysis, Electron Backscatter Diffraction and Secondary Ion Mass Spectrometry will be applied to shells from the Drake Passage. Subsequently historical specimens collected pre-industrialisation on expeditions such as the British rrs Discovery (1901-1904) and the German South Polar Expedition (1901-1903) will be compared with recent collections from BiOPEArL cruises (2006- 08) and NBP1103 (2011). Bivalve specimens which qualify for the study are shallow water species found on both sides of the Polar Front and within the study area, between the Falkland islands and the base of the Antarctic Peninsula, e.g. *Limatulopygmaea* (Phillipi, 1845), *Astarte longirostris* (Orbigny, 1846) and *Cyclocardia astartoides* (Martens, 1878). Changes in bivalve calcification resulting from decreased pH may be visible in the internal structural and geochemical characteristics of the shells, indicating whether ocean acidification is already affecting marine calcifying organisms in the southern Ocean. (ORAL PRESENTATION)

New possibilities in anatomical studies micro-CT-protocols and their use for investigations in soft-bodied organisms

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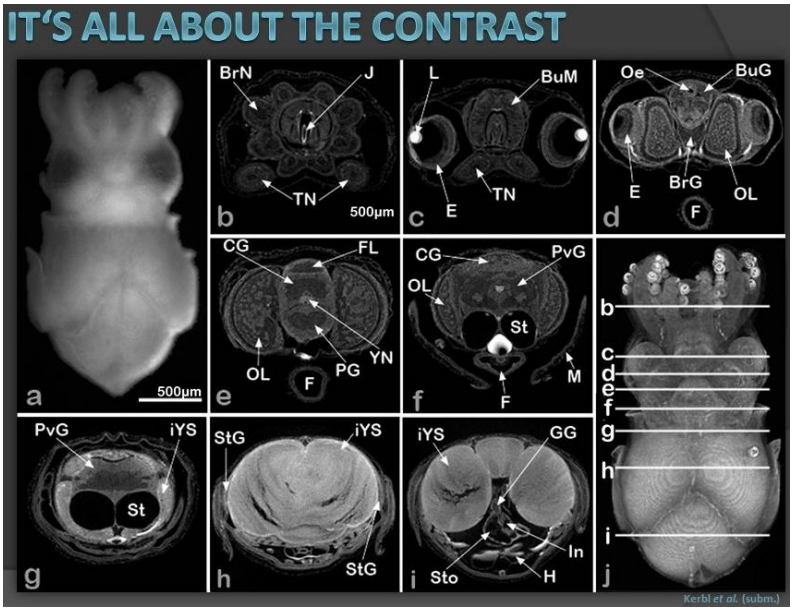

Working with softbodied organisms like molluscs includes many problems in specimen preparation. Although a lot of information can be deduced from the internal anatomy, observations and analyses of specific structures mostly involve specimen destruction. The combination of methods is gaining importance in many fields of biology, so a more conclusive look can be obtained from a single specimen. We want to demonstrate the applicability of Micro-cT for investigating specific internal structures in soft-bodied organisms as well as the possibility to combine it with other methods. Micro-cT is used mostly in osteological studies as well as in palaeobiology and material science, where bones and other calcified structures show a high contrast to the surrounding medium such as air. Using different contrasting agents such as elemental iodine or phosphotungstic acid, we obtained data from the nervous system of different embryonic stages in the Hawaiian Bobtail squid. This information was further used for a 3D-reconstruction of the ganglionic system. By doing 3D-reconstructions, volumetric data are obtained using the 3D-reconstruction software AMiRA. The ganglionic systems of cephalopods are especially concentrated and the increasing fusion during development can be illustrated quite well. Although the voxelsize of about 2.5tm cubed does not allow investigations on the cellular level, additional information can be obtained by serial sections made from the already scanned specimens. These do not show any signs of damage due to the x-ray beam. Especially when working with 3D-reconstructions and subsequently applied techniques, image stacks obtained by Micro-cT are highly advantageous, because they are perfectly aligned, show no distortions such as irregular compressions and section can not be lost. Although the resolution is not as high as in semi-thin or even ultra-thin section series, tissues and organs can be discriminated by the different densities of the materials. (ORAL PRESENTATION)

Pyramidula pusilla: A closer look at the phylogeography of Alpine populations (Gastropoda: Pulmonata:Pyramidulidae)

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*Pyramidula pusilla (*Vallot, 1801) is a pulmonate land snail and belongs to the monotypic family of Pyramidulidae. It is by far the most widespread among the European representatives of this genus, ranging from the Mediterranean to Western and Central Europe. The preferred habitats are sun-exposed calcareous rocks from lowlands to high altitudes (above 2200m asl in Austria). In order to gain a first insight into the phylogeography of *P. pusilla*, a DNA sequence analysis was performed. For this purpose a ~650 bp fragment of the cytochrome c oxidase subunit 1 gene (COI) was sequenced. Up to now, we have investigated 203 individuals collected at 77 sampling sites, mostly located in Austria in the Eastern Alps and a few in the Carpathians and southern Europe. Based on sequence data, a neighbour-joining tree was calculated. As a main result, this tree reveals a split into two distinct clades, each with multiple subclades. There is no obvious geographic pattern and in some cases, individuals from the same locality are found within different clades. On the other hand, individuals from distant localities sometimes share the same haplotype. Whether the partitioning into two mitochondrial clades indicates the existence of two distinct species or merely expresses a high degree of genetic variation within the Alpine populations of *P. pusilla* cannot be answered yet and needs further genetic and morphological investigation. (POSTER)

Systematics of the operculate land snail genus *Cyclophorus* Montfort, 1810

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The Cyclophoridae are dioecious terrestrial caeonogastropod operculate land snails with a long fossil record extending to the European Mesozoic and with a wide current geographical distribution. *Cyclophorus* are the most species rich genus in the Cyclophoridae with over 100 described species distributed from South Asia to the Western Pacific region. The current study is focused on systematic research and development of conservation strategies. In addition to its intrinsic scientific interest a reliable taxonomy is also important for ensuring sustainable harvesting of exploited species as managers, who mistakenly treat multi-species genera as a single taxon, may fail to effectively regulate off-take levels for each component species. Species limits in *Cyclophorus* are notoriously difficult to establish with numerous geographically isolated populations exhibiting seemingly minor differences in morphology. Recent works on karyotype variation in *Cyclophorus* indicate that there are a number of cryptic species. For this study, *Cyclophorus* tissues were sampled from 96 individuals of 34 taxa based on morphospecies. The snails were collected from 67 localities in Thailand and 7 additional localities in south-east and East Asia. Provisional identifications were based on the literature and examination of reference collections, including type material. Examples of *Cyclotus*, *Rhiostoma*, and *Leptopoma* were used as outgroups. Using 16s rRNA and cOi genes, we constructed a maximum likelihood tree. Most branching nodes were supported with reliably high bootstrap values. The project is still in its early stages and mapping of distributions will help interpretation of the data but it is already clear that currently recognized wide ranging species such as *Cyclophorus volvulus* and *Cyclophorus fulguratus* divide into many groups and the significance of this will need to be critically evaluated. (POSTER)

Evolution of asymmetrical glochidia in the Unionidae (Mollusca: Bivalvia)

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Scanning electron micrograph of the asymmetrical glochidia of *Contradens sp.* (Unionidae).

Glochidial morphology has been an important character in freshwater mussel systematics for over 100 years. Despite its taxonomic significance, it has not been considered in most modern phylogenetic studies. For example, five Southeast Asian genera have been observed to possess asymmetrical glochidia, which have a prominent marginal process on one of the two glochidial valves. Furthermore, these genera have never been strongly supported in any phylogenetic study. Although many larval characters are homoplastic, we hypothesize that this asymmetrical larval morphology represents a novel synapomorphy that is in disagreement with the current classification. Our research uses a combined evidence approach that uses mitochondrial (COI and 16S) and nuclear (28S) genes, as well as morphology to test the monophly of genera bearing asymmetrical glochidia. Tree estimation methods utilized include maximum parsimony, maximum likelihood and Bayesian inference. The results of this research will be discussed in the context of freshwater mussel larval evolution and classification. (ORAL PRESENTATION)

Hermaphroditism in the Antarctic brooding bivalve *Lissarca miliaris* - maximising reproductive output in an extreme cold environment

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The Antarctic marine environment is extreme in its low stable temperatures and seasonally-intense pulse of primary productivity. Invertebrates must therefore adapt to maximise reproductive output in an environment where low temperature and limited food supply slows larval development. Brooding is a common and successful reproductive trait in Antarctic marine bivalves. *Lissarca miliaris* is a small, relatively short lived and shallow water brooding bivalve with a distribution spanning the Magellan Region, the sub-Antarctic islands and the continental Antarctic. By using histological and dissection techniques on specimens of *L. miliaris* from King George and Signy island, an unusual hermaphrodite reproductive trait is described. Specimens demonstrate both simultaneous and sequential hermaphrodite traits – male and female gonads develop simultaneously but the production of oocytes is reduced while testes are ripe and shell size is small. The dominant sex switches to female in specimens above 3mm shell length although male reproductive tissue persists. The number of previtellogenic oocytes exceeds the number of oocytes extruded, which may indicate a phylogenetic link to a planktotrophic past within the genus. This unusual case of hermaphroditism maximises reproduction in a species limited by the females' capacity to brood its young and demonstrates a specialised adaptation in the extreme cold, stenothermal and food limited environment of the southern Ocean. (POSTER|)|

How to identify fossil molluscan communities associated with seagrass? An example from the Miocene of Banjung Ante, Java, Indonesia

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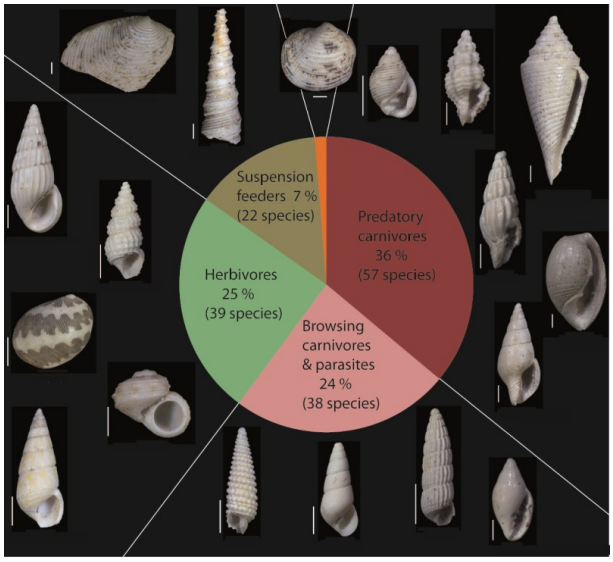

Seagrass meadows are highly productive habitats which play an important role in sediment stabilisation and nutrient cycling. They provide food and shelter for a diverse associated faunal community of vertebrates and invertebrates, such as molluscs. Seagrass meadows also played an important role in the past. They originated about 100 Ma ago and expanded geographically during the Miocene when major diversifications in numerous marine taxa also took place in the Indo-Malayan region, today's centre of marine biodiversity. Due to their low preservation potential, seagrasses are rare in the fossil record. Therefore the occurrence of ancient seagrass meadows has to be inferred from sedimentological and palaeontological data such as associated molluscan-foraminifer faunas. High abundances of small grazers such as *Bittium* and the occurrence of certain key taxa such as the neritid gastropod *Smaragdia* might provide indication for the former presence of seagrasses. Here we show a highly diverse and exceptional well preserved fossil assemblage from Banjung Ante (Yogyakarta, central south Java) as an example of a likely seagrass associated molluscan fauna. The fauna is of early Burdigalian (Early Miocene) age according to the associated larger benthic foraminifers. The molluscan assemblage is dominated by small to minute gastropods. All in all 4127 individuals of 163 species of bivalves and gastropods including *Smaragdia* were found. Based on the ecological composition, the gastropods and bivalves were assigned to six feeding guilds. The percentage of each feeding guild is illustrated in terms of diversity and abundance. The difference between diversity and abundance data is remarkable: small herbivorous gastropods are by far the most abundant group, but predatory carnivores are clearly the most diverse. The ecological pattern investigated shows striking similarities to another fossil seagrass associated molluscan fauna from East-Kalimantan (Beets, 1941) and a modern seagrass associated molluscan fauna from Spain (Rueda et al., 2009) while it differs from a number of communities from other habitats such as coral reef associated faunas (own observations) and estuarine communities (Lozouet & Plaziat, 2008). Further research will be carried out to investigate the possibility for the characterization of ancient seagrass habitats by the ecological composition of fossil molluscan communities. (ORAL PRESENTATION)

Indiscriminate males: mating behaviour of a marine snail compromised by a sexual conflict?

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In promiscuous species, sexual conflict over mating frequency is expected. This is because male fitness increases with repeated mating, whereas for females, repeated mating can increase costs more than gains. The conflict will be greater in species where females receive far more sperm than needed for fertilisation. Marine snails of periwinkles, *Littorina* are highly promiscuous and females increase mortality risks substantially during mating. Comparing life-histories among four species of *Littorina*, one species - *L.saxatilis* lives in many times higher densities and has a longer mating period than the other species. Females of this species are unlikely to be sperm limited, and a sexual conflict over mating frequency is expected. Pre-copulatory behavior (male trail-following) shows that in *L. littorea, L. obtusata* and *L. fabalis,* males follow female mucus trails for longer distances than male trails. This suggests that females release a gender-specific cue in their mucus to attract males. In *L. saxatilis* however, males follow trails of both sexes for equally long distances. This halves the number of costly matings for females which increases female fitness, while males decrease fitness by wasting time and energy on tracking males. This is also reflected by previous studies that show a high degree (30-40% of mating pairs) of male-male matings in *L. saxatilis.* We conclude that there likely is a sexual conflict over mating frequency which causes this gender-indiscriminate mate choice in *L. saxatilis.* (ORAL PRESENTATION)

Food preferences of land snails from river floodplains affected by invasive plants

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Some of water meadow snail species occur high on the leaves and stems of some invasive plants. These invasive plant species occupy a large amount of space and other plant species cannot compete with them. Snails in such a vegetation often have no other source of food nearby. We therefore tried to investigate whether or not the invasive plants serve as a food source for two common snail species. Food preferences of *Succinea putris* and *Urticicola umbrosus* for five of the most widespread invasive plant species were tested. These plants included *Impatiens glandulifera, Helianthus tuberosus, Fallopia japonica, F. sachalinensis a F.x bohemica* and one native species – stinging nettle *Urtica dioica.* We used three different methods: histological sections, analysis of excrements and laboratory tests of the food preferences. From the histological sections it was impossible to identify the plants. The majority of the plants did not provide any recognizable structures for the identification in the snail faeces. The only convincing identification was of *H. tuberosus* and *U. dioica* which were characterised by their trichomes. According to the results of the laboratory tests, the most important factors for the snail's food preferences are the plant species and the condition of the plant material. *U. umbrosus* consumed much less fresh material than *S. putris*. Consumption of the frozen leaves was larger for both species. The most preferred plant species were *U. dioica* and *H. tuberosus*. Only frozen *I. glandulifera* was consumed. Both, fresh and frozen. *Fallopia* spp. were rejected. (ORAL PRESENTATION)

Systematics of terrestrial snails of the family Streptaxidae Gray, 1860 in Thailand

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Carnivorous terrestrial snails of the family Streptaxidae though poorly known are among the most remarkable of living pulmonates since they are highly specialized predators hunting various kinds of prey but principally land snails from other families, slugs, earthworms and some insect larvae. They are distributed across tropical areas of South America, Africa and Asia. Streptaxids can be distinguished from other land snail groups by a combination of their shell characters, lanceolate radula teeth and yellow to bright orange body. Shells may be flattened, heliciform to high spired, often with whorls following an oblique axis, thin to solid, generally glossy, sometimes transparent and often with apertural barriers. The majority of species are known only from their shells. Internal anatomy has rarely been used for discriminating different taxa. Live specimens were collected from 91 localities in 28 provinces throughout Thailand. Reproductive organs, especially penis, penis sheath, vas deferens, vagina, gametolytic sac and duct, free oviduct and talon were examined under a stereo-microscope. On the basis of shell and reproductive organ characters, 26 species in 5 genera were recognized and examples of each species were drawn using *camera lucida*. On streptaxids, the penis possesses cat-like claws that are supposed to differ in size and shape and pattern of distribution between taxa but these have not been studied systematically. One difficulty is that they may be minute and of a similar pale colour to surrounding tissue and thus difficult to see under a light microscope. Further proposed studies will involve critical point drying of penial and vaginal preparations for investigation under SEM and examination of vaginal walls to establish if any complementary structures such as surface pits can be recognized. In addition, the Thai streptaxid genera will be added to an existing molecular phylogenetic tree of the Streptaxoidea. (POSTER)

Ecological measures of selection in H and M ecotypes of *Littorina saxatilis*

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Littorina saxatilis the rough periwinkle, a marine gastropod, is emerging as a model system for studying ecological speciation. It is widely distributed across rocky shorelines in the North Atlantic, is extremely polymorphic (shell colour, shell shape, behaviour) and it is prone to local adaptation because of its low average dispersal and ovo-viviparous reproductive strategy. Pairs of phenotypically divergent ecotypes can be observed across multiple locations, exhibiting a cline in shell shape across the vertical shore gradient, and these clines are maintained through divergent natural selection. However, despite displaying phenotypic divergence the ecotypes are not completely reproductively isolated, with gene flow still occurring. T o understand how natural selection can maintain ecotypes despite gene flow, a large scale reciprocal transplant study was carried out to try and provide estimates of the direction and magnitude of selection on UK populations. The ecotypes in the UK are known as H and M (high-shore and mid-shore) and previous genetic studies have detected small areas of the genome which exhibit high levels of differentiation, indicating possible loci influenced by selection. The aim of the study is to examine the relationship between selection on morphology and determine whether this can be linked to selection on detected genetic outliers. (POSTER)

Living with acidification: the effects of rising CO_2 levels on juvenile development in the common whelk *Buccinum undatum*

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The oceans have become subject to both warming and increasing CO_2 levels. Rising CO_2 levels are more evident in some areas than others with certain 'hotspots' developing. In particular, high-latitude areas are affected, with the polar and sub-polar seas being predicted to be the first areas to become under-saturated with respect to aragonite and calcite. Understanding how species are affected by changes in CO_2 levels will aid predictions as to how global warming will affect faunal compositions worldwide. This may be particularly true for early ontogeny in marine invertebrates, which are often considered the more vulnerable part of the lifecycle. The common whelk *Buccinum undatum* is a shallow-water snail found on both sides of the North Atlantic from northern Iceland down to the southern coast of England. Using individuals collected from close to the northern end of its distribution (Breiðafjörður, Iceland), we investigated the effects of CO_2 on early juvenile development. Juveniles were maintained at temperatures of 3 and 6°c and at pH levels of 8.1 and 7.6. Twenty four individuals were sampled every 2 weeks for 10 weeks. Weight (as a proxy for growth) and respiration were examined. Total individual weight, flesh weight and shell weight were higher in all 6°c treatments than in any 3°c. Within each temperature, all weights measured were higher at pH 8.1 than at pH 7.6. shell:flesh weight ratios indicated higher ratios to be present in both pH 8.1 treatments, regardless of temperature, with the highest ratios being observed at 6°c, pH 8.1. Minimal variations in respiration rates were seen across any treatments throughout the investigation. The lower growth levels and decreased shell thickness indicated here under low pH conditions suggest individuals may be physically 'worse off' under future predictions. This has the potential to harm reproduction and increase likelihood of predation. These results will help us to understand the effects of increasing CO_2 concentrations on marine fauna and may indicate how species might be affected in the light of future climate change. (POSTER)

Genetic and morphological diversity in the genus *Cochlodina* (Gastropoda: Clausiliidae)

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Cochlodina (Gastropoda: Clausiliidae) is a genus of European pulmonate land snails. All species within the *Cochlodina* except for *Cochlodina laminata* have restricted distributions. *C. laminata* appears to be an exception, with a distribution range covering substantial part of Europe. In this range, it exhibits great morphological and genetical variability. We hypothesise that *C. laminata* is a complex of cryptic species, for which distinct morphological features have yet to be found. Our aim is to describe this variability and explain its causes, as well as investigate the phylogenetic relationships within genus *Cochlodina* with special focus on *C. laminata,* using combined molecular and morphological approach. A preliminary analysis has been carried out on 81 individuals collected in six European countries (Austria, Czech Republic, northern Italy, Romania, Slovakia and Slovenia). Sequences of mitochondrial 16s rDNA gene were obtained. In the resulting neighbour-joining tree, most specimens exhibiting features of *C. laminata* formed a distinct but differentiated group, but some also grouped with several other species. This suggests that *C. laminata* is a cryptic complex and that substantial diversity remains undiscovered within the genus. Further sampling is necessary and the results from this preliminary analysis will be combined with morphological analysis and further molecular data, such as COI sequences. (ORAL PRESENTATION)

Land snail middens in the late Pleistocene and early Holocene in North Africa: ongoing research at Grotte des Pigeons (Taforalt), Morocco

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Shell middens are a well known component of the archaeological record with an extensive global distribution. Land snail middens occur widely throughout the circum-Mediterranean, particularly in North Africa, yet are relatively understudied when compared with the better known coastal marine middens. The site of Taforalt (Grotte des Pigeons) in north east Morocco contains thick, ashy, midden deposits with considerable numbers of land snails, dating to between 13,000 and 11,000 BP. Recent excavations at the site have provided the opportunity to reinvestigate the iberomaurusian layers as part of the wider Cemeteries and Sedentism Project. This poster presents the preliminary results of the molluscan analysis which commenced in January 2010. Initial results indicate a distinct change in fauna between the yellow series layers and the overlying grey series. The grey series is characterised by the large edible species *Alabastrina alabastrites, Helix cf aspersa, Dupotetia dupotetiana, Otala punctata, Cernuella sp*, and *Theba* sp which appear to represent an abrupt intensification in the use of land snails as a food source. Significant quantities of associated plant material and animal bone suggest that land snails are part of a broader based diet which is adopted from around 13,000 BP. (POSTER)

Rock boring by the bivalve *Petricola dactylus* increases invertebrate richness in a wave-swept Patagonian intertidal environment

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Boring invertebrates increase bedrock topographical complexity and overall habitat diversity. intertidal *Petricola dactylus* burrows persist after bivalve death, infill with sediments, and provide habitat for other species in otherwise flat limestone surfaces that are subject to intense wave splash. Here, we analyzed if vacant burrows of the bivalve *P. dactylus* increase invertebrate richness in a Patagonian intertidal limestone outcrop. Areas with and without burrows were compared by constructing species accumulation curves (n = 59). Rarefaction techniques and the chao2 species richness estimator were used to analyze the curves. Species richness was higher in areas with burrows (20 ± 2.13) than unmodified areas (8 ± 1.99). Chao2 values did not differ from the observed species richness values, indicating that our sampling was exhaustive enough to detect all the species in each habitat type. Twelve out of the 20 species found were restricted to burrows, 2 species were exclusively found at the rock surface, and only 6 species were found at both habitats. The most common species inhabiting burrows were the mussel *Brachidontes rodriguezii* and the polychaetes *Lumbrineris tetraura* and *Syllis gracilis*. These results show that vacant *P.dactylus* burrows dramatically increase invertebrate richness in physically stressful intertidal limestone outcrops. (ORAL PRESENTATION)

Colonisation patterns of cockle *Cerastoderma edule* Linnaeus (1758) post-larvae

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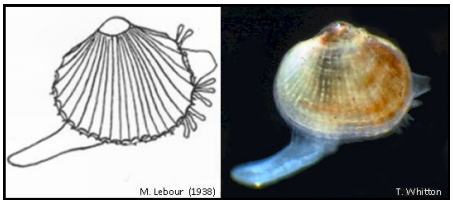
Cockle populations often have highly patchy distributions and the source of this spatial variability in distribution is currently considered to be generated through early post-settlement processes. The objective of this study was to record initial colonisation patterns and how they change over time across the shore, to elucidate possible processes creating patchiness. A staggered nested design was used on 8 occasions from June 2010 to January 2011 at Traeth Melynog on Anglesey with 75 sample points distributed across 15 transects at exponentially increasing distances, from 0.7 to 133.3 m. All cockle post-larvae sampled were counted and their shell length measured. Settlement of post-larvae occurred in late May to early June and was restricted to the low shore with a peak density of 4,663 post-larvae /m^2 at a mean shell length across all stations of 777 tm ± 43 (S.E.). After June, colonisation of the mid-shore and to a limited extent the high shore took place, resulting in a distribution similar to that of the adult cockles. The low intertidal shore was important for initial benthic colonisation of cockles in 2010. This indicates that post-larval up-shore redistribution may be significant for population structure and distribution. This has implications for the understanding of post-settlement mortality spatially on a shore through heterogeneous size and density distributions but also temporally as post-larvae redistribute either actively by byssopelagic migrations, or passively in scouring currents. (ORAL PRESENTATION)



Evaluating the role of the Himalayas as a biogeographical barrier for freshwater gastropod species (*Gyraulus spp.*)

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The Himalaya is the highest mountain range on earth, separating the Indian subcontinent from the mighty Tibetan Plateau. Based on biogeographical data of terrestrial organisms, the Himalayan mountain range forms a boundary between Palearctic and Oriental faunas. For freshwater organisms, however, the biogeographic role of the Himalayas remains largely unknown as in these taxa, boundaries are often related to watersheds and not to mountains *per se*. In this study, biogeographical patterns of the planorbid freshwater gastropod genus *Gyraulus* were investigated. As *Gyraulus* spp. are widely distributed on the southern side of the Himalayas as well as on the Tibetan Plateau, three different scenarios regarding the role of the Himalayas as a potential biogeographical barrier for Gyraulus spp. can be postulated: (1) The mountain range does not act as a major barrier, allowing gene flow from north to south and vice versa, (2) it represents a partial barrier only allowing unidirectional gene flow or (3) it acts as a strong barrier for *Gyraulus spp.*, completely preventing gene flow. For testing these scenarios, *Gyraulus* specimens from the Himalayas and the Tibetan Plateau were investigated genetically by sequencing two mitochondrial genes (partial COI and Lsu rRNA). The results show that different major clades of *Gyraulus* are distributed in the Himalaya region. The *Gyraulus* faunas north and south of the mountain ridge, however, are completely different and no faunal overlap exists. The Himalayas, thus, represent a major biogeographical boundary for *Gyraulus spp.*, probably by acting as a strong historical dispersal barrier preventing gene flow. The drainage divides on the Tibetan Plateau play only a minor role for large-scale biogeographical patterns in *Gyraulus spp.*, indicating the possibility of primarily bird-mediated dispersal. These findings are concordant with patterns found for the lymnaeid freshwater gastropod genus *Radix* in a related study. (ORAL PRESENTATION)

Systematic revision and phylogeny of "Chelidonura" (Gastrooda:Cephalaspidea:Aglajidae)

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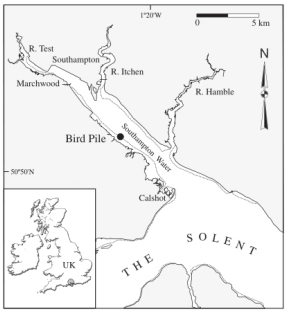
The genus *Chelidonura* is the most diverse of the family Aglajidae with over 20 species worldwide. Recently however, its monophyletic status has been questioned. Systematic studies of the genus have been based mostly on the description of the external morphology (colour pattern and shape of cephalic-posterior shield) whereas data on the anatomy and internal shells remain poorly known for most species. Description of species based on juvenile forms and chromatic variations have been common and this lead to a confusing taxonomy with high number of synonym names. The aims of this project are therefore to (1) test the monophyly and to establish the phylogenetic relationships of the genera of Aglajidae, (2) discriminate between species of *Chelidonura sensu lato* and (3) generate species-level phylogenies in order to hypothesize on the diversification patterns and biogeography of aglajids. Here, we present a preliminary molecular phylogeny of *Chelidonura sensu lato* as well as a discussion of the usefulness of anatomical data (female and male reproductive systems, buccal bulb structure, nervous system, and shell morphology) for discrimination of species. This project is funded through a doctoral grant to the first author by the Consejo Nacional de Ciencia y Tecnologia (CONAcyT- México, Fellowship BAZs/188890/2010.Buccinum (POSTER)

The reproductive cycle and variation in oocyte size of the Manila Clam, *Tapes philippinarum* (Adams and Reeve, 1850), from Bird Pile, Southampton Water



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The non-indigenous species *Tapes philippinarum* (Manila clam), introduced in the Solent system and Southampton Water in about 2005 has been intensely harvested because the high marketable value. Currently (October 2011), the only management measure is the enforcement of the EU Minimum Landing size (MLs) legislation (35mm length). The effects of the MLs on the long-term viability of this fishery and the likely consequences of a proposed reduction of the MLs to 20 mm were examined using histological characterisation of the reproductive cycle and size at sexual maturity. Gametogenesis was observed from February to October and gonad maturation was reported from May onwards. Spawning was detected between May and September with one peak period occurring from June to August. Size at first sexual maturity was 16.0 mm (shell length) in males and 19.0 mm in females. The highest percentage of maturation however (93.48 – 100%), was found in animals larger than 25 mm. The oocytes were found to be measurable from May to October. The diameter increased (Mann-Whitney *U* test; $P<0.01$) with time from minimum median (37.65-39.96 µm in May 2009) to maximum (50.42-53.53 µm in July and August 2009). Females over 30 mm produced larger oocytes (median of 44.45-49.11 µm) in comparison with the smaller size categories (below 30 mm in length with a median diameter of 32.83 µm) (Mann-Whitney *U* test; $P<0.05$). (POSTER)

Geographic variation in the reproductive mode of *Cylindrus obtusus* (Draparnaud, 1805) (Gastropoda: Helicidae)

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In *Cylindrus obtusus* (Draparnaud,1805), a land snail endemic to the north-eastern calcareous Alps of Austria, preliminary investigations revealed geographic differences in shell size and the genital tract. Moreover, in a recent investigation, genetic groups were detected that correspond to the differences in genital anatomy. Microsatellite analyses indicated that in the western populations, genotypes are in Hardy-Weinberg equilibrium, whereas eastern populations display a significant excess of homozygotes at all loci. Altogether these results suggest an altered mode of reproduction in eastern populations where selfing seems to occur predominantly. Two new approaches could provide more information on the reproductive strategy of *C. obtusus*. Firstly, a comprehensive investigation of the genital tract was conducted, comprising length measurements of the stylophore and the mucus glands, the presence of a love-dart and the anatomy of the male tract. The individuals used for this investigation were also analysed genetically to explore the correlation between genetic differentiation and genital anatomy. Secondly, a histological investigation should provide more information about possible differences in functionality of the mucus glands. So far, geographic variation could only be found in the love-dart-complex in the eastern populations. Here, the mucus glands were significantly shorter and asymmetrical and the stylophore was also shortened, compared with the western populations, where the mucus glands were long and symmetrical. In the eastern populations, a love-dart was present in all individuals. In the western populations, some individuals lacked a love-dart, which may be explained by the fact that it had been shot already during copulation. The results indicate that size reduction of the mucus glands and the stylophore may not influence the general production of a love-dart and mucus secretion, but it might influence the amount of product. As there is little knowledge about the reproductive cycle of *C. obtusus*, an extended histological investigation covering seasonal variation would be necessary to clarify functional aspects. (ORAL PRESENTATION)

News of publications

Mónica Medina, Shruti Lal, Yvonne Vallès, Tori L. Takaoka, Benoît A. Dayrat, Jeffrey L. Boore, T. Gosliner (2011) Crawling through time: Transition of snails to slugs dating back to the Paleozoic, based on mitochondrial phylogenomics. *Genomics,* 4 (1), 51-59.

This article report 13 new opisthobranch mitochondrial genomes are reporteds showing strong support for currently accepted opisthobranch clades. *Siphonaria* is supported as a member of the Opisthobranchia. Multiple taxa show major genome rearrangements. Molecular dating supports the divergence of opisthobranchs at 424 mya.

Stine Slotsbo, Lars Monrad Hansen, Martin Holmstrup (2011) Low temperature survival in different life stages of the Iberian slug, *Arion lusitanicus*. *Cryobiology,* 62 (1), 68-73.

The slug *Arion lusitanicus* Mabille (Gastropoda: Pulmonata: Arionidae) is an invasive species which has spread to most parts of Europe. *A. lusitanicus* seems to cope well with the local conditions and has become a serious pest in most European countries. Therefore there is an urgent need for better knowledge of the relative importance of climatic conditions, in order to develop strategies for pest management. The aim of this study was to investigate the influence of subzero temperatures in relation to winter survival. *A. lusitanicus* is freeze-tolerant in some life stages. Most juveniles and some adult slugs survived being frozen at −1.3 °C for 3 days, but none of the slugs survived freezing at −3 °C. The eggs survived subzero temperatures (down to −2 °C). Juveniles and adults may survive in a supercooled state (down to −3 °C) but are generally poor supercoolers. The winter survival of *A. lusitanicus* seems to depends on migration to habitats protected from low temperatures, e.g. under plant litter, buried in the soil or in compost heaps.

Tal Mizrahi, Joseph Heller, Shoshana Goldenberg, Zeev Arad (2011) Heat shock protein expression in relation to reproductive cycle in land snails: Implications for survival *Comparative Biochemistry and Physiology - Part A:* 160, (2), 149-155

Land snails use heat shock proteins (HSPs) as part of their survival strategy. The auhtors tested whether the reproductive cycle of land snails affects the endogenous levels of HSPs. HSP levels in the foot tissue, albumen gland and eggs of two *Sphincterochila cariosa* and *S. zonata* were examined before and after laying eggs. There was reduction in the expression level of Hsp70 isoforms and Hsp90 in the foot of both species before egg laying. The authors conclude that a trade-off between survival and fertility is responsible for the level of HSPs in the foot tissue and that HSPs are involved in the reproductive process. The parental provision of HSPs may be part of a "be prepared" strategy, and HSPs may play important roles in the survival strategy of land snails during the early life stages. Our observations also highlight the importance of the reproductive status in study of whole organisms.

Rolanda Lange, Joscha Beninde, Verena Reichel, Johanna Werminghausen, Tobias Gerlach, Nils Anthes (2012) Copulation duration does not predict sperm transfer in a marine hermaphrodite *Animal Behaviour,* 83 (2), 469-472

Ejaculate production imposes substantial costs, so males are expected to allocate sperm prudently. When it varies with female traits this can represent male mate choice. Many studies rely on proxies such as copulation duration since it is difficult to directly measure sperm transfer. Previous work in the simultaneous hermaphrodite sea slug *Chelidonura sandrana* showed that longer copulations occurred with larger or sexually isolated partners, indicating strategic ejaculation. However, the underlying assumption of a tight correlation between copulation duration and sperm transfer remained untested. Using a novel, nonlethal sperm-counting method, sperm transfer in *C. sandrana* was found to occurr at a predictable rate only early during copulation but subsided thereafter. As a result, total sperm counts varied independently of copulation duration, making the latter an unreliable proxy for sperm transfer. This work offers perspectives to revisit strategic ejaculation in *C. sandrana* and to study in detail the fitness effects of consecutive copulatory phases.

Continued on page 24

Evolution of different modes of development in the *Littorina*: a molecular phylogenetic approach

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My PhD. thesis research is examining how differences in larval development among marine invertebrates contribute to speciation. I aim to disentangle how these differences factor into three of the four evolutionary "forces:" migration, drift and selection. Littorinid gastropods are an ideal group to research because they are abundant, well described and closely related species show dramatic differences in larval development.

18 described species of *Littorina* have three distinct larval forms. Eight species develop from planktonic egg capsules released into the water column, where they then hatch out as planktotrophic larvae, or feeding swimming larvae that are released into the water column and eventually settle and metamorphose into benthic adults (Reid 1996). Nine species have encapsulated non-planktotrophic larvae, laying egg masses on the substratum which go through metamorphosis inside the chorion and hatch as crawl-away juveniles (Reid 1996). Many planktotrophic and non-planktotrophic species can co-habitat rocky shores and there is usually little difference in their ecology (Figure 1).

One species, *Littorina saxatilis*, develops similarly to the encapsulated nonplanktotrophic species, but females brood the embryos (Reid 1996). Planktotrophic development is found as the predominate development in the subfamily Littorininae (Caenogastropoda: Littorinidae) and is found in the most basal *Littorina* species (Reid 1989; Reid 1996). Therefore, it is hypothesized to be plesiomorphic or the most ancestral form of development. One species in *Littorina* with planktotrophic development, *Littorina keenae*, has been placed in its' own subgenus *Littorina* (*Planilittorina),* and has been shown to be the most basal species morphologically and molecularly (Reid 1996, Reid *et al.* 1996). There are only two other records of non-planktotrophic development having evolved in the Littorininae, in the genera *Littoraria* and *Tectarius* (Reid 1989). It has been hypothesized to have evolved once in both cases (Reid 1989; Reid et al. 2010).

Figure 1. Picture of the planktotrophic *Littorina scutulata*, *L. plena* (in white boxes) and the non-planktotrophic *L. sitkana* (in dashed line boxes) in the high intertidal during low tide, Collins Cove, San Juan Island, USA. Scale bar is 10 mm

Seven species with planktotrophic development are placed in the subgenus *Littorina (Littorina)* and all the species with non-planktotrophic larvae have been placed in the subgenus *Littorina (Neritrema)* (Reid 1996). Studies examining the development of *Littorina* species in each of the three subgenera showed that *L. (Neritrema) subrotundata, L. (Neritrema) sitkana, L. (Neritrema) obtusata,* and *L. (Neritrema) saxatilis* are remarkably similar in developing "broad fans" of short cilia on their velar lobes and in how they use cilia to uptake proteins during their encapsulated development (Moran 1999; J. Hofstee and B. Pernet, unpublished data). These adaptations for encapsulated development appear to be derived compared to the planktotrophic *Littorina* species examined (Moran 1999; Hofstee and Pernet, unpublished data). Therefore, from these results, it is most parsimonious to hypothesize that the *Littorina (Neritrema)* species have evolved from a common ancestor with non-planktotrophic development.

A molecular phylogenetic analysis of *Littorina* by Reid *et al.* (1996) using three mitochondrial genes found an unresolved polytomy of nine of the 18 species examined. These data were reanalyzed and I found, with little support, the monophyly of all species in the *Littorina (Neritrema)* (Figure 2). These analyses did not produce enough informative data to obtain a topology that showed many of the species relationships in this group with high support, therefore more data are needed to study species relationships within *Littorina*.

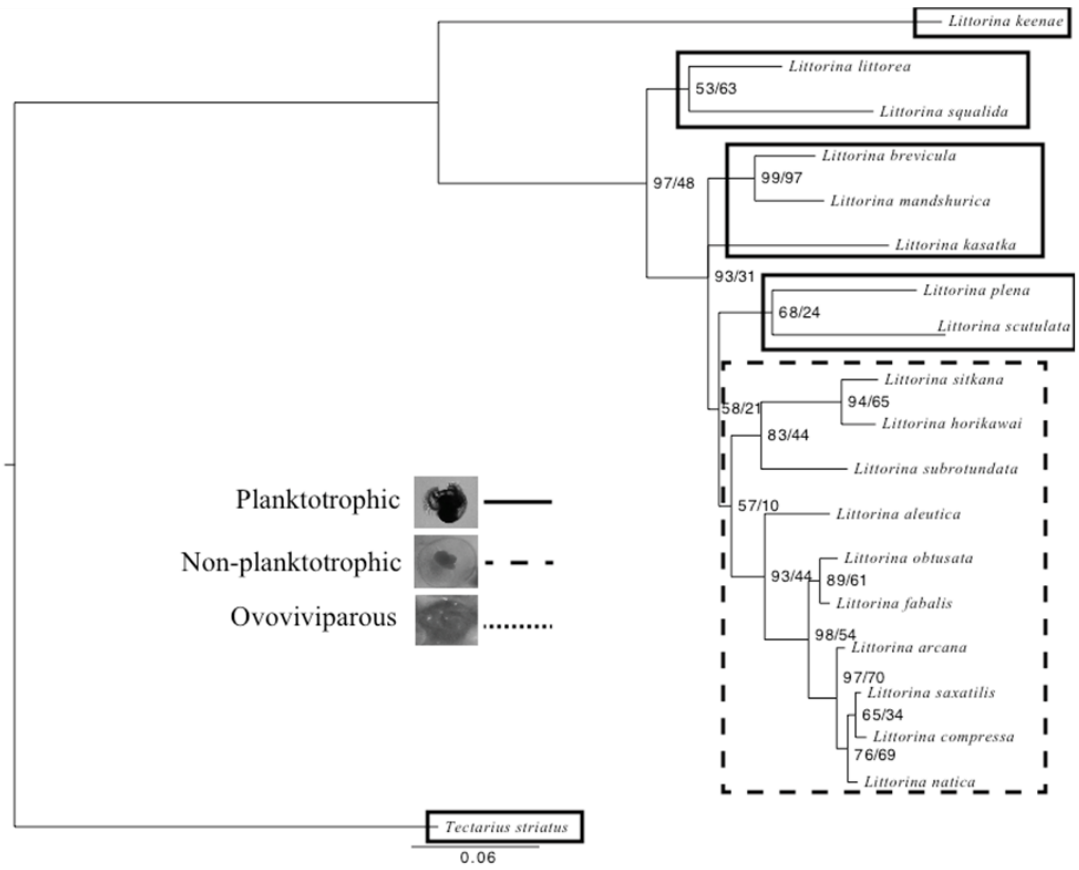

Figure 2. Phylogeny of data from Reid et al (1996.) for all 18 described species of *Littorina* reanalyzed. A concatenated dataset of mtDNA Cytochrome B, 16S rRNA and 12S rRNA was run in MrBayes for 10 million generations and RAxml using a best fit model of GTR + I + G for each locus found using MrModelTest and DT-ModSel respectively. Posterior probabilities from MrBayes/bootstrap support from RAxml are labeled after the nodes as percentages.

In collaboration with Dr. David Reid at Natural History Museum, London, I have been able to obtain multiple individuals of each species of *Littorina*. Most of these species have two individuals sampled throughout their range to account for a larger amount of the genetic diversity within each species. Sequences from a 407 bp fragment mtDNA COI and a 599 bp fragment of nucDNA HSC70 were used. COI was sequenced for 12 different species and 18 individuals and HSC70 was sequenced for 10 species. Both genes were concatenate to make a dataset of 15 of the 18 species. *L. keenae* was used as an outgroup and Maximum Likelihood and Bayesian methods were used (Fig 3.).

With the re-analysis of mitochondrial data from a previous analysis showing monophyly of the subgenus *Littorina (Neritrema)* with relatively low support, and new data at two new loci for 15 species showing paraphyly of this subgenus with low support, it seems that more data are needed to infer species relationships in *Littorina* , especially to resolve the placement of the nonplanktotrophic species: *L. sitkana*, *L. subrotundata* and *L. horikawai*. In another analysis of the phylogeny of the subfamily Littorininae using two mitochondrial genes and one nuclear gene, the species *L. sitkana* and *L. horikawai* were found sister to the planktotrophic species *L. plena* and *L. scutulata* in one analysis and found to be monophyletic (in MrBayes; pp = 87) with all other *Littorina (Neritrema)* with another analysis (in BEAST; pp = 71) (D.G. Reid *et al.* unpublished data).

The status of the monophyly of *Littorina (Neritrema)* is still unresolved. Morphologically it seems very likely that these species are monophyletic, but the molecular data at this point are ambiguous. A large proportion of the data showing monophyly of *Littorina* (Neritrema) has been from mtDNA (Fig.2, D.G. Reid et al. unpublished data). It is possible that the data showing *Littorina (Neritrema)* as monophyletic is the result of a coalescent geneology of mitochondrial DNA that is not truly reflective of the species tree (Liu et al. 2009). While this seems less likely given the developmental data of *Littorina* spp. with nonplanktotrophic development, more data from independent, nuclear loci are needed. Also, using multiple individuals from each species and using coalescent approximations of species trees will help to disentangle species relationships of recently diverged taxa considerably better than using concatenated sequence data (Heled and Drummond 2010).

Follow up studies will include sequencing two individuals from all described *Littorina* species at COI and HSC70 and analyzing data using *BEAST, a coalescent phylogenetic framework that has been shown to better capture the true species trees than concatenated phylogenetic analysis (Heled and Drummond 2010). If low support is still found for the placement of *Littorina (Neritrema)* taxa, additional loci shown to be informative between and within littorinid species will be added (28S rRNA and EF1a) (Williams and Reid 2004; Reid *et al.* 2010; G. Charrier unpublished data).

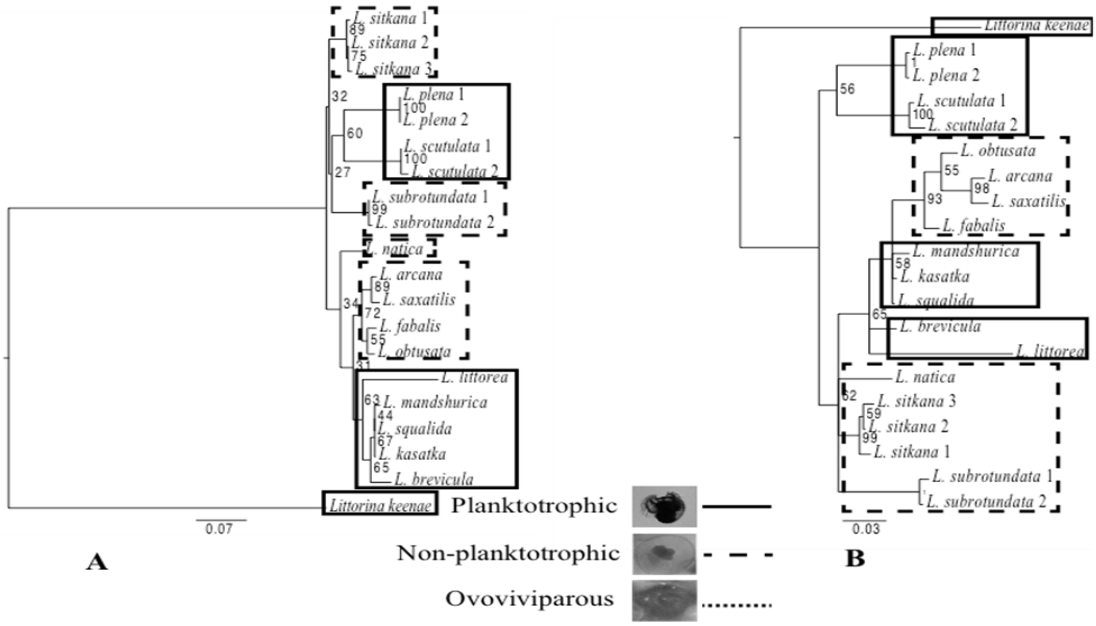

Figure 3. Phylogeny of mtDNA COI and nucDNA HSC70 for 15 of the 18 described species of *Littorina*. The dataset was concatenated and run in A) RAxml with 100 bootstrap replicates using a best fit model of GTR + I + G for RAxml was used and in B) MrBayes for COI, GTR + I + G and GTR + G were used. Bootstraps are labeled after the nodes in A and posterior probabilities are labeled in after the nodes in B. Posterior probabilities from MrBayes/bootstrap support from RAxml are labeled after the nodes as percentages.

Acknowledgements

I would like to thank the Malacological Society of London for providing me with a Research Grant to partially support this work. I would also like to thank the NSF OACIS GK-12 Fellowship, Friday Harbor Laboratories, University of Washington Department of Biology and NSF grants to Billie J. Swalla for additional support. I also would like to thank D.G. Reid, T. Stephens, R. Elahi, B. Pernet, S. Lindsey, D. Roberts, T. Ozawa, Y. Kano, N. Zaslavskaya, J. Austin, Y.M. Mak, S.T. Williams, E. Rumbak, L. Johnson and E.G. Boulding for providing collections for this study.

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RESEARCH GRANT REPORT

Microhabitat preferences of co-existing forest Clausiliidae

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Introduction

The European clausiliids (Gastropoda: *Clausiliidae*) are mostly forest-dwelling snails (Licharev 1952) which avoid forests that have undergone heavy human transformation (Pokryszko & Cameron 2006). In the rich Carpathian forests as many as 16 species of Clausiliidae can occur at one site (Pokryszko & Cameron 2005). Such diversity among morphologically similar species raises questions about the partitioning of resources and the limiting factors for particular species. The aim of the present research was to determine the relationship between individual co-existing clausiliid species and particular microhabitat features, especially the presence and quantity of fallen timber.

Methods

The studies were carried out in Romincka Forest in northeast Poland. The fauna of this forest includes 12 species of Clausiliidae (Marzec 2010). In terms of clausiliid diversity it is among the richest of the lowland forests of Europe (Pokryszko & Cameron 2005). In the field, patches of dry-ground forest 100 m^2 in area were selected. The precise quantity of dead wood in each area was calculated. Only live specimens of clausiliids were collected. The following microhabitat features were recorded – habitat type: litter, live tree, dead wood; for live trees: species, breast-height diameter; for dead trees: wood type (log, stump, branch, fragment, tree, bark), position (lying on the ground, standing, hanging or leaning on a live tree), thickness, diameter of wood, decomposition class (from 1 for fresh wood – the least decomposed – up to 5 for the most decomposed, rotting wood); for litter: thickness, chief component, presence of additional components, pH.

Results

In total 945 specimens of *Clausiliidae* were collected from the 10 areas, belonging to eight species: *Cochlodina laminata* (237 specimens, 10 sites), *Clausilia cruciata* (164, 7 sites), *Macrogastra plicatula* (161, 8 sites), *Clausilia dubia* (112, 6 sites), *Bulgarica cana* (98, 7 sites), *Laciniaria plicata* (91, 4 sites), *Macrogastra ventricosa* (74, 7 sites), and *Macrogastra latestriata* (8, 3 sites).

As the quantity of dead wood increased, the total number of clausiliids specimens at the site also increasesd (r = 0.8, P<0.01, n=10 sites). However when individual species are considered, only the numbers of *M. ventricosa* and *C. cruciata* were related to the quantity of dead wood at the site – the more dead wood, the greater the numbers of the species (for *M.v.* r = 0.8, 130% P<0.02, n=7 sites; for *C.c.* r = 0.9, P<0.01, n=7 sites). Also the richness of clausiliids expressed in terms of the number of clausiliid species at a site was not found to depend on the quantity of dead wood (r = 0.47; P= 0.16).

Clausiliids occurred in three microhabitats: on dead wood, on live trees and in the litter. No species was limited to one type of microhabitat. Almost all species were present in all of the aforementioned types of habitat (the least numerous *M. latestriata* was an exception). Most species were on dead wood (Figure 1). *C. cruciata* and *B. cana* were most numerous on live trees. The majority of species were least abundant in the litter.

The preferences of the various species were verified for the following features of dead wood: position (Figure 2), degree of decomposition of wood (Figure 3), and diameter of wood or log (Figure 4). *M. plicatula* and *L. plicata* were most frequent on lying dead wood, *C. dubia* on standing trees, and *C. cruciata* on hanging trees. The other species did not display significant differences in their selection of dead wood in different positions.

Clausiliids had different preferences as to the degree of decomposition of dead wood (Figure 3), although no species was limited to wood of a particular decomposition degree. *C. cruciata, C. dubia* and *B. cana most* often occurred on dead wood with first degree decomposition, *C. laminata was* on dead wood with second degree decomposition, and *M. plicatula* and *L. plicata* were on dead wood with third degree decomposition.

In the case of dead-wood diameter, as with other microhabitat features, Clausiliidae did not display any strong dependence on the feature. Most of the species occurred on dead wood with different thicknesses (diameters), displaying only certain preferences (Figure 4). Only *C. dubia* did not occur on dead wood with diameter exceeding 40 cm, even though such wood was present at the sites where that species occurred. *M. plicatula, M. ventricosa* and *L. plicata* were more abundant on thick dead wood. *C. dubia* and *C. cruciata* were more abundant on thin dead wood

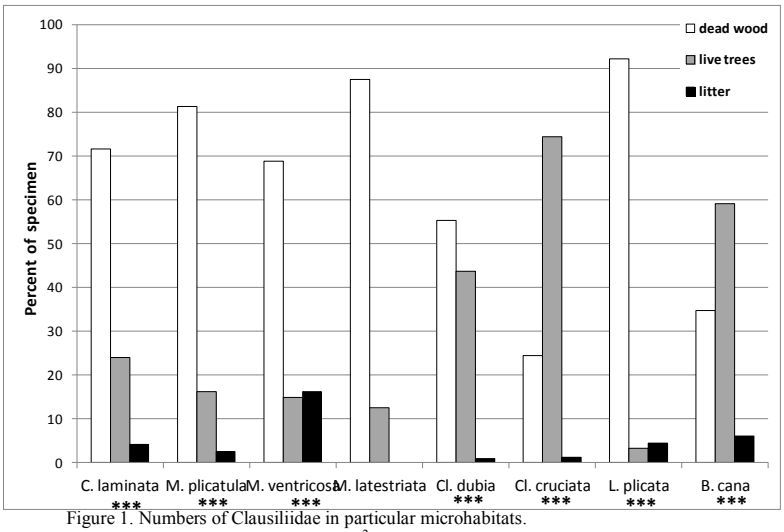

Figure 1. Numbers of Clausiliidae in particular microhabitats.
* Statistically significant differences, X^2 test, * P<0.05; ** P<0.01; *** P<0.0001

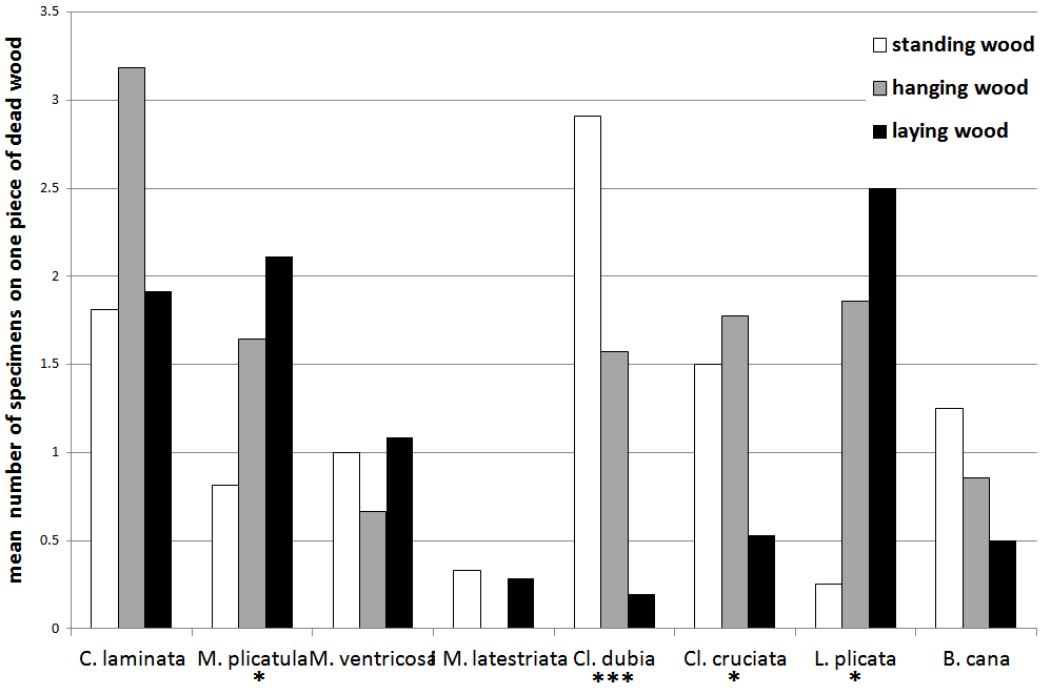

Figure 2. Numbers of Clausiliidae on dead wood in different positions

Among the species occurring in large numbers on live trees, preferences for live tree species and tree diameter were verified. No statistically significant efffects were found. Clausiliids had different preferences as to the degree of decomposition of dead wood (Figure 3), although no species was limited in occurrence only to wood of a particular decomposition degree. *C. cruciata, C. dubia* and *B. cana most* often occurred on dead wood with first degree of decomposition, *C. laminata* on dead wood with second degree of decomposition, and *M. plicatula* and *L. plicata* on dead wood with third degree of decomposition.

In the case of dead wood diameter, as with other microhabitat features, Clausiliidae did not display any strong dependence on the feature. Most of the species occurred on dead wood with different thicknesses (diameters), displaying only certain preferences (Figure 4). Only *Cl. dubia* did not occur on dead wood with diameter exceeding 40 cm, even though such wood was present at the sites where that species occurred. Species preferring thick dead wood are *M. plicatula, M. ventricosa* and *L. plicata;* species preferring thin dead wood are *Cl. dubia* and *Cl. cruciata.*

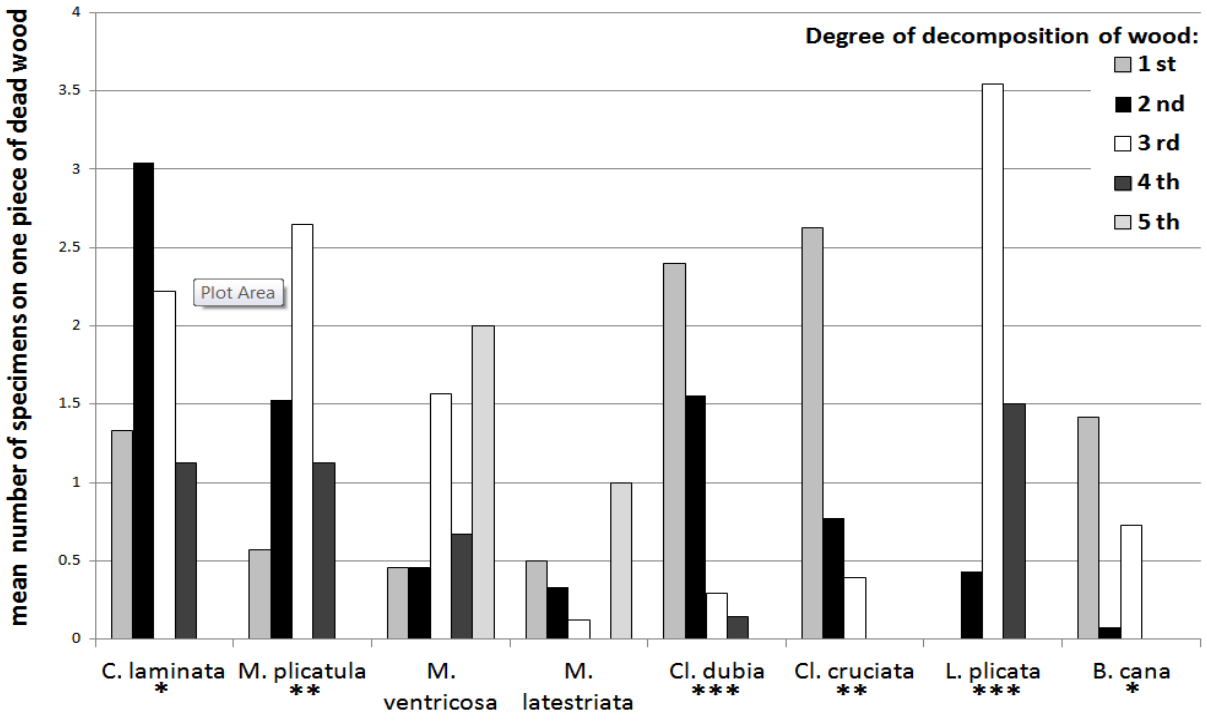

Figure 3. Numbers of Clausiliidae on dead wood with different degree of decomposition

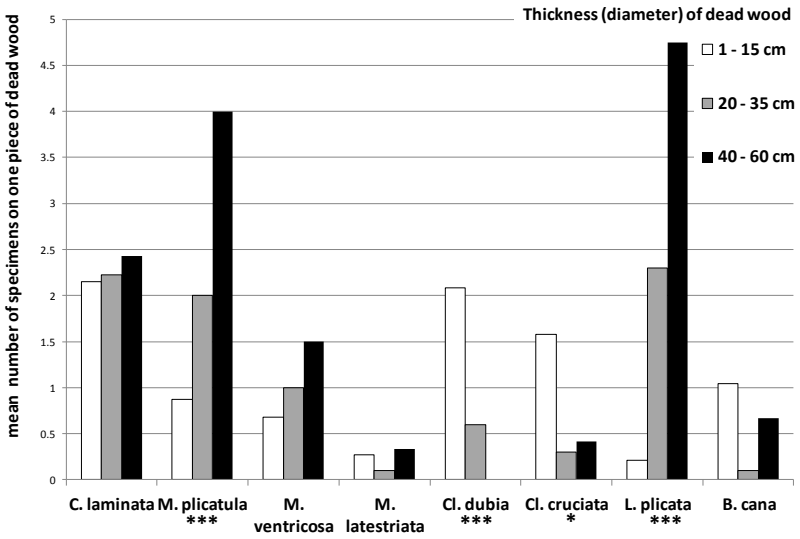

Figure 4. Numbers of Clausiliidae on dead wood with different thickness.

Among the species occurring in large numbers on live trees, preferences for live tree species and tree diameter were verified. No statistically significant effects were found. The numbers of individual species of Clausiliidae were not limited by the numbers of other Clausiliidae co-existing at a site. In the case of *M. ventricosa* and *C. cruciata*, the number of specimens of the species was found to increase together with the number of specimens of all other species at the site ($r = 0.91$, $P<0.01$, $n = 7$ sites for *M. ventricosa* and $r = 0.87$, $P<0.01$, $n = 7$ sites for *C. Cruciata)*. In most cases the populations of particular species are not limited by the number of potentially competing species at the same site. An exception was *C. dubia* ($r = –0.9$, $P<0.01$, $n=6$ sites) which was numerous only at sites where there occurred only two other species apart from it. In both cases, these species were numerous, and as demonstrated above, it was not the number of specimens of other species that could have caused a reduction in the numbers of *C. dubia*. Probably the reduction in numbers of *C. dubia* is due competition with one or several species. At the sites where *C. dubia* was numerous, *C. cruciata, B. cana* and *M. ventricosa* were not present, although these species occur at all sites at which *C. dubia* does not occur in large numbers.

Discussion

Clausiliids are characterized by a wide degree of ecological tolerance. There were no strong associations between particular species and microhabitat components. Clausiliids took advantage of all available microhabitats, and differences between species were expressed in terms of their frequency of occurrence in particular habitats. The high ecological tolerance displayed by Clausiliidae would appear to be something natural and expected, since like most gastropods they are relatively immobile animals, exposed to the risk of being passively carried to unfavourable patches of the environment. The ability to survive in an inferior habitat provides the possibility of overall survival and return to a preferred habitat.

Although generally Clausiliidae are opportunistic, with a high level of ecological tolerance, competition between them cannot be said to be absent. For example, *Clausilia dubia* avoids *Clausilia cruciata* or *Bulgarica cana*, these being species with very similar environmental preferences. The competition effect, insofar as it has been identified, here is strong and one-sided, *Cl. dubia* being the weaker, displaced species. The scale of the research was not sufficient to identify other examples of competition, although this does not mean that they do not exist.

On the other hand, we have the example of *M. ventricosa* and *Cl. cruciata*, species which were more numerous as the number of other Clausiliidae at a site increased (this relationship was a reflection of the quantity of dead wood at the site). This may mean that in a case where the environment offers large amounts of all of the elements necessary for life (food, hiding places, egg-laying places, etc.), the mechanisms of competition are very weak or absent, since all species and individuals are in a situation of excess of resources. It may be that interspecial competition has an influence on the composition and richness of Clausiliidae only in situations of limited resources. The case of *Clausilia dubia* and the differences in microhabitat preferences between species suggest that the composition and richness of Clausiliidae fauna is not dependent solely on random colonization and extinction.

Acknowledgement

This study was funded by a research grant from The Malacological Society of London

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RESEARCH GRANT REPORT

Pearl mussels show plasticity of responses to different predation risks but also show consistent individual differences in responsiveness

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This manuscript is the result of the funding that was granted to me by the Malacological Society of London. The study examined the impact of the presence of a predator cue to a solitary versus a group of freshwater pearl mussels, and highlights the consistency in the behaviour of individual mussels to various predation threats. This is an abstract of the full paper which is published in Behavioural Processes (2012)

Introduction

Animals aggregate to reduce predation risk and grouped animals benefit from the dilution effect (Krause & Ruxton, 2002). Within a population, there are also consistent individual differences in behaviour, termed behavioural syndromes or personality (Sih *et al.,* 2004). Some animal species show consistent individual differences in boldness (Briffa *et al.,* 2008). This study examines trade-offs between feeding and closure (startle response) in freshwater pearl mussels (*Margaritifera margaritifera*). Additionally, this study examines if there are behavioural consistencies or syndromes by using different startle stimuli and asking if there is individual consistency or concordance in the responses to these stimuli. It is predicted that if aggregation reduces predation risk then group-living animals should show shorter startles (closures) than solitary animals. Individuals were subjected to startlle stimuli, with motivation inferred by measuring the time taken to reopen.

Materials and methods

Freshwater pearl mussels were reared at the Ballinderry Fish Hatchery, Northern Ireland. Focal mussels were randomly assigned to one of two treatments: (i) solitary (n = 14) or (ii) group-living (n = 13) (mass: 2.7 to 17.6 g). Nine mussels, not being tested, were randomly chosen from a separate tank placed (prior to the focal mussel) in the arena set to contain the group-living focal individual. Between stimuli, mussels recovered for one hour. Startle durations were measured from stimulus application (mussel closure) until the mussel reopened. The shadow stimulus consisted of switching off a lamp for 1 s, decreasing light intensity. The next stimulus consisted of dropping a tennis ball onto the tank lid from a height of 30 cm. The tank lid was then lifted in preparation for the final stimulus. The final stimulus consisted of tapping on the side of the focal mussel's shell three times over approximately 2 s with a plastic rod (135 mm × 9 mm (Ø)). Startle duration was measured by timing the duration between the final tap and the mussel re-opening. At the end of the experiment mussel wet weight (grams) was determined. The three stimuli were presented in the same order for all animals: (i) shadow; (ii) tennis ball and (iii) plastic rod. The key reason for using three stimuli was to examine consistency of responsiveness to different stimuli within individual animals. Arenas were washed and water replaced prior to testing the next replicate. For a detailed experimental protocol see Wilson et al. (2012).

Variance in startle duration was examined using a General Linear Model with repeated measures. Startle duration was normalized using logarithmic transformation (Log_{10}). Analyses were carried out using R v2.11.1 (R Development Core Team 2010). To test for consistency in individual behaviour the degree of concordance in startle durations between each stimulus, Kendall's coefficient of concordance (W) was calculated using SPSS v18.

Results

Solitary animals took significantly longer than group-living animals to recover from startles ($F_{1, 25} = 8.2$, $P = 0.009$; Fig. 1). Individual responses were significantly concordant across stimuli, within each treatment (Individual: $W = 0.495$, $c^2_2 = 13.9$, $P = 0.001$, $n = 14$; Group: $W = 0.361$, $c^2_2 = 9.4$, $P = 0.009$, $n = 13$).

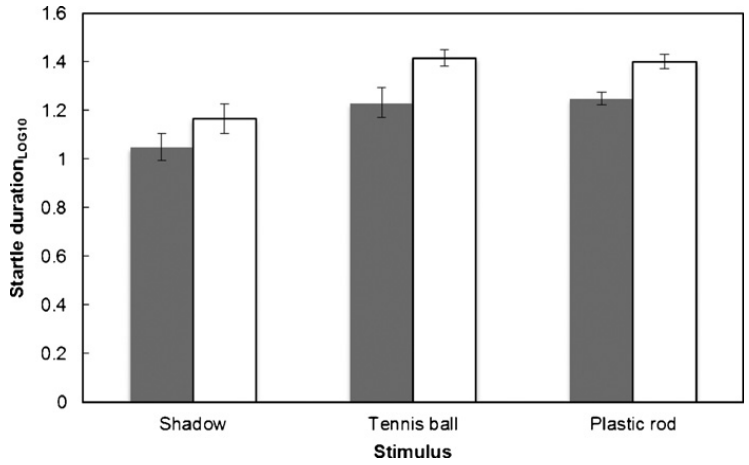

Fig. 1. Mean startle duration$_{Log\ 10}$ (seconds) for focal mussels within treatments (individual and group) for each stimulus ± standard errors. Grey bars represent group-living mussels, white bars represent solitary mussels.

Discussion

Group-housed mussels showed shorter startle durations than solitary mussels, consistent with the idea that other mussels are detected, allowing a quicker return to feeding due to the trade-off between predator avoidance and feeding. The mussels in the group-living condition were presumably exposed to odours of their conspecifics. It is also possible that food was depleted in the grouped condition, which increased motivation to feed, hence the shorter closures. If individual mussels remain open in the presence of a predator there is a greater likelihood that it will be predated since the light coloured respiratory siphons make it more visible to predators (Robson *et al.,* 2007). Results also show behavioural plasticity consistent with the idea of trade-offs between costly predator avoidance and the need to feed. However, the results also indicate that the degree of plasticity is constrained because the startle responses of individuals were significantly concordant across the three novel stimuli, thus showing that these animals have individual differences in responsiveness. Those animals that showed short responses for one stimulus also showed short responses to another stimulus even though the absolute duration of responses may differ between stimuli (or order of testing). This phenomenon has not been shown for a bivalve species providing emphasis that bivalve behaviour is complex, meriting further investigation (Robson *et al.,* 2007). The differences observed could have arisen because of intrinsic long-term differences between individuals in terms of variation in sensory systems, central nervous system, endocrine function and motor systems and these might be due to genetic and environmental differences during development (reviewed by Sih *et al.,* 2004).

Acknowledgements

The Malacological Society of London funded this project through a Small Research Grant.

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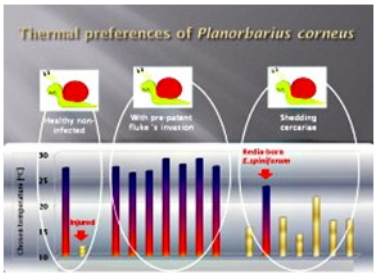
Wilson CD, Arnott G & Elwood R (2012) Freshwater pearl mussels show plasticity of responses to different predation risks but also show consistent individual differences in responsiveness. *Behavioural Processes* doi:10.1016/j.beproc.2011.12.006

News of publications

Travis V. Nielsen, Louis A. Gosselin (2011) Can a scavenger benefit from environmental stress? Role of salinity stress and abundance of preferred food items in controlling population abundance of the snail *Lirabuccinum dirum*. *Journal of Experimental Marine Biology and Ecology*, 410, 80-86

For scavengers, food availability is determined by both the abundance of species used as food and the rate at which individuals die and become available to the scavengers. Environmental conditions sufficiently stressful to kill individuals might play a role in providing food for scavengers, but only if scavengers can tolerate harsher conditions than their food species. We examined the roles of species preferences, abundance of food species, and ability to survive reduced salinity in determining the abundance of a scavenger, the intertidal gastropod *Lirabuccinum dirum*. *L. dirum* is an opportunistic scavenger, preferring dead specimens healthy specimens, and also preferring the mussel *Mytilus trossulus* over 5 other species of benthic invertebrates. *L. dirum* was significantly more tolerant of low salinity conditions than the abundant barnacle *Balanus glandula*. Surveys at 16 field sites on the west coast of Vancouver Island, revealed that *L. dirum* population density was only weakly correlated with total density of all food species combined. Food availability was not a limiting factor. *L. dirum* density was however, strongly related to salinity stress. *L. dirum* appears to be more tolerant to salinity stress than some of its food species and lives primarily in habitats that experience relatively high salinity stress. Periodic mortality of benthic invertebrates due to salinity stress may therefore be an important factor determining food availability to *L. dirum*. *L. dirum* may therefore take advantage of sites with fluctuating salinity, as these sites could provide a periodic supply of dead or stressed specimens.

Elżbieta Żbikowska, Anna Cichy (2012) Symptoms of behavioural anapyrexia – Reverse fever as a defence response of snails to fluke invasion. *Journal of Invertebrate Pathology*, 109 (3), 269-273



The thermal preferences of *Planorbarius corneus* individuals infected by larvae of digenetic trematodes was investigated . In 2009 and 2010, snails were obtained from 10 water bodies in central Poland. The relationship between the seasons and the occurrence of patent invasions in hosts found in the shore-zone of lakes was observed. Parasite infection affected the thermal preferenda of *P. corneus* placed in a thermal gradient. Individuals that shed cercariae of *Bilharziella polonica, Cotylurus sp., Notocotylus ephemera, Rubenstrema exasperatum/Neoglyphe locellus, Rubenstrema opisthovitellinum, or Tylodelphys excavata* displayed symptoms of behavioural anapyrexia, similar to experimentally injured snails. This response increased the survival of infected individuals while simultaneously prolonging the period of shedding of dispersive forms of parasites. Infected snails bred at 19 °C, lived longer than at 26 °C and the shedding rate of cercariae was reduced at a lower temperature.

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Travel Grant Reports

6th Congress of the European Malacological Societies
Vitoria-Gasteiz (Spain), 18-22 July 2011

Opening ceremony

Enjoying the night life of Vitoria-Gasteiz

The triennial CEMS meeting took place in the city of Vitoria-Gasteiz, capital of the Basque Country, in the north of Spain, organised by Benjamín Gómez-Moliner and sponsored by the Spanish Malacological Society (SEM), the Vitoria-Gasteiz City Council, the Basque Country University (UPV-EHU), the Basque Country Water Agency (URA), the Basque Country Regional Government, the Environmental Studies Centre (CEA), the Ebro River Hydrographic Confederation, the Alava Province Government and the Malacological Society of London (MSL), which awarded financial support to thirteen students. The awarded students acknowledged the MSL in their posters and during their oral contributions. There was also support from the Italian Malacological Society (SIM), the French Malacology Society, the Portuguese Malacology Institute, the Dutch Malacological Society and the Conchological Society of Great Britain and Ireland. Around 110 participants from more than 15 countries attended the congress, which included invited conferences, 43 oral communications and 76 posters. The research reported employed a wide variety of techniques, ranging from the most classic to the most modern technologies. Symposia included :

Poster session

Endangered species
Hot-spots of Biodiversity
Biogeography and phylogeography of the Mediterranean region and Macaronesia:
Systematics and taxonomy of Western-Palaearctic Mollusca:
Biology, reproduction and culture of molluscs:
Ecology of molluscs
Invasive alien molluscan species:

Visit to the Añana Salt Valley

Social activities included an opening presentation from Dr David Aldridge (University of Cambridge) followed by a guided visit to the most representative places in the historic centre of Vitoria-Gasteiz. On Friday, the last day of the congress, participants could enjoy guided visit to the Añana Salt Valley, followed by a guided visit to the "Marqués de Riscal" winery for the delicious congress closing lunch.

After the luncheon, there was an award presentation for the best posters and oral communications. On Thursday evening, the Spanish Malacological Society (SEM) celebrated its General Assembly, where the change of its executive committee took place. The new president of the society is Jesús S. Troncoso (University of Vigo), and the new vice-president is Gonzalo Giribet (Harvard University). Finally, congratulations should be extended to Benjamín Gómez-Moliner and the Organising Committee for their excellent treatment delivered during the whole congress. The Malacological Society of London has offered to organize the next edition of the CEMS, being the alternative candidate to the Italian city of Bari.

Fernando Aneiros
Photogrphs by Fernando Aneiros & Cristian Aldea

News of publications

Mario Nieves-Soto, Fernando Enriquez-Ocaña, Pablo Piña-Valdez, Alfonso N. Maeda-Martínez, José Raymundo Almodóvar-Cebreros, Héctor Acosta-Salmón (2011) Is the mangrove cockle *Anadara tuberculosa* a candidate for effluent bioremediation? Energy budgets under combined conditions of temperature and salinity. *Aquaculture* 318, (3–4), 434-438.

To determine extreme and optimum temperature and salinity for growth in the mangrove cockle Anadara tuberculosa, we measured the scope for growth in adult cockles exposed to 16 treatments composed of combinations of four salinities (20, 30, 40, and 50 psu) and four water temperatures (23, 26, 29, and 32 °C). Higher clearance rates were recorded in cockles maintained at 30 and 40 psu and 32 °C. Consistently high clearance rates (0.9 to 1.14 l g–1 h–1) were recorded in cockles held at 40 psu, regardless of temperature. Absorption efficiency was higher at 20 psu and lowest at 40 and 50 psu. Absorbed energy increased with decreasing salinity and increasing temperature. Respiration energy was higher at low to moderate salinities (20 to 40 psu) and at intermediate temperatures (26 and 29 °C). The lowest respiration energy and excretion energy were recorded in cockles held at 50 psu, regardless of temperature. Excretion energy was inversely related to temperature and salinity, with high values in cockles held at low salinity (20 and 30 psu) and low temperature (23 and 26 °C). Scope for growth was directly related to temperature and inversely related to salinity. The highest scope for growth occurred in cockles held at 32 °C (120.4 to 327.3 J g–1 h–1) and the lowest in cockles held at 23 °C (4.3 to 84.1 J g–1 h–1). The mangrove cockle can tolerate a wide range of temperature and salinity and maintain positive scope for growth. This species could be grown under a wide variety of conditions, especially in tropical lagoons receiving fresh water runoff. However it can also be grown in challenging environments such as shrimp ponds effluents and take advance of the cockle tolerance to extreme conditions

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XXII Encontro Brasileiro de Malacologia (EBRAM). 4 - 8 September 2011 Fortaleza, Brazil.

Last September I was fortunate to participate in the XXII Brazilian meeting of Malacology (EBRAM) held in the city of Fortaleza. This biennial event was started in 1969 by the Brazilian Society of Malacology (SBMA) and the objectives are to provide a forum for discussion of professional and academic bodies, NGOs and businesses, providing a space for presentation and discussion of research results, to promote exchange between researchers and students in several institutions, to promote discussion of malacological topics relevant to society, especially in relation to education, public health and conservation, and to facilitate exchanges between institutions, professionals and students at national and international levels, especially in Latin America.

There were 550 participants, including many student.. There were 8 round-tables, 13 conferences, 11 mini-courses, 77 oral presentations and 190 Posters on a wide range of topics (Taxonomy, Systematics, Reproduction, Development, Physiology, Genetics, Pathology, Pollution, Biodiversity, Anatomy, Morphology, Phylogeny, Ecology, Biogeography, Cultivation, Biology, Collection and Education).

The main theme was the study of biodiversity to establish processes and guidelines that lead to sustainable use of natural resources.

The inaugural lecture on "*Biodiversity in Molluscs*" by Dr. Simone, raised the issue that biodiversity of molluscs is mostly dealt with in an incomplete way, despite the molluscs being one of the most diverse taxa, with important interactions with human, ranging from nutrition, to sanitation, crafts and collections. In most species, only the two extremes are known - shell and DNA -. The premature abandonment of morphology beyond the shell has led to distortions in systematics and phylogeny. About 100,000 molluscan species have been described and there are about 400,000 to 1,000,000 species in existence. How do we take decisions about a particular situation, if only one tenth of Molluscan species have been described?

Poster: "*Potamolithus* Pilsbry & Rush, 1896 (Gastropoda, Lithoglyphidae): What do we know of the anatomy of their species?"XXII EBRAM.

In this context, I presented a poster on the anatomy of *Potamolithus* Pilsbry & Rush, 1896 (Gastropoda, Lithoglyphidae), a genus endemic to South America which contains the highest number of species in Argentina (22). Many of this species are considered vulnerable, by having a restricted distribution, and half have been called into question, since there are only shell descriptions, which can show great variability. In this poster, I review the anatomy of *Potamolithus paranensis* (Pilsbry, 1911) and *Potamolithus simplex* (Pilsbry, 1911) finding that diagnostic taxonomic characters include the penis and pallial organs.

Finally, the stay in Fortaleza, a beautiful city, was framed by a perfect climate full of sun and hospitality. I want to thank the organisers of EBRAM and particularly *The Malacological Society of London* for supporting my travel to this conference.

Verónica Núñez

In Memoriam

Dr. Wladimir Lobato Paraense 16 November 1914 - 2012

W.L.Paraense made an extraordinary contribution to malacology, particularly in the fields of medical and veterinary malacology. Although I never knew him personally, I worked in fields that overlapped his and regularly referred to his publications over a period of forty years. His work was repeatedly cited and constantly referred to by a wide range of scientists.. With the recent death of W.F. Paraense, malacology has lost one of its iconic figures.
http://noticias-malacologicas-am.webnode.pt/news/in-memorian-dr-wladimir-lobato-paraense-/

G Dussart

GEORGE CRAWFORD

10 June 1910 - 16th April 2011

I met George for the first time briefly at the 3rd Malacological Congress in Vienna in 1968. He was at that time a member of the Unitas Council and attended the meeting together with two of his children, John and Jocelyn. I was attending the Congress attended the Congress for the first time and was well taken care of by Danish and British colleagues, among them George. He had visited Norway in 1935 collecting crustaceans, especially freshwater mysids, and in the few moments he could spare me he talked about his trip to Norway where he visited his colleague in Tromsø, Mueumdirector Tron Soot-Ryen. He had not forgotten me when we met at the next congress in Geneva in 1971. This time he brought his car and his daughter Jocelyn. One evening they took me and Ken Boss to a delicious meal in a French restaurant somewhere across the border. I tasted escargots for the first time and I have never had anything like it in other restaurants, though I have tried many times. After this Congress George and I started to correspond and he also helped me by correcting the English language in articles.

Later, he and the family moved to Grendon where they bought a really old stone build house with a thick thatched roof. Here they had a large garden and even a well, although not in use. His wife Dorothy whom he married in 1941 was trained as a gardener and they both grew their vegetables, a passion they both loved. Up to the age of 99 he was still growing his own runner beans, French beans, onions, leeks, carrots and broccoli. I visited him and his lovely wife twice and enjoyed their hospitality. Then at the 8th Malacological Congress in Budapest 1982 I drove down to Antwerp, picked up George who came by ferry from Britain and together we drove across Belgium, Germany and Austria down to Hungary. As he had encyclopaedic knowledge we had a marvellous trip where he poured out his knowledge on history, botany and zoology. We drove along small roads where, for example, he taught me every tree species and flowering bush foreign to me along the route. On a small road in Hungary we even met a wild boar with four piglets. Hungary had still closed borders and the armed police and military personnel who stopped us along the road found it rather strange that we had one Norwegian and one British passport. We had to explain every time. Once we even got a speed penalty at less than £ 2!

When George's wife died, it was a heavy loss as he was not used to manage alone. Even though he was much engaged in his family, our friendship grew and he kept me informed of all small and larger happenings. During the Malacological Congress in Edinburgh 1986 we met for a meal somewhere in the city every evening. On of these evenings at a French restaurant Eugène Binder joined us and he persisted in offering the right wine to the meal. I did not dare to look at the label but both headwaiter and two waiters were present to pour it – and tasty it was. Still today I am curious as to what chateau we drank. So in 2001 George asked if he and his son, John could visit me and my wife, Tut, here at Skogli in Oppdal. He was at that time 90 years old and his son 56. They came for two weeks in July and as he was in good physical shape we had many interesting hikes in the mountains around Oppdal. They even could observe Musk ox at distance on the Dovre plateau. On the "open day" at the local Museum he enjoyed himself discussing old displayed farming tools with the locals. When living in Kent, Dorothy and he kept sheep and as Oppdal County has the largest population of sheep in Norway, there were much to discuss.

The visit was a success and nine years later he again contacted us asking if he and his daughter Jocelyn could join us for a fortnight having spent a few days close to Stockholm visiting his old friend Bengt Hubendick. The year before he invited his older sister, who was about one hundred years at that time, on a cruise along the Norwegian coast and north to Spitsbergen. In Tromsø he met with the crustacean specialist, Professor Wim Vader at the Tromsø Museum, and together they looked at the scientific collections which he also had seen when visiting Tromsø in 1935. Although ninety-nine years old he and Jocelyn (60 at that time) arrived with the train from Gardermoen, this time without observing Musk ox. He was still in good shape and our longest trip out in the field measured 6 km. He had not forgotten his botany and on the wild flower day here, he stood in front of the audience informing on the Latin names and what was interesting about the flowers, while the local botanists had a hard time coming through with their own information.

George Crawford walking with his daughter Jocelyn

My last visit to his home in Grendon was together with Elizabeth Platts in summer 2009. Jocelyn had prepared a wonderful lamb steak for lunch which he cut and served at the table. Afterwards we enjoyed coffee out in the garden which still had a larger part set out for gardening. As the thatched roof house with stone walls in Grendon was not the easiest to keep warm during winter, this last winter he had got a room at an elderly home and there he died peacefully on the 16th April 100 years and 9 month old, after taking farewell with most of his family around him. He said he had experienced a long and joyful life and did not have much more to look forward to. George will be greatly missed not only by his family but also among colleagues and friends – peace with his memory.

Jon-Arne Sneli, Emeritus Professor
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February 2012

REMINISCENCES OF MY TIME WITH THE MALACOLOGICAL SOCIETY OF LONDON

by George Crawford

I joined the Mollusca Section of the Natural History Museum in November 1935 and became a member of the Malacological Society in December. In February 1937, I was made Secretary (largely, *I* think, because like my predecessor, I was on the Museum staff) and continued in that post until February 1959; though during the war, when I was on service, L R Cox of the Museum's Palaeontology Department took over my duties in addition to his own as Treasurer. After the war I transferred from the Museum to the administrative Civil Service, but continued to work in London.

In 1959 Joyce Rigby of Queen Elizabeth College replaced me as Secretary, but I served on the Council till 1972 and attended meetings regularly until early in 1976 when I moved out to Northamptonshire. During this long period of active membership (plus 17 or 18 years of more passive membership) a number of very significant changes have taken place in the Society, especially as regards meetings and publications.' In 1935 there were still 8 survivors of the original membership of whom Fulton, Kennard and Tomlin attended meetings fairly regularly, and read papers for publication in the Proceedings. Tomlin still worked on the Museum's Collection, as an unofficial worker, and was very helpful to me as an inexperienced member of staff.

At that time the Museum's collection of shells was housed in the Shell Gallery, which was open to the public, in 208 large and beautiful mahogany cabinets. Most of the specimens were in locked drawers - which could be unlocked on request for *bona fide* students -and on top of the drawers were sloping glass show-cases, also locked, where selected specimens representing a majority of described species and many of them marked as types were on display, mounted and labelled and arranged in systematic order. These were much frequented by interested students of all ages who worked along the cases, rather like bees working the flowers of a well-stocked herbaceous border.

Shortly before the War the Museum's Trustees decided that this fine large gallery could be put to better use, and the collection was removed -to the basement where visitors could not study the specimens except on application to Museum staff. This change was unwelcome to many members of the two Societies (Malacological and Conchological), and I believe it was as a result that Tomlin bequeathed his very fine collection not to the Natural History Museum but to the Liverpool Museum.

Before the War, and for a time afterwards, meetings were held in the rooms of the Linnaean Society in Burlington House. Papers for publication were read by their authors at the meetings. Many were concerned with taxonomy including descriptions of new species or varieties, or with local faunas. Comparatively few dealt with soft-part morphology,cell-structure, genetics or habits of the living animal. There were still a high proportion of amateurs among the members, and far fewer university research workers than there are now. Museum staff, then as now, were well represented and played an important part in the running of the Society. In fact the Society as I first knew it, must have been very similar in activities, type of membership and conduct of business and meetings to the Society at its foundation in 1893.

At least twice during these early years - and quite probably before I was a member - Council considered proposals for a merger with the older Conchological Society. These proposals, seemingly so sensible, were judged to be impracticable and came to nothing. The two Societies continue to serve distinct, though overlapping, clienteles which could not, I think, be so well served by a single society.

George Crawford with his wife Dorothy

While I was President, a group of distinguished European Malacologists sent a proposal to the two Societies for the holding of a congress in London with a view to founding a European organisation for the study of Mollusca - one which would organise periodic meetings where students from various countries could meet to discuss their work. The Societies approved this proposal and jointly organised a Congress in London in September 1962.

L R Cox of the Museum's Palaeontology Department was Chairman of the Congress Committee. I was a member but took little part in the detailed work of organisation. This fell largely on the staffs of the Museum, which provided rooms for meetings, and of Queen Elizabeth College, where Joyce Rigby was on the staff. The College provided accommodation for visiting members of the Congress and the opening social session was held there.

I had the very interesting task of chairing a series of meetings to discuss the proposal to set up a European organisation. At an initial plenary session it was agreed that there was a need for such an organisation, and an international working party was set up to formulate a constitution and rules. We met a number of times during the Congress and presented our proposals in English, French and German to a final plenary session where, after a long and animated discussion, they were approved. The Unitas Malacological Europaea (as it was originally named) has survived and flourished, extending its range to become world-wide with the dropping of the word "Europaea" in 1977. Congresses have been held every 3 years successively in Copenhagen, Vienna, Geneva, Milan, Amsterdam, Perpignan, Budapest, Edinburgh, Tubingen and Siena.(1)

In the early seventies Council became keenly aware of a complex of problems facing -the Society. These were not entirely financial, though serious difficulties were being caused by inflation and especially by heavy increases in printing costs. These led to periodic increases in subscriptions which depressed recruitment of new members, and caused Council to question how far the services and advantages offered to members could be held to justify the subscriptions needed to break even financially.

In 1975, under the Presidency of R H Nisbet, Council set up a working party to consider the problems facing the Society and to submit proposals for tackling them.(2) The members were Denise Crampton, ,J F Peake, Jennifer Plummer and T E Thompson with myself in the chair. We sent an elaborate questionnaire to all individual members seeking their views on a variety of questions, especially on what advantages they hoped to gain by membership and how far their expectations were being met. A very high proportion of members replied, throwing a great deal of light on what they expected from the Society with suggestions for improvements in our procedures and our services to members. In reporting to Council, we analysed their replies and made recommendations which Council implemented with vigour, sometimes going beyond what was positively recommended. For instance, if my recollection is correct, we expressed some doubt on the practicability of two major recommendations on which Council fortunately took a more robust line. I refer to the introduction of a Newsletter and of annual awards for the most promising initial contribution to the study of Molluscs, both of which have been among the more successful innovations introduced at that time.

In my view a great deal of the success and high reputation of the Society in recent years is the direct result of Council's recognition of the critical situation at that time, of its foresight in commissioning a far-reaching enquiry, and of its courage and energy in making the innovations and changes needed. These changes would not, of course, have been effective without the energetic support of officers of the Society and other members.

GEORGE CRAWFORD: SOME MEMORIES

A recent account of the 'Origin and Evolution of the Unitas Malacolgica' by Eddie Gittenberger brought memories flooding back to me of the first Congress in London in 1962. As a new recruit to the Natural History Museum, I met George Crawford during meetings to organise this event. He was always there as the quiet voice of reason encouraging and healing differences, an antidote to some of the more vociferous members of the Committee.

It was at the Conference that George flourished and for me established his reputation for quiet diplomacy, respected by all nationalities and making friends amongst many different groups. His quiet smile and the twinkle in his eye were winning attributes and he liked people – to talk, discuss and argue in his restrained way, always polite, but firm. Indeed he could be characterised as a quintessential English diplomat with a classical education, but a trained scientist with a working knowledge of languages which he would never admit to. These qualities were important in situations that now may be quite difficult to comprehend, but then tensions were still strong between some of the national groups after the Second World War.

I remember sitting at the table greeting all the delegates as they arrived and registered. As they talked in that relaxed atmosphere it was obvious there were many different expectations of what the Congress was going to deliver. For some it was a unique opportunity to meet old friends they had not seen for nearly a quarter of a century, so for a few the meeting was also quite an emotionally charged occasion. While there was a mix of Europeans, there were others from the Southern Hemisphere and North America.
It was on the first morning of the Congress, when the formal discussions about forming a Union opened with strong opinions being expressed, that George's skills were displayed. He managed to keep the meeting moving forward, in spite of much prevarication and disagreements. After that session, there was considerable despondency amongst some of us that a Union could ever emerge, even though a group had been set up to draft a provisional constitution and rules. Interestingly some of the American heavyweights were encouraging the assembly to form a European Union that complemented the American.

Fortunately an evening meeting was arranged with George again in the chair; here he was supported by Zilch and Binder so that controversial points could be discussed in three languages. Many years later I suggested to him that I had been convinced that his personal knowledge of languages would have sufficed, but that he had realised some provocative comments were being made and involving the others helped to diffuse the situation; this George denied while quietly smiling. He has admitted in print that he was at his wits end, at a crucial point when 'Anna Bidder of Cambridge leant across from her front seat and in a sufficiently penetrating whisper suggested that I should call for brief adjournment' which the whole room heard. It worked and there was unanimous agreement that a Union should be formed. It was a magnificent effort on George's part, almost certainly nobody else could have achieved such a result, and he was proud of the outcome.

Probably nobody at the Congress realised that at this time George was commuting from rural Sussex where he was supporting his wife in running a farm. He was rising early to tend the animals and then coming to the Congress. Subsequently he came to many congresses bringing his children and enjoying meeting old friends and being part of the wider family of malacologists.
Earlier in his career he had studied natural sciences at Cambridge and in November 1935 he joined the British Museum (Natural History) staff where, although his interests were primarily in Crustacea, he was perversely placed in the Mollusca Section. He joined the Malacological Society in December 1935. He talked about those early days with some degree of enjoyment as it was here that his interests in the group developed. In 1937 he participated as a museum representative in a major expedition to Lake Titicaca and was placed in charge of the collections. Amongst the collections he gathered together was a rich assemblage of small freshwater gastropods that had radiated in the lake; these were studied later by his friend Bengt Hubendick.

During World War II George spent most of the time working at Bletchley Park of 'Enigma' fame, although in conversations he would with characteristic modesty play down his own role. However, the notes left for his children show that after transferring from a searchlight battery he rose to Captain in the Intelligence Corps and played an important role in the implementation of the information generated by the code-breakers.

After the war he did not return to work at the Museum, instead he became a member of the regular Civil Service in the Department of Education. I never heard him talk extensively about his work there; instead he was more interested in the Malacological Society and something dear to his heart the farm run by Dorothy, his wife. He would talk about sheep and other aspects of farming and gardening, this practical aspect obviously gave him great pleasure. It was these diverse facets of his life from the intellectual to the practical that were displayed in his conversations and these were coupled with an incredible memory that he retained into old age. It was only later in life that he admitted to the level of commitment and energy it had taken to be involved with the farm.
I met George regularly at Malacological Society meetings and committees where he was very much the elder statesman. He strongly supported the Society, except for the period when he was away on war duty, as he had acted in all capacities from President, Secretary, Treasurer and member of Council. After the meetings it was at the social gatherings over cups of coffee or a drink where I cemented my admiration for George's abilities to mix with people of all ages. He helped to lay the foundations of a much stronger Society.

In writing these memories of George I have been very conscious that he would be embarrassed by some of praise bestowed on him. He would have undoubtedly wished to discuss certain points and tactfully suggest some amendments, but these are my memories of a person with whom conversations were always stimulating and provocative, even when I last spoke to him in his 99th year. Now one realises it was a privilege to have known such a modest, but gifted, man.

John Peake
February 2012

Grants and Awards

MARCH 26

American Malacological Society Student Travel Award

The American Malacological Society is pleased to announce that this year AMS will be awarding $500 Student Travel Grants to students and very recent graduates for travel to this year's AMS/COA meeting in Cherry Hill, NJ from June 16-24, 2012. Deadline for applications is March 26, 2012.
Contact - Amanda S. Lawless www.ansp.org

AS SOON AS POSSIBLE

Marine mollusca taxonomist in Moscow, Idaho, USA

EcoAnalysts, Inc. is currently hiring for a marine mollusca taxonomist in our Moscow, Idaho office. The successful candidate will have at least three years experience of taxonomy of marine molluscs, particularly bivalves and gastropods of North America. The successful applicant must have a good work ethic, be able to meet deadlines, be willing to go the extra mile, and work well in small groups as well as independently.
Contact via EcoAnalysts career page at http://www.ecoanalysts.com/careeropps.php.

APRIL 1

PhD Studentship (4 years) : Evolution in marine planktonic gastropods

Starting May 1st 2012, the Netherlands Centre for Biodiversity (NCB)
Euthecosomes (shelled holoplanktonic gastropods) have delicate aragonite shells and have been identified as exceptionally vulnerable to rising CO2. Using naturally occurring gradients in the degree of ocean acidification across spatial and temporal scales, the candidate will examine vulnerability to ocean acidification, historical population demography, and molecular signatures of selection. They should have a Master's degree in biology with an interest in oceanography, marine biology, ecology & evolution. Excellent English language (written and verbal) is required. Supervised by Dr. Katja T.C.A. Peijnenburg.
Application including your curriculum vitae, and the names and e-mail addresses of at least two referees by April 1st 2012 by e-mail to; sollicitaties@ncbnaturalis.nl
Contact - Dr. Bert W. Hoeksema, E-mail: bert.hoeksema@ncbnaturalis.nl

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APRIL 30

UNITAS MALACOLOGICA STUDENT RESEARCH AWARDS FOR 2012

Two awards, each of up to €1 000, are offered every year to students engaged in research projects of a malacological nature. These will generally be projects undertaken in pursuit of higher academic degrees (e.g. M.Sc. and Ph.D.). Normal budget items include consumables, small expendable equipment (non-capital items) and research-related travel. The awards cannot be used to cover salaries, institutional overheads, permanent capital equipment or to support attendance at conferences (UM Travel Grants will be available to attend the congress in 2013). Only students who are fully paid-up members of UM are eligible to apply for these awards. Students will be required to provide Referee's letters of support with their applications.
The next deadline for submissions is 30 April 2012. Applications must be completed on an application form which is available on the UM website http://tinyurl.com/2pl4fc and should be sent as an e-mail attachment…
Contact UM secretary, Prof. Jesús Troncoso (troncoso@uvigo.es).

JUNE30

MALACOLOGICAL SOCIETY OF LONDON
TRAVEL AWARDS & RESEARCH AWARDS

Contact—Dr Suzanne Williams,
Natural History Museum, Cromwell Rd., London. SW7 5BD
s.williams@nhm.ac.uk

DECEMBER 15

MALACOLOGICAL SOCIETY OF LONDON
TRAVEL AWARDS

Contact—Dr Suzanne Williams,
Natural History Museum, Cromwell Rd., London. SW7 5BD
s.williams@nhm.ac.uk

FORTHCOMING MEETINGS

MARCH 17

International Conference on Molluscan Shellfish Safety (ICMSS)

9th International Conference. 'ICMSS2013 Twenty Years: Defining Future Shellfish Safety Frontiers through Innovation in Science and Policy' to be held at the Bayview Boulevard, Sydney from 17 - 21 March 2013
Conference website www.ICMSS2013.com
Contact - icmss2013@iceaustralia.com

MARCH 31

Malacological Society of London—Molluscan Life Histories and Annual General Meeting April 20-21

Two day meeting at the Institute of Marine Sciences, University of Portsmouth, UK
Deadline for submissions - March 31
Contact—Dr Simon Cragg Molluscan.lifehistories@port.ac.uk .
See application forms later in this Bulletin.

Mid-Atlantic Malacologists (MAM) meeting Delaware Museum of Natural History in Wilmington

One-day meeting designed to facilitate contact among professional, amateur, and student malacologists who are interested in any aspect of molluscan biology. Doors open at 9am for coffee and bagels. Talks start around 9:30 and go until 4:30 with a break for lunch. Presentations (15 minutes max.). No dues, officers, abstracts, or publications associated with the meeting – just a day to talk mollusks. The DMNH collection and library are available for use before or during the meeting.
Contact – Liz Shea eshea@delmnh.org Visit www.delmnh.org,

MAY 1 FOR JUNE 16 2012

American Malacological Society/Conchologists of America - Joint Convention

AMS starts on June 16 and runs to the morning of the 21; COA opens on the 19th, and the joint AMS/COA sessions are on Wednesday the 20th. COA ends with the Bourse on the 23rd and 24th. Papers, two auctions, a joint banquet with a major speaker, excursions to local attractions. The venue is the Crowne Plaza Philadelphia hotel and conference center in Cherry Hill, New Jersey. Registrants for one meeting can get a special deal on the other. Forms are now available on line at www.conchologistsofamerica.org and http://www.malacological.org/meetings/2012/
Contact - Paul Callomon callomon@ansp.org
The Academy of Natural Sciences of Drexel University Philadelphia, PA 19103

JUNE 24

Western Society of Malacologists & International Workshop on Opisthobranchs

University of California-Santa Cruz, California June 24 - 27, 2012
The meeting will be held among the redwoods (and banana slugs) on the campus of the University of California-Santa Cruz in Santa Cruz. Housing and meals available on campus.
Contact: WSM President Dr. Janet L. Leonard jlleonar@ucsc.edu
IWO's Dr. Angel Valdes aavaldes@csupomona.edu

APRIL 30th FOR 4 SEPTEMBER

International Meeting on Biology and Conservation of Freshwater Bivalves

Bragança, Portugal on 4-7 September 2012
The 1st announcement is on the website with the scope, scientific and organizing board already online:
http://esa.ipb.pt/bivalves/

SEPTEMBER 25-29th 2012

Eleventh International Congress on Medical and Applied Malacology

State University of Rio de Janeiro), Brazil
Co-hosted by the
International Society for Medical and Applied Malacology (ISMAM)
Brazilian Malacological Society (SBMa).
Web site www.icmam2012.com.br
Contact - Dra. Silvana Thiengo President of the Organizing Committee sthiengo@ioc.fiocruz.br

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FEBRUARY 18-22

BioSyst.EU 2013 Global systematics!

Joint meetings of the European biosystematic societies to represent systematics embracing both extinct and extant micro- and macro-organisms. Deadline for submissions 31 March 2012….for registration 31 October 2012
Contact mathias.harzhauser@nhm-wien.ac.at

Publications and access

MOLLUSCA TENTACLE 20 NOW AVAILABLE ON LINE

To all interested in mollusc conservation: the latest issue - number 20 - of Tentacle (the newsletter of the IUCN - Species Survival Commission - Mollusc Specialist Group) is now available online. Tentacle is now in its seventh year in color, with many web links and e-mail addresses.
http://www.hawaii.edu/cowielab/issues.htm

On the Mollusca listserver, Richard Petit posted the following notice....

"Recently a reprint of Lamarck's 1816 *Liste* was offered without charge. Dr. Akihiko Matsukuma has compiled an index to the *Liste*. It may be downloaded without charge from http://conchologia.com/ where it is Issue No. 6."

Chertoprud M. B., Chertoprud E.S., 2010. Identification book of the freshwater invertebrates of the Center of the European Russia. 3rd Edition. ISBN 978-5-87317-638-0. 179 p., many ill., format 145x203 mm, soft cover; In Russian with English resume. $25.00

Kruglov N. D., 2008. Two Systems of Mollusks of the Family Lymnaeidae (Gastropoda Pulmonata): European and Russian. Where is the truth? Part I. Analysys of the system on generic and subgeneric levels. 18 p., 28 figs in 2 plates, bibligr. 23 titles; in Russian with English Abstract. $10.00

Kruglov N. D., 2009. Two Systems of Mollusks of the Family Lymnaeidae (Gastropoda Pulmonata): European and Russian. Where is the truth? Part II. Life forms of pond snails and the problem of species in malacology (Pulmonata Gastropoda Lymnaeidae). 19 p., 5 pls with many figs, bibligr. 18
titles; in Russian with English Abstract. $10.00

Seifert D.V., Khokhutkin I.M., 2010. Ecology of land snail Fruticicola fruticum. Moscow, KMK Scientific Press Ltd. 91 p., 27 b/w figs., 15 tabs, 149 references cited. In Russiam with English resume. $15.00

Stoyko T. G., Bulavkina O. V., 2010. Identification book of the land molluscs of forest-steppe of Right-bank Povolzhie. ISBN 978-5-87317-639-7. 96 p., many figs., 17 color plates, format 165x235 mm, soft cover, In Russian with English resume. $25.00

TREASURE OF RUSSIAN SHELLS, VOL. 9. VITRINIDAE. By Roman Egorov, 2011. 285x205, 1 tab., 1 plate, 51 b/w figs (drawings and photo), 6 full color photos, 15 maps, index, list of references 86 titles, 33 pages. In English. ISSN 1025-2517. $22.00
Contact - Roman V. Egorov colus2004@yandex.ru

ACCESS TO DIGITAL ARCHIVE AND COLLECTION

A few years ago, thanks to Academy Trustee I. Wistar Morris III, the Academy of Natural Sciences of Philadelphia acquired a major collection of mostly terrestrial and fluviatile shells from Jens and Christa Hemmen in Germany comprising c23,000 lots with 220,000 specimens, from the Mediterranean, the Caucasus and eastern Central Asia. This material is represented at http://clade.ansp.org/malacology/collections/ We have also updated complete our electronic inventory and are aiming for completion in 2012.
Contact - Paul Callomon callomon@ansp.org

PUBLICATION OF "THE ANNUAL MEETINGS OF THE AMERICAN MALACOLOGICAL SOCIETY: THE WHO, WHAT, WHEN, AND WHERE, 1931 TO PRESENT,"

This includes all AMU/AMS meetings plus those of the AMU Pacific Division (1948-1969).

http://www.malacological.org/publications/epubs.php
Direct link to pdf: http://www.malacological.org/pdfs/ams_meetings.pdf

Each meeting page includes the group photo, the program cover (or other photos if these were unavailable), plus meeting "statistics" including how many participants, how many papers and posters presented, what the symposia, workshops, and field trips were, plus some society data for that year (annual dues and total membership). It is relevant for anyone interested in malacology, malacologists, or the history of science.
Contact – Dr Paula M. Mikkelsen email - pmm37@cornell.edu

GUIDE TO THE LAND SNAILS AND SLUGS OF MONTANA BY PAUL HENDRICKS

This new 214-page publication is available as a (29.6 MB) pdf file from the Montana Natural Heritage Program at http://mtnhp.org/reports/MolluscFieldGuide.pdf

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SOCIETY NOTICES

The objectives of the Society are to advance education and research for the public benefit by the study of molluscs from both pure and applied aspects. We welcome as members all who are interested in the scientific study of molluscs. There are Ordinary Members, Student Members and Honorary Members. Members are entitled to receive a copy of the *Journal* and such circulars as may be issued during their membership. The society's Web Site is at:

http://www.Malacsoc.org.uk

Publications

The Society has a continuous record of publishing important scientific papers on molluscs in the *Proceedings*, which evolved with Volume 42 (1976) into the *Journal of Molluscan Studies*. The *Journal* is published in annual volumes consisting of four parts which are received by fully paid-up members and student members. Members also receive The *Malacologist*, the Bulletin of the Society, twice a year.

Meetings

In addition to the traditional researches on taxonomy and systematics, new experimental, chemical and molecular techniques are amongst he topics considered for discussion meetings and papers for publication in future volumes of the *Journal*.

Subscriptions

The Annual Subscription is due on 1st January each year.

- Ordinary Members £45 (or US$ equivalent)
- Student Members £25 (or US$ equivalent)

Methods of Payment

(1) Sterling cheque to "The Malacological Society of London".

(2) Banker's standing order to: The Northern Bank (Sort code 95-01-49), 49-51 University Road, Belfast BT7 1ND, for the credit of "The Malacological Society of London" (a/c 70030422).

(3) Credit card: Overseas members ONLY may pay by credit card: the Society can accept VISA and MasterCard payments only. Please provide the Membership Secretary with your card number and expiry date, card type (VISA or MasterCard.), the name on the card, and the cardholder's address (if this differs from your institutional address). Receipts will only be sent if specifically requested.

(4) Overseas members wishing to pay electronically should contact the Membership Secretary (R.COOK@KINGSTON.AC.UK) for SWIFT/BIC and IBAN numbers of our bank.

Institutional Subscriptions to the Journal

Enquiries should be addressed directly to Oxford University Press, Walton Street, Oxford OX2 6DP, U.K.

Awards and Grants - see back page.

Change of Member's Address

Please use the address slip on the *Journal* wrapper to inform us, through Oxford University Press, of a change of address, or inform the Membership Secretary.

APPLICATION FOR MEMBERSHIP OF THE MALACOLOGICAL SOCIETY OF LONDON

I wish to apply for Ordinary*/Student* Membership (*delete one)

I enclose a cheque payable to "The Malacological Society of London" for my first annual subscription.

Title . . . . Name . . . . . .

Department . . . . . Institution . . . . . .

Street . . . . . City . . . . . .

Post /Zip Code . . . . . Country . . . . . Email . . . . . .

Malacological Interests . . . . . .

Signature . . . . . Date . . . . . .

Please send the completed form and cheque to the Membership Secretary:

Dr Richard Cook, School of Life Sciences, Kingston University, Penrhyn Road, Kingston-upon-Thames, Surrey KT1 2EE, U.K.

News of publications

Marcin Czarnoleski, Tomasz Müller, Justyna Kierat, Landon Gryczkowski, Łucjan Chybowski (2011) Anchor down or hunker down: an experimental study on zebra mussels' response to predation risk from crayfish. *Animal Behaviour*, 82 (3) 543-548

Predation cues influence the strength of byssal attachment in bivalves. In zebra mussels, Dreissena polymorpha, anchorage increases in response to nonforaging roach, Rutilus rutilus, but decreases in response to artificially crushed conspecifics, and it remains unaltered by nonforaging crayfish. Given that anchorage to hard substrata protects against dislodgement by predators, the defensive value of its weakening under predation threat is unclear. Our first experiment examined changes in the byssal attachment of zebra mussels in response to active predation by the spinycheek crayfish, Orconectes limosus. We found that zebra mussels decreased their attachment strength when exposed to cues released as crayfish foraged on conspecific mussels. Our second experiment tested whether crayfish have a capacity for chemosensory detection of live zebra mussels. We exposed hungry crayfish resting in shelters to water with or without cues from live mussels. The cues stimulated abandonment of shelters. Our results agree with recent findings that zebra mussels reduce filter feeding in response to predation cues that contain odours of crushed conspecifics. We suggest that this response helps zebra mussels to evade odour-navigating predators (e.g. crayfish) by suppressing the emission of disclosing metabolites, and that a consequence of this physiological suppression is a predator-mediated decrease in byssal attachment.

Society Awards and Grants

The Malacological Society of London makes a number of Awards and Grants. These are in addition to financial support for meetings, including travel bursaries to the Molluscan Forum.

Research Grants

The Research Grants Scheme was established to commemorate the Society's Centenary in 1993. Under this scheme, the Society anticipates making **at least five awards each year**, each with a value of **up to £1500** to support research on molluscs that is likely to lead to publication. The closing date for applications each year is **15th December**. Grants are preferentially conferred on students and researchers without professional positions, without regard to nationality or membership of the Society. Preference is also given to discrete research projects that fall within the subject areas covered by the Society's *Journal of Molluscan Studies*. Applications will be assessed by scientific merit, value of the project, and the extent to which the research will benefit the applicant's scientific aspirations. The successful applicants will be notified by 31st March and announced at the Annual General Meeting. The conditions of the award, notes of guidance and an application form are on the Society's website at **www.Malacsoc.org.uk**

Travel Grants

Travel Grants are available as bursaries to support attendance at a conference or workshop relevant to malacology. Grants are preferentially conferred on students and researchers without professional positions. The value of each of these awards is **up to £500**, and the Society anticipates that **at least five awards** will be made annually. The application should have the support of the project supervisor. In years when a UNITAS Congress is held, a number of these awards are likely to be used to support participation at this meeting. There are two closing dates each year, **30th June** for travel starting between 1st September of the current year and 28th February of the following year, and **15th December** for travel starting between 1st March and 31st August of the following year. The conditions of the grant, notes of guidance and an application form are on the Society's website at **www.Malacsoc.org.uk** Preference will be given to members of the Society.

Sir Charles Maurice Yonge Awards

Successful applications for Research Grants or Travel Awards that are concerned with the study of **Bivalvia** may be awarded as Sir Charles Maurice Yonge Awards.

Annual Award

This Award is made each year for an exceptionally promising **initial contribution** to the study of molluscs. This is often a thesis or collection of publications. The value of the Award is **£500**. Candidates need not be a member of the Society but must be nominated by a member. There is no application form: the nominating member should send the material for evaluation with a covering letter or letter of support to the Honorary Awards Secretary. The closing date each year is **1st November**. The winner(s) will be notified by 31st March, and announced at the Annual General Meeting.

Applications

Applications for Research Awards and Travel Grants should be sent by post, not email, to the **Honorary Awards Secretary,** Dr Suzanne Williams, Natural History Museum, Cromwell Rd., London. SW7 5BD

Enquiries may be made by post, or by email to s.williams@nhm.ac.uk

The Malacological Society of London

University of Portsmouth

Molluscan Life Histories and Annual General Meeting

The Meeting

The meeting commences at 11am on Friday 20th April and concludes mid afternoon on Saturday 21st April. It will consist of presentations from invited speakers and offered talks from experts and developing experts in the field, as well as a poster session. The Malacological Society of London AGM will take place at lunch time on Friday 20th in Institute of Marine Sciences

Sponsors have provided a prize for the best student contribution (oral and poster). The registration fee is £20 per head (paid on the day) which includes a sandwich buffet for lunch and refreshments throughout the day. The Malacological Society has agreed to subsidise student registration fees. The topic of the meeting is Molluscan Life Histories. We have confirmed contributions relating to life histories in the deep-sea, wood-boring bivalve brooding, palaeontological evidence of life histories, invasive species and reproduction and larval development. Registration and presentation forms should be completed and emailed to the address provided below.

The Institute of Marine Sciences

The conference will be hosted at the Institute of Marine Sciences, a former Royal Navy research and testing facility. Acquired in 1996 and the subject of an intensive and ongoing refurbishment programme, this multidisciplinary research and teaching facility is situated at the mouth of Langstone Harbour on the south eastern corner of Portsmouth. The meeting will be held in the teaching block, but participants will be able to visit the research labs and aquarium.
Portsmouth & Surrounding Areas

Portsmouth boasts a rich maritime and naval history and is home to famous ships including HMS Warrior (the world's first armour-plated, iron-hulled warship), the Mary Rose and Lord Nelson's famous flagship, HMS Victory. Gunwharf Keys can be found next to the world famous dockyard, a large shopping centre containing designer outlets, restaurants and bars. Here you can find the landmark 170m tall Spinnaker Tower, offering stunning views of Portsmouth Harbour, Old Portsmouth and the Dockyards. In Old Portsmouth you can explore the fishing port (perhaps select a live lobster from the tanks) and go on to Portsmouth Point to overlook the mouth of the harbour, take in a pint and fish and chips. If you envisage exploring the countryside around, you should consider the South Downs, the UK's newest national park, and also the New Forest, created for hunting by William the Conqueror, where you can see deer, ponies, donkeys, cattle can be seen roaming free over huge areas of heathland and forest. The Isle of Wight can be reached in ten minutes by hovercraft where you can discover the famous Jurassic coast.

Travel to Portsmouth

Full details of travel options to Portsmouth are given at http://www.port.ac.uk/aboutus/contact/. Select http://www.port.ac.uk/aboutus/contact/maps/portsmouth/ to find the Institute of Marine Sciences at the SE corner of the Island of Portsmouth. Images of your destination are shown at http://www.port.ac.uk/aboutus/contact/maps/portsmouth/ and associated pages harbour, take in a pint

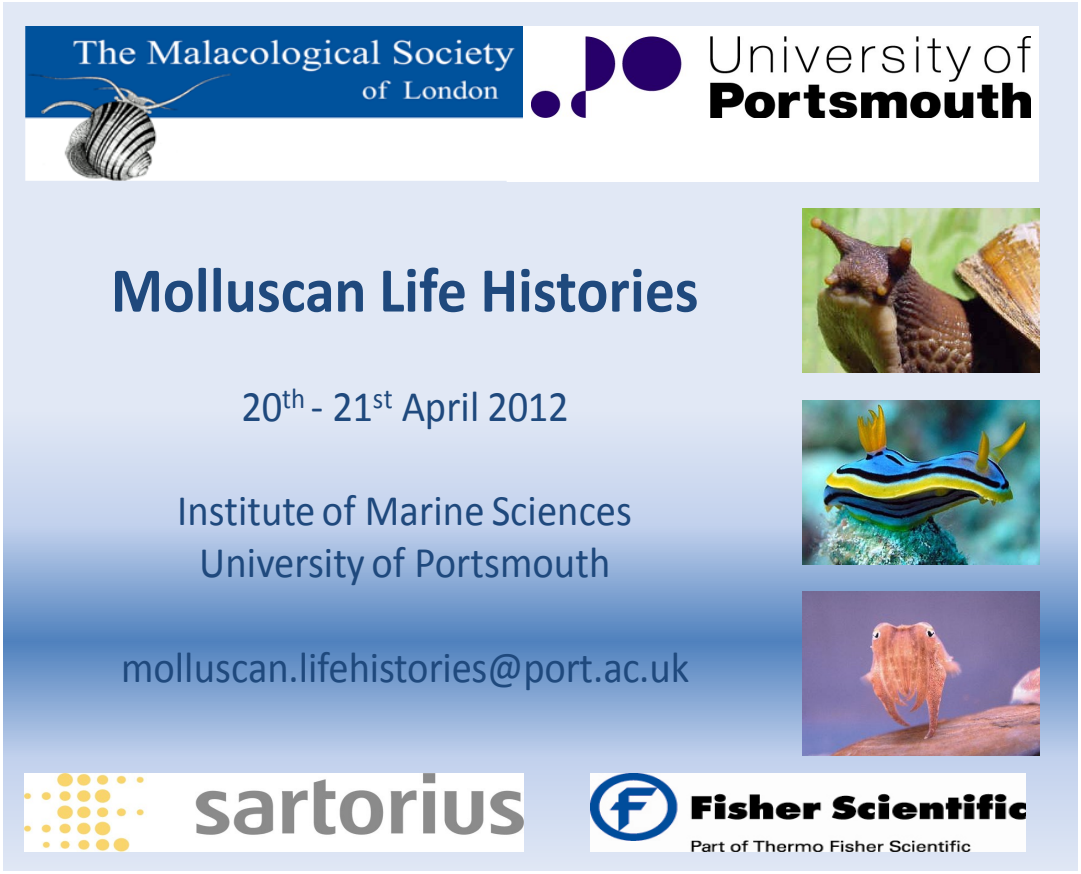
Accommodation

If you require a accommodation during your stay, we recommend the following hotels:

Queen's Hotel	Holiday Inn	Premier Inn
Clarence Parade, Osbourne Road, Portsmouth, Hampshire, PO5 3LJ	Pembroke Road, Portsmouth, Hampshire, PO1 2TA	Long Curtain Road, Southsea, Portsmouth, Hampshire, PO5 3AA
Reservations Tel. 02392822466	Reservations Tel. 08714234876	Reservations Tel. 08715279014

Contact details

If you have any further enquiries, please contact the organising committee.
Email: Molluscan.lifehistories@port.ac.uk
Address: The Institute of Marine Sciences
Ferry Road
Portsmouth PO4 9LY UK
Phone: +44 (0)2392 845804



I would like to make a presentation at the Malacological Society conference meeting 20th – 21st April at the Institute of Marine Sciences, Portsmouth. (Deadline for presentations - March 31)

I would like to submit a either a poster ☐ or an oral presentation* ☐
*All posters should be in an A0 format.

Title of Presentation:

Presentation Details:
Name: _____
Email address _____

Abstract (<200 words)

The Malacological Society of London

University of Portsmouth

To book your place at the Malacological Society meeting 20th – 21st April at the Institute of Marine Sciences, Portsmouth, please complete this registration form and return to Molluscan.lifehistories@port.ac.uk .

1 Personal Details:

Title: Prof. ☐ Dr. ☐ Mr. ☐ Ms. ☐ Mrs. ☐

Surname: _____ First Name: _____

Institution: _____

Address: _____

City: _____ Country: _____

Post Code: _____

2 Your Requirements:

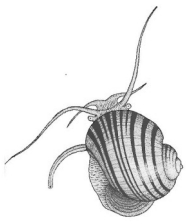
Would you like to present at the meeting? Yes ☐ No ☐
The registration fee (collected on arrival) includes lunch and refreshments provided over both days.
Do you have any dietary preferences that we should be aware of? If so, please indicate here.
_____
Do you require any special assistance at this conference? If so, please indicate here.
_____
Do you wish to attend an evening meal on the 20th? Yes ☐ No ☐*

*Details including prices will be given closer to the event

AGM

THE MALACOLOGICAL SOCIETY OF LONDON

Registered Charity No. 275980



The 119th Annual General Meeting of The Malacological Society of London will take place at 1300 in the lecture theatre of the Institute of Marine Science, University of Portsmouth during the lunch break of The Society's meeting on *Molluscan Life Histories*

Agenda for AGM

1. Apologies for absence
2. Minutes of the last (118th) AGM
3. Matters arising
4. Financial report, including approval of Auditors
5. Annual report of Council (delivered by the President)
6. Awards
7. Election of Council
8. Any other business

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COUNCILLORS	Current	Proposed
	2011-12	2012-13
President	Mark Davies	Tony Walker
Ex-officio		Mark Davies
Vice Presidents	David Aldridge	David Aldridge
	Suzanne Williams	Simon Cragg
Councillors	Fred Naggs	Fred Naggs
	Liz Platts	Liz Platts
	Richard Preece	Richard Preece
	Robert Cameron	Robert Cameron
	Jon Ablett	Jon Ablett
	Ellinor Michel	John Grahame
Hon. Secretary	Tom White	Tom White
Hon. Treasurer	Katrin Linse	Katrin Linse
Membership Secretary	Richard Cook	Richard Cook
Journal Editor	David Reid	David Reid
The Malacologist Editor	Bill Bailey	Georges Dussart
Awards Officer	Tony Walker	Suzanne Williams
Web manager	Tony Cook	Tom White
Archivist	Georges Dussart	Bill Bailey
Co-opt 1	Simon Cragg	
Co-opt 2	Martine Claremont	