

The Newsletter of the IUCN/SSC Mollusc Specialist Group  
Species Survival Commission • IUCN - The World Conservation Union

# TENTACLE



## Editorial

Congratulations to Paul Pearce-Kelly on being awarded the 2007 Ulysses S. Seal Award for Innovation in Conservation (see p. 26).

Paul has been one of the major figures in land snail conservation, coordinating the captive breeding programme for partulids, the charismatic but endangered tree snails of many of the islands of the Pacific.

A partulid has been the motif on the front page of every issue of *Tentacle*, right from number 1, which appeared in December 1989. The drawing, which is still the same drawing on this page, was provided by the Durrell [then Jersey] Wildlife Preservation Trust, one of the many institutions around the world that are involved in captive breeding of partulids. Captive breeding programmes are an important part of conservation of biodiversity, even if at present there is little foreseeable possibility of re-introducing the captive bred animals into the wild. By maintaining accurate records of which individuals breed with which (stud-books if you will) and by spreading the overall effort across a number of institutions globally – in the case of partulids, these are not only in Jersey but also in zoos and universities elsewhere in the UK, USA and Australia – the chances of genetic problems arising from either inbreeding or outbreeding depression can be minimized and the chance of all captive populations being wiped out by a catastrophic natural event (a flood or tornado for example), loss of power to the facility, or rapid invasion of the colonies by pathogens, can be avoided.

Paul has coordinated this complex programme since the early 1990s, working tirelessly from his base at the London Zoo, as well as participating in expeditions to the Pacific. He thoroughly deserves this recognition. Ulysses S. Seal (1979-2003) was the equally tireless, dedicated and charismatic chairman of the Conservation Breeding Specialist Group of the Species Survival Commission, and a major figure in IUCN. It is a great honour for Paul to receive this award. Perhaps it also reflects, or at least we can hope that it will reflect, a greater awareness of invertebrates and especially molluscs and their conservation status and needs. It is ironic, then, that this is the

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first issue of *Tentacle* that has not included a section on partulids or other Pacific island land snails. Hopefully that will

be remedied in the next issue (2009) as these snails continue to be seriously threatened.

*Tentacle* is now a web-based newsletter, accessed at [www.hawaii.edu/cowielab/Tentacle.htm](http://www.hawaii.edu/cowielab/Tentacle.htm), where all issues are available. Since I announce the publication of each new issue to all who are on my *Tentacle* e-mail distribution list, please keep me updated with your current e-mail addresses so that you do not drop off the list. I also announce the availability of each issue on the MOLLUSCA listserv (for details, see p. 30 of this issue of *Tentacle*) and the UNITAS MALACOLOGICA members e-mail list.

As always, I reiterate that the content of *Tentacle* depends largely on what you send me. *Tentacle* is one means to publicise the threats molluscs face – and the conservation successes. *Tentacle* reaches many far corners of the world and includes submissions from diverse and distant locations dealing with a wide variety of molluscs, terrestrial, freshwater and marine. It is also a free, easy way to advertise your own projects! Sometimes I include articles not directly dealing with threatened molluscs (alien species, for instance). But many issues are linked to the threats faced by molluscs and there is no good reason to exclude them from a newsletter such as this. So I encourage anyone with anything relevant to mollusc conservation, even in a broad sense, to send me an article, however short. Don't wait until I put out a request for new material (usually via the MOLLUSCA listserv). Send me something now, and it will be included in the next issue (published once a year, in January). I would especially like to have more from members of the Mollusc Specialist Group – I have not heard from many of you for a long time!

I usually make only editorial changes to submitted articles and I accept almost everything sent to me. However, before I accept an article I will assess whether it really includes anything relevant to mollusc conservation and whether any conclusions drawn are adequately supported by the information presented. So try to explain the conservation relevance in your article and be sure not to speculate too wildly! Unjustified statements (even if they are probably true) do a disservice to conservation as they permit our critics to undermine our overall arguments. *Tentacle*, however, is not a peer-reviewed publication and statements made in *Tentacle* remain the authors' responsibilities.

Printing and mailing of *Tentacle* has been supported in the past by UNITAS MALACOLOGICA, the international society for the study of molluscs, for which the Mollusc Specialist Group is most grateful. To become a member of UNITAS, fill out the application form at the end of this issue of *Tentacle*.

Membership of the Mollusc Specialist Group is by invitation. However, everyone is welcome to submit articles to *Tentacle* and to promote its distribution as widely as possible.

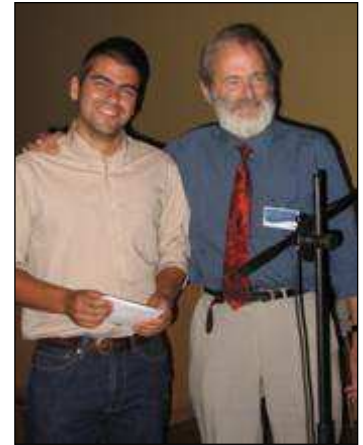
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## NEWS

### Conchological Society award for best poster (student or amateur) on conservation

From Mary B. Seddon

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



#### *Unio tumidiformis* Castro 1885: A highly endangered endemic species (Bivalvia: Unionidae) from the southwestern Iberian Peninsula

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

Following our recognition, using molecular phylogenetic analysis, that Portuguese *Unio crassus* (*sensu* Haas) was an endemic form, we redescribed this species, which was first



Joaquim Reis measuring water chemistry at one of his sites.

designated as *Unio tumidiformis* Castro, 1885. We revised the collections in the Natural History Museums in Lisbon, Coimbra and Porto (Portugal), Madrid (Spain) and Paris (France). It shares some morphological characters with central and northern European populations of *U. crassus*, its genetic sister species, but it is clearly distinct from all other European *Unio*.

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

*Unio tumidiformis* is restricted to the southern Atlantic basins of the Iberian Peninsula, mainly in the Guadiana basin. It is a



Shells of *Unio tumidiformis*.

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

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

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

### Pacific island snails nominated for listing

From Winston Ponder

Nine terrestrial snails from Norfolk Island (5 species) and Lord Howe Island (4 species) have been nominated for listing under the Australian Government's Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The nominations used museum collections made over more than 100 years to determine decline.

### Prozac is bad news for mussels

From: *Oryx* 41(2): 128 [from *Marine Pollution Bulletin* (2006) 52: 1326]

Freshwater mussels are having a difficult time of it; 70 % of the 300 freshwater mussel species native to North America are threatened, declining or extinct. The causes are multiple, ranging from competition from invasive species to habitat loss and pollution. Now, the first study of ecotoxicological effects of the anti-depressant drug Prozac (fluoxetine) has found that the drug affects the reproductive cycle of freshwater mussels by causing females to release their larvae prematurely, before they are able to survive. Prozac, remnants of which enter streams and rivers via wastewater, is one of America's most prescribed anti-depressants, and may also affect the development of fish and frogs.

## DOCUMENTING LAND SNAIL DIVERSITY – HAVE YOU CONSIDERED LOCAL CENTRES OF BOTANICAL ENDEMISM?

By Dai Herbert & Adnan Moussalli

Although the land snail fauna of South Africa may be relatively well known when compared to most other parts of Africa, we continue to discover undescribed species at a quite surprising rate. It is instructive to consider why this should be so, what factors underpin these new discoveries and what the conservation implications may be. Recent findings concerning the genus *Sheldonia* s.l. (Urocyclidae) illustrate this well. We have been working on a phylogenetic revision of this genus using both morphological and molecular data, and although we initially thought it to be a taxonomically well studied genus, our research has uncovered surprising undocumented diversity, including at least eight undescribed species. These are not cryptic species exhibiting minimal morphological differentiation and diagnosable only by genetic means. They are species exhibiting clearly distinct morphological characters and were in fact first identified as undescribed entities on morphological grounds. Molecular analysis has confirmed their validity and has shown that some even represent manifestly distinct genetic lineages within the broader *Sheldonia* radiation.

So what has led to these discoveries? Clearly additional sampling has been significant, but the critical factor has been that fieldwork has included poorly collected areas and areas identified by the botanical community as local centres of plant endemism. Three of the newly discovered taxa occur in the northern parts of South Africa, one in forest habitats of the Soutpansberg and two in the forests of the Wolkberg (one each in the Serala and Blyde subcentres), a fourth is known only from one locality in the Maputaland centre, three occur in the coastal Pondoland centre (one in forest, but two surprisingly in the thicket (valley bushveld) biome) and the eighth in the poorly collected afrotemperate forest habitats of the Maclear region, at the southern extremity of the Drakensberg range.

From a biogeographical perspective it is easy to appreciate that the historical environmental processes that have created these local foci of plant endemism could likewise underpin similar foci of land snail endemism. The instructive issue here is that the botanical community has done much important research in identifying these areas, and this can be used to inform and add value to malacological fieldwork. Although it would be short-sighted to focus our fieldwork solely on areas of plant endemism, since we should not assume *a priori* that snail endemism will track plant endemism exclusively, our preliminary results show strong concordance between floral and molluscan endemism. Therefore, when surveying the land snail fauna of poorly studied areas, incorporating centres of plant endemism into the field work programme is likely to be a particularly valuable strategy.

From a conservation perspective, land snail species endemic to local centres of plant endemism are likely to be range-



*Sheldonia* sp. n. 1 from afro-montane forest at the southern end of the Drakensberg, Maclear district, East Cape, South Africa.



*Sheldonia* sp. n. 2 from thicket habitats in the Mbashe River valley, Pondoland centre of plant endemism, East Cape, South Africa.



*Sheldonia* sp. n. 3 from afro-montane forest in the Soutpansberg centre of plant endemism in northern South Africa.

restricted and thus candidates for red-listing. The discovery of new taxa in such centres is thus an important step toward documenting the potentially threatened components of land snail diversity. This in turn can be used as additional

motivation for the preservation of habitat when these centres themselves are threatened by exploitation for financial ends, as is the case with the Pondoland centre where coastal mining is being vigorously championed by the commercial sector.

Congruent patterns of snail and plant endemism also suggest that, for poorly studied taxa for which specific information is inadequate, conservation planning and prioritization based on plant bioregionalisation is likely to capture a significant portion of the undiscovered and potentially threatened diversity. Obviously this is a second best option, and admittedly non-vagile invertebrates often show fine-scale patterns of endemism that a surrogate approach might miss, but the urgency to conserve biodiversity is such that decisions and actions cannot wait for more detailed information.

Nonetheless, it behoves us to discover as much of our undocumented land snail diversity while we still can, and we believe field work targeting centres of plant endemism is a useful tactic to employ, given that resources are invariably limited.

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## HAS THE TRANSFER OF *XEROCRASSA DAVIDIANA PICARDI* TO A MORE PROTECTED LOCALITY TURNED INTO A FAILURE?

By *Henk K. Mienis*

The pagoda-like land snail *Xerocrassa davidiana picardi* (Haas, 1933), family Hygromiidae, is confined in its distribution to a few kurkar outcrops, a local sandstone formation, in the Bene Beraq-Ramat Gan-Givatayim region in the central coastal plain of Israel (Mienis, 2003). A survey of the area in 2004-2005 revealed only a single population on Givat HaAntennot [Antenna Hill] in Givatayim.

In the winter of 2005 surveyors started working on the hill, and after questioning, we learned that there are advanced plans to turn the last refuge of *Xerocrassa davidiana picardi* into a building plot.

In cooperation with the Israel Nature and National Parks Authority (IPPNNA) some 250 living snails were collected on the hill in Givatayim and transferred in January 2006 to a similar kurkar outcrop in the Botanical Garden of Tel Aviv University in Ramat Aviv (Mienis, 2007).

A check of the place where the snails had been released, during rainy days in January, February and March 2007, turned into a rather disappointing event. We failed to spot even a single living snail! We noticed, however, that one snail had moved at least some 5 m from its original release point (Mienis & Ben-David-Zaslow, 2008).

On 7 January 2008 we had another look in the Botanical Garden. Although the weather was perfect, a constant drizzle

was falling, we found only a few empty shells and not a single live snail. Unfortunately it seems that our effort to establish a new colony of *Xerocrassa davidiana picardi* in a protected place has turned into a failure.

Since the only natural population of the species in Givatayim is still highly endangered by destruction of its habitat we will try to transfer once more a large number of this unique subspecies to the Botanical Garden in the coming weeks.

Mienis, H.K. 2003. *Xerocrassa davidiana picardi*: a terrestrial snail on the brink of extinction in Israel. *Tentacle* 11: 10-11.

Mienis, H.K. 2007. Progress report for the Mollusc Collection 2005-2006. *The National Collections of Natural History, Tel Aviv University, Annual Report 2005/2006*: 28-31.

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## THE NARROW-MOUTHED WHORL SNAIL *VERTIGO ANGSTIOR* (PULMONATA: GASTROPODA: VERTIGINIDAE) – DISTRIBUTION AND HABITAT DISTURBANCE IN NORTHWESTERN POLAND

By Zofia Książkiewicz

Fifteen *Vertigo* species are known from Poland. Two of them are threatened globally: *Vertigo angustior* and *Vertigo moulinsiana*. In summer 2007 (from July to September) I conducted field work in western Poland searching for *Vertigo angustior*. Collecting at a range of localities allows both comparison of microhabitats of the species found and updating their recorded distributions, including discovering new localities. It is also a good opportunity to detect threats that may influence these populations.

Poland, as a member of the European Union (EU), was requested to conduct a Forest Inventory Control, "Natura 2000". The second annex of the EU Habitats Directive includes the narrow-mouthed whorl snail, *Vertigo angustior* (Gastropoda: Pulmonata). The species is also included in the global 2000 IUCN Red List of Threatened Species as LR/cd (Hilton-Taylor, 2000). In Poland the snail is listed in the *Red Data Book* (Pokryszko, 2004).

I carried out field work covering the Regional Directorate of the State Forest (RDSF) in the following areas (Fig. 1): Pila, Torun, Zielona Gora, Szczecinek, Szczecin (Forest Inspectorates in Osno Lubuskie, Miedzyrzecz, Trzciel and Rzepin) and Wroclaw (Forest Inspectorates in Swidnica, Miekinia and Lubin).

In my opinion this rare snail species is unambiguously

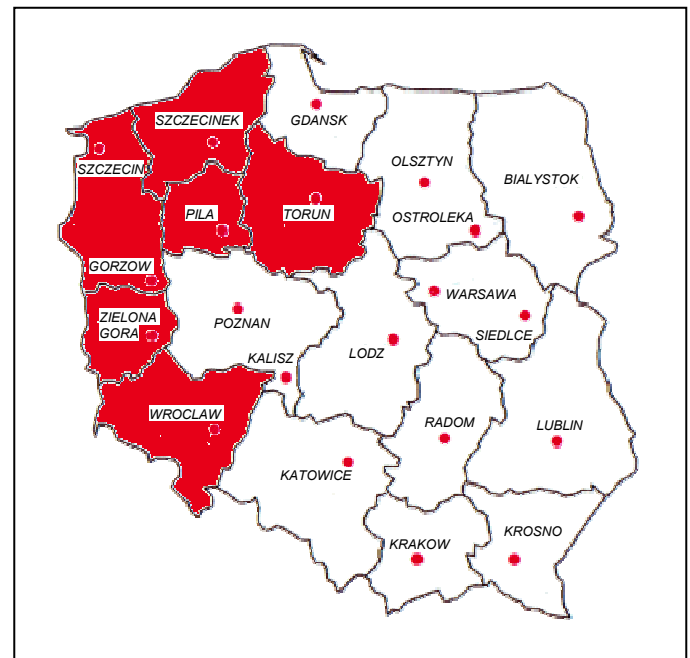


Fig. 1. The borders of the Regional Directorate of the State Forest (RDSF) in Poland. The study was conducted in RDSF Szczecinek, Torun, Pila, Zielona Gora, partly in Szczecinek and Wroclaw (coloured red).

endangered by human activity. In this article I discuss the inappropriate ways in which the snail's habitats is being influenced.

### New localities of *Vertigo angustior* in Poland

The narrow-mouthed whorl snail occurred in calcareous lowland bogs covered by *Carex acutiformis* and *Carex paniculata* (*Magnocaricion* alliance). The species requires a dense vegetation cover and a thick layer of dead litter. The highest densities of the snails are found in open areas in river valleys and permanently wet fens, although it never occurs in floodplains.

The range of the species covers the whole of Europe. Previously, over 20 viable populations had been found throughout Poland (Fig. 2) (Pokryszko, 1990). However, the species appears to be declining (Pokryszko, 2004).

During my studies 49 new localities were recorded. While the species is common in northwestern Poland, I have not discovered any localities in the southwestern part of the country; there is a lack of suitable sites.

The following new localities (Fig. 2) of *Vertigo angustior* were recorded (with map grid square references).

Two localities near Lupawa (XA 53), Gogolewo (XA 52), Bytow (XA 60), Debница Kaszubska (XA 32), Czarne (XV 25), Krepko (XV 20), Plytnica (XV 10), three localities near Okonek (XV 23), four localities near Jastrowie (XV 22), two localities near Tuchola (XV 93, XV 84), two localities near Studnica (WV 42, WV 60), three localities near Krzyz (WU 65), two localities near Sarbia (WU 91), two localities near Zlotowo (WU 37), Milogoszcz (WU 88), Manowo (WU 89), Osno Lubuskie (VU 91), two localities near Wystok (VU 90), four localities near Rzepin (VT 89), Brody (VT 83), Gadow

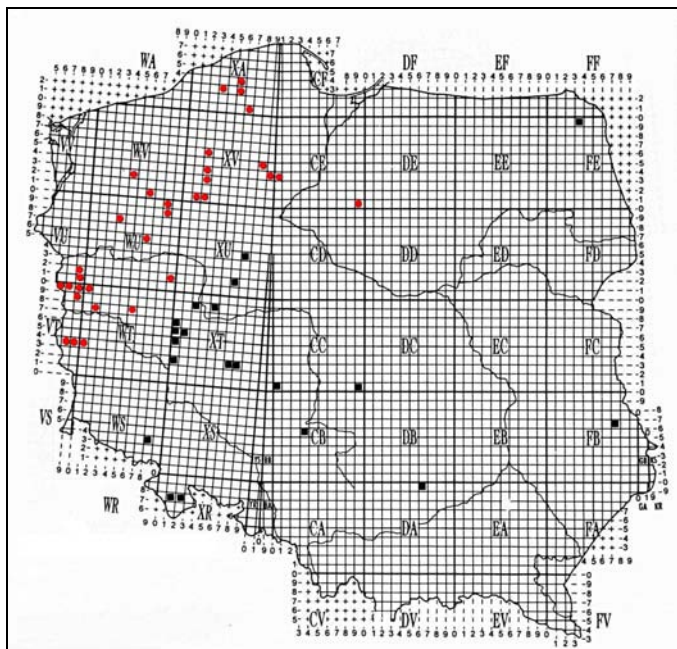


Fig. 2. Distribution of *Vertigo angustior* in Poland; red circles – new localities, black squares – localities given by Pokryszko (1990).

(VT 98), Radzikow (VT 99), Budachow (VT 93), Rzeczyca (VT 79), two localities near Torzym (WT 09), two localities near Bytnica (WT 17), Babimost (WT 57), two localities near Bialkow (WT 03), Brodnica (CE 90), Cekcyn (CE 03).

Including the results of this study, there are about 80 functional populations of *Vertigo angustior* in Poland. The present study revealed the highest concentrations of individuals in the river valleys of the Ilanka, the Pliszka, the Rurzyca, the Plytnica, the Debrzynka, the Dobrzyca, the Bukowka, the Radew, the Lupawa, the Samborka, the Konitopska, the Slupia and the Stazka. It is likely that there are more localities at which the species occurs in the eastern part of Poland.

#### Human activity - disturbance of *Vertigo angustior* habitats

*Vertigo angustior* and its habitats are considered to be sensitive. It seems that mowing sedges is the most serious threat to this species' populations in Poland. Cutting sedges is a result of EU recommendations. This activity stops forest succession and helps to preserve meadowlands but on the other hand it may destroy *Vertigo angustior* (Pokryszko, 2003; Killeen, 2003). In the studied area, the most severe impact from mowing was near the villages of Babimost and Brodnica.

Flooding as well as drainage have a negative influence on the narrow-mouthed whorl snail's populations. Fortunately, modification of water regimes by building dams on rivers or deepening of drainage channels was rarely observed in the study area.

Sites where the narrow-mouthed whorl snail occurs are also threatened by eutrophication. This factor seems to have a great influence on *Vertigo angustior*'s populations (Pokryszko, 2003; Zajac, 2004). In the studied area, the worst situation was noticed at localities near Krzyz (the Bukowka River valley), Rzepin (the Ilanka River valley) and near Tuchola (the Stazka River valley).

Although this study resulted in discovering a considerable number of new localities it also leads to some alarming conclusions. Mowing sedges, modification of aquatic systems and eutrophication are the greatest problems for *Vertigo angustior* in Poland. It is necessary that the study of this species continues, in order to discover new localities, estimate the total population size, and effectively protect it.

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## CREEPING INVASIVE: THE THREAT OF AN INTRODUCED *MELANOIDES* GASTROPOD IN LAKE MALAWI

By Ellinor Michel, Martin J. Genner & Jonathan A. Todd

As part of an expanding effort of species discovery, delineation and description of the endemic thiarid gastropods of Lake Malawi, a surprising discovery was made that underscores the importance of accurate, fine-scaled species recognition. Results from a combination of molecular and morphological work revealed that Lake Malawi harbours not only a number of native lineages of *Melanoides* gastropods but also an invasive *Melanoides* (Genner *et al.*, 2004). Among the natives to the Lake Malawi basin, the group *Melanoides polymorpha* includes, as you might guess from the specific name '*polymorpha*', huge morphological diversity. 'Morphs' of this species are potentially identifiable as 'species equivalents' as they are strongly genetically differentiated based on AFLPs, however their reproduction is primarily asexual (Genner *et al.*, 2007), so their equivalence to 'standard' species (e.g. those defined under the biological species concept) is somewhat debatable. There is also a second native *Melanoides* whose shell looks quite distinct from those of the various *M. polymorpha* morphs and is commonly identified as *M. tuberculata* (e.g. Brown, 1994). Additionally, DNA sequence results have uncovered a third separate lineage of *Melanoides* that is identical to *M. tuberculata* native to Southeast Asia. We have termed this a camouflaged invasion,

as the new *M. tuberculata* looks similar to the native *M. tuberculata* on first glance, although it can be recognized by subtle but distinctive shell characters.

The absence of this invasive snail from historic museum collections indicates that it arrived in Lake Malawi recently, certainly in the last 25 years and potentially as an introduction through the ornamental fish trade. Moreover this invasive *M. tuberculata* is becoming extremely common (Genner *et al.*, 2004). It is not only possibly displacing members of the other *Melanoides* gastropods native to the area, but its sheer abundance may be influencing other aspects of the lacustrine ecology of the region. The photograph shows a recent haul from Lake Malombe, a large peripheral water body of Lake Malawi. Here fishers use “nkatcha nets”, fine-meshed bottom-weighted seines set at approximately 5 m depth before being pulled together at the base by a swimmer. This net drags up everything, which is landed and sold by the tin bucket-load (left-hand side of the picture). Buyers dump the catch on the ground and pick the fish from the snails. The landing beaches are now carpeted with a thick layer of dried or decomposing invasive *Melanoides tuberculata*. In 1996 the fishers of Malombe caught only fish (MG, personal observation). We hypothesize that among the many possible reasons for the rapid expansion of this invasive is release from parasite pressure, as our work has shown that the invasive *Melanoides* is unexpectedly free from the parasites common to native thiarid gastropods (Genner *et al.*, 2008). The invasive snail has also recently been found in Lake Chilwa, a huge shallow lake in a neighbouring catchment. Future colonisations of freshwaters throughout the region are likely. This is a point of conservation concern for the benthic ecosystem functioning in Lake Malawi, which includes other endemic gastropods, fish and crustaceans.



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## THE RARE LAND SNAIL *GLYPHYALINIA RADERI* IN PENNSYLVANIA, USA

By Timothy A. Pearce

*Glyphyalinia raderi* (Dall, 1898) is a rare land snail of the north central Appalachian region in the eastern United States. It was reported by Pilsbry (1946: 281) and Grimm (1971) from one county in Maryland and by Hubricht (1985: 118) from four counties in the states of Kentucky, Maryland and Virginia. Those literature localities surround West Virginia suggesting the snail's presence there, and indeed the Carnegie Museum of Natural History (CMNH) mollusc research collection contains 15 lots of *G. raderi* from 9 counties in that state, all collected before 1940.

I was surprised to find a specimen of this apparently scarce species in Pennsylvania in 2005 during a “BioBlitz” event in Twin Hills Park in Mount Lebanon, just south of Pittsburgh in Allegheny County. Two things surprised me about this find: (1) 100 years of land snail biologists at the CMNH had overlooked this population located only 11 km from the Museum, and (2) I did not expect to find a rare snail in a city park. I found the empty specimen on 20 May 2005 in a leaf litter sample and returned 10 days later to find another empty shell. The 3.3 mm diameter shell with 3.8 whorls was readily identified by the very close regular radial striae, the very large umbilicus, approximately one third of the shell diameter, and the flat, rapidly expanding whorls.

Since the time that I found the Mount Lebanon specimens, the species has been found in additional localities, in 2006 during a survey of limestone areas of western Pennsylvania, and in other snail survey work. In addition, one lot of this species from Allegheny County, Pennsylvania, at the Smithsonian Institution National Museum of Natural History (NMNH 592605, E side of Sandy Creek, slope, coll. J.P.E. Morrison, 27 Aug. 1948) indicates that my finds are not the first time *G. raderi* has been found in Pennsylvania, but other than brief mentions by Pearce (2006, 2007), its occurrence in Pennsylvania had not previously been reported in the literature.

The species is now known in Pennsylvania from five localities in four counties (Allegheny, Fayette, Greene, Washington). These localities in Pennsylvania increase the global number of known county occurrences for this species from 13 to 17

(previous literature reports are from Carter County, Kentucky, Alleghany County, Virginia, Pulaski County, Virginia, Allegany County, Maryland, and previous CMNH museum records from the following nine counties in West Virginia: Cabell, Grant, Greenbrier, Marion, Mercer, Mingo, Monroe, Pendleton and Pocahontas). Note that the Alleghany County, Maryland, population is believed to be extirpated (NatureServe, 2007).

As previously noted (Hubricht, 1985), *G. raderi* seems to be a calciphile. In a study targeting limestone areas in Pennsylvania in 2006, I took 44 samples in western Pennsylvania (each with four replicates within 400 m<sup>2</sup>) from 11 areas (mean distance between samples at an area was 876 m, minimum was 54 m) and measured calcium concentration. The four samples having *G. raderi* were from litter samples with greater leaf litter calcium content (mean with *G. raderi*, 17.4 g Ca/kg; mean without, 8.9 g Ca/kg, t-test,  $p = 0.04$ ), thus supporting the idea that *G. raderi* is a calciphile. Simpson Hill is a limestone area (calcium concentrations not measured) with the distinction of having the greatest land snail diversity in Pennsylvania, the most abundant *G. raderi* (individuals per litre of leaf litter), and the freshest looking shells of *G. raderi* (Fig. 1).



Fig. 1. *Glyphyalinia raderi* from Simpson Hill. 1 – pale brown shell indicating relatively recently dead; 2 – white shell, which probably died longer ago.

To my knowledge, no living specimens have been collected. Pilsbry (1946, quoting H.B. Baker) noted only “subfossil” specimens that, “although chalky, they still retain the characteristic sculpture”. None of the 87 specimens I found in Pennsylvania was collected alive (none contained dried snail tissue), although some shells retained some pale brownish colour, so seemed more recently dead. Hubricht (1985) noted that the species is probably a burrower, and a burrowing habit could explain the finding of empty shells in cliff areas where they wash out of the cliff face. Another possibility is that the species is extinct, and we are finding only the remaining shells. Since shells appear to decompose more slowly in limestone areas, finding shells in calcium-rich areas might not mean that they are strict calciphiles but that the shells persist better in calcium areas. However, some of the shells seem fresh enough that I hesitate to think the species is extinct. One way to address whether they are subterranean would be to visit a known locality and dig to seek living snails.

Despite their subterranean habit, erosion might bring

subterranean snails to cliff surfaces. Of the 44 areas sampled, *G. raderi* were found among the steepest half of slopes (mean slope with *G. raderi* – 32.8°, mean without – 28.5°), but the difference was not significant (t-test,  $p = 0.42$ ). In addition to the sites included in that analysis, Simpson Hill was a cliff with *G. raderi*.

The global status of *G. raderi* is considered to be G2 (imperiled, at high risk of extinction due to very restricted range; NatureServe, 2007). In individual states, it is ranked S1 (critically imperiled) in Kentucky, SH X (state historical, extirpated) in Maryland, S1S2 (imperiled to critically imperiled) in Virginia, and S2 (imperiled) in West Virginia (NatureServe, 2007; Maryland DNR, 2007). It is not currently listed in Pennsylvania, pending my submitting a proposal to list it.

The unexpected finding of this species in a city park might indicate that it is somewhat tolerant of human disturbance. If it has a subterranean calciphile habit, it might be insulated from changes including acid rain, invasive plants and animals, and deforestation. On the other hand, specimens from the city park could be remnants of now extinct populations.

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## TRACKING LAND SNAIL EXTINCTIONS FROM SPACE

By Menno Schilthuizen & Reuben Clements

A century and a half ago, Charles Darwin wrote: “So profound is our ignorance, and so high our presumption, that we marvel when we hear of the extinction of an organic being”. Extinction rates have multiplied dramatically since then, but the erosion of biodiversity continues to be ignored and (mis)presumed by many. Even the most conservative



calculations of species extinctions are often met with accusations of undue alarmism. For this reason, conservation scientists need to arm themselves with evidence that extinctions are truly happening here and now (Clements *et al.*, 2006).

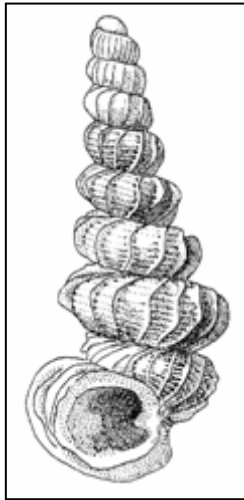


Fig. 1. *Diplommantina lenggongensis*, a characteristically endemic, obligately limestone-dwelling species from west Malaysian karsts. (Drawing: Menno Schilthuizen)

In limestone karst ecosystems, land snail extinctions can be documented very precisely. Throughout tropical Asia, karsts occur as small, isolated outcrops that often rise as spectacular towers from the surrounding plains. In Malaysia alone, at least 800 separate limestone outcrops exist, each averaging just a few hundred metres in diameter. Many groups of terrestrial gastropods, such as several genera of Vertiginidae and Diplommatinidae (Fig. 1), exhibit high degrees of site-endemism with many species restricted to just a single outcrop. For example, the Subis karst on Malaysian Borneo is home to at least 50 site-endemic species of land snails (Vermeulen & Whitten, 1999).



Fig. 2. Bukit Sagu near Kuantan, west Malaysia, as seen in 1997; quarrying has just begun on its northern flank. (Photo: Menno Schilthuizen)

While the Subis karst is protected, most other outcrops are not, particularly in densely populated areas such as west Malaysia and Java where many have been quarried for limestone to produce cement. Unlike timber extraction where regeneration is possible in principle, the exploitation of this non-renewable resource leads to the inevitable extinction of site-endemic species, a process that is likely to escalate, given the increasing rates of limestone quarrying in the region.

We advocate the use of remote sensing for monitoring and highlighting extinction processes in karst snails. In 1997, our field work in west Malaysia verified that quarrying had removed 75 % and 10 % of the Panching and Sagu karsts, respectively (Schilthuizen, 2004; Fig. 2). Ten years later, a snapshot of these karsts through Google Earth now indicates that Panching has been quarried away entirely, whereas less than 50 % of Sagu remains (Fig. 3). This means that the land snail species *Opisthostoma sciaphilum* (restricted to Panching) is now extinct, and the extinction of *O. senex* (endemic to Sagu) will happen in the next ten years.



Fig. 3. Satellite image of Bukit Sagu in 2007; quarrying has removed more than 50 % of the outcrop. (Image: Google Earth)

Similar extinctions are occurring on quarried karsts across Malaysia, which is why we have added critically endangered karst-endemic land snails from Malaysia to the IUCN *Red List* ([www.iucnredlist.org](http://www.iucnredlist.org); select “Malaysia” from countries and search for “Gastropoda”). Conservation scientists could use publicly available satellite images (e.g. from SPOT and IKONOS satellites) and widely used tools such as Google Earth to document and directly monitor observable extinction events in snail faunas with high site-endemism. With this perversely simple method at our disposal, we may now harness the emotional impact of satellite imagery to show the reality of the biodiversity crisis.

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## NON-MARINE MOLLUSC DIVERSITY IN PARANÁ STATE, SOUTHERN BRASIL

By A. Ignacio Agudo

The State of Paraná (9,000 km<sup>2</sup> of territory – 25,000 ha of private reserve areas of natural heritage) is, after the neighbouring Santa Catarina State (Agudo & Bleicker, 2006a; Agudo, 2007a), the second smallest part of Brasil's southernmost region (Fig. 1), situated between the States of São Paulo (to the north), Mato Grosso do Sul (to the northwest) and Santa Catarina (to the south); its western neighbours are Paraguay and Argentina, with the Atlantic Ocean forming its short eastern border, strongly dissected by bays. Paraná has a unique terrain that is divided into the Coast, and the First, Second and Third Plateaus (Fig. 1). Each are well defined regions that are separated by mountains and cliffs. With the largest continuous stretch of Atlantic Coastal Forest in the country, the Coast is the region between the Atlantic Ocean and the Serra do Mar coastal mountains (Fig. 2). On the western slope of the mountains, with an average altitude of 900 m, is the First Plateau, where the city of Curitiba is located. Farther to the west is the Serra de São Luiz do Purunã mountain range, leading to the Second Plateau, covered by araucaria forest, portions of cerrado forest and rolling plains, known as the Campos Gerais (General Fields) (Fig. 3). Finally, heading towards the Boa Esperança (Good Hope) mountains in the central and southern region or the Cadeado mountains to the north, we reach the Third Plateau, subdivided by the rivers Ivaí, Piquiri and Iguaçú.

Three independent great river systems drain the land: the Paranapanema to the north, the Iguazú to the south and the Paraná to the west. Some lesser drainages discharge into the Atlantic Ocean, forming a fourth system. The Paranapanema, which forms the border with the states of São Paulo and Mato Grosso do Sul, joins the Paraná in the northwest, the Paraná thence forming the border with Paraguay. Further south, the Iguaçú also joins the Paraná at the Foz do Iguaçú in the southwest, in the globally famous Iguaçú Waterfalls National Park, bordering Argentina and Paraguay (Fig. 2).

The non-marine malacological fauna in this southern part of Brasil is poorly documented, with the exception of the native giant terrestrial snail, *Megalobulimus parafragilior* (Leme & Indrusiak, 1990) (Megalobulimidae), an endemic species of the Atlantic Forest that is threatened with extinction.

The first comprehensive studies of this region are those of Gofferjé (1950) and Rios (1975), although the first studies of the marine molluscs of the State were published during the middle of the last century (Morretes, 1938, 1949, 1952, 1953, 1954a, b). Additional recent efforts have been made to increase our knowledge (Agudo, 2004, 2005; Fischer *et al.*, 2005; Agudo, 2006a-d; Colley & dos Santos, 2006; Agudo, 2007a, d; Agudo-Padrón, 2007; Colley, 2007; Colley & dos Santos, 2007; Colley & Salgado, 2007; Latoski *et al.*, 2007; Takeda *et al.*, 2007a, b; Thiengo *et al.*, 2007). Today, based on bibliographical information, including examination of literature deposited in institutional and private collections outside the State, and intensive field work, we can now

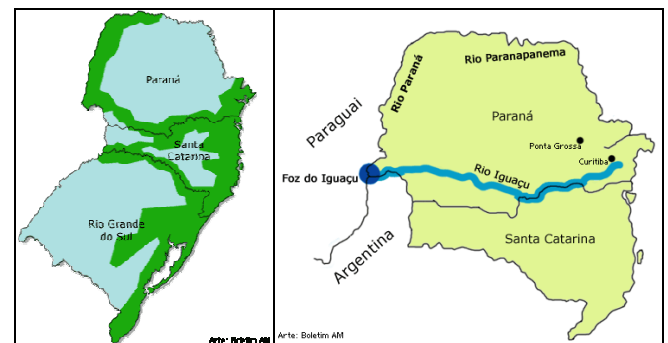


Fig. 1. Paraná State – geographical location and features.

document the fauna as follows.

The non-marine malacological inventory currently includes 125 species and subspecies, among them 107 Gastropoda (14 Prosobranchia, 6 Gymnophila, 87 Pulmonata) and 18 Bivalvia (13 Unionoida, 4 Veneroida, 1 Mytiloida), distributed in 63 genera, 35 families and 2 classes. Of these, 48 Gastropoda (6 Prosobranchia, 5 Gymnophila, 37 Pulmonata) and 8 Bivalvia (3 Mycetopodidae, 3 Hyriidae, 2 Corbiculidae) also occur in neighbouring Santa Catarina State (Fig. 4).

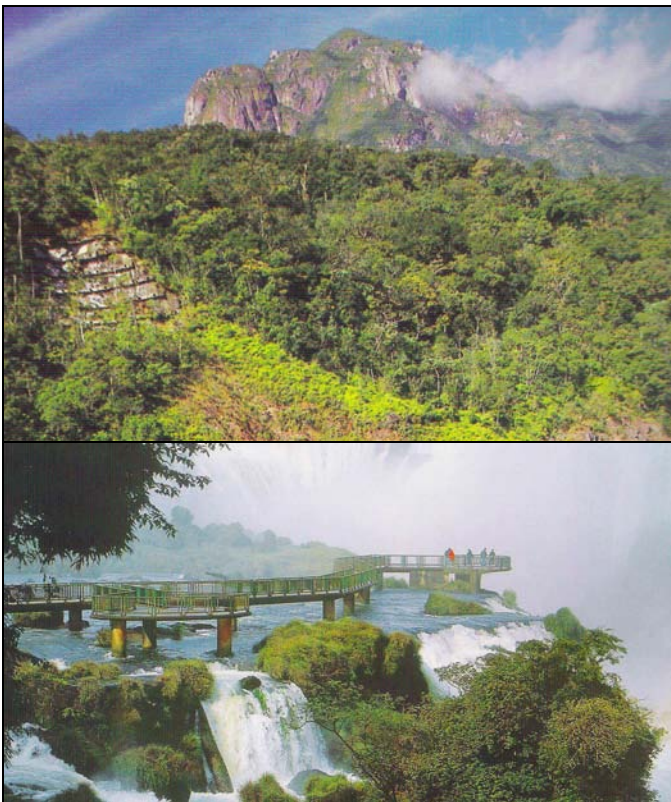


Fig. 2. Top – Serra do Mar, between the Atlantic Coastal Plain (the smallest of the southernmost Brazilian regions) and the First Plateau. Bottom – Iguaçu Waterfalls National Park, in the lowlands of the Third Plateau, tropical damp forest habitats rich in exuberant diversity of non-marine molluscs.

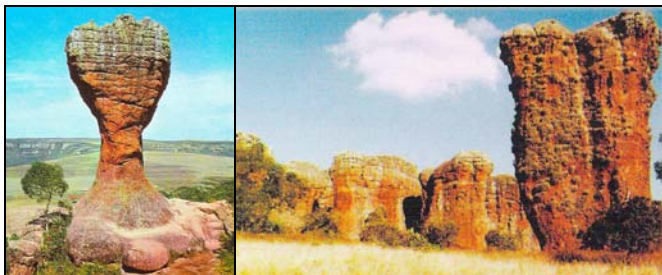


Fig. 3. Vila Velha State Park, in the Second Plateau (Campos Gerais region), an area with very limited records of molluscs.

Of the 107 gastropod species recorded, 77 are terrestrial (3 Prosobranchia, 6 Gymnophila, 68 Pulmonata) and 30 are freshwater species (11 Prosobranchia, 19 Pulmonata). Of the 35 families, 2 are notable for their diversity: Megalobulimidae (Gastropoda, Pulmonata, 16 species) and Mycetopodidae (Bivalvia, Unionoida, 7 species).

The classification of the species currently known in the State, following Simone (2006) and Thomé *et al.* (2006) is as follows. Family names, authors and dates of Gastropoda follow Bouchet & Rocroi (2005).

#### Class Gastropoda

107 species, 52 genera, 30 families

#### Subclass Prosobranchia

14 species, 9 genera, 5 families

Ampullariidae Gray, 1824 (8 species), Hydrobiidae Stimpson, 1865 (1), Thiaridae Gill, 1871 (2), Cyclophoridae Gray, 1847

(2), Helicinidae Férussac, 1822 (1)

#### Subclass Gymnophila

6 species, 3 genera, 1 family

Veronicellidae Gray, 1840 (6)

#### Subclass Pulmonata

87 species, 40 genera, 24 families

[Recent literature (Colley & Salgado, 2007; Colley & dos Santos, 2007) also indicates the occurrence in the State of Charopidae Hutton, 1884, not listed below.]

Succineidae Beck, 1837 (2), Ancyliidae Rafinesque, 1815 (1), Chiliniidae Dall, 1870 (2), Ellobiidae Pfeiffer, 1854 (1), Physidae Fitzinger, 1833 (3), Lymnaeidae Rafinesque, 1815 (1), Planorbidae Rafinesque, 1815 (12), Subulinidae Fischer & Crosse, 1877 (6), Limacidae Lamarck, 1801 (2), Agriolimacidae Wagner, 1935 (1), Philomycidae Gray, 1847 (1), Achatinidae Swainson, 1840 (1), Bulimulidae Tryon, 1867 (15), Amphibulimidae Fischer, 1873 (1), Megalobulimidae Leme, 1973 (16), Strophocheilidae Pilsbry, 1902 (7), Odontostomidae Pilsbry & Vanatta, 1898 (5), Bradybaenidae Pilsbry, 1934 (1), Haplotrematidae Baker, 1925 (1), Streptaxidae Gray, 1860 (2), Helicidae Rafinesque, 1815 (1), Systrophiidae Thiele, 1926 (1), Thysanophoridae Pilsbry, 1926 (1), Valloniidae Morse, 1864 (1), Zonitidae Mörch, 1864 (1), Euconulidae Baker, 1928 (1)

#### Class Bivalvia

18 species, 11 genera, 5 families

#### Order Unionoida

13 species, 7 genus, 2 families

Mycetopodidae Gray, 1840 (7), Hyriidae Swainson, 1840 (6)

#### Order Veneroida

4 species, 3 genera, 2 families

Corbiculidae Gray, 1847 (2), Sphaeriidae Deshayes, 1854 (2)

#### Order Mytiloida

1 species, 1 genus, 1 family

Mytilidae Rafinesque, 1815 (1)



Fig. 4. Common local (Paraná, Santa Catarina) freshwater mussel *Anodontites tenebricosus* (Lea, 1834).

Among the regions mentioned above, two clearly defined natural areas harbour the largest number of species recorded in the state: (1) the area including the exuberant relief of the Serra do Mar coastal mountain range (Fig. 2), the continuous natural domain of the Alluvial Tropical Atlantic Forest, and the great Curitiba metropolitan area, located on the western slope of the coastal mountain in the First Plateau, with a mean altitude of 900 m, the origin of the nascent Iguaçu river and the transition area including the remainder of the araucaria forest and fields; (2) the area between Foz do Iguaçu and the territory of the National Park and Waterfalls of the same name (Fig. 2), in the west and southwest bordering the Third Plateau (Agudo, 2007a, c), domain of the characteristic “Alluvial Stationary Tropical Forest”. Scarce and isolated records occur throughout great areas of the Campos Gerais in the Second Plateau (Agudo, 2007a; Fig. 3), and in central (Fig. 5), northern and northwestern areas in the Third Plateau (Agudo, 2007c).

In the central Atlantic Forest area of the Serra do Mar (Fig. 2), six snake species of the family Colubridae (genera *Dipsas*, *Sibynomorphus*, *Tomodon*) are recorded that use several terrestrial molluscs, slugs of the family Veronicellidae among them, as exclusive food resources (Morato, 2005: 94, 103, 110, 115, 118), an interesting aspect of the regional malacological natural history.

Regarding the conservation situation, just 10 of the species recorded in the State (7 freshwater Bivalvia – 5 Mycetopodidae, 2 Hyriidae; 3 terrestrial Gastropoda – 2 Megalobulimidae, 1 Strophocheilidae) are listed according to global IUCN categories: 7 as Vulnerable – *Anodontites tenebricosus* (Lea, 1834) (Fig. 4), *Anodontites trapesiaalis* (Lamarck, 1819), *Fossula fossiculifera* (d’Orbigny, 1835), *Monocondylaea paraguayana* d’Orbigny, 1835, *Mycetopoda siliquosa* Spix, 1827, *Diplodon expansus* (Küster, 1856), *Diplodon martensi* (Ihering, 1893); 3 as In Danger – *Megalobulimus grandis* (von Martens, 1798), *Megalobulimus parafragilior* (Leme & Indrusiak, 1990), *Mirinaba curytibana* Morretes, 1952 (Mansur *et al.*, 2003: 64-69; MMA, 2003, 2004; Scarabino, 2004: 273). All are included in the *National Plan of recovery and of administration for species of Pisces and aquatic invertebrates* (MMA, 2006: 23-24).

Finally, on 22 May 2007, the Instituto Ambiental do Paraná (Environmental Institute of Paraná) published for the State the first *Official list of exotic invader species known in the State of Paraná* (IAP, 2007), including three mollusc species: the giant African snail, *Achatina fulica* (Bowdich, 1822) (for its known distribution in the state, see Fischer *et al.* (2005: 3, fig. 1), the Asian garden snail *Bradybaena similaris* (Rang, 1831) and the Asian freshwater mussel *Limnoperna fortunei* (Dunker, 1857) (see Belz *et al.* (2005a, b), Belz (2006), Agudo (2007b: 18) and Takeda *et al.* (2007b) for its distribution in the Iguaçu, Ivaí and Piquiri river basins; Silva (2006) and Takeda *et al.* (2007a) for the Itaipú Hydroelectric Reservoir and adjacent areas in the Paraná river basin; Fig. 5). Other non-native species, based on Agudo & Bleicker (2006b), Campos & Calvo (2006), Simone (2006: 306-312), Thomé *et al.* (2006), Takeda *et al.* (2007a) and Thiengo *et al.* (2007: 102-103), present in the regional inventory but not included in the list,

include two freshwater Asiatic clams (*Corbicula fluminea* (Müller, 1774) (Fig. 5) and *Corbicula largillierii* (Philippi, 1844)), the traditional European “escargot” (*Helix (Cornu) aspersa* Müller, 1774), three terrestrial slugs that are recognized agricultural pests and vectors of parasitic diseases (Agudo, 2006b) (*Deroceras laeve* (Müller, 1774), *Limacus flavus* (Linnaeus, 1758) and *Limax maximus* Linnaeus, 1758), two other terrestrial snails (*Opeas hannensis* (Rang, 1831), which is frequently but incorrectly referred to as *Lamellaxis* (= *Opeas*) *goodallii* (Miller, 1822), and *Subulina octona* (Bruguière, 1792)), the slug *Pallifera* sp. (Philomycidae), an alien species currently in the process of being identified (Thomé *et al.*, 2006: 64), and the Euroasiatic freshwater snail *Melanoides tuberculatus* (Müller, 1774).



Fig. 5. Occurrence (red circles) of the golden mussel, *Limnoperna fortunei* (Dunker, 1857), in the Iguaçu and Paraná river basins (left); agricultural aqueduct (right) in the central region (high lands of the Third Plateau – Ivaí river basin), invaded by the freshwater clam *Corbicula fluminea* (Müller, 1774).

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## CHARACTERISTIC HABITAT AND CONSERVATION STATUS FOR WISCONSIN TERRESTRIAL GASTROPOD SPECIES

By Joan P. Jass

For each native terrestrial gastropod species reported from Wisconsin by Jass (2004), assignment to one of three major habitat categories (grasslands, wetlands, woodlands) was made based on information given by Hubricht (1985). For those reported from a range of habitats, assignment was based on the habitat type listed first. Resulting percentages were: grasslands 15 %, wetlands 30 %, woodlands 55 %.

State conservation rankings have been assigned by the Wisconsin Natural Heritage Inventory (WI NHI), with eight sequential categories ranging from secure to critically imperiled. Seven of the Jass (2004) species were not listed by WI NHI. Of the rest, 64 % were considered to be unrankable because of lacking or conflicting information or were unranked. None was ranked as totally secure. The most secure ranking given, a category between secure and apparently secure, was assigned to two species. Three ranked as apparently secure, and two were ranked between apparently secure and vulnerable. Seven species were categorized as vulnerable, two between vulnerable and imperiled, two as imperiled, and five as critically imperiled. Of the 23 given conservation status rankings, 13 % were categorized as grassland species, 22 % as wetland species and 65 % as woodland species. Of the 16 ranked from vulnerable to critically imperiled, 19 % were grassland species, 31 % wetland species and 60 % woodland species.



*Vitrina angelicae*, one of the 16 species with Vulnerable to Critically Imperiled conservation status rankings in Wisconsin (Milwaukee Public Museum Mollusk lot 220689-25, collected 5 miles [8 km] north of Eagle, Waukesha County, Wisconsin, 21 June 1979; shell diameters < 5 mm).

Those seeking to maximize their resources in conserving the native fauna frequently search for ways of prioritizing their efforts. This exercise was undertaken as a preliminary attempt to determine whether the terrestrial gastropods most in need of conservation attention in the state were disproportionately found in one of the major habitat categories. Grassland and wetland species were disproportionately high in the vulnerable to critically imperiled categories. However, since the majority of species have not been ranked, any conclusion from this exercise should be viewed as possibly interesting but preliminary conjecture.

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## THE H. D. ATHEARN MUSEUM OF FLUVIATILE MOLLUSKS, CLEVELAND, TENNESSEE

By Arthur E. Bogan, Jamie Smith & Cynthia M. Bogan

The extensive collection of freshwater mollusks in the Museum of Fluviate Mollusks was donated to the North Carolina State Museum of Natural Sciences. The Museum of Fluviate Mollusks represents the largest privately held freshwater mollusk collection in North America: 23,344 cataloged lots. Collection content focuses on the diverse freshwater molluscan fauna of the eastern United States and Canada but also has representatives from 53 other countries. Athearn collected and exchanged specimens from 1940 until about 2006. He collected extensively across the United States and Canada and made two trips to Mexico. The importance of the collection is the extremely detailed locality data, the variety of sites collected and the time of collection: 1940 through the 2000s. Athearn collected large series of gastropods, sphaeriids and unionoid bivalves at each site visited. His choice of sites included very small streams that have since been modified, channelized or put into culverts. Athearn also focused on rivers in the southeastern United States where a dam was built and the flood gates had been closed. His collections from reservoir areas represent the last collections before the river and its fauna were inundated. Athearn is the last known person to have collected the Coosa River endemic pleurocerid genus *Gyrotoma* in Alabama in 1965. Gastropod collections were preserved in methyl alcohol and then allowed to air dry. Many of the specimens have been cleaned by dermestid beetle larvae but some of the rare, endangered or extinct gastropod taxa still contain dried bodies. This collection was moved to Raleigh in June 2007 and is being rehoused in archival quality vials and museum trays. A total of 7,500 lots of Sphaeriidae and gastropods have been rehoused and arranged by family and genus. Computerization

of localities listed in the collection catalog has begun with 1,500 localities entered and an estimated 8,500 localities left to be entered. This significant resource has been available on a limited basis. The G1, G2 and G3 global ranked freshwater bivalve species have been databased. This database includes 3,709 lots of 197 extinct, endangered and threatened unionoid taxa. Data from specimens in the Museum of Fluvial Mollusks will be added to our searchable database, soon to be available on the Museum's website.

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## LAND SNAILS OF SOUTHERN ILLINOIS (USA) AND SOME NOTES ON CONSERVATION

By Marla L. Coppolino

Many areas of North America remain in need of quantitative surveys of land snail abundance and diversity. One challenge in carrying out such surveys lies in the ability to convince state agencies that land snails are worthy of study. I was offered a position that my advisor, Dr. Frank (Andy) Anderson, had secured through a State Wildlife Grant from the Illinois Department of Natural Resources (IDNR) and US Fish and Wildlife Service. This work will not only improve our knowledge of snail diversity of the region with the highest faunal and vegetation diversity in the state of Illinois, but it is also my thesis research that will lead to my Master of Science degree.

To begin, I introduce the general plans of my project. The area of my study comprises six counties that border the eastern bank of the Mississippi River. This area was chosen because it represents the highest faunal and vegetational diversity in the state, as well as the highest land snail diversity (Hubricht, 1985). Much of it is characterized by limestone bluffs and rocky outcroppings, favoured by land snails as habitat. I am using a stratified random sampling quadrat technique, along with leaf litter sampling, to collect snails. I am also collecting and testing soil samples, and recording data on habitat and habitat complexity (according to a simple index I developed based on elevation differences, vegetation diversity, and amounts of exposed rock as parameters). A few of the preliminary results are as follows. Literature from Baker (1939), Hubricht (1985) and Hutchison (1989) (a local ecologist), along with specimens collected in this study and collections at the Field Museum of Natural History, indicate 88 living species in these six counties, representing approximately 70 % of the species recorded in the state of Illinois! Highest abundances are in areas of limestone and high soil calcium levels, while highest diversity is found in areas with greatest habitat complexity. Several species not previously recorded in the state are mainly invasive slug species, such as *Arion intermedius* Normand, 1852 and *Lehmannia valentiana* (Férussac, 1821). One species,

considered "critically imperiled" by NatureServe because of its limited range, is *Euchemotrema hubrichti* (Pilsbry, 1940). Frank Anderson has published several reports on it in recent years (Anderson, 2005, 2007; Anderson & Smith, 2005), including an article in *Tentacle* (Anderson, 2006), and I am pleased to say that two populations are found to live in great numbers, although in a very small geographical range.

Why perform assessments such as these? As malacologists, we know their value, in terms of producing systematic checklists, understanding species ranges, assessing ecological requirements and the possibility of finding species new to science. But what about the value of surveys in terms of land snail conservation, and how do we convince officials at funding agencies that this work is necessary, when most of them are only familiar with charismatic megafauna?



Juvenile *Euchemotrema hubrichti* (Pilsbry, 1940). (Photo: Marla L. Coppolino)

Along with my research, I am developing several products to enhance the value of my study and make the information gained from it more useful on a broader scale. First, I have included an outreach component, to help educate the local (and beyond) community about land snails. I give presentations to various non-malacological groups, such as branches of the Sierra Club, Audubon Society and similar organizations, in which I highlight the importance of land snails in ecosystems. In these presentations I explain how land snails play a vital role in the ecosystem, through their uptake of soil nutrients, which are then brought to higher trophic levels by predators. Birders have been particularly impressed by the importance of snails in the diets of birds, including some species of songbirds, passerines and turkeys (Beasom & Pattee, 1978, Graveland *et al.*, 1994). I have also proposed an educational poster of land snails of Illinois to the IDNR, which, if accepted, could be published in 2009, and will feature images of snails and facts on snail biology and ecology, along with steps the public could take to aid in land snail conservation.

Another aspect is a website that includes a systematic species list, and will soon include a key to the snails of my research area, along with species descriptions and an illustrated glossary (currently under construction).

I have had many conversations with state agency wildlife officials, and each time I share with them the vital functions land snails perform in their environment, they are grateful to have gained this knowledge. I have found some evidence that land management officials who make decisions without regard to land snails could be enacting plans that are potentially harmful to snail populations. For example, prescribed burns are often done for purposes of cultivating certain vegetation types, but without adequate understanding of their effects on land snails. One botanist, who carried out such burns in this area, had performed an informal study on snail abundances, before and after burns. However, he did this study *without* understanding that about half the species in the local snail fauna are smaller than 5 mm in width, so he did not even look for the presence of such “micro” snails. He was surprised, and enlightened, to learn how many species are minute in size!

In sum, I feel it is safe to say that we will be in continual need of contributions to the body of information on land snail abundances and ranges to enhance our knowledge of what is out there, and what requires conservation action. It seems, over the course of my project thus far, that by working as a bridge between the research and conservation worlds, it is possible to widen the minds of people of all groups, including conservation officials, just by sharing knowledge of some basic biological and ecological features of land snails. Simple relations such as these could be of help in guiding future conservation efforts for land snails and land management decisions.

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## SOUTHERN AFRICA FRESHWATER ASSESSMENT

By Thomas K. Kristensen

The IUCN regional assessment of freshwater molluscs was undertaken by Thomas Kristensen, Chris Appleton and Barbara Curtis in 2006. The freshwater molluscan fauna in southern Africa is not as rich as that of the East African region, with 122 species assessed (Table 1). The regional assessment showed that only 10 of the species, 8 % of the fauna, were threatened with extinction (Endangered or Critically Endangered).

**Table 1.** Regional threat assessments for southern Africa.

IUCN <i>Red List</i> Category	Number of species
Critically Endangered	3
Endangered	7
Vulnerable	0
Near Threatened	4
Least Concern	63
Data Deficient	39
Not Assessed	6
Total	122

### Threatened species

Two species, *Septaria borbonica* and *Septaria tessellaria* (Neritidae), have limited distributions in KwaZulu Natal (Republic of South Africa), which are under pressure from industrial, residential and recreational development.

*Lobogenes michaelis* (Hydrobiidae) has a very limited range (three small areas in southern Congo and Zambia), but with no recent records the species may well be in further decline.

Species in the genus *Tomichia* have small ranges and specialised habitats; these taxa are considered threatened as they are extremely sensitive to changes in their ecosystems from industrial and domestic waste pollution, mining activities as well as changes to the seasonal rainfall regimes.

The bivalve *Etheria elliptica* has a limited occurrence in the eastern part of Angola and is assessed as Endangered. However, the range information is rather dated, and consequently this assessment requires follow-up survey work.

### Threats

The principal threat in the region comes from declining quality of habitat for these species, from a variety of sources:

- Over abstraction of water for irrigation.
- Water pollution from domestic and industrial sources.
- Sedimentation from mining waste.
- Dune mining in southern Africa.
- Dam development schemes.
- Use of molluscicides for bilharzia control.

### Data deficiency

Data Deficient assessments constituted 31 % of the total for a number of reasons:

- Poorly known distributions. Many of these species are very small and hence easily overlooked in general surveys.



- Taxonomic uncertainty relating to the specific status of some of the species complexes in the region. This makes evaluation of distributional data for each species difficult.
- Only known from type specimens.

#### Conservation Actions

- All threatened species need surveys to confirm their ranges
- Data deficient species require surveys, as these may also be threatened species.
- Data deficient species require further taxonomic research to establish species limits.

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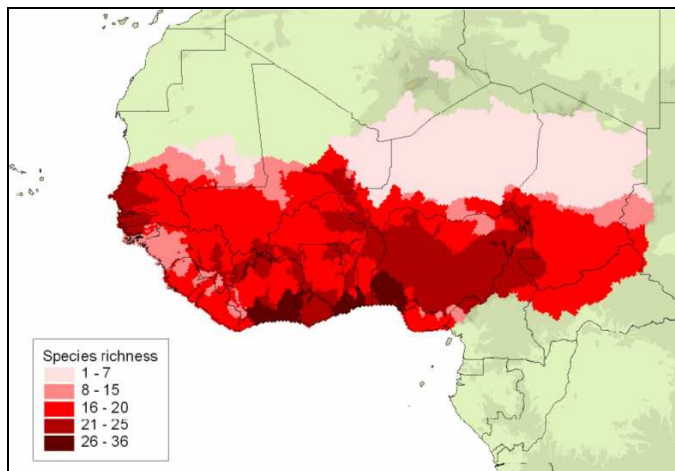
## SUMMARY OF THE WEST AFRICA FRESHWATER ASSESSMENT

By Mary B. Seddon

This IUCN project commenced in 2005, with assessments (Table 1) led by Thomas Kristensen and Anne-Sofie Stensgaard and evaluations by Mary Seddon and Anna McIvor, and was completed in 2007. These species will be placed on the IUCN *Red List* for 2008.

#### Regional hotspots

The main areas of endemism lay in the streams and rivers of Sierra Leone, Liberia and Ivory Coast through to western Nigeria.



Map of species richness. Pink/red – areas assessed.

#### Threats

The declining quality of habitats on the rivers in West Africa results from a variety of sources including use of pesticides in crop plantations, expansion of bauxite mining and damming for hydro-electric power. The pollution, sedimentation, changing flow regime and increased water temperature threaten a range of endemic species from Sierra Leone, Ivory Coast and Guinea. The most notable species are those in genera that are restricted to West Africa (e.g. *Sierraia outambensis*, *Soapitia dageti*). Some bivalves in River Casamance (Senegal) have not been recorded recently and may

**Table 1.** Regional threat assessments for West Africa.

IUCN <i>Red List</i> Category	Number of species
Critically Endangered	5
Endangered	6
Vulnerable	3
Near Threatened	2
Least Concern	57
Data Deficient	16
Not Assessed	5
Total	95

be extinct (D. van Damme, personal communication).

The rapid decline of Lake Chad over the last 20 years has led to listing of four endemic taxa, although the taxonomic status of these species requires review.

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## VERNALIZATION REQUIREMENTS OF TERRESTRIAL GASTROPODS AND GLOBAL WARMING

By Aydın Örstan

Vernalization is the cold-induced triggering of flowering in certain plant species. The delaying, and at the same time, the triggering of flowering by a long period of cold prior to spring is an adaptive process because it blocks flowering in the fall before the winter (Sung & Amasino, 2005). Most references to vernalization refer to it in relation to plants. But I see no reason why a similar process could not have evolved in some terrestrial invertebrates, including gastropods. A vernalization requirement in gastropods would prevent oviposition until the spring and would be adaptive if eggs and juveniles were likely to be killed by low winter temperatures.

In fact, Price (1979) showed that the semi-terrestrial snail *Melampus bidentatus* collected during the warmer months of the year did not lay eggs for almost a year when kept at 22 °C but that the same snails started laying eggs following a 20-day period at 3°C. Likewise, Elwell & Ulmer (1971) showed that the North American terrestrial endemic snail *Anguispira alternata* kept at room temperatures for long periods stopped laying eggs and that oviposition could be initiated by refrigerating the snails at 10 °C for four weeks.

How will the gastropod species that may require a vernalizing cold period prior to reproduction fare if global warming decreases the duration of suitably cold periods below critical lengths? Species with restricted ranges will face extinction unless they quickly evolve new variants that do not need vernalization to reproduce or they expand their ranges northward to colder climates.

It may, therefore, be prudent for us malacologists to try to identify the gastropod species that require vernalization, assess their extinction risks if global warming trends continue and devise plans to help the potentially endangered populations

survive. I propose three tests for identifying such species.

1. It should be possible to determine which species require vernalization by exposing captive snails and slugs to low temperatures and then comparing their reproductive output to those of control groups kept at constant temperatures year round (Elwell & Ulmer, 1971; Price, 1979).
2. If a molecular marker for vernalization (Sung & Amasino, 2005) can be identified in a species known to require vernalization, for example *A. alternata*, then the same marker can be searched for in other species.
3. By observing snails and slugs in the winter, it may be possible to identify the species with vernalization requirements. At the onset of winter, *A. alternata* clusters and hibernates under logs (Shelford, 1913), buried in soil (Jones, 1935) or under leaf litter (Riddle, 1981). *Allogona profunda*, another North American endemic snail, also becomes dormant for several months during the winter (Blinn, 1963). Therefore, as a working hypothesis, I propose a field marker: the species that remain dormant throughout the winter require vernalization prior to reproduction. Although this hypothesis is speculative at the moment, it is testable using test number 1.

Not all terrestrial gastropod species that live in areas where winters are cold become dormant in the winter. Some remain partially active during the winter. One such species is another North American endemic snail, *Mesodon thyroidus*, which apparently goes in and out of dormancy depending on the weather (Blinn, 1963). I suspect that species like *M. thyroidus* do not require vernalization to be able to reproduce in the spring.

It should be sufficient to apply the proposed tests, singly or in combination, only to those species whose ranges include higher latitudes, for the species of sub-tropical or tropical areas are unlikely to have evolved dependency on a vernalization process for reproductive success.

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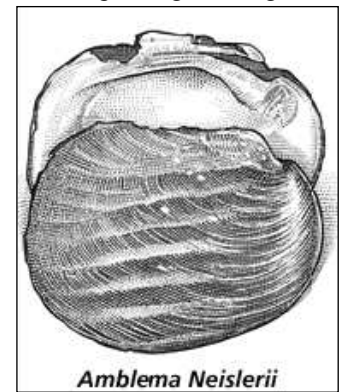
## FRESHWATER BIVALVES IN NORTH AMERICA

### Atlanta is flexing muscles in its war on a little bivalve - both rely on reservoirs drying up in a drought - Army Corps on the spot

By Ann Carrns

From: *The Wall Street Journal* online October 26, 2007: p A1

ATLANTA—They are unassuming little creatures that spend their lives burrowing into sandy beds of Florida’s Apalachicola River, filtering water and ingesting detritus. They are too tough for people to eat, but they make tasty snacks for blue herons. They are members of an endangered species, *Amblema neislerii*, more commonly known as the fat threeridge mussel. Until this summer, few people in Georgia had heard of the humble bivalves. But a prolonged drought has changed all that. The protected mussels depend for sustenance on the same river system that provides drinking water for millions of people in metro Atlanta. That’s causing an intensifying struggle for the same resource that Georgia state officials consider an epic battle of Man versus Mussel. At stake is a looming water shortage in Georgia, as well as the



survival of a species considered a bellwether for the health of the coastal ecosystem along Florida’s Panhandle. Metro Atlanta’s main source of drinking water is 39,000 acre [15,795 ha] Lake Lanier, a 50 year old reservoir built and controlled by the U.S. Army Corps of Engineers. Under a 2006 deal with the U.S. Fish and Wildlife Service, which co-administers the Endangered Species Act, the Corps has to send enough water from Lanier and other reservoirs into the Chattahoochee River and connecting rivers downstream, including Florida’s Apalachicola River, to sustain the endangered mussels. But because of the drought Georgia wants the Corps to reduce the amount of water it is letting through. The flow also cools two power plants – one in Alabama and one in Florida – located between Atlanta and the mouth of the Apalachicola in the Florida Panhandle 350 miles [563 km] away. The river’s delivery of fresh water also feeds the Gulf Coast spawning grounds of the threatened Gulf sturgeon. As months with little rain steadily lowered the level of Lake Lanier, which provides drinking water for roughly three million people, marooning boat docks and exposing vast flats of red mud, the Corps has continued to open the Lake Lanier dam enough to maintain a steady stream of the millions of gallons of water believed necessary to keep the mussels in Florida alive. State officials in Georgia estimate that if severe drought conditions persist, the reservoir could be nearly dry by the end of January. “If this water isn’t conserved now, it’s going to be lost for everyone”, says Atlanta attorney Bruce Brown, who heads the state’s legal

efforts in the water crisis. Last weekend, with a shriveled Lake Lanier as a backdrop, Georgia Governor Sonny Perdue lashed out, blaming “silly federal bureaucratic rules” for the state’s dilemma. An onlooker displayed a placard asking, “Where in the U.S. Constitution does it say, ‘protect the mussels?’” And U.S. Representative John Linder, a Republican, said the Corps is behaving “as though mussels are more important than our children and grandchildren”. Georgia filed suit against the Corps last week, demanding it hold back more Lake Lanier



water. A court hearing is scheduled for Nov. 19. Gov. Perdue also fired a separate volley Saturday, beseeching President Bush to declare a major disaster in Georgia – a step the state’s lawyers say would exempt the Corps from compliance with the Endangered Species Act. Governors of both Florida and Alabama countered by asking President Bush not to. The Federal Emergency Management Agency [FEMA], which is weighing the disaster request, says it’s not necessarily that simple. The last drought-related federal disaster decree was three decades ago, a FEMA spokesman says. The White House Council on Environmental Quality, which coordinates environmental policy, says it’s studying the situation. “I can’t emphasize how complicated this is”, says the FEMA spokesman, Aaron Walker. Alabama’s governor opposes a reduction in water flow partly because it could force the shutdown of a nuclear plant near his state’s border with Georgia. South of the state line in Florida, state officials and wildlife advocates say Georgia’s behavior is unneighborly, and putting at risk not only mussels and sturgeon but the oyster and seafood industry in Apalachicola Bay. The bay produces 90 % of Florida’s oysters, which depend on a balance of freshwater and saltwater to thrive. Reducing the river flow makes the bay saltier and lets predator fish swim closer in to eat the oysters. Some fishermen say their oyster catches are already suffering from the reduced freshwater flows caused by the lack of rain. “You’re talking about killing off this bay”, says Tommy Ward, an oyster dealer near Apalachicola. Florida officials say they would be more sympathetic if metro Atlanta did a better job of reducing its water use. For years, as unbridled development consumed millions of acres of real estate around Atlanta, water conservation was rarely a consideration. During a severe drought earlier this decade, the region began imposing summer water-use restrictions, but took few steps toward longterm water management policies once the rains returned, environmentalists say. After a summer of gradually escalating

water limits, the state last month banned most outdoor watering in northern Georgia. Residents in some areas are eagerly rattling out neighbors with suspiciously green lawns; one county even relies on reports from its fleet of school-bus drivers to root out illegal sprinkling. But golf courses can still legally water their greens, and commercial car washes continue to operate. On Tuesday, Governor Perdue ordered utilities throughout North Georgia to cut their water use by 10 %, and urged residents to treat drying lawns and dirty cars as a “badge of honor”. Tougher steps may be in the offing. The Corps agrees the outlook is “serious”, but not as dire as the state is portraying it. Lake Lanier has roughly nine months of water, if water below normal “usable” levels in the reservoir are used, according to the Corps. A Corps spokesman said the agency is consulting with the Fish and Wildlife Service on ways to reduce the flow of water without running afoul of the Endangered Species Act. If the Corps must curb water releases, one possibility to protect the mussels might be to lower levels incrementally, hopefully giving the creatures time to migrate toward water in the center of the stream. Federal biologist Jerry Ziewitz says the mussels can survive short periods of drought. “They literally clam up”, he said, by tightly closing their shells and holding their breath. But ultimately, they need water flowing over their gills to breathe. Allies of the mussels are skeptical. If the mussels dwindle further, says Dan Tonsmeire, head of environmental group Apalachicola Riverkeeper, it means the entire river and its estuaries are suffering too: “They’re the canaries in the coal mine”.

## MARINE MATTERS

### Cephalopod conservation

By Roland C. Anderson

People do not think of cephalopods as being endangered or threatened but many are being harvested for food and other purposes. Are any cephalopods endangered? So far, we do not know, but there are indications that numbers of some are decreasing rapidly.

Chambered nautiluses, *Nautilus* and *Allonautilus* spp., are nowhere near the numbers in the places they used to be caught in large numbers. Since the 1970s and 1980s thousands of these living fossils, little changed from the times 500 million years ago when they ruled the seas, have been caught for food, for their shells, for science or for public aquariums in Palau, Indonesia and the Philippines (Monks, 2002). But now few are caught in the deep-water traps where they were caught before.

The famed mimic octopus of Indonesia is getting even more difficult to find than it was before (Caldwell & Shaw, 2002). It was never easy to find, only in certain specific mudflats in undeveloped areas and it is considered rare anywhere. It looks like its numbers are rapidly decreasing as it is caught by local fishermen and sold to tropical fish stores and aquariums, in spite of its poor survival in captivity. It has never reproduced in captivity.

It looks like few if any octopuses, squids or cuttlefish are endangered from over-harvesting for food. Dr. James Wood (personal communication, 17 December 2007), proprietor of the Cephalopod Page, states that many cephalopods are good candidates for human harvest since “they are the weeds of the sea” and have rapid growth and semelparous life history strategies. To protect the giant cuttlefish (*Sepia apama*) of southern Australia from over-harvest, certain areas have been set aside as reserves where the cuttlefish lay eggs, a rare proactive stance by any government (Norman, 2000). However, that area is now threatened with a proposed desalinization plant (Faulkner, 2007).

There are few statistics to support whether any cephalopods are endangered or not. But one octopus species may have been eradicated or locally gone extinct. The Caribbean small-egged pygmy octopus, *Octopus joubini*, cannot be found any more where it was once common (J.A. Mather, personal communication, 16 December 2007). Other pygmy octopuses in the Caribbean may be a different species as they have large eggs (*O. mercatoris*). Locally, some bays where *O. joubini* used to be common are now bereft of that species, either due to human activities (pollution), climate change or over-collecting.

In a conservation newsletter one would expect to hear about molluscan extinctions, endangerments or threats, but there is at least one case in which a cephalopod increased its range because of human intervention. The pharaoh cuttlefish, *Sepia pharaonis*, which was historically harvested throughout the Red Sea and was originally described from the Gulf of Suez at the head of the Red Sea, is now found and harvested in the western Mediterranean as a Lessepsian migrant, having moved through the Suez Canal. It has increased its range into the Mediterranean and now one in four cuttlefish caught in Israel is *S. pharaonis*. Most of the rest are the common cuttlefish, *S. officinalis* (Mienis, 2003). It is interesting that humans rail against alien animal introductions such as slugs that eat our flowers and vegetables, or lionfish that affect our marine ecology and threaten scuba divers, but the introduction of a harvestable commodity such as the pharaoh cuttlefish merits little mention in the media.

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## Marine molluscs at the reef flat of Punta Galeta (Panamanian Caribbean)

By Maria Virginia De La Hoz

Punta Galeta is a natural reserve of the Panamanian Caribbean (west of the city of Colón, lat 9°24'18"N, long 79°51'48.5"W). It is located at Bahia Las Minas, a shallow water embayment, the margins of which are dominated by mangrove forests, seagrass beds and coral reefs. Its position on a global oil transport route makes it vulnerable. Punta Galeta provides complex habitats for many mollusc species because of the convergence of mangroves, sea grasses and coral reefs, making it an area of great biological value.



Location of Punta Galeta in Panama.

For this reason the Smithsonian Tropical Research Institute (STRI) has carried out long term monitoring of the coral reef ecosystem, including recently a malacological community survey, after some unplanned environmental modifications occurred close to Galeta. These disturbances included a major oil spill that occurred in 1986 at Bahia Las Minas, near these potentially vulnerable ecosystems. Also, solid wastes are transported constantly, by currents, from the Panama Canal towards the reef flat of Galeta. Overexploitation of natural resources makes the situation worse.

This article summarizes some results from a baseline study carried out in 2005 to document molluscan richness and abundance in the marine ecosystems of Punta Galeta, emphasizing the reef flat. Sampling was done by snorkeling or by walking along ten transects perpendicular to the shore line; the shallow waters ranged from a few centimeters to about 1.5 m in depth. The survey constitutes the latest information gathered and also resulted in development of a reference collection available at the Galeta Marine Laboratory (STRI).

In total, 86 species (Table 1) were recorded (34 % are recorded only as dead shells on the beach), contrasting with the more than 200 species recorded in the early 1980s before the oil spill, demonstrating that the mollusc fauna of Punta Galeta needs more attention. The rocky intertidal zone of the reef flat is the largest habitat occupied by molluscs in Galeta because of its irregular topography, which allows them to protect themselves from external dangers. The very shallow environment typical of the area, and the presence of extremely low tides, is an oceanographic condition not very common in the Caribbean, that allows the presence of abundant bivalves, gastropods and polyplacophorans adapted to withstand varying periods of drying.

**Table 1.** Mollusc species found in the shallow marine ecosystems of Punta Galeta (Panama). VA – very abundant, C – common, O – occasional, R – rare. Asterisked species only recorded as dead shells on the beach.

Species	Relative abundance
<i>Barbatia domingensis</i>	C
<i>B. tenera</i>	VA
<i>Arca imbricata</i>	O
<i>Anadara notabilis</i> *	R
<i>Pinna carnea</i> *	O
<i>Atrina rigida</i> *	R
<i>Pinctada imbricata</i>	O
<i>Isognomon bicolor</i>	VA
<i>I. radiatus</i>	O
<i>Lima</i> sp.	R
<i>Lucina pectinata</i> *	C
<i>Codackia orbicularis</i> *	VA
<i>Crassinella martinicensis</i> *	R
<i>Chama macerophylla</i> *	R
<i>Periglypta listeri</i> *	O
<i>Dosinia</i> sp.*	O
<i>Tellina radiata</i> *	C
<i>T. listeri</i> *	O
<i>T. laevigata</i>	R
<i>Donax variabilis</i> *	C
<i>Semele proficua</i> *	R
<i>Asaphis deflorata</i> *	O
<i>Trachycardium muricatum</i> *	R
<i>Corbula caribaea</i>	R
<i>Acaea pustulata</i> *	O
<i>Diodora cayennensis</i>	O
<i>Diodora variegata</i>	O
<i>Diodora</i> sp.	O
<i>Cittarium pica</i>	O
<i>Astraea caelata</i> *	C
<i>Astraea tecta tecta</i>	O
<i>Nerita tessellata</i>	O
<i>N. fulgurans</i>	VA
<i>N. versicolor</i>	VA
<i>N. peloronta</i>	VA
<i>Neritina virginea</i>	C
<i>N. melagris</i>	C
<i>Littorina angulifera</i>	C
<i>L. ziczac</i>	C
<i>L. angustior</i>	VA
<i>Nodilittorina tuberculata</i>	O
<i>Tectarius muricatus</i>	C
<i>Modulus modulus</i>	C
<i>M. carchedonius</i>	O
<i>Cerithium eburneum</i>	C
<i>C. lutosum</i>	C
<i>Cerithium litteratum</i>	O
<i>Batillaria minima</i>	VA
<i>Strombus pugilis</i>	O
<i>S. raninus</i>	O
<i>S. gigas</i>	R
cf. <i>Hipponix antiquatus</i> *	R
<i>Crepidula</i> sp.	C
<i>Natica</i> sp.*	C
<i>Trivia pediculus</i>	R
<i>Cypraea zebra</i> *	R

<i>Cypraeassis testiculus</i>	O
<i>Cassis tuberosa</i>	R
<i>Charonia variegata</i> *	R
<i>Cymatium pileare</i> *	O
<i>Tonna galea</i> *	O
<i>Pterotyphys pinnatus</i>	R
<i>Thais deltoidea</i>	R
<i>Purpura patula</i>	C
<i>Morula nodulosa</i>	O
<i>Pisania pusio</i>	C
<i>Nassarius vibex</i> *	R
<i>Leucozonia ocellata</i>	O
<i>Latirus infundibulum</i>	O
cf. <i>Latirus carniferus</i>	O
<i>Ficus communis</i>	O
<i>Vasum muricatum</i>	R
<i>Morum oniscus</i>	C
<i>Olivella floralia</i> *	O
<i>Oliva reticularis</i>	R
<i>Mitra nodulosa</i>	R
<i>Mitra barbadensis</i>	R
cf. <i>Terebra nassula</i> *	R
<i>Bulla striata</i> *	VA
<i>Haminoea</i> cf. <i>succinea</i> *	R
<i>Ischnochiton</i> sp.	O
<i>Ischnoplax pectinata</i>	R
<i>Stenoplax purpurescens</i>	R
<i>Acanthopleura granulata</i>	C
<i>Acanthochitona rhodea</i>	C
<i>Octopus vulgaris</i>	C

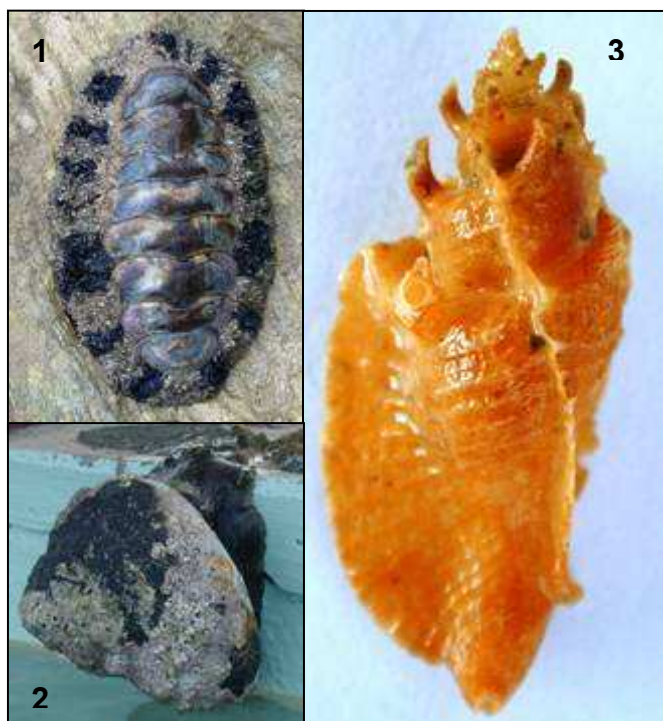
Gastropods comprise the bulk of the community, of which the high relative abundances of snails, including species of *Nerita*, *Littorina* and *Tectarius*, indicates its recovery after the spill, after having suffered high mortalities. However, families believed to be vulnerable and previously present in the area, seem to be very rare or absent today (Conidae, Olividae, Volutidae, Cypraeidae, Muricidae, Fasciolaridae). Further monitoring may confirm the local extinction of species belonging to these families.

Additional factors not related to the spill, may have caused the lowering of species richness and abundance. One of these is overcollecting of major species such as edible *Strombus* spp. and *Cittarium pica*, living specimens of which are rare, and *Crassostrea rhizophorae*, *Mytilopsis sallei* and *Brachiodontes exustus*, which are no longer present in the area.

Contamination by all kind of wastes from the Panama Canal may be another cause. The great accumulations of empty shells are a peculiar feature at the beaches of Punta Galeta to be assessed in further research. Most of these species were not recorded alive in this study. Maybe some of them have been transported from adjacent habitats, including the nearby subtidal zone in deeper waters beyond the fore reef, where no samples were taken. Nevertheless, many of them are documented from shallow waters, so predation by another species, such as *Octopus vulgaris*, may be important, or they may have been affected by pollution, or by overcollection. This could be confirmed through future long term monitoring.

Understanding the effects of environmental threats faced by molluscs in reef flats has been neglected; therefore rigorous

environmental assessments, based on previous results, are needed. Greater efforts are needed to enhance public awareness of the value and vulnerability of marine molluscs at this important natural reserve, in spite of work STRI is carrying out in Panama in its long-term coral reef monitoring and environmental education programs.



1 – *Acanthopleura granulata*, a common polyplacophoran on the rocky substrate; 2 – *Cittarium pica*, one of the most overcollected species at the study area; 3 – *Pterotyphys pinnatus*, a rare muricid found in very shallow waters.



*Tectarius muricatus*, often at high densities in the driest places in the reef flat.

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## Six thousand foreign spider conchs destroyed in Elat

By Henk K. Mienis

On 16 October 2007 a message appeared in the local news in Israel that in Elat a large amount of marine shells and some corals had been found in a rented room by inspectors of the Israel Nature and National Parks Protection Authority (INNPPA). The material was packed in seven large tea-boxes (Fig. 1) and consisted of more than 6000 Spider conchs and some pieces of corals. The material was confiscated by the INNPPA because in Israel both molluscs and corals are protected animal groups that may not be collected or imported without a proper license. In spite of great efforts no trace has been found of the importer, the origin of the material or the date of its arrival in Israel.



Fig. 1. Close-up of the spider conchs and corals before being crushed.

Two months later the INNPPA decided to destroy the material. The actual destruction took place on 23 December 2007 with the help of a road-roller (Fig. 2), which left behind a heap of 1.5 tons of shell and coral crunch (Fig. 3).

Fortunately, a small sample consisting of 32 spider conchs had been saved for further study and permanent storage in the National Mollusc Collections of the Hebrew University of Jerusalem (HUJ) and the Tel Aviv University (TAU).

The following species were involved: arthritic spider conch, *Lambis (Harpago) chiragra arthritica* Röding, 1798 (HUJ 51745/4 and TAU MO 60003/4); orange spider conch, *Lambis*

(*Lambis*) *crocata crocata* (Link, 1807) (HUJ 51746/1); common spider conch, *Lambis* (*Lambis*) *lambis* (Linnaeus, 1758) (HUJ 51747/8 and TAU MO 60004/7); lesser scorpion conch, *Lambis* (*Millepes*) *scorpius indomaris* Abbott, 1961 (HUJ 51748/4 and TAU MO 60005/4).

The presence of *Lambis chiragra arthritica* and *Lambis scorpius indomaris* shows that the material originated somewhere in the Indian Ocean, most likely from the east coast of Africa. All four species are shallow water dwellers. Since some of the material still contained the dried animal, including the operculum, the specimens were not originally collected for food, but for the shell trade.



Fig. 2. Road-roller ready for crushing the shells and corals. In the background some of the tea-boxes.



Fig. 3. Mixed spider conch and coral crunch.

I thank Dr. Reuven Ortal and the photographer, Keren Mizrahi, both of the Israel Nature and National Parks Protection Authority, for supplying me with, respectively, the background information and the photographs.

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## Visitors to the east coast of Sinai in Egypt continue to impact the populations of *Lambis* and *Tridacna*

By Henk K. Mienis

As I have written in a previous issue of *Tentacle* (Mienis, 2002) the entire phylum Mollusca is protected by law in Israel. This means not only that you are not allowed to collect molluscs without a permit anywhere in Israel, but also for maintaining a collection or receiving or importing self-collected mollusc material from abroad you need in principle a license provided by the Israel Nature and National Parks Protection Authority (INNPPA). The latter ruling especially is hardly known to the general public.

The east coast of Sinai in Egypt is a favourite spot for many Israeli holidaymakers, and especially during Passover and Succot (Feast of Tabernacles) hordes of Israelis invade Sinai. Being abroad they think that what is forbidden in the tiny part of east Sinai near Elat, is allowed in the huge Egyptian part of that peninsula. They return to Israel via the Taba border crossing with their car boot loaded with trophies collected in the shallow waters of the Gulf of Aqaba not knowing that customs officers on both side of the border will inspect their car nor that on the Israeli side rangers of the INNPPA will also carry out inspections. All the trophies – shells, corals, crabs, sea stars, fossils, dried puffer fish, carapaces of either sea turtles or tortoises, horns of mountain-goats and even stones polished by the scouring effect of seawater and sand, whether self-collected or bought from local Bedouins – will be seized by the authorities. In extreme cases this will be followed by prosecution.

Usually after several months all this impounded material will be transferred by the INNPPA to either the Mollusc Collection of the Hebrew University of Jerusalem (HUJ) or that of the Tel Aviv University (TAU). In order to give you an idea of the composition of such shipments, I describe briefly an example of recently received material. Through the courtesy of Dr. Reuven Ortal (INNPPA) I received on 22 July 2007 about 150 kg of shells, corals, sea stars, stones, etc. that had been confiscated from travellers arriving from Sinai and crossing the border at the Taba check-point.

The material received consisted of:

Molluscs: *Tectus dentatus* (8), *Tricornis tricornis* (4), *Lambis truncata sebae* (32 adult specimens), *Chicoreus ramosus* (3), *Chicoreus virgineus* (2), *Tridacna squamosa* (10 complete live-collected specimens), *Tridacna maxima* (32 complete live-collected specimens), *Tridacna* spp. (25 loose valves) and about 5 kg of various smaller shells, 80 % of which consisted of valves of *Asaphis violascens* and *Circenita callipyga*

Corals: *Fungia echinata* (4), *Fungia fungites* (2) and various other species (10)

Sea urchins: *Heterocentrotus mammilatus* (10 loose spines)

Sea stars: unidentified large species up to 25 cm diameter (14)

Mammals: *Capra ibex* (1 horn)

All the rest consisted of beach pebbles, heavily damaged shells and coral crunch.

The molluscs have been incorporated into the HUJ mollusc collection. The corals and other invertebrates have been given

to the invertebrate collection of the same institute, while the ibex horn has been given to the paleontological collection, where it will be used for DNA research in the future.

Striking was the large number of live-collected *Lambis* and *Tridacna* among the confiscated material. The 67 specimens of *Tridacna* are especially of concern because all species belonging to this genus are not only listed in CITES Appendix II but in order to collect them one has to free them from the corals surrounding these large bivalves. In other words, in order to collect a *Tridacna* one has to destroy part of the biotope in which they are living.

This shipment of confiscated material has been chosen only as an example. Usually twice a year such a load of poached material arrives at one of the universities. In order to reduce the collecting of shells and the destruction of coral reefs along the coast of east Sinai in Egypt warning signs in Hebrew, Arabic and English that it is prohibited to bring shells, corals and other marine and terrestrial biological specimens from Sinai to Israel should be posted on the Israeli side of the Taba border crossing. Leaflets containing a similar message should be handed out to everyone during passport control. Hopefully this will reduce the unnecessary damage caused to the marine environment along the east coast of Sinai.

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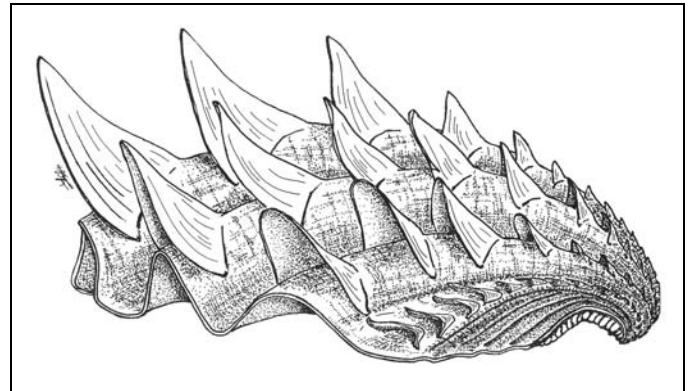
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## Giant clam conservation and research in Singapore

By Peter A. Todd & James R. Guest

Research on giant clams in Singapore has been ongoing for the past eight or nine years, with the few precious brood-stock animals being passed on from one researcher to another like family jewels! Previous efforts have focused on reproduction and aquaculture, but more recently we have been looking at giant clam conservation, as well as some additional pure research. In a recent paper (Guest *et al.*, 2007) we assessed the current status of giant clam populations around seven of Singapore's reefs, encompassing a total area of 9670 m<sup>2</sup>. The surveys revealed very low mean densities (just 0.24 individuals per 100 m<sup>2</sup>) and only three species were encountered (*Tridacna squamosa*, *T. maxima* and *T. crocea*). Although there is little in the way of baseline data, earlier papers suggest that these animals were once much more abundant on Singapore's reefs. In 2004, we successfully spawned and reared a large batch of juveniles of *T. squamosa* in hatchery facilities at one of Singapore's southern islands. To see whether dwindling giant clam populations can be actively restored despite Singapore's heavily impacted environment, we transplanted 144 juvenile clams of *T. squamosa* to four reefs to study survival and growth. After seven months, 116 (80.6 %) were recovered and all specimens had increased in

shell length (growth rates among reefs ranging from 3.3 mm to 4.8 mm per month) suggesting restocking efforts using maricultured clams may be effective in enhancing populations.



Juvenile *Tridacna squamosa* valve. (Illustrator: Ang Yuchen)

Additional, yet unpublished, conservation work includes a study modelling the dispersal of local giant clam larvae to determine the degree of connectivity among Singaporean reefs and those of neighboring countries. We are also making good progress exploring the effects of artificial substrates on larval settlement. Both these projects are aimed at eventually increasing local recruitment. Finally, we have demonstrated that *Tridacna squamosa* juveniles aggregate, both in the lab and on the reef, and that this is via chemotaxis (Huang *et al.* 2007). This behaviour is probably an anti-predator response or a way of ensuring fertilization success during synchronous spawning events. If the latter is the case, the conservation implication is that restocking efforts should ensure that clams are placed in clusters rather than spread widely. There are considerable challenges involved in maintaining healthy reef communities around Singapore and only one small area has so far been designated as a nature reserve. Without a concerted effort to conserve giant clams it is highly likely that these iconic species will one day vanish from Singapore's reefs.

Guest, J.R., Todd, P.A., Goh, E., Reddy, K.P. & Sivalonganathan, B.S. 2007. Can giant clam (*Tridacna squamosa*) populations be restored on Singapore's heavily impacted coral reefs? *Aquatic Conservation: Marine and Freshwater Ecosystems* doi:10.1002/aqc.888

Huang, D., Todd, P.A. & Guest, J.R. 2007. Locomotion and aggregation in the fluted giant clam (*Tridacna squamosa* L.). *Journal of Experimental Marine Biology and Ecology* 342: 269-281.

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## BOOK REVIEW

### *Vigilância e controle de moluscos de importância epidemiológica: diretrizes técnicas* [Surveillance and control of molluscs with epidemiological importance: technical directives]



By Ronaldo Santos do Amaral, Silvana Carvalho Thiengo & Otávio Sarmiento Pieri [communicated by Silvana C. Thiengo]

Brasil, Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Vigilância em Saúde. 2007. *Vigilância e Controle de Moluscos de Importância Epidemiológica: Diretrizes Técnicas* [Surveillance and Control of Molluscs with Epidemiological Importance: Technical Directives]. Editora do Ministério da Saúde, Brasília, 178 p., il. (Série A - Normas e Manuais Técnicos). [In Portuguese]

This book, written by 17 experts commissioned by the Brazilian Ministry of Health contains a comprehensive and well illustrated review of the techniques and guidelines for surveillance and control of molluscs with medical and veterinary importance in Brasil. Since schistosomiasis caused by *Schistosoma mansoni* is the main parasitic disease transmitted by snails in Brasil, the book deals most extensively with the intermediate hosts (*Biomphalaria glabrata*, *B. straminea* and *B. tenagophila*) emphasizing the following themes: ecological aspects, techniques of collecting, laboratory rearing, relaxing and fixing for dissection, packing and shipping of snails, as well as searching for and identifying *Schistosoma mansoni* larval stages and rearing of the trematode in the laboratory. For host snail identification a

detailed, well illustrated dissection procedure is provided and molecular techniques are outlined. Guidelines and techniques for biological, physical and chemical control of the snail hosts are given, and the national environmental laws regulating the application of control measures are transcribed and commented on. An illustrated list of terrestrial and freshwater exotic species of economic and parasitological importance (*Helix aspersa*, *Achatina fulica*, *Melanoides tuberculatus*, *Limnoperna fortunei* and *Corbicula largillierti*) is also provided. Following on from this theme the book presents control techniques for the African snail, *A. fulica*, as recommended by IBAMA (the Brazilian Environment Institute), as Brasil is currently experiencing an explosive phase of invasion by this mollusc [see Thiengo *et al.* (2007) in the list of recent publications, below]. This book is primarily intended for health planners, managers and field staff involved in control programs. However, it will certainly appeal to professional parasitologists as well as to biologists interested in snail hosts of medical, veterinary and economic importance. And the invasive species dealt with are of conservation relevance. The book is accessible at [http://portal.saude.gov.br/portal/arquivos/pdf/manual\\_controle\\_moluscos.pdf](http://portal.saude.gov.br/portal/arquivos/pdf/manual_controle_moluscos.pdf)

Silvana C. Thiengo, Departamento de Malacologia, Instituto Oswaldo Cruz/Fiocruz, Av. Brasil 4365, 21040-900 Rio de Janeiro, RJ, Brasil. [sthiengo@ioc.fiocruz.br](mailto:sthiengo@ioc.fiocruz.br)

## RECENT PUBLICATIONS RELEVANT TO MOLLUSC CONSERVATION

- Chiba, S., Davison, A. & Mori, H. 2007. Endemic land snail fauna (Mollusca) on a remote peninsula in the Ogasawara archipelago, northwestern Pacific. *Pacific Science* 61: 257-265.
- Espinosa, F., Guerra-García, J.M. & García-Gómez, J.C. 2007. Sewage pollution and extinction risk: an endangered limpet as a bioindicator. *Biodiversity and Conservation* 16: 377-397.
- Florens, F.B.V. & Baider, C. 2007. Relocation of *Omphalotropis pilcosa* (Pfeiffer, 1852), a Mauritian endemic landsnail believed extinct. *Journal of Molluscan Studies* 73: 205-206.
- Gargominy, O. 2007. Pas seulement des *Partula* au menu d'*Euglandina rosea*. *MalaCo* 4: 150-151.
- Gargominy, O. & Ripken, T. 2006. Données nouvelles sur les mollusques (Mollusca, Gastropoda) du Parc national du Mercantour (France) [New data on the molluscs (Mollusca, Gastropoda) of the Mercantour National Park (France)]. *MalaCo* 3: 109-139.
- Graf, D.L. & Cummings, K.S. 2007. Review of the systematics and global diversity of freshwater mussel species (Bivalvia: Unionoidea). *Journal of Molluscan Studies* 73: 291-314.
- Hayes, K.A., Tran, C.T. & Cowie, R.H. 2007. New records of alien Mollusca in the Hawaiian Islands: nonmarine snails and slugs (Gastropoda) associated with the horticultural trade. *Bishop Museum Occasional Papers* 96: 54-63.
- Hershler, R., Liu, H.-P. & Sada, D.W. 2007. Origin and diversification of the Soldier Meadow springsnails (Hydrobiidae: *Pyrgulopsis*), a species flock in the northwestern Great Basin, United States. *Journal of Molluscan Studies* 73: 167-183.
- Kabat, A.R. & Petit, R.E. 2007. Glenn Robert Webb (1918-1999), his molluscan taxa, and his journal *Gastropodia* (1952-1994). *Zootaxa* 1589: 1-21.

- López, M.A., Altaba, C.R., Rouault, T. & Gisbert, E. 2007. The European sturgeon *Acipenser sturio* is a suitable host for the glochidia of the freshwater pearl mussel *Margaritifera auricularia*. *Journal of Molluscan Studies* 73: 207-209.
- McIvor, A.L. & Aldridge, D.C. 2007. The reproductive biology of the depressed river mussel, *Pseudanodonta complanata* (Bivalvia: Unionidae), with implications for its conservation. *Journal of Molluscan Studies* 73: 259-266.
- Ohbayashi, T. & Takeuchi, K. 2007. Fluctuation of the distribution and population of the giant African snail, *Achatina fulica* Bowdich (Pulmonata: Achatinidae) in Chichijima and Hahajima Islands, of the Ogasawara (Bonin) Islands, from the years 1995 to 2001. *Japanese Journal of Applied Entomology and Zoology* 51: 221-230. [in Japanese with English summary]
- Ohbayashi, T., Okochi, I., Sato, H., Ono, T. & Chiba, S. 2007. Rapid decline of endemic snails in the Ogasawara Islands, Western Pacific Ocean. *Applied Entomology and Zoology* 42: 479-485.
- Santos, S.B. dos, Pimenta, A.D., Thiengo, S.C., Fernandez, M.A. & Absalão, R.S. (eds.) 2007. *Tópicos em Malacologia – Ecos do XVIII Encontro de Malacologia*. Sociedade Brasileira de Malacologia, Rio de Janeiro. xiv + 365 p.
- Solymós, P. 2007. Are current protections of land snails in Hungary relevant to conservation? *Biodiversity and Conservation* 16: 347-356.
- Sólymos, P. 2007. Geographic and taxonomic bias in land snail distribution data of Hungary. *Community Ecology* 8: 239-246.
- Sólymos, P., Czentye, I. & Tutkovic, B. 2007. A comparison of soil sampling and direct search in malacological field inventories. In: *Contributions to soil zoology in central Europe, II. Proceedings of the 8th central European workshop on soil zoology held in České Budějovice, Czech Republic, April 20-22, 2005* (eds. Tajovský, K., Schlaghamerský, J. & Pižl, V.), p. 161-163. Institute of Soil Biology, Biology Centre, Academy of Sciences of the Czech Republic, České Budějovice. [www.univet.hu/users/psolymos/personal/publications.php](http://www.univet.hu/users/psolymos/personal/publications.php)
- Terrier, A., Castella, E., Falkner, G. & Killeen, I.J. 2006. Species account for *Anisus vorticulus* (Troschel, 1834) (Gastropoda: Planorbidae), a species listed in Annexes II and IV of the Habitats Directive. *Journal of Conchology* 39: 193-205.
- Thiengo, S.C., Faraco, F.A., Salgado, N.C., Cowie, R.H. & Fernandez, M.A. 2007. Rapid spread of an invasive snail in South America: the giant African snail, *Achatina fulica*, in Brasil. *Biological Invasions* 9: 693-702.

in such a manipulation process. These problems can be avoided by using sophisticated database servers and database connections prior to analysis, but such instruments need information technology skills that are sometimes beyond the capabilities of an individual researcher or naturalist.

The software R is a language and environment for statistical computing and graphics ([www.r-project.org](http://www.r-project.org)). Because R is available as free software, is platform independent and is highly extensible, I decided to write an extension for faunistic count data handling and reporting. The package called “mefa” (current version is 1.0-1) can be downloaded in various formats (source, Windows and MacOS X binaries) from <http://cran.r-project.org/src/contrib/Descriptions/mefa.html> or can be installed directly from the R menu. The name “mefa” stands for metafaunistics, indicating that handling of basic data is only the first, but the most critical and sometimes most time consuming part of data analysis. It contains functions to create and manage objects combining basic faunistic (sample/species/count or cross-tabulated) count data and sample/species attribute tables. Segments (gender, life stage, size class, etc.) within the count data and samples with zero count can be indicated and used in subsequent operations. Reports can be generated in plain text or LaTeX formats. The documentation contains a manual with examples (simple artificial data and real world malaco-faunistic data sets) and a demo (by typing “demo(dolina)” into the R console). Comments on the usefulness and functionality of the package and bug reports are especially welcome.

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## IUCN AND SSC NEWS

All the following communicated by Mary Seddon, Mollusc Specialist Group Chair ([Mary.Seddon@nmgw.ac.uk](mailto:Mary.Seddon@nmgw.ac.uk); additional contact details in the list of Mollusc Specialist Group members at the end of this issue of *Tentacle*).

### Paul Pearce-Kelly wins 2007 Ulysses S. Seal Award

While it is an awesome responsibility to prevent the extinction of those species that are big and charismatic, it is, additionally, an increasingly challenging task to conserve those creatures that most people do not get excited about – at least not in a positive way – such as barberry carpet moths, palm beetles, giant earwigs, spiky yellow wood lice, field crickets, red-barbed ants, not to mention the *Partula* land snails that we are all aware of!

A dedicated champion of the conservation of these small animals has been Paul Pearce-Kelly of the Zoological Society of London and a member of several IUCN/SSC Specialist Groups (including the IUCN/SSC Mollusc Specialist Group and the IUCN/SSC Conservation Breeding Specialist Group). Paul has spearheaded conservation programmes for a great

## NEW SOFTWARE

### From malacological records to analysis: an R package for handling and reporting count data

By Péter Sólymos

Data resulting from malacological field inventories are often stored primarily in a hard copy notebook format and subsequently typed into a spreadsheet. These spreadsheets contain location (samples) and taxon (species) specific information and respective count data. These data can rarely be used directly in a statistical analysis, because one often needs sample and species specific attributes to account for a given question or hypothesis. The manipulation of the data (most commonly subsetting and ordering) is time consuming and may lead to mistakes, and mistakes may lead to false conclusions. Thus it is advisable to check each step rigorously

number and variety of invertebrates. He has now won the 2007 Ulysses S. Seal Award for Innovation in Conservation.

Paul has been described as “the most optimistic, even downright cheerful, conservationist I know” and “a whirlwind of boundless energy and enthusiasm for the task at hand”. For many years Paul, with a fantastic team of zoo specialists, has maintained a conservation breeding programme for the threatened *Partula* species from the islands of the Pacific. Along with Trevor Coote they are now reintroducing some snails back to the islands, with the protection of electric fences. It’s great to see Paul’s energy and enthusiasm recognised, especially for an award in honor of Ulysses S. Seal who was also a very dynamic character.

### **World Conservation Union and climate change**

World Conservation Union President Valli Moosa has voiced his concerns over the international community’s slow response to the causes and impacts of global warming. He said that climate change is unequalled in terms of its truly global nature and that to rise to the challenge and cut greenhouse gases drastically is the responsibility of everyone. The SSC has now set up a specific programme looking at the impacts of climate change on species, and Wendy Foden has been appointed as a programme officer to work on this with funding from the MacArthur Foundation. Wendy recently held a workshop to start the programme and several members of the Mollusc Specialist Group provided comments on issues that concerned them. If you have a species that may be directly impacted by climate change, then Wendy would like to hear from you. Anticipated project outcomes include new tools for conservation planning and species extinction risk assessment. The full report is available at:

[www.iucn.org/themes/ssc/news/2007\\_articles/Climate\\_Change\\_workshop.pdf](http://www.iucn.org/themes/ssc/news/2007_articles/Climate_Change_workshop.pdf)

### **IUCN Species Programme receives GIS software grant to support species assessments**

The IUCN Species Programme has received a GIS software grant through the Environmental Systems Research Institute (ESRI) Conservation Grant Program to support species assessments.

### **Encyclopedia of Life**

A presentation on the Encyclopedia of Life (EOL) initiative was given at IUCN headquarters this month by Dr. Jim Edwards. He demonstrated what the online encyclopedia will look like with a video that you can see on the website at: [www.eol.org/home.html](http://www.eol.org/home.html). EOL is a collaborative effort between a number of different organizations and as such IUCN will be contributing species conservation status information to it in the coming months and years. The first 30,000 pages are scheduled to be broadcast in February 2008.

### **IUCN SSC Sustainable Use Specialist Group (SUSG) Newsletter**

The December 2007 issue of the IUCN SSC Sustainable Use Specialist Group Newsletter is now available as a pdf at: [http://intranet.iucn.org/webfiles/doc/SSC/Gen\\_docs/SustainableDecember2007.pdf](http://intranet.iucn.org/webfiles/doc/SSC/Gen_docs/SustainableDecember2007.pdf) and as html at:

<http://iucn.org/themes/ssc/susg/sustainable/index.htm>

The Sustainable Use Specialist Group website can be found at: <http://iucn.org/themes/ssc/susg/>

### **Nations urged to adopt global vision to save oceans from climate-accelerated collapse**

Late on 18 December 2007 at the United Nations General Assembly, the World Conservation Union (IUCN), the only conservation organization with official observer status at the UN, called for the rapid development of a network of marine protected areas to help the oceans cope with climate change. The full report is available at:

[www.iucn.org/en/news/archive/2007/12/20\\_oceans.htm](http://www.iucn.org/en/news/archive/2007/12/20_oceans.htm)

### **Countdown 2010: a global initiative going local**

Local governments around the world will now be more involved in helping to reduce the loss of biodiversity, thanks to a new agreement that IUCN has signed with ICLEI – Local Governments for Sustainability. “This document marks a milestone for an increased engagement between the constituency of conservation and local governments for advancing the 2010 biodiversity target on the ground. A global commitment needs local action”, said IUCN’s new Director General, Julia Marton-Lefèvre. The full report is available at:

[www.iucn.org/en/news/archive/2007/10/8\\_countdown.htm](http://www.iucn.org/en/news/archive/2007/10/8_countdown.htm)

### **Species Survival Commission (SSC) is restructuring**

Over the last three years the Commission Chair, Holly Dublin, has been working with programme officers and the executive committee to review the current structure of SSC and look at how it might be better structured to deal with species conservation. There are over 7000 volunteers currently working in SSC and as a former Specialist Group Chair, Holly was well aware of the very different work programmes that some groups have established.

Most people recognise that the SSC’s strength is its scientific expertise. This expertise has created the *Red List of Threatened Species* and is a critical differentiator for SSC and IUCN for the future. However, the world’s funding does not easily flow into “basic research” areas. Funding and other pressures focus on deliverables, results and emotional priorities. Thus, SSC finds itself in a position where it must align its value to fundable projects that mean something to humanity and its view of what is important, while retaining taxonomic excellence. The new SSC structure, by clearly separating these activities, gives stature to each and removes some of the problems inherent for groups trying to play too

many roles.

At present, the proposals are that Specialist Groups will not exist in the next triennium, and that we will move to either “Conservation Groups” or “Red List Authorities”, depending on the work undertaken by the group. These decisions will be finalised over the next few months, but will not impact the work that you are doing. In essence it may well mean that there will be a mollusc group dealing with Molluscan Conservation actions and an entirely separate Mollusc Red List Authority.

The new structure is intended to achieve these objectives and to:

- better suit the structure to required functions, creating a more logical, purpose-built organization capable of directly delivering valuable pressure-state-response outputs within IUCN’s “One Programme” agenda and the programmatic and strategic plans of IUCN and the SSC
- respond to recommendations in previous External Reviews of Commissions and the 2001 SSC Voluntarism Study, while increasing participation and responsibility of Chairs
- create a more focused and manageable Commission (more targeted operations, and clearer roles, relationships and responsibilities) while simultaneously creating more and more focused opportunities for the volunteer network
- increase and clarify opportunities for contributions from partners, supporters and donors
- strengthen the focus, flexibility, and consistency of the Red Listing process
- better ensure transparency, accountability, objectivity and scientific independence of the Red Listing process
- make it easier for Specialist Groups to have an explicit work plan and be more effective due to greater focus and role clarity
- enhance the contribution of Specialist Groups to more powerful, collective action on behalf of species conservation
- increase the network’s opportunities for conservation-related collaboration and synergies with other components of IUCN
- provide a clearer, more realistic, definition of mutual expectations between the SSC and Species Programme (SP), including assisting the SP in focusing and tailoring its support to SSC priorities.

More information will be made available once decisions about the future have been made, which will be finalised and approved at the World Conservation Congress in Barcelona in October 2008.

## MEETINGS 2008-2009

### B for Barcelona, biodiversity and beauty: World Conservation Congress 2008



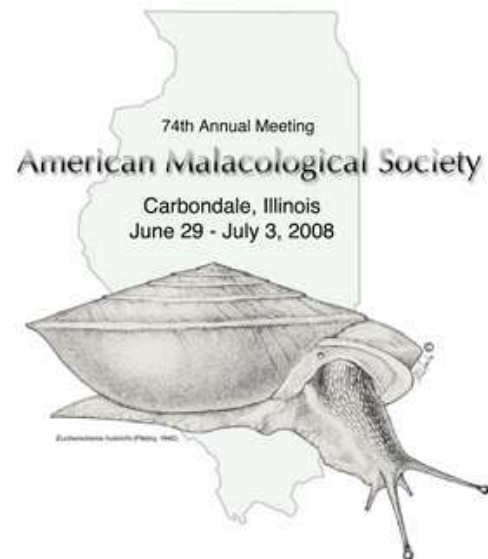
IUCN  
World  
Conservation  
Congress  
Barcelona 2008

**IUCN**  
The World Conservation Union

The 4th IUCN World Conservation Congress will take place in Barcelona, 5-14 October 2008. The IUCN Council intends to make the Congress the most important event for conservation and development in 2008 that moves diversity and sustainability to the core of international decision making. The Congress will celebrate diversity and how natural diversity underpins social, cultural and economic diversity. There are several workshops and forums that will be directly focussing on invertebrate conservation, including an Island Biodiversity workshop chaired by Justin Gerlach. For more details see:

[www.iucn.org/congress/2008/](http://www.iucn.org/congress/2008/)

### American Malacological Society



The American Malacological Society (AMS) will hold its 74th annual meeting in Carbondale, Illinois, USA, from 29 June to 3 July 2008. The venue will be the Southern Illinois University Student Center, which houses an auditorium, several ballrooms and meeting rooms and a number of restaurants and coffee shops. The conference will begin with an icebreaker on Sunday evening. Special events will include an outdoor reception at Blue Sky Vineyard ([www.blueskyvineyard.com](http://www.blueskyvineyard.com)) on Monday night, a poster session and the AMS Auction of molluscan miscellany on Tuesday night and a barbecue

banquet (with vegetarian options) at the 17th Street Bar & Grill Warehouse, Southern Illinois' most unique banquet facility on Wednesday night.

Special sessions and symposia will include:

- Leslie Hubricht symposium and workshop on the taxonomy, distribution and conservation of terrestrial gastropods.

This symposium and workshop are aimed at AMS members, state and federal agency employees and others who are seeking training in land snail collecting, identification and ecology.

Two of the major goals of the symposium and associated workshop are 1) to provide an opportunity for networking among established land snail researchers as well as individuals who lack taxonomic experience but are responsible for day-to-day land snail conservation, and 2) to offer an opportunity for non land snail experts to receive training in basic aspects of land snail biology and identification. Workshop attendees are invited to bring their own shells to identify. The workshop topics covered will include:

- Introduction to land snail collecting strategies
- Introduction to identification terminology and literature
- The major families of macro and micro land snails of North America
- Strategies for the conservation of invertebrates with emphasis on terrestrial snails/slugs
- Introduction to the identification of invasive snails and slugs
- Symposium on molluscan taxonomy in the 21st century
- Special session on cephalopod biology

On Thursday, two field trips will introduce meeting participants to wonderful mollusc habitats in southern Illinois. Participants will be able to take a tour of the Larue Pine Hills/Otter Pond Research Natural Area, a fantastic area of limestone bluffs and outcrops (and home of *Euchemotrema hubrichti*, the conference mascot), or a trip to local aquatic habitats to search for freshwater bivalves and gastropods.

For more information, including travel advice and information on accommodation in and around Carbondale, go to the meeting website: [www.malacological.org/meetings/next.html](http://www.malacological.org/meetings/next.html)

### Western Society of Malacologists 2008



The 41st annual meeting of the Western Society of Malacologists (WSM) will take place in Menlo Park, California (location to be announced), 5-8 June 2008. See the WSM website for details: <http://biology.fullerton.edu/wsm/>  
The 2008 meeting website is coming soon.

### Society for Conservation Biology 2008



The 22nd annual meeting of the Society for Conservation Biology (SCB) will be held at the Chattanooga Convention Center, Chattanooga, Tennessee, USA, 13-17 July 2008. Of particular interest to malacologists will be the following symposium:

#### **Beneath the Surface - The Freshwater Mollusks of the Southeastern United States**

Session Organizer: Ryan Evans

The symposium description is as follows:

Chattanooga is located adjacent to the southern end of the Appalachian Mountains, one of the most biologically diverse temperate areas on Earth. Much of that biodiversity occurs in the creeks and rivers that radiate out from these ancient mountains, eventually to empty into the Atlantic Ocean and various parts of the Gulf of Mexico. The rich biodiversity of freshwater mollusks that occurs here, as well as amphibians, fish, and crayfish, are globally unparalleled and is often compared to the rainforests of South America and the great coral reefs of the oceans. However, various forms of pollution and habitat alterations have greatly affected the extremely diverse fauna of North America. Freshwater mollusks are indicator species that depend on clean water, which all life depends upon for survival.

The Society for Conservation Biology meeting in Chattanooga, especially with its theme "From the Mountains to the Sea", provides a perfect opportunity for the Freshwater Mollusk Conservation Society (see below) to introduce these diverse and unique animals to the broader conservation community. Our take home message to SCB is that no other faunal group in North America has experienced such a drastic level of decline or extinction.

For more information go to the conference website: [www.conbio.org/activities/meetings/2008/](http://www.conbio.org/activities/meetings/2008/)

### Freshwater Mollusk Conservation Society 2009

For information about the Freshwater Mollusk Conservation Society meeting in Baltimore in 2009, contact [Catherine\\_Gatenby@fws.gov](mailto:Catherine_Gatenby@fws.gov)

## INTERNET RESOURCES: LISTS, WEBSITES, ETC.

These are just a few of the many websites dealing with molluscan conservation, and with molluscs and conservation in general.

### Red List

The entire *Red List of Threatened Animals* can be searched at any of the following addresses

[www.redlist.org](http://www.redlist.org) [www.redlist.net](http://www.redlist.net) [www.iucnredlist.org](http://www.iucnredlist.org)

### Invasive Species Specialist Group

Includes details of the Aliens-L listserver and the ISSG newsletter, *Aliens*.

[www.issg.org/index.html](http://www.issg.org/index.html)

### CITES

CITES-L is a Bulletin board restricted to trade issues for endangered species, which is managed from the World Conservation Monitoring Centre in Cambridge. The majority of information relates to mammal and bird trade, but updates to the CITES lists are posted there. To subscribe send a one line message to:

[majordomo@wcmc.org.uk](mailto:majordomo@wcmc.org.uk)

with the command line (in message body):

subscribe cites-l

### Unitas Malacologica

Unitas Malacologica (UM) is the society for worldwide malacologists and malacology. Its aim is to further the study of Mollusca by individuals, societies and institutions worldwide. UM has provided financial support for the production of *Tentacle* and I urge all readers to become members. The UM website has links to many interesting and useful sources of malacological information, including all the UM newsletters, which have a lot of information complementing information in *Tentacle*.

[www.ucd.ie/zoology/unitas/index.html](http://www.ucd.ie/zoology/unitas/index.html)

### Mollusca

The MOLLUSCA listserver is intended as an informal forum for discussions of molluscan evolution, palaeontology, taxonomy and natural history. There are over 700 subscribers. From time to time it has something of interest related to conservation. To subscribe to the list send e-mail to

[listproc@ucmp1.berkeley.edu](mailto:listproc@ucmp1.berkeley.edu)

Then on the first line of the body of the message:

sub mollusca <your\_name>

You will get a reply soon after saying that your name has been added. You will then receive anything that is posted to the list. MOLLUSCA is maintained and managed by David R. Lindberg of the University of California Museum of Paleontology, Berkeley, USA.

### Mollia

The MOLLIA web site includes instructions to authors, subscription information and links to malacological journals. It also allows you to subscribe to the MOLLUSCA listserver (above) and to access the MOLLUSCA archives. MOLLIA, like MOLLUSCA, is maintained at the University of California Museum of Paleontology, Berkeley, USA.

[www.ucmp.berkeley.edu/mologis/mollia.html](http://www.ucmp.berkeley.edu/mologis/mollia.html)

### Freshwater Mollusk Conservation Society

The Freshwater Mollusk Conservation Society (FMCS) is devoted to the advocacy for, public education about, and conservation science of freshwater mollusks, North America's most imperiled fauna.

<http://ellipse.inhs.uiuc.edu/FMCS/>

The FMCS now publishes the journal *Walkerana*

[www.ummz.lsa.umich.edu/mollusks/publications/walkerana/](http://www.ummz.lsa.umich.edu/mollusks/publications/walkerana/)

### American Malacological Society

The homepage of the Society carries a link to its conservation policy.

[www.malacological.org/](http://www.malacological.org/)

### Malacological Society of Australasia

The Society is networked with the leading conservation organizations, and is working with the IUCN Mollusc Specialist Group to list Australia's threatened and endangered species of molluscs.

[www.malsocaus.org/](http://www.malsocaus.org/)

### The Malacological Society of London

[www.malacsoc.org.uk/](http://www.malacsoc.org.uk/)

### Conchologists of America

The homepage of the COA carries a link to a number of pages dealing with its conservation policy and conservation issues.

[www.conchologistsofamerica.org/home/](http://www.conchologistsofamerica.org/home/)

### Field Museum land snails

Information for over 158,000 lots (a lot is a collection of a single species taken from a single locality on a single occasion), including over 2500 type lots, of land snails in the Field Museum (Chicago) collections is accessible at

<http://fm1.fieldmuseum.org/collections/search.cgi?dest=inverts>

### The National Museum Wales – Mollusca

Provides information on the global projects on molluscs underway based in Cardiff.

[www.amgueddfa-cymru.org/en/biosyb/mollusca/](http://www.amgueddfa-cymru.org/en/biosyb/mollusca/)

### Haus der Natur – Cismar

The homepage carries a link to a page on mollusc conservation in Germany, as well as other links.

[www.hausdernatur.de/](http://www.hausdernatur.de/)

### Illinois Natural History Survey

This site has much information on the mussels of North America, with links to other mussel sites.

[www.inhs.uiuc.edu/cbd/collections/mollusk/molluskintro.html](http://www.inhs.uiuc.edu/cbd/collections/mollusk/molluskintro.html)

### Hawaii Biological Survey

The Hawaii Biological Survey (based at the Bishop Museum, Honolulu) web site has searchable databases and much additional information on most Hawaiian organisms, including both indigenous (99 % endemic) and non-indigenous land and freshwater snails, endangered species, and so on.

<http://hbs.bishopmuseum.org/hbs1.html>

### Samoan Snail Project

The Samoan Snail Project has as its goals assessing the diversity and historical decline of the native Samoan non-marine snail fauna, as a first step in its conservation.

[www2.bishopmuseum.org/PBS/samoasnail/](http://www2.bishopmuseum.org/PBS/samoasnail/)

It is part of the Bishop Museum's Pacific Biological survey.

[www.bishopmuseum.org/research/pbs/pbs.html](http://www.bishopmuseum.org/research/pbs/pbs.html)

### Jamaican land snail project

A key to Jamaican land snails is now online, on the DiscoverLife website:

<http://pick4.pick.uga.edu/mp/20q?guide=Molluscs>

The key, with many excellent photographs, is part of Gary Rosenberg's work on the Jamaican fauna:

<http://data.acnatsci.org/jamaica/>

Comments can be sent to Gary Rosenberg, Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, Pennsylvania 19103-1195, USA. Tel +1 215 299 1033, fax +1 215 299 1170, [rosenberg@ansp.org](mailto:rosenberg@ansp.org), <http://clade.acnatsci.org/rosenberg/>

### Tropical land snail project at the Natural History Museum, London

This site provides access to the Sri Lankan and South and Southeast Asian snail projects of Fred Naggs and Dinarzarde Raheem. There are some marvellous photos of brightly coloured snails.

[www.nhm.ac.uk/jdsml/research-curation/projects/tropical-land-snails/](http://www.nhm.ac.uk/jdsml/research-curation/projects/tropical-land-snails/)

### Australian marine invertebrates

*Overview of the Conservation of Australian Marine Invertebrates* by W. F. Ponder, P. Hutchings & R. Chapman (588 p.), published in July 2002, is available in html at [www.amonline.net.au/invertebrates/marine\\_overview/](http://www.amonline.net.au/invertebrates/marine_overview/) and pdf at

[www.amonline.net.au/invertebrates/pdf/marineoverview.pdf](http://www.amonline.net.au/invertebrates/pdf/marineoverview.pdf)

### MUSSEL database project

<http://clade.acnatsci.org/mussel/>

### Hilton Pond Center for Piedmont Natural History

From time to time photo essays about some molluscs encountered at the Center are posted on-line, for example:

[www.hiltonpond.org/ThisWeek011022.html](http://www.hiltonpond.org/ThisWeek011022.html)

[www.hiltonpond.org/ThisWeek030401.html](http://www.hiltonpond.org/ThisWeek030401.html)

[www.hiltonpond.org/ThisWeek000608.html](http://www.hiltonpond.org/ThisWeek000608.html)

### Other useful links

[www.journal-malaco.fr](http://www.journal-malaco.fr)

[www.manandmollusc.net/](http://www.manandmollusc.net/)

[www.staffs.ac.uk/schools/sciences/biology/dhome/dhome.htm](http://www.staffs.ac.uk/schools/sciences/biology/dhome/dhome.htm)

[www.staff.uni-mainz.de/lieb/](http://www.staff.uni-mainz.de/lieb/)

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