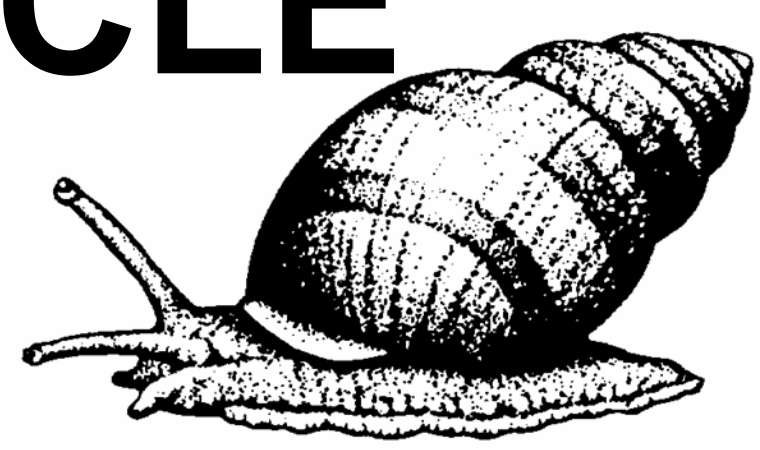
The Newsletter of the IUCN/SSC Mollusc Specialist Group
Species Survival Commission ● IUCN - The World Conservation Union

TENTACLE



UNITAS MALACOLOGICA

Editorial

This issue marks a small change in the layout of *Tentacle*. *Tentacle* began in 1989 as the newsletter of the Mollusc Specialist Group of the Species Survival Commission of IUCN, and it still is this Group's newsletter. However, it now reaches a far wider audience than just the members of the Mollusc Specialist Group, and this can only be considered a good thing. However, because of this, I feel that it is the news articles about molluscs and their conservation, contributed from far and wide by this expanded readership, that should be most prominent in the newsletter. So these articles will now appear at the start of the newsletter. The sections dealing with IUCN and SSC news, and other items of information (meetings, internet resources), that formerly occupied the first few pages are now moved to the last pages of the newsletter, not because they are unimportant, but because they are probably of less immediate interest to this new wider readership of *Tentacle*. Making *Tentacle* a more attractive read, even in a small way, can only help its purpose, which is to inform as widely as possible about mollusc conservation.

One highlight since the last issue of *Tentacle* is the publication in the April 2004 issue of *BioScience* of an article authored by Charles Lydeard and a number of IUCN Mollusc Specialist Group members entitled "The global decline of nonmarine mollusks". It is available on line either directly on the *BioScience* website (http://www.aibs.org/bioscience/) or via a link on the website of the American Malacological Society (http://erato.acnatsci.org/ams/). I encourage everyone to take a look at it. In addition, the proceedings of two notable symposia are now published: *Molluscan Biodiversity and Conservation*, from the World Congress of Malacology in Vienna in 2001, and *The Biology and Conservation of Freshwater Gastropods*, from the American Malacological Society's annual meeting in Charleston in 2002; details are given in the list of recent publications on p. 23.

All issues of *Tentacle* are available on the web at http://www.hawaii.edu/cowielab. Note that this is a new web address. However, because of very limited resources, hard copies are now only sent to those people on the distribution list for whom I do not have e-mail addresses. I announce the publication of each new issue to all who are on the e-mail distribution list, so 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, as it appears, on the MOLLUSCA listserver (for details, see page 27).

As always, I reiterate that the content of *Tentacle* depends

In this issue:

largely on what is submitted to me. *Tentacle* is one means to publicise the threats molluscs face—and the conservation successes. Of course, it is also a free, easy way to advertise your own projects! Sometimes you may notice that I have included articles not directly dealing with threatened molluscs (alien species, slug control). 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 listserver). Send me something now, and it will be included in the next issue (published once a year, in January). Line drawings or in some cases high-contrast black and white photographs are particularly welcome – they must photocopy well in black and white, as the print issue of *Tentacle* is produced by photocopying.

I make only minor editorial changes to submitted articles and I accept almost everything submitted to me—though before I accept it I will make a judgement about whether an article really has anything to say that is relevant to conservation. Statements made in *Tentacle* therefore remain the authors' responsibilities and the balance of each issue reflects more or less whatever I receive.

Printing and mailing of *Tentacle* is supported 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*.

Robert H. Cowie, Editor, contact details in the list of Mollusc Specialist Group members at the end of this issue of *Tentacle*.

NEWS

Abalone fishing ban planned in South Africa

From: *Oryx* 38(2): 125 [from *TRAFFIC Bulletin* (2003) 19(3): 117]

The abalone or perlemoen *Haliotis midae* is a mollusc found in the shallow coastal waters off South Africa. Numbers have plummeted because of overharvesting. Over 95 % of specimens harvested are destined for international markets, particularly in China where it is prized by gourmets. On 18 August 2003 the Government of South Africa published a draft policy which would see a moratorium placed on the recreational fishing of abalone. Some coastal communities depend heavily on abalone fishing for their income and TRAFFIC believes that any regulation of the trade should involve consumer states in monitoring and regulating the trade both to stem the lucrative illegal trade and ensure the sustainability of the resource.

FRESHWATER BIVALVES IN NORTH AMERICA

Important position paper published in *BioScience*

Strayer, D.L., Downing, J.A., Haag, W.R., King, T.L., Layzer, J.B., Newton, T.J. & Nichols, S.J. 2004. Changing perspectives on pearly mussels, North America's most imperiled animals. *BioScience* 54(5): 429-439.

Abstract: Pearly mussels (Unionacea) are widespread, abundant, and important in freshwater ecosystems around the world. Catastrophic declines in pearly mussel populations in North America and other parts of the world have led to a flurry of research on mussel biology, ecology, and conservation. Recent research on mussel feeding, life history, spatial patterning, and declines has augmented, modified, or overturned long-held ideas about the ecology of these animals. Pearly mussel research has begun to benefit from and contribute to current ideas about suspension feeding, life-history theory, metapopulations, flow refuges, spatial patterning and its effects, and management of endangered species. At the same time, significant gaps in understanding and apparent paradoxes in pearly mussel ecology have been exposed. To conserve remaining mussel populations, scientists and managers must simultaneously and aggressively pursue both rigorous research and conservation actions.

The hickorynut mussel, *Obovaria olivaria*, a deepwater unionid under scrutiny in Canadian rivers

By André L. Martel & Isabelle Picard

The freshwater mussel *Obovaria olivaria* (Rafinesque, 1820), also called the hickorynut, occurs in a small number of rivers in eastern Ontario and southern Québec, Canada. Live or empty shells of this small, thick-shelled species have been collected historically in the St. Lawrence and the Ottawa River, as well as more recently in the Coulonge, St. François, Assomption and Batiscan river systems, Québec. Live individuals have only been found in rivers where the lake sturgeon, *Acipenser fulvescens*, is known to occur. The lake sturgeon, a possible fish host for the hickorynut in these rivers, is never abundant, although stocks in the Ottawa River are believed to be reasonably healthy. The hickorynut is known to sometimes thrive in deepwater habitats and just recently SCUBA divers discovered extensive patches of empty fresh shells in the Ottawa River at a depth of 3-4 m. However, live animals are rarely found at any location. There is evidence that the range of this species has declined in Canada in recent years as a result of degradation of water quality and habitat, including the introduction of the zebra mussel and the reduction of its fish host(s). There is no recent mention of this elusive mussel in the St. Lawrence River or the Laurentian Great Lakes, areas where the zebra mussel is known to have caused the most severe damage to unionid stocks. As a result, the hickorynut is currently under assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (evaluation in 2006). The Ottawa River possibly represents the most extensive river

system where most Canadian populations of *Obovaria olivaria* currently live. Research on this unionid is urgently needed in order to better understand the biology and conservation status of this freshwater mussel in Canadian waters.

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THE GATINEAU TADPOLE SNAIL, *PHYSA GYRINA LATCHFORDI,* IN MEECH LAKE, GATINEAU PARK (QUÉBEC): A LARGER POPULATION THAN ORIGINALLY THOUGHT

By André L. Martel & Jaqueline B. Madill

The peculiar *Physa gyrina latchfordi* (Baker, 1928), also called the Gatineau tadpole snail in Canada (Clarke, 1981), was first recorded in October 1880 in Meech Lake, Gatineau Park, Québec, Canada (Heron, 1880). This morphologically-distinct physid was initially named *Physa latchfordi* (Heron, 1880). The taxonomic status of this physid, either as a distinct *Physa gyrina* population or a distinct species, remains uncertain, although it is currently treated as a subspecies of *P. gyrina*. What is certain is that the morphology of this snail is unique among Canadian physid gastropods and thus far it has only been found in several large lakes in the Gatineau Park area (LaRocque, 1933). This park is known for a set of climatological, geological, floral and faunal features found nowhere else in the region.

Historical population surveys of the Gatineau tadpole snail were conducted during the summer months in the 1980s. The belief among park biologists and conservation agents, based on these surveys, has been that the snail was very rare in the park; for example only 31 live individuals were counted during one summer at sites along the entire perimeter of Meech Lake, its primary habitat within the park. From 2001 to 2003, we conducted a time-search survey of the Gatineau tadpole snail at Meech Lake. In contrast to previous historical surveys, searches were conducted during the late fall (November to early December), just before the winter ice started to form along the lakeshore. Preliminary observations had indeed indicated that late fall was the period when all individuals reach maturity (adult shell length about 15-25 mm). Interestingly, these late fall surveys yielded much larger population estimates than previously reported. We therefore estimate that the total population size of the Gatineau tadpole snail in Meech Lake is in the order of 5,000 to 10,000 individuals (Martel et al., 2004). As this species appears to be annual, with adult individuals living about 1 to 1½ yr, we conclude that it is crucial that population surveys of such physids be undertaken during the appropriate season, in this case in late fall. Only then have most individuals reached a shell size large enough for observers to notice their presence while wading along the littoral zone with viewboxes or while snorkeling. In the summer (the traditional period for fieldwork) most Gatineau tadpole snails are small juveniles found clinging on boulders, in bedrock crevices and on large woody debris. At that time, they are too small to be easily seen, thus preventing accurate population surveys. To circumvent this problem and to obtain reasonably accurate population estimates of this physid, we recommend that surveys be conducted in late fall, several weeks before the winter ice begins to form.

Clarke, A.H. 1981. *The Freshwater molluscs of Canada*. National Museum of Natural Sciences, National Museums of Canada.

Heron, G.C. 1880. On the land and freshwater shells of Ottawa. *Transactions of the Ottawa Field-Naturalist's Club* 1: 36-40.

LaRocque, A. 1933. Notes on *Helisoma latchfordi* Pils. and *Physa latchfordi* F.C. Baker. *Canadian Field-Naturalist* 47: 134-135.

Martel, A.L., Madill, J.B., Ponomarenko, D.S., Pigeon, A., & Van Lankveld, N.T. 2004. *Native Freshwater Mussels (Unionidae) and the Gatineau Tadpole Snail (Physidae) in Lac Meech, Gatineau Park (Québec): distribution and abundance (2001-2003)*. Technical Report for the National Capital Commission.

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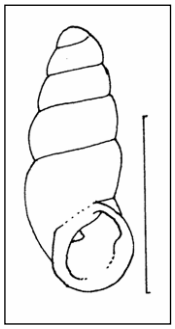
CARYCHIUM NANNODES CLAPP, 1905 FOUND IN PENNSYLVANIA

By Timothy A. Pearce

The minute basommatophoran land snail *Carychium nannodes* Clapp, 1905 is reported from Pennsylvania for the first time. It was collected in 2002 and 2003 in Greene County in the southwestern corner of Pennsylvania at two localities about 10 km apart: one is 2 km NE of Wind Ridge, the other is 3 km N of Aleppo.



Carychium nannodes Clapp, 1905 from Greene Co., Pennsylvania, CM 66538. Scale bar is 1 mm.

The species is known in the Appalachian Mountains from northern Alabama to the northern parts of Maryland and West Virginia (Hubricht, 1985). Hubricht reported this species from two counties that are adjacent to Pennsylvania's southern border: Garrett County in Maryland and Preston County in West Virginia. Hubricht's Preston County record is probably based on specimens he collected in 1958 that are now at the Field Museum of Natural History (FMNH 229477, 229478). If so, then besides being a new state record, the Greene County specimens in Pennsylvania represent a northwestward known range extension for this species of 90 km.

This species, smallest of the Carychiums, is 1.4 mm high and 0.5 mm diameter (Pilsbry, 1948). Hubricht reported that *C. nannodes* is sometimes found with *C. exile*. Indeed, it was

found with *C. exile* at one of the two Greene County localities. The specimens were found in leaf litter samples that contained a moderately high land snail species diversity: 10 and 16. Interestingly, one of the samples (with the lower diversity) is from a regenerating forest on an old pasture.

Carychium nannodes appears to be very uncommon in Pennsylvania, although it is geographically widespread to the south. *C. nannodes* deserves special conservation status in Pennsylvania because it is an uncommon part of the natural heritage of Pennsylvania that may need protection to persist. Furthermore, *C. nannodes* in Pennsylvania is at the northern end of its range and species on the edges of their ranges may contain important genetic variation that can help the species survive (Lesica & Allendorf, 1995).

Hubricht, L. 1985. The distributions of the native land mollusks of the eastern United States. *Fieldiana, Zoology, n.s.* 24. viii + 191 p.

Pilsbry, H.A. 1948. Land Mollusca of North America (north of Mexico). *Academy of Natural Sciences of Philadelphia, Monograph* 3, vol. 2, part 2: xlvii + 521-1113.

Lesica, P & Allendorf, F.W. 1995. When are peripheral populations valuable for conservation? *Conservation Biology* 9(4): 753-760.

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STYGOBITE HYDROBIOIDS: *BYTHINELLA PADIRACI* LOCARD, 1903 – A CASE STUDY FOR SYSTEMATICS AND CONSERVATION

By Jean-Michel Bichain

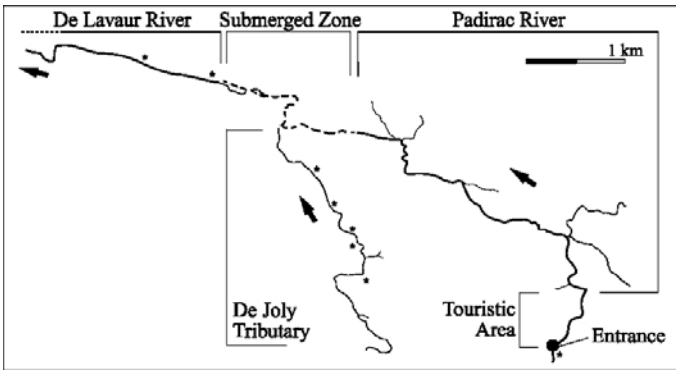
Hydrobioid species richness in European continental waters is currently estimated at 758 species and subspecies (estimate compiled from the 2004 Fauna-Europaea database: http://www. faunaeur.org). Of these, 176 are present in France, and of these 176, ~75 % are endemic to France. Among these endemics, 23 are listed in the *2004 IUCN Red List of Threatened Species* and 27 are nationally protected. The stygobite hydrobioids number approximately 83 taxa in France (Falkner *in* Ferreira *et al.* 2003). Nevertheless, the evaluation of hypogean or epigean hydrobioid species richness and the validity of the nominal species constitute fundamental taxonomic problems because of 1) the poor quality of the original descriptions, 2) the high degree of intraspecific phenotypic variability, which makes interspecific boundaries doubtful (for an overview see Wilke *et al.* 2001), and 3) the lack of studies involving new technologies that could improve specific delimitations. These problems make it difficult to evaluate degrees of threat for this group.

Bythinella padiraci Locard, 1903 is a classic illustration of these general issues. This species is regarded as a restricted endemic of the Padirac karstic network, one of the largest (> 15 km of underground river) and most beautiful European cave systems with 350,000 visitors annually. *B. padiraci* is listed as Vulnerable (VU D2 version 2.3 [1994]) in the IUCN Red List. In the early 20th century, populations were estimated at more than 50,000 individuals within the first 2,000 m from the cave entrance. However, by the 1980s, only a few live individuals were found, and only in the deep cave network (7,000 m from the entrance).

Bythinella padiraci Locard, 1903. Size ~2 mm.
(photo: V. Prié)

In November 2003, we undertook a seven day biospeleological expedition in the Padirac deep network (Bichain et al., 2004) in order to collect living specimens for subsequent studies. The main objectives related to *B. padiraci* were 1) to evaluate the species' validity using molecular and morphometric tools, 2) to quantify both the density and the distribution of the species throughout the entire karstic network, with particular attention being paid to persistence of subterranean populations in the deep parts of the network as well as in places where human pressures are obvious, that is in the upstream network, the touristic area.

The first issue is currently under study and forms part of my Ph.D. research, which focuses on species delimitations and phylogenetic relationships within the genus *Bythinella* Moquin-Tandon, 1856. Concerning the second issue, we noted the disappearance of the species from the first 5,000 m of the network including the tourist area. However, it is still present in the principal courses of the underground river



Map of the Padirac River system. * – sampling localities at which *Bythinella padiraci* was present. The dashed part of the river indicates the fossil galleries.

downstream from its passage through the submerged zone of the karst (over 5,000 m), in a small zone upstream of the touristic area and in the affluent De Joly, principal tributary of the Padirac underground river. In this last location, the population density is ~1,000 individuals per m^2. *B. padiraci* was absent from stagnant waters in fossil galleries, which is explained by its ecological requirements. Other explorations in parallel networks that are connected to the Padirac underground river show that the species is potentially present in all the Padirac catchments area, a limestone surface area of 92 km^2. Nevertheless, its disappearance in the current tourist area clearly illustrates the impact of human activities on this species. The deep network populations may also be vulnerable, from polluted waters that get into the underground hydrological system as a result of domestic and agricultural activities.

A biospeological expedition organized by the Muséum national d'Histoire naturelle, Paris, is planned for April 2005, in order to record the underground population densities and micro-distribution of *B. padiraci* and to identify clearly the origin(s) of the threats.

Bichain, J.M., Boudsocq, C. & Prié, V. 2004. Les Mollusques souterrains du réseau karstique de Padirac (Lot, France) et micro-répartition de *Bythinella padiraci* Locard, 1903 (Mollusca, Caenogastropoda, Rissooidea). *Karstologia* 43: 9-18.

Ferreira, D., Dole-Olivier M.J., Malard, F., Deharveng, L. & Gibert, J. 2003. Faune aquatique souterraine de France: base de données et éléments de biogéographie. *Karstologia* 42: 15-22.

Wilke, T., Davis, G.M., Falniowski, A., Giusti, F., Bodon M. & Szarowska, M. 2001. Molecular systematics of Hydrobiidae (Mollusca: Gastropoda: Rissooidea): testing monophyly and phylogenetic relationship. *Proceeding of the Academy of Natural Sciences of Philadelphia* 151: 1-21.

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THE MOLLUSC SPECIES IN SLOVAKIA LISTED IN THE HABITATS DIRECTIVE

By Ľubomíra Vavrová

In Slovakia, there are 277 mollusc species and subspecies, including non-native species, sporadically distributed in the wild (Šteffek & Grego, 2002).

Since 1 May 2004 Slovakia has been a member of the European Union (EU). One of the main duties of member countries of the EU is to propose a system of important European biotopes (NATURA 2000). The Annexes of the Directive (92/43/EEC) on the Conservation of Natural Habitats and Wild Fauna and Flora (EUHSD) of the European Union include nine mollusc species occuring in Slovakia:

Annex II: *Anisus vorticulus*, *Helicopsis striata, Sadleriana pannonica*, *Theodoxus transversalis*, *Vertigo angustior*, *Vertigo geyeri*, *Vertigo moulinsiana*, *Unio crassus*
Annex IV: *Anisus vorticulus*, *Sadleriana pannonica*, *Theodoxus transversalis*, *Unio crassus*
Annex V: *Helix pomatia*

All of these species are protected by Act of the National Council of the Slovak Republic No. 543/2002 of nature and landscape protection and are listed in Notice No. 24/2003. Currently, specialists in Slovakia are working on a definition of favourable conservation status (FCS) for these important European mollusc species that occur in Slovakia and are developing a methodology for monitoring these species.

The distributions of these species listed in the Annexes are now briefly summarized.

Anisus vorticulus (Troschel, 1834)
Isolated localities mainly in the southern and eastern part of Slovakia (Podunajská nížina lowland and Východoslovenská nížina lowland). It occurs especially in rivers (sporadically water reservoirs) with a high density of aquatic vegetation. In Slovakia only 10 recent localities are known.

Helicopsis striata (Müller 1774)
Calcareous sand biotopes with low grass vegetation. The localities of this species are situated especially in the southern part of Slovakia in the area of Podunajská nížina lowland.

Helix pomatia Linnaeus, 1758
Occurs broadly throughout Slovakia, except in the south-east of the country, especially in lowlands, rarely in areas higher than about 1,100 m above sea level. The main populations are situated near villages. This species prefers bushes in hilly areas, road-sides, gardens, plantations, river valleys and localities on the south-facing slopes of mountains.

Sadleriana pannonica (Frauenfeld, 1865)
This species occurs only in Slovak karst and sporadically in springs in the southern part of the Volovské vrchy Mountains. It is a typical species of karst seeps and springs.

Theodoxus transversalis (Pfeiffer, 1829)
An endemic species of the Danube river. Podunajská nížina lowland is the north edge of its range. During the last 10 yr no living specimen has been found in the Slovak part of the Danube river. Only recently-dead shells have been found and it is presumed that living populations occur in the lower part of the Danube river. The species prefers big rivers with stony bottoms.

Unio crassus Philipsson, 1788
Sporadically distributed in major rivers and streams with stony and sandy bottoms, e.g. the Danube river, Morava river, Tisovník stream, etc. Recently, the first living population of *U. crassus* in Žilinská kotlina basin was recorded (Vavrová & Bitušík, 2003).

Vertigo angustior Jeffreys, 1830
Isolated localities with suitable conditions in all parts of Slovakia. This species lives mainly in permanently wet and calcareous swamps, fens, marshes and meadows.

Vertigo geyeri Lindholm, 1925
Sporadically distributed in basins of the northern part of Slovakia. Occurs especially in open calcareous swamps with high and stable water level and with vegetation of low sedges (e.g. *Carex viridula*).

Vertigo moulinsiana (Dupuy, 1849)
Sporadically distributed in calcareous and permanently wet swamps, fens, marshes, edges of rivers, lakes and ponds, river

floodplains. This species occurs in biotopes with vegetation of sedge (e.g. *Carex paniculata*, *C. elata*), reed (*Phragmites australis*), reedmace (*Typha latifolia*, *T. angustifolia*), etc.

In Slovakia we do not have enough information on the distribution and ecology of these species, especially of wetland mollusc species. For that reason the main goal of mollusc research in Slovakia is to obtain more information that will permit planning of mollusc conservation activities.

Šteffek, J. & Grego, J. 2002. Zoznam mäkkýšov (*Mollusca*) Slovenskej republiky [Checklist of molluscs (*Mollusca*) occuring in the Slovak Republic]. *Acta Univ. M. Belii* 2, 1: 60-70. [in Slovak]

Vavrová, Ľ. & Bitušík, P. 2003. New locality of *Unio crassus* Philipsson 1788 (Bivalvia: Paleoheterodonta) in Slovakia. *Folia faunistica Slovaca*, 8: 35-37. [in Slovak with short English abstract]

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INVASION OF A NORTH AMERICAN ALIEN, *PLANORBELLA ANCEPS* (MENKE, 1830) (MOLLUSCA: GASTROPODA: PLANORBIDAE), IN THE ANCIENT LAKE PRESPA

By Zoltán Péter Erőss, Zoltán Fehér & András Hunyadi

The ancient tectonic Lake Prespa of the Balkan peninsula has been a focus of malacological research for a long time because several rare and endemic mollusc species are found in the lake. Research on the mollusc fauna has been undertaken intensively on the Macedonian shore of this deep lake (Radoman, 1983) but there has not been any serious faunistic research on the Albanian side, only a few ad hoc collections up to the 1990s. In recent years, within the framework of the Hungarian Natural History Museum's program of zoological research, that covers all Balkan countries, some collecting was done in this region, including the territory of all three countries bordering the lake (Fehér et al., 2004).

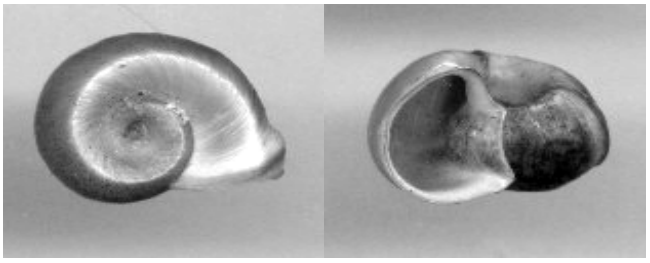
With regard to the mollusc fauna of Lake Prespa, the most remarkable discovery was of the non-indigenous planorbid species, *Planorbella anceps* (Menke, 1830), that is new to the faunas of Albania, Greece and the former Yugoslav Republic of Macedonia, the three countries bordering the lake. Until now we have found live and/or dead specimens at the following locations.

Greece: Psarades, UTM EL01, 20.07.2004, leg. Erőss & Hunyadi [live animals and empty shells].

Macedonia: Krani, UTM EL03, 05.04.2004, leg: Erőss, Fehér & Hunyadi [fresh empty shells]; 1 km E of Stenje, UTM DL93, 05.04.2004, leg: Erőss, Fehér & Hunyadi [empty shells were found in the crevices of a limestone cliff near the shore ca. 150 cm above the level of the lake].

Albania: 1 km NE of Liqenas, at Sveti Atanas i Veliki Antoni church, UTM DL91, 02.07.2003, leg: Erőss, Fehér, Kontschán & Murányi [live animals].

Planorbella anceps, indigenous to North America, first appeared in European freshwater habitats in 1966 in Italy (Henrard, 1968) but it became extinct at this location (Stoch, 2004). Another field occurrence was registered in 2000, in Italy again; some specimens were found in Fonte Arethusa (Syracuse, Sicily), a spring just a few metres from the seashore (Zettler & Richard, 2003). Some occurrences in greenhouses in Germany have also been reported in Mecklenburg-Vorpommern in 1991, 1992 and 2003 (M.L. Zettler, pers.comm.).



Planorbella anceps (Menke, 1830). Shell width ~20 mm. (Specimen is not from Lake Prespa.)

However, its establishment in Lake Prespa seems to have a more serious faunistic and conservation importance, for the following reasons.

1. We have found shells of snails that died a long time ago stuck into rocks along the shore but 150 cm above the recent water level. As the water level of the lake has not been so high for at least 15 yr, we can suppose with good justification that this non-indigenous species has been living in the lake at least for this length of time. This indicates that *Planorbella anceps* has not simply appeared recently in Lake Prespa, but has probably already adapted and established stable populations.
2. As *Planorbella anceps* is well-known in America as the intermediate host of certain hemiurid worms, e.g. *Halipegus occidualis* Stafford, 1905 and *Haematoloechus longiplexus* Stafford, 1902, it may destroy the ecological balance because its introduced parasites may endanger the fish and amphibian fauna living in the lake.
3. *Planorbella anceps* may be a potential competitor of some endemic mollusc species. It is hard to predict the destiny of these species that are being outcompeted, nor of the specific endemic trematode species that live within them.

It is not known yet exactly what the consequences of this establishment of *Planorbella anceps* will involve. It appears that its fate will be different than it was at its first southern European appearance because it seems to be successfully adapted to Lake Prespa and established permanently. Its further spread (e.g. to Lake Ohrid or to Lake Little Prespa) can be assumed. Continuous monitoring of the species' spread is important.

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NON-TOXIC SLUG REPELLENTS AND ANTIFEEDANT SPRAYS

By Ifor D. Bowen & Ahmed Ali

Novel non-toxic mollusc repellents may yet help save the lives of slugs and snails. Research workers at Cardiff University have discovered and developed slug repellents from myrrh resin obtained from the *Commiphora* species of African plants.

Leaf disc assays and spray trials held under field conditions have shown that low concentrations of ethanolic essential oil (between 1 % and 3 %) from scented myrrh displays strong repellent and antifeedant properties against the grey field slug, *Deroceras reticulatum*, and the garden snail, *Helix aspersa*. An aquatic extract containing particular chemical components proved to be especially potent and these are being patented.

Meanwhile, Slugs.biz Limited, part of the Swansea (Wales) based Compton Group, has launched a new slug barrier product via the internet. Its ingredients include solid resin from myrrh, commonly collected in Somalia, and recycled wood chip. These discoveries mean that domestic gardeners and growers will now have an effective eco-friendly alternative to the more commonly used slug pellets that are poisonous not only to slugs but also to other animals.

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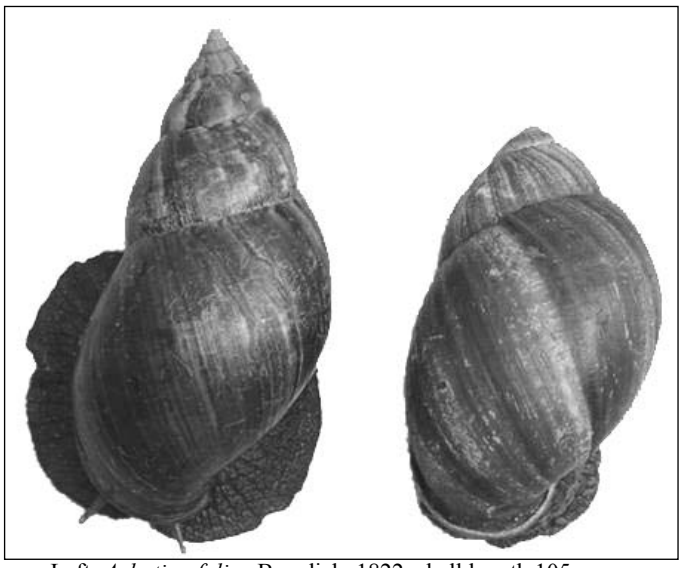
ACHATINA FULICA IN BRASIL: THE CURRENT SITUATION

By Silvana C. Thiengo & Monica A. Fernandez

The giant African snail, *Achatina fulica* Bowdich, 1822, was introduced into Brasil, probably in the state of Paraná, in the 1980s for commercial purposes ('escargot' farming). It is now widespread in at least 23 Brasilian states, including the Amazonian region and some offshore islands, such as Ilha Grande in the state of Rio de Janeiro. Among the reasons for the rapid dispersal of *A. fulica* is its high reproductive capacity, and the tendency for people to release specimens into the wild. *Achatina fulica* generally occurs in dense populations in urban areas where it attacks ornamental gardens, vegetable gardens and small-scale agriculture. Also of concern is the damage caused to the environment, and the



Left: *Achatina fulica* Bowdich, 1822; shell length 105 mm. Right: *Megalobulimus oblongus* Müller, 1774; shell length 102 mm. (photo: Monica Fernandez)

effects on native terrestrial molluscs, as seen in other countries where the snail has already been introduced. In particular, Brasil has some large native snail species, e.g. *Megalobulimulus* spp., that superficially resemble *A. fulica*. Competitive effects may be important, especially because *Megalobulimulus* spp. lay clutches of only 1-3 eggs, whereas *A. fulica* lays clutches of hundreds of eggs. In addition to the importance of *A. fulica* as an agricultural and environmental pest, its role in the epidemiology of the transmission of helminthosis of medical and veterinary concern should be considered. It may act as an intermediate host of *Angiostrongylus cantonensis* (Chen, 1935), a nematode that can cause meningoencephalitis in humans, as reported in some Asian countries and Pacific Islands. It is also considered a potential host of the congeneric species *Angiostrongylus costaricensis* Morera & Céspedes, 1971, which causes abdominal angiostrongylosis, a zoonosis that occurs from the southern USA to northern Argentina.

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REDISCOVERY OF *HELEOBIA ANNANDALEI* IN THE OCTOGON POOL OF TABGHA, ISRAEL

By Henk K. Mienis

The Octogon pool collects the water of a complex of seven slightly warm salt springs, the Heptapegon springs (in Hebrew, En Sheva, which means seven springs), on the shores of Lake Tiberias (Sea of Galilee) near Tabgha, Israel. It is famous for the presence of the blind prawn *Typhlocaris galilea* Calman, a relict species of which two closely related species are known from similar habitats: subterranean cave springs in Calabria, Italy (*Typhlocaris salentina* Caroli), and Cyrenaica, Libya (*Typhlocaris lethaea* Parisi) (Holthuis, 1956; Por, 1963).

Preston (1913) described two hydrobiid species, *Bythinella annandalei* and *Bythinella vexillum*, from the same spring complex near Tabgha, including the Octogon pool and two additional localities. These additional localities have disappeared because of overpumping of the Lake Tiberias; however, the species might still be present in karstic springs on the bottom of the Lake, but these are inaccessible. Mienis & Ortal (1994) transferred *B. annandalei* to the genus *Heleobia* and considered it an endangered species because of its very small and uncertain range.

The correct systematic position of *B. vexillum* has remained unclear. Its dark yellowish brown shell ornamented with axial lines of reddish chestnut is very unlike any hydrobiid species known from the Levant or elsewhere in the Palaearctic.

Prof. Bella Galil visited En Sheva on 1 November 2004 in order to make a video film of the blind prawn in its natural habitat. She took the opportunity to sample the pool and the entrance to the subterranean cave for the presence of molluscs. Three species were encountered: *Theodoxus* (*Neritaea*) sp., *Melanopsis buccinoidea* (Olivier, 1801) and *Heleobia annandalei* (Preston, 1913). Unfortunately not a single specimen was found of *B. vexillum*.

The unknown species of *Theodoxus* is very similar in form, size and colour to *Theodoxus* (*Neritaea*) *subterrelictus* Schuett, 1963, a species described from subterranean caves in the former Yugoslavia. *Melanopsis buccinoidea* is a common species in almost every spring and stream throughout the Levant. *Heleobia annandalei* was encountered in fairly large numbers. In the wake of the rediscovery of *H. annandalei*, two samples collected in Tabgha some 40 yr ago were also recognized as belonging to that species.

According to our data the population of *Heleobia annandalei* in En Sheva seems still to be healthy. Since entrance to the pool and the cave is strictly forbidden, as they are situated on private property of a monastery, the species seems to be well protected at the moment as long as the water table in the area does not change. The status of *Bythinella vexillum* remains, however, a riddle.

I thank Prof. Bella Galil of the Israel Oceanographic & Limnological Research Institute, Shiqmona-Haifa, for donating the material discussed to the National Mollusc Collection of the Tel Aviv University.

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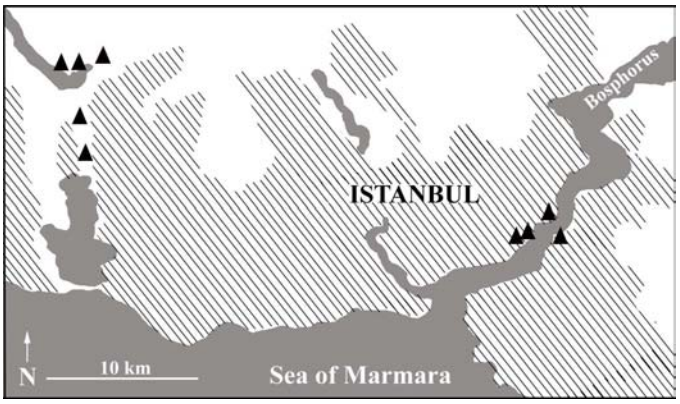
THE STATUS OF *POMATIAS ELEGANS* IN ISTANBUL, TURKEY

By Aydin Örstan

The earliest records of the terrestrial caenogastropod *Pomatias elegans* (Müller, 1774) from around Istanbul date back to the 19th century, for example, Sturany (1894). Although a recent map of the approximate distribution range of *P. elegans* did not include the Istanbul area (Fig. 1 in Jordaens et al., 2001), the species has been found in the city within the last 4 years in cemeteries (Örstan, 2004) and wooded lots on both sides of the Bosphorus as well as on limestone meadows on the western outskirts of the city.



Recent records of *Pomatias elegans* (triangles) from Istanbul, Turkey. Hatched areas approximate the extent of the city and the surrounding communities.

The colonies of *Pomatias elegans* that are located on a few undeveloped and unprotected lots left within the city will be destroyed when such areas are eventually developed. Other colonies live in somewhat more protected areas, such as cemeteries and steep wooded slopes overlooking the Bosphorus. These colonies have become isolated from each other mostly within the last 100 yr when the city rapidly expanded. But how long can they last? Four characteristics of *P. elegans* seem to lessen its likelihood of long-term survival in urban habitats. First, *P. elegans* strictly requires calcareous substrates (Boycott, 1934). Second, it also requires loose soil into which it habitually buries. Third, it has been characterized as a poor disperser (Pfenninger, 2002). Thus, it would not come as a surprise if in a crowded, busy city like Istanbul, the buildings, roads, and non-calcareous or impenetrable soils surrounding even the closely located suitable habitats completely prevented migration between *P. elegans* colonies. This is supported by a study by Baur & Baur (1990) that showed that in Sweden roads curtailed migration between colonies of *Arianta arbustorum*. Even an unpaved 3 m wide track used only by walkers and cyclists was apparently crossed by only a few snails during a 3 month period. Finally, *P. elegans* cannot self-fertilize (Jordaens et al., 2001). The cumulative result could be the gradual extinction of isolated colonies as a result of inbreeding depression. Small colonies are also threatened by random catastrophic events, for example, fires or droughts, that could wipe them out.

There are also a few records of *Pomatias elegans* from the vicinity of Bursa across the Sea of Marmara, about 100 km south of Istanbul, for example, see Boettger (1957). The

colonies of *P. elegans* in the Istanbul-Bursa area appear to be at the easternmost limit of the range of this species. An analysis of range contractions of several animal groups (including *Achatinella* spp. in Hawaii) demonstrated that populations that persist the longest are peripheral populations on isolated and undisturbed islands, or at high elevations, where human activities that are mostly responsible for extinction are less severe or nonexistent (Channell & Lomolino, 2000). Unfortunately, in the case of *P. elegans* the peripheral colonies happen to be in a part of Turkey that is being continuously and severely disturbed by human activities. The snails are more likely to survive indefinitely only if more and larger areas are left aside as parks and reserves.

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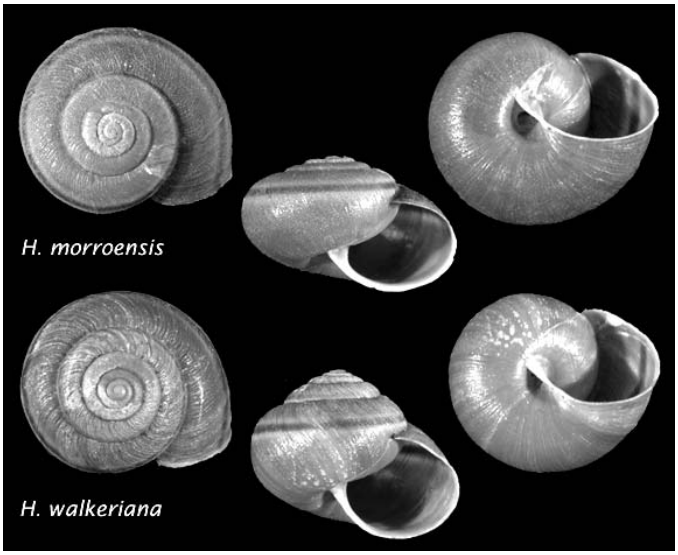
NEW STUDY CONFIRMS RESTRICTED STATUS OF ENDANGERED CALIFORNIA LAND SNAIL

By Jeff Tupen & Barry Roth

The Morro shoulderband, *Helminthoglypta walkeriana* (Hemphill, 1911), is a narrowly distributed helminthoglyptid land snail limited to coastal dune scrub habitats and sandy soils near the city of Morro Bay, in central California. As in much of California, intensive residential development occurred in the Morro Bay region from the early 20th century on. With this increase in population came increases in the rate and magnitude of coastal scrub habitat degradation, resulting largely from land conversion, off-road recreation, and the introduction of invasive plants. Through time, the native habitat of *H. walkeriana* was substantially reduced.

Smith (1970) and Roth (1972) reported *H. walkeriana* as a species at risk because of its scarcity and limited range. Literature records and museum collections indicated that the species historically ranged inland to San Luis Obispo (approximately 30 km east of Morro Bay) and north along the coast to Cayucos (approximately 4 km north of Morro Bay) (Roth, 1973). Roth (1985) was unable to locate *H. walkeriana* at these marginal locations during surveys conducted in 1984, and this result was interpreted by the United States Fish and Wildlife Service (USFWS) as evidence of a declining range. In 1994, the USFWS, as the main federal agency charged with protecting and conserving non-marine species, listed *H. walkeriana* as endangered under the Endangered Species Act (ESA) of 1973, as amended. This action afforded the species relatively staunch regulatory protection (USFWS, 1994). *H. walkeriana* is the only Californian land snail currently afforded legal protection under the ESA. In fact, it is one of only three mollusks in California receiving formal protection by either California state or federal law (the other two are the state threatened Trinity bristlesnail, *Monadenia infumata setosa* Talmadge, 1952, and the federally endangered white abalone, *Haliotis sorenseni* Bartsch, 1940).

When Hemphill (1911) originally described *H. walkeriana* (as *Helix walkeriana*), he also reported the existence of a "variety" ("*Helix* var. *morroensis*") differing from typical *H. walkeriana* in sculptural features. Pilsbry (1939) and Roth (1973, 1985) were unable to clarify the relationship between *walkeriana* and *morroensis*. As a result, most malacologists continued to regard *morroensis* as simply a morphological variant of *H. walkeriana* lacking any significant taxonomic status.



Helminthoglypta from Morro Bay - San Luis Obispo region, central California. Upper figures: *H. morroensis* (Hemphill, 1911); shell diameter 23.1 mm. Lower figures: *H. walkeriana* (Hemphill, 1911); shell diameter 22.1 mm.

In 2001, we located a population of *Helminthoglypta* at the northern margin of the City of Morro Bay, presumably very near the historic Cayucos locality. All material at this site showed the *morroensis* features, especially weak to absent spiral grooves on the shell. We also noted that shells from this location were more depressed than typical *H. walkeriana*, and displayed profusely granular shell sculpture.

Since our original rediscovery of the *morroensis* form, we and

others (Walgren, 2003) have discovered this form occurring at many other locations, as far east as San Luis Obispo. The significance of these findings is that, if those populations represented the species *H. walkeriana*, then the conclusion of a strongly limited (and perhaps contracting) species range – and, potentially, the need for statutory protection – might need re-evaluation. To address this issue we studied the shells and soft anatomy of samples from nine localities. Our analyses of shell form and soft anatomy variability among and within localities led us to conclude that *H. morroensis* is a species distinct from *H. walkeriana* (see Roth & Tupen, 2004). This conclusion confirms that the range of *H. walkeriana* is not very different from that delineated by Roth (1985), as was considered in the original decision to grant the taxon endangered status.

The shell of *Helminthoglypta morroensis* differs from that of *H. walkeriana* in possessing (1) a more depressed shape (lesser shell height/shell width ratio), (2) a larger, less occluded umbilicus, (3) profusely granulated sculpture, and (4) faint to non-existent spiral grooves on the body whorl. The walls of the penial sac of *H. morroensis* are not markedly thin and internally bear 7-10 longitudinal, anastomosing, crenulated pilasters, grading into the inner chamber of the lower, double-walled section of the epiphallus without interruption by a verge or any other structure. In *H. walkeriana*, a tongue-like extension of 2-3 fused pilasters extends about 0.2 mm into the summit of the penial sac; the penis is about 6.9 mm long, hourglass-shaped (compare Pilsbry, 1939: fig. 63B), markedly more slender than the epiphallus, broadening conically at its insertion on the atrium; and the walls of the penial sac are thin, internally bearing seven smooth, thin pilasters, unornamented but slightly thickened and crenulated just below the junction with the epiphallus.

In addition to these morphological differences, the habitat affinities of the two species differ. *H. walkeriana* is found in association with coastal dune scrub habitat on sandy soils, whereas *H. morroensis* is found most commonly associated with grassland and herbaceous cover on clay-based soils or serpentinite outcrops. Thus far, the two species appear to be allopatric.

The prognosis for the future of *H. walkeriana* is uncertain. Land development in the greater Morro Bay region continues to eliminate fragmented and marginal habitats. In September of 1998 the USFWS released its recovery plan for *H. walkeriana* (USFWS, 1998) and in 2001 designated 2,566 acres [1,039 ha] of mostly state-owned land as Critical Habitat for the species (USFWS, 2001). “Critical Habitat” is the legal and regulatory designation for those geographic areas determined by the USFWS as essential for the conservation of a threatened or endangered species. The recovery plan prepared for *H. walkeriana* specifies criteria by which the species may be considered for ESA delisting, or for downlisting from endangered to threatened status. In summary, downlisting may occur when populations of *H. walkeriana* are large enough to minimize the short-term chance of species extinction. Delisting would require assurances that populations and habitats are secure from known threats, and that permanent management programs are in place to ensure habitat suitability and species persistence.

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DISCOURAGING RESULTS IN THE SEARCH FOR THE PATAGONIAN MUSSEL *ANODONTITES PUELCHANUS*

By Pablo R. Martín & Pablo A. Seewald

The Patagonian mussel, *Anodontites puelchanus*, is endemic to the Negro river and its only two tributaries, the Neuquén and Limay rivers, showing a strongly disjunct distribution relative to the rest of the family Etheriidae (see *Tentacle* 12, p. 13-14). The scarce information available suggests that this mussel has always been rare, that it inhabits sand-mud bottoms in lotic environments and that, presumably, it requires a fish host to complete its life cycle. Together with the

Chilean mussel, *Diplodon chilensis*, these are the only two freshwater mussels living in Patagonia east of the Andes. Regrettably, the Negro river basin is the most heavily impacted in Argentinian Patagonia by human activities, such as the construction of many dams and reservoirs, the introduction of exotic species, the use of agrochemicals and the discharge of untreated municipal wastewater.

In view of this situation we have recently initiated studies to gain insight into the conservation status of both mussels in the Negro river basin, aiming at the detection of viable populations to further study reproductive habits and fish host identity, especially concerning the Patagonian mussel.

An extensive survey was performed during a period of relatively low waters (January 2004), with the aim of finding extant populations and determining the present distribution of *A. puelchanus* and *D. chilensis*. Twenty-one sites were visited, as determined by the possibility of access, evenly covering the entire section of the basin that was supposed to be inhabited by the Patagonian mussel according to Bonetto (1973) and Castellanos & Landoni (1990). We carefully inspected each site by wading hundreds of meters along one of the shores, searching for living macrobivalves or their empty valves among the submerged vegetation, among stones, in the sediments or along the strand.

Our efforts to find viable populations of the Patagonian mussel failed completely. Only one living individual of this species was retrieved, at the uppermost site in the Negro river. Only empty valves were found at the other seven sites in that river, including San Javier, the type locality of this species, and two other sites from where museum collections exist. Most of the valves were broken or heavily eroded post-mortem although many were still joined or had remains of the external ligament. A few valves were found at a single site in the lower course of both the Neuquén and Limay rivers.

Living specimens of the Chilean mussel were found at several sites (none in the Neuquén river) though we never found the high densities reported in rivers and lakes of Chile (Parada & Peredo, 1994). The Asiatic clam, *Corbicula fluminea*, was found at all sites along the Negro river, where it was always the most abundant macrobivalve, but nowhere in the Limay and Neuquén rivers. This clam has been linked to the decline of several species of bivalves elsewhere (Bogan, 1993).

The abundance of empty valves of *A. puelchanus* suggests the presence of extant or recently vanished populations in the Negro river, but the few remains found in the lower part of the Limay and Neuquén rivers indicate that the populations reported there have disappeared long ago. All the valves measured more than 5 cm long, indicating a higher fragility of juvenile valves or a prolonged absence of recruitment. Contrarily, living juvenile specimens of the Chilean mussel were found, though only in the lower Limay river, a section not colonized yet by the Asiatic clam.

Archeological evidence of the use of mussels going back thousands of years has been reported in southern Chile (Parada & Peredo, 1994) and in the Negro river. Doering (1881) recorded the mass consumption of the more abundant *D. chilensis* by members of military expeditions. During our survey we gathered some information about the past consumption of native mussels from local people, all of whom were unaware of the presence of two species in the Negro river. Neither of the mussels seems to be abundant enough nowadays to permit such activities.

The Asiatic clam has already colonized the full extent of the Negro river and the presence of the common carp, *Cyprinus carpio*, has now been confirmed along most of its course. Although because of their recent introduction and spread they are surely not responsible for the decline of the native mussels, they probably would hamper any future repopulation or reintroduction attempts.

In addition to the threats already mentioned, perhaps the most important menace to the Patagonian mussel is the almost complete ignorance of its fundamental ecology and the fact that most people living along the river are not even aware of its existence. Although our results are far from auspicious, we are planning to continue our efforts in order to locate remaining populations. We have also already released some notes to academic and popular media to highlight the problems facing mussel conservation and the introduction of non-indigenous aquatic species.

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CONSERVATION OF LAND SNAILS IN THE MOUNTAIN GRASSLANDS OF THE ARGENTINIAN PAMPAS

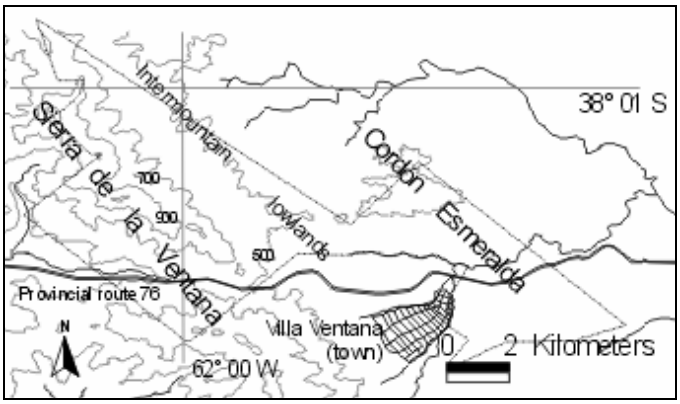
By Valdemar Delhey, Silvana Burela, Julia Pizá, Natalia Ghezzi & Néstor J. Cazzaniga

The Ventana Mountains are not only a remarkable physical feature within a mostly plains region, but also a 'biodiversity island' in the Pampas, the region most modified by agricultural activities in Argentina. These mountains harbor both endemic land snails and species of the surrounding plains. Thus, this is the most important area for land snail conservation in the Pampas, a region with a rather poor overall diversity of terrestrial snails. The state park 'Parque Provincial Ernesto Tornquist' (PPET) is the only reserve protecting these unique grasslands. Major threats to the native biota of the park are biological invasions by feral horses and exotic pines, which could also be affecting land snail

Top - *Austroborus lutescens dorbignyi*; middle - *Discoleus aguirrei*; bottom *Plagiodontes patagonicus*.

populations.

We have recently finished a land snail and earthworm conservation project in this reserve, funded by the BP Conservation Programme 2002 (British Petroleum, BirdLife International and Fauna & Flora International). One of our



The survey area in the Argentinian Pampas

specific goals was to investigate the effect of environmental conditions and the possible impact of horses on the distribution and abundance of four autochthonous macrosnail species: *Austroborus lutescens dorbignyi* (Doering, 1876), *Discoleus aguirrei* (Doering, 1884), *Plagiodontes patagonicus* (d'Orbigny, 1835) and the strictly endemic *Ventania avellanedae* (Doering, 1881). Sampling was carried out at two geographical scales. Environmental conditions recorded included topography, habitat structure, vegetation physiognomy, climatic and edaphic factors, floristic composition and horse impact.

Snail species commonly co-occurred and generally edxhibited similar qualitative responses to environmental variables. At a microgeographical scale, habitat structure variables were the most informative. For example, the four snail species mentioned above clearly preferred habitats with a more or less equal cover of rocks and vegetation. Particularly, rocks seemed to be an important habitat requirement for snails. We found snails partially buried in the soil under stones, attached to rocks and in narrow rock fissures. However, there were some resting site differences among snail species.

Frequency of snail occurrence and abundance across different environments was uneven. There are three main environments in PPET: (1) the Sierra de la Ventana mountain range with the highest altitudes and the greatest diversity of environments (summits, gorges, steep hillsides); (2) the Cordón Esmeralda mountain range, a group of low elevation hills of gentle slope; and (3) the intermountain lowlands, a transition area between the mountain ranges. Horses are present in Sierra de la Ventana and especially in the intermountain lowlands, but a wire fence prevents horses entering Cordón Esmeralda. Snail frequency and abundance was high in Cordón Esmeralda and lowest in the intermountain lowlands. The summits of Sierra de la Ventana had the highest population densities of *P. patagonicus* and *D. aguirrei.* Some responses to ecological variables, including horse impact, might explain this particular distribution pattern.

At the summits of Sierra de la Ventana, the highest densities of *D. aguirrei* and *P. patagonicus* were associated with the endemic dwarf shrub *Grindelia ventanensis*. This cushion-shaped and compact shrub could offer both shelter and food in the harsh environmental conditions of the summits. It is noticeable that even in the absence of rocks this shrub sustains dense snail populations.

Some reasons for the widespread occurrence of land snails in Cordón Esmeralda might be the presence of a homogeneously mixed cover of roughly equal proportions of rock and vegetation, as well as the particular structure of the rocks, typical of this area. These rock outcrops consist of parallel rock layers that offer numerous shelters, such as fissures and the microhabitats created by detached rock layers on the ground.

The intermountain lowlands exhibited marked environmental similarities with Cordón Esmeralda, including climatic and soil conditions. Furthermore, the structure and geological origin of rocky outcrops in these regions are similar. However, snails are usually absent from rocky habitats in the lowlands, probably for two reasons. First, rock outcrops showed a scattered pattern of occurrence. Second, lowlands sustain high horse populations, which might have a direct impact on snails. Some evidence for this impact follows from the fact that the presence of horses in lowlands is one of the clearest habitat differences with Cordón Esmeralda, where snails are frequent and abundant. Moreover, areas of Sierra de la Ventana with high horse impact also had low frequency of snail presence.

Horses could affect snails directly by trampling or indirectly by habitat modification via soil compaction or reduction of height of natural grasslands. Some snail species might be more affected by horses than others. While *A. l. dorbignyi* and *P. patagonicus* were totally absent from areas with high horse impact, some of these areas were inhabited by *D. aguirrei* or *V. avellanedae.* Individuals of the last two species were found in rock fissures, a resting site that is possibly safer from horse impact than those used by *A. l. dorbignyi* and *P. patagonicus*, species more associated with the ground.

Other ecological conditions, climate, topography, as well as calcium content, pH and other soil chemical properties were not important in explaining land snail distribution patterns, although some species tended to prefer a coarse soil texture.

These results support the hypothesis that horses have a negative effect on land snails. As the feral horse population continues to grow, the impact on land snails will probably increase. Therefore, we suggest designing a management plan to control feral horse populations, which are not part of the natural fauna of the reserve. In addition, it is also highly desirable that horses are permanently excluded from Cordón Esmeralda. The other main threat to the local flora and fauna, including land snails, is the spread of exotic pines. We have not found any snail population under long established pine forests. A number of methods of pine control are presently practiced in the park.

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THREATENED MOLLUSCS OF POLAND

By Katarzyna Zajac

The new edition of the *Red List of Threatened Species of Animals in Poland* includes 129 mollusc species of a total of over 270 mollusc species known in Poland. The richest malacofauna is found in southern Poland. This results both from the Pleistocene history of this part of Poland as well as the ecological diversity of the uplands and mountains in this part of the country. Over 230 species of snails are known from Poland (173 terrestrial, about 50 freshwater, 8-9 marine). Unfortunately, over 30 % of them are threatened with extinction and included in the *Red List*. Out of 39 species of bivalves found in freshwater and in brackish water of the Baltic Sea, 20 species have been included in the *Red List* (Table 1). The listings were based on observed degradation of populations, including disappearance of localities, changes in the vertical ranges of species in water bodies, decreases in population number, reduced size and conchological variation in some species in the order Unionoidea.

Table 1. Numbers of mollusc species in different threat categories, as listed in the *Red List of Threatened Species of Animals in Poland*.

	THREAT CATEGORY							
	EX	**CR**	**EN**	**VU**	**NT**	**LC**	**DD**	**TOTAL**
BIVALVIA	1	-	4	12	1	-	2	**20**
GASTROPODA TERRESTRIAL	-	16	1	11	37	1	9	**75**
GASTROPODA AQUATIC	-	1	3	13	10	-	7	**34**
TOTAL	**1**	**17**	**8**	**36**	**48**	**1**	**18**	**129**

EX – extinct, CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern, DD – data deficient.

The main threats to the listed species are habitat degradation or its complete destruction. Anthropogenic changes affect approximately 70 % of the bivalves and are the main threat to species in the family Sphaeridae and to marine species. The most important causes of the elimination of marine species seem to be pollution of the Baltic Sea and a considerable reduction of submerged macrophytes. Bivalves are exceptionally vulnerable to water pollution and habitat change resulting from hydro-engineering works in reservoirs, water courses or their nearest surroundings. The majority of snail species is threatened also by loss of appropriate habitats (mainly forests and marshes), land reclamation and drainage, regulation of rivers, eutrophication and pollution of water, different types of management and exploitation of open areas, and emissions of industrial pollutants, especially those acidifying the environment. Another threat, although poorly recognized, is posed by invasive alien species.

No snail species has died out in historical times; however, many are endangered, as shown in the list. A direct threat is posed to *Helix lutescens* by accidental exploitation. This species is often not distinguished from *Helix pomatia*, collected for commercial purposes. The rarest and most threatened aquatic gastropods are *Borysthenia naticina*, *Gyraulus acronicus* and *G. laevis*. One species, quite new to the Polish fauna, is included in the *Red List*. In the 19th century, *Lithoglyphus naticoides* spread out over the lowland area of Poland, first colonizing all large and medium lowland

rivers and canals. In the opinion of experts (Głowaciński, 2002; Głowaciński & Nowacki, 2004) this was natural extension of the range of this Pontic species. For the last 40-50 yr its strong decline has been observed, attributed to water pollution and river regulations. Only one mussel species, *Margaritifera margaritifera*, seems to be extinct in Poland but there is a plan to reintroduce the species.

Some of the species included in *Red List* are considered as threatened throughout their ranges (e.g. *Unio crassus*, *Pseudanodonta complanata*). The *IUCN Red List* (IUCN, 2004) includes 13 of the 129 mollusc species listed in the *Red List of Threatened Species of Animals in Poland*. Detailed descriptions (with pictures and distribution maps) of the most threatened mollusc species have been published in the Polish Red Data Book (Głowaciński & Nowacki, 2004; also http://www.iop.krakow.pl/pckz/lista.asp?lisy).

Red List of Threatened Molluscs in Poland

Class Gastropoda

Family Hermaeidae
1. *Alderia modesta* (Loven, 1844) - VU

Family Limapontiidae
2. *Limapontia capitata* (Müller, 1774) - VU

Family Eubranchidae
3. *Eubranchus pallidus* (Alder & Hancock, 1842) - VU

Family Aciculidae
4. *Acicula parcelineata* (Clessin, 1911) - DD

Family Bithyniidae
5. *Bithynia* (*Codiella*) *leachii* (Sheppard, 1823) - NT
6. *Bithynia* (*Codiella*) *transsilvanica* (Bielz, 1853) - VU

Family Hydrobiidae
7. *Hydrobia ventrosa* (Montagu, 1803) - DD
8. *Peringia ulvae* (Pennant, 1777) - DD
9. *Obrovia neglecta* (Muus, 1963) - VU
10. *Falniowskia neglectissima* (Falniowski & Steffek, 1989) - DD
11. *Lithoglyphus naticoides* (C. Pfeiffer, 1828) - EN
12. *Marstoniopsis scholtzi* (A. Schmidt, 1856) - NT
13. *Bythinella austriaca austriaca* (Frauenfeld, 1857) - NT
14. *Bythinella zyvionteki* Falniowski, 1987 - VU
15. *Bythinella metarubra* Falniowski, 1987 - VU
16. *Bythinella micherdzinskii* Falniowski, 1980 - VU
17. *Bythinella cylindrica* (Frauenfeld, 1857) - NT

Family Rissoidae
18. *Rissoa inconspicua abella* (Lovén, 1848) - VU
19. *Rissoa membranacea* (Adams, 1797) - NT

Family Valvatidae
20. *Valvata* (*Tropidina*) *macrostoma* Mörch, 1864 - VU
21. *Borysthenia naticina* (Menke, 1845) - CR

Family Lymnaeidae
22. *Stagnicola palustris* (Müller, 1774) - DD
23. *Stagnicola turricula* (Held, 1836) - DD
24. *Stagnicola occultus* (Jackiewicz, 1959) - NT
25. *Stagnicola corvus* (Gmelin, 1791) - DD
26. *Myxas glutinosa* (Müller, 1774) - VU

Family Physidae
27. *Aplexa hypnorum* (Linnaeus, 1758) - NT

Family Planorbidae
28. *Planorbis* (*Planorbis*) *carinatus* Müller, 1774 - NT
29. *Anisus* (*Anisus*) *spirorbis* (Linnaeus, 1758) - DD
30. *Anisus* (*Anisus*) *septemgyratus* (Rossmässler, 1835) - VU
31. *Anisus* (*Disculifer*) *vorticulus* (Troschel, 1834) - NT
32. *Gyraulus* (*Gyraulus*) *acronicus* (Férussac, 1807) - NT
33. *Gyraulus* (*Torquis*) *laevis* (Alder, 1838) - EN
34. *Gyraulus* (*Lamorbis*) *riparius* (Westerlund, 1865) - VU
35. *Gyraulus* (*Lamorbis*) *rossmaessleri* (Auerswald, 1852) - NT
36. *Hippeutis complanatus* (Linnaeus, 1758) - DD

Family Succineidae
37. *Quickella arenaria* (Potiez & Michaud, 1835) - DD

Family Orculidae
38. *Orcula dolium dolium* (Draparnaud, 1801) - VU
39. *Sphyradium doliolum* (Bruguière, 1792) - VU
40. *Pagodulina pagodula altilis* Klemm, 1939 - CR

Family Argnidae
41. *Argna bielzi bielzi* (Rossmässler, 1859) - VU

Family Valloniidae
42. *Vallonia enniensis* (Gredler, 1856) - NT
43. *Vallonia declivis* Sterki 1893 - DD

Family Pupillidae
44. *Pupilla* (*Pupilla*) *triplicata* (Studer, 1820) - DD
45. *Pupilla* (*Pupilla*) *sterrii* (Voith, 1840) - VU
46. *Pupilla* (*Pupilla*) *alpicola* (Charpentier, 1837) - CR

Family Pyramidulidae
47. *Pyramidula pusilla* (Vallot, 1801) - NT

Family Chondrinidae
48. *Granaria frumentum* (Draparnaud, 1801) - CR
49. *Chondrina arcadica clienta* (Westerlund, 1883) - NT

Family Vertiginidae
50. *Columella columella* (von Martens, 1830) - CR
51. *Truncatellina costulata* (Nilsson, 1823) - NT
52. *Truncatellina claustralis* (Gredler, 1856) - CR
53. *Vertigo* (*Vertigo*) *moulinsiana* (Dupuy, 1849) - CR
54. *Vertigo* (*Vertigo*) *modesta arctica* (Wallenberg, 1858 - CR
55. *Vertigo* (*Vertigo*) *ronnebyensis* (Westerlund, 1871) - NT
56. *Vertigo* (*Vertilla*) *angustior* Jeffreys, 1830 - EN

Family Enidae
57. *Chondrula tridens tridens* (Müller, 1774) - NT

Family Clausiliidae
58. *Cochlodina* (*Cochlodina*) *costata silesiaca* (Schmidt, 1868) - CR
59. *Charpentieria* (*Charpentieria*) *ornata* (Rossmässler, 1836) - CR
60. *Macrogastra* (*Pyrostoma*) *tumida* (Rossmässler, 1836) - NT
61. *Macrogastra* (*Pyrostoma*) *borealis borealis* (Boettger, 1878) - NT
62. *Macrogastra* (*Pyrostoma*) *badia crispulata* (Westerlund, 1884) - CR
63. *Clausilia* (*Clausilia*) *rugosa parvula* (Férussac, 1807) – NT

64. *Clausilia* (*Clausilia*) *cruciata cruciata* (Studer, 1820) - NT
65. *Balea* (*Balea*) *perversa* (Linnaeus, 1758) - CR
66. *Balea* (*Pseudalinda*) *fallax* (Rossmässler, 1836) - NT
67. *Balea* (*Pseudalinda*) *stabilis* (L. Pfeiffer, 1847) - NT
68. *Vestia* (*Vestia*) *elata* (Rossmässler, 1836) - CR
69. *Vestia* (*Vestia*) *gulo* (E.A. Bielz, 1859) - NT
70. *Vestia* (*Vestia*) *turgida* (Rossmässler, 1836) - VU

Family Ferussaciidae
71. *Cecilioides* (*Cecilioides*) *acicula* (Müller, 1774) - DD

Family Patulidae
72. *Discus* (*Gonyodiscus*) *perspectivus* (Megerle von Mühlfeld, 1816) - VU

Family Oxychilidae
73. *Daudebardia* (*Daudebardia*) *brevipes brevipes* (Draparnaud, 1805) - VU
74. *Carpathica* (*Carpathica*) *calophana* (Westerlund, 1881) - NT
75. *Cellariopsis deubeli* (Wagner, 1914) - NT
76. *Morlina glabra striaria* (Westerlund, 1881) - NT
77. *Mediterranea inopinata* (Uličný, 1887) - DD
78. *Aegopinella nitens* (Michaud, 1831) - NT
79. *Aegopinella epipedostoma iuncta* Hudec, 1964 - NT
80. *Nesovitrea* (*Perpolita*) *petronella* (Pfeiffer, 1853) - NT

Family Milacidae
81. *Tandonia rustica* (Millet, 1843) - NT

Family Vitrinidae
82. *Semilimax semilimax* (Férussac, 1802) - NT
83. *Semilimax kotulae* (Westerlund, 1883) - NT
84. *Eucobresia diaphana* (Draparnaud, 1805) - NT
85. *Eucobresia nivalis* (Dumont & Mortillet, 1854) - NT

Family Limacidae
86. *Limax bielzii* Seibert, 1874 - DD
87. *Lehmannia macroflagellata* Grossu & Lupu, 1962 - NT
88. *Lehmannia nyctelia* (Bourguignat, 1861) - VU
89. *Bielzia coerulans* (Bielz, 1851) - NT

Family Agriolimacidae
90. *Deroceras* (*Deroceras*) *praecox* Wiktor, 1966 - NT
91. *Deroceras* (*Deroceras*) *rodnae* Grossu & Lupu, 1965 - NT
92. *Deroceras* (*Liolytopelte*) *moldavicum* (Grossu & Lupu, 1961) - LC

Family Arionidae
93. *Arion* (*Kobeltia*) *intermedius* Normand, 1852 - NT

Family Helicodontidae
94. *Helicodonta obvoluta obvoluta* (Müller, 1774) - CR

Family Hygromiidae
95. *Trichia* (*Trichia*) *sericea* (Draparnaud, 1801) - DD
96. *Trichia* (*Trichia*) *villosula* (Rossmässler, 1838) - NT
97. *Trichia* (*Plicuteria*) *lubomirskii* (Ślósarski, 1881) - NT
98. *Petasina* (*Petasina*) *unidentata unidentata* (Draparnaud, 1805) - NT
99. *Petasina* (*Edentiella*) *bakowskii* (Poliński, 1924) - VU
100. *Petasina* (*Filicinella*) *bielzi bielzi* (Bielz, 1859) - VU
101. *Helicopsis striata striata* (Müller, 1774) - CR
102. *Candidula unifasciata unifasciata* (Poiret, 1801) - VU
103. *Perforatella dibothrion* (von Kimakowicz, 1884) - NT
104. *Urticicola umbrosus* (Pfeiffer, 1828) - NT

Family Helicidae
105. *Helicigona lapicida lapicida* (Linnaeus, 1758) - NT
106. *Faustina rossmaessleri* (Pfeiffer, 1842) - CR
107. *Faustina cingulella* (Rossmässler, 1837) - CR
108. *Causa holosericea* (Studer, 1820) - NT
109. *Helix* (*Helix*) *lutescens* Rossmässler, 1837 - NT

Class Bivalvia

Family Margaritiferidae
110. *Margaritifera* (*Margaritifera*) *margaritifera margaritifera* (Linnaeus, 1758) – EX

Family Unionidae
111. *Unio* (*Crassunio*) *crassus crassus* Philipsson, 1788 - EN
112. *Anodonta* (*Anodonta*) *cygnea cygnea* (Linnaeus, 1758) - EN
113. *Pseudanodonta complanata klettii* (Rossmässler, 1835) - EN

Family Mytilidae
114. *Mytilus trossulus* Gould, 1850 - NT

Family Astartidae
115. *Astarte borealis* (Schumacher, 1817) - DD
116. *Astarte elliptica* (Brown, 1827) - DD

Family Cardiidae
117. *Parvicardium hauniense* (Høpner, Petersen & Russell 1971) - VU
118. *Cerastoderma edule* (Linnaeus, 1758) - VU

Family Tellinidae
119. *Macoma calcarea* **(**Gmelin, 1791**)** - VU

Family Sphaeriidae
120. *Sphaerium* (*Amesoda*) *rivicola* (Lamarck, 1818) - VU
121. *Sphaerium* (*Cyrenastrum*) *solidum* (Normand, 1844) - EN
122. *Musculium* (*Musculium*) *lacustre* (Müller, 1774) - VU
123. *Pisidium* (*Cyclocalyx*) *obtusale* (Lamarck, 1818) - VU
124. *Pisidium* (*Tropidocyclas*) *lilljeborgii* Clessin, 1886 - VU
125. *Pisidium* (*Hiberneuglesa*) *hibernicum* Westerlund, 1894 - VU
126. *Pisidium* (*Cingulipisidium*) *nitidum* var. *crassa* Stelfox, 1918 - VU
127. *Pisidium* (*Neopisidium*) *conventus* Clessin, 1877 - VU
128. *Pisidium* (*Odhneripisidium*) *tenuilineatum* Stelfox, 1918 - VU
129. *Pisidium* (*Odhneripisidium*) *moitessierianum* Paladilhe, 1866 - VU

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PACIFIC ISLAND LAND SNAILS

Republic at a turning point: CBS reality series 'Survivor' strikes Palau

By Rebecca J. Rundell

The land snail fauna of the islands of Palau (Republic of Belau, independent since 1994) is spectacular, particularly in terms of the ecological and morphological diversity of its species. Many of Palau's land snails are endemic to the 350-island archipelago and according to recent Palau land snail surveys covering 16 states of Palau, many species have very small ranges, sometimes comprising only one tiny island (Rundell, unpublished). These species are found throughout lowland forests, on leaf litter, vegetation and rocks and even bordering beaches.

The extant diversity and abundance of land snails in Palau is exceptional, especially when one considers the extinctions that have taken place on other Pacific islands (e.g. the Hawaiian Islands). Despite this, the land snail fauna of Palau has received little attention, and comprehensive surveys on all islands are urgently needed.

Increasing construction and development in Palau, ominously foretells a potentially tragic demise for many of Palau's endemic species, including the land snails. Development along Palau's Compact Road on the large island of Babeldaob continues through the most pristine forest in Micronesia. The building of a new capital in Melekeok will probably bring with it further opening of roads and businesses along those roads. Finally, the building of production and 'tribal' camps for the CBS reality television series 'Survivor' on Palau (premiering 17 February 2005) will probably negatively impact land snail habitat. Increased attention to Palau following 'Survivor', while potentially economically positive over the short-term, may have lasting effects.

These recent developments in Palau underscore our need to work to both measure and lessen these effects in an attempt to thwart further land snail extinctions on Pacific islands. While the government and citizenship of Palau are relatively conservation-minded, and important NGOs such as the Palau Conservation Society are committed to managing Palau's species diversity for generations to come, the country is also at a crossroads. In 2009, Palau's Compact of Free Association with the United States will end, meaning that substantial funding from the United States that Palau has seen in recent years will dramatically decline. While Palau struggles to become economically independent (e.g. through increasing infrastructure and expanding tourism), seemingly small development decisions may cause large ripple effects in the conservation realm. Economic development is admittedly vital to the people of Palau, and this economy is becoming increasingly tourism-based. Because most of this tourism is related to Palau's natural beauty, maintaining species diversity in the islands is critical.

Continued survey efforts in Palau's islands are essential for providing baseline data, which are at the heart of solid conservation strategies. I continue to work with the Palau Conservation Society, Palau's Office of Environmental Response and Control, the State Governors, and the people of Palau in better understanding Palau's important land snail fauna through land snail surveys and evolutionary and ecological study. Expanding local knowledge of snails and their habitats, through educational programs with local schools and workshops with conservation personnel is also planned.

I am currently planning a second field season in Palau, which will involve additional land snail surveys, focusing on the species-rich Diplommatinidae. This morphologically and ecologically diverse family is the subject of my dissertation research, which explores the phylogeny, biogeography and potential adaptive radiation of the group in Palau. For more information on the project, including opportunities for field assistants, please contact me.

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Potential impact of an abundant introduced omnivorous land snail, *Oxychilus alliarius* on native land snails on the Island of Hawaii

By Wallace M. Meyer III

Three land snail surveys of the eastern portion of the Island of Hawaii were conducted in 2004 using a variety of collection techniques. The goal was to examine the distribution and habitat utilization of native and introduced snail species along three transects that span an elevational gradient from sea level to 2,500 m. To the disappointment of all involved, introduced snail and slug species now dominate the land snail fauna of the island.

The abundance and widespread distribution of one of the introduced species, *Oxychilus alliarius* (family Zonitidae), was particularly impressive. It was found at all sites above 250 m in elevation and often it was the most abundant species at those sites. Native to Europe (Kerney & Cameron, 1979), it was first recorded in the Hawaiian Islands in the early 1980s on the island of Maui, by which time it was already extremely abundant (Severns, 1984). Unfortunately, *O. alliarius* is known to be omnivorous, preying on other snails and their eggs, as is the case for other species in the family Zonitidae (e.g. Mordan, 1977; Kerney & Cameron, 1979); it is thus a potential threat to the extant native species of the Island of Hawaii, as suggested for Maui by Severns (1984).

These findings prompted a study to examine the potential effect *O. alliarius* may have on the native snail species found within the study area. Extant native land snail diversity in this area consists of three species of Succineidae and five species of 'tornatellinids' (small Achatinellidae belonging to subfamilies other than Achatinellinae). Succineids were chosen for the experiments since they were easily collected and had a much larger size range than the 'tornatellinids'. I specifically wanted to address: 1) whether *O. alliarius* will consume succineid species, and 2) if they do consume succineids, which size classes of succineid would be most impacted.

Results suggest that succineids less than 3.0 mm in shell length are highly susceptible to predation by *O. alliarius*. All snails above 3.0 mm in shell length survived the one week time period allotted for the experiment, whereas snails that were 3.0 mm or less in shell length suffered 89 % mortality. In addition, *O. alliarius* has been observed consuming succineid eggs in the field.

These findings suggest that *O. alliarius* may potentially impact all native land snail populations within the study areas. *O. alliarius* occurs at higher densities than any native species in the habitats where they coexist, and will consume snails less than 3.0 mm in shell length, a size range that includes all the tornatellinids as well as young succineids in roughly their first month of life.

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Conservation status of the endemic Pacific amber snails (Gastropoda: Succineidae)

By Brenden S. Holland & Robert H. Cowie

One of the more speciose and widespread land snail families in the Pacific basin, the Succineidae, provide an excellent model for the investigation of island biogeography and adaptive radiations. We are presently pursuing these topics using molecular markers in a study of the colonization pathways and molecular systematics of the Pacific Succineidae (e.g. Rundell et al., 2004), with funding from the U.S. National Science Foundation (grant DEB-0316308). Amber snails have been highly successful in dispersing across major geographic and oceanic barriers, as evidenced by their circum-global distribution, including all continents (other than Antarctica) and most oceanic islands.

In the Hawaiian archipelago, succineids have colonized all the main high islands, have diversified into 41 species (Cowie et al., 1995), and have radiated into habitats ranging from high mesic scrubland to arid coastal areas and cloud forests. Factors including high growth rate and fecundity (Brown et al., 2003; Rundell & Cowie, 2003) have apparently led to the persistence of healthy populations of certain Hawaiian succineid species, in spite of habitat destruction and the impacts of alien predators, in stark contrast to the extreme decline of other Hawaiian land snail groups such as the Achatinellinae (Hadfield et al., 2004). However, because of the diversity in ecology and life history of succineids, it is not possible to make general, family-wide predictions or assessments of the probable conservation status of many species. After a number of years of field surveys and collections in the Hawaiian Islands by our research group, it has become evident, based on relative abundance of a number of Hawaiian endemics, that the conservation status of species in the family varies greatly.

Other Pacific islands surveyed during this project appear to have been even more dramatically affected than the Hawaiian Islands by anthropogenic introductions, particularly the destructive activity of the predatory snail *Euglandina rosea*. For example, during a recent field expedition to French Polynesia by one of us (BH) only two species of succineids were found after surveying eight islands where succineid diversity had previously been far higher, as documented in an as yet unpublished nomenclatural catalog of the Pacific island Succineidae (Cowie, in prep.). Populations of both species were located at elevations above 1,220 m [4,000 ft]. At elevations below this, and only Tahiti among the Society Islands exceeds this elevation, although dead land snail shells of various species were abundant, no succineids, partulids or other larger and more conspicuous species were observed in either the vegetation or the leaf litter. In the same locations many dead but no live *E. rosea* were found. This suggests that predation by *E. rosea* may have caused the extirpation of these populations of native snails and that *E. rosea* itself had also then died out because of lack of prey. The survey suggested that the patterns of extinction of Succineidae in these islands are similar to those that have been documented for the prominent and well-studied Partulidae (Coote & Loève, 2003), and that the impacts are particularly acute below the apparently critical elevation of about 1,220 m [4,000 ft]. The main high islands of the Marquesas, in northern French Polynesia, retained higher land snail diversity than observed in the Society Islands, but no succineids were found.

On the basis of this admittedly limited survey work, we suggest that although their conservation status is not well documented, the patterns that are emerging suggest that the Pacific succineids have been more severely impacted and the impacts are more geographically widespread than previously realized.

Succinea lumbalis from the Hawaiian Island of Kauai (photo: B.S. Holland)

Regarding the Hawaiian succineids, and based on qualitative observations gathered over the course of many years of field work, we suggest that the conservation status of many of the

endemic species is critical and should be re-assessed by federal and state agencies charged with natural resource management. Irreversible degradation of habitat and the insidious effects of invasive land snail predators are apparently intractable problems, and therefore ongoing and serious threats to all native Hawaiian succineid taxa. The working definition of an endangered species, as a species whose numbers have been so reduced that it is threatened with extinction barring anthropogenic intervention, applies to a number of Hawaiian succineid species. Therefore, the remaining Hawaiian succineid species warrant robust protection. Timely biological monitoring and assessments are imperative for Hawaiian succineid management. Ultimately, we feel that a Multiple Species Conservation Plan is needed, assembling survey information for all of the extant succineid species and habitat types in the Hawaiian Islands, and identifying natural areas for monitoring, management and protection.

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Robert H. Cowie, contact details in the list of Mollusc Specialist Group members at the end of this issue of *Tentacle*.

MARINE MATTERS

Important paper in *Conservation Biology*

Edgar, G.J. & Samson, C.R. 2004. Catastrophic decline in mollusc diversity in eastern Tasmania and its concurrence with shellfish fisheries. *Conservation Biology* 18: 1579-1588.

Abstract: We used historical patterns of deposition of mollusc shells to infer changes to inshore benthic assemblages in the southeastern Tasmanian region over the past 120 years. We identified and counted shells in slices embedded within 1m long 210Pb-dated sediment cores were collected at 13 sites in water depths of 816 m. Declines in mollusc species richness and shell production occurred during the past century at all sites studied, with a mean decline per 5-cm sediment slice from 21 species in 1890 to 7 species in 1990 and in shell abundance from 150 to 30 individuals over the same period. The time course of decline notably corresponded with the history of the scallop dredge fishery, presumably either because scallop dredging caused general declines in populations of mollusc species or because other factors caused a catastrophic regional decline in molluscs that included scallops. As a consequence, the fishery was forced to close. Of major concern is that losses had not previously been recognized but extended throughout the 100-km coastal span of the study. Given that fishing and other anthropogenic impacts, as well as a lack of observational data, are virtually ubiquitous for the coastal zone, major recent losses in mollusc biodiversity may be globally widespread but have gone unnoticed.

The purple dye snail in Mexico: conservation of a natural resource and an ancient cultural tradition

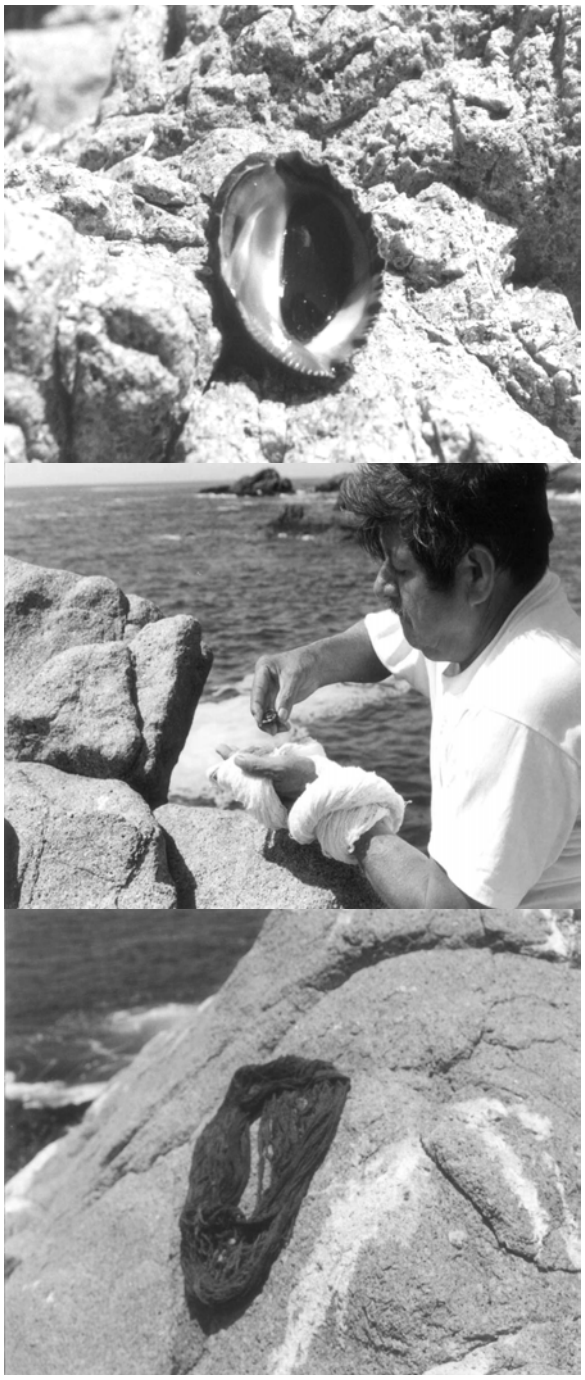
By Emilio Michel-Morfín

Some species of gastropod molluscs are remarkable for their ability to produce dye. Since ancient times, many cultures have used these inks to dye ceremonial garments, often associated with religious traditions and power (Ghiretti, 1996). After discovery of artificial inks, natural inks have become obsolete nowadays. However, with the purpose of preserving a cultural tradition and because of the rarity of these inks, in recent years their use has been re-evaluated (Turok, 1996).

Nowadays, in Mexico, indigenous people of the Pacific coast use the dye secreted by *Plicopurpura pansa*, combining it with other natural inks such as cochineal carmine from the pearl cactus insect *Dactylopius coccus*, and indigo from plants of the genus *Indigofera* (Turok et al., 1988). The purple dye is extracted at the shore by taking the snail off the rock manually and dying a cotton mop directly with the purple dye from the snail.

Plicopurpura pansa, commonly know as the purple snail or dye snail, is a common inhabitant of rocky shores of the intertidal zone of the eastern tropical Pacific. Its distribution is typical Panamic, ranging from Baja California to southern Colombia and the Galapagos islands. When disturbed, its hipobranchial gland exudes a defensive secretion that rapidly photo-oxidizes to give an intense purple hue. In contrast to other molluscs that produce ink (species of *Murex* and *Thais*), the shells of which must be broken in order to extract the dye, extraction from *P. pansa* is done by stimulating the animal's foot and operculum, without the need to sacrifice the organism. Moreover, this allows repetitive "milking" of the same animal.

Since 15 yr ago, research on the purple snail has been undertaken on the rocky shores of Mexico. Evaluation of population parameters together with rates of dye produced as a function of age at first milking and milking frequency allowed us to simulate different exploitation scenarios and to evaluate the most productive dye harvesting strategies, the



Top: *Plicopupura pansa*. Middle: manually dying a cotton mop. Bottom: a dyed mop.

most profitable exploitation intensity and optimum milking frequencies. As a result of laboratory milking experiments and field sampling, it was found that snail mortality is evident when the milking frequency is lower than 21 days (Michel-Morfín & Chávez, 2000; Michel-Morfín et al., 2000, 2002).

Based on the above results, and on snail abundances, purple snails can be considered as a potential resource. In the 1980s, on the Mexican Pacific coast, the purple snail was the subject of profitable exploitation by a Japanese company that used the dye to dye silk kimonos that were highly appreciated in the Eastern culture. However, this activity was done with the goal of obtaining the highest volumes of dye and the time between milkings was not considered, causing high mortality because of the mismanagement of the resource (Turok et al., 1988). This exploitation ended in 1988, when this species was declared as a species under special protection or management, that is, although it is not considered an endangered or threatened species because it is abundant, under Mexican law (NOM-035-ECOL-2002) it is necessary to obtain a special permit to extract the dye. Currently, only the Mixteco people on the coast of the Mexican state of Oaxaca use the snail dye, as they have done since pre-colonial times to dye their traditional clothing (Turok, 1996).

An adequate definition of fishery management strategies would lead to use of an important and valuable ancient resource, as is the purple dye, within a context of respect for the richness and cultural legacy of the traditional use of natural dyes that developed on the Pacific coast of Mexico. This would allow commercial exploitation of the dye produced by the purple snail in other zones of the coast apart from those where it takes place nowadays, benefiting other groups of fishermen, and ensuring sufficient raw material to be used by the Mixteco people for dying hand made garments.

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Dwarf specimens of *Charonia variegata* along the coasts of the Levant: a case of overcollecting or adverse ecological conditions?

By Henk K. Mienis

An Israeli-Spanish marine biodiversity project has recently been carried out in the National Park and Nature Reserve of Akhziv-Rosh HaNiqra, Israel. This region has to be considered one of the most diverse areas along the main coast of the Levant in the eastern Mediterranean.

The mollusc fauna includes some 400 different species of which some 10-12 % consist of so-called Lessepsian migrants, i.e. species that have migrated from the Red Sea to the Mediterranean Sea by means of the Suez Canal (Mienis &

Ben-David-Zaslow, 2004; Mienis et al., in prep.).

The Akhziv-Rosh HaNiqra area is known for the relative large number of the Triton's trumpet, *Charonia variegata* (Lamarck, 1822), which can usually be observed in its crystal clear waters. Also during the project a number of specimens, most of them empty shells, were collected for permanent documentation in the National Mollusc Collection of the Tel Aviv University.

The Spanish marine biologist participating in the project was astonished by the small size of the adult specimens and in his report to the authorities of the Regional Activity Center for Specially Protected Areas (RAC/SPA) in Tunis he suggested that the small size of these Triton's trumpets was probably a result of over-collecting.

The specimens of *Charonia variegata* found in the Akhziv-Rosh HaNiqra area and elsewhere along the coasts of the Levant are indeed much smaller than those found in the western and central part of the Mediterranean Sea. In fact they all belong to the dwarf form, *C. variegata seguenzae* (Aradas & Benoit, 1871). However, I do not agree with the suggestion that this dwarf form has arisen as a negative consequence of over-collecting. The nature reserve of Akhziv-Rosh HaNiqra is one of the most protected areas along the coast of Israel. Moreover the whole phylum Mollusca is protected by law in Israel.

In my opinion, the form of *Charonia variegata* living in the Levant is an excellent example of the widely accepted phenomenon that many molluscs in the eastern Mediterranean are much smaller than their congeners in the western Mediterranean. The eastern Mediterranean is known for the poor nutrient content of its seawater, which has dropped even more after the completion of the Aswan Dam on the river Nile. The diminutive size of *Charonia variegata* in this region is therefore more likely caused by inferior ecological conditions and not by over-collecting.

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An exploration of gamete maturity, growth and movement of *Cittarium pica* (West Indian topshell) in Bermuda

By Erin Meyer & Kathryn Coates

The West Indian topshell (*Cittarium pica*) is a tropical marine gastropod in the family Trochidae. *C. pica* lives on the intertidal rocky shores of several islands in the West Indies and Venezuela at its southern extent and as far north as Bermuda. The islands of Bermuda are located about 1,150 km [700 miles] off the coast of the United States in the Atlantic Ocean. Human settlement of these islands became permanent in 1609. *C. pica* was at high risk of being over-harvested because it is one of two species of large marine gastropods in Bermuda and is the only species readily accessible because of its habitat. Today, people harvest *C. pica* throughout its range both as a food source and for use as bait (Wingate, 1995). By the mid-1800s, when scientific documentation of Bermuda's natural history began, live *C. pica* were not recorded (Wingate 1995). As a result, the population of *C. pica* in Bermuda was deemed depleted in the early to mid-1800s (Madeiros, 2000). The cause of their extirpation is not certain, but possibilities include natural causes (Abbott, 1972), climate change (Wingate, 1995) and over-harvesting (Cattel, 2000). The over-harvesting hypothesis is based on the discovery of broken shells near a military campsite that was occupied until 1812 (Abbott, 1972). However, Abbott (1972) suggested that these shells were occupied by terrestrial hermit crabs.

Cittarium pica
(photo: Kathryn Coates)

Attempts at re-introduction of *C. pica* to Bermuda began as early as 1901, by a Mr. Roberts, who introduced a "large number of the shells" into Hamilton Harbor (Verrill, 1901). Several reintroductions were attempted, but prior to the 1980s, they all failed, most likely because of the location of release or release of too few snails. The first successful reintroduction project was in July 1982 by Teddy Tucker, a marine archaeologist and naturalist. Tucker began the project by researching the locations of their natural habitat in Bermuda (Wingate, 1989, 1995). Later that same year, Tucker imported 82 individuals from the Turks and Caicos and they were subsequently released on the Nonsuch Island Nature Reserve (Wingate, 1989, 1995). To protect the investment and promote recovery, *C. pica* was established as a fully protected species in Bermuda under the Fisheries Protected Species Order of 1989 (Wingate, 1995). Recent population surveys show an ongoing increase in numbers and spread of the species, and they have spread across nearly the entire southern coast of Bermuda.

In the fall of 2003, we began conducting research on the temporal and behavioral aspects of *C. pica* reproduction in Bermuda and the effects of these on recruitment and population structure. The research began with captive rearing experiments and a continuation of the population monitoring. The purposes of the captive rearing experiments were to 1) find a non-lethal method for inducing gamete release, 2) determine any cyclical aspects of gamete maturation and

spawning frequency, and 3) determine the species' size at sexual maturity. The purpose of the population monitoring was to determine whether *C. pica* is continuing to recover in Bermuda by assessing its reproductive success and possibly by identifying any illegal takes.

In June of 2004, we expanded our research to include growth and movement studies. From the beginning of the research, when *C. pica* individuals were brought into the laboratory, we tagged them and recorded shell diameter and weight. These intial laboratory measurements were the foundation for the new studies because the tagging allowed the possibility of extended data collection. No direct growth rates of *C. pica* in Bermuda have been previously reported. Movement studies have not previously been conducted on *C. pica* but could lead to assessment of habitat range and the possibility of population overlap, and evaluation of the validity of the population monitoring techniques used in Bermuda and throughout the range of *C. pica*. With the help of Dr. Annie Glasspool, Dr. James Wood and two interns, over 200 *C. pica* were tagged in a two-day "blitz tagging" event conducted in July of 2004.

By the end of our third field study (September-November 2003, March 2004, June-July 2004) we came to three main conclusions: 1) *C. pica* are probably not synchronous spawners, 2) there are no prominent cyclical aspects to gamete release, and 3) *C. pica* have a larger range of habitat than hypothesized by previous scientists. We also gathered, with the help of Dr. Glasspool and Dr. Wood, some of the first direct growth data on *C. pica*; this growth monitoring is now being conducted by Dr. Coates and Dr. Wood. Over the next few years, we are looking to continue our captive rearing experiments as well as our growth and movement research.

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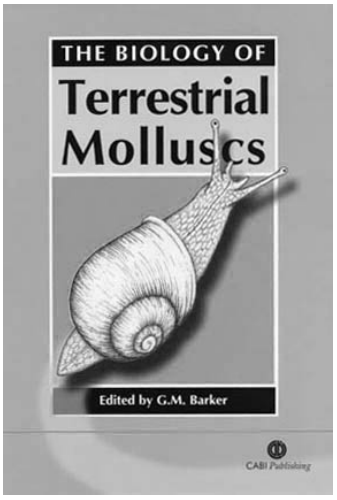
BOOK REVIEWS

By Robert H. Cowie

****SPECIAL OFFER****

This long-awaited trio of books, edited by Gary Barker of Landcare Research, New Zealand, is being offered by the publisher, CABI Publishing, to readers of *Tentacle* at a special discount price of 20 % off. While not explicitly focused on conservation, there is much information in all three books that will interest readers of *Tentacle*.

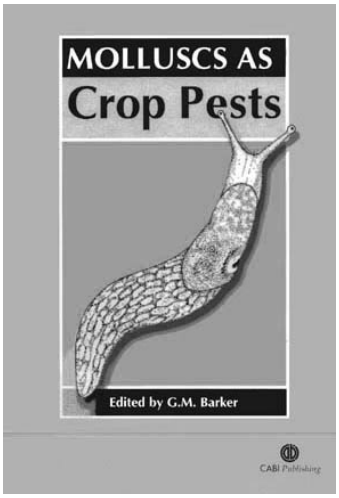


The Biology of Terrestrial Molluscs
2001, 560 p., hardback,
ISBN 0 85199 318 4

Special Discount Price
UK£60.00 (US$112.00)
(Normal Price UK£75.00 / US$140.00)

This book is an important compilation of up to date information that everyone working on molluscs should have access to. Gary Barker's monumental first chapter should be required reading for mollusc researchers. For those working in mollusc conservation, not only will the book serve as an important general source of basic information, but also there is a chapter dealing with conservation genetics of molluscs. The chapters are:

1. Gastropods on land: phylogeny, diversity and adaptive morphology – G.M. Barker
2. Body wall: form and function: D. Luchtel & I. Deyrup-Olsen
3. Sensory organs and the nervous system – R. Chase
4. Radular structure and function – U. Mackenstedt & K. Märkel
5. Structure and function of the digestive system in Stylommatophora – V.K. Dimitriadis
6. Food and feeding behaviour – B. Speiser
7. Haemolymph: blood cell morphology and function – E. Furuta & K. Yamaguchi
8. Structure and functioning of the reproductive system – B.J. Gómez
9. Regulation of growth and reproduction – A. Gomot de Vaufleury
10. Spermatogenesis and oogenesis – J.M. Healy
11. Population and conservation genetics – T. Backeljau, A. Baur & B. Baur
12. Life history strategies – J. Heller
13. Behavioural ecology: on doing the right thing in the right place at the right time – A. Cook
14. Soil biology and ecotoxicology – R. Dallinger, B. Berger, R. Triebskorn-Köhler & H. Köhler

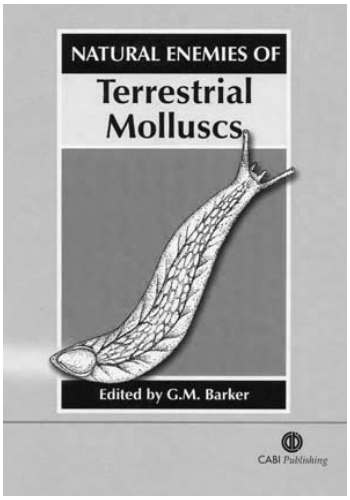


Molluscs as Crop Pests
2002, 472 p., hardback,
ISBN 0 85199 320 6

Special Discount Price
UK£60.00 (US$112.00)
(Normal Price UK£75.00 / US$140.00)

With a few notable exceptions, molluscs have too frequently been ignored as pests, with the focus of agricultural pest control research tending to be on insects, weeds and pathogens. This book is a compilation of much that is known about molluscs as pests, and although focused on agricultural issues, many of the topics covered have conservation implications, inasmuch as these pests are mostly invasive aliens that have many impacts other than their impacts on agriculture, and because measures implemented to control them may have impacts on non-target native species, some of which may be of conservation concern. The chapters are:

1. Chemical control of terrestrial gastropods – I. Henderson & R. Triebskorn
2. Molluscicidal baits for control of terrestrial gastropods – S.E.R. Bailey
3. *Achatina fulica* Bowdich and other Achatinidae as pests in tropical agriculture – S.K. Raut & G.M. Barker
4. Vaginulidae in Central America, with emphasis on the bean slug, *Sarasinula plebeia* (Fischer) – A. Rueda, R. Caballero, R. Kaminsky & K.L. Andrews
5. Apple snails (Ampullariidae) as agricultural pests: their biology, impacts and management – R.H. Cowie
6. Helicidae and Hygromiidae as pests in cereal crops and pastures in southern Australia – G.H. Baker
7. Planorbidae and Lymnaeidae as pests of rice, with particular reference to *Isidorella newcombi* (Adams & Angus) – M.M. Stevens
8. *Urocyclus flavescens* Kerferstein (Urocyclidae) as a pest of banana in South Africa – K. de Jager & M. Daneel
9. *Bradybaena similaris* (de Férussac) (Bradybaenidae) as a pest on grapevines of Taiwan – C.-P. Chang
10. Agriolimacidae, Arionidae and Milacidae as pests in west European sunflower and maize – G. Hommay
11. Helicidae as pests in Australian and South African grapevines – G. Sanderson & W. Sirgel
12. Agriolimacidae, Arionidae and Milacidae as pests in west European cereals – D.M. Glen & R. Moens
13. Agriolimacidae and Arionidae as pests in conservation-tillage soybean and maize cropping in North America – R.B. Hammond & R.A. Byers
14. *Bradybaena ravida* (Benson) (Bradybaenidae) in cereal-cotton rotations of Jingyang County, Shaanxi Province, China – D. Chen, G. Zhang, W. Xu, M. Wang, Y. Liu, X. Cheng & J. Wu
15. Agriolimacidae and Milacidae as pests in lucerne and other legumes in forage systems of north-eastern North America – R.A. Byers
16. Gastropods as pests in vegetable and ornamental crops in Western Europe – G. Port & A. Ester
17. Integrated management of *Cantareus aspersus* (Müller) (Helicidae) as a pest of citrus in California – N.K. Sakovich
18. Gastropods as pests in New Zealand pastoral agriculture, with emphasis on Agriolimicidae, Arionidae and Milacidae – G.M. Barker
19. Agriolimacidae, Arionidae and Milacidae as pests in west European oilseed rape – R. Moens & D.M. Glen



Natural Enemies of Terrestrial Molluscs
2004, 640 p., hardback,
ISBN 0 85199 319 2

Special discount price
UK£96.00 (US$156.00)
(Normal price UK£120.00 / US$195.00)

This book provides a comprehensive synthesis of knowledge on the predators, parasites and pathogens of molluscs. Its focus is on how these might be used to control mollusc pests. However, there is much information on basic mollusc ecology that is relevant to conservation; and of course the manipulation of these natural enemies to control pests may have implications for conservation, not only because of potential non-target impacts on other molluscs but also because some of the measures employed could have potential for control of invasive molluscs that may be preying on or competing with
native mollusc species, some of which may be of conservation concern. The chapters are:

1. Avian and mammalian predators of terrestrial gastropods – J.A. Allen
2. Coleoptera (Carabidae, Staphylinidae, Lampyridae, Drilidae and Silphidae) as predators of terrestrial molluscs – W.O.C. Symondson
3. Diptera as predators and parasitoids of terrestrial gastropods, with emphasis on Phoridae, Calliphoridae, Sarcophagidae, Muscidae and Fanniidae – J.B. Coupland & G.M. Barker
4. Overview of the biology of marsh flies (Diptera: Sciomyzidae), with special reference to predators and parsitoids of terrestrial gastropods – G.M. Barker, L. Knutson, J.-C. Vala, J.B. Coupland & J.K. Barnes
5. Terrestrial planarians (Platyhelminthes: Tricladida: Terricola) predaceous on terrestrial gastropods – L. Winsor, P.M. Johns & G.M. Barker
6. Predatory gastropods as natural enemies of terrestrial gastropods and other invertebrates – G.M. Barker & M.G. Efford
7. Millipedes (Diplopoda) and centipedes (Chilopoda) (Myriapoda) as predators of terrestrial gastropods – G.M. Barker
8. Reptilian predators of terrestrial gastropods – I.L. Laporta-Ferreira & M. da Graça Salomão
9. Heteropteran predation on terresrtrial gastropods – R.R. Jackson & A. Barrion

10. Gastropod predation in spiders (Araneae) – S.D. Pollard & R.R. Jackson
11. Mites (Acari) parasitic and predaceous on terrestrial gastropods – A. Fain
12. Nematodes (Nematoda) parasitic in terrestrial gastropods – S. Morand, M.J. Wilson & D.M. Glen
13. Ciliophoran (Ciliophora) parasites of terrestrial gastropods – J.G. Van As & L. Basson
14. Microsporidae (Microspora) parasitic in terrestrial gastropods – B.J. Selman & A.A. Jones
15. Bacterial and non-microbial diseases in terrestrial gastropods – S.K. Raut

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Robert H. Cowie, Editor, contact details in the list of Mollusc Specialist Group members at the end of this issue of *Tentacle*.

RECENT PUBLICATIONS RELEVANT TO MOLLUSC CONSERVATION

Two notable symposium proceedings appeared during 2004:

Molluscan Biodiversity and Conservation, edited by Ian J. Killeen and Mary B. Seddon, and published as *Journal of Conchology Special Publication* number 3. This volume contains the proceedings of the symposium held in 2001 at the World Congress of Malacology in Vienna. It includes the following papers:

Whitten, T. Malacologists: what are your priorities? p. 1-6.
Ponder, W.F. Conservation of molluscs and other beasts without backbones; issues, strategies and the role of museum collections. p. 7-21.
Cowie, R.H. Disappearing snails and alien invasions: the biodiversity/conservation interface in the Pacific. p. 23-37.
Cameron, R.A.D. From continents to quadrats: species/area relationships in land mollusc faunas. p. 39-54.
Gosliner, T.M. Using phylogenies and geography to establish conservation priorities: case studies from the Indo-Pacific tropics. p. 55-68.
Neves, R. Propagation of endangered freshwater mussels in North America. p. 69-80.
Aldridge, D.C. Conservation of freshwater unionid mussels in Britain. p. 81-90.
Moorkens, E.A. & Costello, M.J. Survival study of the freshwater pearl mussel *Margaritifera margaritifera* after opening with mussel tongs. p. 91-94.
Darrigran, G. & Pastorino, G. Distribution of the golden mussel *Limnoperna fortunei* (Dunker, 1857), (Bivalvia: Mytilidae) after 10 years invading America. p. 95-101.
Jensen, K.R. Diversity of Bivalvia in the Gulf of Thailand: comparing data from three periods between 1880 and 2000. p. 103-108.
Fortunato, H. Central American Neogene and Recent marine molluscan diversity: an overview for conservation purposes. p. 109-121.
Heller, J. & Kadmon, R. The use of GIS mapping techniques in assessing biodiversity. p. 123-132.
Wood, J.B., Robinette, J.M. & Day, C. Conservation meets bioinformatics: new tools for making informed decisions. p. 133-142.
Neubert, E. & Mordan, P. [B.] Non-marine Mollusca of the Soqotra archipelago. p. 143-148.
Schilthuizen, M. Landsnail conservation in Borneo: limestone outcrops act as arks. p. 149-154.
Michel, E., Todd, J.A., Cleary, D.F.R., Kingma, I., Cohen, A.S. & Genner, M.J. Scales of endemism: challenges for conservation and incentives for evolutionary studies in a gastropod species flock from Lake Tanganyika. p. 155-172.

The biology and conservation of freshwater gastropods, edited by Robert T. Dillon, Jr., and published as part of the *American Malacological Bulletin* volume 19. This is the proceedings of the symposium held in 2002 at the annual meeting of the American Malacological Society in Charleston. It includes the following papers:

Richards, D.C. & Shinn, D.C. Intraspecific competition and development of size structure in the invasive snail *Potamopyrgus antipodarum* (Gray, 1853). p. 33-37.
Mower, C.M. & Turner, A.M. Behavior, morphology, and the coexistence of two pulmonate snails with molluscivorous fish: a comparative approach. p. 39-46.
McCarthy, T.M. Effects of pair-type and isolation time on mating interactions of a freshwater snail, *Physa gyrina* (Say, 1821). p. 47-55
Brown, K.M. & Johnson, P.D. Comparative conservation ecology of pleurocerid and pulmonate gastropods of the United States. p. 57-62.
Dillon, R.T., Jr., Earnhardt, C.E. & Smith, T.P. Reproductive isolation between *Physa acuta* and *Physa gyrina* in joint culture. p. 63-68.
Dillon, R.T., Jr. & Frankis, R.C., Jr. High levels of mitochondrial DNA sequence divergense in isolated populations of freshwater snails of the genus *Goniobasis* Lea, 1862. p. 69-77.
Stewart, T.W. & Dillon, R.T., Jr. Species composition and geographic distribution of Virginia's freshwater gastropod fauna; a review using historical records. p. 79-91.
Britton, D.K. & McMahon, R.F. Environmentally and genetically induced shell-shape variation in the freshwater pond snail *Physa* (*Physella*) *virgata* (Gould, 1855). p. 93-100.
McMahon, R.F. A 15-year study of interannual shell-shape variation in a population of freshwater limpets (Pulmonata: Basommatophora: Ancylidae). p. 101-109.
Glaubrecht, M. Leopold von Buch's legacy: treating species as dynamic entities, or why geography matters. p. 111-134.

Wethington, A.R. & Guralnick, R. Are populations of physids from different hot springs distinctive lineages? p. 135-144.

Other publications

Aldridge, D.C., Elliott, P. & Moggridge, G.D. 2004. The recent and rapid spread of the zebra mussel (*Dreissena polymorpha*) in Great Britain. *Biological Conservation* 119: 253-261.

Beaty, B.B. & Neves, R.J. 2004. Use of a natural river flow-through culture system for rearing juvenile freshwater mussels (Bivalvia: Unionidae) and evaluation of the effects of substrate size, temperature, and stocking density. *American Malacologcial Bulletin* 19: 15-23.

Chivian, E., Roberts, C.M. & Bernstein, A.S. 2003. The threat to cone snails. *Science* 302: 391.

Cosgrove, P.J. & Harvey, P.V. 2003. An unusual freshwater pearl mussel *Margaritifera margaritifera* (L.) population in Scotland. *Journal of Conchology* 38(2): 139-146.

Cowie, R.H. & Grant-Mackie, J.A. 2004. The land snail fauna of the Mé Auré cave (WMD007), Moindou, New Caledonia: human introductions and faunal change. *Pacific Science* 58: 447-460.

Duda, T.F., Jr., Bingham, J.-P., Livett, B.G. Kohn, A.J., Massilia, G.R., Schultz, J.R., Down, J., Sandall, D. & Sweedler, J.V. 2004. How much at risk are cone snails? *Science* 303: 955-957.

Edgar, G.J. & Samson, C.R. 2004. Catastrophic decline in mollusc diversity in eastern Tasmania and its concurrence with shellfish fisheries. *Conservation Biology* 18: 1579-1588.

Gurevitch, J. & Padilla, D.K. 2004. Are invasive species a major cause of extinctions? *Trends in Ecology and Evolution* 19: 470-474.
[Includes discussion of the impact of zebra mussels]

Gurevitch, J. & Padilla, D.K. 2004. Response to Ricciardi. Assessing species invasions as a cause of extinction. *Trends in Ecology and Evolution* 19: 620.

Hadfield, M.G., Holland, B.S. & Olival, K. 2004. Contributions of *ex situ* propagation and molecular genetics to the conservation of Hawaiian tree snails. In: *Experimental Approaches to Conservation Biology* (Gordon, M. & Bartol, S., eds), p. 16-34. University of California Press, Berkeley and Los Angeles.

Holland, B.S. & Hadfield, M.G. 2004 Origin and diversification of the endemic Hawaiian tree snails (Achatinellinae: Achatinellidae) based on molecular evidence. *Molecular Phylogenetics and Evolution*. 32(2): 588-600.

Lydeard, C., Cowie, R.H., Ponder, W.F., Bogan, A.E., Bouchet, P., Clark, S., Cummings, K.S., Frest, T.J., Gargominy, O., Herbert, D.G., Hershler, R., Perez, K., Roth, B., Seddon, M., Strong, E.E. & Thompson, F.G. 2004. The global decline of nonmarine mollusks. *BioScience* 54(4): 321-330.

Nelson, L. 2004. One slip, and you're dead... *Nature* 429: 798-799.
[Mentions the possibility that collection of *Conus* for neuroscience research and drug development could impact wild populations.]

Ricciardi, A. 2004. Assessing species invasions as a cause of extinction. *Trends in Ecology and Evolution* 19: 619.
[Comment on Gurevitch & Padilla (2004)]

Rundell, R.J., Holland, B.S. & Cowie, R.H. 2004. Molecular phylogeny and biogeography of the endemic Hawaiian Succineidae (Gastropoda: Pulmonata). *Molecular Phylogenetics and Evolution* 31: 246-255.

Strayer, D.L., Downing, J.A., Haag, W.R., King, T.L., Layzer, J.B., Newton, T.J. & Nichols, S.J. 2004. Changing perspectives on pearly mussels, North America's most imperiled animals. *BioScience* 54(5): 429-439.

Watson, A.M. & Ormerod, S.J. 2004. The distribution of three uncommon freshwater gastropods in the drainage ditches of British grazing marshes. *Biological Conservation* 118(4): 455-466.

IUCN AND SSC NEWS

All the following communicated by Mary Seddon, Mollusc Specialist Group Chair (contact details in the list of Mollusc Specialist Group members at the end of this issue of *Tentacle*)

SSC news from the 3rd IUCN World Conservation Congress, 17-25 November, Bangkok

Launch of the 2004 IUCN *Red List of Threatened Species* and *Global Species Assessment*

IUCN's 3rd World Conservation Congress opened in Bangkok on 17 November to the news that the world is facing an escalating global species extinction crisis. The launch of the *2004 IUCN Red List of Threatened Species* at the start of the conference revealed that 15,589 species face extinction, more than half of which are plants. This includes one in three amphibians, almost half of all tortoises and freshwater turtles as well as one in eight birds and one in four mammals. Species loss has major implications not only for biodiversity, but also for human well-being and sustainable development. A companion publication, the *Global Species Assessment* (GSA) was also launched. Based on the *Red List*, this is the most comprehensive evaluation ever undertaken of the status of the world's biodiversity.

The full story can be found at http://www.iucn.org/themes/ssc/red_list_2004/English/newsrelease_EN.htm

The GSA is at http://www.iucn.org/themes/ssc/red_list_2004/GSA_book/Red_List_2004_book.pdf

And the IUCN Red List website is http://www.iucnredlist.org/

Dr. Holly Dublin – SSC's new Chair

Dr. Holly Dublin has been elected as the new Chair of the Species Survival Commission, taking the reins from David Brackett, who served the maximum 8 yr allowed under the rules of the IUCN statutes. Holly's association with the SSC began over 30 yr ago when she became a member of her first Specialist Group. In 1992 she became Chair of the African Elephant Group. In 1994 she joined the SSC Executive Committee and has been a dynamic participant ever since. She moves with ease between the day-to-day realities and concerns of conservation practitioners and the world of international policy, its financiers and decision-makers. A skilled writer and orator with a long and dedicated history with IUCN and SSC, she will be a committed and effective Chair.

The full story can be found at http://www.iucn.org/themes/ssc/news/Holly.htm

NASA and Oracle announce substantial donations for SSC's Species Information Service

Two major announcements about the development of SSC's Species Information Service (SIS) - a worldwide biodiversity and conservation management tool that includes the IUCN *Red List of Threatened Species* - were made at the Congress.

• NASA (National Aeronautics and Space Administration) signed a joint declaration with IUCN to improve access to, and incorporate NASA data and remote sensing products into the work of IUCN. SIS will be a major beneficiary of this agreement. The full story can be found at http://www.iucn.org/themes/ssc/news/article/2004-11-18-nasa.pdf

• Oracle Corporation announced an in-kind donation to IUCN of Oracle software and support services valued at US$3 million. This generous gift means that SIS now has the necessary technical support and software required to reach its full potential as a worldwide conservation knowledge management system. The full story can be found at http://www.iucn.org/themes/ssc/news/article/2004-11-20-oracle.pdf

A roadmap for improving SSC's global conservation tools

Issues considered critical in furthering the *IUCN Red List of Threatened Species* and the Species Information Service were identified during the SSC meeting. Taking place at the start of the Bangkok Congress, and attended by about 400 Commission members, the session defined ways of improving the usability of the two most well known SSC tools. The full story can be found at http://www.iucn.org/congress/commission/ssc-report.htm

New head of IUCN Species Programme announced

Dr. Jane Smart has been appointed as the new head of the IUCN Species Programme. Jane has been Executive Director of Plantlife International, based in the UK, and brings many years of experience in field-based as well as global plant conservation to the position. She has been a member of SSC and active on the IUCN/SSC Plant Conservation Committee. Until mid 2004 Jane also served as the UK Chair of the IUCN National Committee. She takes up the position in spring 2005.

Letter from the Chair of the Species Survival Commission

Dear SSC Specialist Group member,

Many of you will already know that the World Conservation Congress of IUCN confirmed my nomination by electing me to the Chair of the SSC. Running unopposed provides one of the few certainties in life, but the strong support of IUCN's 1000+ government and non-governmental members gives me great confidence as I take on this position. I am delighted to take the handover from David, as he completes his two-term limit in office.

I bring to this position 30 years as an active Specialist Group member, 12 years as a Specialist Group Chair and a decade on the Executive Committee of the SSC. But even with this deep experience in SSC, the position of Chair presents many new challenges for me, both professionally and personally. I am honoured by my appointment but somewhat awed by the work ahead. I will be communicating with you on a regular basis, to keep you apprised of our progress.

Many of you may be feeling as anxious about the future as I sometimes feel and so I want to provide you some insights into my plans over the coming months. The next six months will be a whirlwind in every conceivable way.

Before the end of the year [2004], I will be travelling from Kenya to the United States and Canada. My mission is straightforward. First, I must officially become a part of my new institutional home, the Wildlife Conservation Society. Following that, I will go immediately to Ottawa to have an extended debriefing and handover with David Brackett. This promises to be a demanding time as we attempt to transition as seamlessly as possible from David's 8-year tenure. In early January [2005] I will travel to Gland to meet with the Director General, the Global Programme Director and many other colleagues in the IUCN Secretariat to continue to build on the good relations we have and to look for new synergies. The challenge is to better integrate our SSC activities, including those of the Specialist Groups, with the ongoing thematic programmes of IUCN and IUCN's policy work, while presenting our case for inclusion among IUCN's key donor priorities.

By mid-February, I must put forward the nominations for my new Steering Committee to IUCN Council for their approval. As these are the people who will provide me day-to-day counsel over the coming four years, I take this task particularly seriously. The process requires much consultation and much thinking about how best to surround myself with able and willing individuals who have the knowledge, wisdom, time, resources and desire to contribute at an even higher level to our somewhat novel style of voluntarism.

Following that, I will be reviewing and revisiting the current Chairs of our Specialist Groups and Task Forces prior to making appointments for the coming four years. I will do this with the assistance of staff, wise men and women on the Steering Committee and yourselves. I will also do this cognisant of one of the most important changes in the history of IUCN - the decision by the Council and formally adopted by the WCC, for all Commissions to join forces with other bodies of IUCN in Gland and in the Regional Programme Offices, to deliver on a single programme - the IUCN Programme 2005-2008.

This has important implications and ramifications for SSC and for its ways of operating; some of these we can predict but others we are yet to discover. From this year on, the SSC and other Commissions will be required to report our progress against measurable targets on an annual basis. Yes, gone are the days when our contribution to species conservation was comprised of simply "doing our own thing"! Nonetheless, we are extremely fortunate in already having in place the SSC Strategic Plan (SP) 2001-2010 and its recently renewed mandate. The SSC SP provides us strong direction for the years to come. For those of you who will continue as SSC Specialist Group (SG) Chairs, this implies doing some things differently and even learning a few new tricks! All this will need to be reflected in the new Terms of Reference for SSC SG Chairs but I am sure none of us are too old or too settled in our ways to turn our backs on such an opportunity. For many Specialist Groups this may be the best chance, yet, to bring their priorities and their expertise to the centre stage of one of

the most powerful forces in the global conservation arena.

These and other decisions of the WCC will mean change in many aspects of how we, as a voluntary Commission of IUCN, do business. While these changes will be more stimulating for some of us and more difficult for others, I believe that change is inherently good and that change in an institution such as IUCN is inevitable, essential and to be welcomed. Having experienced major changes in both my personal and professional lives over the past two years, I think I can speak from experience. Despite the many challenges ahead, I am very keen to do my part with the full backing of the largest of IUCN's Commissions behind me. We must work together to find the balance of needs and demands, at all levels. I am confident that I can count on all of you to actively assist in making this work for SSC while maintaining and enhancing our inheritance as "the Pride of IUCN".

All of this will take time and will present challenges in more ways than one. So, I feel it is important to provide you a backdrop of the real stage on which all of this will be played out. On a personal front, I will be winding down my nomadic lifestyle of the past two years and moving my base of operations from Nairobi to Cape Town. On the work side, I will be establishing the new Chair's office at the South African National Biodiversity Institute, formerly the South African National Botanical Institute, at Kirstenbosch; a branch of South Africa's Department of Environmental Affairs and Tourism. My first priority will be to hire some support staff as, for now, I am running on my own steam in dealing with the many tasks, big and small, before me.

Settling into a new home, taking on a new job, setting up a new office and adjusting to a new way of life while trying to take over the helm of this powerful ship feels somewhat daunting but those of you who have seen me in action will attest that I am not one to shy from hard work. Like all majestic big ships, I anticipate that SSC will move slowly but deliberately into the wind and into a new era. Though there are many difficult sides to this transition, I am approaching it with as much energy and enthusiasm as I can muster - knowing that without this, I won't make it through myself, let alone provide leadership and vision for all of you.

Let me end by asking those of you who know me to help in explaining to those of you who do not the kind of person I am. I am direct and, yes, I can be assertive. I speak my mind but I listen to others and expect them to be candid in return. But, most importantly, I am open-minded, energised, innovative and DRIVEN - driven by the passion that guides all of you to be active in the Species Survival Commission. I welcome you to share your ideas, your visions and your passion with me now and over the years to come.

We need to use our powerful network to empower our members with knowledge about the present and the future.

Now more than ever before, we must be resolute in contributing our individual and collective knowledge and skills towards reducing the rate of global biodiversity loss. Your active involvement in the SSC is one clear demonstration of your determination.

Wishing you all the best with your work and the passion that drives you....

Wishing you, your friends and families a Happy, Healthy Holiday Season.

Holly

Dr. Holly T. Dublin
Chair, IUCN Species Survival Commission

MEETINGS 2004-2005

New currents in conserving freshwater systems: a biodiversity science symposium

This interdisciplinary forum for scientists and conservation practitioners will be held at the American Museum of Natural History, New York City, 7-8 April 2005, to highlight recent successful initiatives in freshwater conservation, and to discuss how and where cutting-edge ideas and tools can be implemented. The symposium will showcase projects that not only integrate scientific fields, but also link science with other disciplines, to generate a fertile landscape for discussing the way forward in freshwater conservation. Please see the website for more information:
http://cbc.amnh.org/symposia/freshwater/

Freshwater Mollusk Conservation Society

The 2005 FMCS Symposium will be held at the Radisson Riverfront Hotel in St. Paul, Minnesota, 15-18 May. The theme of the symposium will be: "Are Your Natives Restless? Holistic Strategies for Conserving Freshwater Mollusks during Exotic Species Invasions". More details are available at the website http://ellipse.inhs.uiuc.edu/FMCS/symposium/ or contact the FMCS chair, Kurt Welke: Kurt.Welke@dnr.state.wi.us

American Malacological Society Annual Meeting

The 2005 American Malacological Society meeting will be held at the Asilomar Conference Center near Monterey, California, 26-30 June. For more information see the AMS meetings website:
http://erato.acnatsci.org/ams/meetings/next.html
or contact the conference organiser and AMS president, Dianna K. Padilla, Department of Ecology and Evolution, Stony Brook University, Stony Brook, New York 11794-5245, USA. Tel +1 631 632 7434, fax +1 631 632 7434, padilla@life.bio.sunysb.edu

2005 Latin American Malacological Congress

Hosted by the Smithsonian Tropical Research Institute (STRI) and the Universidad de Panama, the VI Latin American Malacological Congress will be held in Panama city, Panama, 4-7 July. More details are available on the website http://striweb.si.edu/congreso_malacologia/index.html or contact Helena Fortunato: fortunae@ancon.si.edu

19th Annual Meeting of the Society for Conservation Biology

The Zoology Department of the Universidade de Brasília (UnB) will host the 2005 Society for Conservation Biology Annual Meeting, 15-19 July, bringing together conservation biology scientists, practitioners and students from around the world. The meeting will consider the theme of "Conservation biology capacity building & practice in a globalized world" and other emerging topics through plenary sessions, symposia, workshops, organized discussions, contributed oral presentations, and poster sessions. Field trips to key conservation sites in and near Brasília have been organized to highlight the possibilities that exist. Please see the website for more information: http://www.scb2005.unb.br/
Contact details: Departamento de Zoologia, IB, Universidade de Brasília, Brasília, DF 70.910-900, Brasil. Tel/fax + 55 61 307-3366, scb2005@unb.br

XIX Brasilian Malacological Meeting
XIX EBRAM – Encontro Brasileiro de Malacologia

The next Brasilian Malacological Meeting will be held on the campus of the State University of Rio de Janeiro (UERJ), in the city of Rio de Janeiro, Brasil, 25-29 July 2005. Several symposia are planed: morphology and taxonomy, phylogeny, aquaculture and fisheries, pathology, education, conservation and other topics of particular interests such as public health. There will also be oral and poster sessions. More information is available on the website www2.uerj.br/~sbma
or contact Dra. Sonia Barbosa dos Santos, President of the Brasilian Society of Malacology: sbsantos@uerj.br

INTERNET RESOURCES: LISTS AND WEBSITES

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

UNITAS MALACOLOGICA

http://www.inter.nl.net/users/Meijer.T/UM/um.html

Red List

The entire Red List of Threatened Animals can be searched at
www.redlist.org
www.redlist.net
www.iucnredlist.org

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

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 D.R. Lindberg of the University of California Museum of Paleontology, Berkeley, USA.

Mollia

The MOLLIA web site makes available the UNITAS MALACOLOGICA newsletters (up to 1998), which have a lot of information complementing information in *Tentacle*. The site also includes instructions to authors, subscription information and links to various malacological journals. It also allows you to subscribe to the MOLLUSCA listserver (above) and to access the MOLLUSCA archives. MOLLIA, like MOLLUSCA, is maintained and managed at the University of California Museum of Paleontology, Berkeley, USA.
www.ucmp.berkeley.edu/mologis/mollia.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
with the command line (in message body):

SUBSCRIBE CITES-L

Freshwater Mollusk Conservation Society

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

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 http://www.amonline.net.au/invertebrates/marine_overview/ and PDF at
www.amonline.net.au/invertebrates/pdf/marineoverview.pdf

Invasive Species Specialist Group

Includes details of the Aliens-L listserver and the ISSG newsletter, *Aliens*.
www.issg.org/index.html

MUSSEL database project

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

American Malacological Society

The homepage of the AMS carries a link to the Society's conservation policy, as well as to a pdf of the recent *BioScience* article 'The global decline of nonmarine mollusks'.
http://erato.acnatsci.org/ams/index.html

Unionids

UNIO is a listserver focusing on the biology, ecology and evolution of freshwater unionid mussels. Details, including how to subscribe, are given at the UNIO website: http://my.fit.edu/~rtankers/unio.htm
The primary objectives of the list are (1) to foster communication and collaboration among scientists, researchers, and students engaged in mussel-related activities and (2) to facilitate the informal discussion of regional and federal research priorities. Postings related to mussel conservation issues, including the artificial propagation and captive rearing of threatened and endangered species, are especially welcomed. Subscribers are also encouraged to use the list for posting information on mussel-related meetings, symposia, workshops, and funding opportunities. The list is sponsored by the Florida Institute of Technology and administered and managed by Rick Tankersley (rtank@fit.edu) to whom any questions regarding the list, including problems while attempting to subscribe or post messages, should be addressed. There are currently about 400 members.

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.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

Jamaican Land Snail Project

A key to Jamaican land snails is now online, on the DiscoverLife website at
http://pick4.pick.uga.edu/mp/20q?guide=Molluscs
The key is part of Gary Rosenberg's ongoing work on the Jamaican fauna: http://data.acnatsci.org/jamaica/
The key is still being developed and 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,
http://clade.acnatsci.org/rosenberg

Conchologists of America

The homepage of the COA carries a link to a number of pages dealing with its conservation policy and conservation issues.
http://www.conchologistsofamerica.org/home/

Field Museum land snails

Information for over 142,000 lots (a lot is a collection of a single species taken from a single locality on a single occasion), including over 2,500 type lots, of land snails in the Field Museum (Chicago) collections is accessible at
fm1.fieldmuseum.org/collections/search.cgi?dest=inverts

The Malacological Society of London

http://www.malacsoc.org.uk/

Malacological Society of Australasia

www.amonline.net.au/malsoc/

Haus der Natur—Cismar

The homepage carries a link to a page on mollusc conservation in Germany, as well as other links.
http://home.t-online.de/home/hausdernatur.vwiese/hncengl.htm

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.
hbs.bishopmuseum.org

Links

Useful sites with links to many of the major malacological websites:
www.geocities.com/Paris/LeftBank/6559/scc28.html
manandmollusc.net/
www.staffs.ac.uk/schools/sciences/biology/dhome/dhome.htm
www.uni-mainz.de/~lieb/

SSC MOLLUSC SPECIALIST GROUP

In order to keep these details up to date, please inform the editor, Robert Cowie, of any changes or corrections.

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