The Newsletter of the IUCN/SSC Mollusc Specialist Group
Species Survival Commission • International Union for Conservation of Nature

TENTACLE

UNITAS MALACOLOGICA

EDITORIAL

You may think it is easy to have a mollusc species listed on the IUCN Red List. However, there is a complex and rigorous process that IUCN has implemented that is not as easy as simply sending an e-mail explaining why your favourite species in danger should be listed. Last September I was involved in the formal IUCN process as an 'expert' evaluator of the status of a large number of Pacific island land snail species. This is a two-step process. First, following the identification of people with knowledge of the species, some of these are invited to act as 'specialists' to assess the species for which they have expertise. They are trained in the application of the IUCN criteria to assess a species' status. They then go away and develop their assessments. Second, a group of 'experts' is identified who act as peer reviewers of the assessments developed by the 'specialists'. I went to Suva, Fiji, to participate, along with Drs. Gary Barker and Kostas Triantis as an 'expert' to review the Pacific island molluscs that had been assessed by the 'specialists'.

This process is all very well if you are dealing with, let us say, marine turtles, or cheetahs - well known vertebrates. There are multitudes of people working on these species so that there is a large pool from which to draw 'specialists' and 'experts'.

But in the Pacific, we are dealing with maybe four or five thousand species of land snails. I am arguably the most knowledgeable person regarding the Samoan fauna; Rebecca Rundell, my former graduate student, knows more about the land snails of Palau than anyone (I know a little, but that is essentially the sum total of people with appropriate knowledge of the Palauan fauna); Gary Barker and Gilianne Brodie know the Fijian fauna; Diarmaid O Foighil knows French Polynesian partulids; Olivier Gargominy and Benoît Fontaine know the faunas of a number of the French Polynesian islands. John Slapcinsky and Fred Kraus know the Papua New Guinea fauna probably better than anyone. And a few others have a smattering of knowledge of bits and pieces of this huge diverse fauna.

So, from among this small cadre of people with expertise in the Pacific island land snail fauna, some among those available at the time were selected as 'specialists' and some as

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'experts'. The 'specialists' were able to assess the Fijian and Palauan faunas plus some others, but none had expertise in, for example, the Samoan fauna, which was thus not assessed. I came in as an 'expert' evaluator of these assessments. But, with the exception of a little knowledge of Palau, I do not have expertise in the other areas and so had to evaluate those assessments entirely from my smattering of knowledge combined with first principles. Since my real expertise is in Samoa, but I was not asked to assess the Samoan fauna as a 'specialist', that fauna remains unassessed.

This process certainly is intended to introduce rigour into the assessments, by implemeting a kind of peer review, and may work well for well known vertebrates for which there are many people focussed on one or a few species. But it does not work well for the vast majority of invertebrates, for which just one person may be the only person in the world with expertise on a few hundred species. And we know that invertebrates constitute the vast majority of animal species as well as the vast majority of endangered and extinct species.

A better process for invertebrates, for example for the Pacific island land snails, would be to gather together the knowledgeable people as a single group, rather than dividing them up into 'specialists' and 'experts'. Perhaps a degree of peer review would be lost, but at least those with expertise in a particular taxonomic group or geographical region would be able to have their species assessed. As it is, my Samoan expertise, for example, was not used because I was an 'expert' evaluator of species for which I have less expertise, and since I am the only person able to assess the Samoan species, those species went unassessed.

With maybe ten or a dozen people who have sufficent expertise between them to assess a good proportion of the four or five thousand Pacific island land snail species, it is unfortunate that the IUCN's vertebrate-focussed process has resulted in only a much smaller number of these species being assessed, despite there being expertise in other groups and areas within the Pacific. The paper by Claire Régnier *et al.* (2009), highlighted in *Tentacle* 18, identifies related issues that mean that molluscs are inadequately listed on the IUCN Red List, despite the availability of sufficient appropriate knowledge.

There are some very committed people in IUCN, among whom I definitely acknowledge Helen Pippard, the IUCN coordinator of our meetings (see her summary on p. 37) and Nieves Garcia, our IUCN facilitator. However, the approach to listing invertebrates - and I assume that my Pacific island land snail experience reflects similar experiences with other invertebrate groups - needs to be re-thought to take account of the relatively tiny number of taxonomists/conservationsits who between them cover thousands and thousands of species of snails, flies, worms, beetles and so on.

We evaluated a couple of hundred Pacific island land snail species, but we could have done much more. Most of the species we assessed are threatened to some degree. The other thousands that remain unassessed are probably just as threatened but remain unassessed and unlisted.

Robert H. Cowie, Editor

TENTACLE – PUBLICATION GUIDELINES AND INFORMATION

If you plan to submit an article to Tentacle PLEASE READ THESE GUIDELINES AND FOLLOW THEM!

Tentacle is a web-based newsletter, accessed at www.hawaii.edu/cowielab/Tentacle.htm, where all issues are available. Guidelines for submission of articles to *Tentacle*, and other related IUCN links are also on this website.

If you plan to submit something to *Tentacle*, please read these guidelines. Carefully following the guidelines will make my life a lot easier!

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

I stress that *Tentacle* is not a peer-reviewed journal. Because I accept most articles that are submitted, *Tentacle* might be seen as an easy way to get your original data published without going through the rigours of peer review. *Tentacle* is a newsletter and so it is primarily news items that I want, including summaries of your ongoing studies, rather than full, data-rich reports of your research. Those reports should be submitted to peer reviewed journals. I will increasingly decline to publish articles that I feel should be in the peer-reviewed literature, especially if they are long.

I am therefore setting a limit of three published pages, including all text, illustrations, references, etc., for all articles that I accept in the future for publication in *Tentacle* (though I reserve the right to make rare exceptions if I consider it appropriate).

Also, please make every effort to format your article, including fonts (Times New Roman), paragraphing styles, heading styles, and especially citations, in a way that makes it easy for me simply to paste your article into *Tentacle*, which is created in Microsoft Word. Please pay special attention to the format (paragraphing, fonts, etc.) in past issues. Despite many reminders, it still takes me many many hours formatting your submissions – please do it for me! Especially, please pay very careful attention to the format of references in the reference lists - I still spend inordinate amounts of time deleting commas, inserting colons, changing journal titles to italics, putting initials after not before names, deleting parentheses around dates and so on. Here are examples of how it should be done:

Selander, R.K., Kaufman, D.W. & Ralin, R.S. 1974. Self-fertilization in the terrestrial snail *Rumina decollata*. *The Veliger* 16: 265-270.
South, A. 1992. *Terrestrial Slugs: Biology, Ecology, and Control*. Chapman and Hall, London. x + 428 p.
Barker, G.M. & Efford, M.G. 2004. Predatory gastropods as natural enemies of terrestrial gastropods and other invertebrates. In: *Natural Enemies of Terrestrial Molluscs* (ed. Barker, G.M.), p. 279-403. CABI Publishing, Wallingford.

Also note that all illustrations must fit in a single column, so make sure your maps and diagrams are readable and show what you intend when they are reduced to this size.

Printing and mailing of *Tentacle* has been supported in the past by Unitas Malacologica, the international society for the study of molluscs, for which the Mollusc Specialist Group is most grateful. To become a member of UNITAS, go to its website and follow the links to the application.

Membership of the Mollusc Specialist Group is by invitation. However, everyone is welcome to submit articles to *Tentacle* and to promote its distribution as widely as possible. Since I announce the publication of each new issue to all who are on my *Tentacle* e-mail distribution list, please keep me updated with your current e-mail address so that you do not drop off the list. I also announce the availability of each issue on the MOLLUSCA listserver (for details, see p. 41 of this issue of *Tentacle*) and the Unitas Malacologica members e-mail list.

As always, I reiterate that the content of *Tentacle* depends on what you send me. So I encourage anyone with anything relevant to mollusc conservation to send me something now, and it will be included in the next issue (published once a year, usually in January).

NEWS

Demise of snails in a New Zealand freezer is a sign of the times

From: Nature (17 November 2011) 479: 268, editorial

The world just got a little smaller. If you go down to the woods today in search of a western black rhinoceros (*Diceros bicornis longipes*) you'll be out of luck. Those at the International Union for Conservation of Nature, whose task it is to maintain the Red List of endangered species, have been looking high and low for western black rhinos for some time, but in vain. Last week, they called off the search and declared it extinct. Most of us will never have knowingly met a western black rhino. One feels a keen sense of its passing nonetheless — a sensation to which we are becoming accustomed.

Rhinophiles will also, no doubt, be aware that the northern white rhino (*Ceratotherium simum cottoni*), a cousin of the late western black rhino, is on the brink of extinction, and that the last Javan rhino (*Rhinoceros sondaicus*) outside Java is also believed to have disappeared.

Conservation news is not all bad. The efforts of conservationists to rescue populations from the wild, breed them in captivity and reintroduce them, sometimes pay off. Przewalski's horse (*Equus ferus przewalskii*) was listed as extinct in the wild in 1996, but was brought back after a captive breeding programme, and the wild population is now believed to exceed 300. The Arabian oryx (*Oryx leucoryx*) is also on the up, albeit gingerly. Thanks to captive breeding and reintroductions — intentional or otherwise — the howls of wolves are heard once more where they had been absent for centuries, and wild boar (*Sus scrofa*) are believed to infest parts of Britain with a vigour that would shame an urban cockroach.

Less well publicized, perhaps, are the woes of endangered creatures too small, obscure or superficially revolting to attract headlines. Conservationists have long understood that the public categorizes creatures into two kinds — Cute and Yucky. The land snail *Powelliphanta augusta* tends, arguably, to fall into the latter class. Mature individuals grow to the size of a fist. A rapacious carnivore, it survives by sucking worms out of the ground. Clearly, it is a species that only its mother could truly love. It was discovered in 1996 in a remote mountain ridge on the South Island of New Zealand, its sole known place of residence. Unluckily for the marauding mollusc, its entire range was due to be demolished to make way for an opencast coalmine. About 4,000 snails were caught and released in another part of the area, with 1,600 being placed at their preferred temperature of 10 °C in chiller units in a government conservation-department facility. Unfortunately, a fault in a sensor plunged the temperature in one of the units to zero, and 800 of the snails — a sizeable fraction of the entire species — froze to death. The fault was not noticed immediately because it happened over a public holiday.

The incident highlights an important fact long known in conservation biology, that as species shrink in number, they become ever more vulnerable to sudden mishaps. To suffer because of, say, an avalanche or a brushfire is unfortunate — after all, species have evolved and become extinct innumerable times throughout Earth's history without the interference of *Homo sapiens*. So it is sad that *P. augusta* has come closer to extinction as a result of people's efforts to prevent such an eventuality. But one might, if one were so minded, also look askance at the decision to plonk an opencast mine on the snail's habitat. How different it might have been had the snails been able to disguise themselves as fluffy polar bear cubs or baby pandas. Conservationists can only do so much. When backed with political will, they can do much more.

European environment: alarming decline in plants, molluscs and freshwater fish

Excerpt from IUCN News Release, 22 November 2011

Europe's natural heritage is showing an alarming decline, according to new research published today. The *European Red List*, a part of the *IUCN Red List of Threatened Species*, assessed a considerable portion of Europe's native fauna and flora, finding that a large proportion of molluscs, freshwater

fish and vascular plants now fall into a threatened category.

The assessment of some 6,000 species reveals that 44 % of all freshwater molluscs, 37 % of freshwater fish, 23 % of amphibians, 20 % of a selection of terrestrial molluscs, 19 % of reptiles, 15 % of mammals and of dragonflies, 13 % of birds, 11 % of a selection of saproxylic beetles, 9 % of butterflies and 467 species of vascular plant species are now under threat.

European Commissioner for the Environment Janez Potočnik said: 'The well-being of people in Europe and all over the world depends on goods and services that nature provides. If we don't address the reasons behind this decline and act urgently to stop it, we could pay a very heavy price indeed.'

Freshwater molluscs are the most threatened group assessed so far. Spengler's Freshwater Mussel (*Margaritifera auricularia*), once widespread, is now restricted to a handful of rivers in France and Spain. Currently listed as Critically Endangered, it was considered to be nearly extinct in the 1980s. The species is one of two for which a European-level Action Plan was designed and there are ongoing conservation programmes which allow hope for its future.

'The figures confirm the worrying condition of European molluscs', said Annabelle Cuttelod, IUCN Coordinator of the European Red List. 'When combined with the high level of threats faced by freshwater fish and amphibians, we can see that the European freshwater ecosystems are really under serious threats that require urgent conservation action'.

But there is some positive news and the assessment highlights the success of well-designed conservation measures. Many species protected under the EU Habitats Directive and included in the Natura 2000 network of protected areas now have an improved chance of survival. Additionally, the control of invasive species such as plants, goats and rats for example has benefited the majority of threatened land snails in Madeira over the past 10 years.

'These are encouraging signs that show the benefits of conservation actions supported by strong policy', says Jean-Christohpe Vié, Deputy Director, IUCN Global Species Programme. 'Continued implementation of the current European legislation combined with new conservation programmes is essential to preserve these important native species and their habitats'.

Musselling into river beds

From: Ecology (2011) 92: 1013-1019, and Nature 469: 446, as reported by Oryx 45: 158.

A study that examined the effects of mussel abundance on gravel erosion in artificially-constructed freshwater streams has provided an example of the effects of biodiversity on physical processes, a subject that has been little-studied in the past. Variations in mussel traits, such as size, shell morphology and burrowing behaviour, mean that different species have different effects on gravel-bed erosion. The study found that mussel species richness increased erosion at both high and low densities. At high densities some combinations of species had non-additive effects on erosion, suggesting that the effects of biodiversity on these ecosystem processes can be influenced by organism abundance.

Noise pollution affects squid

From: New Scientist (2011) 210(2808): 15, and Frontiers in Ecology and the Environment (2011) 9: 489-493, as reported by Oryx 45: 312

The effects of underwater sonar on cetaceans has been of increasing concern in recent years, and now a new study has indicated that other marine creatures may also be adversely affected by noise pollution. Experiments in which captive cuttlefish, octopuses and squid were exposed to low-frequency noise for two hours have revealed that the fine hairs in the animals' statocysts, the structures that are responsible for cephalopods' sense of balance and position in the water column, were damaged, with large patches of the hairs missing. On first exposure to the noise the animals were observed trying to escape but soon they stopped moving. These findings support the theory that damage to the bodies of nine giant squid washed up on Spanish beaches in 2001 and 2003 was caused by acoustic trauma sustained from low-frequency sounds from seismic surveys for oil and gas nearby.

IN FAVOUR OF VERNACULAR NAMES FOR MOLLUSCS

By Joseph Heller

Increasing public awareness of mollusc diversity is one of our responsibilities as malacologists. Yet for us to create this awareness, lay people must be able to use names that for them are meaningful, simple and preferably, pretty. The very existence of separate vernacular names for distinct gastropod genera is important, for the lay, to discriminate among them.

Vernacular names are a matter for national and cultural communities, not for international academic circles. It is precisely because there are no international standards for coining vernacular names for molluscs (or any other animal group) that some exchange of ideas seems desirable.

We need vernacular names for the general public, the media, the amateur shell collector, the school child and the academic student. To each of these, different names may appeal. Shell collectors might perhaps prefer vernacular names that are transliterations of the scientific names whereas the electronic media may prefer names that shift away from cumbersome scientific terms.

The target population of users of mollusc vernacular names should, in my opinion, be the local nature-loving teenager: one who knows what snails and bivalves are, and that snails group with bivalves into the larger category of molluscs; but does not know all the various snail genera. Young, motivated and enthusiastic, he picks up a snail in nature, asks 'what snail is this?' and the reply should be a name that is short, meaningful for him and easily remembered. In some future day, when this nature-loving teenager matures and becomes more aware of biodiversity, he may be active in conservation campaigns, may occupy posts in which he will be able to influence conservation strategies or determine education policies, and may educate his children to be aware of biodiversity. It is mainly this section of the public that we should wish to be aware of mollusc diversity. The general public, media, book authors, amateurs, shell collectors should all (and in my opinion easily can) adapt to any name used by an amateur nature-loving teenager, who seeks a name for a mollusc he encounters in nature.

A vernacular name system should encompass all terrestrial, aquatic and marine molluscs likely to be encountered by local devoted naturalists, but the scope should be reasonable: vernacular names should be provided for all molluscs for which they are needed, but the system should not be widened and encumbered beyond this. In practice this means a vernacular-name system for most terrestrial and freshwater, and many (but not all) marine species of the local fauna.

Vernacular names must be stable – the public must not be left to cope with ever-changing vernacular names that trail each of our ever-changing taxonomic revisions; a lion should remain a lion whether *Felis* or *Panthera*. One way to stabilize the vernacular name system is by lumping several closely related genera into one vernacular name. The 'common-name genus' is a group of species closely related in the eye of the amateur (or the general zoologist). Hence there is no need to change vernacular names whenever malacologists change the assignation of species to genera, and the vernacular-name system is broadly immune to changes in the scientific system.

However, lumping belittles biodiversity and does not educate people to become aware of the vast richness of biodiversity. It is the splitting into a diversity of vernacular names that draws attention to rich diversity. We can, say, lump all genera of the marine superfamily Trochoidea into one vernacular name, 'spinning-top'. This is advantageous in that if, in some future taxonomic revision of the Trochoidea, a given species is shifted from one scientific genus to another, the vernacular name is not affected. This is however disadvantageous in that when all local genera of Trochoidea are named 'spinning-top', if one of these is endangered then this loss of one of the top-shells is not very impressive. Splitting improves chances to alert the public, perhaps even to recruit a conservation campaign.

On these lumping versus splitting trade offs, decisions may be guided by size. Differences among tiny animals, of less than about half a centimeter, are not very meaningful to the nature-loving teenager who encounters molluscs in the field, and over-naming irritates. Hence among tiny molluscs, lumping may be the proper strategy.

Some names have already been in common use in the literature of the past decades and in the interest of consistency they should often preferably be approved, even if not very appealing. For molluscs that as yet do not have vernacular names, and for those with an existing vernacular name that is too un-appealing to be accepted, new names must be coined.

The vernacular name of a mollusc species should be composed, like the scientific name, of a generic name (noun) and a specifying name (adjective). Preferably generic names should consist of single words, but in some cases the use of two words is inevitable (e.g. 'sea-hare'). When a generic name is formed by the addition of an attributive word, the two words should be connected by a hyphen, to emphasize that the combination denotes one concept. This gives a broader scope of possible names, especially for naming closely related genera as variations on a theme (e.g. for arcoid bivalves, 'narrow-ark', 'hairy-ark', 'sandy-ark' and 'white-ark'). However, if distant families converge to a similar shape, it would be misleading to give them both the same vernacular name within the same vernacular name system, and this should be avoided (e.g. the patelloid *Acmaea*, the calyptraeid *Crucibulum* and the opisthobranch *Onchidella*, all named 'limpet' by Morris *et al*. (1980) for the inter-tidal invertebrates of California).

A vernacular name should preferably be meaningful in that it gives some little information about the mollusc. This information may relate to habitat (the 'rock-ling' dwells among rocks); feeding habits (the 'coral-slayer' feeds voraciously upon corals); morphology ('blind-ling' has no eyes); color ('white-let' has an all-white shell) or functional biology (the 'leaf-let' harbours many photosynthetic chloroplasts).

In the interests of brevity, the terms 'snail' and 'bivalve' (perhaps also 'clam' and 'mussel') should be dropped from genus-level vernacular-names; even amateur naturalists encountering snail and bivalve genera in nature know they are beholding a snail (or bivalve) and including these terms in the vernacular name would add nothing for these naturalists, but make the name unnecessarily longer (e.g. for the freshwater molluscs of Canada, for which Clarke (1981) gave all eight hydrobiid genera the name 'spire snail', I would favor 'spire').

A vernacular name may be derived from a translation of a scientific name. Such vernacular names are most successful when the scientific name bears a close relevance to the biology or morphology of the genus. (*Coralliophila* dwells exclusively on corals, upon which it feeds, as its name suggests; the vernacular name derived from this scientific name may be 'coral-ler'). However, many scientific names may translate into vernacular names that are dull, meaningless and irrelevant. To name the genus *Microxeromagna* 'small-dry-magna', or the genus *Euchondrus* as 'true-chondrus') is not very helpful, for the lay. Unlinking the vernacular from the scientific name enables a more creative approach of coining attractive names that describe a unique morphology, habitat or behaviour.

The vernacular name of a species, like that of the genus, should preferably be meaningful in that it gives at least some information about the mollusc. However, this information should be brief and if a species has several unique characteristics, only one of these should be used for the vernacular name. The Canadian freshwater snail *Juga plicifer*, which is both graceful and keeled, has been given the vernacular name 'graceful keeled horn snail' (Clarke, 1981); I would have suggested either 'graceful horn' or 'keeled horn'. Further, this information should be meaningful. The vernacular name 'eroded periwinkle', proposed by Morris *et al*. (1980) for *Littorina planaxis* Philippi, should be accepted only if individuals of this species tend, during their lifetime, to become more eroded than others.

Some scientific names honour people and it is tempting to use people's names also in vernacular names. As a matter of personal taste, it seems to me an excellent idea to give *Throchoidea helleri* Forcart the vernacular name 'Heller's snail-let'. Alas, for many nature loving teenagers who encounter *T. helleri* in the field, the name Heller is as yet not sufficiently meaningful. Vernacular names for molluscs should help people to learn and remember molluscs, not to immortalize malacologists; the latter become immortal by being part of a scientific name, or the authors of a scientific name. Therefore, names of people should be avoided in vernacular names.

Geographical terms may be incorporated into vernacular names at the species level. They should be given only to species endemic to a specific geographic area ('Galilee rock-let' for a terrestrial snail that occurs only in Galilee). When a mollusc has both a unique morphological character and an endemic distribution then, in the interests of brevity, the vernacular name should refer to only one of these characters. Such five-word names as 'Giant Columbia River Spire Snail' for the Canadian mollusc *Lithoglypus virens* (see Clarke, 1981) are just too long; either 'Columbia spire' or 'giant spire' would be shorter and consequently, perhaps, more appealing. For the benefit of conservation campaigns, it may often be wiser to emphasize endemism rather than morphology.

Above genus level, a vernacular-name system should parallel the scientific system only in broad outlines but not in any great detail, to avoid its becoming too cumbersome. For groupings between genus and class levels (Gastropoda, Bivalvia etc.) no more than two vernacular names usually suffice, and these may be chosen without reference to any precise taxonomic level (subfamily, superfamily, suborder, order etc.). These categories may vary in rank among the molluscs and should be chosen by the local malacologist to reflect the most important natural groupings of the local fauna. Consequently vernacular names may be given to superfamilies but not to families, or to families but not superfamilies, and the category chosen should be the one that we consider would be most relevant to the teenaged naturalist.

Above the family level, unlinking the vernacular from the scientific name enables a creative approach of coining attractive names that describe a unique morphology, habitat or behaviour. Names coined for Cephalopoda, Opisthobranchia, Doridoidea and Heteropoda could be 'jet-lets', 'sea-cutes', 'bouquet-lets' and 'floating-snails', respectively – more pretty, easily understood and better remembered than translations of these names that would have been ('head-feet', 'gills-behind', 'doris-like' and 'different-footed').

To conclude, common names should arouse public awareness of molluscs and this may best be achieved by targeting the nature-loving teenager who encounters molluscs in nature. A common, vernacular name should be brief, to avoid word trains, yet give some information about the mollusc's habitat, habits, morphology or biology; technical transliterations of scientific names should be avoided. Between the levels of genus and class, one or two intermediate levels of vernacular names usually suffice.

Few people if any would wholeheartedly approve of every single common name, but among malacologists there might be general agreement that common names are highly desirable. If these names help local nature-loving teenagers become aware of mollusc biodiversity in nature, a goal has been achieved.

Clarke, A.H. 1981. *The Freshwater Mollusks of Canada*. Natural Museum of Natural Sciences, Ottawa.

Morris, R.H., Abbott, D.P. & Haderlie, E.C. 1980. *Intertidal Invertebrates of California*. Stanford University Press, Palo Alto.

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MOLLUSCS INTERCEPTED AT THE BORDERS OF ISRAEL IN 2011

By Svetlana Vaisman & Henk K. Mienis

In spite of the efforts by the Plant Protection and Inspection Services (PPIS) of the Ministry of Agriculture in Israel to curb the intentional or unintentional import of land and freshwater gastropods it remains a constant matter of concern. Each year one or more new species of alien origin are discovered in Israel. The most recent example is the discovery of a tiny prosobranch snail belonging to the genus *Pyrgophorus* Ancey, 1888 (family Cochliopidae) in rivers and streams in various areas in Israel (Mienis *et al*., 2011; Mienis, 2011a,b). *Pyrgophorus* species are confined in their natural distribution to the lower parts of rivers all around the Caribbean Sea and Gulf of Mexico (Hershler & Thompson, 1992).

However, usually discoveries of alien snails take place in hothouses or nurseries, because they form a 'Garden of Eden' for foreign land snails and slugs. Since plenty of food and moisture are always available under such conditions, soon large populations of alien species are present in these man-made habitats and in this way hothouses and nurseries may act as distribution centres for potentially invasive gastropods by selling rooted plants destined for planting in anthropogenic habitats (gardens, shrubberies, parks, groves, orchards etc.) all over Israel. Especially in areas that are regularly irrigated, alien species can get easily a foothold. Depending on the origin of such snails and slugs they may also invade natural biotopes and become competitors of native species. After

habitat destruction and pollution, invasive species are one of the major factors endangering the native mollusc fauna.

As already mentioned the number of such non-native snail and slug species is constantly increasing. This is in spite of the fact that the PPIS maintains permanent control posts at the places of entry into Israel, including international airports, harbours along the Mediterranean and Red Sea coasts and land border crossings with Jordan and Egypt. These posts are manned almost everywhere 24 hours a day and merchandise arriving from abroad is being spot checked for the presence of potential pest species including snails.

In order to get an idea what is arriving in Israel in the form of stowaways or by means of intentional illegal imports, we here provide a list (Table 1) and a brief overview of the interception of alien molluscs at border posts carried out by inspectors of the PPIS in 2011, as we did for the 2009-2010 (Vaisman & Mienis, 2011).

Table 1. Molluscs intercepted at the borders of Israel in 2011.

Date	Species intercepted (number of specimens)	Origin	Shipment
9 January	*Cernuella virgata* (2)	France	apples
	Cochlicella acuta (1)		
	Xerosecta explanata (1)		
	Cornu a. aspersum (1)		
1 February	unknown snail (1)	Italy	apples
10 February	*Xerotricha conspurcata* (1)	France	apples
23 March	*Cornu a. aspersum* (1)	South Africa	apples
31 March	*Succinea putris* (8)	France	apples
3 April	*Zonitoides nitidus* (1)	Netherlands	moss in potted plants
	Lehmannia valentiana (1)		
	Unknown slug (1)		
8 September	*Lamellaxis clavulinus* (3)	Netherlands	cut plants
31 October	*Deroceras reticulatum* (1)	Netherlands	cabbage
31 October	*Xerocrassa s. seetzeni* (1)	Jordan	grapes

The nine samples of molluscs that were intercepted by inspectors of the PPIS and submitted for identification, contained 11 species of terrestrial gastropods. Two of these, *Cochlicella acuta* and *Xerocrassa seetzenii seetzenii*, are native species in Israel. Six other species, *Lamellaxis clavulinus* (see p. 15), *Zonitoides nitidus*, *Lehmannia valentiana*, *Deroceras reticulatum*, *Xerotricha conspurcata* and *Cornu aspersum aspersum*, are already known from hothouses, nurseries and gardens in Israel. A small population of *Cernuella virgata* was once living in a garden of the Faculty of Agriculture in Rehovot (Mienis, 1995) and had been previously intercepted on imports (Mienis & Vaisman, 2010; Vaisman & Mienis, 2011). *Succinea putris* has been intercepted in the past but it was the first time that *Xerosecta explanata* had been encountered during inspections of commercial imports. The latter is, however, neither known as an invasive species nor as an agricultural or horticultural pest.

Only in the case of *Cornu aspersum aspersum* found on grapes arriving from South Africa were serious measures taken. The whole shipment of 13 tons had to be cleaned manually of any foreign elements before the grapes were sent by the importer to the various outlets in Israel. The reason behind these measures was that *Cornu aspersum aspersum* is considered in many countries (USA, South Africa, Australia and elsewhere) as a potentially serious plant pest. The only colony of *Cornu aspersum aspersum* known in Israel is confined to the gardens of the Saint Simon monastery in Jerusalem, brought there from Crete by one of the monks for use during Lent.

We thank the inspectors of the Plant Protection and Inspection Services of the Ministry of Agriculture (Bet Dagan, Israel) for supplying us with the material discussed.

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EVENTS LEADING TO THE PROPOSED LISTING OF 26 U.S. SNAILS AND SLUGS AS A RESULT OF PRESIDENT CLINTON'S NORTHWEST FOREST PLAN

By Edward J. Johannes

For the first time the United States Forest Service (FS) and Bureau of Land Management (BLM) went beyond the usual 3F species (furs, fins, and feathers) by adding invertebrates and other taxa to the Northern Spotted Owl (*Strix occidentalis caurina*) (NSO) forest management plan. The NSO listing as threatened in 1990, due to a rapid decline in its population, resulted in an intensive effort to assess thoroughly the biological and economic impacts of curtailing logging in the remnant old-growth or late-successional forests in western Oregon, western Washington and northwestern California (FEMAT, 1993; see Thomas *et al*., 1993, and Marcot & Thomas, 1997, for more complete NSO history (1953-1997)). Public debate and court litigations had expanded the management of the NSO's habitat to include all late-successional old-growth forest-associated species. Terry Frest (Deixis Consultants, Seattle) was asked in 1991 to submit a

report on molluscs within the range of the NSO (Fig. 1) to the NSO Recovery Team (Frest & Johannes, 1991). A list of 57 mollusc species from this report was included in USFWS (1992) and Thomas *et al.* (1993). This initial mollusc list would result, almost two decades later, in the proposed listing of 26 Pacific Northwest snails and slugs.

Fig. 1. Range in the USA of the Northern Spotted Owl (*Strix occidentalis caurina*) and area of Northwest Forest Plan in green.

President Clinton convened a forest conference in Portland, Oregon on 2 April 1993 to seek a solution to the NSO litigation deadlock. After the conference, the Forest Ecosystem Management Assessment Team (FEMAT) was assembled. At the behest of FEMAT, Terry Frest, Edward Johannes and Barry Roth were asked to become members of a 'Mollusk Viability Panel', convened on 21 April and 3-4 June 1993 at the FS Portland, Oregon, office. They were asked to evaluate the effects of proposed management options on molluscs. Information supplied by Roth (1993) and Frest & Johannes (1993) increased the initial list of mollusc taxa from 57 to 108.

An internal agency group (Species (later Scientific) Analysis Team – SAT) designated 43 (19 freshwater snails, seven slugs and 17 land snails) of the 108 molluscs as Record of Decision (ROD) or Survey and Manage (SM) species under the Northwest Forest Plan (NWFP) (USDA & USDI, 1994). The unprecedented SM Program addressed protection and conservation of SM taxa and their habitats by requiring pre-disturbance surveys and mitigation, strategic surveys, management and an annual review of more than 400 species on 10 million ha of federal land within the range of the NSO. During the first ten years of NWFP implementation, the SM Program became one of the more complex, expensive, and controversial aspects of the plan, triggering several lawsuits. Beginning in 1999, FS and BLM started a campaign to remove the SM Program, discontinuing it in 2004. This was overturned by a lawsuit in 2007, but in the same year the FS and BLM eliminated the SM Program once again. The SM Program was reinstated in 2011 as a result of another lawsuit.

Table 1. Twenty-six mollusc species proposed for listing by USFWS.

Scientific Name in USFWS, 2011 (Scientific Name in USDA & USDI, 1994)	**Common Name**
Freshwater Snails	
[5]*Colligyrus convexus* (*Lyogyrus* n. sp. 3)	canary duskysnail
Fluminicola anserinus (*Fluminicola* n. sp. 18)	Goose Valley pebblesnail
Fluminicola multifarius (*Fluminicola* n. sp. 15, 16 & 17)	Shasta pebblesnail
[5]*Fluminicola* n. sp. 2 (same)	tall pebblesnail
[1, 5]*Fluminicola* n. sp. 3	diminutive pebblesnail
[2, 5]*Fluminicola* n. sp. 11	nerite pebblesnail
Fluminicola potemicus (*Fluminicola* n. sp. 14)	Potem Creek pebblesnail
Fluminicola seminalis (same)	nugget pebblesnail
Fluminicola umbilicatus (*Fluminicola* n. sp. 19 & 20)	Hat Creek pebblesnail
[5]*Juga* n sp. 2 (*Juga* (*O.*) n. sp. 2)	basalt juga
[5]*Juga* n. sp. 3 (*Juga* (*O.*) n. sp. 3)	cinnamon juga
[3]*Lyogyrus* n. sp. 1 (same)	Columbia duskysnail
[3]*Lyogyrus* n. sp. 2 (same)	masked duskysnail
[5]*Vorticifex* n. sp. 1 (same)	knobby rams-horn
Terrestrial Snails	
[5]*Cryptomastix devia* (same)	Puget Oregonian
[5]*Cryptomastix hendersoni* (same)	Columbia Oregonian
[5]*Monadenia fidelis minor* (same)	Dalles sideband
[5]*Monadenia troglodytes troglodytes* (same)	Shasta sideband
Monadenia troglodytes wintu (same)	Wintu sideband
[5]*Oreohelix* n. sp. 1 (same)	Chelan mountainsnail
Trilobopsis roperi (same)	Shasta chaparral
[4, 5, 6]*Vertigo* n. sp. 1 (same)	Hoko vertigo
[5]*Vespericola pressleyi* (same)	Big Bar hesperian
[5]*Vespericola shasta* (same)	Shasta hesperian
Slugs	
[5]*Deroceras hesperium* (same)	Evening fieldslug
[5]*Hemphillia burringtoni* (same)	Keeled jumping-slug

[1] not *Fluminicola* n. sp. 3 (Klamath Rim pebblesnail) as in USDA & USDI (1994)
[2] not *Fluminicola* n. sp. 11 (Fredenburg pebblesnail) as in USDA & USDI (1994)
[3] should be placed in *Colligyrus*
[4] should be placed in *Nearctula*
[5] on Oregon Natural Resources Council 1993 listing petition (USFWS, 1994)
[6] Fig. 2

The 2007 decision to discontinue the NWFP SM Program, prompted five conservation organizations (Center for Biological Diversity (CBD), Conservation Northwest, Environmental Protection Information Center, Klamath-Siskiyou Wildlands Center and Oregon Wild) to petition the United States Fish & Wildlife Service (USFWS) in 2008 to list 32 mollusc species as threatened or endangered under the Endangered Species Act (USFWS, 2011). All but two petitioned molluscs are SM species. Of the 44 SM mollusc species, 15 were not included in the petition. Since 1993, eight of the 19 undescribed SM mollusc species have been described (Hershler *et al*., 2003, 2007). To reflect the taxonomic changes, the petition was amended by CBD in 2009 to list 29 species of molluscs. Fourteen of the petitioned molluscs are freshwater snails and 15 are terrestrial (13 snails and two slugs). Twenty-one of the CBD petitioned molluscs (Table 1) were on a 1993 Oregon Natural Resources Council (ONRC; now Oregon Wild) petition to list 83 molluscs. USFWS rejected the ONRC petition on the basis that no adequate range-wide surveys had been conducted for any except one (USFWS, 1994). They also noted that range wide threats, population status and 'taxonomic distinctiveness' or

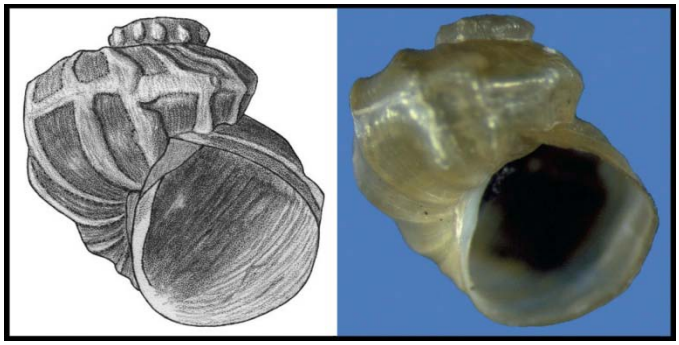

Fig. 2. Drawing (height 14.7 mm) and photo (height 15.1 mm) of *Vorticifex* n. sp. 1 (knobby rams-horn) from Lava Creek (Pit River) drainage, Shasta County, California. (Photo: T. Frest; drawing E. Johannes © Deixis Consultants)

'validity' of many of the petitioned species had not yet been determined.

The paucity of information on SM mollusc distribution, threats or population status cited by USFWS (1994) had been mostly addressed by ten years of surveys (1994-2004) by the BLM, FS and various consultants as part of the implementation of the NWFP SM Program. USFWS found that the CBD petition presented substantial scientific or commercial information to indicate that listing 26 (Table 1) of the 29 petitioned molluscs as threatened or endangered might be warranted under the Act (USFWS, 2011). USFWS felt three petitioned SM molluscs did not warrant listing. USFWS initiated a status review of the 26 species of molluscs. Public comment was requested on scientific and commercial data and other information on the 26 molluscs during a 60 day comment period, which ended on 5 December 2011. The final result of USFWS decision on whether to list all, some or none of these species is pending.

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Additional documents or information can be found at the Bureau of Land Management Oregon/Washington Northwest Forest Plan – NEPA or The Survey and Manage Program of the Northwest Forest Plan web sites.

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FIRST RELOCATION OF FRESHWATER MUSSELS IN URUGUAY

By Cristhian Clavijo, Gastón Martínez & Alvar Carranza

Continental molluscs are one of the more threatened animal groups worldwide (Bogan, 1993; Ricciardi & Rasmussen, 1999; Lydeard *et al*., 2004). In Uruguay, freshwater mussels (Unionoida) are threatened by several anthropogenic pressures (see Clavijo *et al*., 2010). All species of Unionoida recorded from Uruguay have been included in the list of conservation priorities for Uruguay, and explicitly considered in the conservation strategy of the National System of protected areas (Scarabino & Clavijo, 2009). Relocation (transport of live specimens from place to place) is one of the tools suggested for freshwater mussel conservation by The National Native Mussel Conservation Committee (1998). Specimens are taken from affected areas and relocated in a non-impacted area (Cope & Waller, 1995). According to Cope & Waller (1995) the main reason for relocation is damming. To date, in South America, there is a single precedent, the relocation of individuals of the genus *Diplodon* in Chile (Parada & Peredo, 2005). This article reports the first freshwater mussel relocation in Uruguay.

The relocation was done in Salado creek (33°20'47"S, 56°35'12"W) a tributary of the Yí river (Fig. 1). A reason for

the relocation was the projected building of a dam in the middle course of the creek to supply a dairy farm. The dam will be around 10 m high, and will flood a 1.5 km stretch of creek.

First, to evaluate the richness and density of freshwater mussels to be relocated, 13 stations (from the proposed lake endpoint to ca. 500 m downstream from the dam) were chosen (Fig. 1). At each station, mussels were searched for across the width of the stream by feel (hands and feet) and snorkelling. Substrate composition, depth and presence of macrophytes at each station was recorded. Also, we sampled a creek stretch about 1.5 km upstream near the proposed lake endpoint (Fig. 1), in Villasboas creek, Yí river and floodplain lagoons, in order to evaluate the relocalization site.

For this relocation we followed the protocol outlined by Luzier & Miller (2009).

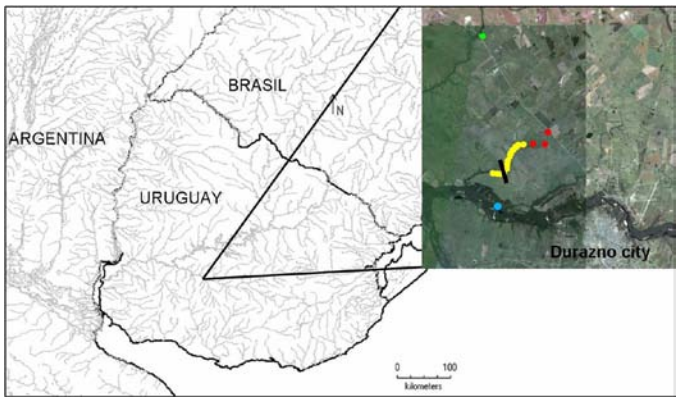

Fig. 1. Affected area in Salado creek (yellow dots), Salado creek upper lake area (red dots), Villasboas creek (green dot) and Yí river (blue dot). The black line represents the location of the proposed dam.

During the fieldwork evaluation (Fig. 2) we collected three species of freshwater mussels: *Anodontites trapesialis*, *Diplodon charruanus* and *D. rhuacoicus*. The estimated numbers of freshwater mussels to relocate was 145 individuals (100 *D. charruanus*, 15 *D. rhuacoicus* and 30 *A. trapesialis*).

The Villasboas creek was not regarded as a potential relocation site because of the possible interaction between the

Fig. 2. Collecting freshwater mussels in Salado creek.

native species and the invasive clam *Corbicula fluminea*. No *C. fluminea* were found upstream of the proposed lake endpoint or in the floodplain lagoon of the Yí river, and individuals of *Diplodon charruanus* were found in these locations. Thus, these sites were selected for the relocation.

The relocation was carried out during 17-18 March 2010. Air temperature ranged between 14 and 29 °C, and the mean humidity was 57 % on 17 March and 80 % on 18 March.

The mussels collected were protected from heat and sunlight, being transported in buckets with a water layer and covered with wet cloths. The time between collection and relocation never exceeded two hours. Before being relocated, the mussels were measured and marked on one of their shells for identification in future studies to evaluate success of the relocation.

During the relocation work (Fig. 3), we colected 138 specimens of five species of bivalves: *Anodontites trapesialis* (45 specimens), *A. patagonicus* (1), *Mycetopoda legumen* (5), *Diplodon charruanus* (83) and *D. rhuacoicus* (4).

Fig. 3. Relocation work.

In total, 133 specimens of four species were relocated. No mortality was recorded during transportation and relocation. Additionally, some specimens collected during the evaluation fieldwork were preserved in 95 % alcohol and deposited in the National Museum of Natural History (MNHN). The relocation work was recorded and will be the subject of a documentary that will be useful for disseminating the experience, a nd thereby promoting freshwater mussel conservation.

We thank Javier García (GEA consultants) for help with fieldwork. Estancias del Lago S.R.L. supported the relocation fieldwork.

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RANGE EXTENSION OF THE ALIEN FRESHWATER SNAIL *MELANOIDES TUBERCULATA* IN ILHA GRANDE, ANGRA DOS REIS, RIO DE JANEIRO, BRASIL

By Isabela Cristina B. Gonçalves, Igor C. Miyahira & Sonia B. dos Santos

Ilha Grande is a continental island located off the south coast of the state of Rio de Janeiro, belonging to Angra dos Reis municipality (Fig. 1). The island is covered by Atlantic Rainforest, a biome composed of a wide range of ecosystems including forests, marshes, salt marshes, rocky shores and mangroves, all of them occurring in Ilha Grande. This variety of ecosystems is determined by geological, climatic and hydrographic variables, leading to great biological diversity, with endemic species of fauna and flora, some of them listed as threatened in the Red List of the state of Rio de Janeiro (Alho *et al*., 2002; Bergallo *et al*., 2000; Rocha *et al*., 2009). The Atlantic Rainforest is also considered a world hotspot of biodiversity (Myers *et al*., 2000).

Among the freshwater mollusc species listed as occurring on Ilha Grande (Miyahira, 2009; Rocha *et al*., 2009; Santos *et al*., 2010), four are surely not native to the island, having possibly been accidentally introduced from the mainland by release from aquaria, as is thought to be the case for *Melanoides tuberculata* (Müller, 1774), *Physa acuta* Draparnaud, 1805 and *Biomphalaria tenagophila* (d'Orbigny, 1835) (Santos *et al*., 2007; Miyahira *et al*., 2010), or perhaps by avian transport, as is thought to be the case for *Uncancylus concentricus* (d'Orbigny, 1835) (Santos *et al*., 2009).

Since the first record of *M. tuberculata* on Ilha Grande in 2005 (Santos *et al*., 2007) at Vila do Abraão (23°8'49.5"S, 44°10'13.4"W; Figs. 1, 2), we have been monitoring the non-native freshwater snails in Ilha Grande (Miyahira *et al*., 2009).

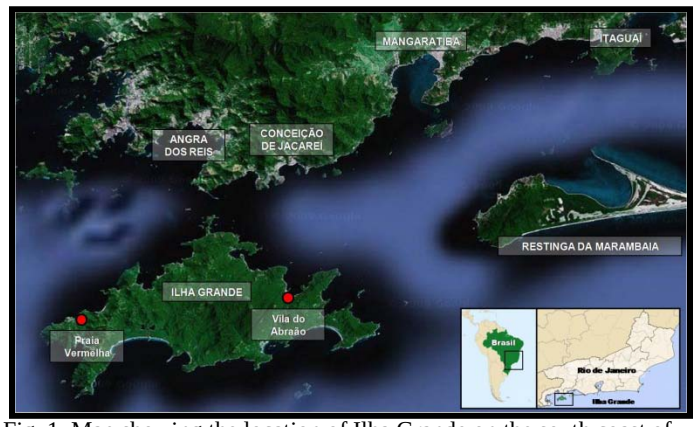

Fig. 1. Map showing the location of Ilha Grande on the south coast of the state of Rio de Janeiro. The red dots indicate the two villages (Vila do Abraão and Praia Vermelha) with *M. tuberculata* populations. The small box on the right shows the position of Brasil in South America and of the state of Rio de Janeiro in Brasil.

Vila do Abraão is the main village and the principal entrance to the island, with around 1481 people, but in the summer this number increases greatly (Cadei *et al*., 2009) because of intense tourism.

As a result of the monitoring field trips we discovered another population of *M. tuberculata* in Praia Vermelha (23°09'42.64"S, 44°20'57.84"W) (Figs. 1, 2), a small village of about 372 people (Cadei *et al*., 2009). There are two small streams at this locality, but the snails were found only in the one near to Ayrton Senna Public School. The first record was on 19 June 2009, when two collectors collected 32 specimens in 10 minutes. Almost a year later, on the second field trip to this locality (19 May 2010), two collectors collected 150 specimens in 10 minutes, showing that this population is apparently well established and growing in this stream. All collected materials are housed at the Mollusc Scientific Collection of the Universidade do Estado do Rio de Janeiro.

Although Praia Vermelha is not as populous as Vila do Abraão, both localities have little or no inspection concerning goods (or other things on which, sometimes, molluscs can be found attached) that come from nearby mainland localities, thereby facilitating alien species introduction. A possible explanation for the presence of *M. tuberculata* in Praia Vermelha, four years after the first record of the species on Ilha Grande (Santos *et al*., 2007), could be aquarium discharge by a resident or from school aquaria used for educational purposes.

Fig. 2. Aspect of streams where *Melanoides tuberculata* (Müller, 1774) was found at Ilha Grande. Left: stream in Vila do Abraão. Right: stream in Praia Vermelha.

The occurrence of two geographically separate populations of *M. tuberculata* led us to believe that there may have been two independent introductions, based not only on the time gap but also on characters of the shell morphology. The specimens of Vila do Abraão (Fig. 3), after periostracum removal, are whitish, with reddish-brown flames and spots. The specimens from Praia Vermelha (Fig. 3) are darker, with brown flames and spots, as well as stronger spiral cords.

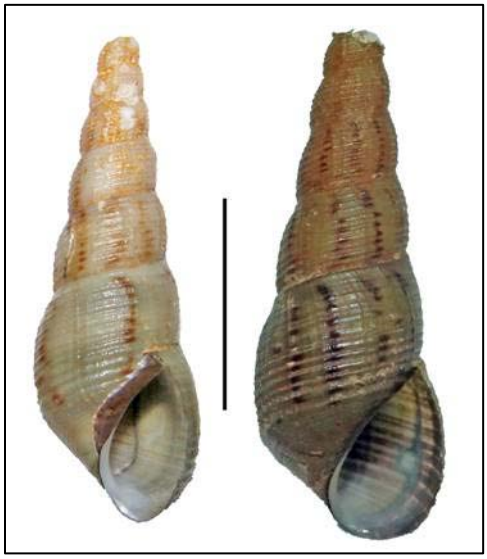

Fig. 3. *Melanoides tuberculata* (Müller, 1774) from Ilha Grande. Left: Vila do Abraão. Right: Praia Vermelha. Scale bar = 1 cm.

Melanoides tuberculata is native to southern Asia and East Africa (Pilsbry & Bequaert, 1927) and was found in Brasil for the first time in 1967, in the city of Santos, state of São Paulo (Vaz *et al.*, 1986). It now occurs in 17 Brasilian states and in the Federal District (Brasilia) (Thiengo *et al.*, 2007).

The range extension of this snail into the freshwater habitats of Ilha Grande is a threat not only to molluscs, but to all freshwater invertebrates. A negative effect of *M. tuberculata* on the small bivalve *Pisidium punctiferum* (Guppy, 1867) and on species of Chironomidae and Odonata was demonstrated by Miyahira (2010) in a study on the population dynamics of *M. tuberculata* inhabiting a stream in Vila do Abraão. This negative effect occurs principally because of the high densities its populations can reach, as already observed in Vila do Abraão (Miyahira *et al*., 2009; Miyahira, 2010). Several authors have shown that this species can displace other species (Pointier, 1993; Guimarães *et al.*, 2001; Thiengo *et al.*, 2005; Miyahira, 2010).

Another risk, already pointed out in a previous study (Miyahira *et al.*, 2010), is the introduction of *M. tuberculata* to the salt marsh lagoons of Praia do Sul and Praia do Leste, habitat of endemic species of hydrobioids (*Heleobia* spp.), as this alien species is able to colonize estuarine environments (Wingard *et al*., 2008; Barroso & Matthews-Cascon, 2009). These lagoons are located in one of the most important conservation areas of Ilha Grande (Praia do Sul Biological Reserve), the last almost intact arboreal ‘restinga’ of the state of Rio de Janeiro.

Mitigation of the damage caused by alien species has to be considered in the conservation of the hydrological resources and biodiversity of Ilha Grande. Further extension of the range of this species needs to be avoided. A possible solution is to increase inspection by control agencies and perhaps to periodically remove the invaders. As already stated, Ilha Grande is an important conservation area, highlighting the need for better control strategies and education to improve the conservation of this important remaining area of Atlantic Rainforest, its hydrological resources and biodiversity.

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LAND MOLLUSCS AND THEIR CONSERVATION IN MONTE BISSE MANAGED FLORISTIC RESERVE, EASTERN CUBA

By David Maceira Filgueira & Beatriz Lauranzón Meléndez

Monte Bisse Managed Floristic Reserve is located in Tercer Frente municipality in Santiago de Cuba province and encompasses an area of 285.8 ha between 237 and 662 m above sea level (Figueredo Cardona, 2004). This is one of six protected areas (La Caoba, Monte Bisse, Monte Barranca, Monte Naranjito, Dos Rios and Hacienda Las Cabezadas) in the midle part of the Cauto river basin, which is 6828 km^2 in total area. In this landscape, semideciduous mesophyll forest covers an area of about 416 km^2 and constitutes the most important areas for conservation. But only 36 km^2 (8.6 % of the semideciduous forest area) is protected (Salmerón López, 2006). The land snail fauna of the Monte Bisse Managed Floristic Reserve has not previously been studied. The present report contributes to knowledge of this fauna and the threats it faces.

During 12-14 May 2004 we surveyed the arboreal and ground dwelling molluscs that inhabit Monte Bisse Managed Floristic Reserve for four hours in the morning of each day. Our camp was located at Peña Blanca (20°06'58"N, 76°15'04"W, 226 m above sea level). Coffee plantations occur from 226 m to 600 m above sea level, and the semideciduos mesophyll forest occurs above this up to 660 m. Both the plantations and the forest were surveyed to ascertain the malacological species composition and endemism, as well as the threats the molluscs face. All samples are deposited in the Malacological Collection of the Centro Oriental de Ecositemas y Biodiversidad (BIOECO: BSC-M).

Five species of land snails, all endemic to Cuba, were recorded living in the semideciduos mesophyll forest. Of these, four species are pulmonates and one is an operculate snail: three live in trees and two on the ground. The recorded species include species that are widespread in eastern Cuba, although the Monte Bisse Managed Floristic Reserve is a new locality record for all the species. The two species of Camaenidae and the Cuban slug occurred in high population densities. This indicates that the semideciduos mesophyll forest provides good conditions for these molluscs. However, no live molluscs were found in the coffe plantations.

Threats to the conservation of land molluscs inhabiting the semideciduos mesophyll forest at Monte Bisse Managed Floristic Reserve include intense human activity that has resulted in destruction and fragmentation of the original plant community. In addition there is no adequate technical and administrative infrastructure to support an ecological station for the development and maintenance of research. Also people from the local communities extract wood illegally for craft, firewood and house building.

The research and monitoring program includes

- Accomplishing other malacological inventories in the area to complete the mollusc list, since during the survey reported here they were not observed in the coffee plantations, though their presence is suspected.
- Reforesting the area with the natural plants belonging to semideciduos mesophyll forest that still occur in the Managed Floristic Reserve.
- Getting adequate funding to build an Ecological Station and support researchers and biodiversity protection personnel in the area.
- Establishing a program of environmental education for the local human communities.

Land mollusc species list

The number of snails of each species that were found per hour living in the semideciduos mesophyll forest is given in parentheses.

Class GASTROPODA
Subclass PROSOBRANCHIA
Order ARCHAEOGASTROPODA
Family HELICINIDAE Latreille, 1825
Subfamily HELICININAE
Genus *Emoda* H. & A. Adams, 1856
Emoda pulcherima pulcherima (Lea, 1834) (Fig. 1). Arboreal species endemic to eastern Cuba (0.66).

Subclass GYMNOMORPHA
Order SOLEOLIFERA
Family VERONICELLIDAE
Genus *Veronicella* Blainville, 1817


Fig. 1. *Emoda pulcherima pulcherima*.


Fig. 2. *Veronicella cubensis*.


Fig. 3. *Caracolus sagemon.*

Veronicella cubensis (Pfeiffer, 1840) (Fig. 2). Found in leaf litter, endemic to Cuba (6.26).

Subclass PULMONATA
Order STYLOMMATOPHORA
Family CAMAENIDAE
Genus *Caracolus* Montfort, 1810
Caracolus sagemon (Beck, 1837) (Fig. 3). Arboreal species endemic to eastern Cuba, but now distributed in western and central Cuba by human activities (3.33).


Fig. 4. *Zachrysia* (*Chrysias*) *bayamensis*.


Fig. 5. *Cysticopsis pemphigodes*.

Genus *Zachrysia* Pilsbry, 1894
Zachrysia (*Chrysias*) *bayamensis* (Pfeiffer, 1854) (Fig. 4). Arboreal species endemic to eastern Cuba (3.33).

Family HELMINTHOGLYPTIDAE
Cysticopsis pemphigodes (Pfeiffer, 1846) (Fig. 5). Found in leaf litter endemic to eastern Cuban (0.8).

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THE SPIKE AWLSNAIL *LAMELLAXIS CLAVULINUS* IN ISRAEL

By Henk K. Mienis, Oz Rittner & Svetlana Vaisman

The terrestrial mollusc fauna of built up areas in Israel is rapidly changing. Most of the native species are disappearing and being replaced by species arriving from abroad. This is well illustrated by a small litter sample taken from among shrubs in the backyard of a house in Motta Gur Street, Ramat Aviv, on 29 November 2011. This sample was taken by H.K. Mienis and O. Rittner, and checked for the presence of snails by S. Vaisman.

The leaf litter contained eight species in addition to three relatively large species also seen in the field. This means that at least 11 species were present at this locality (Table 1).

Table 1. Land snail species from a garden in Ramat Aviv.

**Vallonia pulchella* (Müller, 1774)
**Gastrocopta rupicola* (Say, 1821)
**Lamellaxis clavulinus* (Potiez & Michaud, 1838)[1] (TAU 74868)
**Zonitoides arboreus* (Say, 1816)
Daudebardia saulcyi (Bourguignat, 1852)
**Hawaiia minuscula* (Binney, 1840)
**Prietocella barbara* (Müller, 1774)
Microxeromagna lowei (Potiez & Michaud, 1838)
Monacha syriaca (Ehrenberg, 1831)
Xeropicta vestalis joppensis (Schmidt, 1855)
**Cornu aspersum megalostomum* (Bourguignat, 1864)

* Non-native species
[1] This species has also been listed as *Opeas clavulinus* and *Allopeas clavulinum.*

Of these 11 species recorded only four belong to the native fauna of Israel: *Daudebardia saulcyi*, *Microxeromagna lowei*, *Monacha syriaca* and *Xeropicta vestalis joppensis.* All other species have to be considered invasive alien species that arrived in Israel from other parts of the Mediterranean (*Prietocella barbara*, *Cornus aspersum megalostomum*), from elsewhere in the Palaearctic region (*Vallonia pulchella*), from North America (*Gastrocopta rupicola*, *Zonitoides arboreus*, *Hawaiia minuscula*) or from the tropics, most probably East Africa (*Lamellaxis clavulinus*).

The most interesting species is without doubt the Spike awlsnail, *Lamellaxis clavulinus.* It is recorded here for the first time from a garden in Israel, although it was already known from several hothouses and nurseries in Israel: Kefar Shmariyahu, Noi Nursery, under flowerpots in a hothouse, collected by H.K. Mienis, 9 November 1982 (Mollusc Collection of the Hebrew University of Jerusalem, HUJ 9045; and Mollusc Collection of the Tel Aviv University, TAU 40862); Netzer Sereni, old nursery, under tin cans containing shrubs, collected by H.K. Mienis, 6 January 2004 (TAU 42140); En Gedi, former plant nursery, collected by U. Bar-Ze'ev, 22 May 2004 (TAU 47546, 73834).

Noteworthy is the fact that in recent years *L. clavulinus* has also been intercepted twice at the borders of Israel: Ben Gurion Airport on Hortensia *Hydrangea* species imported from the Netherlands, collected by M. Na'or, 23 November 2005 (TAU 54210), and Ben Gurion Airport on *Dieffenbachia* cuttings arriving from the Netherlands, collected by O. Shuval, 8 September 2011 (TAU 74867).

Although both shipments arrived from the Netherlands, that does not mean that *L. clavulinus* is indeed living there. Horticultural material arriving from the Netherlands is usually bought at the international flower market in Aalsmeer, where horticultural products are being marketed from all over the world. Therefore it is possible that the horticultural material originated from another country, yet we do not rule out the possibility that this *Lamellaxis* species is indeed living in hothouses and nurseries in the Netherlands.

Due to the renewed interest in this tropical species one of us (HKM) visited the old tree nursery in his kibbutz (Netzer Sereni) on 9 December 2011. It is an open nursery with some shading. The nursery is no longer active but the person who was responsible for the nursery is still irrigating the remaining trees and saplings now and then. The plastic walls of the nursery are in part torn and snails living in the vicinity can enter it freely.

Within a few minutes dozens of empty shells and living specimens of *L. clavulinus* were collected from under plastic boxes in which various palm tree saplings are being grown. In a small litter sample taken from under the containers SV found 14 species. Three additional species were either seen (*Eopolita protensa jebusitica*) or collected (*Lehmannia valentiana* and *Deroceras laeve*). Table 2 lists the species encountered.

Table 2. Land snail species from kibbutz Netzer Sereni, with a qualitative assessment of their abundance.

Galba truncatula (Müller, 1774) – many
**Vallonia excentrica* Sterki, 1893 – many
**Gastrocopta rupicola* (Say, 1821) – abundant
Euchondrus species[1] – few
**Lamellaxis clavulinus* (Potiez & Michaud, 1838) – abundant (TAU 74869)
**Zonitoides arboreus* (Say, 1819) – few
Eopolita protensa jebusitica (Roth, 1855) - few
**Hawaiia minuscula* (Binney, 1841) – abundant
**Lehmannia valentiana* (Férussac, 1822) – few
**Deroceras laeve* (Müller, 1774) – very few
Caracollina lenticula (Férussac, 1821) – few juveniles
**Prietocella barbara* (Müller, 1774) – few
Microxeromagna lowei (Potiez & Michaud, 1838) – few
Monacha syriaca (Ehrenberg, 1831) – very few
Xeropicta vestalis joppensis (Schmidt, 1855) – very few
**Cornu aspersum megalostomum* (Bourguignat, 1864) – one adult, few juveniles
Theba pisana (Müller, 1774) – very few

* Non-native species
[1] This is an undescribed species that has been erroneously identified in the past as *Euchondrus ovularis* (Olivier, 1801), a species from Turkey. A formal description is in preparation by Dr. R. Bank of the Netherlands.

As could be expected nine of the 17 species turned out to be of foreign origin.

Living specimens of *Lamellaxis clavulinus* were easily spotted because of their translucent shells and the yellowish colour of the animal (Fig. 1). In some specimens single eggs were seen through the shell. Like most other subulinid species (Schmidt, 1959; Selander & Kaufman, 1973; Selander *et al*., 1974, Selander & Hudson, 1976) it is probably able to reproduce by self-fertilization. This means that a single specimen may start a new colony. Since this *Lamellaxis* species is usually hidden among the roots of plants in nurseries or hothouses during daylight, it is easily transferred from one area to another (see also Dundee & Watt, 1962). In Israel it is probably much more common than we know at present in gardens and other anthropogenic habitats that receive irrigation from time to time.

Fig. 1: *Lamellaxis clavulinus* from the colony present in the old tree nursery in Netzer Sereni, Israel (Photograph Oz Rittner).

From an agricultural and horticultural point of view it is a pity that hardly anything is known about the feeding of this and similar species among the Subulinidae (Karlin, 1956). The usual opinion is that most of them are omnivorous (Auffenberg & Stange, 1988). One of the largest species among the Subulinidae, *Rumina decollata* (Linnaeus, 1758), is considered a carnivorous snail-eating species and has even been propagated for biological control of pest snails (Fisher & Orth, 1985), an unfortunate proposal because they do not stick to harmful snails and slugs but may feed also on endangered endemic species (Cowie, 2001). However *Rumina decollata* and its close relative *Rumina saharica* (Pallary, 1901) also readily feed on all kind of plants and fruits (Dundee, 1986 and personal observations HKM) and may therefore become plant pests.

Due to our lack of information concerning the food of *Lamellaxis clavulinus*, we, like Dundee (1971), are unable to tell whether they are of any economic importance. In the case that these snails are in part carnivorous like *Rumina decollata* then they may have a negative effect on the biodiversity of local endemic species of the genera *Calaxis* and *Cecilioides*, which are often living among the roots of plants, like *L. clavulinus.*

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MOLLUSCS ASSESSED BY COSEWIC IN 2011

By Robert G. Forsyth, Dwayne A.W. Lepitzki & Gerald L. Mackie

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), was established in 1977 and made its first assessment in 1978, but not until 1996 was the first assessment for a mollusc species made. With the declaration of the Federal *Species at Risk Act* (SARA) in 2003, COSEWIC was established as an advisory body for government's decisions to list species under the Act. Using the best available scientific, aboriginal traditional and community knowledge provided by experts from governments, academia and others, the Committee meets twice each year to assess the wild species, subspecies, varieties or other important units of biological diversity considered to be at risk in Canada. As of November 2011, there are 640 wildlife species in various COSEWIC risk categories and another 14 that are extinct. Of these, 31 are molluscs (1 extinct, 2 extirpated, 19 endangered, 3 threatened, 6 special concern).

Under the Species at Risk Act, COSEWIC is required to review its assessments of species every ten years. This year three molluscs were re-assessed:

***Simpsonaias ambigua* — Salamander Mussel:** This small freshwater mussel was reported from two rivers in southern Ontario in 1998. New surveys since the original COSEWIC assessment in 2001 found the continued presence of live individuals in the Sydenham River, one of just a few important

refuges for mussel diversity in south-central Canada. However, extensive sampling in the Thames River failed to find live *Simpsonaias ambigua*; the half-shell found in 1998 is the only evidence of this species in that river. Habitat quality continues to decline from intense agriculture, urban development, and pollution from point and non-point sources throughout southern Ontario, the area inhabited by the Salamander Mussel. In addition, this mussel only uses the Mudpuppy, a salamander, as its host; threats to the salamander are also threats to the mussel. COSEWIC re-examined and confirmed the status of *Simpsonaias ambigua* as Endangered.

***Epioblasma triquetra* — Snuffbox:** Another freshwater mussel from the same region of southern Ontario is *Epioblasma triquetra*. This species is currently found in two rivers, but another population may survive in the Thames River where one fresh shell was found in 1998. The 2001 COSEWIC assessment concluded that it had been lost from most of its Canadian range and was confined to the Sydenham River but live mussels from a reproducing population were subsequently found in the Ausable River beginning in 2006. As mentioned above, southern Ontario is intensively farmed and siltation and pollution are threats to the Snuffbox. As for most at-risk mussels in Ontario, dreissenid mussels have rendered much of the historical habitat unsuitable. The invasive Round Goby, a fish, may pose a new threat by competing with the mussel's two known larval host fishes and by eating juvenile mussels. *Epioblasma triquetra* was re-assessed as Endangered.

***Ostrea lurida* — Olympia Oyster:** *Ostrea lurida* is the only native oyster on the west coast of Canada. In the first few decades of the 20th century, there was a fishery for this species in British Columbia. Although its population suffered large-scale historical declines associated with overharvest, it appears to have been stable in recent decades. However, recent introductions of exotic parasites, predatory snails, green crabs and fouling ascidians, as well as industrial and domestic pollution, pose significant threats; limited dispersal and vulnerability to low temperature extremes and sedimentation from floods and landslides may increase its vulnerability and ability to recover from adverse impacts. This species, first assessed in 2000 as Special Concern, was designated the same in 2011.

One species was newly assessed by COSEWIC in 2011:

***Obovaria olivaria* — Hickorynut:** *Obovaria olivaria* is a freshwater mussel that in Canada is now restricted to mid-to large-sized rivers of southern Ontario and Quebec. The Molluscs Species Specialist Subcommittee (SSC) of COSEWIC had the opportunity to see Hickorynut in their natural habitat (see photo) during a field trip sponsored by La Société Provancher d'histoire naturelle du Canada and Ministère des Ressources naturelles et de la Faune du Québec. There has been an historical decline in the species' distribution with losses of the populations from the Detroit and Niagara Rivers. Current locations are threatened by the continuing invasion of dreissenid mussels and degraded water quality. In addition, the one known host of this mussel, the Lake Sturgeon (*Acipenser fulvescens*), is a species at risk in Canada and may be declining in some areas where the mussel is known to still occur. COSEWIC assessed *O. olivaria* as Endangered in May 2011.

Fig. 1. Hickorynut observed during the Molluscs SSC field trip along the St. Lawrence River, upstream of Québec City, Québec, Canada, in September 2011 (Research Permit approved by Ressources naturelles et Faune Québec). All mussels were returned to their site of collection unharmed. Photo: D. Lepitzki.

More information on COSEWIC and links to the status reports can be found online at the COSEWIC website.

For their expertise on these species, the Molluscs Species Specialist Subcommittee (SSC) of COSEWIC thanks the report writers, Graham E. Gillespie, Jacqueline Madil, André L. Martel, Todd J. Morris, Annie Paquet, Isabelle Picard, and David T. Zanatta.

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NEW RECORDS OF LAND SNAILS FROM THE NATURE RESERVE AND NATIONAL PARK OF THE NIMROD FORTRESS ON MOUNT HERMON, ISRAEL

By Henk K. Mienis, Oz Rittner & Svetlana Vaisman

Mount Hermon or Jebel esh-Sheikh is currently shared by three countries: Lebanon, Syria and Israel. On a rocky promontory on its south-west side at a height of about 800 m are the ruins of the huge Nimrod Fortress or Qala'at al-Subayba. It was initially built in 1228 by Al-Maliq al-'Aziz 'Othman, the governor of nearby Banias or Paneas. It is currently a declared Nature Reserve and National Park.

The land snail fauna of Mount Hermon including the Nimrod Fortress has been reviewed by Bar & Mienis (1979). Some records from the Nimrod Fortress were also published by Mienis (1978), based on material collected after submission of the manuscript of Bar & Mienis (1979). The records of Tohmé & Tohmé (1988) from Mount Hermon are chiefly based on those by Bar & Mienis (1979).

In the meantime the molluscs of Mount Hermon have been thoroughly revised from a taxonomic point of view by Forcart (1981), Nordsieck (1977), Hausdorf (1996) and Wiktor & Mienis (2006). These revisions have resulted in numerous changes in the names used by Bar & Mienis (1979) and Mienis (1978). A summary of these data shows that at least 17 species were known from the Nimrod Fortress by 1980.

On 15 December 2011 Henk Mienis and Oz Rittner looked for snails in and around the ruins of the Nimrod Fortress and in addition a sample of soil and leaves was taken from two localities. The two samples were checked for the presence of snails by Svetlana Vaisman. Through this cooperation we are now able to add eight additional species to the malacofauna of the Nature Reserve and National Park of Qala'at Nimrod, bringing the total to 25 (Table 1).

Table 1. The malacofauna of the Nature Reserve and National Park of Qala'at Nimrod (new records asterisked).

**Lauria cylindracea* (da Costa, 1778)
Orculella sirianocoriensis libanotica (Tristram, 1865)
**Pilorcula raymondi hebraica* (Tristram, 1865)
Pyramidula pusilla (Vallot, 1801)
**Truncatellina haasi* Venmans, 1957
Pleurodiscus erdelii (Roth, 1839)
Buliminus jordani (de Charpentier, 1847)
Euchondrus septemdentatus (Roth, 1839)
Paramastus episomus (Bourguignat, 1857)
Pene sidoniensis (de Charpentier, 1847)
**Turanena benjamitica* (Bonson, 1859)
Cristataria hermonensis H. Nordsieck, 1977
**Calaxis hierosolymarum* (Roth, 1855)
**Cecilioides acicula* (Müller, 1774)
**Daudebardia saulcyi* (Bourguignat, 1852)
Oxychilus camelinus (Bourguignat, 1852)
Gigantomilax eustrictus (Bourguignat, 1866)
**Deroceras libanoticus* (Pollonera, 1909)
Sphincterochila cariosa (Olivier, 1804)
Metafruticicola berytensis hermonensis Forcart, 1981
Monacha crispulata (Mousson, 1861)
Monacha syriaca (Ehrenberg, 1831)
Xeropicta vestalis joppensis (Schmidt, 1855)
Helix texta Mousson, 1861
Levantina spiriplana caesareana (Mousson, 1854)

Except for the slug *Deroceras libanoticus* all the new snails are small or very small. They are difficult to locate in the field and therefore it shows once more that taking soil and litter samples is of utmost importance for getting a better idea of the mollusc fauna of a certain area.

Noteworthy is still the fact that so far all the land snails found in and around the Nimrod Fortress are of strict local origin

It is a pity that the malacofauna of the Lebanese and Syrian parts of Mount Hermon has so far remained virtually unknown.

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RARE *BLAESOSPIRA ECHINUS* IN TWO LOCATIONS IN VIÑALES, PINAR DEL RIO, CUBA

By Alexis Suárez Torres, Iriel Hernández Cobreiro, María Emma Palacios Lemagne & Alejandro Fernández Velázquez

Blaesospira Crosse, 1890, from Pinar del Rio in the western region of Cuba, is a genus of molluscs with one of the most surprising and spectacular shell morphologies in the Americas (Espinosa & Ortea, 2009) (Fig.1). The first specimens collected (by Wright) of the type species, *Blaesospira echinus* (Wright in Pfeiffer, 1864), were simply recorded as from 'Viñales'. Subsequent collecting trips failed to find it, until it was discovered at El Queque by Dr. de la Torre's collectors, who considered these newly collected specimens as consubspecific with those collected before by Wright (Torre & Bartsch, 1941).

Recent discoveries in Viñales have increased knowledge of its geographic distribution. These have been at Sierra de los Acuáticos (Lomba & González, 2002) and Hoyo de los Negros in Sierra Pan de Azúcar (Oliva, 2004). *Blaesospira* was placed originally in the Annulariidae (Espinosa & Ortea, 1999) but later referred to Potamiidae (Espinosa & Ortea, 2009).

Two species have been recognised: *Blaesospira echinus* (Wright in Pfeiffer, 1864), with three subspecies distributed in Viñales, and *Blaesospira hortensiae* Jaume, 1984, from Sitio de la Sierra, on the north side of Sierra de San Andrés (Espinosa & Ortea, 1999, 2009).

Blaeospira echinus populations have been recorded at Hoyo del Grillo in El Queque, Viñales (Wright in Pfeiffer, 1864) Sierra del Infierno (Torre & Bartsch, 1941), Hoyo de los

Fig. 1. Left: *Blaesospira echinus* on limestone; right: Hoyo del Grillo, habitat of *B. echinus*.

Negros, in Sierra Pan de Azúcar (Oliva, 2004; Oliva & Real, 2009) and Sierra de los acuáticos (Lomba & González, 2002).

During 26-27 July 2011 the localities known as Hoyo del Grillo, at El Queque, in Viñales, and Poseta de los Acuáticos, in Sierra de Viñales, Pinar del Río Province, were visited. Notes on the general characteristics of the habitat were taken, including the means of access to the microhabitat, the karst feature, ilumination and forest canopy. Photographs of snails and the habitat in which they were found were taken.

Population density was estimated in 1m x 1m quadrats on the vertical surface of the karst stack where the first specimens were seen. All individuals present in the quadrats were counted. At Hoyo del Grillo, ten quadrats were located on the karst wall at random, and two at Poseta de los Acuáticos, also on the karst wall. The habitat characteristics and details of the locations where snails were found were recorded.

The area where *Blaesospira echinus* is established at Hoyo del Grillo (Fig. 1) is accessed by a narrow fissure at El Queque, which is open at the west side of La Ensenada del Grillo, which allows communication from the west side to the east side. The site where the species occurs is 4 m long, limited at the left side by a stone mound ~3 m high, and on the right by a shady area. The snails were in the moss, moistended by water derived from rain that drains vertically down the limestone surface (Fig. 1).

However, the rain water does not reach the locations where *B. echinus* were found because the slope and the vegetal canopy that grows some meters above precludes this. Beyond this location, the area opens out and becomes lighter, and here *B. echinus* were not found. Ahead is the fissure for access to the site. The greatest height where snails were found was 3 m above the foot of the karst stack.

The second population is located 100 m north of Poseta de los Acuáticos, in Sierra de Viñales, on a rock 1.5 m high and 2.5 m wide. The light is poor and faint and the snails are again in shade where rain does not fall directly on them because of the upper vegetal canopy.

The two *B. echinus* colonies occur in similar habitats and microenviroments as those where the species is found at Sierra Pan de Azúcar.

Population density at El Queque ranges from 1 to 4 individuals/m^2, and at Poseta de los Acuáticos from 12 to 30 individuals/m^2. This is a first approximation and continued studies of abundance will be useful to evaluate the health and preservation status of the population. The species was proposed as threatened (Lomba, 1998) following the Conservation Plan and Threatened Species Management meeting (in Spanish 'CAMP'). In the Red list of threatened and extinct Cuban species, *B. echinus* was considered as Data Deficient (CenBio, 2009).

Examples of this species were not collected, but data for previous collections are given by Lomba and González (2002).

The results of this and previous studies suggest that ecological monitoring to complete the analysis and evaluation of the species is warranted in order to assess its status according to the established criteria of the IUCN.

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FRESHWATER MUSSELS (HYRIIDAE, *DIPLODON*) OF THE STATE OF RIO DE JANEIRO, BRASIL: THE LAST SURVIVORS?

By Igor Christo Miyahira, Maria Cristina Dreher Mansur, Jéssica Beck Carneiro& Sonia Barbosa dos Santos

Diplodon Spix in Wagner, 1827 is the most diverse genus of Hyriidae in South America (Fig. 1). The authorship of the genus is following the suggestions of Cowie *et al*. (2004).

Fig. 1. *Diplodon besckeanus* (Dunker, 1848) collected in the state of Rio de Janeiro. External and internal views. Scale bars: 1 cm.

Graf & Cummings (2007) listed 19 species of *Diplodon*, considering *Diplodon* to be distinct from *Rhipidodonta* Mörch, 1853, in which they listed eight species, following Simone (2006). However, splitting *Diplodon* into two genera (*Diplodon* and *Rhipidodonta*) has not been tested using a phylogenetic methodology, and we prefer to use *Diplodon* in a broad sense, thereby recognizing 27 species.

Specimens from the state of Rio de Janeiro began to be collected during the 18th and 19th centuries and were described by foreign researchers, including Wilhelm Dunker and Isaac Lea, among others. As a result, nine species have been described from the state of Rio de Janeiro (Table I). The greatest part of the material studied by these researchers was deposited in North American and European museums, including all type specimens. These were the first collections to document the diversity and distribution of *Diplodon* in the state of Rio de Janeiro.

Table 1. Species of *Diplodon* described from the state of Rio de Janeiro, Brasil.

Species (original combination)	Author and date	Locality
Unio coriaceus	Dunker, 1848	Negro river
Unio granuliferus	Dunker, 1848	Original description states 'flumine Maccué' [=Maccué river]. A label in the type lot, from Bescke (collector) states 'distr. Canta gallo'
Unio pfeifferi	Dunker, 1848	Negro river
Unio besckeanus	Dunker, 1848	Dunker giva Minas Gerais as the type locality, but are syntypes from Minas Gerais and Rio de Janeiro.
Unio psammactinus	Philippi, 1848	Surroundings of Rio de Janeiro
Unio dunkerianus	Lea, 1856	Macacú river
Unio expansus	Küster, 1856	Cônego river, Nova Friburgo
Unio rhuaconicus	Küster, 1856	Nova Friburgo
Unio martensi	Ihering, 1893	Original description states as type localities: SP?, RS and RJ. On type lot is written "SP?" (SMF 3929).

During the 20th century most studies on freshwater mussels were concentrated in the southern region of Brasil, with several papers published by M.C.D. Mansur. The fauna of other Brasilian regions is poorly known, and the fauna of the state of Rio de Janeiro is no exception. Two species of *Diplodon* from the state of Rio de Janeiro were studied towards the end of the 20th century (Alvarenga & Ricci, 1977a,b, 1981; Ricci *et al*. 1988, 1990), basically from a morphological point of view. These researchers (L.C. Alvarenga and C.N. Ricci) also built a good collection of freshwater mussels at the Museu Nacional do Rio de Janeiro (MNRJ), chiefly with specimens from Rio de Janeiro. Unfortunately, this collection has not received much attention since then.

The ongoing thesis of the first author is a revision of the genus *Diplodon*. We are also collecting freshwater mussels in the state of Rio de Janeiro, in order to generate an up to date distribution map of the genus. We visited the type localities (Table 1), but also others places suitable for freshwater mussels. Mussels are collected by direct search. Other sources of information are museum collections, especially MNRJ, which has a large number of specimens from Rio de Janeiro.

Not all scheduled localities have yet been visited. But from those already inspected some conclusions can be drawn. Concerning the type localities, we have already visited Macacú river (Cachoeiras de Macacú municipality) and Cônego river (Nova Friburgo municipality). When mussels were collected for the first time in these areas, they were small villages. For example, Nova Friburgo was founded in 1818. Küster (1856) described *Diplodon expansus* only 38 years after the founding of the city, although it is possible that the type specimens were collected some years earlier. At that time, impacts on the environment were minimal. Now the situation is completely different. Nova Friburgo is a medium sized city with 182,082 people (IBGE, 2010). Cônego, as well as the name of the river, is the name of a populous neighborhood of Nova Friburgo. Mussels have not been found again in this river perhaps as a result of the completely altered environmental conditions, including margin deforestation and domestic and industrial sewage. Fortunately, we found mussels in another river in the same catchment and municipality, but in a locality away from the centre of Nova Friburgo, although not free of human impacts. These mussels were collected in a small reservoir in the Grande river.

Diplodon dunkerianus (Lea, 1856) and Macacú river, in the municipality of Cachoeiras de Macacú, have a similar history. Although Cachoeiras de Macacú was founded earlier, in 1679, today it is less populous than Nova Friburgo. Macacú river runs through the centre of Cachoeiras de Macacú, sustaining all kinds of impacts (Fig. 2). *Diplodon dunkerianus* is listed in the Brasilian Red Book (Machado *et al*., 2008) and is known from this river and a few other locations (Mansur & Santos 2008). However, we did not find mussels in this river, confirming the conclusion of Mansur & Santos (2008) that this species no longer occurs at the type locality. In this same catchment, mussels were found in a small stream in the municipality of Itaboraí.

Diplodon pfeifferi is considered a valid species and also endemic to the state of Rio de Janeiro. Like *D. dunkerianus*, it is listed in the Brasilian Red Book (Machado *et al*., 2008). Simone (2006) treated this species as a junior synonym of *Diplodon multistriatus* (Lea, 1834), a species with a wide distribution and not listed in the Brasilian Red Book. This is an example of a taxonomic problem influencing conservation considerations. In addition, the Negro river is severly degraded near its headwaters by deforestation and pastures. In the middle stretch of river there is a cement plant on the river margin. So far, we have not found mussels in this river and it is possible that they are not able to survive in this kind of altered environment.

Degradation of freshwater ecosystems is not confined to mussel type localities and can be seen in all regions and

Fig. 2. Macacú river in the municipality of Cachoeiras de Macacú, state of Rio de Janeiro, Brasil. It is possible to see deforestation of the margins, presence of alien plants, buildings on the margins and domestic sewage.

catchments of the state of Rio de Janeiro. For example, in MNRJ there are lots collected in the first half of the 20th century, at Japuíba farm, in the municipality of Angra dos Reis. Angra dos Reis experienced urban sprawl during the last part of the 20th century. The population grew without basic sanitation structures. The area that was a farm crossed by a river around 1950, has become part of Angra dos Reis city, with the consequent degradation of freshwater ecosystems. The stretch of the river is now completely altered. The part of the river where freshwater molluscs prefer to live, because of the accumulation of nutrients and other factors, is also the stretch in which people prefer to live.

In contrast, in some places like Feia lake in the municipality of Campos dos Goytacazes, a big population of *Diplodon* sp. is still found, although the locality is not free of human impacts. The hydrology of the lake was altered through the years in order to reduce flooding of the surroundings, resulting in a decrease in water surface. This lake was considered of great importance to conservation by Scott & Carbonell (1986), especially concerning waterfowl. Finding a population of mussels inhabiting this lake reinforces this importance.

Countless other examples of degradation of freshwater ecosystems in the state of Rio de Janeiro can be given. Certainly several mussels populations are already extinct as a result of development of cities, some of them of considerable taxonomic importance, such as populations from type localities. These extinctions increase the difficulty of solving certain taxonomic problems because we depend in some cases solely on the type specimens, sometimes just one shell, and in most cases, without soft parts.

Besides taxonomic implications, the disappearance of mussel populations also causes ecological problems. Mussels play an important role in freshwater ecosystems, as filter feeders (e.g. Vaughn & Haukenkamp, 2001). These ecological services are therefore being lost. In the Brasilian Red Book 29 species of molluscs are listed, including 27 freshwater species, of which 26 are freshwater mussels, including 10 *Diplodon* species.

These numbers will probably increase as freshwater habitats are destroyed. Considering the continuous expansion of cities putting pressure on freshwater systems, the time for action is now, since if nothing is done, we are really looking at the last survivors.

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DISTRIBUTION OF *UNIO CRASSUS* (BIVALVIA: UNIONIDAE) IN ROMANIA, RELATED TO HUMAN IMPACT

By Ioan Sîrbu, Monica Sîrbu, Ana Maria Benedek & Ioana Gogolincă

The naiad species *Unio crassus* Philipsson, 1788 (Figs. 1, 2) is a flagship species of community interest, listed in Annexes II and IV of the EUHSD (92/43/EEC 1992), the Habitats Directive. It is considered a bioindicator key species, its presence indicating a certain ecological quality of freshwater systems. It lives (or lived) almost throughout Europe (Ellis, 1978; Fechter & Falkner, 1999). According to Van Damme (2011) it is a widespread, variable species, in Europe occurring from the Atlantic to the Ural Mountains, and beyond into the Tigris-Euphrates region and as fas as the Amur Basin, but absent from the British Isles, Iceland, Italy and the Iberian peninsula. Its range was once continuous, but is now extremely patchy wherever it occurs.

Up to the 1950s it was considered the most frequent and abundant naiad species in its range. Now it is widely included as (Critically) Endangered in national Red Lists, often regionally or locally extinct, or with scattered and diminishing populations. For instance, in Germany it is considered more endangered than *Margaritifera margaritifera* (the other naiad bivalve listed in the annexes of the Habitats Directive). There are many populations lacking individuals less than 10 years old (Fechter & Falkner, 1990) and it is becoming locally or regionally extinct (Glöer & Meier-Brook, 2003). In the German Red List it is labelled as 'in danger of extinction' (or '1' in the German code). Regionally within Germany it is categorized as ranging between 'extinct' (category '0') in Berlin to the single instance of 'highly endangered' ('2') in Baden-Württenberg, and as 'in danger of extinction' everywhere else. It is listed in the IUCN Red List as Endangered (Van Damme, 2011).

The situation is similar in other central and western European countries. In central Europe the main threats are pollution (especially nitrate enrichment), but also changes in the fish fauna, as the bivalve's life cycle includes an obligatory ectoparasitic larval stage (the glochidia) hosted by fish. The naiads are filter feeders, important in the self-cleaning function of continental waters and in controlling algal blooming. Often the only species able to inhabit a wide range of flowing waters, the ecological importance of *Unio crassus* is especially marked.

The main recent trends in Romania are highlighted in Fig. 3. The data go back as far as the mid 19th century, especially resulting from the work of M. Bielz (1851) and E.A. Bielz (1867), while the recent information is from Sárkány-Kiss (1997), Sîrbu (2006, 2007) and Sîrbu *et al.* (2006, 2010).

The past and present distribution of *Unio crassus* indicates that it is characteristic of the Romanian Inner Carpathian Basin environment (many rivers and small, clean tributaries, originating from the surrounding Carpathian Mountains arc). It lives preferentially in flowing waters arising from hills, plateaus, depressions, sometimes also mountain brooks and rivers (at lower altitudes), and is often the single naiad species inhabiting these flowing waters, though sometimes occurring

Fig. 1. *Unio crassus* from the Criş rivers basin (Romania).

Fig. 2. *Unio crassus* from the Timiş River (Banat, Romania, in August 2011).

together with *Anodonta anatina* (Linnaeus, 1758) in the upper or middle river courses. It can still be found in the lowlands but is usually outnumbered by other species that are more confined to lentic and more eutrophic conditions. At present it is seldom encountered in slow flowing lowland rivers. When present, it reflects a certain quality of the water and sediments, and is one of the best indicators of ecological conditions. As has been shown, its range was drastically reduced during the period of enforced industrialisation, most extinctions occurring in the main rivers rising from Transylvania (Olt, Mureş, Someş). Except for some inhabited sectors of the upper and (rarely) middle sector of the Mureş and Someş Rivers, it survives mostly as populations inhabiting clean tributaries, sometimes in very small brooks across the whole region. But some of these habitats, some still surviving by chance because of the lack of industrial plants in their basins, are now threatened because of household and farm wastewater discharges. Thus, in some small rivers and brooks, very characteristic of the upper course of the Mureş, the populations are decreasing dangerously (in terms of abundance and distribution). Highly abundant and viable

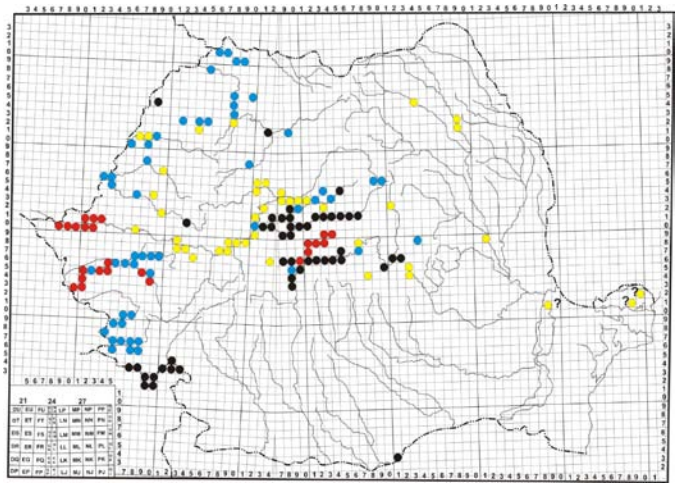

Fig. 3. UTM map of the known distribution of *Unio crassus* in Romania (10 x 10 km grid). Blue dots: found alive by the authors between 1996 and 2010; red dots: data from 2011, mostly in localities where it was considered locally extinct in the early 1990s; black dots: reported in the past, searched for but not found during recent years, or no living individual but only empty shells found; yellow dots: recorded before the 1990s, in the literature or collections, in localities not checked or insufficiently checked during the past 15 years. Question marks indicate that there are doubts concerning the records from these localities, or that the records lack specific localities.

populations are encountered especially in the Nera River (from Bozovici downstream to Zlatiţa, mainly in the Nera Gorges), the middle and lower sectors of the Crişul Negru and Crişul Alb Rivers (densities of more than 100-150 individuals/m^2 recorded in the last few years), the lower Timiş River, the middle Bega River, the middle and lower Caraş River. It is less abundant in the lower sector of the Crişul Repede River, some tributaries from the middle Olt River Basin, the upper and, partly, the middle Mureş River, some sectors of the Someş River and other waters. Its current status in Muntenia and Moldova (the southern and eastern regions of Romania) is unknown because of the lack of research.

Between the 1960s and 1990s, during the communist industrialization period, *U. crassus* became more and more scarce, often regionally or locally extinct, because of pollution and the reduction of environmental quality, draining, desiccation and the building of hydroelectrical plants. Although most populations of naiads now have a highly patchy distribution, there are also some rivers that still support (almost) continuous populations. In the past two decades, linked to reduction of industrial pollution, some recovery of former depopulated sectors of some rivers is taking place (most characteristically in the lower Mureş River, northern Banat region and southern Transylvania). Survival chances, repopulating sources and current environmental conditions shape the species composition and structure of the newly formed communities. Human impact on *U. crassus* as well as on the overall naiad (i.e. Unionidae) communities is seen in a variety of outcomes. The most obvious are regional or local extinctions, but subtler and more often encountered, are changes in community structure and spatial distribution. Mapping the past and current distributions demonstrates major habitat changes in certain areas, but also significant hope for the species' survival in the future. *Unio crassus* is in full progress of recovering at least parts of its former range, in conjunction with trends of increasing quality of the rivers' ecological conditions. This is due partially to the collapse of the former, communist, industrial infrastructure, its replacement with an emerging more environmentally friendly industrial development, reduction of pollution and enforcement of more effective environmental legislation. However, there are still pollution hot-spots, disfunctionality between legislation and socio-economic demands, and new problems are arising. For instance the former centralized heavy industrialized pollution spots have been replaced by a new trend of diffuse, large-scale, wastewater discharges from small industrial plants, households and agriculture, all linked to regional and local development.

We consider that *Unio crassus* should be considered, according to the IUCN Red List Categories and Criteria as 'near threatened' (NT) at the national level, while other sources tend to ascribe it to the vulnerable category. Future monitoring of the distribution, as well as population parameters on local and regional scales, will also provide a useful means of freshwater ecological quality assessment. There are still gaps in national environmental legislation, and there are no specific coherent surveys and management plans concerning this species.

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CONSERVATION OF ENDEMIC LAND SNAILS IN SOUTHERN BRASIL: NEW RECORDS OF ALIEN EUROPEAN SLUGS IN THE HIGHLANDS OF SANTA CATARINA STATE

By A. Ignacio Agudo-Padrón

The Municipal District of Monte Carlo is located in the highland plateau region of Santa Catarina state, Central Southern Brasil (27°13'S, 50°59'W; Fig. 1), with elevations up to 942 m above sea level. It is located in the Taquaruçú River basin, which in turn is part of the network that sets up the Uruguay River basin. The area has a mesothermal humid climate, with cool summers and an average temperature of 16.1 ° C.

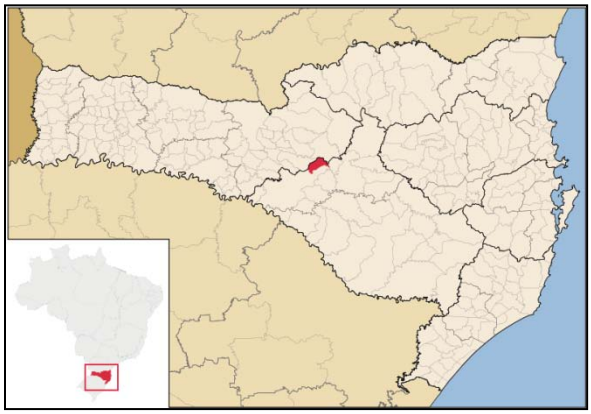

Fig. 1. Location of Monte Carlo Municipal District within Santa Catarina state, Central Southern Brasil. Box: location of Santa Catarina State in Brasil.

The region has suffered severe deforestation as a result of logging, intensive fruit growing, monoculture of grains and vegetables, livestock farming and constant and indiscriminate application of pesticides, leaving only sparse small areas of preserved forest known as 'legal reserve' that are mandated by the Brasilian Forest Code, and that unfortunately are unrepresentative of the great Araucaria forest ("Mata de Araucária") of former times.

This critical situation, generated by environmental degradation and a product of galloping human intervention is distinctly reflected in the impacts sustained by the local faunal biodiversity, particularly the terrestrial molluscs, with native endemic forest snails such as *Megalobulimus musculus* (Bequaert, 1948) (Megalobulimidae) and *Strophocheilus pudicus* (Müller, 1774) (Strophocheilidae) that were formerly abundant and widespread in the region now fast disappearing, becoming increasingly rare and difficult to encounter in nature (Agudo-Padrón, 2008a).

In addition to these factors previously reported, there has been a parallel and alarming introduction and spread of invading alien molluscs (Agudo-Padron & Lenhard, 2010), specifically alien slugs.

On 21 November 2011, with the timely assistance of farmers and local residents, the occurrence of two species of introduced European slugs was verified: *Milax valentiana* (Férussac, 1821) (Milacidae, but treated by most authors as *Lehmannia valentiana*, Limacidae), which was extremely abundant in the locality inspected (Fig. 2), and *Limax maximus* (Linnaeus, 1758) (Limacidae) (Fig. 3), adding to the known geographic distribution of continental molluscs in Santa Catarina state (Agudo & Bleicker 2006; Agudo-Padrón 2008a,b; Agudo-Padrón 2011) and southern Brasil in general (Agudo-Padrón 2009a,b; Gomes *et al*., 2011), occupying the empty spaces left by missing native snails.

Fig. 2. *Milax valentiana*. (Photo: A. Ignacio Agudo-Padrón)

Fig. 3. Leopard-slug, *Limax maximus*. (Photo: A. Ignacio Agudo-Padrón)

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THE CONSERVATION STATUS OF TERRESTRIAL SLUGS

By Megan Paustian

Although slugs are often a major component of terrestrial ecosystems, the basic biology of most species remains surprisingly little understood (South, 1992), and the conservation status of slug species is poorly known. Except for some direly endangered groups, molluscs as a whole do not receive significant attention from conservation organizations and researchers (Lydeard *et al*., 2004). The conservation status of fewer than 3 % of molluscs has been assessed by the IUCN, compared to 43 % of vertebrates, including almost 100 % of birds and mammals (Vié *et al*., 2009). Moreover, malacologists have traditionally ignored slugs in favor of snails (Hubricht, 1985), in part because slugs are difficult to sample (Cameron & Pokryzko, 2005) and maintain in preservative fluids, resulting in a paucity of slug collection records and literature. The intention of this article is to summarize in brief the state of knowledge of threatened slug species with a focus on the IUCN Red List and the NatureServe list, two major databases determining and compiling information on the conservation status of species. Slugs are defined here as a polyphyletic grouping of land snails with a minimal external shell, an internal shell or no shell (Pearce & Örstan, 2006).)

The IUCN Red List has global coverage, although invertebrates such as molluscs do not receive the attention of other clades (Lydeard *et al*., 2004; Régnier *et al*., 2009). The conservation status of species is determined by a combination of criteria including population decline, range, reproductive population size, and extinction probability (see Vié *et al*., 2009). The NatureServe list is restricted to the USA and Canada, covering most of the native slug species. Standards of evaluation include number of populations, population size, and other factors (NatureServe, 2011). Table 1 lists the threatened slugs from both databases, with information compiled from Alonso & Ibanez (1996), Mollusc Specialist Group (1996), Herbert (2000a-d), Frias Martins (2011), Groh (2011), Groh & Alonso (2011), NatureServe (2011) and Seddon (2011).

Almost all threatened slug species listed occur in naturally delimited habitats, such as mountain ranges and islands, that are experiencing or are in danger of undergoing destruction and/or fragmentation. A small geographic range and/or island endemism is a strong predictor of extinction risk (Purvis *et al*.,

Table 1. The slug species evaluated by IUCN and NatureServe and determined to be threatened. Only Red List species with 'vulnerable' or more threatened status and NatureServe species with 'imperiled' or 'critically imperiled' status are included. * = species status uncertain.

Species	Status	Range
IUCN Red List (worldwide)		
Agriolimacidae		
Deroceras tarracense	vulnerable	Spain
Chlamydephoridae		
Chlamydephorus burnupi	vulnerable	South Africa
Chlamydephorus dimidiusi	vulnerable	KwaZulu-Natal, South Africa
Chlamydephorus purcelli	endangered	Western Cape Province, South Africa
Parmacellidae		
Parmacella tenerifensis	endangered	Canary Islands
Veronicellidae		
Laevicaulis haroldi	endangered	KwaZul-Natal, South Africa
Vitrinidae		
Plutonia albopalliata	vulnerable	Madeiran islands
Plutonia angulosa	critically endangered	Santa Maria, Azores
Plutonia dianae	vulnerable	Canary Islands
Plutonia falcifera	critically endangered	Canary Islands
Plutonia machadoi	critically endangered	Canary Islands
Plutonia reticulata	critically endangered	Canary Islands
NatureServe (North America)		
Agriolimacidae		
Deroceras hesperium *	imperiled	Oregon and Washington, USA; British Columbia, Canada
Deroceras heterura	critically imperiled	New Mexico, USA
Anadenidae		
Kootenaia burkei	imperiled	Idaho and Montana, USA; British Columbia, Canada
Ariolimacidae		
Ariolimax buttoni	imperiled	California, USA
Ariolimax californicus	imperiled	California, USA
Ariolimax dolichophallus	imperiled	California, USA
Hesperarion hemphilli	imperiled	California, USA
Hesperarion niger	imperiled	California, USA
Hesperarion plumbeus	imperiled	California, USA
Arionoidea		
Gliabates oregonius	critically imperiled	Oregon, USA
Udosarx lyrata	imperiled	Idaho and Montana, USA
Binneyidae		
Binneya notabilis	critically imperiled	California, USA
Hemphillia burringtoni	critically imperiled	Washington, USA; British Columbia, Canada
Hemphillia danielsi	imperiled	Idaho and Montana, USA
Hemphillia pantherina *	critically imperiled	Washington, USA
Philomycidae		
Megapallifera wetherbyi	imperiled	Tennessee, Kentucky and Virginia, USA
Pallifera pilsbryi	imperiled	Arizona, USA; Sonora, Mexico
Pallifera tournescalis *	critically imperiled	Oklahoma, USA
Philomycus batchi	critically imperiled	Kentucky, USA
Philomycus bisdodus	critically imperiled	Kentucky and Virginia, USA
Philomycus sellatus	imperiled	Alabama and Tennessee, USA

2000). Of the ten species on the Red List for which threats were identified, nine were at risk because of their small native ranges (Fig. 1). A smaller number of slug species on the Red List are currently experiencing measureable population declines, habitat loss, or habitat fragmentation. Endemicity is a common risk factor for slug species. For example, out of a small, random survey of 128 slug species with range and type locality data, I counted 25 species (20 %) that are extreme endemics, only found at or in the immediate vicinity of the type locality (Paustian, unpublished), and although most of these species are not recognized as threatened, they probably deserve more attention.

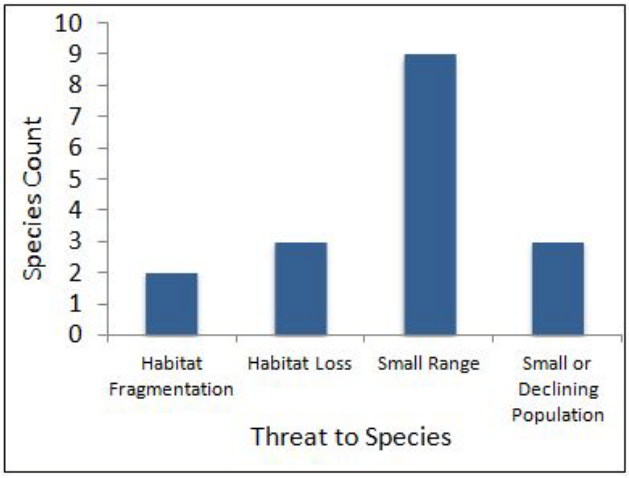

Fig. 1. Number of slug species on the IUCN Red List affected by each of four types of conservation threat. Threats were identtified for ten species, and some species are affected by multiple threats.

In addition, some of the major genera (*Chlamydephora* and *Plutonia*) are carnivorous (Herbert, 1997; Barker & Efford, 2004). Species at higher trophic levels, such as predators, tend to have an elevated risk of extinction (Purvis *et al*., 2000). Thus, other carnivorous slugs, like the little-studied family Rathouisiidae, may deserve attention from conservation researchers.

The major problem of these conservation lists is that the information used to assign species conservation status is incomplete. Ranges are poorly known for many species, and few slug populations are being monitored. The taxonomic status of some species remains uncertain. Of an estimated 700 terrestrial slug species on earth (Paustian, unpublished), IUCN has evaluated 56 (8 %). Nine of the slug species on the Red List were considered too data-deficient to assign a conservation status. Yet, the percentage of slug species evaluated (8 %) was higher than that of molluscs in general (3 %) because of a recent effort to assess the island-endemic genus *Plutonia*, which represents 34 of the 56 species evaluated (Alonso & Groh, 2011; Frias Martins, 2011; Groh, 2011; Groh & Alonso, 2011a,b; Seddon, 2011). Slug taxa occurring in geographic areas in which conservation work is less extensive are under-represented on the Red List. These areas may benefit from the development of regional databases like that of NatureServe, which showcase threatened species that the Red List may not have the data or time to evaluate stringently. NatureServe, which produces conservation recommendations for the USA and Canada, lists 21 slug species as imperiled or critically imperiled, only one of which is included in the Red List (*Binneya notabilis*, which was listed as Data Deficient).

In conclusion, further research is needed to clarify the distributions and taxonomy of terrestrial slug species in order to establish their conservation status. I would suggest particular emphasis on Southeast Asia, South and Central America and most of Africa, which are not well known (Lydeard *et al*., 2004), and on the mainly tropical families Veronicellidae, Rathouisiidae, Helicarionidae and Ariophantidae, which contain many undescribed species and species that have not been reassessed since their original description. Slugs play a major role in decomposition processes (Richter, 1979) and serve as food for many native animals (e.g. Tod, 1973; Whitaker & French, 1986). We do not know how declining slug populations may be affecting ecosystems, much less, for the most part, which of the world's slug species are declining.

This article is informed in part by my project, Terrestrial Slugs Web, to provide data for all species of terrestrial slugs for the Encyclopedia of Life, and which is funded by the Encyclopedia of Life. I thank Tim Pearce for his helpful comments on a draft of this article.

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ARE WETLANDS GOOD FOR LAND SNAILS?

By Timothy A. Pearce & Timothy J. Dolan

Moisture is an important resource for land snails, but would more moisture be better? We are examining whether wetland samples contain greater abundance or species richness of land snails, or more of certain individual species.

Using data from another study, we examined 1076 land snail samples from across Pennsylvania, USA, that included the processing of at least one liter of leaf litter to recover the diverse microsnails. We used ArcGIS to identify which sample localities are within recognized wetland areas (U.S. Fish & Wildlife Service, 2011). We determined that 39 of the samples were from wetlands (as defined by Cowardin *et al*., 1979), but three kinds of wetland (emergent, lake and pond) were represented by two or fewer samples, so we focused on samples from 25 forest/shrub and eight riverine wetlands. We compared abundance and species richness of these 33 samples to those of 92 arbitrarily selected non-wetland samples.

Riverine wetland samples averaged more snail species in greater abundances than either forest/shrub wetland or non-wetland samples ($p<0.005$ in all cases; Fig. 1). In contrast, forest/shrub wetland samples averaged fewer species than riverine or non-wetland samples ($p<0.005$ in both cases) and lower abundance than riverine samples ($p<0.005$); abundances in forest/shrub wetlands and non-wetlands did not differ significantly.

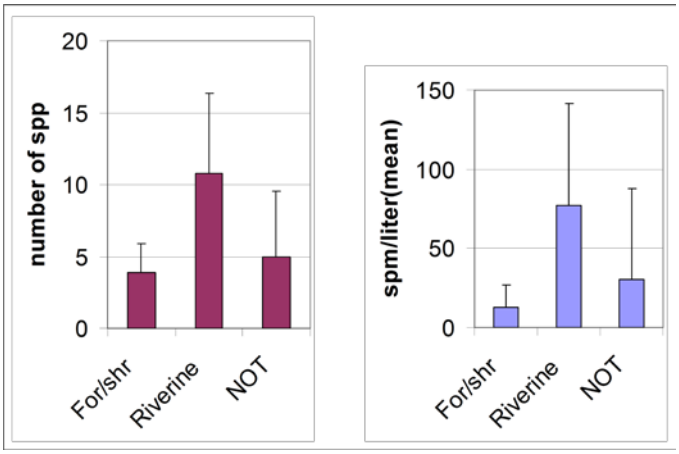

Fig. 1. Number of snail species (left) and abundance (specimens per liter of leaf litter) (right) of snails in forest/shrub and riverine wetlands compared with non-wetlands (NOT). Error bars are standard deviations.

Riverine habitats might be more favourable for snails because there is more humidity in riparian areas, they might have greater nutrient input, and individuals could be carried into the wetland area during flooding. From a land snail perspective, conservation of riverine wetlands appears to be a greater priority than conservation of forest/shrub wetlands, depending on the constituent species of each habitat type.

We are continuing to examine the influence of wetlands on snails by increasing our sample sizes and examining whether wetlands harbour more of certain species. Preliminary results suggest that *Euconulus polygyratus, Pomatiopsis lapidaria* and *Punctum vitreum* are more commonly found in wetlands.

We are grateful to the National Wetlands Inventory for supplying data.

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FRESHWATER BIVALVES IN NORTH AMERICA

Please see the article by Forsyth *et al*. (p. 16) ‘Molluscs assessed by COSEWIC in 2011’, which includes North American freshwater bivalves.

PACIFIC ISLAND LAND SNAILS

Tahiti becomes the focus of *Partula* conservation

By Trevor Coote

The tree snail family Partulidae, with species endemic to many Pacific Islands and archipelagos, has been the focus of population and evolutionary studies since the 19th century, principally in the Society Islands of French Polynesia (Garrett, 1880, 1884; Crampton, 1916, 1932; Johnson *et al*., 1993a). Following mass extinctions beginning in the 1970s due to the introduction of the carnivorous snail *Euglandina rosea* in a failed biological control attempt, attention immediately switched to conservation science (Clarke *et al*., 1984; Cowie, 1992; Coote & Loève, 2003). Researchers working in the field began collecting snails and placing them in universities and zoos in Europe and North America to prevent their certain extinction. The international conservation programme was born in the mid 1980s (Tonge & Bloxham, 1991).

Most of the genetic and evolutionary research in the latter half of the twentieth century took place on the French Polynesian island of Moorea (Murray & Clarke, 1980, 1984; Murray *et al*., 1988, 1991, 1992; Johnson *et al*., 1993a, b; Clarke *et al*., 1996; Goodacre, 2002). As a result, early conservation efforts were focused on that island, notably construction of the world's first snail reserve (Coote *et al*., 2004). In making the decision to re-examine the extensive work carried out by H. E. Crampton at the beginning of the 20th century Bryan Clarke and James Murray (see summary by Johnson *et al*., 1993a) decided to carry out their research on Moorea. They had been deterred somewhat by the complexity of the taxonomy of the *Partula* on Tahiti (Clarke, pers. comm.), the largest, most populous and most accessible of the Society Islands (the archipelago where the evolutionary radiation of the Partulidae had been most spectacular). One species in particular, *Partula otaheitana*, which Crampton (1916) had classified into eight subspecies, had proved especially problematic. So it was the *Partula* of Moorea that became the subjects of detailed studies, including working out various aspects of their genetics. However, after the widespread extinctions of *Partula* on all the islands, it was found that more had survived on Tahiti than elsewhere (Coote, 2007; Table 1).

The first species of *Partula* formally described was *Partula otaheitana* (Bruguière, 1792) from Tahiti. Nearly all the other

Fig. 1. A few of Crampton's original samples in the Bishop Museum, Honolulu. The taxa shown are *Partula otaheitana rubescens* and *Samoana jackieburchi* (see Kondo, 1980; Johnson, *et al*., 1986).

Table 1. History of the genus *Partula* in the Society Islands (replaced by *Samoana* on the Marquesas and Austral archipelagos)

Island	Number of original species	Estimated date *E. rosea* introduced	Estimated extinction date in the wild	Number of species living in the wild	Number of species surviving in captivity
Bora Bora	1	1986	1987	0	0
Huahine	3	1992	1996	0	2
Raiatea	33[1]	1986	1998	1[2]	4
Tahaa	6	1986	1992	0	0
Moorea	7	1977	-	1	5
Tahiti	8	1975	-	4[3]	5
Total	58			5[3]	16

[1] Taxonomic revision could have reduced this number to half or even less.
[2] New species discovered on the highest peak in 2006 (Burch, 2007).
[3] It seems almost certain that *Partula affinis* is now extinct in the wild (listed as critically endangered in the 2007 IUCN RED List), reducing these numbers to 3 and 4.

Tahitian species were described in the 19th century. Crampton's (1916) classification remains the baseline for the taxonomy (Fig. 1). In 1970 John B. Burch made extensive collections of *Partula* from Tahiti, four years before the introduction of *Euglandina rosea*, and the samples were freeze dried (Anonymous, 2004). This collection was made available and, together with samples from the international breeding programme and species still persisting in the wild, used in a comparative DNA study by the University of Michigan in 2005. The findings and their implications for conservation were reviewed by Ó Foighil (2009) in *Tentacle*; in summary more of the original genetic variation remained in the *Partula* species surviving in the wild and in the breeding programme than had been previously suspected (Lee *et al*., 2007). This was a major boost for the conservation of Tahitian *Partula*, especially with a field biologist (myself) in situ and funding apparently available from the French Polynesian government. Despite political and economic complexity a start was made on their practical conservation in 2011.

The first *Euglandina*-proof *Partula* reserve had been built on Moorea in 1994 as part of a two year experiment with mixed results but strong evidence that such a strategy could work given efficient monitoring and maintenance. A second, constructed on the peninsula of Tahiti in 2002 to ring-fence threatened populations (which have since disappeared in the absence of *E. rosea*), was destroyed by a rock fall before it could be put into operation (Coote, 2003). A similar structure had been planned since 2006 to be erected on government maintained land (Te Faaiti Valley), to be funded by the government, on the main island of Tahiti but a series of setbacks has meant that only now has it become a realizable project, thanks in part to additional funding from the Critical Ecosystem Partnership Fund (CEPF). The proposed reserve has now become part of a wider habitat restoration and local education project. The site (Fig. 2) had been identified and marked out two years previously but by 2011 the majority of a 500 m stretch of forest between the river at the entrance to the reserve and the first river crossing, including the small plateau where the reserve is to be constructed, has been cleared of introduced tree and shrub pest species, leaving just one area still to be treated. An even more thorough removal of live *E. Rosea* and other invertebrate pest species will be carried out before snails are imported from the breeding programme. The

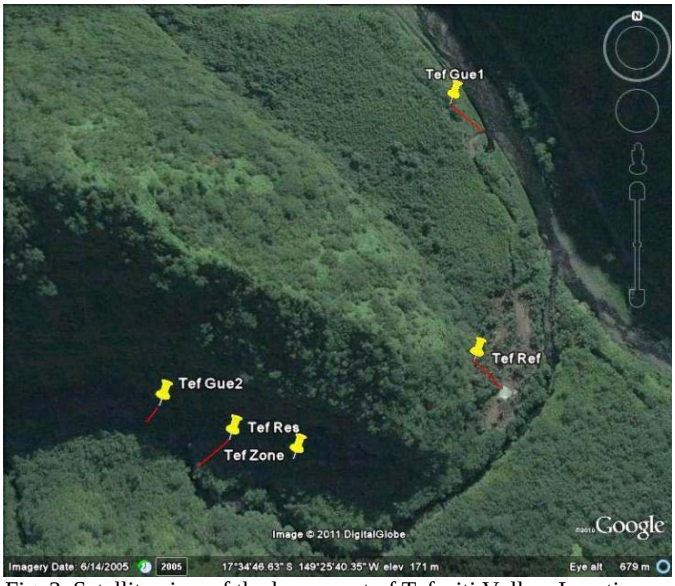

Fig. 2. Satellite view of the lower part of Tefaaiti Valley. Locations are: Tef Gue1 - Papenoo River crossing (*gué* in French); Tef Ref - stretch of bamboo and dirt track from river to first refuge and garden, 259 m from Tef Gue 1; Tef Zone - trail through bamboo and other forest, 197 m from Tef Ref; Tef Rres - the reserve site, 64 m from Tef Zone; Tef Gue2 - short trail past reserve to first river crossing of Te Faaiti Valley, 72 m from Tef Res.

reserve should be constructed in 2012 and there will then be a good representative patch of native habitat largely free of invasive pest species. There is even the possibility of planting some local endemic plant species.

The *Partula* of Tahiti suffered heavy losses during the height of the *E. rosea* introductions and spread (Murray *et al*., 1988). Three single valley endemics quickly went extinct (*P. filosa*, *P. producta*, *P. cytherea*) and five others were admitted into the breeding programme. Of those, four also persisted in the wild (*P. hyalina*, *P. clara*, *P. affinis*, *P. otaheitana*). Only *P. nodosa* was extinct in the wild, though it now seems fairly certain that *P. affinis* has also gone from its natural range. *Partula nodosa* has done spectacularly well in the breeding programme and is the target species for re-establishment, the caveat being that its natural distribution had been in seven valleys on Tahiti's dry west coast, whereas the reserve will be sited in the wetter interior. However, to control for possible mortality due to unfavourable ecological conditions for this species there will be populations (and de facto reserve stock) of *P. nodosa* put into Papehue Valley, which is the valley from which the breeding stock originated and from which *Euglandina rosea* is currently absent. Although it was not practical to construct a reserve in this valley because of land ownership complications, it is accessible for maintenance of small unfenced discrete patches containing these control populations of *Partula*. The other species planned for the Te Faaiti reserve include *P. affinis* and, if stocks permit, *P. hyalina* and *P. clara*, the latter two possibly colour varieties of the same species. *Partula hyalina*/*P. clara* brought in from the breeding programme can also act as indicators of success as they also persist in small numbers in the wild.

After the construction of a predator-proof reserve and the clearance of invasive fauna and flora from a discrete area around the reserve site, bounded on three sides by rivers and the fourth by the cliffs, the result should be a showcase example of native habitat and local biodiversity with information panels for visiting groups, school children and tourists. Given efficient monitoring and maintenance, we are giving the snails from the breeding programme the best possible chance of survival in their natural habitat. The long-term plan is to extend the building of reserves to other Society Islands with the ultimate objective of re-establishing all the French Polynesian species currently in the breeding programme in small managed areas on their islands of origin.

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MARINE MATTERS

Please also see the article by Forsyth *et al*. (p. 16) 'Molluscs assessed by COSEWIC in 2011', which includes a single North American marine oyster.

The effects of road construction on a mangrove tidal flat in Kagoshima, Japan

By Kiyonori Tomiyama, Toshiro Nakashima, Go Onoda, Maya Takeuchi & Yoko Kikuchi

The estuary of the Atago River in Kagoshima Bay, Japan, has a small mangrove forest at its northern end (31°23'N, 130°33'E; Figs. 1, 2), near the northern limit in the Pacific for mangroves. This forest is dominated by *Kandelia candel* (L.) Druce and *Hibiscus hamabo* Sieb. et Zucc., maintained by normal recruitment of young trees raised from seed (Tomiyama, 2003).

Various important animal species inhabit this tidal flat and mangrove forest (Ando & Tomiyama, 2004; Egawa & Sakashita, 2003; Maki *et al*., 2002; Ohtaki *et al*., 2001, 2002; Shimono & Tomiyama, 2002; Takeuchi *et al*., 2008; Tajima & Tomiyama, 2002; Wakamatsu & Tomiyama, 2000). Egawa & Sakashita (2003) and Tomiyama (2003) reported that 37 species belonging to 48 genera in 37 families of Mollusca had been collected in this area (Fig. 3). This area supports the most abundant molluscan fauna in Kagoshima Bay. Many animals listed as endangered by the Ministry of the Environment of the Japanese Government (2007), as well as specifically in Kagoshima (Kagoshima-ken , 2003), inhabit this area, so the mangrove ecosystem is maintained in a good state. In

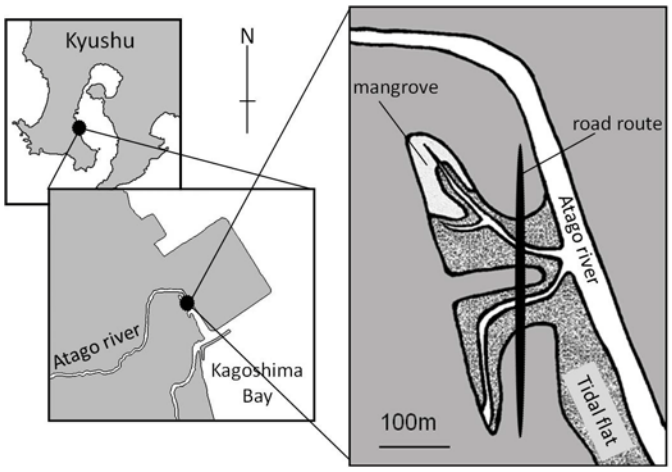

Fig. 1. Map of the study site.

particular, a lot of molluscs listed in the Red Data Book of the Ministry of the Environment of the Japanese Government (2007) inhabit this mangrove, for example *Patelloida* (*Chiazacmae*) *pygmaea forma lampanicpla* (Acmaeidae), *Laemodonta siamensis*, *Melampus sincaporensis* (Ellobiidae), *Cinnalepeta pulchella* (Phenacolepadidae), *Caecella chinensis* (Mesodesmatidae), *Trapezium liratum* (Trapeziidae). There is no other place in Kagoshima Bay where a lot of endangered species occur together (Kagoshima-Ken, 2003). The estuary tideland of the Atago River is noted in the Kagoshima Red Data Book (2003) as 'an important tideland of Kagoshima'.

In 1999, a plan to build a road in the mouth of the Atago River was announced. Kagoshima City government planned the road construction. According to the implementation plan, it was a plan to fill up this tidal flat. If this plan were implemented, the mangrove forest would be destroyed. In those days, the mangrove forest was not in a protected area. From the administration perspective there was no legal duty to protect the tidal mangrove flat. In addition, the construction did not require an Environmental Impact Assessment because the construction area of the planned road was small. If road construction went ahead, the ensuing extinction crisis would include a tidal mangrove flat at the northern limit of these mangroves in the Pacific. We continued to negotiate with the

Fig. 2. The mangrove forest.

Fig. 3. *Cerithidea rhizophorarum.*

administration in order to persuade them to withdraw the planned road construction and protect this tidal mangrove flat. We studied and documented the fauna of the area (Ando & Tomiyama, 2004; Egawa & Sakashita, 2003; Maki *et al*., 2002; Ohtaki *et al*., 2001, 2002; Shimono & Tomiyama, 2002; Tajima & Tomiyama, 2002; Wakamatsu & Tomiyama, 2000). Based on these studies, we explained the situation and the importance of the area at the northern limit of these species in the Pacific.

As a result of negotiations, the original landfill plan was withdrawn, and the plan was changed so that a bridge would be constructed over the tidal flat. The administration also carried out an Environmental Impact Assessment of the tidal flat. According to the construction plan, however, in order to build the bridge, digging for the supports is required and destruction of the local fauna in the area cannot be avoided.

Construction to build a supporting beam on the tideland began in 2009. Although the mangrove forest itself was protected, the administration seemed not to be interested in the importance of the tideland ecosystem, with the exception of the mangroves. For supporting beam construction, deep digging into the tidal flat was necessary and the surface fauna was badly damaged. In September 2011, surface soil of a tidal flat was removed and the ground leveled. The shore of the tideland was natural dunes and no work to protect the shore was performed before construction. As a result of this construction, the fauna of the tidal flat, with the exception of the mangrove forest, was destroyed. For *Melampus sincaporensis* (Ellobiidae), listed in the Red List, this area was its last habitat in Kagoshima Bay, and it is thought that this species became extinct from this tideland as a result of the construction.

It is further thought that the ecosystem of this mangrove forest has been influenced by the intense destruction of the tidal flat. We are investigating how the molluscan fauna of the tideland has changed as a result of this construction. We continue monitoring the fauna of this destroyed tideland. Recovery of the fauna of a tideland may be comparatively rapid if animal larvae are supplied to this tidal flat by the adjacent mangrove forest. We continue our investigation of the Mollusca of this

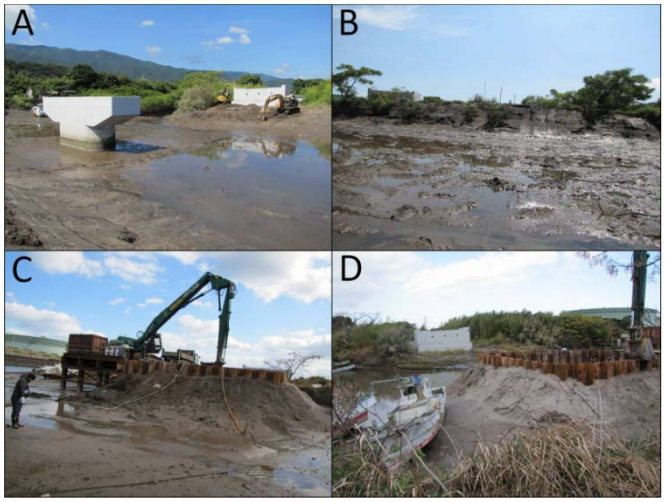

Fig. 4. A: finished supporting beam and mangrove forest. B: tidal flat and the shore of a dune which were destroyed. C, D: digging construction in the tideland.

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Impacts of the alien mussel *Brachidontes pharaonis* on native rocky shore assemblages in the Maltese Islands

By Leanne Bonnici, Julian Evans & Patrick J. Schembri

The mussel *Brachidontes pharaonis* (Fischer, 1870) is a small intertidal mytilid native to the Indo-Pacific region, mainly south-eastern Asia and the Red Sea (Sara *et al.*, 2008) (Fig. 1). It was one of the first Lessepsian migrants, which are species that have invaded the Mediterranean Sea following the opening of the Suez Canal in 1869, and it was recorded at Port Said, Egypt, less than a decade after the opening of the canal (Fuchs, 1878, as reviewed by Safriel *et al*., 1980). This alien species has since spread westwards (see review by Rilov *et al*., 2004) and it was first recorded in the Maltese Islands (central Mediterranean) in October 1970 (Sciberras & Schembri, 2007). Since then it has occurred as a few sporadic individuals on a number of rocky shores around the islands. Recently, however, Mifsud & Cilia (2009) reported that *B. pharaonis* beds were present in Birzebbugia Bay within Marsaxlokk Harbour (Fig. 2). This is the first time that any type of mytilid bed has been reported from the islands; although a number of indigenous species of mussel occur, (*Mytilaster minimus*, *Mytilaster lineatus*, *Mytilus galloprovincialis* and *Perna picta*), but locally none of these form beds. Therefore the *B. pharaonis* beds at Birzebbugia Bay constitute a habitat previously absent from the Maltese Islands.

As most other Mediterranean shores, those at Birzebbugia Bay are microtidal (maximum tidal range is 20 cm) and here the *B. pharaonis* beds occur in the upper infralittoral and mediolittoral zones between the low water mark and a maximum upshore distance of about 2.5 m; the mussels attach to the limestone rock and to each other by means of byssal threads. Mussel beds consist of a structurally complex matrix with numerous interstitial spaces (Cinar *et al*., 2008). The mussel bed matrix itself can support epizoic species that would otherwise be excluded from the shore by the mussels (Dogan *et al*., 2008; Lohse, 1993). Additionally, mobile infauna can benefit from the presence of the bed by seeking shelter within the interstitial spaces between the individual mussels (Cinar *et al*., 2008). Therefore, by acting as an ecosystem engineer *B. pharaonis* has the potential for profoundly affecting the native rocky shore assemblages. Our study investigated the effect of the alien mussel on the native biota by comparing the assemblage of species associated with the mussel beds with those occurring on rocky shores in the same general area where mussels are present but beds have not formed (reference sites).

Fig. 1. An individual of the alien mussel *Brachidontes pharaonis* from the shore at Birzebbugia, Malta.

Fig. 2.The *Brachidontes pharaonis* mussel bed on the rocky shore at Birzebbugia; so far this is the only such bed known from anywhere in the Maltese Islands.

Replicate samples were collected in summer 2010 on two selected shores in Birzebbugia Bay (Fig. 3), one with a developed mussel bed and the other a reference site where no mytilid bed was present but where *B.pharaonis* occurred sparsely as single individuals. The macrofauna were scraped off from 10 cm by 10 cm contiguous quadrats along a transect running from low water mark upshore to the upper boundary of the mediolittoral. The biota collected were sorted, identified and counted. A major difference between the two sites was algal biomass, with samples from the mussel beds having a very low algal biomass in contrast to the high values found in the reference samples. The mussel beds also showed a high density of errant polycheates (Nereidae and Syllidae) and of amphipod crustaceans (*Podocerus* sp., *Photis* sp. and *Hyale* sp.). According to Thiel & Ullrich (2002), highly mobile species roam in the complex matrix provided by mytilid beds whereas sedentary species such as sabellids, which were also predominant in the present study, attach self-constructed tubes between mussels and feed on allochthonous material which is imported into the bed. The number of mollusc species in the mussel beds were found to be very reduced compared to the reference shores; species present in the beds, such as *Rissoa guerinii*, *Gibbula* spp. and *Alvania mamillata*, were much more abundant in the reference samples. These species tend towards a herbivorous diet and the reduced algal biomass present in the mussel beds could explain their low numbers.

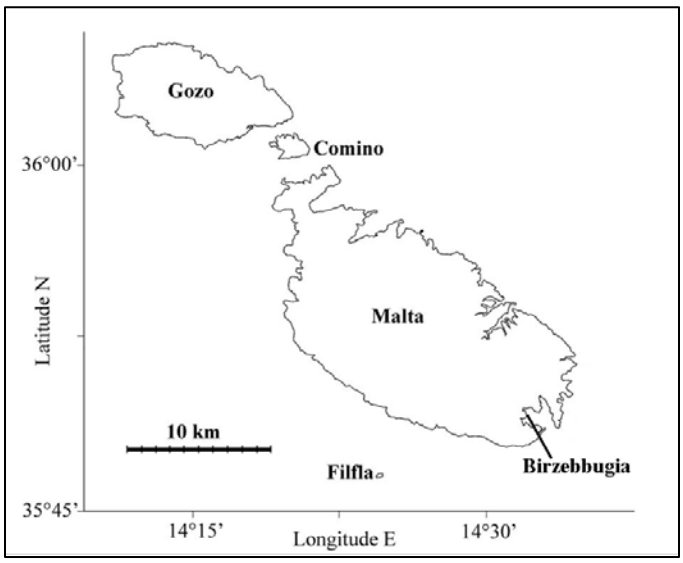

Fig. 3. Map of the Maltese Islands showing the study area and its location on the island of Malta.

Many molluscan species common in the reference samples were completely absent in the mussel beds; these include *Gibberula* spp., *Alvania discors*, *Alvania lineata*, *Chiton olivaceus*, *Nassarius cuvierii* and *Trophonopsis* sp.

The results of this study clearly show that the establishment of *Brachidontes pharaonis* beds on the Birzebbugia shore has had an impact on the native biotic assemblages and that as a group, the molluscs have been greatly affected. Molluscan diversity and population density was low in the *B. pharaonis* beds compared to reference sites located in the same bay but lacking mussel beds, and this suggests that through its habitat engineering capabilities, the previously rare and rather innocuous alien mussel has now become of conservation concern, particularly if beds of this species become established on other rocky shores in the Maltese Islands, including those in marine protected areas. While no native species of particular conservation importance seem to have been affected in the one place from where beds of the alien mussel are presently known, the situation may be very different on other shores, particularly those with vermetid platforms, which are bioconstructions of significant ecological and conservation importance in the Maltese Islands and the Mediterranean region as a whole.

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Doğan, A., Özcan, T., Bakir, K. & Katagan, T. 2008. Crustacea Decapoda associated with *Brachidontes pharaonis* (P. Fischer, 1870) (Mollusca, Bivalvia) beds from the Levantine coasts of Turkey. *Crustaceana* 81: 1357-1366.

Lohse, D.P. 1993. The importance of secondary substratum in a rocky intertidal community. *Journal of Experimental Marine Biology and Ecology* 166: 1-17.

Mifsud, C. & Cilia, D.P. 2009. On the presence of a colony of *Brachidontes pharaonis* (P. Fischer, 1870) (Bivalvia: Mytilidae) in Maltese waters (central Mediterranean). *Triton* 20: 20-22.

Rilov, G., Benayahu, Y. & Gasith, A. 2004. Prolonged lag in population outbreak of an invasive mussel: a shifting-habitat model. *Biological Invasions* 6: 347-364.

Safriel, U.N., Gilboa, A. & Felsenburg, T. 1980. Distribution of rocky intertidal mussels in the Red Sea coasts of Sinai, the Suez Canal and the Mediterranean coast of Israel, with special reference to recent colonizers. *Journal of Biogeography* 7: 39-62.

Sara, G., Romano, C., Widdows, J. & Staff, F.J. 2008. Effect of salinity and temperature on feeding physiology and scope for growth of an invasive species (*Brachidontes pharaonis* - Mollusca: Bivalvia) within the Mediterranean Sea. *Journal of Experimental Marine Biology and Ecology* 363: 130-136.

Sciberras, M. & Schembri, P.J. 2007. A critical review of records of alien marine species from the Maltese Islands and surrounding waters (central Mediterranean). *Mediterranean Marine Science* 8: 41-66.

Thiel, M. & Ullrich, N. 2002. Hard rock versus soft bottom: the fauna associated with intertidal mussel beds on hard bottoms along the coast of Chile, and considerations on the functional role of mussel beds. *Helgoland Marine Research* 56: 21-30.

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Conus synthesis meeting, Field Museum, Chicago, 25-29 October 2011

By Howard Peters

During the last week of October the Biodiversity Synthesis Center at the Field Museum Chicago hosted an IUCN Red List workshop on behalf of the University of York, UK. The purpose of the meeting was to assess threats to over 640 species of cone snails, one of the largest assessments undertaken for this purpose at a single session.

Conus, being the largest genus of marine invertebrates, is of special significance to biodiversity. Occurring primarily in tropical coastal waters, these snails are predatory and capture their meals of fish, molluscs or worms using complex neurotoxins delivered through detached 'harpoons' evolved from their radulae. The toxins, which possibly number in excess of 50,000 across the genus, are of considerable interest to biomedical science with drugs already on the market for the treatment of intractable pain and with many other applications in research. To date, fewer that 1 % of the toxins have been characterized. *Conus* confronts the same threats from fishing, pollution and habitat loss as other tropical marine taxa, but with a carnivorous diet, these gastropod molluscs are at a trophic level where habitat degradation also carries special significance in its potential for reducing prey abundance and disrupting the food chain.

The workshop opened with an address by Callum Roberts of the University of York describing the challenges facing marine science as the impact of over-exploitation, habitat loss, rising sea levels and changes in the marine carbon cycle bring

global fisheries to collapse and threaten the future existence of aragonite-secreting animals such as corals and molluscs. Mark Westneat of the Encyclopedia of Life and Heather Harwell of the IUCN Global Marine Species Assessment, joint sponsors of the meeting, presented the work of their respective organizations. This was followed by a talk from Howard Peters, principal researcher for the Cone Snail Project at York, on the background to the research and its future direction that will include sample surveys of *Conus* populations across variations in habitat. Monika Böhm of the Institute of Zoology at the Zoological Society of London and Mary Seddon of the IUCN Mollusc Specialist Group concluded the formal proceedings with presentations on the application of the standard IUCN Categories and Criteria and the taxonomic approaches to Red Listing.

The meeting divided into six work groups each representing a different biogeographical region to review draft species assessments researched at York over the previous months. Each group consisted of two or three experts for that region with representation from both academia and commerce, including leading malacologists and taxonomists but also major global traders in mollusc shells who are committed to conservation. This unusual approach created a dynamic environment where the 'in-water' knowledge of the traders dovetailed with the scientific expertise of the academics to produce an exceptionally insightful narrative of the distribution, trade and threats facing each species.

Over the following months the assessments will be subject to stringent consistency and accuracy checks before publication on both the websites of the IUCN Red List of Threatened Species and the Encyclopedia of Life where the data will be available for subscription-free access to researchers worldwide.

Fig. 1. Participants in the IUCN *Conus* workshop.

In addition to those mentioned above, other participants at the workshop (Fig. 1) were: Philippe Bouchet, Muséum national d'Histoire naturelle, France; José Coltro, Femorale, Brasil; Tom Duda, University of Michigan, USA; Andrew Hines, Global Marine Species Assessment, USA; Alan Kohn, University of Washington, USA; Suzanne Livingstone, The Biodiversity Consultancy Ltd, France; Eric Monnier, Conservatoire National des Arts et Métiers, France; Hugh Morrison, Australian Seashells, Australia; Ed Petuch, Florida Atlantic University, USA; Guido Poppe, Conchology Inc., Philippines; Gabriella Raybaudi-Massilia, University of Roma Tre, Italy; Jonnell Sanciangco, Global Marine Species Assessment, USA; Sheila Tagaro, Conchology Inc., Philippines; Manuel Jiménez Tenorio, Universidad de Cádiz, Spain; Stephan Veldsman, Gem Science, South Africa; Fred E. Wells, Consultant Marine Ecologist, Australia. (Photo: Beth Sanzenbacher)

Howard Peters, Environment Department, University of York, York YO10 5DD, UK. hp510@york.ac.uk

RECENT PUBLICATIONS RELEVANT TO MOLLUSC CONSERVATION

All reviews and comments are by the Editor of *Tentacle*, Robert Cowie.

The Natural History of Santo

Edited by Philippe Bouchet, Hervé Le Guyader, and Olivier Pascal, 2011. Muséum national d'Histoire naturelle, Paris; Institut de recherche pour le développement, Marseille; Pro-Natura international, Paris. 572 p. ISSN 1281-6213, ISBN MNHN 978-2-85653-627-8, ISBN IRD 978-2-7099-1708-7. €59.00

This lavishly and beautifully illustrated book is a semi-popular account of the 2006 expedition to the island of Espiritu Santo ('Santo'), the largest island of Vanuatu, organized by Philippe Bouchet and others of the Muséum national d'Histoire naturelle, Paris. The primary goal of the expedition was to develop a biodiversity inventory for Santo, from mountain to sea, a baseline of knowledge against which changes, for instance as a result of climate change, might be assessed in the future. The expedition was by far the largest ever mounted to Vanuatu, indeed to this part of the world, involving 233 participants, including 155 scientists.

The book is not a comprehensive, fully referenced documentation of the known biodiversity of Santo. That will have to wait until all the expedition collections are sorted, described and documented, a task that may well take a decade or more - an example of the 'taxonomic impediment'. Instead, as the introduction states, it is 'an attempt to bridge the gap between academic research and conservation and education'. As such, it is a comprehensive introduction to the natural history of a South Pacific island, accessible to the interested lay person but also of great value to scientists and others working on biodiversity in the Pacific. While no references are

cited in the text, a useful bibliography of relevant works is provided.

The overall rationale underpinning the expedition is outlined in the chapter on marine mollusks by Bouchet and others: an attempt to combine a traditional taxonomic inventory with a conservation-oriented rapid biodiversity assessment and a quantitative sampling approach that would permit an ecological evaluation of biodiversity processes. The involvement of local people and communities thoughout the expedition was critical to its success, and the local social context is a thread running through most of the book, with various chapters explicitly focused on it.

Following a brief introduction, the book begins with a section on context - 'Espiritu Santo in space and time' - that covers primarily geology, geography, hydrology and climate, as well as a history of scientific expeditions to Santo and the neighboring region. A history of logging and deforestation as well as the impacts of World War II on the landscape lead to a brief outline of current conservation efforts on Santo.

The meat of the book follows next in a section by section account of the vegetation and flora, the terrestrial fauna, rivers and other freshwater habitats, caves and other karst habitats and marine ecosystems. The plant section includes chapters on Arialiaceae, Cunoniaceae, pandans, orchids, palms, ferns, bryophytes. There is a short section on fungi. The section on terrestrial fauna includes chapters on Orthoptera, termites, bees and wasps, ants, beetles, Lepidoptera, spiders, land snails, birds and amphibians and reptiles; and the freshwater section has chapters on fish, shrimps and crabs, aquatic insects and freshwater snails. The karst section covers bats, fish and shrimps, springtails and microcrustaceans, as well the various interesting karst habitats. The marine section includes chapters on the algal and seagrass communities, fishes, unusual and spectacular crustaceans, mollusks, and a chapter specifically on sea slugs, as well as one on parasites, commensals and so on. There is some lack of consistency in length, style and content among these chapters, no doubt a result of the large number of authors and their differing approaches. They range from a comprehensive checklist of the marine fishes and an extensive treatment of the herpetofauna to relatively brief chapters on ants associated with a species of *Hydnophytum* (Rubiaceae) and on marine interstitial environments. Nonetheless, there is a wealth of information in these pages.

The next major section deals with the impacts of humans on the biodiversity of Santo. It begins with a brief outline of the very limited fossil record, moves on to prehistory and the development of the island societies and then turns immediately to introduced species, with short chapters on synanthropic and feral mammals (touching on the conflicts generated, particularly regarding pigs), alien birds, amphibians and reptiles and land snails. There is a chapter on cryptogenic darkling beetles, another on two species of invasive plants, and one on the diversity of cultivated food plants.

The book concludes with an essay on the conception of the expedition, the choice of Santo as the location (Vanuatu being perhaps the least well known biologically of the major south-west Pacific archipelagoes), preparations and a brief journal of events, difficulties encountered, the legacy of the project, and the educational outreach efforts undertaken locally in association with the expedition.

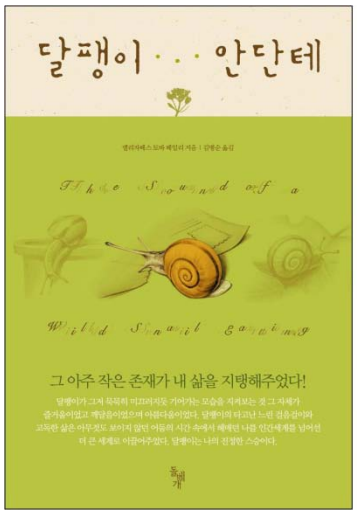
The Natural History of Santo is a very readable account of no doubt one of the biggest natural history expeditions ever mounted; it certainly reminds one of the volumes describing the voyages of the great late eighteenth century French and British explorers in the Pacific. Many of the issues and problems encountered in setting up and running the expedition will be common to other Pacific islands and elsewhere. And since many of the taxonomic groups encountered are represented widely elsewhere in the Pacific, the book is both relevant and instructive for others working on biodiversity assessment and conservation throughout the Pacific. It provides a tantalizing first look at the results of this hugely ambitious project, and one can only look forward to the more scientific fruits of this truly impressive undertaking, a considerable number of which have already appeared, notably in the volume edited by Corbara (2009), and others are noted in the bibliography.

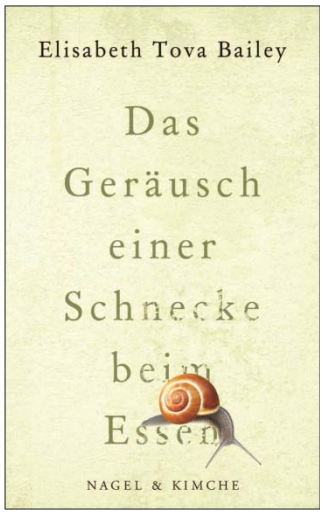
Corbara, B. (ed.) 2009. Santo 2006 Global Biodiversity Survey from sea bottom to ridge crests. *Zoosystema* 31: 397-744.

This review was first published in *Pacific Science* 65: 522-524 (2011).

The Sound of a Wild Snail Eating

Elisabeth Tova Bailey, 2010. Algonquin Books of Chapel Hill, Chapel Hill, North Carolina, USA. ISBN 978-1-56512-606-0. US$18.95.





This delightful book was reviewed in *Tentacle* 19 (2011). The author now tells me that the Korean edition came out recently and the German edition will launch in January 2012. She says that later in 2012 the book will be translated into Japanese, 'simplified' Chinese (mainland China) and 'complex' Chinese (Hong Kong, Taiwan). As each translation becomes available a notice will be added to the author's website. One of the web pages is titled Editions/Translations and there you can see which foreign translations are appearing next. So far there are U.S., U.K. and Australia/New Zealand editions in English.

Illustrated Catalogue of the Land Snails of France

This single issue, supplement 1 of the free on line journal *Malaco*, contains two papers:

Gargominy, O. & Ripken, T.E.H. 2011. Une collection de référence pour la malacofaune terrestre de France. *MalaCo*, HS 1: 1-108.

Gargominy, O. & Neubert, E. 2011. Identifier les clausilies de France. *MalaCo*, HS1: 109-122.

The first, larger work, is a comprehensive catalog of the French fauna, with spectacularly beautiful illustrations. The second, focused on the clausiliids is equally beautifully illustrated. Both works include easy to use keys.

Non-marine snails of Central America

Thompson, F.G. 2011. Annotated checklist and bibliography of the land and freshwater snails of Mexico and Central America. *Bulletin of the Florida Museum of Natural History* 50: 1-299.

The checklist summarizes the known species and subspecies that are recognized from Mexico and Central America. It is an an open access publication.

Symposium on Kimberley marine and coastal science

Brocx, M. & Meney, K. (eds). 2011. Symposium on Kimberley marine and coastal science. *Journal of the Royal Society of Western Australia* 94: 55-418.

Readers of *Tentacle* may be interested in some of the articles in this symposium proceedings issue, for example

Keesing, J.K., Irvine, T.R., Alderslade, P. *et al*. 2011. Marine benthic flora and fauna of Gourdon Bay and Dampier Peninsula in the Kimberley region. *Journal of the Royal Society of Western Australia* 94: 285-301.

The publication is available from the Society or by contacting Bruce G. Livett zebrarockgallery@bigpond.com. The recomended retail price is $65.00 (Australian) + postage and packaging.

Unfortunately I could find no additional details on line other than the list of topics at the symposium. These topics provided the basis for the contributions to the proceedings.

Other publications of interest

This is by no means a comprehensive list, but simply a list of publications I have happened to come across. If you want to have your publications listed in the next issue of *Tentacle*, please send details to me, the editor of *Tentacle*, Robert Cowie.

Allen, D.C. & Vaughn, C.C. 2011. Density-dependent biodiversity effects on physical habitat modification by freshwater bivalves. *Ecology* 92: 1013-1019.

André, M., Solé, M., Lenoir, M., Durfort, M., Quero, C., Mas, A., Lombarte, A., van der Schaar, M., López-Bejar, M., Morell, M., Zaugg, S. & Houégnigan, L. 2011. Low-frequency sounds induce acoustic trauma in cephalopods. *Frontiers in Ecology and the Environment* 9: 489-493.

Cowie, R.H. 2011. *Cornu* Born, 1778 (Mollusca: Gastropoda: Pulmonata: Helicidae): request for a ruling on the availability of the generic name. *Bulletin of Zoological Nomenclature* 68: 97-104.

Glöer, P. & Georgiev, D. 2011. Bulgaria, a hot spot of biodiversity (Gastropoda: Rissooidea)? *Journal of Conchology* 40: 489-504.

Gouveia, A.R., Pearce-Kelly, P., Quicke, D.L.J. & Leather, S.R. 2011. Effects of different calcium conentrations supplemented on the diet of *Partula gibba* on their morphometric growth paramters, weight and reproduction success. *Malacologia* 54: 139-146.

Holyoak, D.T., Holyoak, G.A., Yanes, Y., Alonso, M.R. & Ibáñez, M. 2011. Taxonomic revision, habitats and biogeography of the land snail family Discidae (Gastropoda: Pulmonata) in the Canary Islands. *Journal of Conchology* 40: 583-603.

Horsák, M., Škodová, J. & Cernohorsky, N.E. 2011. Ecological and historical determinants of western Carpathian populations of *Pupilla alpicola* (Charpentier, 1837) in relation to its present range and conservation. *Journal of Molluscan Studies* 77: 248-254.

Killeen, I.J. & Moorkens, E.A. 2011. Distribution and ecology of *Vertigo angustior* Jeffreys 1830 (Gastropoda: Vertiginidae) in an estuary in eastern England. *Journal of Conchology* 40: 515-525.

Lipińska, A.M., Gołab, M.J. & Ćmiel, A.M. 2011. Occurrence of Desmoulin's whorl snail *Vertigo moulinsiana* (Dupuy 1849) in the Nida wetlands (south Poland): interactive effects of vegetation and soil moisture. *Journal of Conchology* 40: 537-541.

McDonnell, R.J. & Gormally, M.J. 2011. A live trapping method for the protected European slug, *Geomalacus maculosus* Allman, 1843 (Arionidae). *Journal of Conchology* 40: 483-485.

Meinertz, J.R., Schreier, T.M., Hess, K.R. & Bartsch, M.R. 2011. Survival and growth of newly transformed *Lampsilis cardium* and *Lampsilis siliquoidea* in a flow-through, continuous feeding test system. *American Malacological Bulletin* 29: 69-75.

Meyer, W.M., III & Cowie, R.H. 2011. Distribution, movement, and micro-habitat use of the introduced predatory snail *Euglandina rosea* in Hawaii: implications for management. *Invertebrate Biology* 130(4): 325-333.

Meyer, W.M., III & Yeung, N.W. 2011. Trophic relationships among terrestrial molluscs in a Hawaiian rain forest: analysis of carbon and nitrogen isotopes. *Journal of Tropical Ecology* 27: 441-445.

Meyer, W.M., III, Ostertag, R. & Cowie, R.H. 2011. Macro-invertebrates accelerate litter decomposition and nutrient release in a Hawaiian rainforest. *Soil Biology and Biochemistry* 43: 206-211.

Moorkens, E.A. 2010. Addressing the conservation and rehabilitation of *Margaritifera margaritifera* (L.) populations in the Republic of Ireland within the framework of the Habitats and Species Directive. *Journal of Conchology* 40(3): 339-350.

Páll-Gergely, B. & Roibu, C.-C. 2011. Land snail fauna of the Humosu Secular Forest (Suceava County, Romania); a new locality of *Serrulina serrulata* (L. Pfeiffer, 1847) (Gastropoda: Pulmonata: Clausiliidae). *Malacologica Bohemoslovaca* 10: 48-50.

Shalack, J.D., Power, A.J. & Walker, R.L. 2011. Hand harvesting quickly depletes intertidal whelk populations. *American Malacological Bulletin* 29: 37-50.

Sugiura, S., Holland B.S. & Cowie, R.H. 2011. Predatory behaviour of newly-hatched *Euglandina rosea*. *Journa l of Molluscan Studies* 77: 101-102.

Zając, K. & Zając, T. 2011. The role of active individual movement in habitat selection in the endangered freshwater mussel *Unio crassus* Philipsson 1788. *Journal of Conchology* 40: 446-461.

IUCN, SSC AND MOLLUSC SPECIALIST GROUP NEWS AND ANNOUNCEMENTS

www.iucn.org/

News and announcements provided by Mary Seddon, chair of the Mollusc Specialist Group of the IUCN Species Survival Commission, unless otherwise indicated.

Data evaluation begins for Pacific Island land snails

By Helen Pippard

As part of the ongoing process to improve and strengthen our knowledge of Pacific Island species, IUCN Oceania is currently undertaking a project to assess land snails for inclusion on the IUCN Red List.

The IUCN Red List is a comprehensive and objective approach for evaluating the conservation status of plants and animals. Essentially it is a database of taxa that have undergone an extinction risk assessment using IUCN's Red List Categories and Criteria. The IUCN Red List currently includes 284 land snails from the Pacific islands. However, many species have been assigned as Data Deficient (lacking sufficient information on population size and distribution to assess their level of threat) or the assessments were carried out using old IUCN guidelines. The assessments of the Pacific island land snails as a whole are therefore in serious need of revision.

A group of specialists met in Suva in February 2011 to undergo training in the Red List process. Following this, the specialists carried out draft species assessments by gathering data on population, distribution, ecology, habitat requirements, threats and utilization for each species.

An evaluation workshop was held in September 2011, during which a group of experts came together to review and verify the draft assessments, supply additional on the ground knowledge, assign a provisional Red List category to each species, and produce distribution maps.

The information collected by the specialists and experts is the most up to date information available, based on published journals, government reports and the results of field research. The knowledge provided on the ground and captured during the assessment phase and at the workshops, is vital to the process.

The species accounts are now undergoing a final review, and results from the assessments will feed into the IUCN Red List later in 2012. The type of information being generated and collated is extremely important in highlighting taxonomic groups and regions that are under particular threat. It can flag individual species that are in need of immediate conservation attention, and can bring species data together to look at overall ecosystem health.

The published assessments can be used to guide decision-making and conservation activities of governments, NGOs and the private sector in the Pacific islands region.

The Red Listing project to carry out assessments on land snails, freshwater fishes and reptiles in the Pacific region is supported by funding from the Critical Ecosystem Partnership Fund and the Fonds Pacifique.

Further information on the IUCN Red List and the assessment process can be found on the Red List website. Further details on the Pacific islands land snail project can be obtained from Helen Pippard, details below.

Helen Pippard, Species Officer, IUCN Oceania. Private Mail Bag, 5 Ma'afu Street, Suva, Fiji. Tel +679 331 9084, helen.pippard@iucn.org

Species on the Edge app is launched

Acclaimed by the US Apple Store as 'New and Noteworthy', the new Species on the Edge app is a detailed guide to 365 species from the IUCN Red List of Threatened Species. Featuring stunning photos and thought-provoking information, it allows users to learn about threatened species from around the world.

Invasive Species

The latest edition of *Aliens*, the newsletter of the IUCN Invasive Species Specialist Group is now available.

Request for information on the conservation status of intertidal wetlands

The loss of intertidal flats and associated habitats, especially mud and sand flats, in East and Southeast Asia, is one of the greatest threats facing the planet's migratory birds. A number of IUCN members have indicated their intention to submit a motion to the IUCN World Conservation Congress in 2012 on the urgent conservation needs of these intertidal flats. Consequently, IUCN has been requested to commission an independent situation analysis of relevant information about intertidal flats in East Asia to append to the motion so as to inform discussion on this issue with the relevant governments and other key stakeholders in the run up to, during, and

following the Congress. Oversight of this situation analysis is being provided by the IUCN Species Survival Commission (SSC), in partnership with IUCN's Asia Regional Office (ARO). IUCN hereby extends an invitation to all SSC members to contribute any information (either published/submitted to refereed journals, or otherwise readily accessible) on, in particular,

- size and location of remaining areas of intertidal flats and associated habitats,
- area of reclamation of intertidal flats and associated habitats, and
- intertidal flats and associated habitats at risk in the future from planned reclamation projects or other such developments.

All information provided will be appropriately acknowledged and cited.

This call has already been sent to members of the IUCN Mollusc Specialist Group in the region, but I am sure there are others that may have information or papers on this issue and I invite you to submit your information directly to Yvonne Verkuil: yvonne_verkuil@hotmail.com.

New IUCN Red List map browser: visualize and explore

The IUCN Red List of Threatened Species website has a brand new feature designed to facilitate the exploration and visualization of species distribution ranges. This new map browser allows Red List users to understand species' distributions, both terrestrial and marine, with the help of underlying imagery. Over 30,000 species maps can be explored in the browser, including all comprehensively assessed groups (such as amphibians, mammals, birds and several marine groups including corals, sharks and many others), as well as several freshwater groups. You can zoom in and out of the maps, and overlay 12 base maps that can be accessed via the basemap feature. The map browser can be accessed via the map thumbnails on individual species fact sheets on the Red List website.

IUCN thanks the MAVA Foundation for their support for this excellent enhancement to the information on the IUCN Red List website.

MEETINGS 2012-13

This is not a comprehensive list of mollusc and conservation related meetings but includes those for which people have sent me details and those that I am generally aware of without doing a thorough search.

IUCN World Conservation Congress

The Congress will take place 6-15 September 2012 in Jeju, Korea. Details are available on the Congress website.

First International Conference on African Land Snails

Snail production for sustainable development and good health, 12-15 February 2012, Institute of Food Security, Environmental Resources and Agricultural Research, University of Agriculture, Abeokuta, Ogun State, Nigeria. Contact kennyademolu@yahoo.com

Brasilian Malacology: Past, Present and Future

The Brasilian Society of Malacology (SBMa) is organizing a Symposium 'Brasilian Malacology: past, present and future' as one of the symposia of the XXIX Brasilian Congress of Zoology, which will be held 5-9 March 2012 at the Salvador Convention Center, Bahia.

The Symposium organization encompasses:

- One pre-congress course: Ecotoxicology and environmental indicators
- Four scientific sessions : Deep sea: new frontiers to molluscan knowledge; Evolution of Brasilian Malacology: from the traveling naturalists to molecular biology; Contribution of molecular biology to malacology; and Dams, hydroelectric power plants and rivers - translocations: consequences to malacological diversity and public health
- One invited plenary conference: Brasilian malacological collections: historical importance and contributions to knowledge
- Oral session for selected contributions of young researchers and students
- Poster sessions.

Dra. Sonia Barbosa dos Santos, President of the Brasilian Society of Malacology (SBMa), gundlachia@yahoo.com.br

Freshwater Mollusk Conservation Society 2012

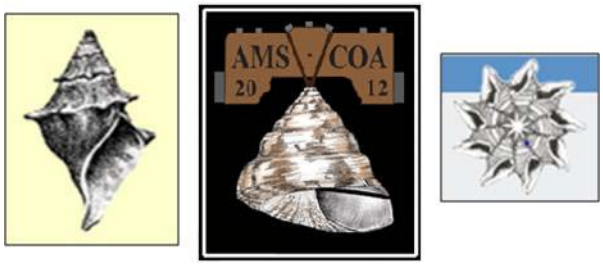
FMCS 2012 Workshop

The Freshwater Mollusk Conservation Society will host a workshop on the topic of 'Incorporating Environmental Flows, Climate Change and Ecosystem Services into Freshwater Mussel Conservation and Management' on 19-20 April 2012 at the Holiday Inn, 197 E. Broad Street, Athens, Georgia, USA. For details see the FMCS website.

International Meeting on Biology and Conservation of Freshwater Bivalves

Bragança, Portugal, 4-7 September 2012. Details at the conference website.

American Malacological Society and Conchologists of America 2012



The 78th meeting of the American Malacological Society will be held 16-21 June 2012 at the Crowne Plaza Hotel, Cherry Hill, New Jersey, USA. The meeting will overlap with the Conchologists of America's annual meeting being held 19-24 June 2012 at the same location. Check the AMS meetings webpage and the CoA conventions page for more details.

Western Society of Malacologists 2012

The 2012 WSM meeting will be held among the redwoods (and banana slugs) on the beautiful main campus of the University of California-Santa Cruz in Santa Cruz, California, USA, 24-27 June 2012.

This is an excellent opportunity to organize symposia and/or workshops on a broad range of topics in molluscan biology. A symposium on Terrestrial Gastropods is being organized by Jan Leonard and John Pearse. Invited speakers include: Thierry Backlejau, Barry Roth, Heike Reise, Bruno Baur, Mike Hadfield, Angela Fields, Timothy Pearce, Frank Anderson and John Forsyth. Those interested in organizing other symposia or doing a workshop should contact Jan Leonard as soon as possible.

Jan Leonard, Joseph M. Long Marine Laboratory
Santa Cruz, California 95060, USA. jlleonar@ucsc.edu

Pacific Islands Species Forum

IUCN Oceania, the IUCN Species Survival Commission, BirdLife International, the Pacific Islands Roundtable for Nature Conservation and the forum hosts, the Government of the Solomon Islands, have announced that the Inaugural Pacific Islands Species Forum will take place in Honiara, Solomon Islands, 25-27 April 2012. The Forum will be an opportunity for scientists, researchers, policy-makers and conservation practitioners to come together and share scientific knowledge relating to species research and conservation in the Pacific. The small island states of the Pacific are isolated, with distance proving a major barrier to the spread of knowledge and facilitation of support networks. As such, there has been a lack of consolidated approaches on species issues within the Pacific Island Countries and Territories (PICTs) and species conservation is often low on the agenda.

The Forum will provide the support needed by experts working in isolation, whilst injecting enthusiasm for people to continue working on key species conservation issues in remote locations.

XI International Congress of Medical and Applied Malacology—XI ICMAM 2012

After two consecutive congresses in Asia (Qingdao, China, 2006; Busan, Korea, 2009), the XI ICMAM will be held in Rio de Janeiro, Brasil, 25-29 September 2012, at the University of the State of Rio de Janeiro.

The congress is being organized jointly by the International Society for Medical and Applied Malacology and the Brasilian Society of Malacology, aiming to bring together students and professionals working on various aspects of mollusc biology, including basic biology, systematics and taxonomy, phylogeny and biogeography, ecology and conservation, invasion biology, parasitology, pharmacology and biotechnology, molecular biology, molluscan diseases, as well as molluscs as pests in agriculture, as bioindicators, as food, etc.
More details at the congress website.
Questions: xiicmam@gmail.com (Dra. Lenita Tallarico and Dra Gisele Introini, Secretaries)

Dra. Sonia Barbosa dos Santos – President of the Brasilian Society of Malacology sbmalacologia@yahoo.com.br
Dra. Silvana C. Thiengo – Chair of the Brasilian Committee for the XI ICMAM sthiengo@ioc.fiocruz.br
Dr. John B. Burch – Chair of the International Committee for the ICMAMs jbburch@umich.esdu

Molluscs 2012

The Malacological Society of Australasia is holding its triennial meeting to bring together scientists, naturalists, and stakeholders to focus on current molluscan research and issues at the University of Melbourne 3-6 December 2012. Further details from the Society website.

International Conference on Molluscan Shellfish Safety (ICMSS)

Ninth International Conference 'ICMSS2013 Twenty Years: Defining Future Shellfish Safety Frontiers through Innovation in Science and Policy' to be held at the Bayview Boulevard, Sydney, 17-21 March 2013. Details at the conference website or contact the conference organisers: icmss2013@iceaustralia.com

Society for Conservation Biology 2013

The SCB's International Congress for Conservation Biology, previously annual, will be biennial starting in 2011. The next Congress will be in 2013, location and date to be determined.

UPCOMING FUNDING OPPORTUNITIES FOR 2012

Most of these announcements are from Mary Seddon, chair of the Mollusc Specialist Group of the IUCN Species Survival Commission. Please direct any questions to her.

Save our Species Funds

Rapid Action Grants will continue to be accepted on an ongoing basis

Rapid Action Grants can be awarded to support projects aimed at addressing urgent and imminent threats that require targeted specific action and with high chance of generating rapid positive results. This includes actions to survey for Critically Endangered species in areas with imminent threats such as proposed dams, mines, aftermath of major climate-induced events (typhoons, earthquakes, fires) or similar activities, where we need to know the impact of events on species and then possibly to implement mitigation schemes (translocation of habitats, rebuilding habitats, managing invasive species). Grant aid is limited to US$25,000. Further calls for full projects will be made later in 2012, but we await details to know whether invertebrates will be included in this call.

How to apply

In order to apply for a grant, potential applicants need to register and submit a proposal through the SOS Online Application Tool that can be accessed through the link below. Potential applicants are invited to first read all the information available on this page in order to confirm that they are eligible for funding under SOS.

Application guidelines

The SOS working language is English. In order to facilitate the revision of the large number of proposals that are received by the Secretariat, applicants are encouraged to consult the Detailed Instructions for Applicants prior to submitting an application through the SOS Online Application Tool accessible via the link above. Projects and activities financed through the SOS grants must be carried out in World Bank client countries.

Safeguard policies

A driving principle of SOS is to prevent and mitigate any harm to people and thus to incorporate environmental and social concerns as an intrinsic part of its project cycle management as well as in that of its grantees. Environmental and social safeguards will be tracked during all stages of the project cycle with the main objective of ensuring that supported activities comply with the policies and guidelines laid out in the Operational Manual and with the World Bank's environmental and social safeguard policies. This includes confirming that measures are incorporated into the project design to prevent, minimize and mitigate potential adverse environmental and social effects of individual projects. Applicants are required to consult the Environmental and Social Management Framework and to refer to them during the preparation of their proposal.

Logical Framework

Please note that a Logical Framework for your project will need to be uploaded in the Project Summary section of your application. Please use the template provided. The SOS Secretariat is looking forward to receiving your applications.

Unitas Malacologica Student Research Awards

Awards of up to €1,000 are offered by Unitas Malacologica (UM) every year to students engaged in research projects of a malacological nature. These will generally be projects undertaken in pursuit of higher academic degrees (e.g. M.Sc. and Ph.D.). Normal budget items include consumables, small expendable equipment (non-capital items) and research related travel. The awards cannot be used to cover salaries, institutional overheads, permanent capital equipment or to support attendance at conferences (UM Travel Grants will be available to attend the congress in 2013). Only students who are fully paid-up members of UM are eligible to apply for these awards. Students will be required to provide letters of support with their applications.

The next deadline for submissions is 30 April 2012. For more details and an application form see the UM website.

Conchologists of America Grants to Malacology

Typically, grants of up to $1,500 each are given to qualified people undertaking field or laboratory research on recent or fossil molluscs, and other molluscan related projects. The deadline for applications is each year on 28 February. For more details see the Conchologists of America website.

INTERNET RESOURCES

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

Red List

The entire *IUCN Red List of Threatened Animals* can be searched at any of the following addresses, which all take you to the same website:
www.redlist.org www.redlist.net www.iucnredlist.org

IUCN Invasive Species Specialist Group

The ISSG website includes details of the Aliens-L listserver and the ISSG newsletter, *Aliens*.

CITES

CITES-L is a bulletin board restricted to trade issues for endangered species, coverd by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It is managed by 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

Unitas Malacologica

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

Mollusca list

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 without the brackets>

Alternatively, send e-mail to

Majordomo@listlink.Berkeley.Edu

And on the first line of the message:

subscribe molluscalist <your_name without the brackets>

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

MalaCo – an online journal

MalaCo (ISSN 1778-3941), a peer reviewed journal referenced by the *Zoological Record*, is an electronic open access publication. Articles, in French or English, focus on the ecology, biology, systematics and conservation of continental [European] molluscs. *MalaCo* publishes original work as well as news, short notes and practical tools for species identification.

Since November 2007, articles have become available on the *MalaCo* website as soon as they are accepted. To submit papers, please see author recommendations and contact the editorial team: J.M. Bichain, X. Cucherat, B. Fontaine, O. Gargominy and V. Prié.

The most recent articles include:

Gargominy, O. & Ripken, T.E.J. 2011. Une collection de référence pour la malacofaune terrestre de France. *MalaCo* HS 1: 1-108.

Gargominy, O., Prié, V., Bichain, J.-M., Cucherat, X. & Fontaine, B. 2011. Annotated checklist of the continental molluscs from France. *MalaCo* 7: 307-382. Extended abstract in English and text in French.

Sarr, A., Kinzelbach, R. & Diouf, M. 2011. Specific diversity and ecology of continental molluscs from the Lower Ferlo Valley (Senegal). *MalaCo* 7: 383-390. Abstract in English and text in French.

Mouthon, J. & Daufresne, M. 2011. Mollusc survey of the Ognon river (eastern France), decline of native bivalve populations (Unionidae, Sphaeriidae) between 1977 and 2007. MalaCo 7: 391-397. Abstract in English and text in French.

For more information contact Mollusc Specialist Group member jean-michel.bichain@educagri.fr

Mollia

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

Unio listserver

Unio is an unmoderated internet listserver focusing on the biology, ecology and evolution of freshwater unionid mussels. The list is sponsored by the Florida Institute of Technology and administered and managed by Rick Tankersley (rtank@fit.edu).

American Malacological Society

The homepage of the American Malacological Society carries a link to its conservation policy. Student research grants are available.

Freshwater Mollusk Conservation Society

The Freshwater Mollusk Conservation Society (FMCS) is devoted to the advocacy for, public education about, and conservation science of freshwater mollusks, North America's most imperiled fauna. Its website has an excellent page of links. The FMCS now publishes the journal *Walkerana*.

Malacological Society of Australasia

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

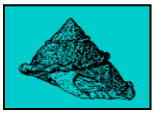
The Malacological Society of London

One of my favourite logos, *Pomacea canaliculata* by David Reid, modified from the original Malacological Society of London logo. Research and travel grants and awards are made each year.

Conchologists of America

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

Western Society of Malacologists



The WSM home page carries links to membership, conferences, grants, and other news.

The National Museum Wales – Mollusca

The Mollusca page of the National Museum of Wales provides information on the global projects on molluscs underway based in Cardiff.

Field Museum land snails

The on-line databse of Chicago's Field Museum mollusc collections contains information for over 158,000 lots (a lot is a collection of a single species taken from a single locality on a single occasion), including over 2500 type lots, of land snails.

Illinois Natural History Survey

The Illinois Natural History Survey's mollusc page has much information on the mussels of North America, with links to other mussel sites.

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.

Tropical land snail project at the Natural History Museum, London

The Tropical Land Snail Diversity site provides access to the Sri Lankan and South and South-east Asian snail projects of Fred Naggs, Dinarzarde Raheem and colleagues. There are some marvellous photos of brightly coloured snails.

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

Jamaican land snail project

A key to Jamaican land snails is now online, on the DiscoverLife website. The key, with many excellent photographs, is part of Gary Rosenberg's work on the Jamaican fauna. 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.

CLEMAM: Check List of European Marine Mollusca

The Check List of European Marine Mollusca database provides a list of taxonomic references concerning all molluscan taxa living in marine waters of Europe.

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.

Haus der Natur – Cismar

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

MUSSEL database project

The MUSSEL Project is an on-going study aimed at the global revision of the classification of the Unionoida, otherwise known as freshwater mussels. The two principle investigators, Daniel L. Graf and Kevin S. Cummings, combine their efforts to maintain an efficient malacological strike force equally capable of working in remote collection localities or urban mollusc collections. Toward this end, they are compiling an exhaustive database of all Recent described unionoid species and genera. This database will eventually serve as the basis for a universal synthesis and revision of freshwater mussel taxonomy.

Oregon/Washington, USA – Interagency Special Status/Sensitive Species Program

The Pacific Northwest Regional Office of the US Forest Service and Oregon/Washington State Office of the US Bureau of Land Management have an interagency program for the conservation and management of rare species including more than 100 molluscs. Species Fact Sheets, Conservation Assessments and survey reports are available online.

Other useful links

www.manandmollusc.net/
www.staff.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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