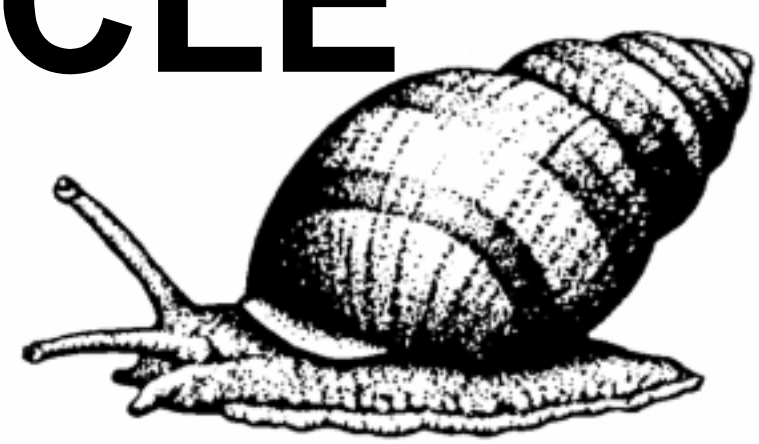
The Newsletter of the IUCN/SSC Mollusc Specialist Group
Species Survival Commission • IUCN - The World Conservation Union

TENTACLE



UNITAS MALACOLOGICA

Editorial

Some people might suggest that conservation in general and conservation of molluscs in particular are irrelevant or at least of minor importance following the dreadful events of 11 September 2001 and their consequences. However, the long-term issues of environmental protection and conservation remain fundamental to the well-being of humanity. We must continue to do everything we can in support of efforts to preserve the health and biodiversity of the ecosystems of which we are a part. I view this newsletter and the projects described within it as a contribution to those efforts.

As always, I reiterate that the content of *Tentacle* depends largely on what is submitted to me. Molluscs continue to face many conservation problems and I consider *Tentacle* a means to publicise them. To this end I make every effort to distribute *Tentacle* as widely as possible, given limited resources. Of course, it is also a free, easy way to advertise your own projects! And this and following issues will also be available on the web. So I encourage anyone with a concern about molluscs to send me an article, however short. It doesn't take long to pen a paragraph or two.

Don't wait until I put out a request for new material (usually via the MOLLUSCA listserver). Send me something now, and it will be included in the next issue. Line drawings (or in some cases high-contrast photographs with white backgrounds) are particularly welcome.

I make only very minor editorial changes to submitted articles and I accept almost everything submitted to me. Statements made in *Tentacle* therefore remain the authors' responsibilities and the balance of each issue reflects whatever I receive.

The interval between the appearance of this issue of *Tentacle* and issue 9 (July 2000) has been too long, largely because I have recently changed jobs, moving across Honolulu from the Bishop Museum to the Center for Conservation Research and Training at the University of Hawaii, and this has taken up a lot of my time over the last year. For this I apologise.

I am creating a list of e-mail addresses for all people who receive *Tentacle*, so please send me your e-mail address. I am also continuing to update the regular mailing list for *Tentacle*. If you receive this issue but some of your details are incorrect, please let me know.

Printing and mailing of this issue was supported by UNITAS MALACOLOGICA, for which the Mollusc Specialist Group is most grateful. To become a member of UNITAS, see page 2.

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

In this issue:

JOIN UNITAS MALACOLOGICA

Publishing of *Tentacle* is supported by UNITAS MALACOLOGICA, the international organization for the study of mollusks. Application forms to join UNITAS are available from the UNITAS Treasurer: Dr. J. Van Goethem, Institut royal des sciences naturelles de Belgique, Rue Vautier 29, B-1040 Bruxelles, Belgium; e-mail vangoethemj@naturalsciences.be
The current membership rate is 48 Euro (approx. US$43 or UK£30) for three years.

IUCN, SSC AND MOLLUSC SPECIALIST GROUP NEWS

All contributions from Mary Seddon

Species Survival Commission Invertebrate Scoping Workshop, 7–9 November 2001, Washington D.C., USA

Mollusc interests represented by Mary Seddon, Paul Pearce-Kelly and Justin Gerlach

Executive Summary

Invertebrates represent the vast majority of our planet's biodiversity and comprise over 95 % of all described animal species. Most of the ca. 10,000 new species discovered every year are invertebrates. In addition to their indispensable role as recyclers, pollinators, key positions on most food chains, many invertebrate groups have a vital economic, scientific and cultural value for mankind [*sic*]. Many of these organisms are responsible for creating and maintaining soil, recycling nutrients and ensuring clean water and air, for pollination of critical plants and for pest control. These ecoservices make it possible for humans (and most other life forms) to exist on earth, and they provide the foundation for economic activities that generate disposable income (agriculture, forestry, horticulture, waste disposal, tourism).

Although the majority of invertebrate species on earth remain to be scientifically described and investigated, we know that levels of endemism are exceptionally high with many thousands of species confined to small, fragmented areas. Furthermore, there are many species (across a diverse range of taxonomic groups) whose conservation status is well established. Their vulnerability is illustrated by the fact that in the *2000 IUCN Red List of Threatened Species*, 1,928 species of invertebrates were listed as threatened (29 % of all assessed species). Concerted efforts are therefore essential if we are to begin to adequately meet their conservation needs. A way needs to be found to address their current underrepresention in global conservation initiatives.

SSC is uniquely placed to enable invertebrate specialists, and the wider conservation community, to most effectively tackle the many and diverse conservation needs for these species. Recognizing this, the IUCN convened an invertebrate strategic planning workshop at the offices of Conservation International in Washington D.C. on 7-9 November 2001. The workshop was facilitated by Onnie Byers of the Conservation Breeding Specialist Group and included 12 participants from seven countries and representing seven specialist groups, SSC headquarters and the Red List and Trade programmes (see section 7). The workshop aimed to develop a strategy for enhancing IUCN's input to global invertebrate conservation through the invertebrate network of IUCN's Species Survival Commission. The outputs of the workshop will assist with increasing the role of invertebrates in biodiversity status assessments, via Red Listing, and increasing the prominence of invertebrate conservation issues within the IUCN network, and the wider conservation community.

Tasks formulated during the workshop

1. Lack of taxonomic and conservation related knowledge

Limited taxonomic, ecological and field conservation status knowledge and the current lack of utilisation of such expertise that does exists limits our ability to effectively incorporate invertebrates into conservation action.

Given our current knowledge of particular invertebrate systems that knowledge is often not effectively utilised in conservation actions and plans. This is in part due to a lack of clear action implementation definition in the action plans (who does what when etc.). What is achievable at the member level and what needs to be carried forward at the higher SSC secretariat (or higher level)?

While we recognise that morphospecies are very valuable for comparative landscape studies for conservation of ecological integrity where invertebrates are the major component, it is essential to have taxonomic verification.

Outputs

1.1. Develop linkage and collaboration with the wider invertebrate community. [SSC strategic plan objective 3]

Targets

1.1.1. Establish a broader coverage of invertebrate taxa groups through the formation of new Specialist Groups [SGs] (current gaps include arachnids, marine crustaceans, Coleoptera and Lepidoptera are not currently adequately covered). *Achieved by 2004*

1.1.2. SSC should form an Invertebrate Conservation Committee to oversee the establishment and coordination all invertebrate SG groups and related conservation activities. The speedy formation of this proposed committee is regarded as a priority action need. *Establish in 2002*

1.1.3. Develop and maintain an electronic network (ideally as a component of SIS) to best allow invertebrate workers to be identified, communicate and share key information. A small working/communication group needs to take this forward. *Initiated by 2002*

1.2. Co-ordinate taxonomic and conservation activity at individual and agency level. [SSC objectives 1 and 3]

Target

1.2.1. Specialist Group chairs and members needs to contact editors of journals that publish taxonomic descriptions and encourage them to include a Red List assessment as part of descriptions/revisions/checklists. *2002*

1.3. Generate and link reliable and accessible web-based biodiversity and status data. [SSC Objective 3]

Target

1.3.1. Ensure sufficient linkage to existing key (including specimen based) databases. This needs to be part of the function of SIS or coordinated through GBIF (Global Biodiversity Information Facility). *Initiated in 2002 and ongoing*

1.4. Influence and support relevant efforts (e.g. Global Taxonomic Initiative and GBIF) to encourage increasing current resource levels. [SSC Objective 3]

Target

1.4.1. IUCN should liaise with GBIF and other initiatives to ensure that relevant data is made available for addressing SSC's conservation objectives. Results need to be communicated to the membership. *Initiate in 2002*

1.5. Facilitate identification of priority taxa of conservation concern. [SSC objective 1]

Targets

1.5.1. The Invertebrate Conservation Committee (ICC) needs to co-ordinate efforts to target key taxa for assessing invertebrate conservation status across ecosystems. *Initiate in 2004*

1.5.2. Specialist Groups should be encouraged to produce user-

friendly specimen identification guides. Where such material already exists, the SGs need to ensure their distribution.

1.6. SSC/IUCN needs to address the fact that species protection laws can prevent specimen collecting for scientific and conservation purposes. The ability to undertake such work is essential for obtaining reliable data on species status. [SSC objectives 1 and 3].

Target

1.6.1. The Committee needs to address how this conflict can be reconciled and make appropriate recommendations to SSC. *Initiate 2002*

2. Habitat destruction

Invertebrates are being lost at a rapid rate as a result of habitat destruction and much of this loss is unseen and unknown, whether in the tropical forest, freshwater or on the ocean floor. Habitat destruction can be synergistic with alien invasives for invertebrates.

Output

2.1. Accurate assessments of invertebrate biodiversity loss relating to type and intensity of existing habitat destruction.

Target

2.1.1. Promote the implementation of accurate loss assessments (e.g. greater involvements of invertebrates in EIAs). *SSC by 2004*

2.2. Proactive baseline assessments for monitoring of invertebrates as related to trends and future potential habitat destruction.

Targets

2.2.1. Promote the use of invertebrates in geographical prioritization exercise (e.g. the use of selected taxa in global prioritization congruence activities). *SSC 2002.*

2.2.2. Development and promotion of standardized international sampling methodologies. *SGs with other agencies, start immediately. Product by 2005*

2.2.3 Review the impacts on invertebrate communities in priority habitats (e.g. caves, mangroves). *SGs by 2005*

2.3. To underscore the value that small habitat fragments can have for invertebrate conservation.

Targets

2.3.1. Collect case studies and review the value of patches and small fragments for invertebrate conservation. *SGs by 2002*

2.3.2. Prepare a summary overview of the above for public consumption (e.g. BBC Wildlife, National Geographic, etc.). *SSC in conjunction with SGs by 2002*

2.4. Assessing synergistic impacts of habitat destruction with other threatening processes as agents of local and/or global extinction.

Target

2.4.1. To highlight instances where the interplay of different impacts has resulted in exceptionally high loss of invertebrate diversity such that a discontinuity has occurred.

3. Human resource issues

The current inability to effectively identify and efficiently communicate with invertebrate specialists and access related key data is a major hindrance to progress.

Output

3.1. Enhance the current information and networking mechanism so as to fully utilise the knowledge and ability of the international invertebrate community. [SSC objective 3]

Targets

3.1.1. Establish and manage an information network capable of efficiently identifying and linking human and information resources from the wider (i.e. non SSC) invertebrate community (see 1.3.1.). *Ditto 2002*

3.1.2. SSC to create better taxonomic representation through creation of additional SGs, revitalization of existing SGs and possible modification of SGs (see 1.1.1.).

3.1.3. Better coordination of invertebrate SG activities through a dedicated steering committee (see 1.1.2.).

3.1.4. Establish the post of an invertebrate SSC officer (along the lines of the plant officer).

3.1.5. Better linkage with other interdisciplinary SGs such as the Invasive Species SG, Reintroduction SG, Veterinary SG and the Conservation Breeding SG (see 1.1.2. and 1.1.3.).

3.1.6. Initiate new regional invertebrate SGs (e.g. South Asia and Australia and Europe). Ensuring that efficient linkage exists between the regional groups and taxonomic specialist groups are essential. *Initiate 2004*

3.1.7. Improve liaison with the *ex situ* breeding community to increase species programme capacity and increase knowledge on trade issues etc. (see 1.1.3.).

3.1.8. SSC needs to develop a motivating mechanism whereby contributors to the SSC process are better rewarded (e.g. reciprocal information exchange). *Initiate 2002*

4. Invasive species

Alien invasive taxa are recognised as a prime cause of invertebrate population decline and loss.

As far as the big threat issues, such as climate change, habitat fragmentation, sustainable use and invasive species, are concerned the considerations are largely the same as the other species groups and as such invertebrates should be accorded equal conservation focus.

One invasive species problem unique to invertebrates invasive species issues carries a public perception that all invertebrates are pests. Given the high economic impact of many invertebrate invasives there is a strong case for devoting funding to addressing these issues.

Importance: Economic loss; Biodiversity loss

Output

4.1. In conjunction with the ISSG, to raise the consciousness of the problem (dealing with different perceptions and why it is important; audiences: public, managers and policy makers).

Targets

4.1.1. Raise consciousness of deliberate and accidental introductions to a wide audience. *SGs by 2002*. See 5.1.

4.1.2. Produce case studies on problems, economic impacts and biodiversity loss including examples of pests and paradoxes. *SGs by 2002*

4.1.3. Work in collaboration with ISSG to produce guidelines for assessment and monitoring of invertebrate invasive species (including the possibilities of early warning systems). *SGs by 2004*

4.1.4. Promote case studies of where invertebrate diversity has rebounded in response to management of alien invasives. *ISSG with SGs by 2002*

4.2. Enhance the representation within SSC of invertebrate issues in management of invasive species.

Targets

4.2.1. Design a programme and develop guidelines in collaboration with ISSG to illustrate the significance and management of alien invasive invertebrates and the impact of various types of alien invasive organisms on the invertebrate community. *SG by 2004*

4.2.2. Develop an early warning system for selected invertebrate taxa in collaboration with ISSG. *SG by 2004*

4.2.3. Produce case studies on problems, economic impacts and biodiversity loss including examples of pests and victims. *SG by 2002*

4.3. Facilitate better information exchange about invasive invertebrate species and their effects on other species.

Targets

4.3.1. Develop linkages between ISSG databases and others relevant. *SG by 2002.* See also 5.

4.3.2. Encourage SGs to submit information to relevant programs (e.g. GISP, ISSG). *SGs by 2002 and ongoing*

5. Lack of awareness

We recognize that awareness is a multifaceted problem with different perceptions among different human groups, whether they be researchers, policy makers, regulators, managers or the public. There is a need to portray the realistic compositional and functional value of invertebrates to all these groups.

Output

5.1. To harness information on the value of invertebrates in maintaining ecological integrity and health and to disseminate the information in popular form through print and electronic media; e.g. special issue of *World Conservation* on invertebrates. [SSC objective 3 related]

Targets

5.1.1. Highlight successful conservation and education programmes, and related activities, around the world. *Initiate 2002*

5.1.2. Promote the use of vernacular names of invertebrates in the context of public awareness raising efforts. *Initiate 2002*

5.1.3. SSC needs to incorporate invertebrates in their briefing materials as fully as possible. *Initiate 2002*

6. Pollinator loss

There is a concern that we are facing a massive pollinator crisis and loss across many ecosystems.

Output

6.1. Quantify and characterize the problem.

Targets

6.1.1. Link with International Pollinator Initiative and other organisations and institutions. *SSC and SGs by 2002*

6.1.2. Critically debate the real necessity for having a Pollinator SG. *SSC and SGs by 2002*

Interface with Social Insects SG where appropriate. SGs ongoing.

7. Climate change

We recognize that global change is a major overall threat to all invertebrates—terrestrial, freshwater, marine, across the world, and that it is interactive with other major threats including alien invasives and habitat destruction. Climate change could be beneficial to some species but detrimental to others (e.g. mountain tops and shallow marine fauna and freshwater ponds).

Output

7.1. Monitor fluxes in selected taxa across all ecosystems. Document and publicise these results. [SSC objective 1]

Targets

7.1.1. SSC invertebrate groups to liaise with the IUCN Climate Change Programme. This may include an ability to access educational and related support materials and data. *Initiate 2002*

7.1.2. The Invertebrate Conservation Committee needs to investigate how this issue might best be addressed by the respective specialist groups. This may require a dedicated workshop to discuss this issue in detail. *Initiate 2003*

7.1.3. Mobilise invertebrate networks to accrue baseline data on how global climate change is affecting biodiversity. *Initiate 2003*

7.1.4. SSC to continue and improve data-sharing between regions. *Initiate 2002*

7.1.5. Feed into global climate change fora. *Initiate 2002*

8. Exploitation and sustainable use

Certain harvested invertebrate species are not being sustainably used.

Output

8.1. Identify those species that are threatened through exploitation, e.g. pet trade, commercial and small scale harvest, bycatches, etc.

Target

8.1.1. Compile red data list of those species that are, or may be, unsustainably exploited. *SSC and SGs starting 2002, product by 2004*

8.2. Review the inappropriate use of CITES higher taxon listings where it relates to 'trade' (movement) in scientific specimens and facilitating trade where it has a conservation benefit.

Target

8.2.1. Produce a series of case studies involving appropriate SGs. *SSC with SGs by November 2002*

8.3. Review the conservation value, economic viability and enforcement implications attached to popular invertebrate farming activities.

Target

8.3.1. Produce a series of case studies in collaboration with the Sustainable Use SG and the regional invertebrate SGs. *SGs by 2004*

8.4. Review the impact of bycatches on invertebrate conservation. Identify the types of bycatch and review the implications for invertebrate conservation.

Target

8.4.1. Assessment of the impact of bycatches on invertebrate populations and communities. *SSC and SGs by 2005*

Clearly many of these cannot be achieved without a funding base, however SSC executive committee now have a clear task list to focus their income generation and see where invertebrates can be incorporated into a wider IUCN programme.

Recent IUCN publications of particular interest

Use the World Wide Web to order publications! The World Conservation Bookstore is a compilation of titles available from: CITES—Convention on International Trade in Endangered Species of Wild Fauna and Flora, IUCN—The World Conservation Union, the Ramsar Convention on Wetlands, TRAFFIC—the joint wildlife trade monitoring programme of IUCN and WWF, and UNEP—World Conservation Monitoring Centre. Additionally included are relevant titles from IUCN members or other publishers. The service covers in-print and out-of-print titles from 1948 to the present. The web site is www.iucn.org/bookstore/

Shine, C., Williams, N. & Gündling, L. 2000. *Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species*. IUCN, Gland. 138 p.

ISBN: 2-8317-0548-7. Price: UK£ 12.50; US$ 18.75. Published by the Commission on Environmental Law (IUCN, CEL) and mainly aimed at understanding legal frameworks for control of alien invasive species. Also available in French and Spanish.

Wells, S.M., Jenkins, M.D., Malleret-King, D. & King, A. (Eds.) 2001. *Conservation of coastal and marine biodiversity in the eastern African region: progress in implementation of the Jakarta Mandate*. IUCN EARO, Nairobi; UNEP. x + 61 p.

For price please contact IUCN Publications Unit.

Burgess, N.D. & Clarke, G.P. (Eds.) 2000. *Coastal forests of eastern Africa*. IUCN, Gland. xiii + 443 p., ill., maps.

ISBN: 2-8317-0436-7. Price: UK£ 35; US$ 52.50.

This book provides an overview of the status of the Coastal Forests in Kenya and Tanzania with information on their biodiversity.

SSC publications

The Species Survival Commission (SSC) Publications Catalogue (July 2001) is now available. An electronic version (MS-Word) is available at: 194.158.18.4/intranet/DocLib/Docs/IUCN1062.doc

This catalogue provides a comprehensive list of SSC publications, but may not include some of the early titles from the 1950s or 1960s that are no longer available. It provides a comprehensive list of SSC's published work and includes short summaries of all Action

Plans and Occasional Papers. Throughout the catalogue, publications are listed in chronological order with the most recent first. SSC Publications can be ordered from: IUCN Publications Services Unit, 219c Huntingdon Road, Cambridge CB3 ODL, United Kingdom; tel +44 1223 277894, fax +44 1223 277175, e-mail info@books.iucn.org, web www.iucn.org/bookstore

Some of the out of print titles may be available on CD-ROM or as photocopies. Please contact: Cécile Thiéry, Librarian, IUCN-The World Conservation Union, Rue Mauverney 28, CH-1196 Gland Switzerland; tel +41 22 999 01 35, fax +41 22 999 00 10, e-mail cet@iucn.org

SSC Marine Conservation Programme planning workshop

An SSC Marine Programme planning meeting was held 5-7 November at the offices of Conservation International in Washington D.C. Convened by the Ocean Conservancy, organised by Amie Brautigam and facilitated by Simon Stuart, the meeting brought together 26 participants representing a wide range of expertise, organisations and geographical areas. Chairs of the SSC Shark, Coral Reef Fishes, Caribbean Fish, Sirenia, Cetacean, Mollusc, and Grouper and Wrasse Specialist Groups were present. Targets and priorities in terms of marine biodiversity conservation were identified within the framework of the 2001-2010 SSC Strategic Plan. Forty targets were identified covering four issues (use and exploitation of marine resources, habitat loss and degradation, invasive species, climate change) and four tools (related to protected areas, tenurial rights, public outreach, SSC management) to be used to help meet these targets were outlined. There was strong consensus on the need for a paper explaining why and how fishing pressure can drive species to extinction. Other top priorities included: an analysis of damaging, non-selective fishing gear; an improvement of fish monitoring methods; a need to address the mariculture issue; production of a briefing on vulnerable life histories for fisheries; closer working relations with the SSC Invasive Species Specialist Group; addressing threats to spawning aggregation; compilation of case studies on non-consumptive uses of live marine resources; and identification and assessment of marine 'hotspots'. A meeting report will be produced by The Ocean Conservancy soon.

New IUCN/SSC specialist groups—Salmon Specialist Group

Those of you who work on mussel species that require salmonids in their life cycle may be interested to know of the new IUCN/SSC Salmon Specialist Group (SSG). This group will work towards conservation of native stocks of salmonid fish that are at risk of extinction throughout much of their ranges in both the northern Pacific and northern Atlantic oceans. Despite broad support for salmon protection and recovery, there is no international forum dedicated to salmon science, monitoring and conservation. The SSG will initially focus on the native range of Pacific salmon, including the United States, Canada, Russia, Japan, China and Korea. Activities will include the creation of a network of salmon scientists and managers, joint publication of a report on the status and threats to anadromous salmonid fish (those that spend most of their lives at sea but migrate to freshwater to spawn) along the Northern Pacific Rim, and publication of a conservation strategy and action plan for Russian steelhead (*Oncorhynchus*/*Parasalmo mykiss*). In the long term, the group will assess the status of salmonid fish for the *IUCN Red List of Threatened Species*; contribute information to the Species Information Service (SIS); and provide expertise on the unique needs of anadromous fish to an overall assessment of freshwater biodiversity decline. Group Chair is Guido Rahr, President of the Wild Salmon Center, The Natural Capital Center, 721 NW Ninth Ave., Suite 290, Portland, Oregon 97209, USA; tel +1 503 222 1804, fax +1 503 2221805, e-mail grahr@wildsalmoncenter.org, web www.wildsalmoncenter.org

Launch of *The Red Book*

The Red Book: The Extinction Crisis Face to Face, produced by IUCN/SSC in partnership with Cemex, one of the world's largest cement companies, and Agrupación Sierra Madre, a Mexican conservation organisation, is a dramatic new tool to communicate the issues surrounding extinction and conservation to broad audiences. Drawing on the IUCN *Red List of Threatened Species*, *The Red Book* combines awe-inspiring imagery with solid science and factual accounts. More than 100 stunning photographs from some of the most renowned photographers reflect the extraordinary beauty and diversity of the natural world. The launch of the book, took place at the Canadian Museum of Nature in Ottawa on 3 December 2001.

The book does mention molluscs and there is a brief illustrated account of the demise of freshwater molluscs in the USA. Each copy sold by IUCN will provide income for research on endangered species. Details can be found on the IUCN web-site: www.iucn.org

IUCN input to CITES criteria review

IUCN has submitted comments, coordinated by the IUCN/SSC Wildlife Trade Programme on the review of the CITES Listing Criteria, that will be considered by the chairs of the CITES Animals and Plants Committees in compiling their report to the Standing Committee. The Standing Committee will then prepare a draft resolution for consideration by the Parties at the 12th Conference of the Parties in Chile (COP12). There will be another opportunity for the wider IUCN network to comment during preparation of the IUCN Statement to the Parties for COP12.

CITES: A Conservation Tool—updated edition available

The IUCN/SSC Wildlife Trade Programme has completed the seventh edition of *CITES: A Conservation Tool, a guide to amending the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora*. This publication guides the CITES Parties through the Convention's articles and resolutions. It covers the process for the submission, presentation, and adoption of proposals to amend the Appendices for the 12th CITES Meeting of the Conference of the Parties (COP12). This takes place 3-15 November 2002 in Chile. As well as in booklet form, the seventh edition has been produced on CD for the first time. Both CDs and booklets have been distributed to CITES Parties in time for their preparations for COP12. The guide is available in pdf version in English, French and Spanish via the IUCN/SSC Wildlife Trade Programme web page: www.iucn.org/themes/ssc/programs/trade.htm

New Deputy Coordinator for IUCN's Species Programme

Dr. Jean-Christophe Vié is the new Deputy Coordinator of the IUCN Species Programme. Jean-Christophe is French, a qualified veterinarian, and has a PhD in evolutionary biology and ecology. He has worked for IUCN as the Programme Coordinator of the Guinea-Bissau office and his broad-ranging expertise includes coastal planning, protected area management, and translocation of species. Jean-Christophe's experience includes the directorship of an NGO dedicated to the study and conservation of Guianan wildlife. His career has also taken him to Saudi Arabia, Gabon and the USA and he speaks French, English and Portuguese. Jean-Christophe will be responsible for general operations and management of the Species Programme and network support. He will also take over the role of the Molluscan point of contact at SSC from Mariano Gimenez-Dixon. Thank you Mariano, for mananging to keep up with such a diverse faunal group! Welcome, Jean-Christophe! He already has pictures of snails from his time in West Africa!

A call for information on the effects of climate change on species and ecosystems

As part of the IUCN global strategy on climate change, Brett Orlando, the Union's climate change focal point, is interested to learn more about the work of SSC Specialist Groups, and to link SSC experts into an IUCN-lead effort to assess the impact of climate change on species and ecosystems. SSC experts are invited to contribute to information and expertise for: 1) an atlas of climate envelopes for species and ecosystems to determine the threat posed by climate change; and 2) a monitoring protocol for climate change. A global workshop to review these two products is planned for 2002. There are molluscan cases where climate change has impacted their distributions. If you have interests in being involved in this programme please pass relevant information and contacts to: brett.orlando@iucn.org

Major upgrade of *Red List* website

The *Red List* website—www.redlist.org—has undergone a major upgrade and has been moved to an Oracle database platform, housed at Natural Resources Canada, and is now more stable with a much faster search engine. Users can now search on a wider range of common names, which will help the general public use the site more easily. Many glitches in the data have been ironed out, there is a new page providing links to other organizations conducting work on species conservation, and the help menu has been significantly improved.

New criteria and categories came into effect on 1 January 2001. Most molluscs assessed under A or B will have to change their evaluations in accordance with the new criteria. Full documentation is now required of the species listed. Details of these can be found on the IUCN *Red List* web-site.

Please submit new assessments, corrections or new documentation for the 2003 *Red List of Threatened Species*, deadline is 31st August 2002, to Craig Hilton Taylor (IUCN Red List Officer).

Version 2.0 of RAMAS Red List software available

Version 2.0 of the RAMAS® software used for assessing the conservation status of species for possible inclusion in the *IUCN Red List of Threatened Species*, is now available. The software incorporates the revised *Red List* Categories. To purchase a copy, please contact Isabelle Weber, IUCN/SSC, Rue Mauverney 28, Gland, CH-1196 Switzerland; fax +41 22 9990015, e-mail isc@iucn.org; or Applied Biomathematics, 100 North Country Road, Setauket, NY 11733, USA; fax: +1 516 751 3435. Single-user and site-licensed copies of the software are priced US$295 and US$445 respectively.

New Freshwater Biodiversity Assessment Officer for Species Programme

William Darwall has been appointed the new Species Programme Freshwater Biodiversity Assessment Officer. William has a MSc degree in fish ecology/evolutionary biology and, since 1998, has been working on a PhD on community ecology of the demersal (bottom-dwelling) fish assemblage in Lake Malawi and its response to fishery exploitation. He has spent the last five years at Lake Malawi and Lake Tanganyika working as a Fisheries Ecologist and Biodiversity Survey Planner and Trainer respectively. Before that he spent five years working on marine conservation issues. William is based at the IUCN/SSC office in Cambridge, UK, starting in January 2002. This position will help implement a freshwater biodiversity assessment which is part of an IUCN/SSC global project and the IUCN Water and Nature Initiative.

Revised Red List criteria

The new improved categories and criteria used for listing plants and animals on the *IUCN Red List of Threatened Species* are now available after a four-year review, called for by IUCN members. The review, coordinated by SSC, involving broad consultation with users and organizations from around the world, has produced a clearer, more open, and easy-to-use system for assessing species. With particular attention paid to marine species, harvested species, and population fluctuations, the review has refined the effectiveness of the *Red List* categories and criteria as indicators of extinction risk. More details at www.iucn.org/themes/ssc/redlists/RLcategories2000.html

THE MOLLUSC SPECIALIST GROUP AND THE SOUTHERN AFRICAN INVERTEBRATES SPECIALIST GROUP – A NEW SYNERGY

by Dai Herbert

For the most part, IUCN specialist groups have been taxon-based. However, recent thinking has put the concept of region-based groups on the table. One such group that has now come into being is the Southern African Invertebrates Specialist Group (SAISG), which held its inaugural meeting in Pietermaritzburg in July 2001. Some concern has been expressed that these regional groups may in fact duplicate some of the activities of taxon-based groups where there is overlap with existing SGs, or worse still compete with them. A possible example of this exists in the case of the Mollusc Specialist Group (MSG) and the SAISG.

While I do not wish to detract from the importance of taxon-based SGs, they are, in reality, rather fragmented entities with members dotted around the globe and not able to meet on a regular basis. Furthermore, although the members may share common interests in the taxon concerned and have similar goals in terms of its conservation, they may in fact be operating under widely differing regional/national paradigms. Indeed, in many respects SG members from one region working on different taxa may have a lot more in common with their regional colleagues belonging to other SGs than might at first be apparent. Shared issues may for example include (in no particular order):-

- inadequate institutional support for biodiversity research (invertebrate research in particular)
- declining human capacity within the fundamental biodiversity research sector
- socially/politically biased research funding policy
- insufficient collaboration between the research and conservation sectors
- profit orientated priorities of tourism-based conservation planning
- lack of awareness of the importance of biodiversity conservation amongst politicians
- low profile of invertebrate conservation
- sites of high diversity/endemism not identified and often not included in current protected area networks
- lack of regional co-ordination so as to facilitate joint funding proposals and larger-scale collaborative projects (e.g. atlassing and red-listing)
- high costs of operating as solo researchers

Issues such as these are likely to have a profound effect on the rate at which our knowledge and understanding of biodiversity grows and on our ability to meet IUCN and Species Survival Commission objectives. This is particularly true for the 'other 99%', with which both the MSG and SAISG are concerned.

Although there may be global trends regarding such issues, much of the related decision making is done at a national level and thus remedial action is best targeted at that level. Trying to address this as individual members of taxon-based SGs is difficult, if not impossible. On the other hand, collectively, members of a region-based group stand a far better chance of making their concerns heard. By speaking with a more unified voice on issues of broader application and concern, we will hopefully make a much bigger impact. With members based in relatively close proximity to each other, we should also be able to meet as a group more regularly. The SAISG promises to add a new dimension to the growing interest in invertebrate research in southern Africa, and invertebrate conservation is likely to benefit considerably through the focus and leadership provided by the group.

In terms of conflict with or duplication of the activities of the MSG, I have no concerns whatsoever. All issues specifically pertaining to molluscs will remain the responsibility of the MSG and will be chanelled through it, e.g. evaluation of submissions for red-listing of southern African molluscs. I believe that the SAISG will be of considerable assistance to the MSG, through its enhanced ability to address many of the issues that are currently impacting negatively on our capacity to identify molluscan conservation priorities in the southern African region.

There are precious few committed invertebrate conservationists around and we need to capitalise on the synergy of collaboration. If we team up we may have sufficient critical mass to achieve substantially more in the local context than any of us could do individually. At the same time a number of groups not represented by SGs will also be brought into the fold. It matters not whether one is specifically interested in dragonflies, millipedes, molluscs or whatever else, the fact is that many of our problems are shared and we need to address them collectively.

Dai Herbert, SAISG (vice-chair), contact details in the list of Mollusc Specialist Group members at the end of this issue of *Tentacle*.

MOLLUSCAN CONSERVATION AND BIODIVERSITY SYMPOSIUM

A symposium on molluscan conservation and biodiversity was held at the World Congress of Malacology (WCM) in Vienna in August 2001. It was organized by Ian Killeen and Mary Seddon and the plan is to publish the contributions as a special issue of the *Journal of Conchology*. The presentations of some of the participants were supported by UNITAS MALACOLOGICA. The following presentations were made:

Winston F. Ponder. The research vs. conservation dilemma – how much data do we need for adequate management?

Robert A.D. Cameron. Constructing species/area curves for continental areas: some British examples.

Philippe Bouchet and the Montrouzier Expedition Party. The magnitude of molluscan species richness in the tropical Indo-Pacific: results from a massive collecting effort at New Caledonia sites.

Robert H. Cowie. Disappearing snails and alien invasions: the biodiversity/conservation interface in the Pacific.

Richard J. Neves. Propagation of endangered freshwater mollusks in North America.

Joseph Heller. The use of modern GIS mapping techniques in assessing biodiversity.

Thierry Backeljau. Genetic and phylogenetic data in molluscan conservation.

Peter Tattersfield, Mary B. Seddon, Dai G. Herbert, Charles Warui, Charles N. Lange & Christine Meena. Biogeographical and biodiversity patterns of land-snails in East and South African forests.

Anton J. de Winter. Land snail species diversity among three rainforest sites in southern Cameroon.

Timothy A. Pearce. Distribution of land gastropods on the Delmarva Peninsula, eastern USA: conservation implications.

Menno Schilthuizen. The evolution of highly endemic, highly derived micro-prosobranchs on isolated limestone hills in Borneo.

Eike Neubert. *Placostylus* revisited – unravelling the puzzle of the big bulimes of New Caledonia.

Gary Rosenberg & Igor V. Muratov. Status report on the terrestrial mollusks of Jamaica.

Ted von Proschwitz. Land snails in calacareous fens in the province of Östergötland (E. Sweden) with some remarks on threats and conservation.

Gerhard Falkner. The genus *Limax* in Corsica: an unexpected diversity and its threats (Gastropoda, Limacidae).

James B. Layzer. Propagation and culture of Unionidae in fish hatcheries.

David C. Aldridge. Conservation of unionid mussels in Britain.

Ioan Sîrbu. Human impact effects on the freshwater mollusc fauna from Transylvania and Banat (Romania).

Ilmari Valovirta. *Margaritifera* river quality.

Mudite Rudzite. Threats to populations of the freshwater pearl mussel, *Margaritifera margaritifera* L., and their conservation strategy in Latvia.

Evelyn A. Moorkens & Mark J. Costello. Survival of the freshwater pearl mussel *Margaritifera margaritifera* after opening with mussel tongs.

Helena Fortunato, J.B.C. Jackson, Jonathan A. Todd, M. Alvarez, A. Heitz, K. Johnson & P. Jung. Molluscan diversity in tropical American oceans: an overview.

Terrence Gosliner. Biodiversity, endemism and evolution of opisthobranch gastropods on Indo-Pacific coral reefs.

Kathe R. Jensen. Bivalve diversity in the Gulf of Thailand: comparing data from 1880-1900 with data from 1960-2001.

James B. Wood. Cephbase II – a new tool for quantifying, cataloging and investigating cephalopod biodiversity.

Gustavo Darrigran & Guido Pastorino. Distribution of the golden mussel *Limnoperna fortunei* (Dunker, 1857), after 10 years of American invasion.

Christopher D. McQuaid. Human exploitation of the intertidal mussel *Perna perna*; implications of mussel biology.

Abstracts of these and all other presentations at the WCM in Vienna are available on the congress website: www.univie.ac.at/WCM2001/

INTERNET RESOURCES: LISTS AND WEBSITES

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

Mollusca

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

listproc@ucmp1.berkeley.edu

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

sub mollusca <your_name>

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

California Museum of Paleontology, Berkeley, USA.

Mollia

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

UNEP World Conservation Monitoring Centre/Red List

Much information on the organizations' activities, and the entire Red List of Threatened Animals, which can be searched.
www.unep-wcmc.org/
www.redlist.org/

CITES

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

Unionids

UNIO is an unmoderated listserver focusing on the biology, ecology and evolution of freshwater unionid mussels. Details are given at the UNIO website: winnie.fit.edu/~rtankers/unio.html
The primary objectives of the list are (1) to foster communication and collaboration among scientists, researchers, and students engaged in mussel-related activities and (2) to facilitate the informal discussion of regional and federal research priorities. Postings related to mussel conservation issues, including the artificial propagation and captive rearing of threatened and endangered species, are especially welcomed. Subscribers are also encouraged to use the list for posting information on mussel-related meetings, symposia, workshops, and funding opportunities. The list is sponsored by the Florida Institute of Technology and administered and managed by Rick Tankersley (rtank@fit.edu) to whom any questions regarding the list, including problems while attempting to subscribe or post messages, should be addressed. There are no limitations on who may subscribe to the list and the subscription is free.

North American mussels

The US National Park Service has added a considerable amount of information on unionids to their web site.
www.nature.nps.gov/wrd/mussels/TOC.htm

Freshwater Mollusk Conservation Society

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

Illinois Natural History Survey

This site has much information on the mussels of North America, with links to other mussel sites.
www.inhs.uiuc.edu/cbd/collections/mollusk.html

Samoan Snail Project

The Samoan Snail Project has as its goals assessing the diversity and historical decline of the native Samoan non-marine snail fauna, as a first step in its conservation.
www2.bishopmuseum.org/PBS/samoasnail

Hawaii Biological Survey

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

Field Museum Land Snails

Information for 140,000 lots (a lot is a collection of a single species taken from a single locality on a single occasion) of pulmonates in the Field Museum collections is now accessible on the web at fm1.fieldmuseum.org/collections/search.cgi?dest=inverts

Malacological Society of Australasia

www.amonline.net.au/malsoc/

American Malacological Society

The homepage of the AMS carries a link to the Society's conservation policy.
erato.acnatsci.org:80/ams/

The Malacological Society of London

www.sunderland.ac.uk/MalacSoc

Links

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

Invasive Species Specialist Group

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

MEETINGS 2002-2004

3rd BioNET-INTERNATIONAL Global Taxonomy Workshop—2002

Theme: 'Towards Sustainable Development: Partnerships for Building Demand-driven Taxonomic Capacity'

The 3rd Global Taxonomy Workshop (3rd GTW), to be held 8-12 July 2002 in Pretoria, South Africa, will focus on plotting a way forward by bringing all stakeholders together, including the end users of taxonomic outputs, the technology providers and the organisations that support national development programmes to underpin the eradication of poverty, sustainable agricultural development, sustainable use and conservation of biodiversity, and ultimately, sustainable development! The best way to achieve this is to form partnerships between the different players, and BioNET-INTERNATIONAL has an important facilitating role to play in this. The aim is to build a real 'global' network of collaborating partners dedicated to providing sustainable, locally-owned, cost-effective and

priority-driven responses to overcoming the Taxonomic Impediment to sustainable development and biodiversity conservation. Very importantly, the 3rd GTW will seek to mobilise partnerships amongst relevant stakeholders in support of implementation of the proposed Programme of Work of the CBD's Global Taxonomy Initiative. For information about the organisation, to register for their monthly newsletter or to register an interest in this meeting, see: www.bionet-intl.org/

V Congreso Latinoamericano de Malacología—2002

The fifth Latin American Congress of Malacology (VCLAMA) will take place 30 June - 4 July 2002 in São Paulo, Brasil. For more information, conatact Dra. Toshie Kawano, Instituto Butantan, Laboratório de Parasitologia, Avenida Doutor Vital Brasil, 1.500 CEP. 05503-900 - São Paulo, Brasil; tel + 55 11 3726 7222, fax +55 11 3726 1505, e-mail tkwano@usp.br. For information in English, contact Dr. Roberto Cipriani, e-mail rcipri@usb.ve

Western Society of Malacologists (USA)—2002

The 35th annual meeting of the WSM will be held July 20-24 2002 at the Asilomar Conference Center on the Monterey Peninsula, California, USA. For more information, contact Nan Franceschini, Department of Biological Sciences, California State University, Hayward, California 94542, USA; tel +1 510 885 3471, e-mail nfrances@csuhayward.edu; or contact Cynthia Trowbridge, e-mail trowbric@ucs.orst.edu

American Malacological Society—2002

The 68th annual meeting of the AMS will take place 3-7 August 2002 in Charleston, South Carolina, USA. Check the AMS website (see above). Or for more information, contact Robert T. Dillon, Department of Biology, College of Charleston, Charleston, South Carolina 29424, USA; tel +1 843 953 8087, fax +1 843 953 5453, e-mail DillonR@cofc.edu

World Congress of Malacology—2004

The next WCM will be held in Perth, Australia, in July 2004. For more information, contact Fred Wells; e-mail wellsf@museum.wa.gov.au

NEWS

Newcomb's Snail (*Erinna newcombi*)

From *Endangered Species Bulletin* 25(1-2): 25

A small freshwater mollusk, Newcomb's snail is found only in remote waterfalls, seeps, and springs of six stream systems on the Hawaiian island of Kaua'i. The [US Fish and Wildlife] Service listed Newcomb's snail on January 26 [2000] as a threatened species primarily because of predation by a variety of non-native species, including fish, snails, frogs, and flies. Other threats include water development projects that could affect the spring habitats upon which this species depends.

New editor and publisher for *Molluscan Research*

Winston Ponder has recently taken on the editorship of the journal *Molluscan Research* and draws your attention to the journal's entirely new publishing strategy.

From 2002, *Molluscan Research* will be published by CSIRO Publishing, Melbourne, Australia, who currently publish 18 other journals. Previously *MR* published only one issue a year but there will now be three a year, one of which may be a monograph. Once the first issue is published in the first quarter of 2002, online copy will be available to subscribers through the CSIRO's website: http://www.publish.csiro.au/journals/. Individual papers can also be purchased online.

The journal's papers will be covered in *Current Contents* and *Biosis* (as well as *Zoological Record*). Abstracts for recent issues are available online on the Malacological Society of Australasia (MSA) website (see above—internet resources).

Papers on all aspects of molluscs can be submitted, including systematics, diversity, biology, ecology, physiology, morphology, conservation and behaviour, as well as book reviews. Short 'research notes' can also be submitted. We will accept papers dealing with molluscs from any part of the world, but our emphasis will be with the Indo-west Pacific, including SE Asia, and Australasian regions. All papers will be reviewed by at least two reviewers and authors will be encouraged to submit fully electronic final copy. Instructions to authors are currently available on the MSA website. Enquires and manuscripts should be sent to:
Dr. W. F. Ponder, Managing Editor, Molluscan Research, Australian Museum, 6 College Street, Sydney, NSW 2010, Australia; e-mail winstonp@austmus.gov.au, tel +61 2 9320 6120, fax +61 2 9320 6050.

Subscriptions: Institutional—Australian AU$100, non-Australian US$75 (contact sales@publish.csiro.au). This subscription includes online access and print copy. A 10 % reduction applies to online access only.

Members of the Malacological Society of Australasia get the print version of the journal free. Membership is AU$70 (Australasia, SE Asia and western Pacific), or AU$100 (rest of world). Application details from chrisann@swavley.com.au or on the MSA website.

Back issues of the journal are available from Capricornia Publications www.booksofnature.com/cgi-bin/web_store.cgi

New editorial staff for *American Malacological Bulletin*

The *American Malacological Bulletin* has a new Editor-in-chief, Dr. Janice Voltzow. Manuscripts should be sent to her at the Department of Biology, University of Scranton, Scranton, Pennsylvania 18510-4625, USA. The new Managing Editor of the journal is Angel Valdes, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, CA, 90007, USA.

FRESHWATER BIVALVES IN NORTH AMERICA

Burrowing bivalves – new publication

Vaughn, C.C. & Hakenkamp, C.C. 2001. The functional role of burrowing bivalves in freshwater ecosystems. *Freshwater Biology* 46 (11): 1431-1446.

Vaughn and Hakenkamp note that freshwater systems are losing biodiversity at a rapid rate, yet we know little about the functional role of most of this biodiversity. The ecosystem roles of freshwater burrowing bivalves have been particularly understudied. In this paper they summarize what is known about the functional role of burrowing bivalves in the orders Unionoidea and Veneroidea in lakes and streams globally. The authors conclude that in North America, native burrowing bivalves (Unionidae) are declining at a catastrophic rate. They believe this significant loss of benthic biomass, coupled with the invasion of an exotic burrowing bivalve (*Corbicula fluminea*), may result in large alterations of ecosystem processes and functions.

Money for mussel conservation

From *Oryx* 34(4): 251 [see also *TRAFFIC North America* 3(1): 5-6]

In February 2000, the US Fish and Wildlife Service and National Fish and Wildlife Foundation announced that more than $260,000 in grants had been awarded to support the recovery and protection of the nation's endangered freshwater mussels. The Foundation manages the Freshwater Mussel Conservation Fund and these grants represent the first instalment of a $1 million restitution payment from a Japanese-owned business, Tennessee Shell Company, that had been investigated for illegal mussel trafficking. US mussels are valued in the cultured pearl industry, particularly the larger and thicker shelled animals from the South and Midwest. The Tennessee Shell Company pleaded guilty to buying and exporting mussels taken illegally from rivers in Michigan, Ohio, Kentucky and West Virginia.

Clams threatened by water extraction

From *Oryx* 35(3): 190 [see also *Marine Pollution Bulletin* 42(3): 168]

Colorado Delta clams *Mulinia colouradoensis* are threatened with extinction as a result of water extraction in Mexico's Colorado River Delta. This species was once the most common at the mouth of the Colorado, but fewer than 30 live clams have been collected since 1992. Since the 1930s there have been gradual changes in the salinity of water in the delata. The Colorado River once delivered all of its fresh water to its delta in the northern Gulf of California. The river is now dry before it gets to the delta as a result of near complete diversion of river water for irrigation and domestic use in the US and Mexico. Reductions in shellfish also have a knock-on effect on bird populations.

Unionids rescued in Pool 8, Mississippi River, La Crosse, Wisconsin, USA

by Marian E. Havlik

After several years of planning, the St. Paul (Minnesota) Corps of Engineers and the Wisconsin Department of Natural Resources conducted a drawdown of 45 cm [1.5 ft] in Pool 8 of the Upper Mississippi River, La Crosse, Wisconsin. Follow-up was to include vegetation monitoring, etc., but there were no agency provisions for returning stranded unionid mussels to deeper water. Prolonged spring 2001 high water (near record flood) complicated the drawdown, but the intentional lowering of water levels began 18 June 2001, at an intended rate of 6 cm/day [0.2 ft/day]. The amount of water level reduction took into account the effect on the commercial navigation channel.

By 10 July 2001, stump fields, sand bars, and mud flats were very visible upstream of Lock and Dam (L & D) 8. The Mississippi River Revival (Winona, Minnesota) sponsored a unionid mussel rescue on 14 July 2001. Forty volunteers spent 5 hours rescuing mussels stranded in shallow water, within a 0.4 km [0.25 mile] radius of a single backwater location at Mississippi River Mile 690.8.

Because of the lack of funding the mussel rescue was not meant to be a research project. However, 5320 unionids (21 species) were collected by wading in water <0.3 m deep, or from exposed sand bars and mud flats. Unionids were grossly cleaned of *Dreissena polymorpha* by volunteers, and identified and counted by myself. Mussels were returned to deeper water from the surface. Two female *Lampsilis higginsii* (Lea, 1857) (federally listed as endangered) and two *Arcidens confragosus* (Say 1829) (listed by the states of Wisconsin and Minnesota as threatened) were found, along with juveniles of most other species.

No attempt was made to quantify the *Dreissena polymorpha* on each unionid. There were up to 100 *D. polymorpha* on some mussels, but there were far fewer than are usually found on unionids closer to the commercial navigation channel.

State and federal agency personnel also rescued several thousand mussels post-flood, in Pools 3, 5, 6, 7 and 8, for a total of over 7700 mussels. But most agency efforts were on monitoring vegetation. The drawdown was done to reclaim "thousands of acres of backwater wetlands, and will last until mid-September 2001. Before the L & D system was established, river levels would fluctuate several feet each season. The dams have forced the Mississippi River to be maintained at unnaturally high levels, not allowing riverbank soils to dry out so wetland plants germinate. The drawdown will be as significant for the health of the river as a flood. Barge traffic will not be affected because of the Corps' extensive dredging to maintain a navigation channel."

"Pool 8 was chosen because ... this large expanse of open water is habitat for plants in marginal condition, so the reduction of water levels should noticeably improve plant quality. ... Close to L & D 7... the water level change will hardly be detectable. Further down river ... the 1.5' [45 cm] drop will be more obvious because the water is more shallow. It is hoped that this new management practice will be the first of many drawdowns to bring the river's wetlands back to life" (Rivertime, Summer 2001, News from Mississippi River Revival, Winona, Minnesota: cleanriver.org).

"The main control point is at L & D 8 where water levels were reduced 18" [45 cm]". The second (control) point is at the La Crosse Gage where the maximum reduction will be 6" [15 cm] or a 4.2' [1.3 m] reading ... 2 control points will help ensure minimal inconvenience for both barges and recreational use" (*Water Level Management Update* 4(2), May 24, 2001).

The public should be educated to rescue mussels in shallow water, remove visible zebra mussels, dispose of zebra mussels in areas where they will die, and then return native mussels to thigh-deep water. Many unionids were stranded and died, both in Pool 8 as well as in other areas of the Upper Mississippi, mostly because of prolonged spring high water levels, but also because of the effects of the drawdown. Unionids moved into shallower water during the flood, and were not able to return to deeper water fast enough as water levels receded faster than planned.

Mussel rescue costs must be built into any future experimental drawdowns.

Marian E. Havlik, Malacological Consultants, 1603 Mississippi Street, La Crosse, Wisconsin 54601-4969, USA; e-mail havlikme@aol.com

Native unionid mussels in small river systems not spared of negative impacts of zebra mussel introductions in Canada

by André Martel

The recent completion of a long-term study on the conservation of native freshwater mussels (Unionidae) in Eastern Canada has shown that small river systems are highly vulnerable to the introduction of the non-indigenous zebra mussel, *Dreissena polymorpha*. Our long-term study assessed the impact of the *D. polymorpha* invasion on unionids of the Rideau River (recently designated 'Canadian Heritage River'), a small (100-km) river system in eastern Ontario, during an 8-year period (1993-2000). We focused our efforts on a 30-km downstream impounded section of the river before, during and after rapid population growth of *D. polymorpha* in the area. The decline of unionids was dramatic. In 1993-1994, three unionid taxa were commonly found in the samples: *Elliptio complanata*, *Pyganodon grandis* and *Lampsilis radiata*. The mean density of unionids declined 5 to 8 fold from 1993 to 1997, coinciding with a rapid increase in *D. polymorpha* densities on unionids. By 2000, i.e. 7 years after the invasion began, all three unionid taxa had been

essentially extirpated from the 30-km section of the river, with only one live individual (*Elliptio complanata*) collected during 10 extensive diving surveys (total estimated riverbed surveyed at that time: 4000 m^2). Our study reveals that the introduction of *D. polymorpha* in a small river system where limnological conditions are favorable to this exotic pest mollusc can cause the complete extirpation of all unionids in a 6-7 year period. There is fear that as *D. polymorpha* abundance keeps increasing at upstream locations the richest unionid communities of the Rideau River (9 taxa) could be imperiled. To conserve unionids as well as the integrity of aquatic ecosystems in Canada and elsewhere in North America we believe it is worth every effort to keep this pest mollusc from being introduced in new river or lake systems.

André L. Martel, Research and Collections, Malacology Section, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ontario, Canada, K1P 6P4; tel +1 613 364 4061, fax. +1 613 364 4027, e-mail amartel@mus-nature.ca

Propagation facility exceeds quarter-million mark

by Dick Neves

The freshwater mussel propagation facility at Virginia Tech in Blacksburg, Virginia has now produced, cultured, and released 260,000 endangered juvenile mussels into the upper Tennessee River basin in Tennessee and Virginia, USA. The facility began releasing cultured juveniles in 1998, to include 9 federally endangered species in the Clinch, Powell, and Hiwassee rivers in eastern Tennessee and southwest Virginia. In 1999, Dick Neves received a grant from the National Fish and Wildlife Foundation and matching non-federal grants from The Nature Conservancy, Virginia Tech, and other organizations to design, construct, and operate a new propagation facility to expand propagation efforts. This facility will become operational in 2002.

With 70 federally endangered mussel species in the eastern US, the need is great but the workers are few. The Freshwater Mollusk Conservation Society will convene a workshop in spring 2002 on Freshwater Mollusk Propagation, to be held at the National Conservation Training Center in Shepherdstown, West Virginia. Mussel biologists from other countries are encouraged to attend this 2-day presentation and training session.

Richard J. Neves, Virginia Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife Sciences, Virginai Tech, Blacksburg, Virginia 24061-0321, USA; e-mail mussel@vt.edu

CONSERVATION OF FRESHWATER BIVALVES IN THE EBRO RIVER

by Cristian R. Altaba

The Ebro is the largest river in Iberia and still harbors a rich fauna typical of pristine large rivers. In its lower reaches, in Catalonia, it retains much of the original riverbed and dynamics, together with prime underwater and riparian habitats. This is the last stronghold of the giant pearlmussel, *Margaritifera auricularia*, once thought extinct and rediscovered here in 1985. In recent years a project financed by the Spanish Ministry of the Environment made it possible to determine that its habitat is fast-flowing reaches with large cobbles, and that its host fish is the river blenny, an endangered species sharing the same habitat. We have also learned that it has an extreme longevity (probably over 150 years), that recruitment is actively taking place in nature, and that it survives as a fragmented population that is viable but fairly small (ca. 2000 individuals).

In 1997 the Asiatic clam, *Corbicula fluminea*, previously known to have entered most other basins in Spain and Portugal, was located in the Ebro delta. No enforced measures were taken to halt this biological invasion when it was still limited to a single irrigation canal. Since then, its spread has been very fast, undoubtedly helped by line fishermen who carry it as cheap bait. Its effects are still unclear, yet its density probably poses a threat for unionoids living in calm to moderately flowing waters.

In July 2001 the zebra mussel, *Dreissena polymorpha*, was found to occur along a 70-km stretch, with peak densities nearing 3000 individuals m^{-2}. During intensive field work in previous years it had not been detected. The only previous citation of this species in Iberia dated from 1983, when very young specimens were found in the Llobregat river (a disastrous flood a few months later eradicated the tiny mussels). The origin of the new focus appears to be in the Ribaroja reservoir just upstream, where central European sports fishermen have repeatedly and illegally introduced several predatory fish that threaten the native species. Indeed, downstream from the dam both maximum density and the proportion of young specimens exhibit a steady decline, pointing to an active spread from a very recent focus.

The future of the native freshwater bivalves in the Ebro is unclear. In the case of *Corbicula fluminea*, there is evidence that it coexisted with *Margaritifera auricularia* during previous interglacials in Italy. However, it has never lived together with *Dreissena* spp., a biological type previously unknown in Iberian freshwaters. Moreover, the Spanish Government intends to carry out its National Hydrological Plan, intended largely to divert water from the Ebro. Yet, there is room for hope: a large project funded by the European Union is now starting, aimed at putting all this knowledge into an effective recovery plan for the giant pearlmussel.

Altaba, C.R. 1990. The last known population of *Margaritifera auricularia*: a conservation priority. *Biological Conservation* 52: 271-286.

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DOES HABITAT PATCH SIZE CORRELATE WITH LAND SNAIL DIVERSITY?

by Tim Pearce

The diversities of several groups of organisms are known to correlate positively with habitat patch size: e.g., birds (Robbins *et al*. 1989), vascular plants (Jules 1998), beetles (Davies & Margules 1998). A conservation implication is that conserving diversity in those groups requires maintaining large enough patch sizes. Do land snail faunas correlate with patch size in a similar way to faunas of other taxa?

At the 2001 World Congress of Malacology (WCM) in Vienna (see article above), I presented preliminary results of my land snail survey on the Delmarva Peninsula, eastern USA, showing that land snail diversity correlated positively with forest patch size. I used samples from 91 forest patches ranging from less than 1 to more than 500

hectares.

This result contrasts with results some people mentioned to me at the WCM. Lindy Brincat, a student of Winston Ponder, found no correlation between rainforest patch size and land snail diversity in an area south of Sydney, Australia (Brincat 1999, personal communication from W. Ponder). Barbara Baucz-Malij, a student of Beata Pokryszko, investigated snail diversity in patches of mostly secondary forest divided by agriculture in south-west Poland and found no relationship (personal communication from B. Pokryszko).

Why did I find a positive correlation while others found no relationship? Could the positive correlation I found on the Delmarva Peninsula be a spurious result? Could the differences in results indicate a difference in how snail faunas of Europe, Australia, and North America respond to forest patch size?

After my talk at the WCM, several people pointed out that nearly all of my patches were less than 300 ha, but data points from the three patches of 500 ha or greater might have caused the positive correlation ($p<0.001$). To test that idea, I analyzed the dataset omitting the patches greater than 300 ha and still found good correlation between diversity and patch size ($p<0.003$).

I plan to add almost ten times as many patches (to total about 800 patches) to the final analysis of patch size and snail diversity. I look forward to seeing whether that larger analysis will corroborate the result I presented at WCM, or if it will show results like those from Australia and Europe. I anticipate publishing the results of this larger analysis, along with other conservation-related articles presented by participants at the WCM, in a special issue of the *Journal of Conchology*, being edited by Ian Killeen and Mary Seddon (see article above).

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ISRAEL'S CONSERVATION LAW INTERFERES WITH COOPERATION BETWEEN AMATEUR COLLECTORS AND SCIENTIFIC INSTITUTIONS

by Henk K. Mienis

Israel is probably the only country in the world where the whole phylum Mollusca is protected by law. This has not always been the case. When I moved from the Netherlands to Israel in 1969 only a few groups of marine gastropods were protected: *Charonia tritonis* along the Mediterranean coast; Cypraeidae from the Mediterranean and Red Sea; Terebridae near Elat; and certain species of *Murex*. It was the latter group, *Murex*, that caused a change in the law in the late 1970s. Shell collectors caught with rockshells in their collecting bags, could prove before the judge that they had not collected *Murex*, but *Chicoreus*, *Homalocantha* or whatever non-*Murex* shell, with the result that the case against them had to be cancelled. These 'loopholes' in the law resulted in a change: all molluscs, dead or alive, were declared as protected natural objects. Not only was it forbidden to collect them within the borders of Israel, but the maintenance of private collections as well as the import of shells also became crimes.

Although this new law was instituted in principle to protect marine molluscs, by declaring the whole phylum Mollusca as protected natural objects, it covered also land- and freshwater molluscs including agricultural pests (*Theba pisana*, *Deroceras* spp.) or those serving as intermediate hosts of parasites of humans (*Bulinus truncatus* and *Biomphalaria alexandrina*) and livestock *(Galba truncatula*, *Radix natalensis*, etc.).

Of course some means were provided to get around these restrictions, for example it is possible to obtain a collecting permit for a justified research project; a permit to maintain a shell collection; or a temporary exemption from the law to allow control of pest snails. However, usually it takes a lot of paperwork and patience to get the necessary documents. The current address for an application to obtain such a permit is: Israel Nature and National Parks Protection Authority (INNPPA), 3 Am VeOlamo Street, Givat Shaul, IL-95463 Jerusalem, Israel.

Because of these severe restrictions and the bureaucratic processes involved, most amateur shell collectors in Israel do not apply for collecting permits. And so they are in constant fear of a knock on the door from officers of the INNPPA. In addition, most collectors do not maintain proper data with their self-collected material. In this way they can always tell an inspector that they bought the material in a souvenir shop. Cooperation with researchers at recognized institutions is also usually avoided because they fear that their names and collecting activities will appear in publications and may serve as evidence of illegal activities.

In my opinion, lots of important information is being lost in this way and therefore a different way has to be found to protect certain mollusc species in Israel. Was it not Tucker Abbott who once wrote that a huge part of our current knowledge about molluscs is based on the collecting activities of amateur collectors?

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IS *ACROLOXUS LACUSTRIS* STILL LIVING IN ISRAEL?

by Henk K. Mienis and Reuven Ortal

Acroloxus lacustris (Linnaeus, 1758) (family Acroloxidae) is a small limpet-like freshwater snail with an extensive distribution in the Palearctic. In Israel it was known from at least two distinct regions: the Hula swamps in the interior and several rivers along the Mediterranean coast.

In the Hula swamps it used to live abundantly on the stems of *Phragmites*, *Typha* and *Papyrus* and on the leaves of *Nuphar* but disappeared when the swamps were drained between 1951 and 1958.

Much less is known about its presence in the coastal rivers. According to Prof. E. Tchernov (personal communication), it was common in the Yarqon river, near Tel Aviv, in the early 1950s; however, not a single specimen is preserved in the National Mollusc Collections at the Hebrew University of Jerusalem and Tel Aviv University. In spite of much research carried out in this highly polluted river along most of its course, it has not been found since at least 1970. This in spite of the fact that a similar limpet-like species, *Ferrissia clessiniana* (Jickeli, 1882), a fairly recent immigrant, has

been encountered commonly on *Nuphar* in the less polluted upper part of that river.

Most probably it did occur in the Qishon River near Haifa, because it has been encountered in material dredged in the Mediterranean Sea opposite the mouth of the Qishon. Today this is the most polluted river in Israel and only occasionally *Physella acuta* (Draparnaud, 1805) and *Physella heterostropha* (Say, 1817), again two introductions, are encountered.

Empty shells were collected by the senior author in the summer of 1969 in the swamps of Kurdani, near Enot Afeq, the starting point of the Na'aman River, south of Akko.

Since no living specimens have been collected in Israel since the early 1960s, *Acroloxus lacustris* was considered extinct in Israel by Mienis & Ortal (1994). However, recent fieldwork (1997-1998) in the Na'aman catchment area revealed the presence of several fresh, empty shells near Kare Na'aman. So far we have failed to locate any living specimens, but we do not rule out the possibility that it still lives in the region. The swampy area where the shells were encountered forms a last remnant of a huge swampy area which was once present on both sides of the Na'aman River. The locality were the empty shells were collected is under constant threat of pollution from effluents of a nearby compost factory (Mienis & Ortal 2001).

Follow up research will show whether any remnants of what seems to be the last Israeli population of *Acroloxus lacustris* are still living near the Na'aman. If this is the case then a suitable biotope with a rich aquatic vegetation should be created in the region to safeguard the further presence of it in Israel. The maintenance of this species in Israel is also important from a genetic point of view, because its presence in Israel constitutes its most south-eastern locality in Eurasia.

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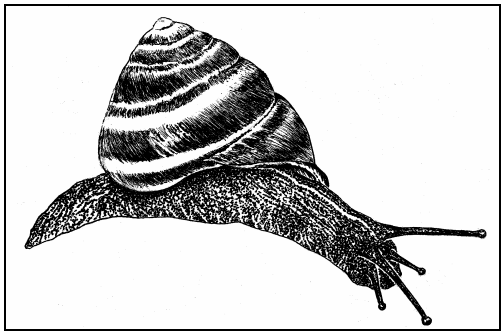
CRITICAL HABITAT LISTING FOR THE AUSTRALIAN CAMAENID LAND SNAIL *THERSITES MITCHELLAE*

by Michael J. Murphy

Thersites mitchellae (Mitchell's Rainforest Snail) has a restricted distribution, occurring only in lowland subtropical rainforest and swamp forest habitats on the coastal plain of far north-eastern New South Wales (NSW), Australia. The species' historical extent of occurrence is estimated as less than 400 km^2. Coastal north-eastern NSW has experienced major development over the last century, initially for agriculture and now increasingly for urban settlement, and the habitat for *Thersites mitchellae* has been drastically reduced through land clearing. The species' current area of occupancy is estimated to be less than 5 km^2, and much of the surviving habitat is in small, severely fragmented remnants, many of which are still at risk from development.

Thersites mitchellae has been officially protected by NSW law since March 1997 through listing as an endangered species under the NSW *Threatened Species Conservation Act* 1995 (TSC Act). The species is also listed as endangered on the *2000 IUCN Red List of Threatened Species*, in the category ENC2a. A recovery plan for the species has been prepared and was approved by the NSW government in July 2001. The recovery plan identifies loss of habitat as the major cause of the species' decline and major threat to its recovery. Additional threats identified include degradation of habitat remnants by fire and exotic weeds and predation of snails by introduced rats. The recovery plan identifies 19 actions to be undertaken to promote the conservation and recovery of the species.



Thersites mitchellae—illustrator Ann Sheppard

One of the recovery actions identified in the recovery plan is the protection of any areas identified as critical to the recovery of the species. The TSC Act makes provision for the identification and declaration of critical habitat for endangered species. Once declared, it becomes an offence to damage critical habitat (unless the action is specifically exempted by the TSC Act) and a species impact statement is mandatory for any developments or activities proposed within critical habitat. The largest known population of *Thersites mitchellae* and largest remaining single area of habitat is in Stotts Island Nature Reserve, a 165 hectare rainforest island in the Tweed River. The NSW government declared the entire island as critical habitat for *Thersites mitchellae* in November 2001. This is the first critical habitat declaration in NSW and the only current critical habitat declaration in Australia.

Declaration as critical habitat gives Stotts Island Nature Reserve the highest protection possible under NSW legislation. The declaration will assist in raising community awareness of the status of *Thersites mitchellae* and the significance of Stotts Island for its conservation, as well as raising the community profile of mollusc conservation in general. Australia has the second highest number of IUCN-listed threatened molluscs in the world, after the USA, and *Thersites mitchellae* is being promoted as a flagship species for mollusc conservation in NSW. This critical habitat declaration will also greatly assist implementation of the TSC Act's critical habitat provisions across a range of endangered species and land tenures by increasing community awareness of these provisions and establishing an administrative process to be followed.

Copies of the recovery plan and critical habitat declaration for *Thersites mitchellae* can be found at the NSW National Parks and Wildlife Service website: www.npws.nsw.gov.au. A paper examining the capacity of the TSC Act to assist with mollusc conservation in NSW in general terms and with specific reference to *Thersites mitchellae* was presented at the Malacological Society of Australasia's *Molluscs 2000 Symposium* in Sydney in December 2000, and is currently being peer-reviewed for publication in the *Australian Zoologist*, a scientific journal published by the Royal Zoological Society of NSW.

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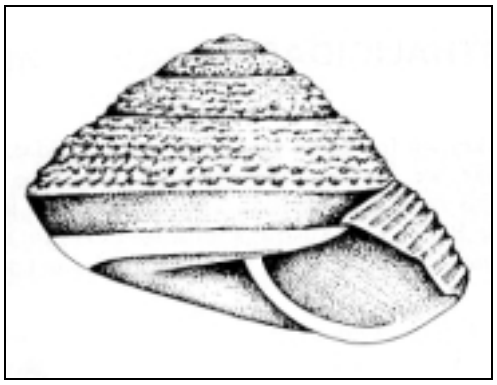
ANOGLYPTA LAUNCESTONENSIS DELISTED IN TASMANIA

by Kevin Bonham

Anoglypta launcestonensis (Reeve, 1854) is a spectacular caryodid land snail endemic to the inland north-east forests of Tasmania, Australia. The shell is about 35 mm wide and usually deep brown with a striking yellow band underneath. The animal can be brown, tan, yellow, orange or red. It is often associated with rotten logs and lives almost exclusively in rainforests and mixed forests containing myrtle (*Nothofagus cunninghamii*) and sassafras *(Atherosperma moschatum*) trees.

The snail's restricted nature (a range of about 70 km x 50 km), habitat preferences and slow recovery from logging have long been known, but concern about the species led to listing as Endangered by IUCN (Wells *et al*. 1983), later downgraded to Vulnerable. At this time (e.g., Kershaw 1988) the snail was portrayed, for instance, as generally very scarce, unreliable in occurrence, restricted in altitude, and suffering from low fecundity. More extensive study (e.g., Bonham 1996) based on field surveying and more advanced habitat estimation methods than previously available, found that the snail was actually fairly common, and more widespread than expected (overall, over 100 times more numerous than first thought), and that low fecundity was merely the natural downside of long lifespan and low mortality.



Anoglypta launcestonensis

The *Tasmanian Threatened Species Act 1995* formalised threatened species status for *A. launcestonensis* but the *Act*'s formal criteria were not released until late 1997. These criteria were modelled on IUCN (1996) but lack any 'three generations' rule, disallow listings for species that have large and widespread secure populations, and include only one sub-Vulnerable category, Rare, for species that meet various statistical limits and are also 'at risk'. Assessing many species in early 1998, I determined that *A. launcestonensis* did not qualify in Tasmania and nominated it for delisting.

This delisting was endorsed by the Scientific Advisory Committee and the Minister for the Environment, but appealed in court by the Tasmanian Conservation Trust, one of many conservation groups to question the assessment process and state concerns that the delisting would result in increased logging. Actually, listing in Tasmania does not automatically prevent logging, and the management practices required for this species were so similar to existing forest management that it is unclear whether delisting will make much difference. One 'conservationist' protest against the logging of a coupe was conducted under the pretext 'Save the Snail'. The issue was also the subject of dozens of newspaper articles, most of them inaccurate and sensationalist.

The court decisions rejecting this appeal following a lengthy case can be found at www.rmpat.tas.gov.au/decisions/j20099.htm and www.rmpat.tas.gov.au/decisions/00j55.htm. While *A. launcestonensis* was delisted, the case cast doubts upon the relevant Tribunal's ability to accurately assess less clear cases (there were serious misunderstandings of some evidence presented, especially that concerning future decline rates of the species) and the Tribunal's order that each side bear its own costs is seen as a major impediment to proceeding with further delistings in complex and politicised cases.

The snail's presence on threatened species lists (despite the inaccuracy and under-justification of many 'estimates' stated as fact) has contributed immensely to the species' conservation, with formal habitat reservation increased from a token 1 % in 1980 to an impressive 38 % now. Assessment of the species against the new IUCN criteria shows that despite intensification of scheduled logging under the controversial Regional Forest Agreement (1997), the recent increase in the Vulnerable A3 decline threshold from 20 % to 30 % (and the expansion of area of occupancy estimates to at least triple the Vulnerable D2 threshold) means that the species should be downlisted to Near Threatened. This species arouses strong emotions even among scientists because of its beauty and taxonomic distinctiveness, but I am hopeful this proposal will be accepted.

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NUEVO REGISTRO DE LOCALIDAD PARA *BLAESOSPIRA ECHINUS* EN CUBA

by Alina Lomba Garmendía and Adrián González Guillén

Blaesospira echinus ("Wright" Pfeiffer) (Mollusca: Gastropoda) fue descrita en el año 1864 (Espinosa & Ortea 1999). Posterior a la fecha de su descubrimiento se le buscó afanosamente. No fue encontrada hasta pasados 70 años, momento en el cual Don Carlos de la Torre comunica a toda la sociedad de malacólogos tan importante hallazgo (Jaume 1935).

Para sorpresa y alegría nuestra la situación se repite. Esta vez ha sido encontrada, luego de muchos años de infructuosa búsqueda, una población de *Blaesospira echinus.* En uno de los paredones de la Sierra de los Acuáticos, en la Sierra de Viñales, Pinar del Río, el segundo autor de este trabajo encontró una población de la citada especie. En la colección básica del Museo Nacional de Historia Natural (MNHNCu) se depositaron 9 ejemplares, su número de catálogo es 08.113. La localidad tipo de esta especie es Lado norte del Queque, Viñales, Pinar del Río. La diagnosis, según Alayo & Espinosa (inédito), es la siguiente:

> Concha con las vueltas completamente sueltas en toda su longitud, con aspecto de tirabuzón. Color de blanco a amarillento o pardo pálido. Vueltas adornadas con cuatro hileras de espinas huecas y elevadas, colocadas en series axiales y espirales. Longitud 6,9-8,1 mm; anchura 6-7 mm

Blaesospira echinus no es una especie bien representada en las colecciones de estudio. En la Ciudad de La Habana solo encontramos unos pocos ejemplares en las colecciones 'Müller' y Básica, ambas ubicadas en el IES y en la colección 'M.L. Jaume' del MNHNCu. En colecciones de otras regiones del país no hemos tenido la oportunidad de trabajar. Es lógico pensar que cualquier material ubicado en las colecciones actuales provenga de la colecta que hizo tan feliz a Don Carlos y que llegó a manos de otros malacólogos por intercambio de ejemplares.

En 1998, durante las sesiones del Taller Plan de Conservación y Manejo de Especies Amenazadas (CAMP), esta especie fue propuesta dentro de la categoría de amenazada (Lomba 1998).

Le agradezco a las siguientes personas por la ayuda brindada, a Esteban Gutiérrez y Antonio López del Museo de Historia Natural (MNHNCu) por la revisión del documento y las sugerencias brindadas, a Mercedes por su colaboración en la búsqueda de la literatura necesaria. A Maikel Sánchez, del MNHNCu, por su ayuda en el tratamiento a la imagen de *B. echinus* y a Edith Aguado, también del MNHNCu, por conducirme al Fondo de Manuscrito de la Biblioteca de Ciencia y Tecnología.

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POSSIBLY INVASIVE LYMNAEID IN THE ISOLATED ECOSYSTEM OF LAKE BAIKAL

by Marc Stift, D. Sherbakov, K. Mamonova, T. Sitnikova and Ellinor Michel

The unusually diverse ecosystems of Lake Baikal (southern Siberia) are composed predominantly of endemic taxa. However, on recent Baikal expeditions the generalist snail *Lymnaea auricularia* was observed in high abundancies in habitats that were previously dominated by Baikal endemics.

Lymnaea auricularia was previously known to be widespread in the swamps around the lake and in shallow bays, and had occasionally been observed in sheltered areas such as around harbour piers. But until recently, it had never been observed on fully exposed rocky coasts. It had been suggested that *L. auricularia* was not able to deal with the extremely cold, turbulent and nutrient-poor habitat of 'open Baikal', either because of direct physical stress or for indirect reasons, such as competitive exclusion by endemic snails.

During an expedition in July 2001, *L. auricularia* was observed in 16 locations and populations were sampled from 13 locations along the coast of the southern half of Lake Baikal. We are working to characterise the differences among these populations and to determine their origins. We are using molecular markers (microsatellites) to determine genetic differentation between 'exposed' and 'sheltered' populations. We are paralleling the genetics with a multivariate description of basic shell variables.

We hypothesize that 'exposed' populations originate from the closest 'sheltered' populations. If this hypothesis proves to be correct, it suggests that a change in environmental circumstances has enabled establishment of *L. auricularia*. As distributions of many organisms shift because of global warming, we are concerned that this might be the case in Lake Baikal as well. This leads us to the critical conservation question of whether *L. auricularia* has occupied a new niche or is competing with the Baikal endemics.

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ANTIGUAN LAND SNAILS BENEFIT FROM SNAKE CONSERVATION

by Paul Craze

While it is hardly a malacologist's paradise, the Caribbean state of Antigua and Barbuda may soon find land snails incorporated into its most successful and high profile conservation project, thanks to efforts to safeguard a critically endangered snake. Two small islands to the north of Antigua are home to the Antiguan racer (*Alsophis antiguae*), the world's rarest snake, currently at a population size of around 80 mature adults. Since 1995 this harmless species has been the subject of a major conservation effort (the Antiguan Racer Conservation Project or ARCP) jointly managed by the Antiguan Forestry Unit, the Environmental Awareness Group (an Antiguan NGO), the Durrell Wildlife Conservation Trust, Fauna & Flora International, the Island Resources Foundation and Black Hills State University. While the long term survival of the snake is by no means secure, the success of the ARCP can be seen in the recovery of the species from a small, unhealthy group of individuals to the expanding, breeding population seen today (Daltry *et al*. 2001).

Although the racer has been the main focus of environmental efforts to date, the ARCP has always been mindful of all the fauna and flora of Antigua's northern and eastern islands. One of its most significant actions has been the eradication of rats from twelve of the offshore islands (Varnham *et al*. 1998). While this has doubtless benefited many organisms, including land snails, quantitative evidence for the effects of rat removal on ecological communities is rare (Florens *et al*. 1998). This year has seen the first stage of a study aiming to add quantitative results to the, so far, anecdotal evidence of post eradication effects on the Antiguan islands. The study will monitor selected groups of plants and animals on an island recently cleared of rats compared to a control (K.J. Varnham personal communication). Of all the groups selected for monitoring, land molluscs will be the most exhaustively surveyed. Finding a clear effect of rat removal on land snail populations would be a significant addition to the available literature on this interaction.

Whether or not they are seen to respond to the absence of rats over the time scale of the study, Antiguan land snails are certain to gain from this increased attention. The timing of the survey coincides with an increased emphasis in the ARCP towards conservation and management of the northern and eastern Antiguan islands as an entire, functioning ecosystem. The fact that land snails are now being considered by the ARCP means that their conservation needs will be clearly on the agenda.

All of this is clearly encouraging to those interested in mollusc conservation but it is unlikely to do much to prevent the loss of land

snail diversity in the region because of the low diversity and low rate of endemism seen on the island. Antigua has a particularly small land mollusc fauna, comprising about eight taxa (Nutting 1919). The range of most of these extend to the northern and eastern islands with *Bulimulus guadalupensis* and the operculate *Cistula antiguensis* being the most common. Neither of these is threatened and, of the remaining species likely to be encountered, none is presently a source of concern for conservationists. Work currently underway on samples from the islands is likely to identify several species of microsnail as yet unrecorded in Antigua and these may be of conservation importance. Such findings are essential in raising awareness of conservation amongst local people.

There is, however, one species that may yet turn out to be the focus of conservation effort. Antigua hosts a population of the regionally rare *Pleurodonte formosa*. To my knowledge, the last sighting of living specimens on Antigua was at a site in the south of the island in 1919 and even then the species was not abundant (Nutting 1919). My own searches in the same area in 2001 produced no live individuals, only shells. Recent sub-fossil shells were also found on one of the islands being considered for re-introduction of the racer and, while these have not been dated, their presence suggests that this island may still be able to support *P. formosa*. If this snail is threatened on the main island of Antigua, the presence of an area offshore, protected and monitored because of the presence of snakes, immediately suggests a possible *P. formosa* re-introduction.

Pleurodonte formosa.
Width 22 mm, height 12 mm. From an original by Mike Bungard, freelance wildlife artist (mbungard@hotmail.com)

The most encouraging sign for malacologists is the fact that such a major project is paying attention to the conservation needs of land molluscs at this important stage of its work. It is a tribute to the quality and openness of the ARCP personnel and shows the effectiveness of the all-encompassing, democratic management structure they have set up for the project. Antigua may not be a hot spot for snail biodiversity but we can at least be assured that its handful of species will have someone to watch over them.

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GASTROPODS OF LAKE TANGANYIKA: SEDIMENTATION THREATS AND ENDEMISM PATTERNS

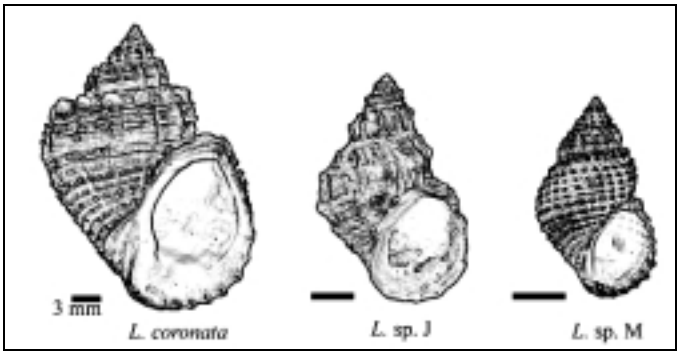
by Ellinor Michel, Peter McIntyre and Jon Todd

Whether one's perspective for conservation priorities is on numbers of endemic species or on evolutionary derivation, the endemic gastropods of Lake Tanganyika warrant special attention. On paper, 62 % of the 60 currently recognized species are endemic (Brown 1994), and the addition of approximately 35 new and redescribed endemic species will bring the total gastropod endemicity to over 75 % (Michel & Todd in prep.; West *et al*. submitted a, b). In practice, virtually all of the numerous snails one encounters in the lake are endemics, with non-endemics limited to lake-marginal habitats. The Tanganyikan endemics are special because they have evolved in this ancient lake basin (West & Michel 2000; Michel 2000) to fill numerous ecological niches, dominating the molluscan fauna and acting as major players in all Tanganyikan benthic ecosystems. Diversity is concentrated in the littoral zone, especially on rocky substrates, and it is this area that is most threatened by anthropogenic sedimentation. The endemics tend to be poor dispersers, increasing their susceptibility to local impacts. Furthermore, the structure of diversity is typical of endemic species flocks, with some species distributed lake-wide, and others as point endemics. This presents special challenges for biodiversity assessment work and quantitative evaluations of ecological impacts.

Our team has been working on the distributional and ecological aspects of current conservation problems in Lake Tanganyika. Within the framework of the Nyanza Project (www.geo.arizona.edu/nyanza/index.htm), we have been doing fine-scale ecological surveys of benthic herbivorous snails and fish at sediment-disturbed and undisturbed sites. Previous, broader spatial comparisons of littoral sites indicated that deposition of sediment eroded from the steep shoreline reduces the diversity of ostracods, snails and fish in rocky areas (Alin *et al*. 1999; Cohen *et al*. 1993). The rocky littoral is increasingly affected by watershed deforestation, road building, and other sources of soil runoff. However, we found no significant effects of sedimentation on the diversity or abundance of snails, or the abundance of the two most common genera of herbivorous fishes (Michel *et al*. 2002; McIntyre *et al*. in prep.). Sedimentation did lead to moderate reductions in the evenness of species representation within snail assemblages. Data on snail faeces and material collected from rocks at sediment-disturbed and undisturbed sites suggested that snails selectively graze on epilithic algae under the sediment layer, but are unable to avoid consuming large amounts of inorganic sediments at disturbed sites. This reduction in foraging efficiency may be associated with a large downward shift in size distributions and female size at reproduction at sedimented sites. Sedimentation also exerted strong indirect effects on the snails. Within the most cosmopolitan species, frequencies of

shell scarring by predatory crabs and castration by parasitic trematodes were greatly reduced by sediment disturbance. The impact of these indirect effects on the endemic gastropods is likely to be important, but the lack of a response at the community level suggests that the dramatic effects on feeding efficiency, life history, and risks of predation and parasitism offset each other. Thus, assessing the actual extent of human impacts may be difficult without combining individual, population, and community-level responses, and differentiating between direct and indirect effects of disturbance.

On larger distributional scales, point endemicity confounds our ability to effectively compare diversity and assess conservation impacts (Todd *et al*. 2001). We focussed on one genus, *Lavigeria*, as it is demonstrably the most diverse 'species flock'-forming clade in this ancient rift lake, with high levels of sympatry among the approximately 30 species recognized to date (Michel & Todd in prep; West *et al*. submitted b). These species are the most prominent benthic macroinvertebrates in the rocky littoral zone. While some species are widely distributed along most of the 1400 km of shoreline, others are point endemics with distributions measured in kilometers or hundreds of meters. We have sampled both regionally (lake-wide) and locally to catalogue molluscan diversity, determine community composition, and test for habitat disruption. While we demonstrated a regional impact of increased anthropogenic sediment accumulations on snails from rocky substrates (especially in Burundi, the area of highest human population density and greatest sedimentation), the pattern is complex and compromised by small species ranges. As we can not yet comment on ecological equivalence of the different species at different sites, impact comparisons are difficult. Although we expect that much of the point endemism is primary (i.e. resulting from local speciation), the broad distribution of subfossils of *L. coronata* indicate that the only known population of living individuals is relictual rather than a point endemic. Moreover, species turnover even on the scale of a few kilometers makes controlled comparisons difficult for testing the effects of sediment impacts on the endemic fauna.



Three point endemic species of *Lavigeria* from the Kigoma region of Lake Tanganyika, East Africa: *L. coronata*, *L.* sp. J and *L.* sp. M (open nomenclature in revision, Michel & Todd in prep.)

We have also found that previous estimates of the malacofauna seriously underestimate overall diversity through limited geographic sampling. In our current sampling of 150 rocky sites (700 lots, 15,000 specimens) we find that our eight regional blocks (defined using substrate and tectonic criteria, but located primarily on the eastern shore) had an average of 1.5 species endemic to each. This implies that the as-yet unsampled Congolese coast may reveal many more endemic species. This situation is not unique to *Lavigeria* – for example, *Paramelania* and *Reymondia* also encompass unrecognized species diversity (West *et al*. submitted b).

A recent call to "break the planning paralysis" and simply set out aquatic reserves without further sampling (Coulter 1999) seems highly premature. The molluscan data suggest that if we want to conserve ecosystems rather than only economically important or pretty fish, we need both more detailed, intensive sampling of ecosystem functions and more geographically widespread sampling of species distributions.

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ON THE SPREAD OF *MELANOIDES TUBERCULATUS* IN BRASIL

by Silvana C. Thiengo, Monica A. Fernandez & L.R. Di Simone

In contrast to the deliberate introduction of the Afro-asiatic snail *Melanoides tuberculatus* (Müller, 1774) in some Caribbean islands (e.g., Guadeloupe) as a competitor of the snail host of *Schistosoma mansoni*, in Brasil its introduction seems to have been accidental, probably by the aquarium trade, attached to aquatic plants as either juvenile snails or eggs. It was first reported in Santos, State of São Paulo, in 1967 and now, 35 years later, it is found in the States of Minas Gerais, Espírito Santo and Rio de Janeiro (southeast Brasil); Mato Grosso do Sul and Goiás (central Brasil); Tocantins (northern Brasil); Pernambuco and Bahia (northeast Brasil). In São Paulo and Rio de Janeiro, where extensive survey work has been done, this

species has been collected from almost all hydrographic basins, where it inhabits lotic and lentic, polluted or clean waterbodies, generally occurring in dense populations. The rapid spread of *M. tuberculatus*, its adaptability to a wide range of environmental conditions, and its high reproductive capacity certainly threaten the native mollusc fauna and must be investigated.

Considering the lack of substantial taxonomic and ecological studies on the freshwater mollusc fauna of Brasil and the environmental impact caused by alien species, and despite the possible effectiveness of *M. tuberculatus* as a competitor of the planorbid intermediate hosts of *Schistosoma mansoni*, which occurs widely in Brasil, the expansion of this species must be controlled.

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PACIFIC ISLAND LAND SNAILS

Snail predator now in Samoa

The following story appeared in the *Samoa News* of 28 December 2001. A letter I (*Tentacle* editor, Robert Cowie) sent in response was published in the *Samoa News* of 2 January 2002. The tragic thing is that the people promoting the "flat worm", presumably *Platydemus manokwari*, are either unaware of or don't care about the fact that as well as preying on giant African snails (*Achatina fulica*) this predator also preys on native snails. It is quite possible that it is indeed controlling *A. fulica*, although there has been no scientific demonstration of this, and the African snails may be declining for other reasons, as they generally have done elsewhere some time after their original introduction and spread. *Platydemus manokwari* has been seriously implicated in the decline of endemic snails on Guam and is considered a threat to native snails wherever it is introduced. So far the flatworm is only known to be present in the Samoan archipelago on the island of 'Upolu (Samoa, formerly Western Samoa); it has not been introduced to American Samoa. Here's the story:

AFRICAN SNAILS UNDER CONTROL

APIA—Once described as a "real threat" to Samoa's agriculture when it was first discovered in the early 90s, the African snail is slowly diminishing, many thanks to its foe the "flat worm".

"Flat worms" look like earthworms and are not a threat to agriculture, according to the Samoa Observer newspaper, based on information from the country's Department of Agriculture.

The results, according to the Director in Crops Division, Sooalo Alapati, are "positive".

"Preventing the spread of African snails is now under control," Alapati is quoted by the newspaper as saying. "That's because we have discovered a biological control agent called the flat worm which attacks and kills African snails".

The "biological agent" was discovered a year after the African snail was first discovered in Faleula. It later spread to Alafua and other neighbourhood villages.

"We used chemicals before but that proved costly for us. It didn't have much effect on the bug as well," Alapati added. "Not only does the flat worm work, but it doesn't cost us anything."

The Department of Agriculture is now breeding flat worms at its laboratory at Nuu and the results are positive with hardly any African snail reports from villages.

Now the government is montoring villages in Savaii.

The Samoan Snail Project

by Robert H. Cowie

The Samoan Snail Project has been funded primarily by the the U.S. National Science Foundation (grant DEB 9705494) and the U.S. National Park Service. The purpose of the project is to provide a foundation for assessing the diversity and historical decline of the native Samoan non-marine snail fauna, as a first step in its conservation. The project has achieved these preliminary goals but is now on hold until additional funding can be secured.

The Project website, which includes, photographs, maps, a simple guide to the species, a nomeclatural catalog and bibliography, and a database of specimens in both the Bishop Museum (Honolulu) and Field Museum (Chicago) is at www2.bishopmuseum.org/PBS/samoasnail/

Eua expansa
(islands of Savai'i and 'Upolu)

Eua zebrina
(islands of Tutuila and Ofu)

The specific objectives of the project, 7 of them, were essentially those set out in the NSF grant proposal, and have been accomplished as follows:

1. Capture all data from Samoan non-marine material in the Bishop Museum (Honolulu). Fully verified data from all lots (11,768 lots) from American Samoa and Samoa (formerly Western Samoa), including c. 1800 new lots, are available on the Project website.

2. Review Samoan land snail material in the Field Museum (Chicago). The Field Museum holds the second largest collection of Samoan non-marine snails, although less than 10 % of the amount in the Bishop Museum. All the pulmonate material in the Field Museum (447 lots) is on the web, linked to the Project website.

3. Sort and identify material from recent and new surveys in the Samoan Islands. All previously unaccessioned, unsorted, and unidentified material from the Islands, plus new material, has been fully processed and is available for study.

4. Undertake field work to ascertain further the current status and distribution of the fauna. Five field trips were undertaken covering all main islands of American Samoa. In addition, two assistants/trainees from the American Samoa Community College undertook independent field work on Tutuila.

5. Produce a simple field guide for use in Samoa. A draft of this photographic guide was tested by Samoan trainees. It is available on the Project website. A hard copy version is planned, but requires funding support.

6. Build synoptic reference collections to be deposited in American Samoa and Samoa (formerly Western Samoa). Reference collections were placed in the National Park of American Samoa and the

American Samoa Community College (Land Grant Program), but it was not possible to deposit one in [Western] Samoa.

7. Train graduate students from the University of Hawaii. Four students were employed as assistants, all gaining training in modern natural history museum practices and familiarity with the Samoan snail fauna.

The following specific findings result from the survey work undertaken as part of the project.

Findings from the 1998 survey work on the islands of Tutuila, Taʻü and Ofu were:

- The surveys recorded 19 of the 42 previously known native land snail species, 11 of the 12 aliens, and 3 of the 6 cryptogenic (unknown origin) species previously known from American Samoa.
- Eight species were recorded for the first time.
- Two undescribed (presumed endemic) species were discovered.
- One species (*Samoana abbreviata*), previously thought to be extinct was rediscovered, although in very small numbers.
- The known island distributions of 11 species were extended.
- Focus on the partulid tree snail species showed that all four (*Eua zebrina*, *Samoana abbreviata*, *S. conica*, *S. thurstoni*) should be considered endangered.
- Comparisons with surveys undertaken predominantly in the 1920s and 1930s, 1975, and 1992 showed that the fauna is becoming a homogeneous subset of Pacific-wide and pantropical alien species, as these species replace the declining native/endemic diversity.

Trochomorpha apia
(islands of Savaiʻi, ʻUpolu and Tutuila)

Field work in 2001 focused on the islands of Olosega and Aunuʻu.

Findings from this field work were:

- *Samoana thurstoni* was discovered on Olosega. This is the first record of a partulid from this island and is of major conservation significance.
- The known land snail fauna of Olosega was increased from 6 to 30 species.
- The known land snail fauna of Aunuʻu was increased from 2 to 22 species.
- That these two relatively accessible islands were previously so poorly known malacologically, yet have now been shown to harbor significant land snail faunas, suggests that other less accessible islands in the Pacific may be even less well known and emphasizes the need for more survey work.

Publications relating directly to the Samoan Snail Project are:

Cowie, R.H. 1998. *Catalog of the nonmarine snails and slugs of the Samoan Islands. Bishop Museum Bulletin in Zoology 3*. Bishop Museum Press, Honolulu. viii + 122 p.

Cowie, R.H. & Cook, R.P. 1998. Partulid and other land snails of the National Park of American Samoa. *Tentacle* 8: 14-15.

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Cowie, R.H., Rundell, R.J., Mika, F. and Setu, P. in press. The endangered partulid tree snail *Samoana thurstoni* on Olosega and the land snail diversity of the Manuʻa Islands, American Samoa. *American Malacological Bulletin*.

Other closely related publications that also deal with Samoan snails include:

Cowie, R.H. 1998. Homogenization of Pacific island snails. *World Conservation* 4/97-1/98: 18.

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Rundell, R.J. 2001. *Phylogeny, biogeography and reproductive biology of the Hawaiian endemic succineid land snails*. MS thesis, University of Hawaii.

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Hawaiian succineid project

by Rebecca J. Rundell and Robert H. Cowie

The Succineidae are found world-wide, and a unique radiation is found in the Hawaiian Islands. There are 42 endemic Hawaiian succineids that are found in a wide range of habitats, from montane rainforest to xeric coastal areas. Some Hawaiian succineid species are tree-dwelling, while others live in the leaf litter, on tree ferns and on low vegetation. Like most other Hawaiian land snails, the succineids are probably threatened with extinction.

Since 1999, we have undertaken an evolutionary, biogeographical and conservation-oriented study of the Hawaiian succineids. This has involved collaboration with several conservation agencies, particularly the State of Hawaii's Natural Area Reserve system and the Maui Land and Pineapple Company—many succineid species are located in the native forests that are (fortunately) managed by these agencies. The evolutionary component of the project involved collection of fresh tissue for DNA sequencing. Although the impetus for this study was to investigate the phylogeny and origins of Hawaiian succineids, aspects of these species' conservation became increasingly relevant during the course of the project. Many of the species were difficult, if not impossible, to find and this limited the scope of the study. Several species, like *Succinea konaensis* and *Succinea quadrata*, both Hawaii Island endemics, were rare. Survey work that is focused on historical ranges of succineid species is needed in order to determine whether they should be recommended for endangered status under the Endangered Species Act. Currently, all Hawaiian succineid species are listed as "species of concern", which affords them no formal, legal protection. Museum work focusing on the Bishop Museum's (Honolulu) extensive collection of Hawaiian succineid specimens and electronic databases will provide the necessary background for targeted field work. Historical ranges for several species have been assessed but more work is needed.

The reproductive biology of two rainforest-dwelling succineids was

also investigated. These species' short time to reproductive maturity in particular may be responsible for their survival, in contrast to the slow-maturing achatinelline tree snails. Further study on natural history aspects of dryland succineid species may provide additional insights.

In general, Hawaiian succineids have proven amenable to both evolutionary and conservation-related study. We have also begun to extend the project to include other succineids around the Pacific. This will continue to provide new insights on the origins and evolution of Pacific invertebrates. It is our hope that the natural history information gained will serve as a foundation for increased protection and conservation of these unique animals and their habitats.

This project benefited from support of the U.S. National Science Foundation, grant DEB-9705494.

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Protecting the last populations of endemic tree snails in the Society Islands, French Polynesia.

by Trevor Coote

The well-documented extinction of all seven species of *Partula* in the wild on Moorea between 1975 and 1985 was followed by further disastrous species losses on the other islands of the Society group of French Polynesia. Despite the exhaustive efforts of so many dedicated individuals, the situation there remains extremely grave. The latest set of extensive fieldwork conducted in 2001 by myself and colleagues from Tahiti in the Society Islands has starkly highlighted the parlous state of the endemic tree snail species on those islands. These surveys have confirmed the loss of all species of *Partula* in the wild on the Society Islands outside of Tahiti. Up to 35 species have been lost from Raiatea, thereby eliminating an outstanding example of island evolutionary radiation. On Huahine, the disappearance of *P. varia* and *P. rosea* had an economic and social effect on the local community: many of the women of the villages lost their livelihoods, and the artisan's association also folded. In addition, Tahaa and Bora Bora have lost all of their species. On Moorea, the extinctions of *Partula* in the wild ended well over a decade ago but remnant populations of *Samoana attenuata* still survive. All other species of *Partula* have been lost from the Society Islands.

As a direct result of predation by *Euglandina rosea*, the diminishing populations of the five partulid species on Tahiti are now the sole remnant of over 70 endemic partulid species that until very recently inhabited the Societies. Since the expedition of 1995 undertaken by the Pacific Island Land Snail Group, in-country biologists have provided information on the spread of *E. rosea* to the point where we now have a good idea of its distribution throughout Tahiti. A number of discoveries of small populations or sporadic individuals of partulids on this island occurred between 1995 and 1997, and have continued. It seems that remaining populations of partulids on the larger part of the island, Tahiti Nui, are confined largely to the interior, much of which is very difficult to access. The situation on Taiarapu Peninsula, Tahiti Iti, differs in that the best populations exist in the coastal regions of the south-east of the island. Again, we have a reasonable idea of the spread of *E. rosea*, though the situation in the interior still needs clarifying.

The discovery of the predator in significant numbers in Faaroa Valley (one of the prime remaining areas of *Partula* distribution on Tahiti) in January 2001 was a major blow. Faaroa Valley was until then the last remaining valley on the Peninsula of Tahiti yet to yield evidence of the predator's presence. Moreover, this valley was home to representatives of each of the five species of Tahitian partulid still extant (*Partula clara, P. affinis, P. otaheitana, P. hyalina* and *Samoana attenuata*), as well as both remaining *Trochomorpha* species (*T. cressida* - endemic to Tahiti, and *T. pallens* - endemic to the Society Islands). Nevertheless, despite this alarming discovery, an effective and inexpensive practical conservation measure was available to prevent the inevitable extinction of the species in this critically important range area: the construction of predator-proof reserves using cheap and locally available materials. This conservation strategy has been evaluated on Moorea, and Oahu in the Hawaiian Islands. The funding has since been obtained from The Biodiversity Trust, and preparations are under way to carry out this logistically complex task.

I visited Faaroa Valley in July, and again in November, 2001, and was heartened to find that the situation had not deteriorated and that further spread of the predator had not occurred. The construction of the reserve has been sanctioned by both the owner of the land, and the local government authorities, with whom I am now collaborating over the longer-term protection of the endemic snail species and their associated habitat. All the elements are in place for the project to go ahead in April/May of 2002. There is strong local community (and international) concern and desire to save these populations Without this immediate action, followed by long-term management, these populations face almost certain extinction. We believe that the construction of predator-proof reserves is the ideal current strategy, and could become a model for the protection of other invertebrate species facing similar fates.

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Genetic clues to a biogeographic mystery: using molecular sequences to reconstruct the evolutionary history of endemic Hawaiian tree snails

by Brenden S. Holland and Michael G. Hadfield

As part of our ongoing efforts to stop the dramatic loss of endemic Hawaiian tree snail species and to gain insight into the evolutionary relationships among those remaining, we are using genetic markers to define management units (Holland & Hadfield in press) and investigate the phylogenetics of extant taxa throughout the Hawaiian Islands (Holland & Hadfield in prep). Although the native Hawaiian land snail fauna ranks among the most remarkable island radiations, with over 750 endemic species (Cowie *et al*. 1995), field surveys indicate that up to 75 % of the native gastropod biodiversity has recently been lost. This holds true as well for the Hawaiian tree snails, comprising the endemic subfamily Achatinellinae. From a scientific standpoint, this situation provides an opportunity to test theories involving relationships among population-level genetic variation, population size, isolation, and vulnerability to extinction. From a conservation perspective, genetic data may be used to improve management strategies and to set priorities for efforts such as deciding where to place predator exclusion structures in order to maximize genetic diversity.

Conventional biogeographic theory proposes that the achatinelline ancestor arrived first on the island of Maui less than two million years ago, and subsequently spread to other islands, radiating via allopatric speciation (e.g. Thacker & Hadfield 2000). Our data, however, do not support a Maui origin, and in fact strongly suggest that the subfamily originated on the much older island of Oahu (3.7 million years old) (Holland & Hadfield in prep). In addition, using cytochrome oxidase I (COI) sequences, we have found an estimated rate of molecular evolution that is about half of that estimated for the 16S gene (Thacker & Hadfield 2000).

Through the application of molecular markers we have (1) identified unique intraspecific haplotypes and defined evolutionarily significant units (ESUs) for the Oahu tree snail *Achatinella mustelina*, (2) provided guidelines and recommendations to regional wildlife managers for prioritization of *in situ* protective efforts for *A. mustelina*, (3) gained insight into the evolutionary relationships among all of the extant Hawaiian tree snail taxa at the molecular level, and (4) revised the estimated the rate of molecular evolution, as well as the time and island of origin of the Achatinellinae.

Genetic data are also being used to devise breeding plans and monitor genetic diversity of captive populations that will eventually be used to supplement or replace depleted natural communities of snails (see Olival & Hadfield 2000). Genetic data may prove instrumental in the ongoing efforts to curb the drastic decline of native Hawaiian tree snails by increasing their numbers in the wild, and may provide a model program for other projects with similar objectives (Hadfield *et al*. in press).

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MARINE MATTERS

Giant octopus surveys in Puget Sound

by Roland C. Anderson

In my job as the octopus caretaker at the Seattle Aquarium (Seattle, Washington, USA) I am frequently asked how many octopuses there are in Puget Sound (a large estuary off the northeastern Pacific) and how the population has been doing over the years, questions that have conservation implications. To answer these questions, the Seattle Aquarium organized an annual divers' survey of the giant Pacific octopuses (*Enteroctopus dofleini*) in Puget Sound in 2000. We hoped to establish a baseline of how many octopuses are in the area and conduct this survey every year, so we can see if the population is healthy or if there are fluctuations from year to year.

In addition to the large cadre of volunteer divers at the Aquarium, we enlisted the help of sport divers in the area to look for octopuses. In support of this effort, I spoke to numerous scuba diving clubs, sent information out by mail and e-mail to dive shops and web addresses and made numerous phone calls alerting divers of the upcoming octopus census. In addition, our public information specialist arranged for media coverage of the event, resulting in publicity in newspapers, radio and television.

The first year, 114 divers saw 18 octopuses, most of which were seen in Hood Canal, an arm of Puget Sound. In 2001, 67 divers saw 15 octopuses, all of which were in Puget Sound proper. Fewer divers participated in the second year, possibly because the count was held the day after the season's worst snowfall. Although the snow was melting, many areas had black ice on the roads, and this may have kept some divers out of the water. In spite of fewer divers, more octopuses were seen per diver effort in 2001. Hopefully, with more advertising and better weather, more divers will participate and see more octopuses in the upcoming third survey, to be held in February 2002.

Although we only have two years' worth of data so far, it looks like there are fluctuations in the population from year to year, and certainly by location, as several sites where many octopuses were seen the first year had none the second. We'll know more as we get the information from surveys in future years.

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Oyster Restoration in South Carolina

by Nancy Hadley

The eastern oyster, *Crassostrea virginica*, forms living subtidal and intertidal reefs that are a dominant feature of many Atlantic and Gulf coast estuaries. These reefs provide refuge and nursery habitat for adult and juvenile fishes, shrimp and crabs. In South Carolina estuaries, intertidal oyster reefs are often the only 'live bottom' and appear to perform the same functions for fish as seagrasses do elsewhere (Coen & Luckenbach 1999b; Williams & Heck 2001). Previous work in South Carolina has documented the presence on intertidal oyster reefs of over 67 species of finfish and invertebrates, often reaching densities over 150/m^2.

Along the southeastern coast of the United States oysters occur primarily in the intertidal zone, adjacent to *Spartina* saltmarsh. Healthy oyster reefs can provide a living bulkhead to reduce shoreline erosion and protect *Spartina* saltmarsh. *Spartina* has been documented to be an important habitat for estuarine productivity (e.g., as a feeding ground for juvenile fishes and their prey) and is known to perform many other ecological functions such as buffering run-off (Weinstein & Kreeger 2000).

As a part of their normal feeding activities, oysters filter large volumes (up to 200 liters/day/oyster) of water, removing both algae that they use as a food resource and suspended particles. Filtering by dense populations of oysters can significantly improve water clarity and control excessive growth of algae from nutrient over-enrichment and eutrophication. Improved water quality benefits all estuarine organisms.

Human activities, in concert with natural phenomena, have greatly affected the distribution and abundance of oysters in the US. In many areas, oyster habitats have declined precipitously in recent years as a result of many factors including over-harvesting, physical disturbance by harvesting and other human activities, particularly recreational boating, diseases, nutrient enrichment through runoff, alteration of natural flow regimes and salinity patterns, loss of appropriate substrate for new recruits, and reduced water quality accompanying rapid coastal development (Lenihan & Peterson 1998; Coen & Luckenbach 2000; Luckenbach *et al*. 1999; Breitburg *et al*. 2000). In the Chesapeake Bay region, once the center of the US oyster industry, only 1 % of the historic oyster resources still remain (Chesapeake Bay Foundation 2000).

The intertidal oysters of South Carolina and its neighboring states are less intensively harvested, as they are considered of little value for

the half-shell trade. However, they are being increasingly impacted by anthropogenic stressors such as boat wakes. In fact, in many of the more heavily utilized creek systems essentially no oysters remain. South Carolina oyster resources suffer from a lack of husbandry, particularly of the common property grounds managed by the State. Appropriate husbandry includes replanting of oyster shell to provide substrate for subsequent generations. If removal by harvesting is not offset by replanting the resource declines because of reduced recruitment. Pilot studies have demonstrated that oysters will readily recruit to shell substrate in areas that otherwise have little or no recruitment because of lack of suitable attachment sites. This indicates that South Carolina still has adequate breeding populations (adult stocks) and recruitment is limited by substrate. Although a fully functional reef requires 3-5 years to develop, oyster shell alone attracts many more fish than adjacent bare mud flats (Coen *et al*. 1999a, b). An impressive suite of invertebrates (over 85 species) quickly colonizes the oyster shell providing food sources for larger invertebrates and finfish and beginning the natural process of stabilizing the shell. Even bare shell traps sediments and absorbs wave energy reducing erosion of adjacent saltmarsh (Meyer 1996, 1997; Chose 1999; Coen & Fischer 2000, N. Hadley *et al*. unpublished).

In 2001, the South Carolina Department of Natural Resources (SCDNR) initiated a pro-active effort to involve the public in hands-on restoration and enhancement of intertidal oyster habitats and to increase public awareness of habitat value through education. An integral part of the project is to involve schoolchildren through field trips, monitoring activities and targeted lesson plans. In the project's first season, community volunteers joined scientists to place over 4000 bushels of oyster shell into plastic mesh bags that were used to build 33 reefs at 13 sites along the South Carolina coast. Twelve teachers attended a workshop to learn about oyster habitat and develop lesson plans for implementation on the new reefs. The reefs will be monitored by citizens and scientists to learn more about site selection, shell stabilization, rates of recruitment, and restoration technology in general.

Similar community-based projects have been very effective in Virginia, Maryland and New Jersey where literally thousands of citizens participate each year in 'Oyster Gardening', shell bagging, and other restoration efforts. These citizens gain a vested interest in the resource that results in their exercising influence on legislative and policy decisions. SCDNR hopes that a similar awareness will result from the new project in South Carolina. Funding for this project was provided by NOAA – Community-based Restoration; NOAA – EPA Five Star Challenge Grant; NOAA – Coastal Services Center; SC Sea Grant Consortium; FishAmerica Foundation, and Hilton Head Island Foundation.

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Restoration webpage www.csc.noaa.gov/scoysters
Shellfish research webpage
www.mrd.dnr.state.sc.us/marine/mrri/shellfish/index.htm
Shell recycling information www.dnr.state.sc.us/marine/regs/sfrecycling.html

What we don't know about nautilus

by James B. Wood

Once, the ocean was full of externally shelled cephalopods. Two subclasses, the Nautiloidea (late Cambrian to present) and Ammonoidea (Devonian to Cretaceous) were commonly found in the world's oceans and ranged greatly in size and morphology. Today, all of the Ammonoidea are extinct. There are only two genera left (*Allonautilus*, *Nautilus*) with a total of seven species.

No one has been able to track a nautilus in the wild from hatch to maturity. In fact, no one knows where their eggs are laid in the wild. Captive nautiluses often develop buoyancy and shell formation problems. Only three places have been able to produce fertile nautilus eggs in captivity and no one has been able to raise one to maturity.

We do not know what the life span is or how long it takes a nautilus to reach maturity. We do know that these ancient mollusks drive in the slow lane, especially when compared to their modern cephalopod relatives. Most cephalopods live for about a year and die. Some, like *Idiosepius pygmaeus*, are born, grow, reproduce and die in 80 days or less. Even the giant octopus, *Enteroctopus dofleini*, only lives for about three years. Deep-sea octopuses like *Bathypolypus arcticus* may live longer. Since they are exothermic and live at 4ºC their metabolism is extremely slow. Still, most cephalopods studied to date live for about a year. Nautilus, in contrast, may live for 20 years.

Cephalopods tend towards semelparity, the life-history pattern of reproducing once and dying. Entire populations of some species exist only as eggs at certain times of the year. At times there are no adults or juveniles, just eggs. And all of them are in one basket. This strategy is the opposite of the bet-hedging strategy that many animals adopt to ameliorate the effects of environmental and ecological change. For most cephalopods, the population can rise like a phoenix from seemingly nothing during favorable conditions. In bad times they are few and fisheries based on them rapidly collapse.

Nautilus is an exception to the general cephalopod pattern here too;

these living fossils reproduce for many years although, you guessed it, no one knows how long.

Cephalopods typically produce hundreds to half a million eggs depending on species. Most of their hatchlings become food for something else. The potential is there for huge population booms when times are good. Again, nautilus is different. Once mature, nautilus only lays a few eggs each year, about 12. These eggs are huge and are among the biggest eggs relative to adult size of any animal.

The nautilus shell is beautiful and is prized by shell collectors. To a lesser degree these animals are collected for the aquarium trade. The ancient Greeks described the logarithmic spiral as "The Golden Rectangle". The ever-increasing spiral is used as a logo for many businesses as a symbol of both mathematical and aesthetic perfection.

Nautiluses are collected by trapping in parts of the world where people have to worry about their next meal even more than a graduate student. I'm not aware of any restrictions on the collecting of nautilus, but even if there were some, enforcement would be difficult.

Nautilus grows slowly, takes a relatively long time to reach maturity and lays only a few eggs. While we don't know how long they take to reach maturity, how many are out there or how many are collected from the wild, we do know that slow growth rates, a long time to maturity and low fecundity are life-history traits of an animal that will not bounce back quickly if over-exploited.

There are many "what ifs" and unknowns about nautilus. I'm unsure if they should be protected, as there are few data. If they should, will we have sufficient data to make a strong argument based on facts of population size and impact of fishing? Even then, how would we be able to enforce regulations in developing parts of the world? There is so much we don't know about nautilus, we need to learn much more.

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