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

TENTACLE

EDITORIAL

A year ago in *Tentacle* issue 22, I once again expressed my desire to step down as Editor. Well, I am still here, now after 20 years and this my 19th issue of *Tentacle*. However, I am now ably assisted by two Associate Editors, both long-time members of the Mollusc Specialist Group: Dr. Justin Gerlach and Dr. Kathryn Perez.

Justin, now based in Cambridge, UK, has for a long time been interested in the endemic land snails of oceanic islands, having completed his Ph.D. in 1994 on the ecology of the predatory snail *Euglandina rosea*, the well-known scourge of these endangered faunas. Much of his research has focused on the fauna and flora of the Seychelles, but he recently returned to Pacific island tree snails and last year published *Snailing round the South Seas – the* Partula *story* (see page 35 of this issue of *Tentacle*). Additional details of his research and other conservation activities can be found at his website.

Kathryn obtained her Ph.D. in 2005 and recently moved from the University of Wisconsin La Crosse to the University of Texas-Pan American (UTPA) in Edinburgh, Texas, USA. She has been involved primarily with North American land and freshwater snails and their conservation, but has also made a brief foray into threatened hydrobiids of the Great Artesian Basin of Australia. Kathryn has been an active and enthusiastic member of the American Malacological Society's conservation committee for a number of years. She is especially involved in public outreach and innovative education. More details can be found via her UTPA website and her personal website.

With Justin and Kathryn now helping me with much of the detailed editing and formatting of your submissions, my life has become much easier and so I will continue to act as Editor for the time being, until someone else wants to take over and modernise this perhaps rather aging newsletter. But as I have done many times before, I stress that it is especially important for the editorial team that you make every effort to format your submissions in the precise style of *Tentacle*, as explained on the following page.

Robert H. Cowie, Editor

In this issue: click on page

TENTACLE – PUBLICATION GUIDELINES AND INFORMATION

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

If you plan to submit something to *Tentacle*, please read these guidelines. Carefully following the guidelines will make the lives of the editorial team a lot easier!

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

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

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

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

Selander, R.K., Kaufman, D.W. & Ralin, R.S. 1974. Self-fertilization in the terrestrial snail *Rumina decollata*. *The Veliger* 16: 265-270.

South, A. 1992. *Terrestrial slugs: biology, ecology, and control*. Chapman and Hall, London. x + 428 p.

Cowie, R.H. & Robinson, D.G. 2003. Pathways of introduction of nonindigenous land and freshwater snails and slugs. In: *Invasive species. Vectors and management strategies* (ed. Ruiz, G.M. & Carlton, J.T.), p. 93-122. Island Press, Washington.

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

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

Membership of the Mollusc Specialist Group is by invitation. However, everyone is welcome to submit articles to *Tentacle* and to promote its distribution as widely as possible. Since I announce the publication of each new issue to all who are on my *Tentacle* e-mail distribution list, please keep me updated with your current e-mail address so that you do not drop off the list. I also announce the availability of each issue on the MOLLUSCA listserver (for details, see p. 44 of this issue of *Tentacle*) and the Unitas Malacologica members e-mail list.

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

NEWS

Extinct snail rediscovered in Seychelles

From:
http://www.iucn.org/news_homepage/all_news_by_theme/species_news/?18301/Extinct-snail-re-discovered-in-Seychelles

5 September 2014

A field expedition on Aldabra Atoll, Seychelles, has resulted in the re-discovery of the Aldabra banded snail (*Rhachistia aldabrae*), which was *declared extinct in 2007*. This snail (Fig. 1) was locally abundant in the 1970s but its numbers fell rapidly, likely due to the increasing frequency of dry years on Aldabra as a result of climate change. The last time a living individual of the species was recorded was in 1997.

The snails were found again on 23 August 2014 in dense mixed scrub of a little-visited part of Aldabra by the keen eyes of Junior Skipper Shane Brice of the *Seychelles Islands Foundation* (SIF).

"I was bush-bashing through the scrub when I spotted a mysterious snail that I'd never seen before on the island," says Shane, "I was very excited!"

"This exciting news shows that you do not need to be a highly qualified scientist to make interesting discoveries," says Dr Mary Seddon, Chair and Red List Coordinator of the IUCN Species Survival Commission (SSC) Mollusc Specialist

Fig. 1. Aerial view of Aldabra. (Photo: Foto Natura 2005) Aldabra banded snail (*Rhachistia aldabrae*). (Photos: C. Onezia, Seychelles Island Foundation)

Group. "As they are small and well camouflaged, landsnails can survive in small crevices and deep within undergrowth, and hence may be re-found after long periods when they are believed to be extinct."

On searching the area further, the SIF team located several individuals, including juveniles, which was encouraging as these young snails are considered to be particularly vulnerable to desiccation as a result of reduced rainfall and had not been recorded since 1976.

"I thought deep down, surely it can't be the endemic snail!" says Catherina Onezia, SIF Senior Ranger and Assistant Training Officer. "I only dared to believe it once I checked it out back at the office".

The team were exploring infrequently visited parts of Malabar Island, Aldabra's second largest island, when the snails were found. One of the aims of the field expedition was to document all of the invertebrates observed, but the team never dreamed that they would make such a find. The snails are unmistakeable, with beautiful elongated deep purple shells lined with bright pink bands. Identification of the snails has also been confirmed by mollusc experts Dr. Vincent Florens of the University of Mauritius and Seychellois naturalist Pat Matyot.

There is still very little known about the ecology of this rare snail but the re-discovery provides a second chance to protect and study this species in the wild and ensure that it is not lost again. Aldabra is one of the largest raised coral atolls on Earth, with an area of approximately 150 km², most of which lies only 1-2 m above sea level. Climate change impacts such as sea level rise and drought continue to be major threats throughout the snail's range. Aldabra was designated a World Heritage Site by UNESCO in 1982 and is managed and protected by the Seychelles Islands Foundation.

The atoll is a refuge for many other threatened species including the world's largest populations of Aldabra Giant Tortoises (*Geochelone gigantea*) and one of the largest congregations of nesting Green Turtles (*Chelonia mydas*) in the Indian Ocean.

The re-discovery of the Aldabra Banded Snail provides a beacon of hope. "Despite major global environmental threats like climate change, this discovery shows that investments into protecting unique island biodiversity are well-placed," says Dr Frauke Fleischer-Dogley, SIF CEO.

For further information, please contact Ms. Rowana Walton, Communications Officer at the Seychelles Island Foundation: *communications@sif.sc*

ONGOING RESEARCH INTO THE NATURAL HISTORY AND ECOLOGY OF AN ENDEMIC AND LITTLE KNOWN APPLE SNAIL FROM THE ALTO PARANÁ AND IGUAZÚ RIVERS (ARGENTINA)

By Pablo R. Martín, Silvana Burela & Fernanda M. Gurovich

Most of our knowledge of the biology and ecology of Neotropical apple snails (Ampullariidae) relates to only three species of the dozens that inhabit freshwater habitats from the Florida Peninsula (USA) to the Southern Pampas (Argentina). The worldwide interest in two of these species (*Pomacea canaliculata* and *Marisa cornuarietis*) is no doubt motivated by their invasiveness and voracious feeding habits, characteristics that have led to their intentional spread as biological control agents (for aquatic weeds and schistosome-bearing snails) and as promising aquaculture animals. Only one species, the Florida apple snail (*Pomacea paludosa*), has been intensively studied in relation to conservation concerns, but even in this case the interest has been mostly incidental as it constitutes the staple food of a U.S. Federally Endangered raptor, the snail kite, *Rostrhamus sociabilis* (Posch *et al.*, 2012). With the exception of conchological, taxonomic and nomenclatural aspects, most Neotropical apple snails are poorly known or completely unknown, although some recent studies have been gathering information on the natural history of a few species, i.e. *Pomacea bridgesii* (Coelho *et al*., 2012) [probably *P. diffusa* – ed.] and *Asolene platae* (Tiecher *et al*., 2014, in press).

On the basis of this increasing but still very fragmentary knowledge, apple snails are habitually seen as quite tough snails with a high biotic potential and an ability to thrive almost anywhere due to their dual respiration system (branchial and pulmonary), resistance to desiccation, generalist feeding habits and unpalatable and even toxic eggs. However, these generalizations may not apply to all apple snails since most of their diversity remains unexplored (Martín *et al.*, 2013).

There are 11 or 12 species of apple snails that occur within Argentina in the lower Río de la Plata basin but only five have been included in the Red List of Threatened Species (IUCN, 2014). Three of them were considered of "Least Concern" because of their presence in three countries (although they inhabit a single drainage basin or part of it) and one, the invasive *Pomacea canaliculata*, due to its wide distribution

and positive population trends (Martín *et al*., 2013). Only one species was categorized as Data Deficient, because of the lack of reliable information on its distribution, even though this state of affairs also applies to many others. The situation is at the same time better and worse on the eastern shore of the lower Río de la Plata since in República Oriental del Uruguay all ten apple snail species have been evaluated with six considered to be under threat, and therefore subjects of priority conservation (Clavijo & Scarabino, 2013).

Pomacea americanista is one of the least known species of Argentinean apple snails. It is the most recently described Argentinean apple snail species, described in 1919 by von Ihering on the basis of shells from Alto Paraná river (at Encarnación City, Paraguay) and the Iguazú Falls (type locality). Hylton Scott (1957) commented on its very restricted geographical distribution and documented some additional localities. *Pomacea americanista* was originally described in *Ampullaria* by von Ihering (1919) and later placed in the genera or subgenera *Asolene* and *Pomella* (Hylton Scott, 1957; Cowie & Thiengo, 2003). *Pomella* was recently synonymized with *Pomacea* (Hayes *et al*., 2012), based on taxonomic work on *Pomacea megastoma*. *Pomacea americanista* resembles *P. megastoma* in sharing an expanded aperture that is much bigger than the operculum and it is also treated here as a species of *Pomacea*. Anecdotal observations, the type locality, (one of the highest and more complex systems of waterfalls in the world) and the shell shape, all suggest that *P. americanista* dwells in fast-flowing water on hard substrates but little is known definitively about its natural history, distribution and conservation status, which has not yet been addressed by the IUCN.

The southernmost part of the native range of *P. americanista* has been impounded by an Argentinean-Paraguayan hydroelectric project, the Yaciretá complex, which has already been responsible for the extinction in the wild of two species of rapids-dwelling endemic snails and the total extinction of another two (Vogler *et al*., 2014). Other large dams have been or are being built in the Alto Paraná and Iguazú rivers upstream of the known range of *P. americanista*, mostly in Brasil. For instance, Guaíra Falls, located between Paraguay and Brasil, were submersed by Itaipú, the largest hydroelectric project in the world. Deforestation, intensification of land use (Fig. 1) and the consequent siltation are driving changes in organic matter and sediment inputs into aquatic communities. Invasive molluscs with high biotic potential and biofouling habits like the golden mussel *Limnoperna fortunei* are widespread and still spreading in the Rio de la Plata basin and are important threats to apple snails, especially those that dwell on hard substrates (Clavijo & Scarabino, 2013).

Our aims are to study the natural history, demography and environmental tolerance of *P. americanista* with the goal of achieving a better understanding of the factors that limit its distribution and abundance and the environmental changes that may be threatening it to help with categorization according to the IUCN criteria.

Last summer we hand-collected egg masses from a tributary of the Iguazú river (Misiones province, Argentina; Fig. 2) with

Fig. 1. Deforestation and agri-sylviculture activities in the Iguazú river basin (Misiones province, Argentina). (Source: Google Earth)

Fig. 2. Collection site of *Pomacea americanista* egg masses at Misiones province (Argentina). (Photo: Fernanda Gurovich)

the required legal permissions. The egg masses were taken to the laboratory and incubated until hatching. At hatching, 50 individuals were randomly selected as experimental individuals (Fig. 3). The snails were reared individually in 3 L aquaria under controlled conditions (water temperature, light and food; Fig. 4) and all possible aspects of their life history, including life span, copulation and egg-laying behaviour, fecundity, etc. were studied. Total shell length of the snails was measured weekly. At first, the growth rate was similar in both sexes but after some weeks it became faster in females. Once a week, all snails were pooled in a common aquarium to observe sexual activity (Fig. 4). We observed that males reached sexual maturity before females, because they tried to mount them but were rejected. Once the females began to accept males as partners in copulations (Fig. 5) they started to lay egg masses soon afterwards. Currently we are incubating all the laboratory egg masses under controlled conditions to gather data on oviposition behaviour, number of eggs per egg mass, egg size, duration of development, viability and hatchling size. Survivorship was so high that we could not obtain information on mortality (only one snail died); however, our plan is to continue the rearing process until the entire cohort dies to gather more data about this important life history trait.

During our field trips we are gathering information about the present distribution of *P. americanista* along the Paraná and Iguazú rivers. We are also planning to study museum

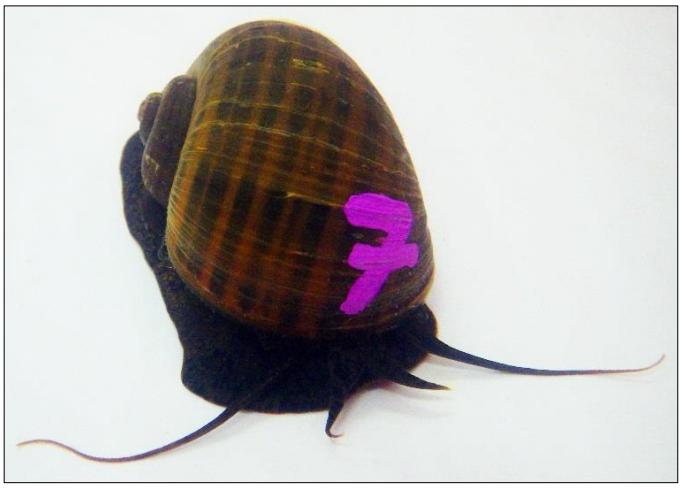

Fig. 3. *Pomacea americanista* reared at Laboratorio de Ecología (INBIOSUR). (Photo: Fernanda Gurovich)

Fig. 4. Rearing facility for *Pomacea americanista* (left) and arena for copulation (right) at the Laboratorio de Ecología (INBIOSUR). (Photos: Fernanda Gurovich)

collections to obtain information about its historical distribution in order to evaluate recent range restrictions. With the same aim we are also gathering information from ecological, archaeological and palaeontological literature to help delineate its natural range, although this task will be hindered by incorrect or dubious original identifications, a common hindrance in a family with a shell-based taxonomy and with much phenotypic plasticity in shell traits (Cowie *et al*., 2006; Estebenet *et al*., 2006).

Recent reviews have emphasized apple snails as invaders and pests (Joshi & Sebastian, 2006; Horgan *et al*., 2014) but also as promising evolutionary and genomic models for scientific research (Hayes *et al*., 2009, in press). However, from a conservation viewpoint apple snails have been seen mostly as trouble-makers (e.g. Burlakova *et al*., 2008; EFSA, 2014). Nevertheless, they also deserve to be studied as vulnerable species (Clavijo & Scarabino, 2013; Martín *et al*., 2013), providers of ecosystem services (Hayes *et al*., in press) and for their potential role in biotic resistance against invasive aquatic weeds (Morrison & Hay, 2011) and snails (Maldonado & Martín, 2014). Hopefully, in the future there will be a change in the way researchers, conservation managers and the general public view these interesting snails and in their attitudes toward them.

Our research on *P. americanista* and other species of apple snails is funded by grants from the Universidad Nacional del Sur (UNS, PGI24/B185) and the Agencia Nacional de Promoción Científica y Tecnológica (ANPCyT, PICT 2012-1956), and through a five-year doctoral scholarship granted by the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) to Fernanda M. Gurovich to study the biology and ecology of *P. americanista*.

Fig. 5. *Pomacea americanista* pair in copulation at Laboratorio de Ecología (INBIOSUR). (Photo: Fernanda Gurovich)

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CANADA'S LIST OF AT-RISK MOLLUSCS LENGTHENS

By Dwayne A.W. Lepitzki

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), a group of species and conservation experts, is the independent body that assigns conservation status to species using the IUCN criteria and recommends listing and legal protection under the Canadian Species at Risk Act (see *Tentacle* 21 for details). In 2014, two molluscs were reassessed by COSEWIC and another was assessed for the first time.

Fig. 1. Dromedary jumping-slug (*Hemphillia dromedarius*). (Photo: Kristiina Ovaska)

Round pigtoe (*Pleurobema sintoxia*), a freshwater mussel confined in Canada to four watersheds in southern Ontario, was originally assessed as Endangered in May 2004. According to the Species at Risk Act, at-risk species should be reassessed by COSEWIC every 10 years. In May 2014, the status of Endangered was confirmed. Urban development, agricultural runoff and impacts from introduced dreissenid mussels (Zebra mussel *Dreissena polymorpha* and Quagga mussel *D. rostriformis bugensis*) and Round goby (*Neogobius melanostomus*) fish continue to threaten its survival in Canada.

The Dromedary jumping-slug (*Hemphillia dromedarius*) (Fig. 1) was originally assessed as Threatened in May 2003. It was reassessed as Threatened in May 2014. This relatively large slug, up to 6 cm when fully extended, was undeservedly a finalist in the 2013 Ugly Animal Preservation Society's contest but thankfully, did not win. This charismatic microfaunal species is known from fewer than 20 sites on southern Vancouver Island, British Columbia, despite a great deal of searching. The species' global range does extend southward into Washington State and extreme northwestern Oregon. Its Canadian west coast habitat, moist, older-growth (> 80 years old) forests, is fragmented by logging and threatened with the increasing frequency and severity of droughts associated with climate change.

The new species added to the COSEWIC list of at-risk molluscs is the Broad-banded forestsnail (*Allogona profunda*). In Canada, this large (shell diameter up to 3 cm) snail is known to occur currently only on Pelee Island in Lake Erie and in Point Pelee National Park, along the north shore of the same Great Lake. It was the first terrestrial mollusc outside British Columbia to be assessed as at-risk by COSEWIC. Its disappearance from neighbouring islands around Point Pelee was probably caused by over-abundant nesting Double-crested cormorants (*Phalacrocorax auritus*) (Fig. 2). Its small Canadian range and the continuing threats of shoreline erosion caused by climate change and shoreline development, trampling from recreational activities and predation by non-

Fig. 2. Middle Sister Island, Lake Erie, Ontario, formerly inhabited by the Broad-banded forestsnail (*Allogona profunda)*. The Double-crested Cormorant nests in the trees and absence of living herbaceous layer are clearly seen. (Photo: Robert Foster, 20 April 2013)

native, introduced wild turkeys (*Meleagris gallopavo)* resulted in a status of Endangered.

More information on COSEWIC can be found at http://www.cosewic.gc.ca. The finalized new status reports for the reassessed species should be available on the SARA Public Registry (www.sararegistry.gc.ca) soon; the previous reports are currently posted. The status report on Broad-banded forestsnail should be available publically after September 2015.

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THE DISCOVERY AND POSSIBLE EXTINCTION OF A *LEIOSTRACUS* LAND SNAIL IN SOUTHEASTERN BRASIL

By Rodrigo B. Salvador & Luiz R. L. Simone

The southeastern region of Brasil is historically the most explored and exploited in the country; its natural covering was fiercely degraded throughout the few centuries of the country's history. However, many new discoveries still seem to wait in the remnants of the Atlantic forest, especially regarding the little studied terrestrial molluscan fauna. An expedition by shell dealer José Coltro Jr. and his team in May 2012 to the region of Nanuque, in northern Minas Gerais state (Fig. 1), managed to recover many land snails. Part of this material was donated to the collection of the Museu de Zoologia da Universidade de São Paulo (MZSP, São Paulo, Brasil) and was studied by us (manuscript recently submitted). As a testament to the incomplete knowledge of the Brasilian fauna, some of the animals recovered represent new species.

One of these new species is a striking *Leiostracus* snail (Pulmonata: Bulimulidae), the shell of which bears spiral bands of black, brown, yellow and/or red colour (Fig. 2).

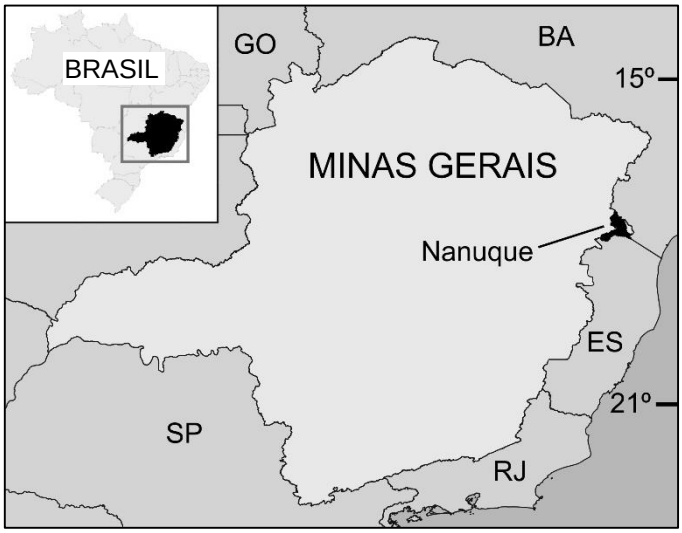

Fig 1. Map showing the municipality of Nanuque, in Minas Gerais state. Abbreviations of the neighboring states: BA, Bahia; GO, Goiás; ES, Espírito Santo; RJ, Rio de Janeiro; SP, São Paulo.

Fig. 2. *Leiostracus* sp. nov., living specimen (MZSP 106178; shell length ca. 24 mm).

Shells with distinct colour patterns are not uncommon in the genus, but they usually consist only of varying tones of yellow and brown (e.g. Simone, 2006; Salvador & Cavallari, 2013). A fair number of specimens was collected (15 living and 24 empty shells), which allowed us to study the anatomical features of this new species and to have a good idea of the amount of variation in the colour pattern of the shells. This pattern is extremely variable, with three main variants over a white base: 1) one broad spiral red or reddish brown band on the middle portion of the whorl (flanked by one or two lines of brownish dots), a more basal dark brown or black spiral band and a red or brown spiral band surrounding the umbilicus (Figs. 3A, B); 2) spire almost lacking white regions and with a very thick orange spiral band on the middle portion of the whorl, flanked by lines of brownish dots, with several spiral bands below it (from top to bottom: yellow band superimposed on the above-mentioned line of brownish dots; dark brown or black band; another thick orange band; and, finally, a red band surrounding the umbilicus) (Figs. 3C, D); 3) spire almost lacking white regions and with a very thick spiral dark brown to black band and, below it, a single line of brownish dots, followed by a greater white portion and two more basal dark brown or black spiral bands, one of them

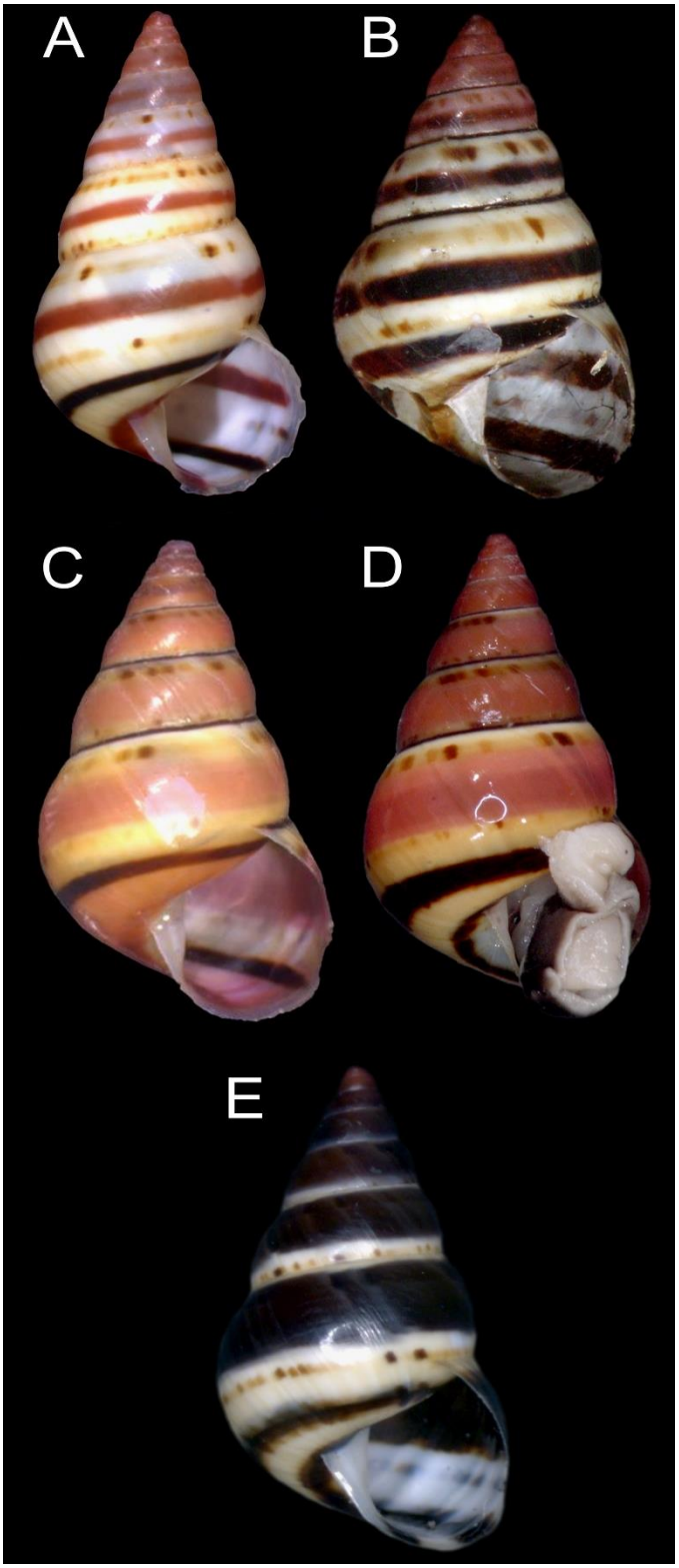

Fig. 3. Variation of shell colour patterns of *Leiostracus* sp. nov. A. MZSP 106177, shell length ca. 25 mm. B. MZSP 106179, shell length ca. 23 mm. C. MZSP 106178, shell length ca. 21 mm. D. MZSP 106178, shell length ca. 23 mm. E. MZSP 106179, shell length ca. 23 mm.

surrounding the umbilicus (Fig. E). Conchologically and anatomically, *Leiostracus* sp. nov. shows the normal features seen in Bulimulidae (Breure & Schouten, 1985), but with a few remarkable anatomical features that will be further explored in our forthcoming paper. These snails are usually found on trees or tall bushes and it remains unknown whether their remarkable colour pattern is related to camouflage, aposematism or if it indeed plays any role in the animals' lives at all (although it should be noted that many specimens show signs of predation by birds).

The precise collection locality is a very small fragment of Atlantic rainforest in the vicinity of the city of Nanuque, close to the Mucuri River and surrounded by tomato crops. A couple of weeks after our manuscript was submitted, we spoke to the collector, J. Coltro, again. This time, he brought us very alarming news: he and his team had returned to the collection locality in Nanuque, only to discover that the forest fragment had been devastated in order to open space for either more crops or for livestock. Whether the new species we were describing in the manuscript, including the striking *Leiostracus* depicted here, have already become extinct remains to be seen, as they may still thrive unknown and undisturbed in other localities; but it is not unusual for land snails to show very restricted geographical ranges. This story serves as a clear reminder that many species are becoming extinct even before becoming known to science, a situation that might be most dire for land and freshwater snails, the group of animals deemed the most imperiled and with the highest extinction rates (Lydeard *et al*., 2004; Régnier *et al*., 2008).

The rainforest around Nanuque, in particular, has been severely degraded since the final decades of the 19th century by incessant woodcutting, crop and livestock production and the construction of railroads and highways (Cerqueira Neto, 2005; Martins, 2010). In many cases the sparse remnants of Atlantic forest are centers of diversity and perhaps even endemism, and might act as refuges for many species (e.g. Salvador & Simone, 2015). These forest fragments clearly require protection and appropriate legislation. Knowledge of the local fauna of each site is usually the first step towards this goal, but sometimes scientific progress is much more snail-paced than agriculture and industry and, thus, more proactive protection measures might be required.

We are deeply grateful to José Coltro Jr. (Femorale) for donating this amazing material for study (and also for sharing the dire news of the locality's destruction) and to Carlo M. Cunha (now at the Academy of Natural Sciences in Philadelphia) for the photo of the living snail.

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ACTIVE CONSERVATION OF THREATENED INDIGENOUS LAND SNAILS IN THE URBAN AREA OF JOINVILLE, SANTA CATARINA STATE, CENTRAL SOUTHERN BRASIL

By A. Ignacio Agudo-Padrón & Jefferson Souza da Luz

Among the most notable terrestrial molluscs occurring in the State of Santa Catarina, the small central portion of southern Brasil (Fig. 1), are the giant land snails of the genus *Megalobulimus*. The 13 confirmed species (Agudo-Padrón, 2014) are severely endangered mainly because of human activities causing rapid changes in the natural environment.

In the light of this, a nursery of native giant forest snails, *Megalobulimus paranaguensis* (Pilsbry & Ihering, 1900), was created in the city of Joinville (Fig. 2) by Mozart de Souza, following the discovery in the region of a natural population (26-27 August 2013) and the opportune rescue of seven adult specimens that still survived in heavily degraded wasteland in the northern section of the city (Fig. 2).

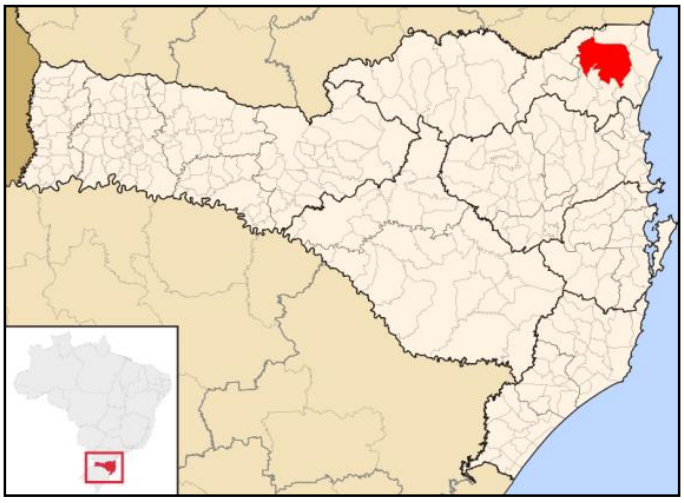

Fig. 1. Santa Catarina State, central southern Brasil, with the municipal district of Joinville in red.

Fig. 2. Some of the local specimens of *Megalobulimus paranaguensis* (Pilsbry & Ihering, 1900) rescued and kept in the nursery. (Photos: Mozart de Souza)

The finding provides a new locality record for the species in the state, where it had previously only been confirmed in the neighboring municipal district of Garuva (Agudo-Padrón *et al*., 2013), as well as representing an unprecedented expansion of its range in Brasil (Miranda *et al*., 2014).

The nursery project aims to ensure the perpetuation of the natural population of the species in this region (Fig. 3) through planned reintroduction in permanent protected areas (municipal forest gardens) within the city as well as in other places to be determined during the course of the work.

Fig. 3. Aspects of the "urban nursery" implemented in Joinville city, with successful seasonal birth of hatchlings from eggs laid by adult specimens rescued. **(**Photos: Mozart de Souza)

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NEW DATA ON *CERION TRIDENTATUM ROCAI*, LOCALLY ENDEMIC TO BOCA CIEGA, LA HABANA, CUBA

By Alexis Suárez Torres & José Martínez Guerra

The finding of a new population of *Cerion tridentatum rocai* Clench & Aguayo, 1953, on the Itabo River bank, in Boca Ciega, Havana, Cuba, approximately 4 km west of the type locality, allows us to determine the actual range of the species. This increases the biological value of the Protected Natural Landscape Laguna del Cobre-Itabo area to which the species is restricted.

For a long time, the existence of a small population of this mollusc near the Hotel Itabo was known, but it had not been identified. A recent visit to the locality enabled us to recognize the subspecies and to determine its range.

The subspecies *C. tridentatum rocai* was previously only known from its original description, which mentioned the possible disappearance of the populations that were localized around the bank of the briny lagoons in Guanabo (Clench & Aguayo, 1953). These lagoons were drained for settlement expansion in the early 20th century.

In the coastal zone from Guanabo to Boca Ciega, conditions are favourable for the development of cerionid populations because of the diverse patches of vegetation that exist. However, their presence had not been confirmed until a small population was found near Hotel Itabo.

This population, limited to an area no bigger than 10 square metres, was only known to the people who work at the protected area some 60 metres west of the public area at the Hotel Itabo. This area has been unoccupied for approximately ten years and, during this time, had been undisturbed by human development. The molluscs are in the grass growing in the shade near the mangrove swamp, and on the trunks of coconut palms (Figs. 1, 2).

A more detailed inspection around the area allowed us to discern that the population has a wider range, including among the *Coccoloba uvifera* plants growing near the river. The species avoids the direct, harsh coastal conditions as they are found only between the vegetation and the coast on the leeward side. It differs characteristically from *Cerion tridentatum tridentatum* Pilsbry & Vanatta, 1895, which lives in the vegetation growing in the shore crag on the actual coast, at Rincón de Guanabo, La Habana.

Figs. 1, 2. Habitat of *C. tridentatum rocai*.

It is possible that *C. tridentatum rocai* originally had a wider distribution, including the unidentified type locality. The present population may have been the only one to survive the fragmentation of its habitat, or it may represent a peripheral population that moved, colonizing this new habitat. It is very interesting to have found this population near the river bank; perhaps the characteristics that prevail in this ecosystem are those that are needed to support the population, resembling the existing conditions that had existed near the lost briny lagoons.

It is recommended that this species and its habitat should be added to the programs and plans for the protected area, such as the conservation plan, established under the legal decree number 201: "Sistema nacional de áreas protegidas" of 23 December 1999; law number 85: "*Ley Forestal*"; decree-law number 136: "*Del patrimonio forestal y fauna silvestre y sus contravenciones*". Also, ecological monitoring to minimize the factors that could threaten this range restricted endemic cerionid is recommended.

We are grateful to Ideawild for its support of the investigative work, to Nancy Galdo for revision of the English version, to Gladys Gil who helped in the research, to Alejandro

Fernández for critical revision of the text and to Esteban Gutiérrez who has been keeping abreast of this investigation.

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SMALL ACTIONS MAKING BIG DIFFERENCES: RESCUE OF SMALL NATIVE ARBOREAL SNAILS IN AN URBAN AREA OF FLORIANÓPOLIS, SANTA CATARINA STATE, CENTRAL SOUTHERN BRASIL

By A. Ignacio Agudo-Padrón

The distruction of natural habitats (removal of remaining native forests, for example) as a result of rampant urban advancement is now the main anthropogenic factor leading to extinction of several species of continental molluscs in southern Brasil. This is especially the case in coastal and slope areas.

However, there are critical areas with isolated green remnants in the middle of the urban chaos. There it is still possible to find representatives of some of the native regional malacofauna.

Such is the case, briefly described here, in the southern zone of the municipal district in the mainland sector of the city of Florianópolis (Fig. 1). Specifically in the so-called "Bairro Capoeiras" we recently executed a silent but active race against time. The "Barrio Capoeiras" has a long history of disturbance; its name (translating as the Barns Quarter) derives from the neighbourhhod being created in the 19th century from the extensive low-forest fields, "capoeiras" (barns). From the 19th century the first residences began to appear along the current Rua Santos Saraiva. Commercially, this street was the most important link between Florianópolis and the rest of the state, and allowed travellers and traders access from the mainland. In addition there were pastures for

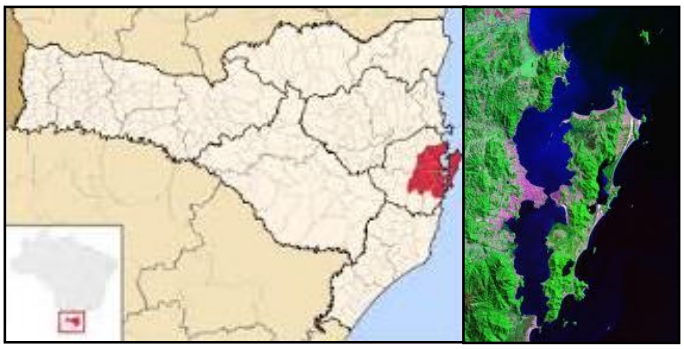

Fig. 1. Location of the municipal district of Florianópolis (red) in Santa Catarina State (left); the "Bairro Capoeiras" (pink) in the eastern zone of the district (right).

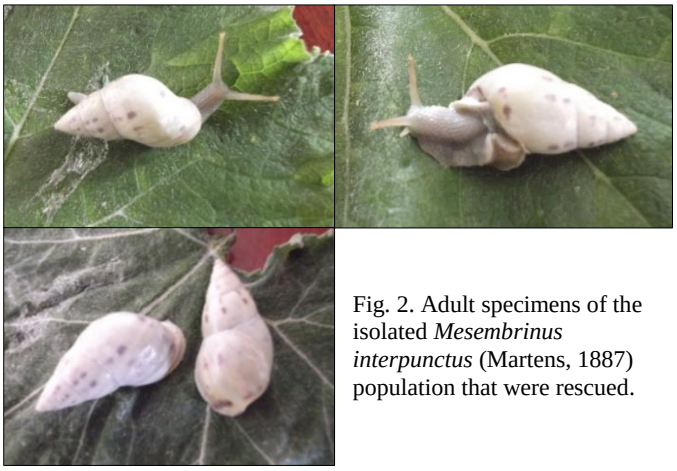

Fig. 2. Adult specimens of the isolated *Mesembrinus interpunctus* (Martens, 1887) population that were rescued.

livestock and several slaughterhouses for selling beef to the traders of central Florianópolis, functions that were common in the neighborhood until the 1960s. From this decade urban growth began and the end of the 1970s saw the construction of the first condominiums.

On 5 October 2014, a humid day with high winds, six specimens (two adult and four juvenile) of the typical native forest snail species *Mesembrinus interpunctus* (Martens, 1887) (Bulimulidae, Orthalicidae) (Fig. 2) were unexpectedly detected by us above a wall enclosing an area of obviously abandoned ground, populated by some medium-sized trees and high herbaceous vegetation (Fig. 3).

On the same day we were told that the ground would soon be the subject of a construction project to build a small residential condominium. Its natural vegetation cover and accompanying faunistic biota were doomed.

From that moment, and in a short period of nine consecutive days, we executed an individual monitoring effort and the systematic removal of all the native arboreal snails found at the site. The specimens collected were immediately transferred to a safe place, however temporary – a greenhouse in a backyard that reproduces the basic conditions of a forest (Fig. 4).

Fig. 3. Original site of the isolated population of *Mesembrinus interpunctus* in the "Bairro Capoeiras".

Fig. 4. Forest environment (greenhouse) to which the isolated population of *Mesembrinus interpunctus* was temporarily transferred.

In the course of the rescue work a parallel malacofauna survey of the site found a basically invasive alien fauna of typically synanthropic species (3 slugs and 2 small terrestrial snails) and a few native veronicellid slugs.

By the end, a lot comprising 67 individuals of *Mesembrinus interpunctus* of diverse sizes and developmental stages had been rescued. All of these were to be transferred to the protected environment of the "Bosque Vereador Pedro Medeiros" after a period of acclimatization. This is a remnant of forest in the nearby neighborhood of "Estreito", where the species has previously been recorded, along with other native forms (Agudo-Padrón & Luz, 2014).

As expected, finally the remaining vegetation in the monitored site was totally destroyed by the construction works. However, the rescued local population of *Mesembrinus interpunctus* managed to survive in the release area, opening up the possibility of its perpetuation in the region.

For more complete and detailed information, please contact the author of this report.

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MOLLUSCS INTERCEPTED AT THE BORDERS OF ISRAEL IN 2014

By Svetlana Vaisman & Henk K. Mienis

Israel is probably the only country in the world where the entire phylum Mollusca is protected by law. Not only living molluscs but also their empty shells are covered by that law. Collecting, rearing, trading and so on is only possible by obtaining a permit issued by the Israel Nature and National Parks Protection Authority.

At first glance it looks as if the molluscs in Israel have VIP status, yet they are constantly endangered by changes in their habitats and recurring cases of pollution. This has led already to the extinction of quite a number of land and freshwater molluscs (Mienis, 2009a).

The constant arrival of alien mollusc species in the form of illegal imports for the aquarium trade or hitchhikers on a large variety of commodities has only worsened the situation faced by local species. In many instances allochthonous species have completely replaced autochthonous species. For example, if a student is asked to bring snails and/or slugs living in their parents' or neighbours' garden to school, 80-90 % are of foreign origin. The same is true for lawns, parks, ponds and lakes in urban areas. To give only a few examples: *Cornu aspersum*, *Eobania vermiculata*, *Prietocella barbara* and *Lehmannia valentiana*, all introduced species, are the most abundant garden snails and slugs seen in Israel. Most aquatic habitats in Israel are dominated by the permanent presence of *Physella acuta* often accompanied by *Pseudosuccinea columella* and *Planorbella duryi*, all species of North American origin. In all these cases, on land and in the water, these aliens replace local species.

The only organization in Israel that can curb the constant influx of additional allochthonous species is the Plant Protection and Inspection Services (PPIS) of the Ministry of Agriculture, stationed at the borders of Israel. Although their main function is to prevent the import of agricultural pests they also prevent the introduction of possible alien faunal and floral elements that may endanger or alter the biodiversity of Israel. As such it is an important tool in the conservation of the local mollusc fauna of Israel.

Inspectors of the PPIS stationed at Ben Gurion Airport near Lod, the Mediterranean harbours of Haifa and Ashdod and the border crossing with Jordan near the Allenby Bridge (King Hussein Bridge) have each provided in 2014 (as of the time of writing) one sample of intercepted land and freshwater molluscs.

The material was handed over to Mrs. Svetlana Vaisman of the mollusc identification unit of the PPIS in Bet Dagan. She brought the samples to Mr. Henk K. Mienis for final verification and permanent storage in the mollusc collection of the Steinhardt Museum of Natural History and National Research Center of Tel Aviv University.

The four samples arrived from three countries: France (2), Jordan (1) and Thailand (1), and contained nine taxa: six species of terrestrial snails and three species of freshwater snails (Table 1).

Regarding terrestrial snails, the import of apples (*Malus* species, mainly of the variety Pink Lady) from France is often accompanied by the discovery of land snails in the pedicel notch. That notch forms an excellent hideout for snails. *Cernuella virgata* was intercepted from a container with 22.4 tons of apples that had arrived in the harbour of Ashdod. This hygromiid species has been intercepted before in a shipment

Table 1. Molluscs intercepted at the borders of Israel in 2014.

Date	Species intercepted (number of specimens)	Origin	Shipment
9 January	*Cernuella virgata* (1)	France	apples
26 January	*Monacha obstructa* (1) *Helix engaddensis* (1) *Levantina spiriplana caesareana* (1)	Jordan	luggage
9 April	*Filopaludina m. martensi* (~360) *Filopaludina javanica continentalis* (~40) *Pomacea canaliculata* (79)	Thailand	luggage
26 May	*Oxyloma elegans* (4) *Cochlicopa lubrica* (1)	France	apples

of apples arriving from France. In that case the entire shipment, more than 23 tons, was returned to France because *Cernuella virgata* is considered a serious agricultural pest in areas with a Mediterranean climate (Mienis & Vaisman, 2010). Also in the current case the shipment of apples was returned to France.

A second shipment of apples that arrived in Haifa contained three specimens of *Oxyloma elegans*, a species that is also known to occur in Israel naturally, and one specimen of *Cochlicopa lubrica*, which has never been encountered before in Israel. The latter is a Holarctic species and it is doubtful whether it can establish a viable population under natural conditions in Israel.

The three living snails of as many species found in the luggage of a Chinese tourist crossing the Jordanian-Israeli border were confiscated because all molluscs (alive or dead) are protected by law in Israel as soon as they enter the country. The import, transfer, sale or any other handling of molluscs in Israel without a permit is strictly forbidden. We do not know what the Chinese tourist intended to do with the snails.

Regarding freshwater snails, an inspector of the PPIS stationed in the arrival hall at Ben Gurion Airport discovered in the luggage of a temporary worker from Thailand several plastic bags filled with 4.6 kg of living freshwater snails. He brought the snails to Israel with the intention of growing them for food. In this sample, the apple snail *Pomacea canaliculata* was represented by 79 specimens. All the other snails, several hundred (!), belonged to the genus *Filopaludina*. The majority (90 % or about 360 specimens) belonged to *Filopaludina martensi martensi*, which not only had been intercepted several times in the past (Mienis, 2009b) but also has been found recently in a commercial pond and aquarium fish centre in Tel Mond, Israel (where temporary Thai workers are employed!). The remaining 10 % (or about 40 specimens) belonged to *Filopaludina javanica continentalis*, which has never been seen before in Israel.

Both *Filopaludina* species are well known intermediate hosts of Echinostomatidae, which may cause severe infections in humans (Brandt, 1974). Not only from a legal but also from a medical and zoological point of view it is prohibited to import such snails into Israel.

We thank the inspectors of the Plant Protection and Inspection Services of the Ministry of Agriculture for supplying us with the material discussed.

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NEW RECORDS OF ROCK DWELLING MOLLUSCS AT RISK FROM TOURIST DEVELOPMENTS ON THE COASTAL ZONE OF PESQUERO NUEVO, HOLGUÍN, CUBA

By Alejandro Fernández, Alexis Suarez & Steffen Franke

The diversity of terrestrial molluscs in the coastal area at Holguín is notable, especially in the families Cerionidae and Annulariidae (González, 2008).

In 1990 the impetuous development of sun and beach tourism in Holguín province started and continued in the 21st century (CISAT-GAMMA S. A., 2012). The coastal landscapes have changed and these habitat disturbances have evidently had an impact on the terrestrial molluscs.

The poorly known local endemic species should have a major significance as a conservation focus. There is previous work on land snails in Pesquero Nuevo (ENIA, 1997; Fernández *et al*., 2000), but rock dwelling molluscs of the genus *Chondropoma* Pfeiffer, 1847, in Pesquero Nuevo were not previously recorded. Our goal was to expand the knowledge of the geographical distribution of the rock dwelling molluscs in support of biodiversity conservation.

The sampling area included the shore vegetation (between the shore and the rocky vegetation complex), the ecotonal evergreen forest zone and the internal lagoons. The following locations were sampled: 1) Punta Linguete, microphyllous evergreen forest (dry forest); 2) Estero, microphyllous evergreen forest (dry forest); and 3) Punta Esterito, sandy coastal vegetation complex (strand vegetation) and rocky substrate, in Pesquero Nuevo, Rafael Freyre municipality (Fig. 1). Field work was carried out from 26 February to 8 March 2014. The sampling unit was 1 m^2, and 15 samples were taken at each site, taken at random. Only adult specimens were

Fig. 1. Three sampling sites on Playa Pesquero Nuevo: 1. Punta Linguete; 2. Estero; 3. Punta Esterito. Aerial view, tourist area with International Hotels.

counted individually. The vegetation types follow criteria established by Capote & Berazain (1984).

At sites 1, 2 and 3 the following species of rock dwellers were recorded for the first time: *Chondropoma solidulum vitaense* Torre & Bartsch, 1938 (sites 1, 2 and 3) and *Limadora garciana sillaensis* (Torre & Bartsch, 1942) (Annulariidae) (site 2) (Fig. 2). At site 3 one population of *Cerion torrei ornatum* Blanes in Pilsbry & Vanata, 1898 (Cerionidae) (Fig. 3) was found. This last species is considered an inhabitant of the sandy coastal zone; most specimens were seen on *Coccoloba uvifera* (L.) (sea grape) and others were found on *Metopium toxiferum* (L.) Krug & Urb. (poison tree, poison wood).

Chondropoma solidulum (Gundlach in Pfeiffer, 1860), a regional endemic (Holguín and Guantanamo province) of the eastern part of Cuba, includes seven described subspecies (Espinosa & Ortea, 1999), among them *C. solidulum vitaense*, previously known only from Bahía de Vita, being a new record for Pesquero Nuevo. Living specimens were always found on well-developed karstic rocks and among isolated calcareous rocks. The population density of adults in different sites varied from 0 to 8 individuals/m^2.

Chondropoma s. vitaense had a wider distribution, being found at all sites, but *Limadora garciana sillaensis* was only found at one site, and in low abundance (two adult specimens in 15 m^2).

Limadora garciana (Aguayo, 1932), known from a few localities in Holguín province: Sao Arriba (Holguín), Loma el Catey, Loma Punta Alta (Banes) and Silla de Gibara (Santa Lucia) (Espinosa & Ortea, 1999); this is a first record for the

Fig. 2. Left: *Limadora garciana sillaensis*; right: *Chondropoma solidulum vitaense* (scale mm).

Fig. 3 *Cerion torrei ornatum* on trunk of sea grape.

coastal zone, and its geographical distribution is now expanded.

At site 1, other rocky dwelling molluscs had previously been recorded: *Microceramus angulosus* (Gundlach in Pfeiffer, 1857) (Urocoptidae) (Fernández & Franke, 2008) and *Eutrochatella (Microviana) spinopoma* Aguayo, 1943 (Helicinidae) (Richling *et al*., 2007).

All these species are threatened because the calcareous rocks are removed and used to make stone walls, disturbing the microhabitat. The micro-distribution of terrestrial molluscs using rocky substrata is important when balancing tourism development and conservation.

In the sandy coast vegetation complex (site 3: Punta Esterito, West) *Cerion torrei ornatum* was found. Although it is not a rock dweller, it could be affected by construction activities in the area.

Consequently, if we are interested in the conservation of these species, the limits of their micro-distribution should be marked and monitored and then the habitat should be restored by means of the following actions:

- Maintain controlled access by means of informative signposting;
- preserve the current state of the sandy coast and rocky coast vegetation complexes and avoid plant cutting to preserve the structure and composition of the habitat, use natural paths inside the forest, constructing a footbridge to reach the shore without affecting the molluscs of the locality;
- do not remove calcareous rocks from their original sites;
- replant the forest with autochthonous plant species, that correspond to the original vegetation complex;
- establish measures against forest fires and implement other environmental regulations;

- take into account the load capacity in the tourist area.

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NEW LOCALITY FOR *LIGUUS FASCIATUS* (MÜLLER, 1774) FROM THE ISLAND OF YOUTH, CUBA

By Jane Herrera Uria

The Cuban terrestrial malacofauna is characterized by its high number of species and percentage of endemism. According to Espinosa & Ortea (2009), the genus *Liguus* Montfort, 1810 (Gastropoda: Orthalicidae) is represented by three endemic species: *L. blainianus* (Poey, 1851), *L. flammellus* Clench, 1934 and *L. vittatus* (Swainson, 1822). *Liguus fasciatus* (Müller, 1774) is found in Cuba and the Florida Peninsula. This genus also includes *L. virgineus* (Linnaeus, 1767) from La Española.

The most restricted of all is *L. flammellus*, with seven subspecies, restricted to Viñales Park in Pinar del Río Province. Shells are slender, covered with many flammations, and the length is 40-50 mm. There are four subspecies of *L. vittatus*. These are common from Cabo Cruz to Ensenada de Mora in Granma Province; shells are 40-45 mm long and differ in having white, yellow and brown wide bands. *Liguus blainianus* has ten subspecies and their distribution is more extensive: Pinar del Río, Artemisa, Mayabeque and La Habana Provinces; the length is 35-45 mm, and the distinctive character is the black tip of the shell.

Liguus fasciatus was described by Müller in 1774 as a marine mollusc in the genus *Buccinum* Linnaeus, 1758. This is the species of *Liguus* with the broadest distribution, it is the most abundant and has the greatest variability in colour and pattern. At present there are around 80 Cuban subspecies and 60 in the Florida Peninsula and adjacent keys.

The Island of Youth (IY) (in Spanish, Isla de la Juventud), formerly known as the Isle of Pines, is the biggest island of the Canarreos Archipelago (2,202 km^2). It is located to the southwest of Cuba, and is divided into two large zones by the Ciénaga de Lanier. In the last century, five subspecies of *Liguus fasciatus* were reported from IY. In 1934, William J. Clench described two from Punta del Este (Clench, 1934). Later, in 1954, Miguel L. Jaume described the other three (Jaume, 1954), two from Faro de Carapachibey and one from Sierra de Caballos (Table 1). The taxonomic status of these subspecies must be revised because they seem to contradict the concept of subspecies.

Table 1. Subspecies of *Liguus fasciatus* from IY, Cuba.

Species	Holotype	Type locality
Liguus fasciatus torrei Clench, 1934	Museum of Comparative Zoology (MCZ), Harvard, USA, no. 58805 (Fig. 1A).	Punta del Este, IY, Cuba.
Liguus fasciatus pinarensis Clench, 1934	MCZ, Harvard, USA, no. 58806 (Fig. 1B).	Punta del Este, IY, Cuba.
Liguus fasciatus evangelistaense Jaume, 1954	Instituto de Ecología y Sistemática (IES), La Habana, Cuba, no. 25306 (Fig. 1C).	Faro de Carapachibey, IY, Cuba.
Liguus fasciatus pharius Jaume, 1954	IES, La Habana, Cuba, no. 25309 (Fig. 1D).	Faro de Carapachibey, IY, Cuba.
Liguus fasciatus caballosense Jaume, 1954	IES, La Habana, Cuba, no. 25296 (Fig. 1E).	Sierra de Caballos, IY, Cuba.

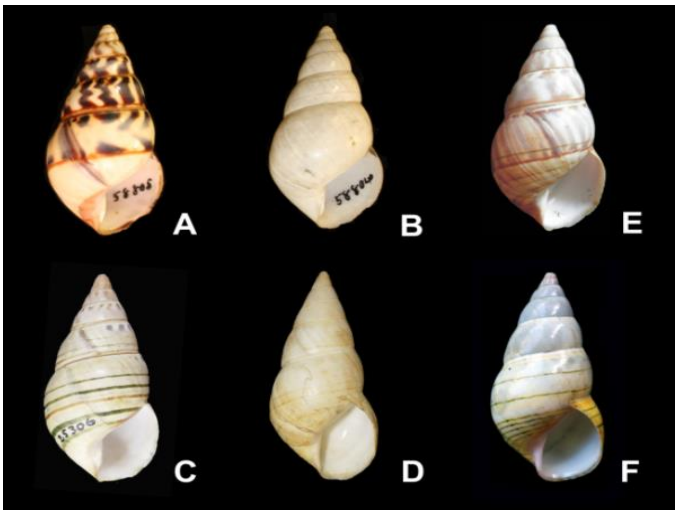

Fig. 1. Subspecies of *Liguus* from IY, Cuba. Labels as in Table 1.

Fig. 2. Map of Sierra de las Casas in IY.

Sierra de las Casas is located in the north of IY (Fig. 2). These mountains are a protected area (Protected Natural Landscape) and have the highest percentage of endemic terrestrial snails of the Island of Youth. During June to October 2014, we made three field expeditions to this locality. We found a new population of *L. fasciatus* (Fig. 1F), with specimens corresponding to the morph known as *L. fasciatus crenatus* (Swainson, 1821). This pattern of colours is present in many localities of Cuba: shell completely white with periostracal green lines; after death of the snail these lines disappear. A phylogenetic revision is necessary to clarify the taxonomic status of all subspecies of *Liguus fasciatus*, particularly those of the Island of Youth.

We thank the Rufford Foundation for the Rufford Small Grant that has been very important in support of the field work. We thank Dr. José Espinosa for reading the manuscript and making helpful suggestions. Also we thank Adam Baldinger, Collection Manager of Malacology at the Museum of Comparative Zoology for the photos of the holotypes A and B.

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SMALL STEPS TOWARDS THE CONSERVATION STATUS ASSESEMENT OF *DROBACIA BANATICA* IN ROMANIA

By Voichița Gheoca

Drobacia banatica (also reported as *Chilostoma banaticum*, *Helicigona banatica*, *Chilostoma banatica*), the Banat rock snail (Fig.1), is one of the four land snail species from Romania included in Annex II of the Council of the European

Fig. 1. *Drobacia banatica* – juvenile (upper image) and adults from Vișișoara, Brașov.

Communities Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive).

A quaternary relict, considered the most common species of the interglacials (Lozek, 1964), *D. banatica* had a much wider distribution across Europe in the preglacial period, but its current natural range is limited to Romania, Hungary and Ukraine. It has been introduced to Germany (Clauss, 1979), and possibly other European countries (Domokos, 2004).

The species' centre of distribution is the western part of Romania – Banat and Crișana (Bába, 1982, Grossu, 1983), where the most representative populations are found. In Hungary the species' distribution is limited to several locations in the eastern part of the country, in the Tisa, Mureș and Criș river valleys. The Hungarian populations are considered to have Romanian origins, as the species was transported along the river valleys before river regulations were in place (Bába & Kondorossy, 1995; Gheoca, 2011). In fact, the first report of *D. banatica* in Hungary dates back to 1935 and is supposed to be a shell transported along with alluvial deposits by the Mureș River from the Arad area (Czógler, 1914-1936, as cited by Baba & Kondorossy, 1995).

Historically in Romania, the species is known to have inhabited the western and southern Carpathians and subcarpathian area from the Tibles Mountains in the north to the Aninei Mountains in the south and the Ciucas Mountains in the east (Bielz, 1867; Grossu, 1955, 1983, 1993). In the southern part of the southern Carpathians it descends along the river valleys and reaches the subcarpathian area. Some of the populations from the Apuseni Mountains are considered by Grossu as a distinct species, *Drobacia maeotica*, but Lengyel & Páll-Gergely (2010) consider the smaller individuals from

these populations to be *D. banatica*, based on their identical anatomical characteristics and the presence of intermediate individuals.

In Romania, *D. banatica* is relatively eurybiotic. The species lives mainly along the river valleys from the mountain area to the plain, mostly at medium elevations. It is a hygrophilous macrophagous species, preferring forested areas, shrubs or at least abundant herbaceous vegetation with scattered trees in the proximity of a water source, including parks, gardens, roadsides and railway embankments. The snail is generally found in the litter, under stones, among rotten wood and logs, on rocks, on plants and on the soil surface. It seems to be quite resistant to human disturbance, able to populate fragments of habitat preserved by chance along the river valleys, roadsides or railways, the latter representing refuges often at the limit of conditions for survival.

At this point the actual information regarding the species in Romania is limited to data concerning its present distribution. The available current information largely confirms the historical distribution of the species. The past and current records are presented in Fig. 2.

The most important difference between the past and present occurrence of *D. banatica* is its absence in the far west of the country. Among the populations probably lost are those considered the source of southern Hungarian populations, from the lower Mureş Valley, Arad region. The severe anthropogenic disturbance through deforestation, development of infrastructure, expansion of urban areas and modification of rural areas, intensive agriculture, changes in river flow regime and aridification have all led to severe habitat loss. The most critical loss for *D. banatica* is that of the riparian forests, one of the most important green corridors in agricultural areas. In populated rural areas, the lack of appropriate legislation and control over the last 25 years has resulted in chaotic cutting, such that in some areas the river banks are completely depleted of their woody vegetation. In these areas, roadsides and railways are often the most important biodiversity corridors. These are less affected by direct disturbance, but are still influenced by traffic and maintenance, especially by fire management, which although prohibited is nevertheless quite commonly undertaken.

During the past decade, climatic fluctuations, especially prolonged droughts, have also affected land snails, particularly those living in locations where shelter is scarce, and especially if the lack of precipitation is accompanied by high temperatures (Gheoca & Costea, 2013). These extreme conditions exacerbate the effect of human disturbance and subject *D. banatica*, especially in lowlands, to severe constraints that may affect this species more severely than during the last century.

Knowledge of the current distribution is not sufficient on its own to allow assessment of the conservation status of this species, the evaluation of population sizes being also necessary. In 2014 a first step was taken as part of the national program of monitoring the invertebrate species included in the annexes of the Habitats Directive. The monitoring program for *D. banatica* will start in 2015. The selection of the populations

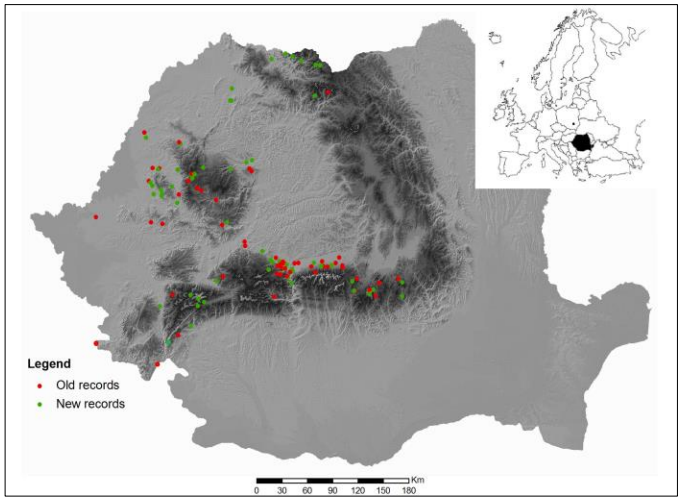

Fig. 2. Past and present distribution of *Drobacia banatica* in Romania. In red the historical distribution (Bielz, 1867; Grossu, 1955, 1987, 1993; The Collection of the Transylvanian Society of Nature Sciences, Bruckenthal Museum, Sibiu) and in green the current distribution (Negrea, 1995; Bába & Sárkány-Kiss, 1999a, b; Chincea & Odorescu, 2000; Domokos & Váncsa, 2005; Domokos & Lennert, 2007; Gheoca *et al*., 2008; Sîrbu *et al*., 2009; Lengyel & Páll-Gergely, 2010; Cameron *et al*., 2011; Gheoca, 2011, unpublished data). For the past records the location is approximate, as usually mentioned.

to be monitored aims to cover the species' distribution, to evaluate the populations located at the boundaries of its range, but also those considered as sources of genetic variability for the neighbouring countries. Thus, the populations to be assessed are located in the centre of the species' range, as well as outside the Carpathian arch, in the Ciucaş Mountains at the eastern limit, Maramureş Mountains, near the Ukrainian border and near the Hungarian border.

Similarly to other helicid snails in Romania, *D. banatica* breeds in early summer (June-July). This period and the period immediately following emergence from hibernation (May) also mark the snails' most active period. The number of active snails is greatest during this period and it is the most appropriate time for sampling.

Assessment of population parameters including abundance and age structure, and their correlation with habitat conditions, will allow a first evaluation of this species' conservation status. The monitoring should be carried out every ten years at least for those populations considered to be the most vulnerable following the first assessment.

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A NEW SPECIES DISCOVERED IN AN URBAN PARK WITHIN THE THIRD LARGEST CITY IN THE WORLD

By Luiz Ricardo L. Simone

A new species of the genus *Adelopoma* (Diplommatinidae), minute terrestrial operculate snails, was discovered in the Burle Marx Park, in the city of São Paulo, Brasil (Fig. 1) by my colleague Claudio Mantovani Martins. This species is described and named by Martins & Simone (2014). The park has a small fragment of the original Atlantic forest that existed in the São Paulo area. As the park is surrounded by skyscrapers, the local environment is not totally natural, but it is a good sample of the original ecosystem. Additionally, a part of the forest fragment is threatened by real estate development and a possible parking area. Biological observations revealed that the *Adelopoma* n. sp. is extremely fragile; the specimens died in the simple transport to the laboratory. This fact, associated with the extreme environmental restrictions, indicates that the species should be classified as endangered.

Fig 1. Region of Burle Marx Park, with the fragment of Atlantic forest where a new species of *Adelopoma* (lower-right) (shell height 2.6 mm) was recently discovered. (Aerial photo: Google Earth)

The study also demonstrated the poor state of knowledge of the invertebrate fauna in Brasilian ecosystems. The Paulista Plateau, in particular, is a vast platform area where the huge city of São Paulo grew up over 459 years. This expansion has been to the detriment of the local Atlantic forest fragment that contained several endemic species. Certainly, several species must have been extinguished even before they were discovered. The mollusc collection of the Museu de Zoologia of the Universidade de São Paulo has several samples under study, collected in the 19th and 20th centuries, that are species

collected in regions that are today huge urban areas and favelas. These species are certainly now extinct.

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THE PRECARIOUS OFFICIAL CONSERVATION STATUS OF MOLLUSCS IN THE STATES OF SANTA CATARINA AND RIO GRANDE DO SUL, SOUTHERN BRASIL

By A. Ignacio Agudo-Padrón

So far, the full inventory of molluscs occurring in the State of Santa Catarina, the small central portion of southern Brasil, comprises a confirmed total of 888 species and subspecies (668 marine forms and 220 non-marine forms, of which 150 are terrestrial and 70 limnic/freshwater). This is the result of a modest increase in systematic surveys since 1996. In contrast, the essential knowledge of their conservation status (e.g. Fig. 1) remains worryingly stagnant and deficient.

In September 2014, for the first time in history, the conservation status of 21 non-marine taxa from the State of Santa Catarina was officially assessed within the general context of the country (ICNBio, 2014), including 11 freshwater bivalves (8 Mycetopodidae, 3 Hyriidae), 1 limnic gastropod (Ampullariidae) and 9 terrestrial gastropods (2 Bulimulidae/Orthalicidae, 3 Megalobulimidae, 1 Streptaxidae, 3 Charopidae). The complete Santa Catarina species list is available on Facebook.

Four years earlier, a preliminary attempt at evaluation (Fig. 2) ended up being a failure, considering only four marine taxa (Santos, 2010; Agudo-Padrón, 2011a, b).

A parallel alarming situation has been observed in the neighbouring southern state of Rio Grande do Sul, where a recent official evaluation included only 5 gastropod taxa, including 3 marine (Olividae) and 2 terrestrial (1 Megalobulimidae, 1 Strophocheilidae, Fig. 3), incomprehensibly leaving out the freshwater bivalves, today considered the most endangered molluscs because of the restriction and vulnerability of their habitats. The 2002 version of the official list for Rio Grande do Sul (Marques *et al*., 2002) includes 11 species of native limnic bivalves. The new complete Rio Grande do Sul species list is available on line as a pdf.

Research and increased knowledge of the conservation status of molluscan biodiversity in the southernmost regions of Brasil, the states of Santa Catarina and Rio Grande do Sul, are necessary in view of the rapid changes to the natural environment due to human activities and rapid invasion by alien species. There are similarly urgent needs for in-depth

Fig. 1. IUCN conservation status of the native giant forest snail *Megalobulimus proclivis* (Martens, 1888), endemic to southern Brasil.

Fig. 2. March 2010 – Santa Catarina Molluscan Workshop Group (above right) and two of the marine taxa officially included (left): *Olivancillaria contortuplicata* (Reeve, 1850) (above); *Crassostrea mangle* Amaral & Simone, 2014 [= *Crassostrea brasiliana* (Lamarck, 1819)] (below).

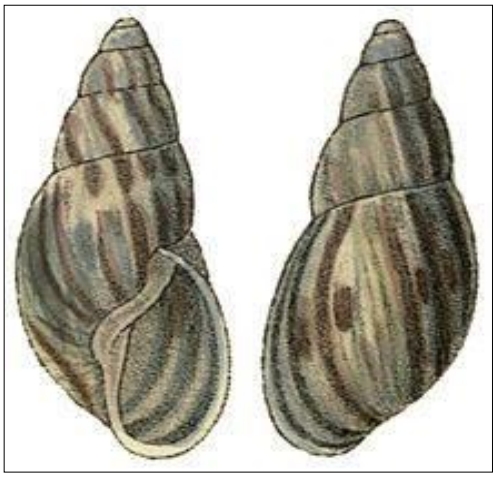

Fig. 3. The native forest snail *Anthinus henselii* (Martens, 1868), endemic to southern Brasil. (Illustration from Pilsbry, 1898: pl. 41, figs. 37, 38; modified

ecological studies, including population biology and life histories.

For more complete and detailed information concerning the species recognized to date in these states, the bibliography and others aspects, please contact the author and see previous articles in *Tentacle*.

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NEW LOCALITY FOR *PRIOTROCHATELLA STELLATA* (GASTROPODA: HELICINIDAE) FROM THE ISLAND OF YOUTH, CUBA

By Jane Herrera Uria

The Island of Youth (IY) (Fig. 1) has an area of 2,202 km^2 and is the largest island of the Canarreos archipelago, the second largest island in the Cuban archipelago, and the sixth largest of all of the Antilles. In the northern part of the IY there are four important sierras that are the habitats of the largest number of terrestrial molluscs in the IY: Sierra de las Casas, Sierra de Caballos, Sierra Colombo (Fig. 2) and Sierra Bibijagua (Fig. 3).

The genus *Priotrochatella* Fischer, 1893 belongs to the Helicinidae and contains four species: *Priotrochatella constellata* (Morelet, 1847), *P. stellata* (Velazquez in Poey, 1852), and *P. torrei* Clapp, 1918 from Cuba, and *P. josephinae* (Adams, 1849) from Jamaica.

The most important paper on this genus is by Clench & Jacobson (1970), based on collections of the Museum of Comparative Zoology, Harvard. According to Clench & Jacobson (1970), the Cuban species of *Priotrochatella* are well separated geographically on the IY: *P. constellata* in the

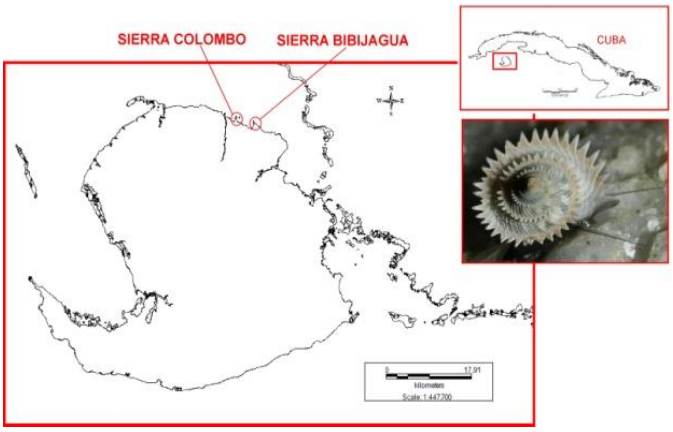

Fig. 1. Map of the Island of Youth, Cuba.

Fig. 2. Sierra Colombo from Sierra de Caballos, IY, Cuba.

Fig. 3. Sierra Bibijagua from Sierra de Caballos, IY, Cuba.

northern part of Sierra de las Casas, *P. torrei* on the southern part of Sierra de las Casas, and *P. stellata* only in Sierra de Caballos. Over six days in November 2014 we visited Sierra Colombo and Sierra Bibijagua. Only 12 and 6 species of land snails have been reported, respectively, from these localities (Milera & Correoso, 2003).

Unexpectedly, we found ten specimens of *Priotrochatella stellata* on the marmoreal rocks in Sierra Bibijagua (Figs. 4, 5), which Clench & Jacobson (1970) had only reported from Sierra de Caballos. The high point of Sierra Bibijagua is 75 m above sea level, and is located at 21.89271°N, 82.73631°W. We also found *Priotrochatella stellata* in the northern part of Sierra Colombo (130 m above sea level). In both cases it was not abundant, which may be because of forest fires.

Priotrochatella stellata is not well represented in Cuban collections. For that reason, the material collected is housed in

Fig. 4. Member of the field team: Josué Francisco González.

Fig. 5. *Priotrochatella stellata* on marmoreal rocks of Sierra Bibijagua, IY, Cuba.

the National Museum of Natural History of Cuba, and will be used for a transitory exhibit on the land snails of the IY.

We thank the Rufford Foundation for the Rufford Small Grant that has been very important in support of field work.

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THE LAND SNAIL FAUNA OF THE TOKARA ISLANDS, JAPAN

By Kiyonori Tomiyama, Shino Ichikawa, Takayuki Nakashima, Yusuke Katanoda, Kazumasa Ohkubo & Reiko Sakai

Quantitative analyses of the land snail fauna were undertaken in the Tokara Islands, in the northern Ryukyu Islands of southern Japan, extending over approximately 180 km from north to south (Fig.1). This area has been considered to be the border between the Palearctic and Indo-Malayan (Oriental) zoogeographical regions. The faunal boundary between the

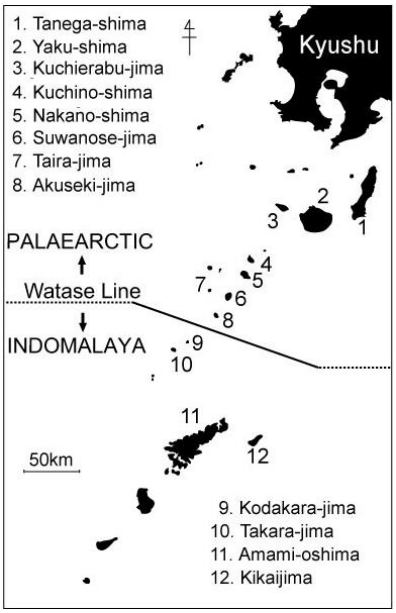

Fig. 1. Map of Tokara Islands in the northern Ryukyu Islands. Seven islands (No. 4 to 10) in the Tokara Islands were investigated.

Palearctic and Indo-Malayan regions, the Watase Line, runs between Akuseki-jima and Kodakara-jima in the Tokara Islands (Tomiyama, 1983).

The fauna and flora of the Tokara Islands are rather different from those of the Osumi Islands (Tanega-shima/Yaku-shima) to the north, and the Amami Islands (Amami-oshima, etc.) to the south (Kurozumi, 1994; Ichikawa *et al*., 2014). Previous biogeographical studies have regarded this island group as an "ecotone". For example, Tomiyama (1983) compared the land snail fauna of the Tokara group and surrounding islands and suggested that this ecotone is bordered by Kuchino-shima and Nakano-shima in the north and by Akuseki-jima and Takara-jima in the south. The fauna of Kuchino-shima, the northernmost island of the Tokara group, was rather similar to that of the Osumi Islands group. Later, when studying intraspecific variation in *Satsuma tanegashimae* in this region, Tomiyama (1984, 1988) found that the population of the entire Tokara Islands (except Kodakara-jima and Takara-jima) differs from those of the Osumi Islands group. To explain this discrepancy, we conducted a more detailed faunal survey on the land snail species in this region in 2007 to 2014. Land snails were collected manually, paying particular attention to leaf litter, tree trunks and dead trees. Faunal similarities among the islets were analyzed via Nomura-Simpson's Coefficients (NSC; Simpson, 1949) and a dendrogram was constructed adopting the group average method (Fig. 2). In total, 44 species belonging to 32 genera in 13 families were collected during the survey, among which eight species represented first records for particular islands (Figs. 3, 4). In terms of their land snail faunas, Kuchino-shima formed a group with Nakano-shima, Taira-jima, Suwanose-jima and Akuseki-jima. Kodakara-jima and Takara-jima formed another cluster. A clear faunal boundary was recognized between Akuseki-jima and Kodakara-jima, as documented in some other animal groups (Fig. 2).

The fauna of the Tokara Islands (southern half of the northern Ryukyus) was recognized to be similar to that of the Osumi Islands (northern half of the northern Ryukyus). This result

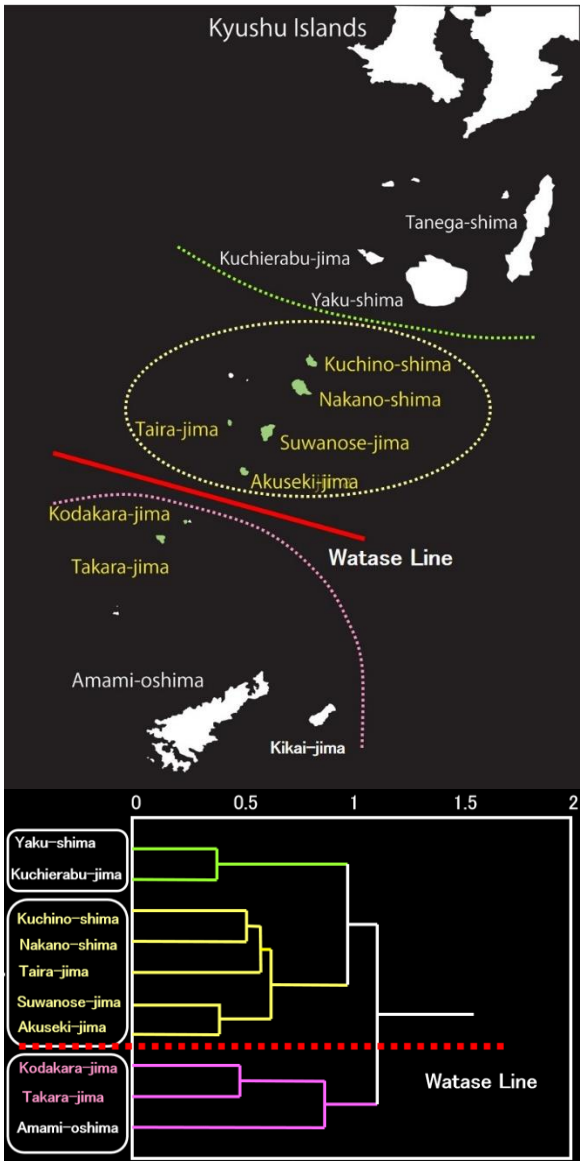

Fig. 2. Top – The middle and northern Ryukyu Islands showing the subdivision of this faunal region based on the distributional pattern of land snail species. Green islands and yellow island names: Tokara Islands. Green dotted line: land snail fauna of the Osumi group; yellow dotted line that of the Tokara group; pink dotted line that of the Amami group.
Bottom – Dendrogram showing the similarities among land snail faunas based on the Nomura-Simpson's Coefficient (NSC, group-average method). Green: Osumi group; yellow: Tokara group; pink: Amami group.

was not consistent with the assumption that the fauna of this island group might have been strongly influenced by the fauna of the Amami group (northern half of the middle Ryukyus). The present study did not suggest that the Tokara Islands might have sunk below the water surface, or that they had never been been connected with adjacent land masses in the past. Instead, they were considered to have been connected with the Osumi Islands, later to have formed a separate land mass, and to have never been submerged.

Ichikawa *et al*. (2014) compared the present situation of the land snails with previous studies in the Tokara Islands,

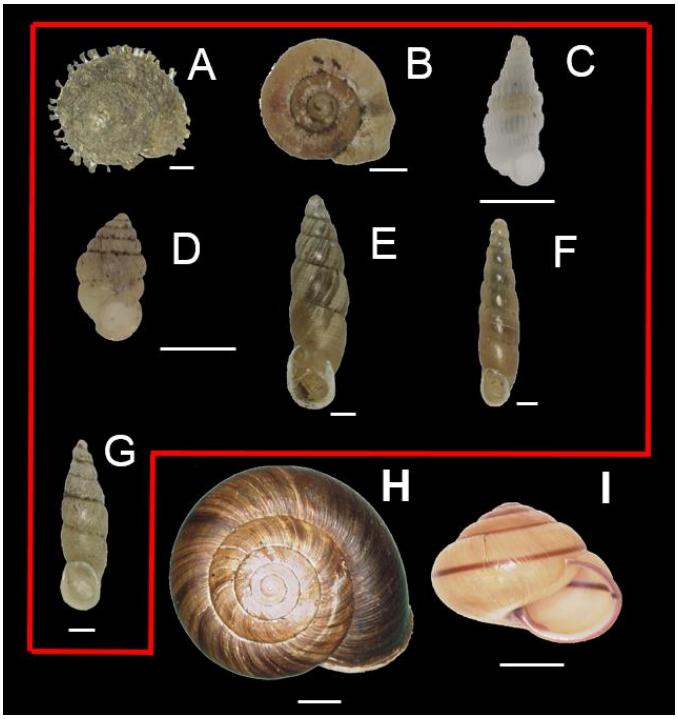

Fig. 3. Some Tokara Island species. Those within the red line are endemic to the Tokara Islands. A: *Japonia shigetai* (Minato, 1985), B: *Chamalycaeus laevis* (Pilsbry & Hirase, 1909), C: *Diplommatina turris chineni* (Minato,1981) , D: *Diplommatina nesiotica* (Pilsbry & Hirase, 1909), E: *Proreinia vaga* (Pilsbry, 1909), F: *Zaptyx nakanoshimana* (Pilsbry, 1909), G: *Proreinia echo* (Pilsbry, 1909), H: *Euhadra tokarainsula* Minato & Habe, 1982, I: *Satsuma tanegashimae* (Pilsbry, 1901). Scale bars 1 mm (A-G), 1 cm (H, I).

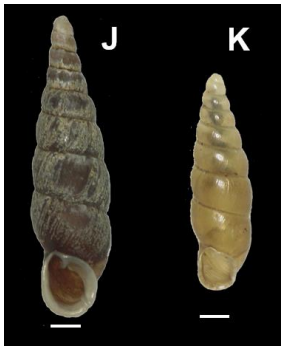

Fig. 4. Two sister taxa from the Tokara Islands, probably distinct species; J: *Metazaptyx daemonorum daemonorum* (Pilsbry, 1909) from Kuchino-shima and Nakano-shima, K: *Metazaptyx daemonorum tokarana* (Pilsbry, 1909) from Taira-jima, Suwanose-jima, Akuseki-jima, Kodakara-jima and Takara-jima; sympatric in Akuseki-jima. Scale bars 1 mm.

suggesting that some species seemed to have become extinct and that the number of locations for most species had decreased. In the Tokara Islands, protection measures for animals and plants, including land snails, have not been adopted. An emergency measure to protect the biota of the Tokara Islands is expected in the future.

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LAND SNAILS OF SIERRA DE LAS CASAS PROTECTED AREA (ISLAND OF YOUTH, CUBA) AND THEIR CONSERVATION PROBLEMS

By Jane Herrera Uria

Islands have inspired biologists since the beginning of scientific exploration, more than two centuries ago. Since Darwin and Wallace's time, research on island biotas has contributed substantially to our understanding of species formation, adaptive radiation, community assembly and extinction.

The Island of Youth (IY), Canarreos archipelago in southwestern Cuba, is considered one of the most important sites for endemism in Cuba because 30 % of its land snails are local endemics, like the exclusive genus *Pineria*. Sierra de las Casas Protected Area is located in the north of the IY. The reserve covers 300 ha with a maximum elevation of 261 m above sea level. Sierra de las Casas Protected Area (Fig. 1) has the highest percentage of endemic terrestrial snails of the IY (Espinosa & Ortea, 1999).

In general, the malacofauna of the IY has been well studied, but the existing information is scattered and out of date. The first malacological revision of the IY was published by Henderson (1916); he found 35 taxa. Later, Yong & Perera

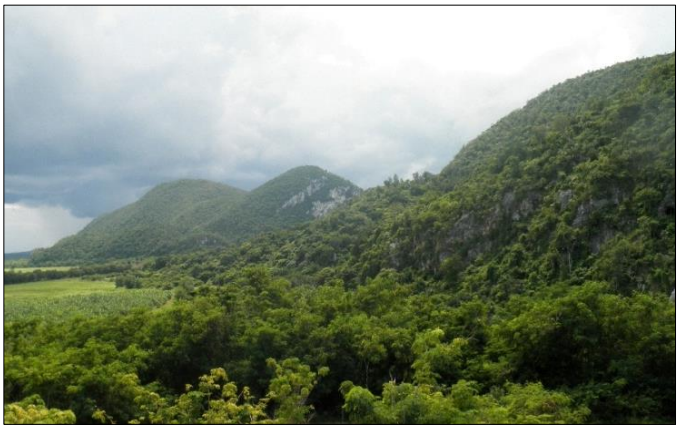

Fig. 1. Sierra de las Casas, IY.

Fig. 2. Deforestation.

(1984) studied the freshwater molluscs and reported 12 species on the island, only six of which had been reported previously. Milera & Correoso (2003) updated the list of molluscs of the IY, reporting 99 taxa in total (freshwater and terrestrial molluscs). No new data have been reported since then. For this reason the present research is important in terms of the current status of the land snails of Sierra de las Casas, completing their inventory and assessing the threats they face.

During June to October 2014 the terrestrial molluscs of northern and southern Sierra de las Casas were collected by hand, on rocks, fallen trunks and vegetation. All specimens were deposited in the scientific malacological collection of the National Museum of Natural History of Cuba. The species composition, endemism and threats were assessed using the following bibliography: Clench & Jacobson (1970); Torre & Bartsch (1958); Espinosa & Ortea (1999, 2009).

For the Sierra de las Casas Protected Area we reported 25 terrestrial mollusc species: 12 operculate species and 13 pulmonates. Of these, 14 species are endemic to the IY (56 %) and 10 species are introduced (44 %).

In their national biodiversity study, Vales *et al.* (1998) claimed, that the majority of Cuban terrestrial molluscs are threatened. In the case of the land snails of Sierra de las Casas, there are many threats to the conservation of these invertebrates. Damage to vegetation structure, inappropriate agricultural practices, introduction of exotic plants and animals, droughts, hurricanes and natural and human caused fires are some of them. But the principal threat to the conservation of terrestrial molluscs inhabiting these mountains is the intense human activity over an extensive period that has resulted in destruction and fragmentation of habitats. We detected human-caused deforestation (Fig. 2) and habitat fragmentation (Fig. 3). One of the principal economic activities in IY is marble export, with extraction primarily from Sierra de las Casas and Sierra de Colombo.

Land snails of Sierra de las Casas, IY
*endemic species

Class GASTROPODA
Subclass "PROSOBRANCHIA"
Family HELICINIDAE
Helicina adspersa Pfeiffer, 1839
Alcadia hispida (Pfeiffer, 1839)
* *Priotrochatella constellata* (Morelet, 1847)

Fig. 3. Habitat fragmentation.

* *Priotrochatella torrei* Clapp, 1918
* *Troschelviana scopulorum* (Morelet, 1849)
* *Troschelviana callosa* (Poey, 1854)
Family PROSERPINIDAE
Proserpina globulosa (d'Orbigny, 1842)
Family MEGALOMASTOMATIDAE
* *Farcimen procer procer* (Poey, 1854)
Family POTAMIIDAE
* *Chondropoma vespertinum vespertinum* (Morelet, 1851)
* *Rhytidopoma pinense pinense* Torre & Bartsch, 1941
* *Opisthosiphon pupoides pupoides* (Morelet, 1849)
* *Opisthosiphon moreletianum moreletianum* (Petit, 1850)
Subclass "PULMONATA"
Family VERONICELLIDAE
Veronicella cubense (Pfeiffer, 1840)
Family ORTHALICIDAE
Liguus fasciatus (Müller, 1774)
Family UROCOPTIDAE
* *Nesocoptis pruinosa pruinosa* (Morelet, 1849)
* *Nesocoptis pruinosa casasensis* Jaume & Torre, 1972
* *Pineria terebra terebra* Poey, 1854
* *Pineria beathiana* Poey, 1854
Family SUBULINIDAE
Lamellaxis gracilis (Hutton, 1834)
Obeliscus terebraster (Lamarck, 1822)
Family OLEACINIDAE
Oleacina subulata (Pfeiffer, 1839)
Oleacina follicularis (Morelet, 1849)
Oleacina straminea (Deshayes, 1819)
Family SPIRAXIDAE
* *Spiraxis poeyanus* (Pfeiffer, 1866)
Family CEPOLIDAE
Jeanneretia bicincta (Menke, 1830)

We thank the Rufford Foundation for a Rufford Small Grant that has been very important in support of field work.

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DOES INVASION OF *LANTANA CAMARA* (VERBENACEAE) AFFECT LAND SNAIL DIVERSITY?

By Aravind N.A. & Roshmi Rekha Sarma

Invasive alien species (IAS) are one of the greatest threats to biological diversity. Biodiversity loss and extinction due to IAS is considered second only to habitat loss (Vitousek *et al*., 1996). Over the last two decades, there has been an increased recognition of the impact of IAS on ecosystem structure and function and globally many studies have documented the impact of IAS from genes to ecosystems (Vitousek *et al.*, 1996; Levine *et al*., 2003).

India is home to nearly 17,000 species of plants, of which 40 % are exotic, 25 % of which are considered as invasive (Raghubanshi *et al*., 2005). One among them is *Lantana camara* (Vebenaceae), which was introduced in 1807 as an ornamental plant and has now invaded most parts of the country. A native of Central and South America, it is now common in more than 60 countries (Parsons & Cuthbertson, 2001) and is considered among 100 of the World's Worst Invasive Species. In India, it is found in almost all types of habitat except desert and high altitudes in the Himalayas.

Previous studies on *Lantana* in India have mainly focused on its physiology and impact on pollination and there have been few studies of its wider ecological impact (Murali & Sidappa Setty, 2001; Aravind *et al*., 2006, 2010; Sundaram & Hiremath, 2012). Apart from a couple of studies, there are no studies on how *Lantana* invasions impact animals. Here in this

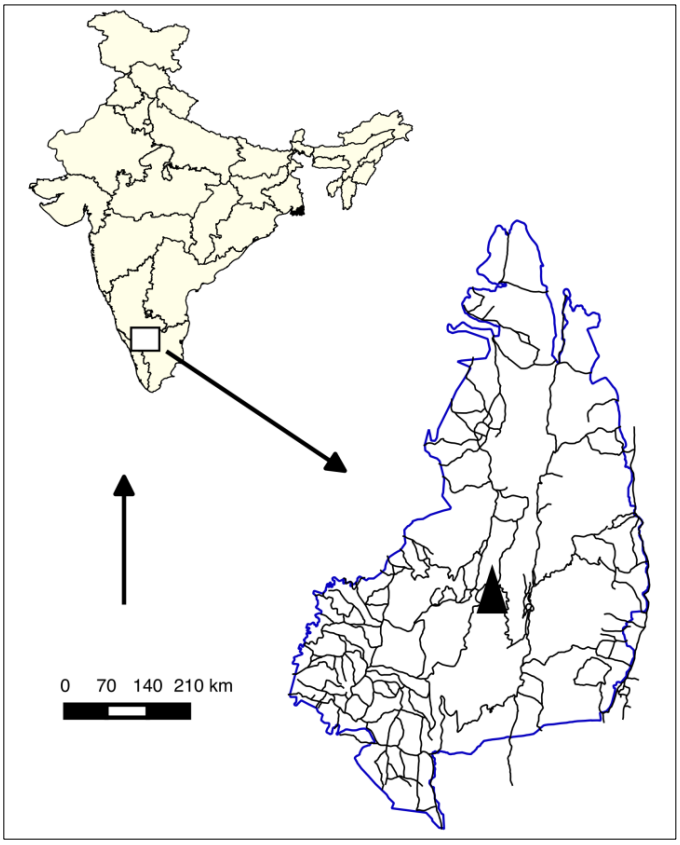

Fig. 1. Location of Biligiri Rangaswamy Temple Tiger Reserve. Triangle indicates sampling location in moist deciduous forest.

short communication, we provide preliminary results of an ongoing study on the impact of *Lantana* invasion on land snails in the Western Ghats of India.

The study was carried out in the Biligiri Rangaswamy Temple Tiger Reserve (BR Hills) in southern India. The BR Hills is located in the eastern side of the Western Ghats biodiversity hotspot (Fig. 1). The area of BR Hills is 540 km^2 with highly undulating terrain (Aravind *et al*., 2001), more than 75 % of which is infested with *Lantana* (Sundaram & Hiremath, 2012). The invasion is greatest in moist deciduous forest and least in evergreen forests. The invasion is not uniform, varying from patches with no *Lantana* to high density patches (>100 individuals per 10 x 10 m area). This provides a good setting to test the impact of *Lantana* on land snail communities.

We selected plots with low and high density *Lantana* based on visual estimation and used a site with no *Lantana* as a control. Five plots in each comparison group were selected. We recorded snail populations and different habitat parameters such as soil temperature (°C), altitude (m asl), canopy cover (%), litter depth (cm) and cover (%), compactness of soil (qualitative: soft, moderate and hard) and soil moisture (%) for each plot. The data were analysed using different diversity measures (species richness and Shannon diversity) and Pearson's correlation was computed to assess the relationship between habitat parameters and species richness and abundance.

In total, 110 individuals belonging to six families, 12 genera and 23 species were recorded in 15 plots. The results show

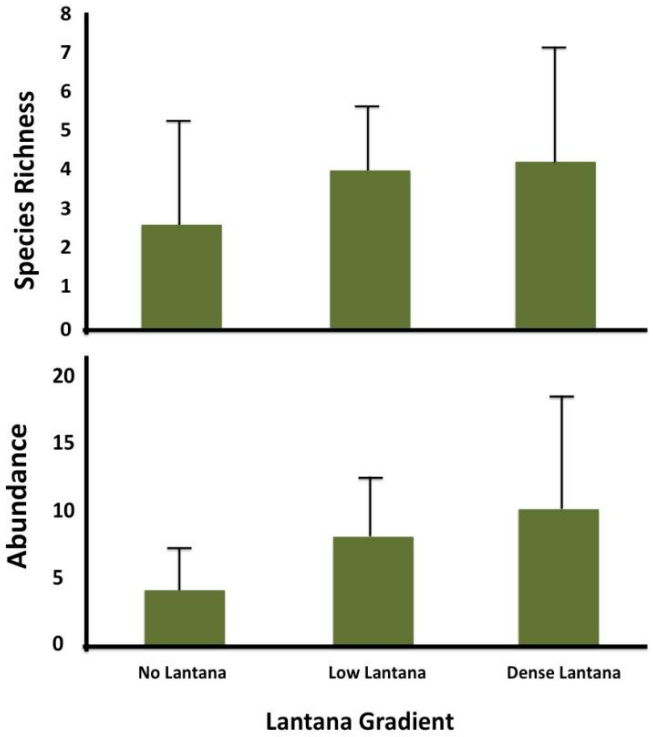

Fig. 2. Top: mean species richness of land snails in different *Lantana* gradients; bottom: mean abundance of land snails in different *Lantana* gradients.

that although land snail diversity and abundance increased with *Lantana* density (Fig. 2), this was not statistically significant (ANOVA: p >0.05). Richness ranged from 1 to 5 species in no *Lantana* plots, 3 to 6 species in low *Lantana* plots and 2 to 8 species in dense *Lantana* plots. Abundance ranged from 3 to 20 individuals per plot. Among the 23 species, two species (*Glessula* sp. and *Kaliella barrakporensis*) account for about 64 % of total land snail abundance. Out of 23 species only six occur across all three *Lantana* levels. The similarity between the plots ranged from 30 % to 60 %. There is no clear clustering of plots across the *Lantana* gradient. However, there is some clustering of control plots.

Macro-snails (>5 mm in greatest dimension) dominate the community with 60 to 65 % of all the individuals recorded. The plots with *Lantana* have more macro- than micro-snails (Table 1). The abundance of micro-molluscs decreased by 3-6 % in response to *Lantana* invasion but this was not significant (chi square: p = 0.89). Among different habitat variables, only litter depth was correlated with land snail abundance (r = -0.619, p <0.05). No other significant correlations were detected.

Lantana invasion in Indian forests is a serious conservation issue (Sundaram & Hiremath, 2012). Due to the speed of its spread across the Indian subcontinent, it is reasonable to expect that there could be significant changes in the ecosystem due to its presence. We chose land snails as indicator taxa because of their low mobility and sensitivity to any change in the environment, such that they would probably be affected by *Lantana* invasion. Our results did not show a decrease in

Table 1. Percent abundance and change in macro- and micro-snails at different *Lantana* densities.

***Lantana* Density**	**Macro**	**Micro**	**% Change**
No *Lantana*	60.00	40.00	0
Low *Lantana*	65.91	34.09	-5.91
Dense *Lantana*	63.33	36.67	-3.33

species richness and abundance under *Lantana*, contrary to the general belief that *Lantana* reduces species richness and abundance. This could be due to the increased moisture level and thick layer of leaf litter under *Lantana*. The dense *Lantana* is also protected from any sort of disturbance from humans or by wild animals. Other studies on the impact of *Lantana* on birds showed that there is high species richness and abundance at intermediate densities (Aravind *et al*., 2010); on the other hand, plants respond differently (Murali & Sidappa Setty, 2001; Aravind *et al*., 2006).

The species richness and abundance gives little indication of the changes in community structure in response to invasion. We analyzed this using community similarity and size class analyses. The similarity between the plots with different densities of *Lantana* is very high indicating many species are common in all of them, but also all but one control plots cluster together and had only 30 % similarity, indicating that the control plots have different species composition compared to the *Lantana* invaded area. Although not statistically significant, the size class guild analysis shows increased abundance of macro- over micro snails in the invaded areas, suggesting that invasion may favour large snails over small ones. A similar result was observed in another study in the Western Ghats (Patil & Aravind, in press).

In summary, there is no clear pattern to indicate that *Lantana* reduces land snail populations at BR Hills. However, this is only a preliminary result and should be viewed with caution. More detailed and long-term studies over a large area with more plots may give a better picture of what is happening.

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OBSERVATIONS ON THE REVIEW OF THE LIST OF ENDANGERED NON-MARINE MOLLUSCS OF BRASIL

By Sonia Barbosa dos Santos, Igor C. Miyahira, Norma C. Salgado, Ingrid Heydrich, Meire S. Pena, Eduardo Colley, Monica A. Fernandez, Silvana C. Thiengo, Suzete R. Gomes, Maria Júlia M. Silva, Isabela Cristina B. Gonçalves, Luiz Eduardo M. de Lacerda, Lenita de F. Tallarico & Drielle dos S. Martins

On 18 December 2014, the Ministry of Environment of Brasil published the "Official National List of Fauna Threatened with Extinction" (MMA, 2014a) and the "Official National List of Fauna Threatened with Extinction-Fish and Aquatic Invertebrates" (MMA, 2014b). This work was linked to the review of the continental fauna (freshwater and terrestrial) threatened with extinction, coordinated by the Chico Mendes Institute for the Conservation of Biodiversity (ICMBio) (Santos & Carvalho, 2014). This review covered 12,256 species evaluated by 1,383 specialists.

The new lists are the culmination of a process that began with a call to Brasilian malacologists asking for nominations of candidate species. As Taxon Coordinator the first author received a number of candidate species for the list of endangered species but only 144 species were considered because many nomination protocols submitted were not complete. The conservation status of each species had been evaluated previously in a Workshop of Evaluation, which took place in the city of Iperó, state of São Paulo, during 22-28 September, at the National Academy of Biodiversity (Fig. 1).

Table 1. Recent list of threatened continental molluscs in Brasil. VU- vulnerable, EN- endangered, CR- critically endangered.

Species	Common name	Status
Freshwater mussels		
Bivalvia Unionoida Hyriidae *Diplodon* (*Rhipidodonta*) *koseritzi* (Clessin, 1888)	Marisco-do-junco	EN
Mycetopodidae *Mycetopoda legumen* (Martens, 1888)	Faquinha-arredondada	EN
Freshwater snails		
Gastropoda Caenogastropoda Ampullariidae *Pomacea sordida* (Swainson, 1823)	Caramujo-de-água-doce	EN
Hydrobiidae *Potamolithus karsticus* Simone & Moracchioli, 1994	Caramujo-de-caverna	CR
Potamolithus troglobius Simone & Miracchiolli, 1994	Caramujo-de-caverna	CR
Littorinimorpha Pomatiopsidae *Spiripockia punctata* Simone, 2012	Unknown	EN
Pulmonata Lymnaeidae *Lymnaea rupestris* Paraense, 1982	Caramujo-de-água-doce	VU
Physidae *Physa marmorata* Guilding, 1828	Caramujo	VU
Planorbidae *Plesiophysa dolichomastix* Paraense, 2002	Caramujo-de-água-doce	CR
Land snails		
Gastropoda Gymnomorpha Veronicellidae *Phyllocaulis renschi* Thomé, 1965	Lesma	EN
Pulmonata Bulimulidae *Thaumastus lundi* Pena, Salgado & Coelho, 2005	Unknown	CR
Tomigerus (*Digerus*) *gibberulus* (Burrow, 1815)	Caracol	EN
Odontostomidae *Macrodontes dautzenbergianus* Pilsbry, 1898	Unknown	VU
Streptaxidae *Hypselartemon alveus* (Dunker, 1845)	Unknown	VU
Succineidae *Succinea lopesi* Lanzieri, 1966	Unknown	VU
Megalobulimidae *Megalobulimus cardosoi* (Morretes, 1952)	Aruá-do-mato	CR
Strophocheilidae *Gonyostomus insularis* Leme, 1974	Caracol-da-ilha	EN

Fig. 1. The National Academy of Biodiversity, in the city of Iperó, state of São Paulo. (Photo: Luiz Eduardo M. Lacerda)

All candidate species without sufficient data (biology, distribution, life cycle, specific threats, etc.) were excluded from evaluation to allow application of the IUCN criteria. Several researchers contributed with nominations of candidate species, but only the authors of this note attended the Workshop of Evaluation (Fig. 2).

All the proposed endangered species were next submitted to a Workshop of Validation, at which the candidate species were evaluated by experts in the application of IUCN criteria. The Workshop of Validation occurred in the city of Natal, state of Rio Grande do Norte, during 2-28 November. It was attended by Sonia Barbosa dos Santos (Taxon Coordinator) and Dr. Igor Christo Miyahira (as expert on freshwater bivalves, the group with the greatest number of candidate species). Out of the 299 endangered invertebrates, 17 are molluscs, including two freshwater mussels, seven freshwater snails and eight land snails (Table 1). The major difference when comparing to the previous list (Machado *et al.*, 2008; Santos *et al.*, 2013) concerns freshwater mussels; 24 species were excluded from the list due to the absence of sufficient information according the IUCN criteria.

Fig. 2. Members of the Workshop of Evaluation of candidate species for the Brasilian Red Book. From left to right and back to front row: Silvana Thiengo, Norma Salgado, Ingrid Heyndrich, Monica Fernandez, Drielle Martins, Igor Miyahira, Suzete Gomes, Isabela Gonçalves, Lenita Tallarico, Maria Julia Silva, Meire Pena, Luiz Eduardo Lacerda, Eduardo Colley, Sonia Santos. (Photo: ICMBio)

During 2015 all the work will be reviewed, aiming for the publication of the new edition of the Red Book of Brasilian Fauna Threatened with Extinction.

More information is available at the ICMBio homepage.

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CONSERVATION STATUS OF *MARGARITIFERA LAOSENSIS* IN VIETNAM

By Arthur E. Bogan & Van T. Do

Margaritifera laosensis (Margaritiferidae), listed by IUCN as Endangered, is today restricted to small rivers in the Mekong River Basin in northern Laos. Historically it was reported from northern Myanmar, Thailand and Laos. Our fieldwork in 2012 examined the area around Dien Bien Phu, Dien Bien Province, Vietnam for the continued existence of *Margaritifera laosensis*. Dien Bien Province is west of Hanoi on the border with Laos and is in the Mekong River Basin. Museum specimens of *M. laosensis* from the University of Michigan Museum of Zoology were collected from this area around 1900. No specimens were found in the field, in various markets examined and no local people were aware of this species in small streams during our field work in 2012. We continued our search for this rare unionid during our 2014 fieldwork in the central highlands of Vietnam, also drained by tributaries to the Mekong River. There is a single specimen in the collection of the Institute of Ecology and Biological Resources (Vietnam Academy of Science and Technology) reported to be from this area. During the trip we visited local markets and spoke to local people selling fish, freshwater bivalves and gastropods about where the animals they were selling had been collected. Other local residents and fisherman were asked about local freshwater mussels. We stopped along the road near a school and asked about freshwater clams in the area and talked to a boy who said he had collected mussels in a local stream a couple of months earlier (Fig. 1). This stream is a tributary of the Sê San River, an eastern tributary of the Mekong River, in Kon Tum Province, Vietnam. He took us to the locality and we searched over 100 m of stream but could not locate any mussels. He said the animals were eaten and the shells ground for medicine. He pointed out a picture of the distinctive shape of *Margaritifera laosensis* as the animals he had collected.

Fig. 1. Young boy wading in a tributary of the Sê San River, an eastern tributary of the Mekong River, in Kon Tum Province, Vietnam where he had found *Margaritifera laosensis*.

We were not successful in confirming the continued existence of *Margaritifera laosensis* in the central highlands of Vietnam but remain optimistic that the local boy recently collected this species. Confirmation of the existence of this species in the central highlands will require continued fieldwork.

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PACIFIC ISLAND LAND SNAILS

Revisiting *Partula* biology

By Justin Gerlach

I first became involved with the partulid tree snails of the South Pacific in the early 1990s when studying the ecology of *Euglandina rosea* for my Ph.D. I collected some of the last surviving *Partula* on the island of Raiatea, French Polynesia, descendants of which survive today in the captive breeding programme. At the time I also started revising the confused taxonomy of the Raiatean species, but as it was not a central part of my research I shelved the project. In 2003 I revived my interest in partulids, revisiting issues around the taxonomy, ecology and conservation of the snails with a new perspective. This interest has expanded into several research avenues.

The main focus of my current work on partulids is a complete taxonomic revision of the family. With more than 30 supposed species, Raiatea was supposed to support around a quarter of the diversity of *Partula*; revising its taxonomy would therefore make a substantial contribution to clarifying the evolution of that genus. When I readdressed the issue it quickly became clear that any revision of the Raiatean species needed to be done in the context of the taxonomy of the family as a whole. As a result I have undertaken a comprehensive review of the family, which will result in a new Partulidae monograph to complete the work started by Henry Crampton in 1906. This will be ready for publication in 2016 to coincide with the centenary of the publication of Crampton's first volume on the *Partula* of Tahiti. Crampton's three monographs (Tahiti, the Marianas and Moorea) were remarkable productions of early 20th century evolutionary biology, the series was never completed and needs to be updated to fit the 21st century.

Given the extinction of most partulid populations, my revision has to rely on the captive populations and the material in museum collections. Locating type material has been particularly challenging but I have managed to examine specimens of almost all named taxa. However, the type specimens of several appear to be lost or misplaced. I would be interested to hear from anyone who knows anything of these taxa. Locating the earliest historical material has been intriguing. Unfortunately I have not been able to locate the

Fig. 1. The Chemnitz *Partula faba* and other 1769 material.

original specimen of the very first published partulid: Martyn's *Limax faba* (which was subsequently designated as the type species of the genus and is available nomenclaturally from Gmelin). The second specimen, illustrated by Chemnitz, did turn up in the Copenhagen Museum collections (Fig. 1). To be able to borrow the specimens collected on Captain Cook's first voyage to the South Pacific (1768-71) was remarkable.

I have collated all the information on these historically important specimens and the story of the Partulidae since 1769 into a book (Gerlach, 2014), an exercise that revealed to me how remarkably intertwined natural history exploration and evolutionary biology have been, with almost every major name linking into the story somewhere.

More recent museum material has included the great collections amassed by Cuming, Pease and Garrett, but most importantly of all, by Crampton. The preservation of his many thousands of specimens in the Academy of Natural Sciences, Philadelphia (ANSP) (Fig. 2), has enabled me to evaluate geographical variation in samples that would be simply impossible to collect today, even for the species that still persist. Crampton only looked at shell variation and the majority of this material has never been examined in detail, so it has been a great privilege to be allowed to dissect some of it. The preservation of most is so good that dissection of specimens pickled over a century ago was usually extremely easy. Unfortunately, Crampton preserved them in formalin so they are currently not useable for DNA studies. At least good old fashioned conchology and anatomy can be completed.

In addition to the fantastic shell collection, the ANSP also has Crampton's archives – 18 boxes of notes and manuscripts. These include the measurements of almost all the shells he collected, an astounding resource. From this historical material I am able to address most of the taxonomic problems that characterise the Partulidae. Most of the French Polynesian species can now be resolved and I am revising the New Guinea and Solomon Islands species in collaboration with Cindy Bick who has been working on these species at the University of Michigan. There are a few enigmatic species still to be evaluated in Fiji and in Wallis and Futuna, islands for which Crampton had prepared descriptions of new species but had never

Fig. 2. Crampton's collections in ANSP – one of the boxes of shells and the spirit material.

published them. I have yet to decide whether these manuscript species are valid. One outstanding oddity is *Partula newcombiana*, known from a specimen from Salibabu in the Indonesian Talaud Islands. This is the most westerly and most isolated *Partula* record, but it is possible that the record is not erroneous. Does anyone know anything of the Talaud Islands, could there ever have been a *Partula* there, and could it still exist?

A sideline of the taxonomic revision arises from finding that the large numbers of specimens collected by Bryan Clarke and Jim Murray on Moorea in the 1960s (preserved in the Natural History Museum, London) contained identifiable material in their guts. Dissection of gut contents allows the diet of wild collected specimens to be determined long after their extinction. These proved to be easily identifiable to broad groupings (detritus, fungi, plant tissue and other snails) and in some cases to individual plant species. Moorean samples show some ecological separation in terms of diet, which fits with what is known of their ecology before the extinction. Crampton's material also contains identifiable gut contents, which have now been sampled for almost all *Partula* species.

This finding inspired Paul Pearce-Kelly to propose that the material might also be useful for microbiological studies. A new project is now underway at the Zoological Society of

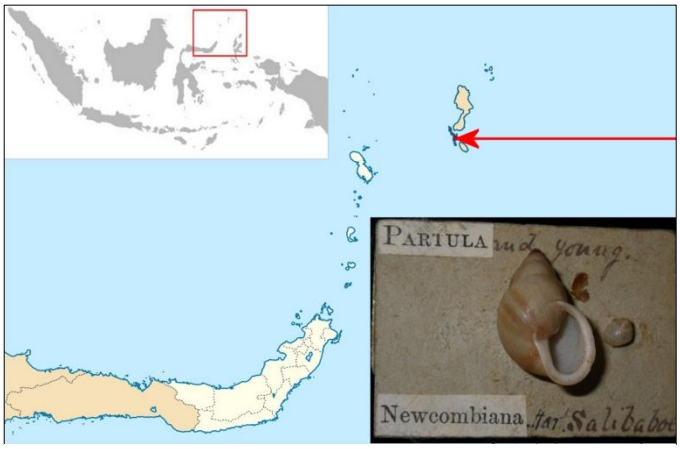

Fig. 3. *Partula newcombiana* and the Talaud Islands of Indonesia.

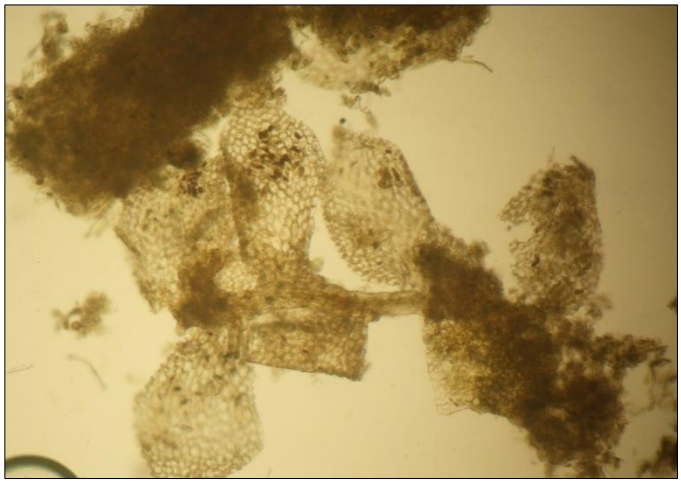

Fig. 4. Gut contents of a *Partula* specimen collected in 1906.

London looking at the wild microbiology, based on samples I collected from the museum specimens. It is hoped that this will identify whether there have been changes in the microbial fauna (parasitic, commensal and symbiotic) in the captive populations. This, combined with the new data on the wild diet, should enable improvements to be made to the captive conditions.

An additional sideline to the project has been the revival of an old population model I had developed for the *Euglandina rosea* and *Partula* interaction. My original model from the 1990s was fundamentally flawed and I have created a new version that models the impact of *E. rosea* on *Partula* populations. This time I have structured it so that it models the spread of the predator across the islands. This still needs some work but what I have produced so far indicates that some isolated populations of *Partula* may persist, as Trevor Coote has found in the field. These appear to be very vulnerable to changes in conditions, especially climate changes, and such populations would need continuous monitoring and, in at least some cases, management. Although this offers some hope for some species in the future, there is one major uncertainty: the impact of the New Guinea flatworm *Platydemus manokwari*. This is spreading on many islands and at present we lack the ecological information to be able to predict its impacts. Will it be the final straw for the remaining partulids, or will it knock down the *E. rosea* populations instead? At the moment I do not have access to the flatworms but I would be very interested in research collaborations on these questions. Once the taxonomic study is finished I intend to focus on the issues of *E. rosea* and flatworms.

I have put together all of my research interests in partulids into a website "*Partula* pages". In this I aim to draw together useful information on partulids and *E. rosea*, including links to research projects and the literature. It is very much a work in progress and I am always happy to include links to any projects or resources.

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Fig. 2. Tahitian chestnut (*mape*) habitat. (Photo: Don McFarlane)

Partula conservation programme update

By Paul Pearce-Kelly, Claude Serra, Trevor Coote, Bob Merz, Glenn Frei, Dave Clarke & Don McFarlane

Isn't it typical? One waits ages for a *Partula* programme update and then two come along at once! (But see *Tentacle* 17 – Editor.) Justin's summary of the taxonomic revision initiative and the importance of museum material for informing such research highlights the ongoing scientific interest in these remarkable molluscs. It also illustrates how diverse the support spectrum needs to be when trying to realise successful species conservation efforts.

For the last 28 years the international zoo community, French Polynesian environmental agencies and IUCN's SSC Conservation Breeding and Mollusc Specialist Groups have collaborated to save as many partulid species as possible from the extinction crisis following the introduction of *Euglandina rosea* to the Society Islands. The initial rescue phase of the programme was followed by a conservation strategy that can be summarized as follows:

- Species protection: for surviving species in degraded habitat in the lowland areas of Tahiti and Moorea;
- Habitat protection: for those species found at high elevations in habitat containing endemic species of plants, trees and shrubs;
- Re-establishment: of the species maintained in the breeding programme.

An ongoing funding initiative by the international zoo community and the French Polynesian government has enabled *Partula* field biologist Dr. Trevor Coote to work in region to help implement the strategy's work plan. Extensive survey work has clarified the status of the surviving remnant partulid populations and enhanced understanding of the predator species status and interaction with the native mollusc species. Other invasive species, including the New Guinea flatworm *Platydemus manokwari*, the little fire ant *Wasmannia auropunctata* and the Cuban slug *Veronicella cubensis* have also been studied, along with the influence of climate change. Key endemic snail habitat sites have been included in the French Polynesian Government's biodiversity priority areas schedule and there is greater public awareness of the partulid snails' story and the danger of introduced predators.

Additional preparatory work for the re-establishment phase of the programme included the construction of a dedicated *Partula* reserve in Te Faaiti (Fig. 1), funded by a Critical Ecosystem Partnership Fund grant with follow up monitoring and maintenance support by the Mohamed bin Zayed Species Conservation Fund.

The potential of Tahitian chestnut trees, *Inocarpus fagifer* (*mape* in Polynesian) (Fig. 2), to provide a level of natural protection from periodic incursions of *E. rosea* is perhaps the most promising development. Both the reserve and *mape* options will be trialed in the commencement of the re-establishment programme for *Partula nodosa*, *P. affinis* and *P. hyalina* in early 2015.

This article is dedicated to the memory our programme colleague Bryan Clarke (Fig. 3), who, as many readers will have already heard, passed away last year. Together with his

Fig. 1. Te Faaiti *Partula* reserve. (Photo: Trevor Coote)

Fig. 3. Professor Bryan Clarke (left) with research colleague Professor James Murray. (Photo: Paul Pearce-Kelly)

long-term research collaborator James Murray, Bryan was the driving force behind the *Partula* conservation initiative and is greatly missed by all his programme colleagues.

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Bob Merz, *Partula* Species Survival Plan Coordinator.
Glenn Frei, *Partula* SSP Studbook Keeper.
Dave Clarke, *Partula* EEP Studbook Keeper.
Don McFarlane, International *Partula* Studbook Keeper.

MARINE MATTERS

Living on the edge? State of vermetid crusts in the Maltese Islands (central Mediterranean Sea)

By Georg Küstner, Julian Evans & Patrick J. Schembri

Gregarious vermetid molluscs act as bioconstructors, forming crusts or reefs in the intertidal or shallow sublittoral zones of sub-tropical and warm-temperate waters (Fig. 1). Vermetid reefs are considered valuable habitats as they protect coasts from erosion, regulate sediment transport and accumulation, serve as carbon sinks, and also augment the species diversity found in the littoral fringe (Milazzo *et al*., 2014). In the Mediterranean, vermetid reefs are built through the synergistic action of the vermetid gastropods of the *Dendropoma petraeum s. l.* species complex (Fig. 2) and the coralline alga *Neogoniolithon brassica-florida* that grows between the gastropod shells and cements the reef, and triggers vermetid settlement (Chemello & Silenzi, 2011). The largest and best developed reefs occur in the eastern parts of the Mediterranean, but such bioconstructions are also common in the central-southern area in places where the winter temperature of surface coastal waters does not fall below 14 °C. The Maltese Islands represent the southernmost point of occurrence of vermetid reefs in the central Mediterranean (Chemello & Silenzi, 2011) and here these bioconstructions take the form of thin to moderately thick crusts covering the calcareous rock at and just below mean sea level (Azzopardi & Schembri, 1997).

The reefs' position on the edge of the shore renders them susceptible to regression caused by anthropogenic impacts (Chemello, 2009). Vermetid reefs are therefore considered to be endangered habitats and have been listed in the Mediterranean Red Data Book (UNEP/IUCN/GIS POSIDONIE, 1990). They are also included in the reference list of priority habitats to guide selection of sites of conservation interest within the purview of the Barcelona Convention (UNEP-MAP-RAC/SPA, 2006). In addition, *D. petraeum s. l.* is listed in Annex II (Endangered or Threatened Species) of the Protocol for Specially Protected Areas and Biodiversity in the Mediterranean (SPABIM Protocol of the Barcelona Convention) given that living populations of this vermetid are necessary to maintain the structure and functioning of the reefs.

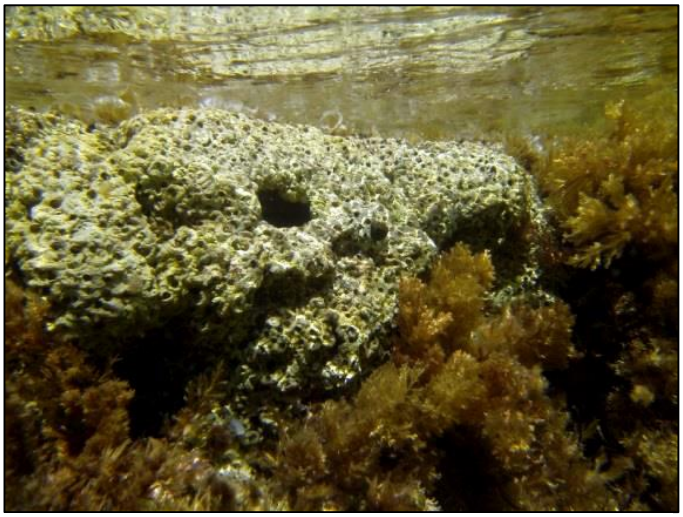

Fig. 1. Underwater view of the seaward edge of a vermetid crust at Marsascala, Malta. (Photo: Georg Küstner)

The future seems bleak for vermetid reefs in the southeast Levantine Sea. Degradation of these reefs was noted as early as 1961, and although patches with live individuals of *D. petraeum s. l.* were still present up to around 10 years ago, recent surveys indicated that the vermetid populations have declined drastically, if not disappeared entirely (Galil, 2013). This was mainly due to direct impact of urban development on reefs, or due to suffocation of vermetids by algal overgrowth as a consequence of organic loading of the water (Galil, 2013). The situation is somewhat better in Sicily, where crusts and reefs are degraded along "only" 40 % of the coastline where they occur (Chemello, 2009). However, Milazzo *et al*. (2009) indicated that the arrival of the invasive alien mussel *Brachidontes pharaonis* may represent a direct threat to vermetid reefs, causing negative effects on the coverage and density of *D. petraeum*.

Fig. 2. Close-up view of a vermetid crust showing several live individuals of *Dendropoma petraeum.* (Photo: Georg Küstner)

Given the evident regression of vermetids elsewhere in the Mediterranean, including in neighbouring Sicily, an intensive survey of the coastline around the Maltese Islands was initiated to assess the condition of vermetid crusts in this area. Special attention was given to the occurrence of two invasive alien species, the aforementioned *B. pharaonis* and the alga *Caulerpa cylindracea*, both of which have become common inhabitants of the lower mediolittoral to upper infralittoral regions on Maltese shores. These two species are able to form dense aggregations, and therefore have the propensity to negatively impact *D. petraeum* reefs.

This survey has indicated that there is at least one location where a vermetid crust has been extensively degraded as a consequence of coastal development. On the other hand, most of the surveyed locations where vermetid bioconstructions were known to occur still harbour thriving crusts, while several new areas with such crusts have been mapped. The coverage of *B. pharaonis* or *C. cylindracea* associated with the crusts was relatively low and these had no discernible impact on the populations of *D. petraeum*, the peak abundance of which exceeded 2000 individuals/m^2 in nearly all the surveyed locations. Therefore, it appears that in Malta *D. petraeum* is not living on the edge of extirpation, but on the edge of the shore, where it continues to contribute to the formation and existence of vermetid crusts.

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Chemello, R. 2009. Marine bioconstructions in the Mediterranean Sea. A state-of-the-art on the vermetid reef. *Biologia Marina Mediterranea* 16: 2-18.

Chemello, R. & Silenzi, S. 2011. Vermetid reefs in the Mediterranean Sea as archives of sea-level and surface temperature changes. *Chemistry and Ecology* 27: 121-127.

Galil, B.S. 2013. Going going gone: the loss of a reef building gastropod (Mollusca: Caenogastropoda: Vermetidae) in the southeast Mediterranean Sea. *Zoology in the Middle East* 59: 179-182.

Milazzo, M., Quattrocchi, F., Graziano, M., Badalamenti, F., Sarà, G. & Chemello, R. 2009. Invasive mussels directly threat intertidal vermetid reef: some evidences from a Sicilian MPA. In: *Proceedings of the InterMED Workshop 9-10 March 2009*, p. 12. Palermo, Italy.

Milazzo, M., Rodolfo-Metalpa, R., Chan, V.B.S., Fine, M., Alessi, C., Thiyagarajan, V., Hall-Spencer, J.M. & Chemello, R. 2014. Ocean acidification impairs vermetid reef recruitment. *Scientific Reports* 4: 4189.

UNEP/IUCN/GIS POSIDONIE, 1990. Livre rouge "Gérard Vuignier" des végétaux, peuplements et paysages menacés de Méditerranée. *Mediterranean Action Plan Technical Reports Series* 43: 1-250.

UNEP-MAP-RAC/SPA, 2006. *Reference list of Mediterranean marine habitat types for the selection of sites to be included in the National Inventories of natural sites of conservation interest*. UNEP-MAP-RAC/SPA. 5 p.

Georg Küstner, Department of Agriculture, Ecotrophology & Landscape Development, Anhalt University of Applied Sciences, Bernburg (Saale), Germany. georgkuestner@gmx.de
Julian Evans & Patrick J. Schembri, Department of Biology, University of Malta, Msida MSD 2080, Malta. julian.evans@um.edu.mt, patrick.j.schembri@um.edu.mt

Cone snails open a door to early conservation initiatives

By Howard Peters, Bethan C. O'Leary, Julie P. Hawkins & Callum M. Roberts

The cost of contributing to the IUCN Red List can often be daunting, in particular review workshops where experts from around the world must be brought together for a week or more of deliberation (Rondinini *et al*., 2014). With funding scarce and most often directed at new candidate species, important decadal re-assessments may be left languishing on the back burner, depriving the Red List of critical new data and weakening its authority. To reduce the overall costs of investigation but at the same time sound preliminary warnings for species approaching at-risk status, we have taken a broad-brush GIS-based approach that targets species based on individual range size coupled with a composite score of environmental threat (Peters *et al*., 2015).

Using the recent Red List assessment of over 630 species of the marine gastropod genus *Conus* (Peters *et al*., 2013), we sought to identify species that are range-restricted and subject to high anthropogenic pressure. The results not only confirmed many of the findings of the Red List assessment, but more importantly highlighted potentially at risk species overlooked by the Red List.

We used global spatial data of current anthropogenic threats to the marine environment including ocean based pollution, nutrient loading, artisanal fisheries, species invasions, etc., taken from Halpern *et al*. (2008). Additionally we used forward projections to 2030 and 2050 of thermal stress and ocean acidification from Burke *et al*. (2011). The threats were gridded to 1° geographical cells and mapped against the bathymetrically corrected areas of occupancy for each *Conus* species. The results showed not only individual species at greatest risk, but those biogeographical regions containing the highest concentrations of endemic and range-restricted species where all, or a very high percentage of their range occurs in areas of greatest human impact.

Although there will always be specific threats applicable to individual species that require detailed assessment, this holistic approach is particularly relevant to species-rich groups of sessile or sedentary animals, especially non-migratory taxa such as invertebrates, including molluscs – whether marine, freshwater or terrestrial – where confined distribution coupled with potential loss of habitat and other risks can be quickly identified through the application of spatial data. Used in conjunction with the Red List, the results can contribute to a reduction in data deficiency and add to the rationale for determining the categories and criteria of a standard assessment.

Burke, L., Reytar, K., Spalding M. & Perry, A. 2011. *Reefs at Risk Revisited*. World Resources Institute, Washington D.C. 130 p.

Halpern, B.S., Walbridge, S., Selkoe, K.A., Kappel, C.V, Micheli, F., D'Agrosa, Bruno, J.F, Casey, K.S., Ebert, C., Fox, H.E., Fujita, R., Heinemann, D., Lenihan, H.S., Madin, E.M.P, Perry, M.T., Selig, E.R., Spalding, M., Steneck, R. & Watson, R. 2008. A global map of human impact on marine ecosystems. *Science* 319: 948-952.

Peters, H., O'Leary, B.C., Hawkins, J.P., Carpenter, K.E. & Roberts, C.M. 2013. *Conus*: first comprehensive conservation red list assessment of a marine gastropod mollusc genus. *PloS one* 8(12): e83353.

Peters, H., O'Leary, B.C., Hawkins, J.P. & Roberts, C.M. 2015. Identifying species at extinction risk using global models of anthropogenic impact. *Global Change Biology* 21(2): 618-628.

Rondinini, C., Di Marco, M., Visconti, P., Butchart, S.H.M. & Boitani, L. 2014. Update or outdate: long-term viability of the IUCN Red List. *Conservation Letters* 7: 126-130.

Howard Peters, Bethan C. O'Leary, Julie P. Hawkins & Callum M. Roberts, Environment Department, University of York, Heslington, York, YO10 5DD, UK. howard.peters@york.ac.uk

Effects of storm-induced sand-scour on limpets

By Jake Jefford

Between October 2013 and February 2014 south-west Britain was hit by several unusually intense storm surges.

Westcombe Beach (50° 17.769′ N, 3° 55.038′ W) is a sandy shore in southern Devon that bore the brunt of the winter storm waves. Dr. Richard Kirby of the Marine Biological Association in Plymouth, who visits Westcombe regularly, returned after the storms and noticed sand-blasted shores with unusually glossy, orange-yellow shelled *Patella* limpets on abraded and barren rocky outcrops. The findings of Dr. Kirby motivated my visits to Westcombe Beach to observe this phenomenon, and it was clear that the removal of limpet periostraca was the result of wave-induced sand-scour. Sand-scour is a process whereby suspended particles in the water column abrade the rocky shore. While a number of studies have focused on post-mortem molluscan shell damage by sand-scour, only a few studies have looked at its impacts on living organisms, such as at Ningo, Ghana, where shore modification by sand-scour has led to an absence of the limpet *Patella safiana*, which is usually common on Ghanaian shores (Evans *et al*., 1993).

Such observations give rise to questions about the impacts of storm events on the ecology of intertidal molluscs. Storm events will inevitably increase in the future with rising sea temperatures (IPCC, 2014), requiring decisions to be made about the conservation measures that will be needed to prevent long-term damage to these organisms in the years to come.

In order to establish the direct effects of sand-scour on *Patella* at Westcombe Beach, monthly visits were made; photo-quadrats were taken across the intertidal zone (Pech *et al*., 2004) and limpet samples collected, to see changes in shell characteristics over time. Findings were compared with those from a sheltered shore (Eastern Kings, 50° 21.678′ N, 4° 09.602′ W). Recorded characteristics included changes to the outermost shell layer, the periostracum and shell thickness.

Over the course of ten months, clear changes in these factors were observed. First, there were clear changes in shell periostraca among limpet clusters (Fig. 1). For example, limpet C: in March, the shell was bare; in June, periostracal recovery was evident and juvenile algae (*Ulva lactuca*) were

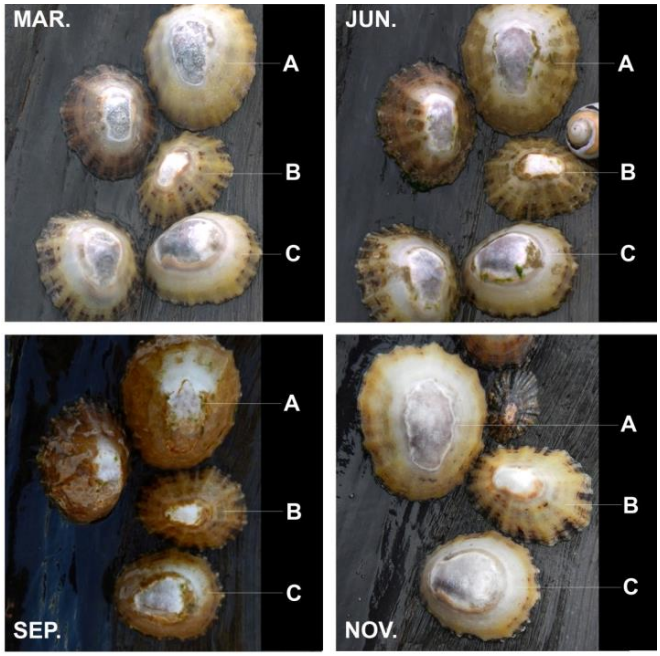

Fig. 1. Photographs of one limpet cluster at Westcombe Beach in March, June, September and November 2014. Limpets A, B and C can be recognised at each month, with evident periostracal recovery between March and September. In November, following a few storms, the periostracum was once again sand-scoured and the shells left bare. (Photos: Jake Jefford)

seen around the apex; in September, periostracal recovery was even more evident and the shell appeared darkened; in November, following a period of mild storms, the shells once again appeared bare and the periostracum removed. Such a finding implies that storm-induced sand-scour will affect the physical characteristics of patellid shells. This is coupled with the fact that sand-scoured shells on Westcombe Beach were thinner for their size compared to those at storm-sheltered Eastern Kings. For example, samples (n = 12, volume: 10,001-15,000 mm^3) collected at Westcombe Beach in April had a mean shell thickness of 2.56 mm, while corresponding samples collected at Eastern Kings had a mean shell thickness of 2.70 mm. Further data analysis is underway to determine the effects of sand-scour on shell thickness. If this pattern is consistent, future storms may thin patellid shells, making them more prone to predation by shell-breaking natural predators such as crustaceans and whelks.

I would like to hear from anyone who knows how limpets repair the outer layers of their shells.

Evans, S.M., Gill, M.E., Hardy, F.G. & Seku, F.O.K. 1993. Evidence of change in some rocky shore communities on the coast of Ghana. *Journal of Experimental Marine Biology and Ecology* 172: 129-141.

IPCC. 2014. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (ed. Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Farahani, E., Kadner, S., Seyboth, K., Adler, A., Baum, I., Brunner, S., Eickemeier, P., Kriemann, B., Savolainen, J., Schlömer, S., von Stechow, C., Zwickel, T. & Minx, J.C.). Cambridge University Press, Cambridge and New York. xv + 1435 p.

Pech, D., Condal, A.R., Bourget, E. & Ardisson, P-L. 2004. Abundance estimation of rocky shore invertebrates at small spatial scale by high-resolution digital photography and digital image analysis. *Journal of Experimental Marine Biology and Ecology* 299: 185-199.

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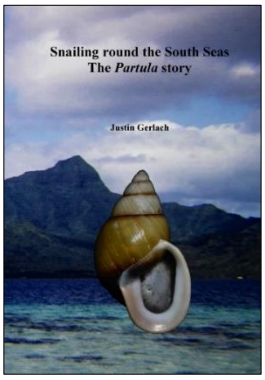
RECENT PUBLICATIONS RELEVANT TO MOLLUSC CONSERVATION

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

Snailing round the South Seas – the *Partula* story



Justin Gerlach, 2014. Phelsuma Press. ISBN-10: 0953378764 ISBN-13: 978-0953378760, Paperback (e-book available). £9.99, €12.99, US$16.99 plus postage.

From the author's website:

"Snailing round the south seas - the *Partula* story" is an account of the development of evolutionary biology centered around the remarkable story of the *Partula* tree snails of the South Pacific.

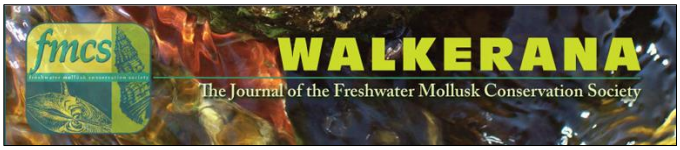
This starts with the great 18th century voyages of exploration characterised by the expeditions of Captain Cook. These used the skills of many of the first professional naturalists. Charles Darwin caught the tail end of the days of exploration, and whilst he himself never worked with *Partula*, he was a great influence on those who did.

At the start of the 20th century the old approaches of collection and Darwin's observational natural history were superseded by a new generation of biologists, eager to combine field data with the new concepts of genetics and statistics. The most remarkable of these was Henry Crampton, already a notable biologist by the time he turned to *Partula*, Crampton started one of the most remarkable studies ever undertaken: the analysis of variation and evolution of the tree-snails of every single valley across the Society Islands. Although Crampton never finished his work on the quarter of a million snails that he collected, the results that he did publish inspired other researchers. With them the study of evolution in the wild became the study of genetics.

For over 200 years *Partula* were at the heart of the development of the biological sciences. All this came to an end after 1974 when carnivorous snails were introduced to Tahiti in a catastrophic effort at biological control. Within the space of 20 years one of the most dramatic extinction events unfolded, devastating a remarkable island species radiation. Today just a handful of species survive, as tiny relict populations in the wild, or in a captive breeding programme.

Partula remain at the heart of cutting-edge projects, but now those are dedicated to the precarious task of keeping species from extinction.

Walkerana



Walkerana returned to publication in 2012 as the on-line journal of the Freshwater Mollusk Conservation Society, based in North America. In 2014, two issues (numbers 1 and 2 of volume 17, containing 6 papers) were published. You have to be a member of the FMCS to obtain the papers on line.

MalaCo – an on-line journal

Unfortunately, I am told by one of the editors, Mollusc Specialist Group member Benoît Fontaine, that *MalaCo* is temporarily not publishing new papers, although it is hoped that it will re-start in the future.

Journal of Threatened Taxa

The latest issue (Vol. 7, No. 1, January 2015) of the *Journal of Threatened Taxa* is available on line now.

AMS Imperiled Species Newsletter

Keep up to date on threatened and endangered molluscs with the American Malacological Society's Imperiled Species Newsletter from Jay Cordeiro, Chair of the AMS Conservation Committee. It is available on the AMS conservation webpage. The most recent issue is for October 2014.

Biology and conservation of freshwater bivalves – Special issue of *Hydrobiologia*

Lopes-Lima, M.P.M., Sousa, R.G., Varandas, S.G.P., Froufe E.M.B. & Teixeira, A.A.T. (ed.). 2014. Biology and conservation of freshwater bivalves. *Hydrobiologia* 735(1).

This special issue includes 20 papers by diverse authors dealing with the biology and consservation of freshwater bivalves in numerous parts of the world, including Spain, France, Russia, North and South America and Australasia.

Other publications of interest

This is not a comprehensive list but simply a list of publications I have happened to come across. If you want to have your publications listed in the next issue of *Tentacle*, please send details to me, Robert Cowie, the editor of *Tentacle*.

Bolotov, I. Vikhrev, I., Bespalaya, Y., Artamonova, V., Gofarov, M., Kolosova, J., Kondakov, A., Makhrov, A., Frolov, A., Tumpeesuwan, S., Lyubas, A., Romanis,T. & Titova, K. 2014. Ecology and conservation of the endangered Indochinese freshwater pearl mussel, *Margaritifera laosensis* (Lea, 1863) in the Nam Pe and Nam Long rivers, northern Laos. *Tropical Conservation Science* 7(4): 706-719.

Brodie, G., Barker, G.M., Stevens, F. & Fiu, M. 2014. Preliminary re-survey of the land snail fauna of Rotuma: conservation and biosecurity implications. *Pacific Conservation Biology* 20(1): 94-107.

Buckley, T.R., White, D.J., Howitt, R., Winstanley, T., Ramón-Laca, A. & Gleeson, D. 2014. Nuclear and mitochondrial DNA variation within threatened species and subspecies of the giant New Zealand land snail genus *Powelliphanta*: implications for classification and conservation. *Journal of Molluscan Studies* 80: 291-302.

Caldwell, R.S., Copeland, J.E., Mears, G.L. & Douglas, D.A. 2014. Notes on the natural history and ecology of *Inflectarius magazinensis* (Pilsbry & Ferriss, 1907) (Gastropoda: Polygyridae), the Magazine Mountain Shagreen. *American Malacological Bulletin* 32(2): 211-216.

Espinosa, F., Rivera-Ingraham, G.A., Maestre, M., González, A.R., Bazairi, H. & García-Gómez, J.C. 2014. Updated global distribution of the highly endangered marine limpet *Patella ferruginea* (Gastropoda: Patellidae): an example of biodiversity loss in the Mediterranean. *Oryx* 48(2): 266-275.

Haag, W.R. & Williams, J.D. 2014. Biodiversity on the brink: an assessment of conservation strategies for North American freshwater mussels. *Hydrobiologia* 735: 45-60.

Horáčková, J., Juřičková, L., Šizling, A.L., Jarošík, V. & Pyšek, P. 2014. Invasiveness does not predict impact: response of native land snail communities to plant invasions in riparian habitats. *PLoS ONE* 9(9): e108296.

Inoue, K., Monroe, E.M., Elderkin, C.L. & Berg, D.J. 2014. Phylogeographic and population genetic analyses reveal Pleistocene isolation followed by high gene flow in a wide ranging, but endangered, freshwater mussel. *Heredity* 12: 282-290.

Kemencei, Z., Farkas, R., Páll-Gergely, B., Vilisics, F., Nagy, A., Hornung, E. & Sólymos, P. 2014. Microhabitat associations of land snails in forested dolinas: implications for coarse filter conservation. *Community Ecology* 15: 180-186.

Martins, C.M. & Simone, L.C.L. 2014. A new species of *Adelopoma* from São Paulo urban park, Brazil (Caenogastropoda, Diplommatinidae). *Journal of Conchology* 41(6): 765-773.

Meyer, W.M., Gary, D.T.A., Yeung, N.W., Dirks, C., Leung, K., Léon, J.A., Ressler, D.T.B., Curry, P.A. & Hayes, K.A. 2014. Native arboreal land snails in the Mt Kaala Natural Area Reserve, Oahu, Hawaii, have similar plant preferences: implications for conservation. *Journal of Molluscan Studies* 80: 469-472.

Naranjo-García, E. & Smith, A.G. 2014. Update on the Terrestrial Mollusks of Chiapas, Mexico. *American Malacological Bulletin* 32(1): 32-51.

Roznere, I., Watters, G.T., Wolfe, B.A. & Daly, M. 2014. Nontargeted metabolomics reveals biochemical pathways altered in response to captivity and food limitation in the freshwater mussel *Amblema plicata*. *Comparative Biochemistry and Physiology, D* 12: 53-60.

Salvador, R.B., da Silva, N.G., Alves, R.J.V., de Moura, R.L. & Simone, L.R.L. 2014. New records of *Helicina inaequistriata* (Gastropoda: Helicinidae) from Rio de Janeiro and São Paulo states, Brazil. *Check List* 10(4): 936-938.

Salvador, R.B., Silva, N.G., Cunha, C.M., Simone, L.R.L. & Alves, R.J.V. 2014. Rediscovery of living land snails on Trindade Island, Brazil. *American Malacological Bulletin* 32(1): 140-142.

Saupe, E.E., Hendricks, J.R., Peterson, A.T. & Lieberman, B.S. 2014. Climate change and marine molluscs of the western North Atlantic: future prospects and perils. *Journal of Biogeography* 41(7): 1352-1366.

Slapcinsky, J. 2014. Hypervariable or hyperdiverse, an independent assessment of the taxonomically confusing land snail genus *Tropidophora* (Pomatiidae: Littorinoidea: Caenogastropoda) in Madagascar. *American Malacological Bulletin* 32(2): 259-266.

Vogler, R.E., Beltramino, A.A., Peso, J.G. & Rumi, A. 2014. Threatened gastropods under the evolutionary genetics species concept: redescription and new species of the genus *Aylacostoma* (Gastropoda: Thiaridae from High Paraná River (Argentina-Paraguay. *Zoological Journal of the Linnean Society* 172: 501-520.

Waterhouse, B.R , Boyer, S. & Wratten, S.D. 2014. Pyrosequencing of prey DNA in faeces of carnivorous land snails to facilitate ecological restoration and relocation programmes. *Oecologia* 175(2): 737-746.

IUCN, SSC AND MOLLUSC SPECIALIST GROUP NEWS AND ANNOUNCEMENTS

www.iucn.org/

News and announcements provided by Mary Seddon, chair of the Mollusc Specialist Group of the IUCN Species Survival Commission, and Robert Cowie, editor of *Tentacle*.

FREE English special edition of Terre Sauvage featuring SOS and IUCN Red List

To help celebrate more than 50 years of IUCN's commitment to protecting our world's natural heritage, *Terre Sauvage* magazine has published a special edition of its monthly wildlife magazine dedicated to the IUCN Red List of Threatened Species (the knowledge) and SOS – Save Our Species (the action). This beautiful special edition is available in French in print and digital formats and for free in the English digital version. You can download the English version through a link on the SOS news page. We hope you enjoy reading this special edition and can share it onward. Thanks and kind regards, The SOS Team.

New Director-General for IUCN

In January 2015 IUCN welcomed a new Director General, Inger Andersen. Previously Vice President for the Middle East and North Africa (MENA) at the World Bank, Ms. Andersen was responsible for the Bank's strategy and operations throughout the region. She succeeds Julia Marton-Lefèvre, who served as IUCN Director General from January 2007.

A Danish national, Ms. Andersen began her career working on desertification and dryland issues in Sudan. At the World Bank, she worked primarily on water, environment and sustainable development, with special focus on the Africa and MENA Regions. In 2010, she was named Vice President for Sustainable Development, overseeing the technical quality of the Bank's portfolio and leading the Sustainable Development Network.

Progress on Red Listing

In 2014, 408 new mollusc assessments were published, so by the latest update to the Red List (2014.3) we have assessed 7,217 mollusc species, with 1,950 considered Threatened. Additions include further species of Cephalopoda, eastern Mediterranean freshwater molluscs and other individual submissions such as some Threatened species of land snails from Malaysia.

Plectostoma sciaphilum (Fig. 1), a snail known from a single limestone hill in Peninsular Malaysia, is now listed as Extinct as a result of the hill being entirely destroyed by limestone quarrying by a large company. The future of several other species in the region is uncertain for similar reasons. While some mining companies are starting to take the necessary steps to reduce their impact, IUCN is urging stronger commitment to preventing further extinctions. IUCN has written an official letter to the cement company drawing attention to the current status of these species, which include a species named after the company, *Charopa lafargei*.

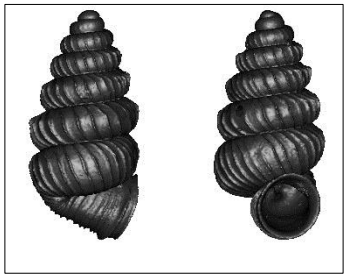


Fig. 1. *Plectostoma sciaphilum*.

Another species listed shows that it is not necessary to have finished describing a species, although a publication should be in an advanced stage. The Kaputar pink slug, *Triboniophorus* sp. nov. "Kaputar" (Fig. 2), endemic to Mount Kaputar in New South Wales, Australia, was listed as Endangered based on its restricted range and threats from climate change and habitat loss. The species is naturally very limited in its distribution and habitat requirements, as it occupies the highest parts of Mount Kaputar and as temperature in the area

Fig. 2. *Triboniophorus* sp. nov. "Kaputar". (Photo: M.J. Murphy, November 2010)

increases and habitats disappear, it has nowhere to move to. Habitat is being degraded by increased frequency of fire and grazing by feral pigs. Much of the high-elevation wet eucalypt forest on freehold properties bordering the eastern edge of Mount Kaputar National Park has been cleared for agriculture and it is likely that the majority of habitat for this species outside the park has been lost.

Tables of possibly extinct species on the Red List website

In response to requests by the IUCN SSC Mollusc Specialist Group a new table (Table 9) has been added to the summary statistics detailing the species that are considered Critically Endangered (Possibly Extinct) and Critically Endangered (Possibly Extinct in the Wild). The Red List version 2014.3 now lists 733 EX, 32 EW, 460 CR(PE) and 3 CR(PEW), totaling 1,228 species believed to be Extinct or Possibly Extinct. Of the species assessed, 443 species of mollusc were considered to be EX, EW, CR(EW) or CR(PEW). This indicates that molluscs are one of the groups that have suffered most extinctions. It also acknowledges that some species are considered likely to be extinct, but leaves them as Critically Endangered, as we know that surveying the remaining remnant habitats is difficult, especially for small species that may be living at very low densities in complex habitats that are difficult to sample.

Red List training courses

There is an on-line Red List training course "*Assessing Species' Extinction Risk using IUCN Red List Methodology*" including all of the topics covered in a typical IUCN Red List assessor training workshop, with some additional lessons that allow the learner to explore some aspects of the Red List Categories and Criteria in more detail. The course structure involves seven modules, as follows:

- Module 1: Introduction to the IUCN Red List. This module introduces learners to IUCN and the IUCN Red

List, and provides an insight into how IUCN Red List data are used to inform and catalyse conservation action.

- Module 2: IUCN Red List assessments. This module provides an overview of what an IUCN Red List assessment is and how to transform raw data into a published IUCN Red List assessment.
- Module 3: IUCN Red List categories and criteria. This module includes 11 lessons covering all aspects of the IUCN Red List categories and criteria and how to use IUCN methodology to assess a species' extinction risk.
- Module 4: Supporting information for IUCN Red List assessments. This module provides an outline of the supporting information required for IUCN Red List assessments.
- Module 5: IUCN Red List mapping protocols. This module presents the IUCN Red List mapping standards.
- Module 6: IUCN Species Information Service. This module explains what SIS is, who can access it, and how to use the system.
- Module 7: Regional IUCN Red List assessments. This module outlines how to use the IUCN Red List methodology to complete scientifically rigorous Red List assessments for a regional or national Red List.

Final course exam. The final exam is designed to test your knowledge of the IUCN Red List, the IUCN Red List assessment process, and your skills in calculating the various parameters used in IUCN Red List assessments. Passing the exam with a mark of over 75 % will entitle you to a certificate to prove that you have successfully completed the course.

The course is available in English, French and Spanish. You will need to create a user profile to use the on-line training course.

Go to IUCN On-line Training course on Red List assessments for more information.

Submitting a new or revised Red List assessment

The IUCN Red List of Threatened Species is essentially a checklist of taxa that have undergone an extinction risk assessment using the IUCN Red List categories and criteria. The majority of assessments appearing on the IUCN Red List are carried out by members of the IUCN Species Survival Commission (SSC), IUCN Red List authorities (RLAs), Red List partners, or participants in IUCN-led assessment projects.

However, assessments can be done by anyone and submitted to IUCN for consideration. For new assessments, documentation is required to meet the minimum IUCN documentation standards. Anyone can submit an assessment, providing it has been undertaken at a global level. The Red List database is updated every 6 months, and each time the version number reflects the update (e.g. 2014.1, 2014.2, 2014.3). The required information is as follows:

Taxonomy

Name of Species (including Authority)	
Common name of species	
Taxonomic reference (e.g. checklist)	
Family	

Distribution

The species needs to be mapped in order for a Red Listing to be accepted. A map can be submitted as an excel spreadsheet of latitude/longitude, a Google Earth polygon as a KML file, or an Arcview GIS shape file. Alternatively the GEOCAT mapping tool may be used: either upload your data points from a spreadsheet or use the mapping tool to select sites. GEOCAT will calculate the EOO/AOO sizes from your data points.

General description	
Number of known sites	
Countries of occurrence	
Extent of occurrence (km^2), based on a minimum convex polygon around all known points, plus possible points.	
Area of occupancy (km^2, based on 2 x 2 km size grid cells around known points	

Habitats and Life-cycle

General habitats	
Notes on microhabitat requirements of the species	
Information on habitat status Any data on whether changes in habitat have impacted the species	
System (marine/freshwater/terrestrial)	
Maximum age of the species	
Age of the species	

Population information

Any information on species abundance and density, and any data on population trend within distribution	
Population trend (increasing/decreasing/stable/unknown)	

Threats to the species

Description of current principal threats	
Description of habitat changes	
Past threats (no longer operating)	
Any future threats	
Are the threats known to be impacting the species?	
Changes to species e.g. species mortality levels, decline in abundance, reduced reproductive ability, skewed sex ratios, lack of juvenile recruitment	

Conservation actions for species

Description of any ongoing plan to restore populations	
Legislation (national, CITES, EU appendices etc.)	
Presence in protected areas or World Heritage Site	
Any research actions required? (habitat monitoring, taxonomic research, population monitoring, ecology and life histories)	
Suggested conservation actions	
Is this species a candidate for an Amazing Species profile?	
Proposed conservation status	
Rationale	
Comments on change from previous status (if applicable)	

Reference information

Bibliography	
Name(s) of assessor	
E-mail address	
Institution	
Suggested reviewers	
Picture file available (jpeg) Use the species name to submit file	
Map file format (e.g. xml, xls) Use the species name to submit file	

There are guidance documents available on the IUCN Red List website, under resources, if further information on listing is required. The mapping information is also available.

Submission of comments, corrections and additional information is most welcome and should be sent to the IUCN Global Species Programme Red List Unit at this address:

IUCN Global Species Programme Red List Unit
IUCN UK Office, 219c Huntingdon Road
Cambridge CB3 0DL, United Kingdom.
E-mail: redlist@iucn.org

More about mapping

More information about mapping can be found in the IUCN Red List training resources. Some key points are provided here.

1. Using *Arcmap*
IUCN has developed a series of documents for those wanting to use their datasets for Red List assessments:

- IUCN Red List Toolbox (14 MB) – Includes the IUCN Red List species mapping toolbox for ArcMap.
- EOO calculator (42 KB) – Calculates the extent of occurrence for ArcMap 10.1 and above.
- Mapbatcher (400 MB) – An ArcMap document providing an automated way to create multiple static maps of species distributions using the IUCN Red List spatial data.
- Basedata (ArcMap version 10.1, 500 MB) – As a geodatabase containing all the individual shapefiles as seen below, excluding the empty species shapefile.
- Individual shape files e.g. empty species shapefile, city points, countries, islands, lakes, rivers 3 m line, SIS regions level 1, SIS European countries, FAO areas, elevation and bathymetry rasters.

2. Using GEOCAT
The simple GEOCAT mapping tool allows you to either upload existing data or place points on a map, and then save in a suitable format for the IUCN Red List. Full details about the tool can be found in:

Bachman, S., Moat, J., Hill, A.W., de la Torre, J. & Scott, B. 2011. Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *ZooKeys* 150: 117-126.

The "Amazing Freshwater Species" campaign

This year the IUCN SSC freshwater team want to highlight Amazing Freshwater Species and are asking for help in compiling interesting stories on our freshwater species, as freshwater biodiversity is not receiving the attention it deserves and they hope this will help. The aim is to create several papers, with information and species profiles, to target a broad range of sectors: public organizations, conservation agencies, private companies and potential donors. We need a range of stories providing global coverage, as well as different taxonomic groups.

Among molluscs, there are many candidate species, like the cementing bivalves, rare cave species, spring species that live in very hot water, as well as lots of species with interesting biology or amazing looking shells. You may have a different type of story, such as successful conservation action, a conservation problem, for example species that live in a demilitarised zone on the border of two countries. Maybe you have recently found a species thought to be extinct. Perhaps you are working on a species only known from a single location that is rare (e.g. a candidate for an Alliance For Zero Extinction (AZE) species or site). All of these stories are interesting too!

The essential element for the story is the availability of a stunning image of a species, which must be living, preferably in its habitat.

These species do not need to be on the Red List now, as this is a communication about amazing species, but we should document the species during the process, so I would need a one-page profile covering the minimum documentation standards, to upload to the Red List this year.

For each proposed species, in the first instance we need:

Species Name:	
Current/proposed Red List status:	
Type of habitat?	
Country of occurence:	
Why is the species of special interest?	
Do you have a high quality image to share?	

Please send your species nominations to:
Mary Seddon: Freshwater Gastropods
Manuel Lopes-Lima: Freshwater bivalves

If selected then high quality images will need to be sent to Richard Lansdown: rlansdown@ardeola.demon.co.uk

Threatened freshwater project in the Tropical Andes region, South America

A new project has been established by Conservation International, in collaboration with IUCN and the SSC Mollusc Specialist Group, to do the Red List assessments of freshwater biodiversity of the Tropical Andes region (Colombia, Ecuador, Peru and Bolivia). This includes the assessment of freshwater molluscs in the region. The project is in the data collation and assessment phase at present, and scientists from the region have participated in two workshops this year, one in Peru and the other in Colombia. There is some overlap with assessments previously made during the IUCN Sampled Red List Index (SRLI) workshop in London in 2010, so some assessments will be updated more rapidly than is normally possible.

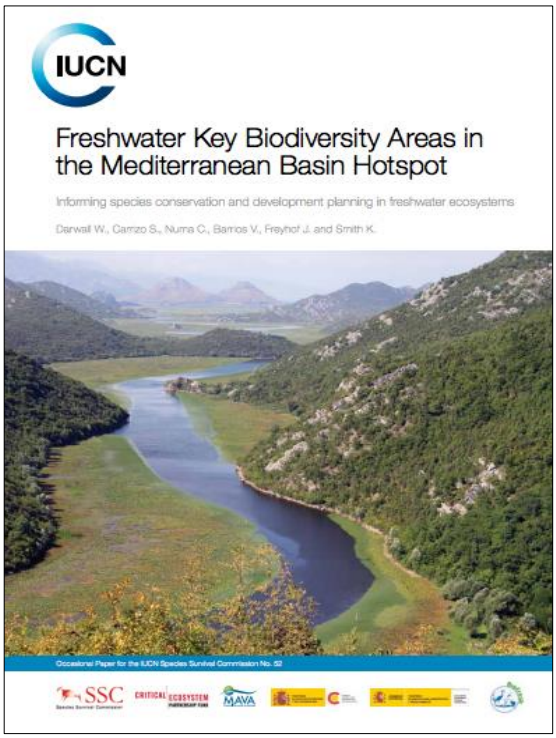
Preventing species extinctions resulting from climate change

This commentary led by Resit Akcakaya of the IUCN Red List Standards and Petitions committee published in *Nature Climate Change* describes how recent studies show that current IUCN Red List assessment methods can identify

species vulnerable to extinction because of climate change. They found that species must be assessed more completely and more regularly, and adaptation actions initiated swiftly once threatened species are identified.

Akçakaya, H.R., Butchart, S.H.M., Watson, J.E.M. & Pearson, R.G. 2014. Preventing species extinctions resulting from climate change. *Nature Climate Change* 4: 1048-1049.

Threatened freshwater biodiversity sites in the Mediterranean



Of the 167 freshwater Key Biodiversity Areas (KBAs) identified, mapped and validated throughout the Mediterranean region (Fig. 1), 75 % occur outside the boundaries of any pre-existing protected areas or other KBAs, according to the main results of an IUCN assessment completed in November 2013 (Fig. 2; Darwall *et al*., 2014).

An estimated 70-75 % of the world's inland wetlands, along with many of the freshwater species that live in them, have been lost in the last 100 years. Freshwater biodiversity is poorly represented within protected areas, which are a critical tool for conservation of these habitats. The species data from freshwater fish, freshwater molluscs, dragonflies, freshwater crabs and crayfish were used to identify critical sites of freshwater biodiversity as the basis for a more representative protected areas network for freshwater species.

This new assessment coordinated by IUCN sets the foundation for such a network in the Mediterranean Basin Hotspot, a region rich in highly threatened freshwater species.

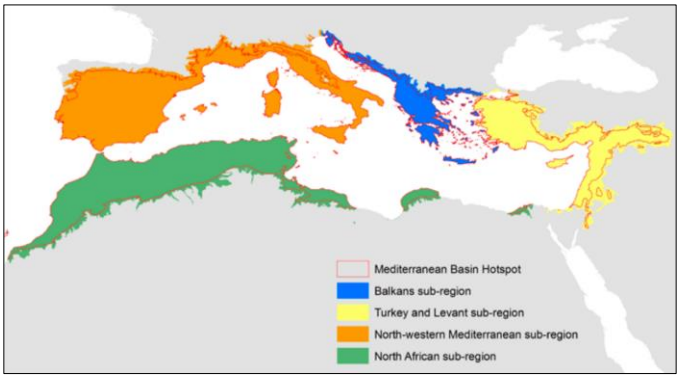


Fig. 1. Sub-regions of the Mediterranean Basin Hotspot.

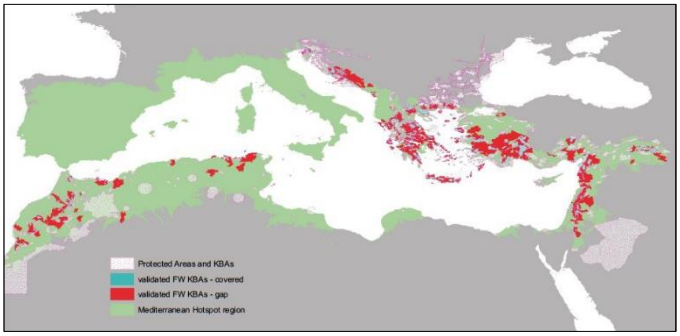


Fig. 2. Main results of the IUCN assessment of freshwater KBAs in the Mediterranean Basin Hotspot.

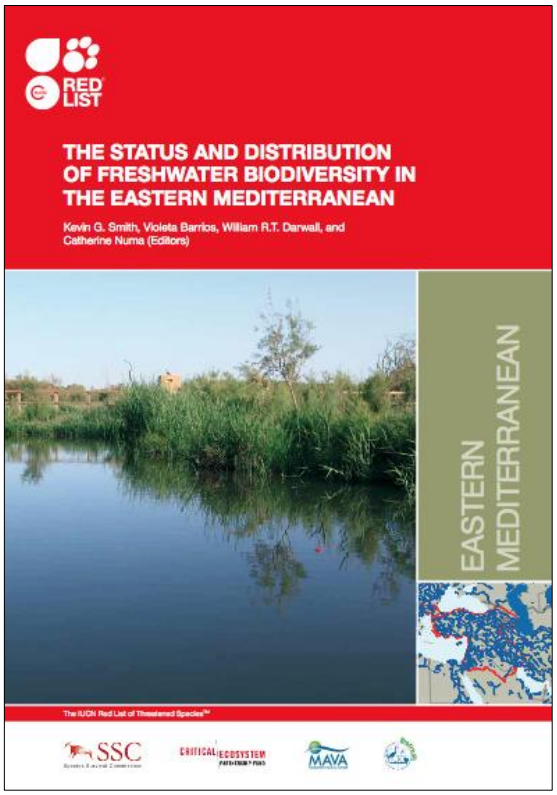
The study reveals that at least 167 sites in the Mediterranean Basin qualify as freshwater Key Biodiversity Areas (KBAs) covering a total area of 302,557 km^2. Of these KBAs, 40 also meet the criteria qualifying them as Alliance for Zero Extinction (AZE) sites, representing some of the last remaining refuges for one or more Critically Endangered or Endangered species.

"Through this project we are putting freshwater biodiversity on the map in a region of the world where pressures on inland wetlands are rapidly driving species to the edge of extinction – a number have already been lost. The next crucial step is to build widespread awareness of these important sites and to stimulate targeted conservation on the ground" commented Will Darwall, Manager of the IUCN Freshwater Biodiversity Unit and project coordinator. KBAs are globally significant areas for the persistence of biodiversity and can guide the selection of new protected areas or the expansion of existing site networks. They were also recognized by the Convention on Biological Diversity as important for reaching global protected area targets.

Increasing severity of droughts, hydrological alterations following construction of dams, over-abstraction of surface and ground waters, water pollution and invasive species are the primary threats to freshwater species according to the experts.

Darwall, W., Carrizo, S., Numa, C., Barrios, V., Freyhof, J. & Smith, K. 2014. *Freshwater Key Biodiversity Areas in the Mediterranean Basin hotspot: informing species conservation and development planning in freshwater ecosystems*. IUCN, Cambridge and Malaga. x + 86 p.

Threatened freshwater biodiversity sites in the Eastern Mediterranean



This assessment coordinated by the IUCN Freshwater Biodiversity Unit completes the regional assessment for the circum-Mediterranean zone, allowing a more in depth analysis of the biodiversity hotspots. This Eastern part of the Mediterranean Basin, is a region rich in highly threatened freshwater species.

Over 45 % of the molluscan fauna is threatened with extinction in the region (Fig. 1; Seddon *et al*., 2014), one of the most highly threatened taxonomic groups, contrasting with the dragonflies – with a more mobile lifestyle – of which only 6.7 % of species are threatened. In this region freshwater molluscs were most threatened by modification of the freshwater habitats (e.g. damming, canalisation, improving water take-off at springs), pollution and climate change (threats of increased drought events, changing water flow patterns and ground-water sources).

The project was funded by the Critical Ecosystem Partnership Fund, the MAVA Foundation and the Spanish Agency for International Development Cooperation (AECID), with contributions from the European Commission's BIOFRESH project and the National Parks Autonomous Agency (OAPN) of the Spanish Ministry of Agriculture, Food and Environment.

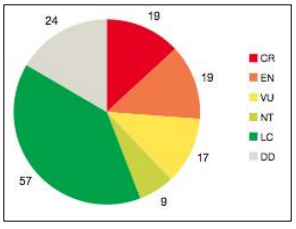


Fig. 1. Number of species of Eastern Mediterranean freshwater molluscs in each IUCN Red List category.

Seddon, M. Kebapçı, Ü., Lima-Lopes, M., van Damme, D. & Smith, K. 2014. Freshwater Molluscs. In: *The status and distribution of the freshwater biodiversity of the Mediterannean* (ed. Smith, K., Barrios, V., Darwall, W. & Numa, C.), p. 43-56. IUCN, Cambridge, Malaga and Gland.

IUCN publication on biodiversity for business

IUCN. 2014. *Biodiversity for business: a guide to using knowledge products delivered through IUCN*. IUCN, Gland. 48 p.

Without biodiversity, there is no business. Companies are therefore major players in this landscape and are responsible for their impact on biodiversity and ecosystem services. But, in order to act responsibly, they need information on where these biodiversity impact-related risks and opportunities lie. IUCN and WBCSD have joined forces to develop this manual that describes the various knowledge products that exist and explain how they can help businesses in assessing, valuing, managing and reporting on businesses' impacts and dependencies on biodiversity, and in achieving compliance with environmental standards and certification schemes.

IUCN publication on the benefits of natural world heritage

Osipova, E., Wilson, L., Blaney, R., Shi, Y., Fancourt, M., Strubel, M., Salvaterra, T., Brown, C. & Verschuuren, B. 2014. *The benefits of natural World Heritage: identifying and assessing ecosystem services and benefits provided by the world's most iconic natural places*. IUCN, Gland. vi + 58 p.

This study identifies and assesses the diversity of ecosystem services, and in turn the benefits that World Heritage sites can deliver to society and the economy through direct and indirect use or through inherent non-use values. It also aims to increase awareness and understanding of the multiple services and benefits that ecosystems can provide as well as their contribution to the well-being of local, national and global communities.

IUCN publications on biodiversity offsets

IUCN now has a working party looking at the trends and policy options for biodiversity offsets. Last year saw the production of several publications, all available in pdf format for download from the IUCN website. Notably:

IUCN. 2014. *Biodiversity offsets technical study paper*. IUCN, Gland. 65 p.

Offset policies are considered when looking to mitigate for biodiversity impacts as the result of a large new development project. This document was developed as there were various different ways in which biodiversity offsets had been discussed by governments and NGOs around the world. This report summarises the key elements of offsetting best practice upon which IUCN's Technical Study Group believes there is sufficient agreement for IUCN to recommend them to its

members through an offset policy. The key elements are:

- Biodiversity offsets have the potential to provide net gains in biodiversity in the right context, but this has rarely yet been realised in practice (Section 2).
- The high-level principles of offsetting best practice are reasonably well agreed (Section 2).
- The principal reason that offsets fail to achieve no net loss or net gain appears to be lack of clear policy requirements that offer unambiguous guidance to developers and offset providers, limited capacity for implementation of mitigation, inadequate monitoring and enforcement, and – particularly – insufficient political will to require and enforce best practice in offsetting (Section 2).
- Offsets should be applied within the context of the mitigation hierarchy (Section 3).
- Offsets should be planned within a dynamic landscape context, taking into account cumulative impact scenarios (Section 3).
- Offset systems should aim to achieve at least no net loss and preferably a net gain for all biodiversity, through addressing – as a minimum – significant residual direct and indirect impacts (Sections 4 and 5).
- In practice, it is necessary to focus specific offsetting measures and measurement of losses and gains on good surrogates of broader biodiversity and on biodiversity of the highest conservation concern (e.g. rare and restricted biodiversity) (Section 4).
- Some – perhaps many – impacts are so significant that they may not be acceptable to society (in which case projects will not be permitted) or cannot be offset, owing to the high risk of failure (Section 4).
- For impacts with a low significance in terms of biodiversity conservation, a simplified approach would be preferable in order to avoid transaction costs that are high relative to the costs of mitigation measures, including offsets (Section 4).
- Societal values concerning biodiversity should be captured within offset goals (Section 5).
- Offset metrics should separately include both surrogacy measures (often habitat-based) and measures for high conservation priority biodiversity that is poorly represented by those surrogates (Section 6).
- Offset metrics should strike a balance between limiting substitution and establishing a currency that is fungible enough to facilitate exchange (Section 6).
- Conservation outcomes from biodiversity offsets should be "additional" (Section 7)
- It is preferable to secure offset outcomes prior to impacts in order to address temporal loss and reduce the risk of offset failure (Section 8).
- The conservation outcomes of offsets should endure at least as long as the impacts are felt (Section 8).
- Public sector developments should abide by the same offset requirements as private sector developments (Section 9).
- It is desirable to allow a level of choice with a variety of options for how offsets can be implemented, but there should be equally exacting standards for all forms of offset implementation (Section 10).
- Shortcomings in monitoring, evaluation and enforcement account for a significant proportion of the cases where mitigation measures, including offsets, have failed to deliver their goals (Section 11).

The flagship knowledge products, such as the IUCN Red List of Threatened Species have significant potential to inform the manner in which the mitigation hierarchy could be applied, the scope of offset policies, the offsetting activities that could be considered as additional and the site selection of biodiversity offsets. For example, priorities for measurement during offsetting may be considered to be particularly vulnerable species or ecosystems (in respective Red Lists) or particularly irreplaceable sites (Key Biodiversity Areas).

IUCN Marine News - issue 11

The IUCN Global Marine and Polar Programme produces the *Marine News* e-newsletter. Issue 11 was released at the IUCN World Parks Congress in Sydney in November 2014. The 50 page publication has a focus on tropical marine ecosystems.

MEETINGS 2015-2016

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

Brasilian Society of Malacology: 24th EBRAM

The Brasilian Society of Malacology (SBMa – Sociedade Brasileira de Malacologia) will hold its 24th Brasilian Malacological Meeting in Rio de Janeiro in September 2015. The congress will be hosted by the University of the State of Rio de Janeiro (UERJ), Maracanã Campus. The second

Symposium of Young Latin-American Taxonomists is planned. It will be a great opportunity for all young researchers to discuss and exchange their results. In addition, special sessions of contributed papers, oral presentations and posters will be open to all aspects of malacology. Registration will begin in March 2015. More information will become available as soon as possible at the SBMa website, or contact Dra. Sonia Barbosa dos Santos, President of the SBMa: sbmalacologia@yahoo.com.br.

Amercan Malacological Society 2015 meeting

The 81st annual meeting of the AMS will take place from 28 to 31August 2015 at the University of Michigan Biological Station. The meeting will feature a keynote address by Alison Sweeney who investigates the evolution and functional diversity of optical devices of molluscs that are associated with vision and camouflage and that facilitate photosynthesis of symbionts.

A special symposium, Early Career Malacologists, will showcase the work of researchers in the early stages of their careers, especially students, and highlight fresh directions in the study of molluscs. Jingchun Li and Alvin Alejandro are organizing the symposium—please feel free to suggest invitees to this symposium to Jingchun (jingchun@umich.edu). An additional session on freshwater molluscs, Great Lakes Malacology, is also in the works.

The tentative meeting schedule includes a welcoming reception on 28 August, oral presentation sessions on 29-31 August, a poster session and an auction to raise funds for student research on 29 August, a banquet on 30 August and opportunities for field trips on 31 August.

The meeting venue is on the shores of an inland lake (Douglas Lake) in northern Michigan, a region of the state that has attracted wilderness enthusiasts and summer trippers from all parts of the Midwest of the USA for over a century. Although marine molluscs are a far ways off, the station grounds and local areas abound with numerous varieties of freshwater and terrestrial molluscs! On-site amenities at the station include a medium and large seminar room to host presentations, cabins for lodging, a dining hall for meals, and hiking trails that provide opportunities for local field excursions. Surrounding areas offer prospects for exploring state parks (e.g. Wilderness State Park and Cheboygan State Park), a designated dark sky park (Headlands International Dark Sky Park), beaches (yes, beaches!), Mackinac Island, the Upper Peninsula of Michigan, wineries and craft breweries. Opportunities to visit the University of Michigan Museum of Zoology's Mollusk Division collections will be available immediately following the meeting.

Information on registration, submission of abstracts as well as lodging and transportation options are posted on the meeting's website. Please direct any questions or suggestions for additional themed sessions to Tom Duda (tfduda@umich.edu).

Western Society of Malacologists 2015

Western Society of Malacologists

The 48th annual meeting of the WSM will be held June 25-28, 2015 (Thursday to Sunday) at California State University Fullerton. Details and a call for abstracts will be posted in early 2015. Meanwhile, please contact WSM President, Dr. Danielle Zacherl if you need further details.

Conchologists of America 2015 convention

The Broward Shell Club cordially invites you to attend the 2015 COA convention in Weston, Florida, on the edge of the unique Florida Everglades, 14-18 July 2015. Planned field trips (12-13 July) will include a snorkelling trip, an Everglades land snail adventure and an Everglades airboat ride adventure. Information can be found at the COA conventions website.

Second International Meeting on Biology and Conservation of Freshwater Bivalves

The meeting will be held on 4-8 October 2015 at SUNY Buffalo State in beautiful Buffalo, USA. More information is available at the conference website.

Society for Conservation Biology 2015

The SCB's International Congress for Conservation Biology (ICCB), previously annual, is now biennial. For 2015 The SCB is proud to team up for the first time with Agropolis international and the French Foundation for Research on Biodiversity (FRB) to host the 27th ICCB and the 4th European Congress for Conservation Biology (ECCB) to be held on 2-6 August 2015 in Montpellier, France.

Amercan Malacological Society 2016 meeting

The 82nd annual meeting of the American Malacological Society will take place in Ensenada, Mexico, in conjunction with the Western Society of Malacologists. The venue will be the Universidad Autónoma de Baja California. Tentative dates are 10-14 June 2016. The organization will arrange for transportation between the San Diego International Airport and the venue. For more information contact:

Dr. Ángel Valdés
Department of Biological Sciences
California State Polytechnic University
3801 W. Temple Ave.
Pomona, California 91768-4032, USA.
Phone: (909) 869-4064

World Congress of Malacology, 2016, Penang, Malaysia

The World Congress of Malacology (WCM) is the triennial event of Unitas Malacologica (UM) and we welcome you to be part of it. Malaysia is proud to be hosting the congress for the very first time.The congress is open to all contributions in the field of malacology and will host symposia as well as contributed papers and posters. High diversity in the scope of papers covering all aspects of molluscs are welcome. The organizing committee would like to take this opportunity to extend invitation for all to propose symposium themes for which you are prepared to act as symposium organizer. The following symposium themes have been proposed:

- Ecology of marine molluscs
- Molluscan aquaculture in a changing climate
- Molluscan biodiversity and biogeography in the Indo-West Pacific
- Integrating molecules, morphology, biology and biogeography in "Opisthobranch" research

WCM2016 will be an opportunity for the international malacology community – academics, researchers, etc. – to present their work, exchange ideas, and develop collaborations and networking with other countries.

The WCM2016 congress will be held in the beautiful island of Penang, Malaysia. Penang has been long regarded as the food capital of Malaysia and is known as the "Pearl of the Orient". Penang has been listed as a UNESCO World Heritage Site since 2008 for its heritage buildings, art and culture. The congress is planned to be held in June 2016, which coincides with the fruit season in Malaysia. This will enable all international participants to have the opportunity to taste the local tropical fruits especially the King of Fruits (durians). I am confident that Penang will be a place full of excitement for all, and I would like to invite all of you to come and see for yourself. I am looking forward to your participation in Penang in 2016.

Aileen Tan Shau-Hwai
President, UNITAS Malacologica
Chair, WCM 2016

INTERNET RESOURCES

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

Red List

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

IUCN Invasive Species Specialist Group

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

Unitas Malacologica

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

Mollusca list

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

listproc@ucmp1.berkeley.edu

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

sub mollusca <your_name without the brackets>

Alternatively, send e-mail to

Majordomo@listlink.Berkeley.Edu

And on the first line of the message:
subscribe molluscalist <your_name without the brackets>
You will get a reply soon after saying that your name has been added. You will then receive anything that is posted to the list. MOLLUSCA is maintained and managed by David R. Lindberg of the University of California Museum of Paleontology, Berkeley, USA.

Mollia

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

Unio listserver

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

Malacological Society of Australasia

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

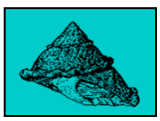
Brasilian Society of Malacology

The Soceidade Brasileira de Malacologia (SBMa) welcomes malacological researchers, professionals and students, Brasilian and foreign, as well as aficionados of molluscs, having as its main objective to encourage the study of malacology, promoting knowledge of molluscs and its dissemination at all cultural levels, and taking reasonable measures to preserve the Brasilian mollusc fauna.

American Malacological Society

The homepage of the American Malacological Society carries a link to its conservation policy and to the newly introduced AMS Conservation Committee Imperiled Species News. Student research grants are available.

Western Society of Malacologists



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

Conchologists of America

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

Freshwater Mollusk Conservation Society

The Freshwater Mollusk Conservation Society (FMCS) is devoted to the advocacy for, public education about and conservation science of freshwater mollusks, North America's most imperiled fauna. Its website has an excellent page of links. The FMCS now publishes the journal *Walkerana* and has all issues of volume 1 on line and available, which includes Jack Burch's Identification of *Eastern North American Land Snails* and two-part *North American Freshwater Snails*.

MUSSEL database project

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

Illinois Natural History Survey

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

The National Museum of Wales – Mollusca

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

Caucasian Snail Project

The Caucasian Land Snails project is a major collaborative effort. The website is maintained by Bernhard Hausdorf, mollusc curator at the Zoological Museum, Hamburg University.

Tropical land snail project at the Natural History Museum, London

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

CLEMAM: Check List of European Marine Mollusca

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

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.

Samoan Snail Project

The Samoan Snail Project has as its goals assessing the diversity and historical decline of the native Samoan non-marine snail fauna, as a first step in its conservation. It is part of the Bishop Museum's Pacific Biological Survey.

Haus der Natur – Cismar

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

Australian marine invertebrates

Overview of the Conservation of Australian Marine Invertebrates by W. F. Ponder, P. Hutchings & R. Chapman (588 p.), published in July 2002.

Field Museum land snails

The on-line databse of Chicago's Field Museum mollusc collections contains information for over 158,000 lots (a lot is a collection of a single species taken from a single locality on a single occasion), including over 2,500 type lots, of land snails.

CITES

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The majority of information relates to mammal and bird trade.

Other useful links

www.manandmollusc.net/
www.staff.uni-mainz.de/lieb/

ARTICLE ADDED ON THE DAY OF PUBLICATION

MOLLUSC CONSERVATION AND *CHECK LIST*, THE JOURNAL OF BIODIVERSITY DATA

By Diogo B. Provete & Robert G. Forsyth

Check List is a bimonthly peer-reviewed, open access, on-line only journal, devoted to publishing lists of species and notes on the geographic distribution of any taxon. Biodiversity data are essential for studies oF biogeography and provide a baseline for the conservation of biodiversity as a whole. Effective conservation action begins with understanding the distributions of species. The main purpose of *Check List* is to publishing biodiversity data that are usually too basic for publication in standard journals. With the publication of volume 10, issue 6 in December 2014, the journal will have completed its tenth year.

Several articles on molluscs have been published recently that focus on poorly known or rare species and therefore are particularly relevant for species' conservation. Among these and published this year (2014) is one on *Helicina inaequistriata* Pilsbry, 1900 (Fig. 1a), a poorly known terrestrial snail reported from Ilha do Cabo Frio, southeastern Brasil (Salvador *et al*., 2014). In addition to the new record, Salvador *et al*. (2014) mapped all known occurrences of *H. inaequistriata* in the Brazilian states of São Paulo and Rio de

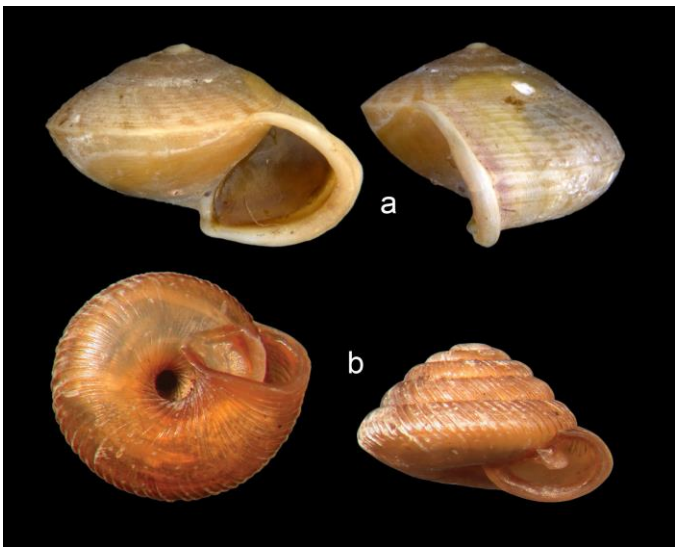


Fig. 1. Two species of land snails for which new geographic distributional data were presented in *Check List*: a, *Helicina inaequistriata* from Ilha do Cabo Frio, Brasil; diameter 9.4 mm (Salvador *et al*., 2014); b, *Strobilops aeneus* from Ottawa, Ontario, Canada; diameter 2.9 mm (Forsyth & Oldham, 2014).

Janeiro. In another article on a terrestrial snail, Forsyth & Oldham (2014) reported new records of the rare (at least in Canada) *Strobilops aeneus* Pilsbry, 1926 (Fig. 1b). This

species, which is now known from only eight sites in Ontario, Canada, had gone unnoticed in the province for 65 years. Purported records from other provinces were also discussed.

Aquatic molluscs have also been the subject of *Check List* articles. The large, nektonic Diamondback squid, *Thysanoteuthis rhombus*, is rarely captured in Brasilian waters. Two individuals were recorded from the Brasilian coast by Cunha & Oliveira (2014), who concluded that *T. rhombus* occurs south of the confluence zone of the Malvinas and Brasil Currents.

Other articles report invasive species, which if not directly related to species' conservation, may impact natural ecosystems considerably. Among these are: the first record of freshwater snail *Pseudosuccinea columella* (Say, 1817) from Salta province, Argentina (Davies *et al*., 2013); discovery of the marine bivalve *Isognomon bicolor* (C.B. Adams, 1845) rafting on garbage to the Uruguay coast (Breves *et al*., 2014); and the first record of the terrestrial slug *Deroceras invadens* Reise, Hutchinson, Schunack & Schlitt, 2011 in Newfoundland, Canada (Forsyth 2014).

Check List is an on-line only journal and publication costs are kept to a minimum and essentially cover the costs associated with DOI registration and hosting. Momentous changes happened in 2014 that saw *Check List* move to an on-line journal management system (Open Journal Systems) hosted by www.biotaxa.org. We continue to find ways to improve the journal, expedite reviews and offer better indexing of content. Our next big step is to integrate the records published by us with the Global Biodiversity Information Facility (gbif.org), which would make the records available to a broader audience and make them easily retrievable.

While articles on Mollusca have always been in the minority compared with other taxa, the *Check List* editorial board would like to invite (or remind) authors to submit their work. Also, we currently have only one subject editor for Mollusca (Robert Forsyth), but the submissions have increased recently and we are in need of another editor. Those who would like to contribute can e-mail Robert Forsyth with their CV and a letter of intention.

Breves, A., Scarabino, F. & Leoni, V. 2014. First records of the non-native bivalve *Isognomon bicolor* (C.B. Adams, 1845) rafting to the Uruguayan coast. *Check List* 10(3): 684-686.

Cunha, C.M. & Oliveira, L.E. 2014. Geographic distribution of *Thysanoteuthis rhombus* (Cephalopoda, Thysanoteuthidae) on the Brazilian coast. *Check List* 10(4): 939-942.

Davies, D., Nieva, L., Choke, L.A., Issa, F.S., Pujadas, J. & Pepelitchi, L. 2014. First record of *Pseudosuccinea columella* (Say, 1817) from Salta province, northwest Argentina (Mollusca: Gastropoda: Lymnaeidae). *Check List* 10(3): 597-599.

Forsyth, R.G. & Oldham, M.J. 2014. Distribution of *Strobilops aeneus* Pilsbry, 1926, in Canada, with two new Ontario records (Mollusca: Gastropoda: Strobilopsidae). *Check List* 10(2): 397-401.

Forsyth, R.G. 2014. First record of *Deroceras invadens* Reise, Hutchinson, Schunack & Schlitt, 2011 (Gastropoda: Pulmonata: Agriolimacidae) from the island of Newfoundland, Canada. *Check List* 10(1): 149-150.

Salvador, R.B, N.G. da Silva, R.J.V. Albes, R.L. de Moura & L.R.L. Simone. 2014. New records of *Helicina inaequistriata* (Gastropoda: Helicinidae) from Rio de Janeiro and São Paulo states, Brazil. *Check List* 10(4): 936-938.

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