

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

# TENTACLE



UNITAS MALACOLOGICA

Editor – Robert H. Cowie



## GUEST EDITORIAL: AN INITIATIVE TO ADVANCE CONSERVATION OF SOUTH AMERICAN FRESHWATER BIVALVES

By Grupo BIVAAS

In the editorial of *Tentacle 19*, the editor, Robert Cowie, who knows very well the global reality of mollusc conservation, focused attention on the poorly known South American non-marine molluscs and the need for efforts to address their conservation, and asked “Who will stand up and lead this?” The fauna, as in most of the world, is seriously threatened by intensification of land use, deforestation, construction of large dams and the impacts of invasive species (in South America notably *Corbicula* spp., *Limnoperna fortunei* and *Melanoides tuberculata*). Knowledge of non-marine molluscs in South America is still insufficient to develop appropriate conservation plans. The taxonomy remains unclear in many genera, the anatomy is unknown for the majority of the species, vast areas of the continent remain unexplored, and in only few cases do we have information about the ecology of species and their communities. And there are few researchers attracted by the group despite the incredible diversity and the degree of threat.

But not all is lost, in 2012, one year after Dr. Cowie asked the question above, a group of researchers from Argentina, Brasil, Peru and Uruguay, motivated and inspired initially by Cristhian Clavijo, met in Rio de Janeiro and formed a group named BIVAAS (Freshwater Bivalves of South America, from the initials in Spanish or Portuguese). Since then, we have initiated a series of meetings using the regional malacological congresses, and in 2017 we had our first continental meeting, in Uruguay in the context of the Latin American Congress of Malacology (X CLAMA). Our group is now well established, with over 20 members representing most South American countries and including people at all levels from undergraduate students to widely respected senior researchers.

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After some discussion, guidelines and aims were drawn up. Now we have a schedule and the view to becoming a formal organisation.

The goals of BIVAAS are to integrate South American freshwater mussel researchers, combining our expertise and increasing the resources to promote studies of taxonomy, distribution patterns and life-histories in support, eventually, of implementation of better conservation strategies. We also will continue to engage in scientific outreach activities to

introduce to the public, decision makers and stakeholders the importance of freshwater mussels.

We are facing one of the strongest challenges in the conservation of molluscs, but we will stand up and lead the conservation efforts of freshwater bivalves in South America. Support of our initiative in any way is very welcome.

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Coordinator, Claudia Callil

## IN MEMORIAM — TONY WHITTEN

From the [IUCN website](#) 18 December 2017

Conservationist Tony Whitten, who was the Founding Chair of the IUCN SSC Specialist Group on cave invertebrates, was tragically killed in a cycling accident on November 29 2017. Friend and colleague, and member of the IUCN Species Survival Commission (SSC) Steering Committee, Elizabeth Bennett reflects on Tony's colourful life and extraordinary contributions to global conservation.



The conservation world has just lost a unique enthusiast and champion, and so many people have lost a deeply loved family member or friend. Tony Whitten was one of the most admired and respected people in the whole global conservation community, with the combination of his warm personality, deep integrity, ability to connect with people in all realms and spheres, his wonderful sense of humour, and also his unbridled enthusiasm and fascination for nature, especially for the less “warm and fuzzy” creatures that are so often overlooked by others.

I first met Tony in Cambridge when we were students. He and his wife Jane had just returned to write up their theses after they had been living in Siberut studying, in his case, Kloss gibbons and, in Jane's, small mammals, and I was about to head out to Malaysia for my own research. Right from the start, they made their home a warm welcoming place for me, as well as for so many others. They have continued to do so up to this day with, in more recent times, those visits often including donning wellies to join both of them in helping to pick salad from the end of the garden for dinner, having, of course, to check out the garden ponds for newts on the way.

Tony, as a graduate student, had written the conservation master plan for Siberut, and opened the world's eyes to the

importance of the Mentawai Islands and their four endemic primates, so I wondered where he would go next, since that would already be a career high for so many people. The answer was, he and Jane, with their newly growing family, moved back to their cherished Indonesia. Amongst other things, he led a small team to produce the ground-breaking “Ecology of...” series of books in English and Bahasa, inspiring a whole generation of Indonesians and others in the region to learn and care about their natural environment. It was through the first of these, “The Ecology of Sumatra”, that I fully realized the breath of Tony's interest in nature, and the level of both his fascination as well as detailed knowledge around such a wide range of species and ecosystems. How thoroughly I used the information in the book on the values of mangroves! And it was from him that I learned that the distribution of fish in Borneo's rivers followed ancient Sundaic river systems, with those in the north having species in common with mainland Asia, and those in the south with Java. Who knew?! Tony did.

Tony then went on to become Senior Biodiversity Specialist at the World Bank – perhaps an unusual choice for an ardent field conservationist. But through his role there, he facilitated major conservation progress across Asia by his innovative use of major funding streams, including channeling millions of dollars into conservation in Mongolia, another country which he rapidly grew to love. This was in spite of his falling off a horse there giving him a couple of broken ribs; when we met at the IUCN Congress in Jordan just after that, we joked about his Napoleon impression with his arm strapped across his chest. Playing hooky for half a day from that Congress with Tony and a couple of other friends to visit the ancient city of Jerash, while we were being awed at the Roman remains, Tony was seeking tiny snails in the ancient walls and showing them to us with vast enthusiasm.

Recognizing that the key to inspiring people to care about wildlife is knowing what they are looking at, Tony also worked in the World Bank, this time with Kathy MacKinnon, to initiate the Bank's programme to produce local-language field guides – the final list stands at about 111 beautiful guides, on mammals, birds trees, freshwater fish and more.

On one field trip during his time with the Bank, Tony was passing through Singapore and took a day out to visit me in Sarawak where I was then living. He was clearly suffering from a heavy cold and feeling distinctly under the weather, but that never deterred his passion for nature. Part way through our conversation he suddenly leapt to his feet with enthusiasm, looking at one of the house geckos pottering up the wall... “You have a *Gekko monarchus*!” as he rushed to find his camera.

Tony then moved to head the Asia-Pacific Programme for FFI – in many ways taking him closer to his roots and passions, as well as allowing him to be closer to his family. The new David Attenborough Building as home to the Cambridge Conservation Initiative was a perfect base for Tony, with its combination of academic as well as global conservation institutions. From the start, he was hugely optimistic about the synergies that would come about by having so many organizations all in one place. In

addition to the stimulating work environment there, he also relished the social one, noting that if you hang around the coffee room for long enough, you'll eventually meet all of your conservation friends from your entire career.

In addition to his work overseeing FFI's programmes across Asia, Tony was also the founder Chair of the IUCN SSC Specialist Group on cave invertebrates, aiming to raise their conservation profile. Tony's passion for often-overlooked species means that 11 new species have been named after him, mainly the herps and invertebrates that so fascinated him.

Tony's warmth and enthusiasm for life, and commitment to individual people, means that he has friends in countries all over the world. He has always also been a totally committed family man. He and Jane have four absolutely terrific kids, now adults with their own varied enthusiasms and passions and also, just recently, their own children. Their enthusiasms in turn have infected Tony; when he and Jane visited me in New York a couple of years ago, we went to a jazz club and, to my total amazement, at the end of the set Tony remarked how the 12/8 jazz beat can be a bit of a challenge! Knowledge he had presumably gleaned from his world music-performing son.

Tony's personal and professional legacy is immense. He was a true gentleman and someone who always made you smile. His life was cut tragically short while it was still at its peak, with his two new grandchildren, and his planning to dedicate more time to promoting conservation of karst systems and cave invertebrates amongst others. He is already deeply missed, and will be long remembered and treasured.

#### *And from the editor*

Tony was a member of the IUCN Mollusc Specialist Group, of which *Tentacle* is the newsletter (see [Tentacle 24](#), page 3). I met him only once, at the World Congress of Malacology in Vienna in 2001. We were both participating in a symposium on Molluscan Biodiversity and Conservation. Among his diverse interests Tony had developed "an irrational and uncontrollable interest in snails", especially in the endangered limestone karst faunas of Southeast Asia. He gave an impassioned plenary address exhorting malacologists to become more involved in conservation. I can do no better than quote the conclusion of the published version of his address (Malacologists: what are your priorities? *Journal of Conchology Special Publication 3*: 1-6):

"I would venture to suggest that the majority of malacologists need to poke their heads out from the security of their shells and slither rapidly to be heard and become involved in the issues that threaten the organisms on which their careers are based. This does not mean that this topic take over your own particular speciality and distract your research programme, but it does recognize that you have *a profound responsibility to do something* [my italics]. The actual and potential threats to many mollusc species, and the trends, can't get much worse."

The threats remain and whether the trends have worsened or not is something on which we all no doubt have an opinion based on our own experiences. Tony's words, however, are just as valid today as they were in 2001.

**Tony Whitten: born 10 April 1953; died 29 November 2017**

## NEWS

### Breeding the most threatened bivalve on earth: *Margaritifera marocana*

*From the IUCN Save Our Species website, 30 October 2017*

How do you save a Critically Endangered river mussel species from extinction when a dam upstream and increased human disturbance in the vicinity is threatening its only known home?

Find out by clicking on the [article](#).



The Critically Endangered *Margaritifera marocana* mussel is endemic to Morocco. (Photo: SPVS)

This story concerns just one of more than 250 threatened species supported by more than 100 projects in the SOS portfolio. Each one completed offers a wealth of practical lessons and insights into conservation action across numerous taxonomic groups and challenges. Explore the SOS [interactive project map](#) and sign up for the [SOS newsletter](#) to keep up to date on further news from our grantees and visit the project page to learn more.

## MEASUREMENT AND MONITORING OF SUB-LETHAL DAMAGE (STRESS) TO THE FRESHWATER PEARL MUSSEL *MARGARITIFERA MARGARITIFERA*, A TOOL FOR CONSERVATION MONITORING

*By Evelyn A. Moorkens & Ian J. Killeen*

The freshwater pearl mussel *Margaritifera margaritifera* (L., 1758) is critically endangered in Europe and is in severe decline throughout its global range. It is highly sensitive to changes in its river bed environment and to the very clean, low nutrient water from which it filter feeds. *Margaritifera margaritifera* is well known for its continuous slow decline, mainly attributed to the loss of oxygen from river bed gravels in which the juvenile mussels are completely buried for the first five years of their lives, and thus, through lack of recruitment, populations age over time and decline towards extinction.

The loss of juvenile recruitment is not the only cause of decline of a mussel population. Many monitoring studies have reported the presence of dead adult mussels and fresh shells that are in much greater numbers than would be accounted for by annual deaths of aged individuals. Where such a cache of recently dead shells is located, it is considered to be a mussel "kill". Kills may

be the result of a sudden severe toxic pollution event (such as a spill of sediment from a quarry), but other pollution events, when investigated, were found to have resulted in sub-lethal affects. In such cases, mussels were still alive but poorly filtering and often lying on their sides out of the sediment or lifted much higher than their normal buried position (Fig. 1).



**Fig. 1.** Examples of stressed mussels.

In these situations, subsequent monitoring surveys showed declines in adults, sometimes two years later, or a kill event was reported following the next period of high flow (flood conditions).

As a result of the correlation of loss of mussels a considerable time after a negative event, an investigation was undertaken to quantify sub-lethal stress in mussels and their loss or recovery over time.

Laboratory methods of stress assessment are not suitable for field assessment, and moving mussels from the field into the laboratory would subject them to the confounding problems of the stress involved in transporting and maintaining them out of their natural environment. Therefore, from 2012 to 2017 a simple process for testing stress in the field has been evaluated.

Custom made steel tongs were used to measure mussel stress. The tongs were designed to open under pressure, in the opposite way to scissors and clamps. These types of tongs were once used to check mussels for pearls, an activity that is now illegal. More recently such tongs have been used by mussel scientists (often as part of captive breeding techniques) to open the mussel just 2-3 mm in order to insert the tip of an otoscope, or a fine needle, to check whether female mussels are brooding larval glochidia within their gill structures. As handling mussels and putting excessive pressure on the mussel can be damaging, extreme care is needed to ensure that only enough pressure is applied to provide information on muscular strength and no more. Tongs for this purpose do not need to be strong enough to open healthy mussels, only to check whether there is resistance to shell opening. A five point scale was used to define stress level (Table 1).

The results of early use of this technique have demonstrated its usefulness, and a full research paper covering the results to date is in preparation. The aim of this article is to alert those that work in the area of conservation management of *M. margaritifera* and other sensitive bivalve molluscs that the single and cumulative effects of stress are severe, long term, and are likely to act in combination with other negative pressures resulting in a more negative combined outcome for the population. Consideration of the stress condition of any population would therefore be useful to add to other methods

**Table 1.** Five point stress level scale when using tongs to check mussel stress.

Stress level	Definition
Unstressed	Mussels have high resistance to opening with tongs, and are often so tightly closed that the tongs cannot be easily inserted.
Slightly stressed	Mussels show resistance to opening and valves close again slowly.
Stressed	Mussels show some resistance to opening but the surveyor could keep opening the shell. Valves close over time (minutes).
Very stressed	Mussels show poor resistance to opening with tongs, very little pressure needs to be exerted, valves do not fully close in 5 minutes.
Moribund	Mussels are gaping or show no resistance to opening, difficult to know if the individual is dead or alive.

of assessments of status, conservation measures and impact assessments of populations.

The loss of muscle tone is not an early indicator of stress; it demonstrates the response over time to poor feeding conditions that may take months to manifest, by which time damage has been done. This method does highlight the location and severity of that damage.

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## LAND SNAIL SURVEY OF THE SABAL PALM SANCTUARY, RIO GRANDE VALLEY, TEXAS, USA

By Kathryn E. Perez, Briante Najev, Benjamin T. Hutchins & Jeff Nekola

The Rio Grande Valley of Texas, USA, is a region at the intersection between the Nearctic and Neotropical biogeographical realms. Historically the upland vegetation in this region was either Tamaulipan thornforest (mezquital) or subtropical savannah. Tamaulipan thornforest (Diamond *et al.*, 1987) is dominated by *Leucophyllum frutescens* (cenizo), *Prosopis glandulosa* (honey mesquite), *Opuntia engelmanni* var *lindheimeri* (Texas prickly pear) and a variety of additional acacias, native grasses and shrubs (NatureServe, 2009). Thornforest was interspersed with substantial patches of subtropical savannah hosting a large community of native grasses (Johnston, 1963). In riparian areas, the valley was characterized by stands of *Taxodium nucronatum* (Montezuma cypress) and *Sabal mexicana* (Sabal palm or Mexican palmetto) in the delta region (Lonard & Judd, 2002).

Stands of *Sabal mexicana* are palm-dominated but mixed with other woody plants such as *Leucaena pulverulenta* (tepeguaje), *Ehretia anacua* (anacua) and *Ebenopsis ebano* (Texas ebony). Notable neotropical vertebrate fauna include ocelot (*Leopardus pardalis*), hooded oriole (*Icterus cucullatus*) and northern cat-eyed snake (*Leptodeira septentrionalis*). This region has been heavily modified by humans, with extensive clearing for livestock grazing,

agriculture and urbanisation reducing the extent of Tamaulipan thornforest in Texas (Lehmann, 1969) to less than 2% of the former range (Jahrsdoerfer & Leslie, 1988). Little primary forest remains. The introduced African *Megathyrsus maximus* (Guinea grass) and *Pennisetum ciliaris* (buffelgrass) have driven out native grasses and inhibit succession and successful reforestation by native thornforest (Vora, 1992; Judd *et al.*, 2002; Lonard & Judd, 2006; Sternberg, 2003).

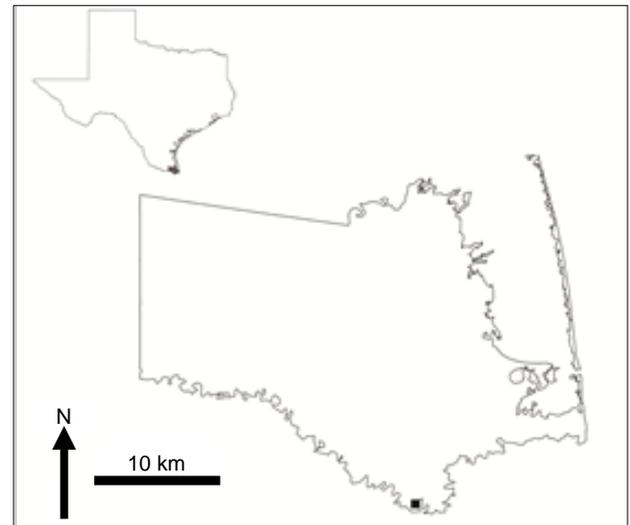


**Fig. 1.** Typical view of south Texas palm grove habitat. Sabal Palm Sanctuary, Cameron County, Texas, USA. Site 4 of this study. (Photo: Ernesto Herrera, 10 November 2015)

As part of a broader survey of land snails across Texas we are surveying the major vegetative types in the Rio Grande Valley. While we are still processing most of these samples, we have a complete data set for our sampling in the [Sabal Palm Sanctuary](#) (Fig. 1), a forest preserve site administered by the Gorgas Science Foundation. The preserve is a 213 ha tract, with ~8 ha consisting of the most biologically intact primary growth forest of *Sabal mexicana* (Mexican palmetto) in the region. In older sources, the preserve is referred to as “Rabb Ranch”, referring to the land owners that preserved the palm forest. The tract is in the floodplain of the Rio Grande, which forms the eastern border of the preserve (Fig. 2).

Our sampling consists of collecting large-bodied snails by hand and sieving leaf litter in a set of stacking sieves. We also beat some vegetation, such as fallen palm fronds and short bushes, over the sieves. We examine the surface of the sieve screen and retain the leaf litter until we have counted ~1,000 microsnails. The leaf litter is then dried, sieved again and snails are picked and identified under the microscope.

We sampled six sites (Table 1) covering the breadth of habitat diversity in the Sabal Palm Sanctuary. Habitats targeted were identified using the Texas Parks and Wildlife Ecological Mapping System (Elliott *et al.*, 2014). Site 1 was classified as South Texas Disturbance Grassland: a secondary woodland



**Fig. 2.** Map of Texas, USA, showing outline of Cameron County. Black square indicates Sabal Palm Sanctuary.

savannah with an understory of invasive African grasses (Fig. 3). Site 4 was a South Texas Floodplain Herbaceous Wetland, dry at the time of sampling. We sampled four sites classified as primary South Texas Palm Grove habitat with variable palm densities. One site, dominated by thorn woodland plants on a ridge of sand, had very few palms (site 2). Site 3 was a transitional site with mixed palms and thorn woodland plants on alluvial soil. Sites 5 and 6 were dominated by primary Sabal Palm in a low-lying area subject to regular flooding and on an upland, respectively.

Across these six sites, we collected and identified 7,508 terrestrial gastropods belonging to 23 species (Table 1). The



**Fig. 3.** View of South Texas Disturbance Grassland secondary regrowth site (site 1). Sabal Palm Sanctuary, Cameron County, Texas, USA. (Photo: Kathryn E. Perez, 24 March 2017)

**Table 1.** Number of land snail individuals per species found in the Sabal Palm Sanctuary, Brownsville, Cameron County, Texas. For site details see text. Asterisks indicate species that are probably non-native to the region (Robinson, 1999; Perez, 2011).

Snail species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<i>Deroceras laeve</i>	-	-	-	-	-	1
<i>Euconulus trochulus</i>	-	-	1	2	10	-
<i>Euglandina texasiana</i>	2	3	7	-	2	3
<i>Gastrocopta contracta</i>	-	-	34	91	5	53
<i>Gastrocopta pellucida</i>	303	1426	105	12	17	564
<i>Gastrocopta riograndensis</i>	35	-	-	27	-	-
<i>Gastrocopta riparia</i>	-	-	-	-	-	-
<i>Gastrocopta tappaniana</i>	-	-	6	-	1	2
<i>Glyphyalinia umbilicata</i>	82	-	278	5	65	127
<i>Gulella bicolor*</i>	-	1	1	1	1	8
<i>Guppya gundlachi</i>	49	242	478	61	18	127
<i>Hawaiiia minuscula</i>	40	343	73	112	62	66
<i>Helicina orbiculata tropica</i>	98	68	134	26	61	167
<i>Linisa texasiana</i>	-	-	-	4	4	-
<i>Polygyra cereolus</i>	-	-	-	1	-	-
<i>Praticolella mexicana*</i>	7	40	2	-	-	-
<i>Praticolella salina</i>	2	2	-	-	-	-
<i>Pupisoma dioscoricola</i>	-	191	15	42	1	80
<i>Pupoides albilabris</i>	-	31	1	-	-	-
<i>Strobilops hubbardi</i>	-	-	2	-	3	13
<i>Thysanophora hornii</i>	138	174	300	3	12	182
<i>Thysanophora plagiopycha</i>	18	166	197	12	7	313
<i>Zonitoides arboreus</i>	-	-	27	1	37	1

South Texas Palm Grove (primary, transitional) site (site 3) with a mix of Sabal Palm and Thornforest vegetation had the highest number of species (17). Overall, *Gastrocopta pellucida* was the most common snail, with 33 % of encountered individuals, followed by *Guppya gundlachi* (13 %), *Thysanophora hornii* (11 %), and *Thysanophora plagiopycha* (10 %). Two putative non-native species were found (*Gulella bicolor* and *Praticolella mexicana*) but *Belocaulus angustipes*, which is known to occur in the Lower Rio Grande Valley region was not observed.

Species of particular interest at this site included tropical species occurring near the apparent northern extents of their ranges. This includes *Euglandina texasiana* and *Praticolella salina*, which are restricted to the Gulf coastal plain in Texas and Tamaulipas. In North America, *Gastrocopta riograndensis*, *Guppya gundlachi*, *Strobilops hubbardi*, *Thysanophora plagiopycha* and *T. hornii*, which are widely distributed in Mexico and Central America or the Caribbean, just reach into the southern United States in Texas and/or Florida and New Mexico.

One particularly noteworthy finding was collection at sites 1 and 4 of *Gastrocopta riograndensis*. In site 4, a closed-depression, herbaceous, wetland habitat, living individuals of this species were found, although previously it had only been documented from river drift in Texas and New Mexico. Finding a population with living individuals in this region, including in secondary successional habitat, is encouraging. To our knowledge this is the first time live individuals of this species have ever been collected (Hubricht, 1985).

A second noteworthy discovery concerns *Strobilops hubbardi*. Repeated sampling near Indianola, Texas, the type locality for *S. hubbardi*, has failed to produce any shells of that species. Other published reports of *S. hubbardi* outside the Lower Rio Grande Valley appear to be erroneous. Consequently, the Sabal Palm Sanctuary is the only location in the state where the species is currently known to persist.

This work is funded by Texas Parks and Wildlife and by the College of Sciences, University of Texas Rio Grande Valley. We appreciate the Gorgas Science Foundation granting permission to sample at the Sabal Palm Sanctuary. We thank Andrew McDonald and Raziel Flores for suggestions on field site selection and for botanical expertise.

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## THE ENDANGERED DUNE-DWELLING LANDSNAIL *XEROSECTA EXPLANATA*: ALARMING RESULTS FROM THE 2017 DISTRIBUTION UPDATE IN FRANCE

By Vincent Prié, Ugo Schumpp & Alexis Rondeau

*Xerosecta explanata* is a dune shoreline specialist, rarely found over a few hundred metres from the shoreline. According to the literature, the species is known throughout southern France's Mediterranean shoreline, extending to the region of Valencia in southern Spain (Welter-Schultes, 2012; Kerney & Cameron, 1999). Its distribution also includes two populations far inland in Catalonia in Spain (Frank, 1987) and near Carcassonne in France (Geniez & Bertrand, 2001), unconfirmed data related to the area between Oran and Algiers in Algeria (Bourguignat, 1864), and a localised population in the Balearics (Gasull, 1965; Puente, 1994).

According to this literature, the species seems to be widely distributed in shoreline ecosystems of the western Mediterranean. However, suitable ecosystems in its supposed original range are being highly impacted by human activity, especially tourism, which leads to intense urbanisation of the dune area in both France and Spain. We therefore conducted a three-year survey to investigate to what extent the range of the species had shrunk in recent decades in France, which presumably hosts most of the remnant populations. Here, we present the first results of this extensive survey and propose an update of the distribution and conservation status of *Xerosecta explanata*.

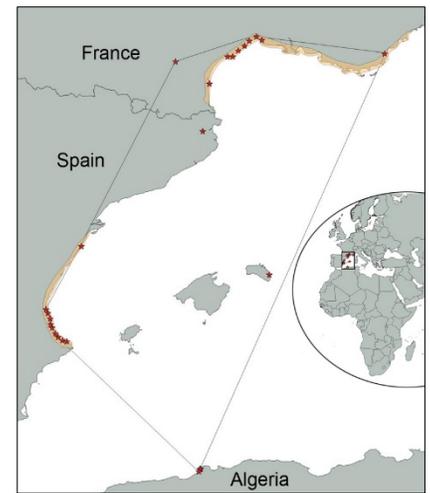
We first created a habitat map of the entire French Mediterranean coast, based on Google satellite images, to determine suitable habitats to be surveyed. We then set up a protocol of standardized transect sampling, from the shore inland, with transects 100 m apart and sampling every 5 m on each transect (Fig. 1). Not all presumably suitable habitats could be sampled in this way, but most of the areas likely to be suitable have been visited at least once.

Our results show that the actual extent of the species' distribution is much more restricted than what was expected (Fig. 2). Urbanisation along the Mediterranean coast of France has heavily impacted the dune shoreline. Furthermore, in the presumed suitable habitats, *Xerosecta explanata* was not always found. In fact, according to the current progress of our work, only two populations were found. The main one extends along about 100 km of coastline around the city of Montpellier and is highly fragmented. The second one is at a single

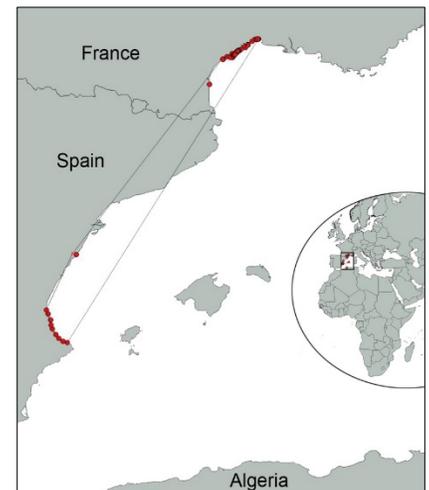


**Fig. 1.** Habitats mapping based on Google Earth images and locations of transects in one of the sites identified as favourable.

**Fig. 2.** The optimistic view. Global distribution of the species based on literature data. The yellowish area indicates the potential distribution of the species in Europe according to Welter-Schultes (2012). The convex polygon outlines the optimistic extent of occurrence according to the IUCN definition.



**Fig. 3.** The real situation. Red dots – living populations. The convex polygon excludes the inland populations and those of Algeria and the Balearics.



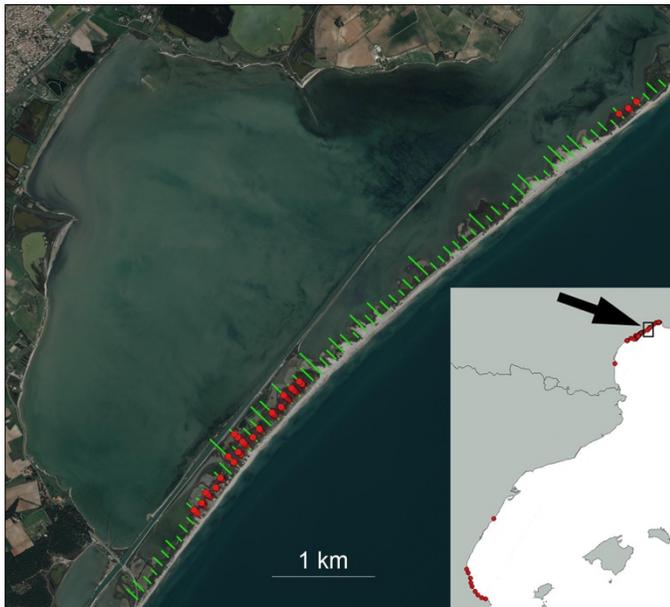
location near the town of Leucate, south of the main population. A very small population may subsist in the eastern part of the French Mediterranean shoreline near the town of Sainte-Maxime, but suitable habitats could not be surveyed because they are on private property.

Considering the data from Algeria as valid, and an eastern limit of the species distribution in France at Sainte-Maxime, the historical extent of occurrence (EOO), as defined by the IUCN, was about 216,000 km<sup>2</sup> (Fig. 2).

It is very likely that the population from Algeria is extirpated or that the literature record results from a misidentification (Matinez-Orti, 2010). The population from the Balearics is supposed to have resulted from an introduction and is also extirpated (Matinez-Orti, 2010). The inland data in France and Spain (Fig. 2) are probably also the result of a misidentification (Marinez-Orti, 2010; A. Bertrand, pers. com.).

As such, the actual EOO has shrunk to an area of about 33,000 km<sup>2</sup>, which represents a contraction of about 85 % (Fig. 3). The species subsists only at four locations (in the sense of the IUCN criteria): in France, the main population around Montpellier and an isolated population near Leucate; in Spain the population of Valencia and Alicante provinces and a recently rediscovered very small population near the town of

Alcocebre (Prades & Bataller, 2014). The main and least impacted population is the one around Montpellier. However, although it extends along about 100 km of shoreline, it is fragmented and threatened by urbanisation. In one of the two sites where the species is most abundant, an intensive survey has been conducted based on the transect protocol described above. The results (Fig. 4) show that even in remarkably suitable habitats, the distribution of the species remains patchy. Hence, from a snail point of view, the main population is highly fragmented and subject to local extirpations in the future.



**Fig. 4.** The precise distribution of *Xerosecta explanata* in one of the most populous locations shows that the actual micro-distribution is highly fragmented. Green lines – transects established 100 m apart, sampled every 5 m; red dots – occurrence of *Xerosecta explanata* in sampled plots.

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## MEASURES TO CONTROL *LISSACHATINA FULICA*: IMPACT ON NATIVE TERRESTRIAL MOLLUSCS IN THE DOMINICAN REPUBLIC

By *Altagracia Espinosa*

There is a large number of endemic terrestrial molluscs in the island of Hispaniola (Dominican Republic and Haiti), as well as in other Caribbean islands. In many habitats, species diversity is high but population sizes are low. Many of the native and endemic species are threatened by introduced molluscs such as the giant African snail, *Lissachatina fulica* (Bowdich, 1822) (Achatinidae), which has recently been found in the Dominican Republic. In this country, it has a heavy impact on the local fauna and flora because of its high reproductive rate and voracious feeding, and competition for food and space. *Lissachatina fulica* (Fig. 1), often referred to as *Achatina fulica*, is regarded as among 100 of the world's worst invasive alien species according to the Global Invasive Species Database (GISD, 2018), with a very high impact on agriculture, the environment and human health.

Since the 1990s, *L. fulica* has been recorded in the New World (Borrero *et al.*, 2009; GISD, 2018). It was reported for the first time in Cuba in 2014 (Vázquez & Sánchez, 2015) and in November 2016 in the eastern region of the Dominican Republic. In this region, soils of coralline origin are common and are ideal substrates for many species of molluscs. In December 2016, in a visit to an enclosed residential area in El Cocotal in the municipality of Bavaro (La Altagracia province), the presence of *L. fulica* was confirmed on a golf course and in an abandoned house that was not completely built.

In August 2017, we visited a secondary forest adjacent to El Cocotal. It has a surface coverage of approximately 60 %, boulders of various sizes, vegetation debris, grass, *Leucaena leucocephala* (*lino criollo*) and *Ficus* sp. (Fig. 2). Nine mollusc species were found in addition to *L. fulica*. On a



**Fig. 1.** *Lissachatina fulica* in a natural habitat.



**Fig. 3.** *Drymaeus (Antidrymaeus) dominicus*.



**Fig. 4.** Area shown in Fig. 2 after deforestation.



**Fig. 2.** Secondary forest in the eastern region of the Dominican Republic.

30 cm x 30 cm boulder, eight individuals of *Abbotella aenea* Watters, 2010 were found, and others were in crevices of adjacent boulders. Six individuals of *Helicina (Umbonata) liobasis* Thompson, 1982 were also found at this location. On

plants of *lino criollo*, there were individuals of *Drymaeus (Antidrymaeus) dominicus* (Reeve, 1850) (Fig. 3) at heights above 150 cm, *Cepolis monodonta* Lea, 1931 between 90 and 150 cm, and *Bulimulus guadalupensis* (Bruguère, 1789). On other boulders, there were *Parachondria gnota* (Pilsbry, 1935) and *Beckianum beckianum* (Pfeiffer, 1846), and on vegetation debris there were *Caracolus excelens* (Pfeiffer, 1853), *Zachrysia provisoria* (Pfeiffer, 1858) and *Subulina octona* (Bruguère, 1798).

In January 2018 (four months later), in another visit to the same forest, it was found that some deforestation had been done to eradicate *L. fulica* populations. However, this deforestation had not eradicated *L. fulica* but had destroyed the habitat for other molluscs (Fig. 4). During this visit, the only native species observed was *C. monodonta*.

*Lissachatina fulica* uses the same substrate as the nine native species found in the area, and is larger in body size and has higher population density, which confers on it a great advantage over the native and endemic terrestrial mollusc species. To these biological advantages, humans are adding deforestation and the application of molluscicides.

*Lissachatina fulica* has quickly established around the municipality of Bavaro, and the main reason seems to be these human activities.

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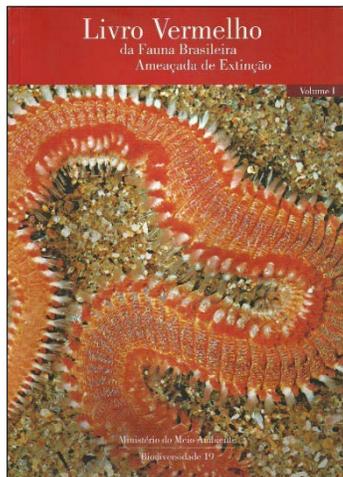
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## NEW EVALUATION OF THE LIST OF ENDANGERED NON-MARINE MOLLUSCS IN BRASIL IN PROGRESS

By Sonia Barbosa dos Santos & Igor Christo Miyahira

As reported by Santos & Carvalho (2014) the Instituto Chico Mendes para a Conservação da Biodiversidade (ICMBio), headquartered in Brasília, was responsible for leading the process of analysing and assessing the risk of extinction of species of the Brazilian fauna. The aim was to update the *Red Book* (Machado *et al.*, 2008) (Fig. 1) of endangered species, including terrestrial and freshwater molluscs.

An evaluation workshop and a validation workshop were conducted during 2014 (Santos *et al.*, 2015) and led to publication of the *Executive Summary. Brazil Red Book of Threatened Species of Fauna* (ICMBio, 2016). This book (Fig. 2) describes the evaluation process and provides the list of



**Fig. 1.** Cover of the Brazilian Red Book (Machado *et al.*, 2008).

threatened species. The major difference between this and the previous list (Machado *et al.*, 2008; Santos *et al.*, 2013) concerns freshwater mussels, 24 species of which are now excluded from the list.

This latest *Red Book* lists nine species of freshwater molluscs: two bivalves and seven gastropods. The 2008 list included one gastropod and 26 freshwater bivalves. These changes could be seen as suggesting an improvement in the

quality of waterbodies, as well as enhanced conservation measures for freshwater molluscs. However, the lack of data, which did not allow accurate assessments of conservation status for many species, combined with more rigid application of the IUCN criteria explain the differences. Most bivalves were classified as DD (Data Deficient) or NT (near threatened), although many of them were formerly included in one of the threat categories.

Following discussions at meetings of the Brazilian Society of Malacology (SBMa), a new evaluation of risk of extinction of non-marine molluscs is going to take place in collaboration with experts and researchers who have relevant expertise, ensuring rigour and technical accuracy of the compiled information about each candidate species. This new evaluation is being coordinated and sponsored by ICMBio. Besides this, to develop an assessment of threatened species that is really consistent with the size and environmental diversity and degradation of our country, we need to address the challenges of increasing basic research on the biology, taxonomy and distribution of non-marine molluscs.

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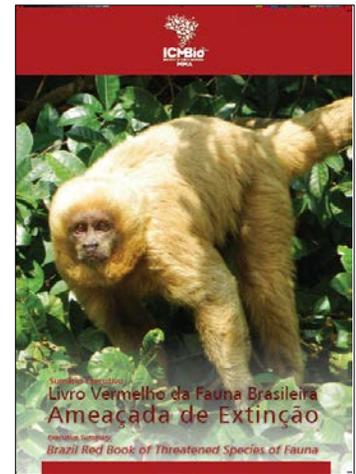
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**Fig. 2.** Cover of *Executive Summary: Brazil Red Book of Threatened Species of Fauna* (ICMBio, 2016).

## MOLLUSCS ASSESSED BY COSEWIC IN 2017

By Dwayne A.W. Lepitzki & Joseph P. Carney

Only three mollusc species were assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2017, two for the first time and the other a reassessment. COSEWIC is Canada's independent body of experts that assesses the conservation status of species using the IUCN criteria and recommends listing and legal protection under the Canadian Species at Risk Act (SARA; see [Tentacle 21](#) for details). The Act requires at-risk species to be reassessed every ten years.

The eastern pondmussel (*Ligumia nasuta*) is widely distributed across southern Ontario and occurs at low abundance in isolated wetland patches and inland lakes. It was extirpated from offshore waters of lakes Erie and St. Clair following the invasion of dreissenid mussels. Zebra (*Dreissena polymorpha*) and Quagga (*D. bugensis*) mussels are still a threat to this species, as is invasion by the European common reed (*Phragmites australis*) and pollution from urban, agricultural and industrial sources. Additional searches since the previous assessment in 2007 found 17 previously unrecognized subpopulations. These newly discovered occurrences, and the apparent reduction in the rate of population decline, resulted in a change in status from Endangered to Special Concern.

The Canadian SARA defines a wildlife species as a species, subspecies or geographically or genetically distinct population. COSEWIC further recognizes designatable units (DUs) below the species level, as discrete and evolutionarily significant irreplaceable entities of biodiversity. In November 2016, two DUs of the mapleleaf mussel (*Quadrula quadrula*) were both downlisted (see [Tentacle 25](#)).

For the first time, COSEWIC assessed two DUs of a terrestrial mollusc, the western and eastern subspecies of the banded tigersnail. The western banded tigersnail (*Anguispira kochi occidentalis*) occurs in numerous sites across southeastern

British Columbia. While there are continuing low-impact threats to the riparian and floodplain habitat occupied by this species because of residential development, new roads, logging, fire, silviculture and droughts and temperature extremes under climate change, it was assessed as Not at Risk.

Meanwhile, the eastern banded tigersnail (*Anguispira kochi kochi*; Fig. 1), confined to small isolated habitat patches on two Canadian islands in Lake Erie, was assessed as Endangered. Climate change (flooding, extreme temperatures, droughts and changes to frost regimes) is the most serious threat to this species. Additional subpopulations on other, smaller Lake Erie islands have been lost because of human activities and overabundant Double-crested Cormorants (*Phalacrocorax auritus*), which colonised these islands in the early 1980s.

More information on COSEWIC can be found at <http://www.cosewic.gc.ca>. Status reports for these three wildlife species should be posted soon on the SARA Public Registry ([www.sararegistry.gc.ca](http://www.sararegistry.gc.ca)).

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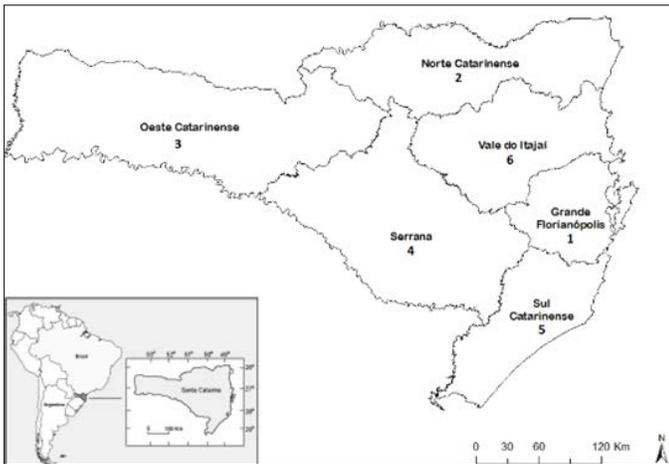
## CONSERVATION OF NON-MARINE MOLLUSCS IN CENTRAL SOUTHERN BRASIL: REVISED AND UPDATED INVENTORY OF SPECIES OF SANTA CATARINA STATE

By A. Ignacio Agudo-Padrón

The latest systematic listing of non-marine molluscs of Santa Catarina state (Fig. 1), generated in 2014 (Agudo-Padrón 2016, 2017) has now been updated to recognise suppressed synonyms and to resolve some other inconsistencies that initially went unnoticed, and to add 12 species (eight land gastropods – seven native and one non-native invasive, and four bivalves – three native and one non-native invasive). The current inventory of non-marine molluscs is now finally consolidated and provides a basic platform of knowledge for conservation of these species. This has been a sustained product of work undertaken over more than two decades of systematic field research, examination of specimens in museum collections and review of the literature. The registry now includes 232 species and subspecies, including 26 non-native taxa (22 gastropods, four bivalves). There are 198 gastropods (156 terrestrial, two amphibious, 40 freshwater) and 34 bivalves (20 mussels, 13 clams, and the invasive golden mussel, *Limnoperna fortunei*). The most recently incorporated species are the native *Leptinaria parana* (Pilsbry, 1906) (Subulinidae), *Bulimulus cf. stilbe* Pilsbry, 1901 (Bulimulidae) (Fig. 2) and the non-native Indo-asiatic *Macrochlamys cf. indica* Benson, 1832 (Ariophantidae) (Fig. 3).



**Fig. 1.** Eastern banded tigersnail (*Anguispira kochi kochi*), Pelee Island, Lake Erie, Canada, May 2013. (Photo: A. Nicolai)



**Fig. 1.** Malacological divisions of Santa Catarina state: 1 – Greater Florianópolis, 2 – Northern Region, 3 – Western Region, 4 – Highlands Region, 5 – Southern Region, 6 – Itajaí River Valley Region.



**Fig. 2.** Sandbanks native snail *Bulimulus* cf. *stilbe*, Ponta do Papagaio seaside resort, Palhoça municipal district, greater Florianópolis, Santa Catarina State. Specimen ~21 mm. (Photo: “Project AM” archives, January 2009).

The identity of one of the five native gastropod species previously mentioned (Agudo-Padrón 2016, 2017) as awaiting taxonomic determination. The rare native *Plekocheilus* (*Eurytus*) aff. *rhodocheilus* (Reeve, 1848) (Amphibulimidae) (Fig. 4), was partially resolved by Breure (2014), but another one later incorporated in the list, *Happia* sp. (Systrophiiidae) (Fig. 5) is still awaiting determination.

Only one native species, the bivalve *Diplodon expansus* (Küster, 1856), syn. *Rhipidodonta charruana* (d’Orbigny, 1835) (Hyriidae), and the following four non-native gastropods, *Lymnaea columella* Say, 1817, *Meghimatium pictum* (Stoliczka, 1873), *Deroceras laeve* (Müller, 1774) and *Bradybaena similaris* (Rang, 1831), occur in all six of the malacological regions established for Santa Catarina state (Fig. 1). In general,



**Fig. 3.** Invasive non-native Indo-asiatic snail *Macrochlamys* cf. *indica*, found in citrus seedlings in a floriculture market, Palhoça municipal district, greater Florianópolis, Santa Catarina State. Specimen ~21 mm. (Photo: Jefferson Souza da Luz, “Project AM” staff).



**Fig. 4.** Native forest snail *Plekocheilus* (*Eurytus*) aff. *rhodocheilus*, Timbé do Sul municipal district (28°45'53.46"S; 49°48'03.52"W, 494 m asl), Santa Catarina state. Specimens 28 and 31 mm. (Photos: Jefferson Souza da Luz, “Project AM” staff).



**Fig. 5.** Native forest snail *Happia* sp. Specimen 19 mm. (Photo: Luís Adriano Funez, Fundação Universidade Regional de Blumenau, Santa Catarina).

for all taxa listed, information concerning their known occurrence in the six malacological regions of the state has been incorporated and updated.

Further research into the conservation status of mollusc biodiversity in Santa Catarina state is necessary (in fact really urgent) in view of the rapid changes taking place to the natural environment as a result of human activities and the parallel rapid process of invasion by alien species. In depth studies of the basic population biology and reproductive cycles of the molluscs are urgently needed, in addition to middle- and long-term ecological research.

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

Special thanks to the lawyer and field naturalist Jefferson Souza da Luz (staff of the “Project AM”, longtime partner) for his important active contribution and participation during the development of this research.

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## PRESUMED EXTINCT LAND SNAIL *MEGALOBULIMUS CARDOSOI* FOUND AGAIN IN PEDRA TALHADA BIOLOGICAL RESERVE, NORTH-EAST BRASIL

By Rodrigo B. Salvador, Laurent Charles, Luiz R.L. Simone & Philippe Maestrati

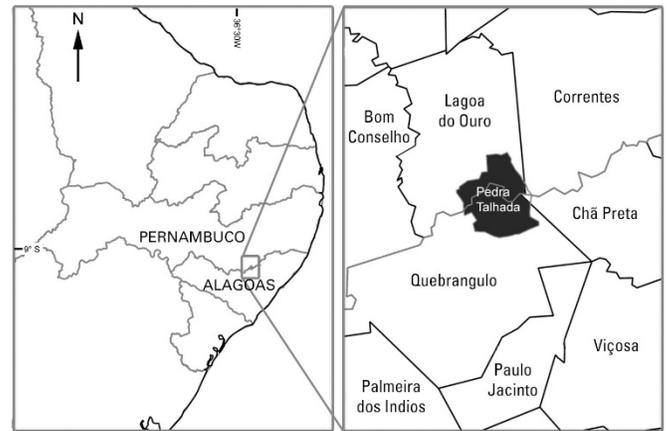
The genus *Megalobulimus* Miller, 1878 contains the largest land snails in tropical America (Jaramillo Roldán *et al.*, 2014). Consequently, they are usually colloquially known as “megasnails”. The shells of *Megalobulimus* are typically heavily calcified and very sturdy, commonly also presenting a thickened peristome in older individuals (Bequaert, 1948; Fontenelle & Miranda, 2012; Miranda *et al.*, 2015). Megasnails are mostly nocturnal and have low population density (Eston *et al.*, 2006; Miranda & Fontenelle, 2015), two factors that make these snails little-studied in the wild (Beltramino *et al.*, 2015).

This scarcity may have led Morretes (1952) to conclude that one particular species of megasnail, *Megalobulimus cardosoi* Morretes, 1952, was extinct in the wild. Mansur (1996a) considered this species extinct in the IUCN Red List, but without offering any explanation for her conclusion. Up to then, this species was only known from its type locality (Simone, 2006), the small municipality of Murici, in northern Alagoas state, north-east Brasil. In our recent work in the Pedra Talhada Biological Reserve, in northernmost Alagoas, we have found fresh shells of this species, something that we believe is worthwhile to communicate to the malacological community.

The Pedra Talhada Biological Reserve (Reserva Biológica de Pedra Talhada, henceforth “Pedra Talhada”) is located at the border of Alagoas and Pernambuco states in north-east Brasil (Fig. 1) and contains a remnant of Atlantic Forest. As is widely known, the Atlantic Forest, once the second largest biome in tropical America, is now reduced to less than 15 % of its original extent (Câmara, 2005). A small fraction of these remnants is preserved in parks and reserves. Pedra Talhada, in particular, was decreed a State Park in August 1985 and then a Federal Reserve in December 1989, encompassing ~4,400 ha of rain forest. For detailed information about Pedra Talhada see Studer *et al.* (2015).

An expedition to study Pedra Talhada’s mollusc fauna was undertaken in September and October 2015 and a full account is currently in preparation by the authors. The work was facilitated by a permit from the ICMBio (Sisbio #48925-2) and financial support from Nordeste, a Swiss NGO working on educational and environmental projects in and around Pedra Talhada since its inception in 1985. The material was deposited in the malacological collection of the Museu de Zoologia da Universidade de São Paulo (MZSP; São Paulo, Brasil).

From a total of 49 collection stations surveyed, fresh shells of *Megalobulimus cardosoi* (Fig. 2) were found in three (Fig. 3). Although the species was not found alive during the expedition, the good preservation of the shells (in a typically



**Fig. 1.** Map showing the location of Pedra Talhada. Image adapted from Tschärner *et al.* (2015).



**Fig. 2.** *Megalobulimus cardosoi*, MZSP 133892 (shell height, 55.3 mm).



**Fig. 1.** View of the environment at collection station PT2015-27, where shells of *M. cardosoi* were found.

acidic environment) suggests freshly dead animals. As such, at least the population of *M. cardosoi* from Pedra Talhada seems to persist, but further studies are necessary to define the species’ actual distribution and numbers, in accordance with IUCN guidelines.



**Fig. 3.** *Biotocus turbinatus*, MNHN unnumbered (shell height 9.9 mm).

In a similar case, the odontostomid species *Biotocus turbinatus* (Pfeiffer, 1845) has also been considered extinct, without further explanation, in the IUCN Red List (Mansur, 1996b). The species was known from Alagoas and Bahia states in Brasil (Simone, 2006). Collection material in the Muséum national d'Histoire naturelle (MNHN; Paris, France) (Fig. 4) indicates that individuals of this species were found alive in 1998 under humid tree trunks in Pedra Talhada. However, neither live animals nor shells were found during the 2015 expedition.

It is well known that land snails are one of the most threatened groups of animals and many species are very sensitive to habitat conditions. Some species (not only snails, but small invertebrates in general), however, can often survive for decades in a very restricted habitat, sometimes of just a few hundred square metres, provided conditions are suitable (Bouchet *et al.*, 1997). As such, before declaring such taxa extinct, one should undertake thorough and careful surveys.

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## MOLLUSCS INTERCEPTED AT THE BORDERS OF ISRAEL IN 2017

By Svetlana Vaisman & Henk K. Mienis

Inspectors of the Plant Protection and Inspection Services (PPIS) of the Ministry of Agriculture stationed at the borders of Israel are the only agents who can prevent the entrance of allochthonous molluscs into 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. This function is therefore an important tool in the conservation of the native mollusc fauna of Israel.

PPIS inspectors stationed at Ben Gurion airport near Lod, the Mediterranean harbours of Haifa and Ashdod, the land border crossings with Jordan and Gaza, and the Palestinian Authority near Kerem Shalom intercepted 27 potential introductions of gastropods in 2017. These included 24 instances of terrestrial gastropods and two of aquatic snails discovered as hitchhikers

**Table 1.** Molluscs intercepted at the borders of Israel in 2017.

Date	PPIS no.	Species intercepted (number of specimens)	Origin	Shipment
9 Jan	386	<i>Deroceras reticulatum</i> (2) <i>Deroceras spec.</i> (1 juv.)	Netherlands	<i>Aphelandra</i>
13 Feb	387	<i>Theba pisana</i> (2 juv.)	Palestine	strawberries
14 Mar	389	<i>Cochlicopa lubrica</i> (1)	South Africa	table grapes
19 Mar	390	<i>Zonitoides arboreus</i> (2)	Netherlands	potted <i>azalea</i>
22 Mar	391	<i>Cornu a. aspersum</i> (1) <i>Xerotricha conspurcata</i> (1)	France	hand apples
16 Mar	392	<i>Theba pisana</i> (many juv.) (2)	Palestine	cauliflower
18 Apr	393	<i>Succinea putris</i> (2 juv.)	France	hand apples
13 Apr	394	<i>Theba pisana</i> (many juv.)	Palestine	hot peppers
12 Apr	395	<i>Theba pisana</i> (many juv.)	Palestine	tomatoes
8 May	396	<i>Theba pisana</i> (many juv.)	Palestine	tomatoes
11 May	397	<i>Theba pisana</i> (many juv.)	Palestine	tomatoes, sweet potatoes
16 May	398	<i>Theba pisana</i> (many juv.)	Palestine	tomatoes
4 Jun	399	<i>Deroceras invadens</i> (1)	Netherlands	potted <i>Ficus</i>
5 Jun	400	<i>Theba pisana</i> (many juv.)	Palestine	tomatoes, hot peppers
15 Jun	401	<i>Theba pisana</i> (many juv.)	Palestine	tomatoes, sweet potatoes
27 Jul	402	<i>Dostia violacea</i> (5) <i>Tylomelania sp. A</i> (4) <i>Tylomelania sp. B</i> (1)	Singapore	freshwater aquarium snails
2 Aug	403	<i>Physella acuta</i> (1)	Netherlands	<i>Hygrophila</i>
2 Aug	404	<i>Pseudosuccinea columella</i> (2)	Netherlands	<i>Aponogeton</i>
3 Aug	405	<i>Deroceras reticulatum</i> (1)	Netherlands	<i>Iris</i> flowers
6 Aug	406	<i>Theba pisana</i> (many juv.) <i>Oxyloma elegans</i> (2)	Palestine	sweet potatoes
19 Oct	407	<i>Deroceras invadens</i> (1) Dried out slug (1)	Netherlands	<i>Sempervivum</i>
22 Oct	409	<i>Xerocrassa seetzenii</i> (3) <i>Zonitoides nitidus</i> (1)	Jordan	olives
9 Nov	410	<i>Deroceras reticulatum</i> (1)	Netherlands	potted <i>Azalea</i>
20 Nov	411	<i>Monacha syriaca</i> (1)	Turkey	<i>Salvia</i> species
20 Nov	412	<i>Theba pisana</i> (1)	Palestine	hot peppers
26 Nov	413	<i>Deroceras reticulatum</i> (1)	Netherlands	potted <i>Fittonia</i>
22 Nov	414	<i>Arion circumscriptus</i> (1)	UK	wood

among imported merchandise, while a single mixed shipment of freshwater gastropods was classified as an illegal import.

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 Israel National Center for Biodiversity Studies of Tel Aviv University.

The 27 interceptions here reported were in shipments from eight countries (Table 1). The 18 taxa represented included terrestrial snails (10) and slugs (3) and freshwater snails (5) (Table 1). Table 1 also provides the date of collection, the species name and number of specimens (in brackets), the country of origin and type of merchandise on which the snails or slugs were intercepted, as well as the PPIS numbers of the mollusc samples. The table is arranged in order of PPIS numbers. PPIS numbers missing in the sequence are of mollusc samples that were collected at localities in Israel; these are not treated here.

Terrestrial snails were found 11 times on shipments of either strawberries (*Fragaria spec.*), cauliflower (*Brassica oleracea*), hot peppers (*Capsicum spec.*), tomatoes (*Solanum lycopersicum*) or sweet potatoes (*Ipomoea batatas*) from the Gaza Strip, Palestine, at the border checkpoint near Kerem Shalom. The merchandise is not imported for use in Israel. In fact its destination is the so-called West Bank, which, like the Gaza Strip, is governed by the Palestinian National Authority.

*Cochlicopa lubrica* is here recorded for the first time on merchandise arriving from abroad. It is interesting that it was found in a shipment of table grapes from South Africa, where it is considered a non-native species (Herbert, 2010).

*Xerocrassa seetzenii seetzenii* is here also recorded for the first time from an import from Jordan. However, it is a naturally occurring species in desert-like habitats in Israel and Jordan.

The invasive slug *Deroceras invadens* is also a new record from imports arriving from the Netherlands. It was encountered in a shipment of potted *Ficus* species and among houseleek (*Sempervivum* species). However, earlier imports have probably been overlooked because since 2013 it has been encountered in several garden centres and hothouses in Israel (Mienis *et al.*, 2014; Mienis & Rittner, 2015).

*Arion circumscriptus* is here recorded for the first time as a hitchhiker on imported merchandise. Since it is listed by Godan (1983) as a pest of potatoes, maize and rape, while it may also serve as an intermediate host of a number of tapeworms that may be harmful to sheep and rabbits, its establishment in Israel should be avoided.

The import of living tropical freshwater snails like species of *Dostia* and *Tylomelania* is a matter of great concern. Aquatic invaders among molluscs are often highly successful and may be encountered in large numbers in natural biotopes. The alien species *Pyrgophorus cf. coronatus*, *Mieniplotia scabra*, *Physella acuta*, *Planorbella duryi* and *Pseudosuccinea columella*, are now all commonly encountered in Israel, while numerous additional species are only waiting for an opportunity to settle in Israel's few natural aquatic habitats (Yanai *et al.*, 2017).

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## PACIFIC ISLAND LAND SNAILS

### Evolving strategy for release of *Partula* species back onto their islands of origin

By Trevor Coote and 27 others

#### First releases of *Partula* in 2015 and 2016

When the first shipments of three species of *Partula* from the international breeding programme due for reintroduction back into the wild arrived on Tahiti in 2015 two experimental release strategies were in place. The first consisted of a small reserve protected against incursion of the carnivorous snail *Euglandina rosea*. The second approach was to release snails directly into unsecured Tahitian chestnut (*mape*) trees, which offered potential as refuges from the predator. This supposition was based on observations of small relict populations of *Partula clara* sheltering in the leaves and branches of this tree species.

The results from 2015 demonstrated unambiguously that the reserve strategy was untenable for many reasons and that direct release into trees was the only realistic option for the reintroduction of *Partula* into the wild (Tentacle 25). In 2016 a new decree was issued by the Environment Department of French Polynesia that permitted the release of ten species and one subspecies of *Partula* at different locations on Tahiti, Moorea and Raiatea. The success of these species, based on speed of dispersal and estimated levels of mortality, was extraordinarily good (Table 1). The exception was on Raiatea, where the unexpected presence of the molluscivorous New Guinea flatworm, *Platydemus manokwari*, appeared to have severely impacted the three released species and put further releases onto this island temporarily on hold.

Species	Location	Release date	Number released	Number dead	% dead
<b>Moorea</b>					
<i>Partula mooreana</i>	Vairahi Valley	20 Sep 2016	592	25	4.2
<i>P. suturalis vexillum</i>	Morioahu Valley	20 Sep 2016	374	4	1.1
<i>P. taeniata simulans</i>	Morioahu Valley	20 Sep 2016	67	1	1.5
<i>P. tohiviana</i>	Afareaito Valley	20 Sep 2016	193	0	0.0
	Old reserve site	24 Oct 2016	446	77	12.1
<i>P. taeniata nucleola</i>	Vairahi Valley	14 Oct 2016	100	9	9.0
<b>Raiatea</b>					
<i>P. dentifera</i>	Faaroa Valley	26 Oct 2016	96	43	44.8
<i>P. tristis</i>	Faaroa Valley	26 Oct 2016	38	12	31.6
<i>P. hebe</i>	Faaroa Valley	26 Oct 2016	81	27	33.3
<b>Tahiti</b>					
<i>P. affinis</i>	Faarapa Valley	21 Sep 2016	201	8	4.0
<i>P. hyalina</i>	Papehue Valley	25 Oct 2016	8	1	12.5
<i>P. nodosa</i>	Papehue Valley	07 Nov 2016	842	10	1.2
<i>P. nodosa</i>	Maruapo Valley	10 Nov 2016	35	0	0.0
<b>Totals</b>			<b>3,073</b>	<b>217</b>	<b>7.1</b>

#### *Partula* releases 2017

The importation procedure for 2017 had already been well established after the four shipments of the previous year. Each crate (from London, Edinburgh and Artis) arrived on a Friday, was approved and signed off on by the official vet and Customs and taken directly to the quarantine facility in the Environment Department (Diren). From there the *Partula*



**Fig. 1.** Checking newly arrived *Partula nodosa*.

were removed from their packaging and counted, including any deaths, and placed into tanks (Fig. 1). Newborns were separated to be maintained in the facility by Diren staff. The snails had already been marked before dispatch with blue spots, the colour signifying the year of release. Experience from 2016 showed that the released *Partula* dispersed too quickly to make it worthwhile to continue numbering individuals for long-term monitoring. All the tanks were checked over the following 2-3 days, serviced as necessary and release pots prepared (roughly one per tank) the night before release.

The following species of *Partula*, with their IUCN Red List conservation status indicated, were involved in the releases (Table 2):

#### Tahiti

- *Partula affinis* (CR). One known surviving population on the peninsula of Tahiti. All those released into a reserve in 2015 died but those released in 2016 into trees in Faarapa Valley dispersed rapidly, with a few deaths.
- *Partula hyalina* (VU). Species widely distributed on Tahiti but nowhere common. A handful released in Papehue Valley in 2016.
- *Partula nodosa* (EW). Most successful species in the breeding programme. Very promising results from 2015 and 2016 tree releases in Papehue Valley.

#### Moorea

- *Partula mooreana* (EW). Small species, specialist on climbing pandanus ('ie'ie). Looked a little vulnerable in 2016 with a few deaths in monitored trees.
- *Partula suturalis vexillum* (EW). Generalist. Seemed fine in the *mape* in 2016.
- *Partula taeniata* (EW). Red List assessed at species level.
  - *P. t. elongata*, a generalist, persists in the wild but is not in the breeding programme.
  - *P. t. nucleola*. One known surviving population in western Moorea. Did well in 2016.
- *Partula tohiviana* (EW). Large, sinistral 'ie'ie specialist, endemic to Afareaito Valley, where most have been released into the site of the abandoned 1994 reserve.

**Table 2.** *Partula* release details for 2017.

Species	Location	Arrival date	Release date	Number released
<b>Moorea</b>				
<i>Partula mooreana</i>	Afareaito Valley	15 Sep 2017	18 Sep 2017	344
<i>P. suturalis vexillum</i>	Afareaito Valley	15 Sep 2017	18 Sep 2017	290
<i>P. taeniata nucleola</i>	Afareaito Valley	15 Sep 2017	18 Sep 2017	206
<i>P. tohiviana</i>	Afareaito Valley	15 Sep 2017	18 Sep 2017	204
	Afareaito Valley	15 Sep 2017	20 Sep 2017	746
<b>Tahiti</b>				
<i>P. affinis</i>	Faarapa Valley	15 Sep 2017	19 Sep 2017	129
<i>P. hyalina</i>	Papehue Valley	15 Sep 2017	23 Sep 2017	90
<i>P. nodosa</i>	Papehue Valley	06 Oct 2017	10 Oct 2017	1,369
newborns/juveniles	Papehue Valley	06 Oct 2017	10 Oct 2017	408
<b>Total</b>				<b>3,786</b>

The basic strategy of attaching pots of *Partula* to trees (Fig. 2) to allow the snails to disperse in their own time had remained unchanged since the original releases in 2015, though there had been a few minor adjustments. The pots were now prepared the day before and lined with dry tissue rather than with messy sphagnum, and the snails were placed in the pots in the morning and only sprayed with water on arrival at the site of release. The water was sprayed inside and on branches above the pots to encourage upward dispersal. It had been necessary to mark the pots with details of the contents with two different markers as the most waterproof pen under field conditions had yet to be established. They were now attached to trees with plastic ties rather than with wire. The wet tissue was removed and the pots cleaned once all the snails had moved out, to get rid of potential predator-attracting slime residue.

All species released in 2017 responded to their new conditions in a very similar manner to the way their conspecifics released in 2016 did. Only low levels of mortality have so far been observed among these releases (Table 3). Information gathered from 2015 and 2016 proved to be invaluable. Over two and a half years *Euglandina rosea* proved to be a much reduced threat compared to the past and *Platydemus monokwari*, though a potentially greater threat, was still a fairly inefficient predator once the *Partula* had dispersed higher in the trees. It seems likely that historical observations

**Fig. 2.** Attaching a pot of *Partula tohiviana* to a climbing pandanus.**Table 3.** Post-release mortality of *Partula* released in 2017, based on finding shells.

Species	Location	Release date	Number released	Number dead	% dead
<b>Moorea</b>					
<i>Partula mooreana</i>	Afareaito Valley	18 Sep 2017	344	26	8.1
<i>P. suturalis vexillum</i>	Afareaito Valley	18 Sep 2017	290	2	0.7
<i>P. taeniata nucleola</i>	Afareaito Valley	18 Sep 2017	206	7	4.9
<i>P. tohiviana</i>	Afareaito Valley	18 Sep 2017	204	86	11.6
		20 Sep 2017	746		
<b>Tahiti</b>					
<i>P. affinis</i>	Faarapa Valley	19 Sep 2017	129	13	11.6
<i>P. hyalina</i>	Papehue Valley	23 Sep 2017	90	4	5.6
<i>P. nodosa</i>	Papehue Valley	10 Oct 2017	1369	46	7.8
newborns/juveniles not counted	Papehue Valley	10 Oct 2017	408	-	-
<b>Total</b>			<b>3786</b>	<b>184</b>	<b>7.3</b>

of *Partula* living at a height of 1-3 m above ground constituted only part of the picture and it may well be that they existed in such density that the higher branches and the canopy probably contained populations as well. That would help to explain why dispersal from the pots was almost always upwards, which is a far better survival strategy, deliberate or otherwise, given the threats faced.

### Moorea

On Moorea the reduced level of threat from the principal predators enabled *Partula tohiviana* and *P. mooreana*, specialists on climbing pandanus ('ie'ie), to be released into their preferred habitat where that shrub was entwined around large trees. To avoid extra trekking to other sites and the crossing of rivers it was decided to release all the Moorean species into Afareaito Valley in the same general area where 2016's *P. tohiviana* had been released near the old 1994 reserve.

Both species suffered a number of initial deaths, though the deaths could not definitively be linked to predation. It was noted also that these two species produced more early newborns than did the others. In the case of *P. tohiviana* there were a number of dead shells and a few survivors from 2016 as evidenced by their yellow marks (Fig. 3). There were also a couple of large unmarked individuals that must have been the progeny from that release. The two generalist species, *P. suturalis vexillum* and *P. taeniata nucleola*, both seemed

**Fig. 3.** *Partula tohiviana*. Left – 2016 survivor; right – 2017 newborn.

secure in their respective release sites with few deaths. Two numbered individuals of *P. t. nucleola* and one adult *P. t. simulans* from 2016 were also seen alive in their release trees in mid-2017.

### Tahiti

On Tahiti, the valley of Faarapa, the 2016 release location for *Partula affinis*, had been bulldozed in August to widen the river following disastrous flooding, and most of the habitat was destroyed. However, there was rapid growth of plants and shrubs and individuals of the extant *Partula hyalina* and *P. clara* were soon observed. It was decided to release the *P. affinis* at the same location again, including into one of the release trees from 2016, which was still standing. As in 2016, this species was the first to disperse from view and, though a few dead shells were found at first, it is likely that the majority had ascended into the contiguous canopy.



Fig. 4. *Partula nodosa*.

For the third consecutive year a number of *Partula nodosa* (Fig. 4) were released into Papehue Valley, the original location of all the zoo breeding stock. In the previous years they had proved to be perhaps the most robust of the species, both in the breeding programme (as well as during transport) and in the field. No *Euglandina rosea* have been recorded in this valley for at least 15 years and, though *Platydemus* is present and has claimed a few *Partula* victims, it has not really impacted the

released populations. No individuals of *P. nodosa* from either of the two previous years have been sighted since, but the release area is large and the habitat is extremely complex. Ninety individuals of *P. hyalina* (extant in the wild and VU on the Red List) were also released into their preferred habitat of wild ginger (*opuhi*). Most dispersed but a few newborns were recorded.

### Conclusion

In the space of three years, ten endemic species and one subspecies of *Partula* tree snails, all but two listed as extinct in the wild, have been released onto three islands of French Polynesia (Tahiti, Moorea, Raiatea) (Table 4). The results on two of those islands (Tahiti and Moorea) have exceeded expectations and the way has been paved to continue with further releases of the remaining species onto Tahiti, Moorea, Raiatea and Huahine in 2018, which would account for all the species held in the breeding programme. After 2018, releases will continue and bi-annual monitoring maintained over the following years to determine whether the ambitious reintroduction programme has eventually translated into the reestablishment of some *Partula* species back onto their home islands.

**Table 4.** Numbers of *Partula* released 2015-2017.

Species	Location	2015	2016	2017	Total
<b>Moorea</b>					
<i>P. mooreana</i>	Vairahi Valley	-	592	-	
	Afereaito Valley	-	-	344	<b>936</b>
<i>P. suturalis vexillum</i>	Morioahu Valley	-	374	-	
	Afareaito Valley	-	-	290	<b>664</b>
<i>P. taeniata simulans</i>	Morioahu Valley	-	67	-	<b>67</b>
<i>P. tohiviana</i>	Afareaito Valley	-	193	204	
	Afareaito Valley	-	446	746	<b>1,591</b>
<i>P. taeniata nucleola</i>	Vairahi Valley	-	100	-	
	Afareaito Valley	-	-	206	<b>306</b>
<b>Raiatea</b>					
<i>P. dentifera</i>	Faaroa Valley	-	96	-	<b>96</b>
<i>P. tristis</i>	Faaroa Valley	-	38	-	<b>38</b>
<i>P. hebe</i>	Faaroa Valley	-	81	-	<b>81</b>
<b>Tahiti</b>					
<i>P. affinis</i>	Faarapa Valley	48	201	129	<b>378</b>
<i>P. hyalina</i>	Papehue Valley	-	8	90	
	Tefaaiti Valley	1	-	-	<b>99</b>
<i>P. nodosa</i>	Papehue Valley	150	842	1777	
	Tefaaiti Valley	70	-	-	
	Maruapo Valley	-	35	-	<b>2804</b>
<b>Total</b>		<b>269</b>	<b>3,073</b>	<b>3,786</b>	<b>7,060</b>

This conservation progress has only been possible because of the long-term collaboration between the French Polynesian environmental agencies and the international zoo community together with IUCN's SSC Conservation Breeding Specialist Group and Mollusc Specialist Group.



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Ross Brown, Collection Manager, Marwell Wildlife, Winchester, UK.

Mark Bushell, Assistant Curator of Invertebrates, Bristol Zoological Society.

Paul Buzzard, Director of Conservation, Detroit Zoological Society.

Dave Clarke, Team Leader, Zoological Society of London.

Maartje de Vries, Lead *Partula* keeper, Royal Artis Zoo, Amsterdam.

Colomba de la Panouse Turnbull, Director, Thoiry Zoo, France.

Jo Elliott, Animal Collection Manager, Royal Zoological Society of Scotland.

David Field, Zoological Director, Zoological Society of London.

Glenn Frei, *Partula* SSP Studbook Keeper, St. Louis Zoo.

Gerardo García, Curator of Lower Vertebrates & Invertebrates, North of England Zoological Society.

Justin Gerlach, Chair - Terrestrial and Freshwater Invertebrate Red List Authority (IUCN/SSC), Cambridge, UK.

Grace Goodey, Veterinary technician, Zoological Society of London.

Don McFarlane, International *Partula* Studbook Keeper, Auckland Zoo.

Bob Merz, *Partula* Species Survival Plan Coordinator, St Louis Zoo.

Bobbi Miller, Field Conservation Coordinator, Woodland Park Zoo, Seattle.

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Tim Woodfine, Director of Conservation, Marwell Wildlife, Winchester, UK.

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## MARINE MATTERS

### Biology and conservation of the giant marine snail *Adelomelon beckii* in Argentina

By Florencia Arrighetti & Pablo E. Penchaszadeh

The giant volutid snail *Adelomelon beckii* (Broderip, 1836) (Fig. 1) is endemic to the western south Atlantic shelf and is distributed from Espiritu Santo (Brasil) to Tierra del Fuego (Argentina) (Weaver & du Pont, 1970). This species inhabits sandy bottoms in water depths of 40-70 m (Weaver & du Pont 1970). It often exceeds 40 cm and sometimes reaches up to 50 cm in shell length (Rios, 1994). This species preys on another carnivorous snail, *Zidona dufresnei* (see Arrighetti, 2009), and on other gastropods and bivalves (Weaver & du Pont, 1970), positioning it among the top benthic predators in the food web. Population densities of *A. beckii* have always been reported as very low (e.g. Carranza *et al.*, 2008). This species is harvested as part of the bycatch by fishing trawlers exploiting shrimp and commercial fish, and its muscular foot is used for human consumption and its large attractive shell is sold in local and international markets as an ornament (Fig. 2).



**Fig. 1.** Pablo E. Penchaszadeh (left) and Florencia Arrighetti (right) holding shells of mature *Adelomelon beckii*. On the table, a shell of a juvenile specimen.

The age at which 50 % of the population reaches gonadic maturity is around 14 years for females (25.6 cm shell length) and 11 years for males (21.9 cm shell length) (Arrighetti & Penchaszadeh, 2010a). The reproductive cycle in the Mar del Plata area (38°S) involves two spawning periods, one during the austral spring (September-November) and the other during autumn (March-April) (Arrighetti & Penchaszadeh, 2010b). The semi-annual pattern shows a clear seasonality that could be related to variation in seawater temperature, an important environmental factor that regulates gonadal development and spawning in many gastropod species (Giese & Pearse, 1977). Males showed a continued gametic emission indicating that



**Fig. 2.** *Adelomelon beckii* shells for sale at a shop in Mar del Plata harbor, Argentina. In front, shells of individuals at reproductive size; behind in the right-hand basket, small shells of non-reproductive individuals, and in the left-hand basket, shells of *Zidona dufresnei*.

there is no relationship with variation in seawater temperature, an unusual pattern for a species from a temperate region. During copulation, the penis deposits the sperm into the bursa copulatrix of the female, where the sperm can be stored for a short period before fertilisation and spawning takes place. Thus this long period of maturity could allow males to increase the number of copulations and fertilise more females during a breeding season. The spawn consists of isolated egg capsules attached to a hard substrate, usually the external surface of an empty scallop shell, with 7-9 embryos per capsule (Penchaszadeh *et al.*, 1999). Hatching snails crawl away from the egg capsule as juveniles of  $17.2 \pm 1.0$  mm shell length. Imposex was reported in *A. beckii* in 2009 (Arrighetti, 2009). This genital abnormality is a widespread phenomenon caused by tributyltin (TBT), a compound used in antifouling paints (Gibbs *et al.*, 1988), and was reported in 2001 for the first time in the South American Atlantic in coastal areas of Mar del Plata, also being found in gastropods associated with harbor waters (Penchaszadeh *et al.*, 2001; Bigatti *et al.*, 2009). *Adelomelon beckii* is the first offshore species in which imposex has been reported in Argentina.

Arrighetti *et al.* (2011) reported that *A. beckii* can reach 28 years of age at 380 mm shell length in the Mar del Plata region, being one of the most long-lived gastropods studied to date. The estimated fishing mortality of  $0.129 \text{ y}^{-1}$  appears to be fairly high for such a long lived species, and consequently the current exploitation rate of 0.614 is much beyond the optimum rate of 0.427. These findings indicate that the current exploitation regime exerts far too high a fishing pressure and will be unsustainable in the long run. Overexploitation is potentially more severe in a species lacking a planktonic opportunity for dispersal and that is affected by imposex, given that this phenomena is known to affect the reproductive activity of the population. Besides, *A. beckii* is important ecologically in the Mar del Plata upper shelf ecosystem because of its trophic position. Taking these factors into

account, the current exploitation level may cause irrevocable changes in *A. beckii* populations and in the associated food web. We fear that without a proper management approach – including minimum size, no-catch periods and no-catch areas – this economically valuable and ecologically important species will be reduced to insignificant levels in the Mar del Plata area within a short period of time. According to the present data, we proposed a minimum catch size of 28 cm shell length for both sexes, allowing each female to spawn over at least two reproductive seasons, and to establish a closed season from September to November, when the most intense spawning events occur. This fishing measure should discourage their landing and in consequence the trade will disappear.

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**Sale of *Nautilus* in Indonesia continues after CITES listing**

By Vincent Nijman

In September 2016 all six species of *Nautilus* were added to Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This means that all international trade, including trade in whole shells and shell fragments, is subject to strict regulations. The proposal to include all *Nautilus* species on Appendix II came from the USA, hitherto the main importer of *Nautilus* shells, and Fiji, Palau and India, three countries within the range of *Nautilus* and where the trade in *Nautilus* was having negative effects on their populations. Trade affected several species of *Nautilus* but the most widespread species, the chambered nautilus (*Nautilus pompilius*) is also the one that is traded in the largest volumes (Floren, 2003; DeAngelis, 2012; Nijman & Lee, 2016). One of the main trading countries of chambered nautilus is, and has been for at least two decades, Indonesia (Fig. 1). Information provided by Freitas & Krishnasamy (2016) suggests that significant shifts have occurred in where chambered nautilus is sourced, probably in response to depleted populations, and that trade from Indonesia may have been on the increase in the years prior to the CITES listing.

While the export of chambered nautilus from Indonesia has been well-documented, mostly based on import figures from third parties (e.g. DeAngelis, 2012), what has received less emphasis is that all trade in chambered nautilus, including its export, has been prohibited since the species was added to Indonesia’s protected species list in 1987 (Nijman *et al.*, 2015). Following Act No 5 “Any and all persons are prohibited to (a) catch, transport, and trade in a protected animal in a live condition; (b) keep, possess, transport, and trade in a protected animal in a dead condition; (c) transfer a protected animal from one place to another, within or outside Indonesia (d) trade, keep or possess bodies, or other parts of a protected animal or the goods made of parts of the animal, or transfer from one place in Indonesia to another, within or outside Indonesia”. Penalties that can be imposed when these laws are broken can total fines of up to IDR 100,000,000 (~US\$ 8,500) and imprisonment for up to five years. Furthermore, since any trade in chambered nautilus also breaks Indonesia’s Fisheries Act 31 of 2004, stronger penalties for illegally trading them can be imposed (i.e. up to seven years imprisonment and fines of up to IDR 3,000,000,000 or ~US\$ 255,000) (Nijman & Nekaris, 2017).

Increasingly, however, it has become clear that these laws are not properly enforced and international trade has continued unabated. For instance, although in June 2012 485 chambered nautilus, among other shells, that were intended for export to China, were confiscated in Surabaya, no convictions have followed; and on 4 September 2015 when 1,515 chambered nautilus shells were seized at Benoa harbour in Bali, and despite being a repeat offender, the trader was not arrested as “he was accompanied by a small child” (Anonymous, 2015). Thus, the need for better international cooperation and regulation of trade in chambered nautilus through CITES is overdue.



### Cukli

Cukli merupakan salah satu primadona kerajinan khas Lombok yang ditawarkan di **Pasar Seni Sayang-Sayang**. Cukli adalah potongan kulit kerang yang dijadikan sebagai hiasan atau ditempel pada obyek tertentu menjadi sebuah hiasan yang sangat indah. Beberapa hasil kerajinan bisa berupa meja, kursi, kotak perhiasan hingga lemari. Produk ini sangat cocok dijadikan oleh-oleh bagi wisatawan-wisatawan baik itu lokal maupun asing.

#### KERAJINAN CUKLI

Cukli merupakan kerajinan yang dihasilkan dari cangkang yang dipotong menjadi lembaran tipis kemudian diukir menjadi berbagai macam bentuk. Proses pembuatan cukli ini disebut di Lombok sebagai mengukir, mengukir atau mengukir. Mengukir adalah kegiatan yang dilakukan oleh pengrajin cukli yang menggunakan alat ukir untuk mengukir cangkang kerang menjadi berbagai macam bentuk. Cukli merupakan salah satu produk kerajinan yang sangat indah dan bernilai seni tinggi.

Kerajinan cukli merupakan salah satu primadona kerajinan khas Lombok yang ditawarkan di Pasar Seni Sayang-Sayang. Cukli adalah potongan kulit kerang yang dijadikan sebagai hiasan atau ditempel pada obyek tertentu menjadi sebuah hiasan yang sangat indah. Beberapa hasil kerajinan bisa berupa meja, kursi, kotak perhiasan hingga lemari. Produk ini sangat cocok dijadikan oleh-oleh bagi wisatawan-wisatawan baik itu lokal maupun asing.

NO	NAMA USAHA/UMKM	PEMILIK	ALAMAT	HP	LOKASI	JUAL
1	USAHA LAINNYA CUKLI TERBUKA	A. Zulham	Pungkip, Jember	08175182007	Blok A No. 1, 2	Stasiun Caringin, Bando, Mera, Mera
2	REHA ARTSHOP	Reha, Pabun	Pungkip, Jember	081764087614	Blok A No. 3	Cukli, kerajinan, ukiran, ukiran
3	USAHA ARTSHOP	Ruslan	Plehan, K. Bano	08187755568	Blok A No. 5	Handy Craft dan Bando
4	GERAI HANDESOVIT	Fitri Susanti	Lombok Tengah (Gorontalo)		Blok A No. 6	Handy Craft
5	SENILE ARTSHOP	Muhaini	Pungkip, Jember	081788321166	Blok A No. 7	Sampul, Hiasan, Ukiran
6	MULTIMEDIA ARTS	H. Zulham	Wiang, Bando	081007504005	Blok A No. 8	Muklas, Kerajinan, Ukiran, Ukiran

**Fig. 1.** Handicrafts with chambered nautilus shell (*cukli*) inlays continue to be promoted by government agencies (here the Agency for Cooperation, Industry and Trade of Mataram, the capital of Lombok). Translated, the upper panel reads: “Chambered nautilus is one of the prime Lombok handicrafts that is for sale in the Sayang Sayang art market. Cukli is a piece of shell that is used as an ornament or worked into an object as a beautiful decoration. These handicrafts can be tables, chairs, jewellery boxes and cabinets. These products are very suitable as souvenirs for both local and foreign tourists”. The lower panel gives a more detailed account and lists the names, owners, addresses and mobile phone numbers of 20 shops that sell chambered nautilus. Nowhere is it mentioned that the species is legally protected and cannot be traded, nor that all nautilus species are listed on Appendix II of CITES and thus cannot be exported without the necessary permits.

At the time of writing this article it had been 15 months since the CITES proposals were adopted, and 12 months since it had entered into force, I conducted a search to assess if chambered nautilus are still openly traded in Indonesia. I focussed on the period after September 2016, and searched for seizures and offers of sale. Since CITES only deals with international trade I searched the Internet for wholesale traders in marine shells, as well as traders that offer individual shells or smaller numbers for sale. Chambered nautilus shells are traded whole or as inlays using shell fragments (see below).

In terms of seizures I found only one since September 2016: on 28 February 2017 an operation at the El Tari international airport in Kupang, West Timor, resulted in the confiscation of one or three chambered nautilus shells (reports in the Indonesian media give conflicting figures).

While three wholesale traders (in Bali, east Java and central Sulawesi) that in the past offered chambered nautilus for sale over the Internet no longer do so, two others (in Bali and south Sulawesi) still do, with one having the capacity to ship four containers a month (presumably these are not all chambered nautilus but also other large shells). Encouragingly, one wholesale trader still has a chambered nautilus shell lamp listed on its website, but stated that it was no longer able to sell it as this was no longer legal.

On the other hand, the island of Lombok continues to promote itself as the area to buy *Nautilus* shell inlaid furniture, jewellery boxes handicrafts etc. (Fig. 1), clearly targeting both domestic and international markets (e.g. Anonymous, 2016). In February 2017 the Lombok Tourism Board published an article promoting chambered nautilus shells handicrafts and furniture, again promoting it as a suitable souvenir for foreign tourists (Anonymous, 2017). After the dip in tourism following the Bali bombing in 2002 the local Lombok government gave out subsidies to local traders to promote its trade and this continued at least until 2010. Ironically, at around the time of the preparation of the CITES proposals, government agencies in Lombok started promoting the sale of *Nautilus* shell inlaid furniture and handicrafts as an art form unique to the island.

It is clear from the above that while some changes have occurred since the inclusion of *Nautilus* on Appendix II of CITES, trade in chambered nautilus continues in Indonesia, and certainly in Lombok it is actively promoted. It is imperative that the trade, including online trade, in chambered nautilus and other protected molluscs continues to be monitored. Local governments must be made aware that it is against national policy to promote the sale of protected wildlife, and enforcement efforts and prosecution of offenders needs to be increased.

I thank the Mohamed bin Zayed Species Conservation Fund and Cleveland Metroparks Zoo for funding the market surveys that gave me insight into the trade in marine mollusc shells.

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## RECENT PUBLICATIONS RELEVANT TO MOLLUSC CONSERVATION

### Freshwater Mollusk Biology and Conservation



*Freshwater Mollusk Biology and Conservation*, formerly *Walkerana* is the on-line journal of the [Freshwater Mollusk Conservation Society](#), based in North America. In 2017, it published two issues (volume 20, numbers 1 and 2) with ten papers. All issues are available on-line with open access.

McMurray, S.E. & Roe, K.J. 2017. Perspectives on the controlled propagation, augmentation, and reintroduction of freshwater mussels (Mollusca: Bivalvia: Unionoida). *Freshwater Mollusk Biology and Conservation* 20(1): 1-12.

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- River watershed streams. *Freshwater Mollusk Biology and Conservation* 20(2): 59-64.
- Bertram, E.P., Placyk, J.S., Jr., Williams, M.G. & Williams, L.R. 2017. Verification of two cyprinid host fishes for the Texas pigtoe, *Fusconaia askewi*. *Freshwater Mollusk Biology and Conservation* 20(2): 65-70.
- Blevins, E., Jepsen, S., Box, J.B., Nez, D., Howard, J., Maine, A. & O'Brien, C. 2017. Extinction risk of western North American freshwater mussels: *Anodonta nuttalliana*, the *Anodonta oregonensis/kennerlyi* clade, *Gonidea angulata*, and *Margaritifera falcata*. *Freshwater Mollusk Biology and Conservation* 20(2): 71-88.
- Stodola, K.S., Stodola, A.P. & Tiemann, J.S. 2017. Survival of translocated clubshell and northern riffleshell in Illinois. *Freshwater Mollusk Biology and Conservation* 20(2): 89-102.
- Strayer, D.L. 2017. What are freshwater mussels worth? *Freshwater Mollusk Biology and Conservation* 20(2): 103-113.
- Ashton, M.J., Tiemann, J.S. & Hua, D. 2017. Evaluation of costs associated with externally affixing PIT tags to freshwater mussels using three commonly employed adhesives. *Freshwater Mollusk Biology and Conservation* 20(2): 114-122.

### Malacological Review

[Malacological Review](#) is still alive, and volume 45/46 (2017) was recently published and is available on-line. There are plans to make previous issues also available on-line. The following papers on North American freshwater mussels, and a valuable guide to land snails of the northeastern USA and southeastern Canada, make up volume 45/46.

- Ahlstedt, S.A., Powell, J.R., Butler, R.S., Fagg, M.T., Hubbs, D.W., Novak, S.F., Palmer, S.R. & Johnson, P.D. 2017. Historical and current examination of freshwater mussels (Bivalvia: Margaritiferidae: Unionidae) in the Duck River basin Tennessee, U.S.A. *Malacological Review* 45: 1-163.
- Ahlstedt, S.A., Walker, C. & Bakaletz, S. 2017. Status of freshwater mussels in the coal mining basin of the New River (Big Sour fork Cumberland River drainage) in portions of Scott, Anderson, Morgan and Campbell County, Tennessee (2006-2008). *Malacological Review* 45/46: 165-191.
- Ahlstedt, S.A., Connell, J.F., Bakaletz, S. & Fagg, M.T. 2017. Freshwater mussels of the National Park Service Obed wild and scenic river, Tennessee. *Malacological Review* 45/46: 193-211.
- Ahlstedt, S.A., Jones, J.W. & Walker, C. 2017. Current status of freshwater mussel populations in the Clinch River at the Appalachia Power Company's Clinch River steam plant, Russell County, Virginia (Clinch River miles 268.3-264.2). *Malacological Review* 45/46: 213-225.
- Getz, L.L., Chichester, L.F. & Burch, J.B. 2017. Land mollusks of northeastern United States and southeastern Canada. *Malacological Review* 45/46: 227-285.

### Journal of Threatened Taxa

All issues for 2017 of the [Journal of Threatened Taxa](#) are available on-line now.

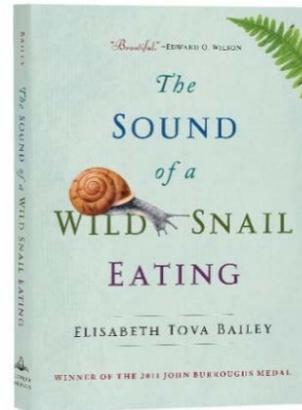
### AMS Imperiled Species Newsletter

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 [January 2016](#), reporting on events in 2015. Maybe a new one will be forthcoming.

### The Sound of a Wild Snail Eating

Elisabeth Tova Bailey, 2010. Algonquin Books of Chapel Hill, Chapel Hill, North Carolina, USA.

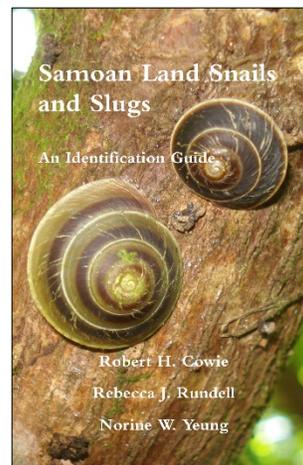


Here is my usual notice of this delightful book. It was reviewed in [Tentacle 19](#) (2011). The original hard cover version was published in the USA in 2010, but hard cover editions in English and translations in French, German, Chinese, Japanese and Korean are also available. It is also available in paperback in some countries. It has received accolades globally. I still

thoroughly recommend it, so if you have not yet obtained a copy, go and get one. An [audiobook](#) edition is available as a Kindle or hard CD. Check out the [author's website](#).

### Samoa Land Snails and Slugs – An Identification Guide

Robert H. Cowie, Rebecca J. Rundell & Norine W. Yeung, 2017. Department of Marine and Wildlife Resources, American Samoa Government. Full colour paperback. viii + 73 p. Available from [Lulu.com](#).



From the back cover:

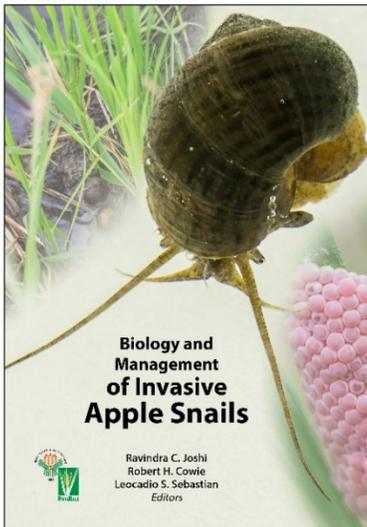
The islands of the Samoan archipelago lie about 14 degrees south of the equator in the central Pacific Ocean. The islands have been formed as a result of complex volcanic activity; they are geologically young. As with most islands of the Pacific, many of the plants and animals of the Samoan Islands are found nowhere else on Earth.

This guide is intended to permit identification of most of the terrestrial snails and slugs of the Samoan Islands. It is intended to be accessible to the amateur naturalist but also to provide the experienced scientist with a compact resource of information. The guide covers both the native and the non-native, introduced, species, which are generally more frequently encountered, especially at low elevations and in habitats disturbed by human activities.

The authors are widely experienced Pacific Island land snail biologists, having undertaken extensive field surveys in the Samoan and Hawaiian Islands and in Palau since 1990.

## Apple snails

Joshi R.C., Cowie R.H. & Sebastian L.S. (eds). 2017. *Biology and management of invasive apple snails*. Philippine Rice Research Institute (PhilRice), Maligaya, Science City of Muñoz, Nueva Ecija. xvii + 405 p.



Invasive apple snails (Ampullariidae, *Pomacea* spp.) are serious agricultural pests but they also cause significant damage to natural wetland ecosystems and have impacts on native species including native aquatic snails. This book, published on-line in 2017, includes 22 chapters covering diverse aspects of apple snail biology and management. The hard copy version is

scheduled for publication in 2018. The book, in pdf format, is available to download free from a number of sources, including the following:

[PhilRice – Philippine Rice Research Institute](#)  
[ResearchGate](#)  
[Cowie lab publications](#)  
[NACA – Network of Aquaculture Centres in Asia-Pacific](#)  
[Global Plant Protection News](#)

## Measuring the Sixth Extinction: what do mollusks tell us?

Cowie, R.H., Régnier, C., Fontaine, B. & Bouchet, P. 2017. Measuring the Sixth Extinction: what do mollusks tell us? *The Nautilus* 131(1): 3-41.

This paper is derived from the [presentation](#) given by Robert Cowie during the [Mollusks in Peril Forum](#) at the Bailey-Matthews National Shell Museum, Sanibel, Florida, in 2016. It includes an update of the influential 2009 paper by Régnier *et al.* (2009), lists all mollusc species now thought to be extinct, and incorporates additional information and interpretation of more recent papers by Régnier *et al.* (2015a, b).

For a pdf of this and of the other papers mentioned here please send an e-mail to me, Robert Cowie (cowie@hawaii.edu).

Régnier, C., Fontaine, B. & Bouchet, P. 2009. Not knowing, not recording, not listing: numerous unnoticed mollusk extinctions. *Conservation Biology* 23: 1214-1221.

Régnier, C., Achaz, G., Lambert, A., Cowie, R.H., Bouchet, P. & Fontaine, B. 2015. [Mass extinction in poorly known taxa](#). *Proceedings of the National Academy of Sciences* 112(25): 7761-7766.

Régnier, C., Bouchet, P., Hayes, K.A., Yeung, N.W., Christensen, C.C., Chung, D.J.D., Fontaine, B. & Cowie, R.H. 2015. Extinction in a hyperdiverse endemic Hawaiian land snail family and implications for the underestimation of invertebrate extinction. *Conservation Biology* 29(6): 1715-1723.

## Is mining the seabed bad for mollusks?

Sigwart, J.D., Chen, C. & Marsh, L. 2017. Is mining the seabed bad for mollusks? *The Nautilus* 131(1): 43-49.

Also based on a presentation given, by Julia Sigwart, at the [Mollusks in Peril Forum](#) at the Bailey-Matthews National Shell Museum, Sanibel, Florida, in 2016, this paper focuses on the recently described “scaly-foot” gastropod, *Chrysomallon squamiferum* Chen *et al.*, 2015, in the Indian Ocean, which was featured in last year’s [Tentacle 25](#). As noted in the paper, “This iconic species has only been reported from three sites in the Indian Ocean, each site hundreds of miles apart and only around half the size of a football field. Two of these three sites are already designated under international exploration licenses for deep-sea mining, to extract rare minerals from the vent chimneys. Economic and political pressures to exploit the seabed are advancing much faster than scientific exploration, putting these vent ecosystems and their molluscan residents at risk”.

Chen, C., Linse, K., Copley, J.T. & Rogers, A.D. 2015. The “scaly-foot gastropod”: a new genus and species of hydrothermal vent-endemic gastropod (Neomphalina: Peltospiridae) from the Indian Ocean. *Journal of Molluscan Studies* 81: 322-334.

## Other publications of interest

This is not a comprehensive list but simply a list of publications that I have happened to come across, additional to those mentioned elsewhere in this section. 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*.

- Balashov, I., Yarotskaya, M., Filatova, J., Starichenko, I. & Kovalov, V. 2017. Terrestrial molluscs of the Tsyri-Pripyat area in Volyn (northern Ukraine): the first findings of the threatened snail *Vertigo moulinsiana* in mainland Ukraine. *Vestnik Zoologii* 51(2): 251-258.
- Fehér, Z., Majoros, G., Ötvös, S., Bajomi, B. & Sóllymos, P. 2017. Successful reintroduction of the endangered black nerite, *Theodoxus prevostianus* (Pfeiffer, 1828) (Gastropoda: Neritidae) in Hungary. *Journal of Molluscan Studies* 83(2): 240-242.
- Gilroy, E.A.M., Gillis, P.L., King, L.E., Bendo, N.A., Salerno, J., Giacomini, M. & De Solla, S.R. 2017 The effects of pharmaceuticals on a unionid mussel (*Lampsilis siliquoidea*): an examination of acute and chronic endpoints of toxicity across life stages. *Environmental Toxicology and Chemistry* 36(6): 1572-1583.
- Goldyn, B., Kaczmarek, L., Roszkowska, M., Guayasamin, P.R., Książkiewicz-Parulska, Z. & Cerda, H. 2017. Urban ecology of invasive giant African snail *Achatina fulica* (Férussac) (Gastropoda: Achatinidae) on its first recorded sites in the Ecuadorian Amazon. *American Malacological Bulletin* 35(1): 59-64.
- Hershler, R., Liu, H.-P., Forsythe, C., Hovingh, P. & Wheeler, K. 2017. Partial revision of the *Pyrgulopsis kolobensis* complex (Caenogastropoda: Hydrobiidae), with resurrection of *P. pinetorum* and description of three new species from the Virgin River drainage, Utah. *Journal of Molluscan Studies* 83(2): 161-171.
- Holland, B.S., Chiaverano, L.M. & Howard, C.K. 2017. Diminished fitness in an endemic Hawaiian snail in nonnative host plants. *Biological Ecology & Evolution* 29(3): 229-240.
- Horsák, M., Hájek, M., Horsáková, V., Hlaváč, J., Hájková, P., Dítě, D., Peterka, T., Divíšek, J., Potůčková, A. & Preece, R.C. 2017. Refugial occurrence and ecology of the land snail *Vertigo lilljeborgi* in fen habitats in temperate mainland Europe. *Journal of Molluscan Studies* 83(4): 451-460.

- Książkiewicz-Parulska, Z. 2017. The impact of temperature on activity patterns of two vertiginid micro-molluscs (Mollusca: Gastropoda) in conditions of high, constant humidity. *American Malacological Bulletin* 35(2): 170-174.
- Lopes-Lima, M. and 48 others. 2017. Conservation status of freshwater mussels in Europe: state of the art and future challenges. *Biological Reviews* 92(1): 572-607.
- Markovic, D., Carrizo, S.F., Kärcher, O., Walz, A. & David, J.N.W. 2017. Vulnerability of European freshwater catchments to climate change. *Global Change Biology* 23: 3567-3580.
- Martynova, A., Hasegawa, K. & Korshunova, T. 2017. The Japanese Red Data book marine mollusk *Japonacteon nipponensis* and a *Japonacteon* population from Russia belong to the same species: molecular evidence and recommendations for conservation. *Global Ecology and Conservation* 9: 82-89.
- McAskill, S. & Douglass, J. 2017. Salinity and temperature alter *Pomacea maculata* herbivory rates on *Vallisneria americana*. *Journal of Molluscan Studies* 83(4): 481-483.
- Miranda, M. & Pecora, I. 2017. Conservation implications of behavioural interactions between the giant African snail and a native Brazilian species. *Ethology Ecology & Evolution* 29(3): 209-217.
- Nicolai, A. & Ansaret, A. 2017. Conservation at a slow pace: terrestrial gastropods facing fast-changing climate. *Conservation Physiology* 5(1): cox007.
- Prosser, R.S., Rochfort, Q., McInnis, R., Exall, K. & Gillis, P.L. 2017. Assessing the toxicity and risk of salt-impacted winter road runoff to the early life stages of freshwater mussels in the Canadian province of Ontario. *Environmental Pollution* 230: 589-597.
- Reich, I., Mc Donnell, R., Mc Inerney, C., Callanan, S. & Gormally, M. 2017. EU-protected slug *Geomalacus maculosus* and sympatric *Lehmannia marginata* in conifer plantations: what does mark-recapture method reveal about population densities? *Journal of Molluscan Studies* 83(1): 27-35.
- Song, Z., Zhang, J., Jiang, X. & Xie, Z. 2017. Linking environmental factors, life history and population density in the endangered freshwater snail *Margarya melanioides* (Viviparidae) in Lake Dianchi, China. *Journal of Molluscan Studies* 83(3): 261-269.
- Stoeckle, B.C., Araujo, R., Geist, J., Kuehn, R., Toledo, C. & Machordom, A. 2017. Strong genetic differentiation and low genetic diversity of the freshwater pearl mussel (*Margaritifera margaritifera* L.) in the southwestern European distribution range. *Conservation Genetics* 18(1): 147-157.
- Tsakiris, E.T., Randklev, C.R., Blair, A., Fisher, M. & Conway, K.W. 2017. Effects of translocation on survival and growth of freshwater mussels within a West Gulf Coastal Plain river system. *Aquatic Conservation: Marine and Freshwater Ecosystems* 27(6): 1240-1250.
- Whelan, N.V., Johnson, P.D., Garner, J.T. & Strong, E.E. 2017. On the identity of *Leptoxis taeniata* – a misapplied name for the threatened painted rocksnail (Cerithioidea, Pleuroceridae). *ZooKeys* 697: 21-36.
- Yeung, N.W., Cowie R.H., Hayes, K.A. & Strong, E.E. 2017. Type specimens of Hawaiian land snails in the Smithsonian Institution, National Museum of Natural History, with lectotype designations. *Smithsonian Contributions to Zoology* 647: i-v, 1-34.
- Zemanova, M.A., Knop, E. & Heckel, G. 2017. Introgressive replacement of natives by invading *Arion* pest slugs. *Scientific Reports* 7: 14908.
- Zieritz, A., Bogan, A.E., Froufe, E., Klishko, O., Kondo, T., Kovitvadi, U., Kovitvadi, S., Lee, J.H., Lopes-Lima, M., Pfeiffer, J.M., Sousa, R., Do, T.V., Vikhrev, I. & Zanatta, D.T. 2017. Diversity, biogeography and conservation of freshwater mussels (Bivalvia: Unionida) in East and Southeast Asia. *Hydrobiologia* On-line early.

## IUCN AND MOLLUSC SPECIALIST GROUP NEWS AND ANNOUNCEMENTS



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

All news and announcements provided by [Mary Seddon](#), chair of the Mollusc Specialist Group of the IUCN [Species Survival Commission](#) (SSC).

### IUCN is 70 years old

This year IUCN is celebrating 70 years of a shared work programme between governments and civil society organisations with the goal of protecting nature. It was established on 5 October 1948 in the French town of Fontainebleau and became the first global environmental union between government agencies and international and national non-governmental organisations. Today IUCN has more than 1,300 state and civil society members, as well as over 10,000 international experts who volunteer their services. It is a global authority on the status of the natural world and the measures needed to safeguard it. IUCN has been instrumental in the creation of key United Nations agreements, such as the World Heritage Convention, the Convention on International Trade in Endangered Species (CITES), the Convention on Biological Diversity (CBD) and the Framework Convention on Climate Change (UNFCCC). Since 1999, IUCN has enjoyed official observer status at the United Nations.

As humanity tackles increasing global challenges, such as climate change and the sixth mass extinction, IUCN's knowledge and expertise are more important than ever. IUCN President Zhang Xinsheng noted that "Throughout its 70 year history, IUCN has championed the protection of nature and its role in achieving sustainable development ... and today, the world is waking up to the fact that the prosperity we want for ourselves and our children's children depends on nature." IUCN Director General Inger Andersen suggests that we should reach out to others as "At this critical juncture in humanity's history, all hands must be on deck to end poverty, protect the planet and ensure prosperity for all ... No one government or organisation can achieve this alone. IUCN's power as a Union – with its knowledge, reach and 70 years worth of experience – is essential for charting the course forward."

To mark its 70th anniversary, IUCN has launched the [Crossroads Blog – Open Letters to IUCN Members](#), which will provide space for debate among IUCN Members and partners on some of the most topical and controversial issues related to nature conservation, sustainable development and beyond.

There will also be a series of [celebrations of IUCN's 70th anniversary](#) taking place around the world.

## Planned Red List updates 2018

The main IUCN Red List updates planned for this year are outlined below; please note that these schedules may be subject to change. The “submissions target date” indicates the date by which submissions for each Red List update should reach the IUCN Red List Unit, but see the information on target dates below. Target dates should not be interpreted as strict deadlines for submissions. When assessments are submitted for publication on the IUCN Red List, they are added to a queue. Assessments may be submitted and added to the queue at any time. The Red List Unit processes assessments (i.e. runs quality checks and decides whether they meet the appropriate standards for publication or whether further work is needed) in the order in which they were submitted. So, assessments submitted earlier are higher up the queue and are checked first.

The IUCN Red List submissions target dates for 2018 are 28 June, 5 April, 23 August and 15 November.

All species require full documentation and a map, even extinct species. The map needs to be supplied as a kml file or a GIS shape file. Map data attributes should be sent together with the map; attributes include author and status (resident/introduction, Possibly Extant/Extant and Possibly Extinct/Extinct).

Mollusc Specialist Group members who have taken the Red List training course may work directly in the Species Information System, a data collation database that supplies the data to the published Red List database. If you wish to contribute species assessments to the Red List, please contact Mary Seddon (general additions), Eike Neubert (Europe), Frank Köhler (Australia) or Manuel Lopes-Lima (freshwater bivalves).

**Important Note:** The IUCN Red List Unit cannot guarantee that assessments submitted before the submissions target date will be published in the next Red List update. This depends on how many assessments are already in the queue and on whether any problems are found in the submitted assessment.

## New IUCN Guidelines for Species Conservation Planning

The IUCN Species Survival Commission (SSC) has released its revised [Guidelines for Species Conservation Planning](#), which aim to ensure conservationists can develop appropriate and realistic conservation plans for species in the current era of profound ecological change, including climate change.

The new SSC chair, Jon Paul Rodriguez is keen to see more conservation initiatives for endangered species that are on the Red List and says “These new guidelines are, however, incredibly important as they reflect the progress and changes that have been impacting conservation planning over the past ten years. They encourage a realistic, evidence based strategic approach to conservation decision making to ensure the best possible outcome for species conservation can be achieved”. Mark Stanley Price comments “Planning is only effective if it is part of a cycle of planning – doing – learning and re-planning. If we delay conservation planning, we risk the

survival of species. We therefore hope the new guidelines show how to create effective conservation plans with imperfect information about a species. The new guidelines are aimed to be as relevant for planning for algae as for elephants, but they can be tailored for any taxon or situation, and we expect them to be revised regularly”.

It is anticipated that the revised guidelines will join several other initiatives within IUCN and elsewhere to ensure the development of future successful conservation plans that meet global targets for biodiversity conservation, such as the Convention on Biological Diversity’s Aichi Target 12.

## Working with indigenous peoples’ organisations

At the 2016 IUCN World Conservation Congress, IUCN members adopted a decision to establish a new membership category for indigenous peoples’ organisations (IPOs). This landmark decision is path breaking and ensures an equal voice for IPOs in IUCN and in the further development and delivery of the [IUCN One Programme](#). As a direct follow-up to this decision, the [Global Programme on Governance and Rights](#) in collaboration with [CEESP](#) is supporting the development of an indigenous-led and self-determined strategy to provide collective vision and direction on how to most effectively utilise the new category and in mobilising, engaging and coordinating action on conservation and natural resource management and indigenous rights at global, regional and national levels.

In Costa Rica IUCN IPO members are meeting to formally establish and begin the collaborative indigenous-led process to develop this strategy.

If there are any ongoing or planned mollusc conservation initiatives that directly engage with IPOs, SSC’s office would like further information so as to facilitate better engagement with IPOs on a range of projects. For any such initiatives please provide:

- Project name, if applicable
- Main potential/ongoing points of engagement with IPOs
- Other partners, if applicable
- Timeframe

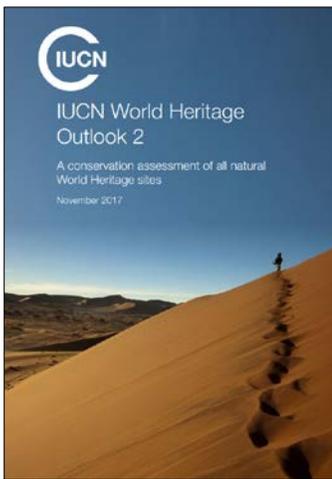
Please send any relevant information to Kaia Boe ([kaia.boe@iucn.org](mailto:kaia.boe@iucn.org))

## IUCN publications 2017-2018

### IUCN World Heritage Outlook 2

Osipova, E., Shadie, P., Zwahlen, C., Osti, M., Shi, Y., Kormos, C., Bertzky, B., Murai, M., Van Merm, R. & Badman, T. 2017. *IUCN World Heritage Outlook 2. A Conservation Assessment of all Natural World Heritage Sites*. IUCN, Gland. 92 p. ([pdf](#))

The *IUCN World Heritage Outlook 2* was published in November 2017. Natural World Heritage sites are internationally recognised as having the highest global nature conservation priority. As of November 2017, there are 241 natural and mixed (both cultural and natural) World Heritage sites, representing about 0.1 % of the total number of protected areas globally, yet with a total coverage of 294 million hectares, accounting for 8 % of the combined surface

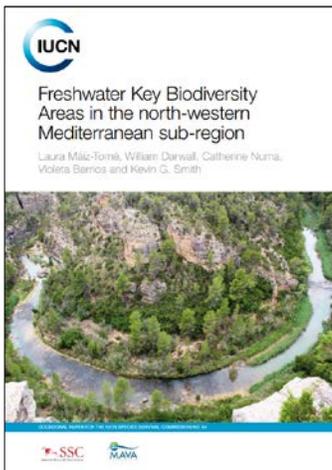


of terrestrial and 6 % of marine protected areas. Monitoring World Heritage sites is an extremely important barometer of the effectiveness of the global community's overall conservation effort. The IUCN World Heritage Outlook system is both forward-looking and proactive. It helps determine where natural World Heritage sites and the critical values they protect are heading, how we

can anticipate their future needs and how we can optimise their contribution to human well-being. It also seeks to celebrate and amplify success, supporting the role of World Heritage sites in demonstrating excellence.

### Freshwater key biodiversity areas in the north-western Mediterranean

Máiz-Tomé, L., Darwall, W., Numa, C., Barrios, V. & Smith, K.G. 2017. *Freshwater Key Biodiversity Areas in the North-western Mediterranean Sub-region*. IUCN, Gland, Cambridge and Malaga. viii + 48 p. ([pdf](#))



Freshwater biodiversity in the Mediterranean Basin Hotspot is remarkably diverse and highly threatened, as confirmed by the IUCN Mediterranean Biodiversity Red List assessments. The process to identify and delineate freshwater Key Biodiversity Areas (KBA) in the north-western Mediterranean, including Portugal, Spain, France, Italy and Malta, has recently been completed with the aim to provide

critical data for priority conservation actions on the ground and better catchment management.

This publication is based on the IUCN Red List data on the conservation status and distribution of freshwater species of fish, molluscs, odonates and plants. Regional experts confirmed 218 KBAs, covering an area of 100,021 km<sup>2</sup> (13 % of the study area). Of these KBAs, 11 also qualify as Alliance for Zero Extinction sites (AZE). AZE sites are places where species evaluated as Endangered or Critically Endangered are restricted to single remaining sites. These results highlight the urgency of developing and implementing effective conservation actions for freshwater biodiversity and better water management.

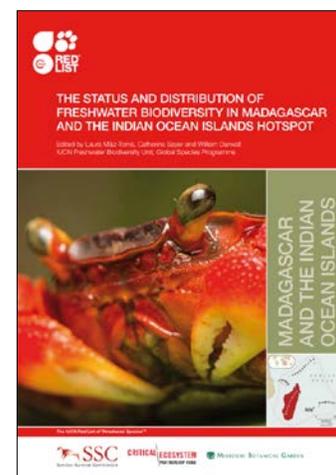
Data gathered by the regional experts, including six mollusc specialists, show that threats to freshwater species primarily

include alterations in hydrology (dams and water abstraction for irrigation and human consumption), competition and predation by invasive alien species, and domestic and agricultural water pollution. These types of threat tend to spread rapidly throughout catchments because of the high levels of hydrological connectivity. For this reason, William Darwall, Head of the IUCN Freshwater Biodiversity Unit, Cambridge, states that "Management of KBAs at the catchment scale is needed to ensure effective species protection from both upstream and downstream threats often originating from some distance outside of KBAs, and to maintain the quality, quantity and timing of water flows required to sustain freshwater ecosystems. Countries in the north western Mediterranean sub-region are recommended to implement an Integrated River Basin Management approach (IRBM or similar) to better coordinate conservation and management actions across sectorial policies such as water, energy and agriculture".

As part of the process, 128 potential Site Champions have been identified as individuals/organisations best placed to raise awareness of the KBAs and the issues faced with regard to biodiversity threat, and to help to implement the required actions to safeguard these globally important sites.

### The status and distribution of freshwater biodiversity in Madagascar and the Indian Ocean islands hotspot

Máiz-Tomé, L., Sayer, C. & Darwall, W. (eds) 2018. *The Status and Distribution of Freshwater Biodiversity in Madagascar and the Indian Ocean Islands Hotspot*. IUCN, Gland. viii + 128 p. ([pdf](#))



The inland waters of Madagascar and the Indian Ocean islands hotspot support a high diversity of aquatic species with high levels of endemism. The information presented in this report will help support implementation of multilateral environmental agreements in Madagascar, such as the Ramsar Convention and the Convention on Biological Diversity, guiding conservation planning and

priority setting at the national level. In addition, this new information will help efforts to achieve targets of the UN Sustainable Development Goals.

Chapter 4 covers the conservation status and distribution of freshwater molluscs (pages 29 to 41), reporting on 66 species from Madagascar.

### Project opportunities with IUCN

#### Improving the performance of the Natura 2000 network

There is a grant programme available for testing the performance of the Natura 2000 network through the 'Green List for N2K' project.

The [IUCN Green List Sustainability Standard](#) is a new global standard for protected and conserved areas, which aims to improve the contribution that equitably governed and effectively managed protected areas make to sustainable development through the conservation of nature, but also through the provision of associated ecosystem services and social, economic, cultural and spiritual values. IUCN is currently carrying out an EU-funded LIFE Preparatory Project – ‘[Improving the performance of the Natura 2000 network through a Green Listing approach](#)’ (LIFE16 PRE BE 001) – to promote effective management and provide a benchmark of excellence.

As part of this project, IUCN is issuing an [Open Call for the testing and application of the IUCN Green List Sustainability Standard in Natura 2000 sites](#), inviting site managers to apply for the testing phase of the project. Selection of Natura 2000 sites for inclusion will be based on a number of criteria, such as management type, land ownership, geographical scope, size, boundaries and participation in existing schemes. Successful candidates will be asked to provide information about their site against a set of criteria and indicators. Site managers will also provide feedback on the general process, evaluate how effectively their site is being managed and whether successful conservation outcomes are being achieved. Please note that this testing phase is applicable to terrestrial Natura 2000 sites only, and that participation in the testing phase of this project does not guarantee the Natura 2000 site will be awarded Green List status.

There are many Natura 2000 sites throughout Europe where there are threatened species of molluscs, hence this provides an opportunity for mollusc specialists to work with management agencies and NGOs to test the IUCN Green List Sustainability Standard.

The testing phase of the project is expected to start in June 2018 and will run for at least one year, ending in May/June 2019. Selected site managers will be expected to allocate some time to gathering the necessary information and provide their feedback to IUCN during this period.

Deadline for applications: 13 April 2018

Who should apply: Natura 2000 sites managers or management agencies

For more information please contact the project manager Ana Nieto ([ana.nieto@iucn.org](mailto:ana.nieto@iucn.org)).

### Update on mollusc Red Listing

At the last update in December 2017 (2017.3) there are over 8,400 global assessments of mollusc species, with over 1,300 draft assessments in the system that are in the process of being Red Listed, including 750 new assessments for Australia. In addition, there are published regional assessments for Europe that have yet to be made into global assessments, and these are not included in the 8,400 species, so molluscs now constitute over 10 % of the published species on the global Red List. Although we still have a way to go in fully documenting the extinct species, we have made significant progress in the last five years in documenting threatened species, including CR

(PEX) species. For the major projects, the proportion of Threatened species is 22-29 % and that of Data Deficient species is 28 % to over 60 % (the latter number is for Cephalopoda).

### Update on the European Red List project

Almost all of the 1,200 additional species have now been assessed and published on the Red List. There is a series of scientific papers now in preparation using the complete dataset and these provide an overview of the threats facing the non-marine mollusc faunas of Europe.

We about about to start phase 3 which will run to 2020 and will include a lot of tidying up all the loose ends that have appeared in the ten years this project has been running. We will also seek out missing species and review Data Deficient species to see if we can move them into a different category. Hence all new survey work and taxonomic work you are currently doing will contribute to phase 3. We will also look to see whether we can learn any conservation lessons, prepare conservation action plans and consider whether we can streamline national to regional to global Red List assessments. As such, if you are currently writing a new species description, especially in Europe, please consider writing a paragraph that includes:

- recommendations on conservation issues facing the species
- current threats to the species or its habitats
- any consequences for taxonomic changes to other species (e.g. a split into two or more distinct species)
- a map of the range of the species

This will facilitate the ability to add the newly described species to the European Red List and the global Red List. Additional assessments should be sent to Eike Neubert ([eike.neubert@nmbe.ch](mailto:eike.neubert@nmbe.ch))

### Update on the global freshwater mollusc assessment

There now are over 3,400 freshwater species listed in the system. The main new additions to this global project came from the project that has just been published on Madagascar (see [p. 27](#) of this issue of *Tentacle*). The freshwater molluscs of Lake Victoria were first assessed in 1996 by David Brown, more fully documented in 2006, and in the last two years a new reassessment has been undertaken including a climate change vulnerability analysis. For 2017-2019 there are two new projects underway, the regions of Wallacea and Lake Malawi, led by Thomas von Rintelen and Christian Albrecht. The Red List of Freshwater Bivalves of Malaysia is about to be published and then these assessments will be finalised and published on the IUCN Red List.

### Grant and other opportunities

#### AZA Conservation Grants Fund

The Association of Zoos & Aquariums (AZA) [Conservation Grants Fund](#) awards grants for animal health, animal welfare, conservation education, field conservation and/or reintroduction, management and/or breeding, and research.

The principal investigator in a grants application must be an AZA member. Many grants are awarded to collaborations among AZA-accredited institutions, government wildlife agencies, academia and conservation NGOs. The average project award is about US\$18,000 for one year projects. The application deadline is 15 March 2018.

### National Geographic Grants

The National Geographic Society has agreed to fund projects identified by the SSC that lead to conservation action. Applications must specifically address priorities published in SSC Species Action Plans. Funds are not restricted by taxon or region. Any questions can be directed to the SSC and more information is available on the [NGS website](#). The deadline is 4 April 2018.

### Mohamed bin Zayed Species Conservation Fund

Applications are invited for the [Mohamed bin Zayed Species Conservation Fund](#) that has been established to provide targeted grants to individual species conservation initiatives, recognise leaders in the field and elevate the importance of species in the broader conservation debate. Next deadline is 30 June 2018.

### The Christensen Fund

The [Christensen Fund](#) makes grants to indigenous-led and community-based organisations for projects that combine biodiversity with cultural diversity. Pre-proposals are accepted for consideration in the following programs: African Rift Valley, Central Asia, Northwest Mexico, Global, and San Francisco Bay Area. Most grants are in the range of US\$50,000 to US\$100,000 for one or two years. The application period for pre-proposals is 1 August through 31 August 2018.

### IUCN in the Netherlands Land Acquisition

The IUCN in the Netherlands ([IUCN NL](#)) provides grants up to €5,000 for the purchase and protection of threatened wildlife habitats and vulnerable ecosystems in Asia-Pacific countries, Africa and Latin America. The grants are to qualified and experienced local conservation organisations. The deadline for applications is 1 May 2018.

### Critical Ecosystem Partnership Funds

There are [CEPF grant opportunities](#) for different hotspots each year. Recent calls were for Eastern Arc Mountains, Tropical Andes, Wallace and the Mediterranean Basin. There is guidance documentation for each hotspot indicating priorities for each call, and these vary, as do the types of organisations funded.

### PhD studentships for new Horizon 2020 Project

Fifteen new [PhD studentships](#) have been announced as part of the Inspire4Nature – Horizon 2020 project. The funded projects range from “Tracking changes in protection of Greek Key Biodiversity Areas” to “Global scenarios of terrestrial vertebrate diversity”. The application deadline is 16 April 2018.

## MEETINGS 2018-2019

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

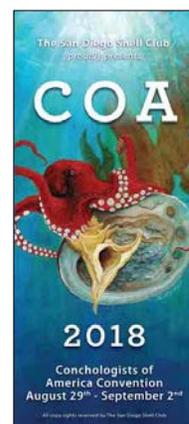
### American Malacological Society and Western Society of Malacologists 2018 joint meeting



Malacologists, students, citizen-scientists, conservationists and resource managers, and mollusc enthusiasts from across the United States and international locales will meet in Honolulu, Hawaii for the 84th Annual American Malacological Society (AMS) and the 51st Annual Western Society of Malacologists (WSM) meetings. The current presidents of these two historical malacological societies have joined forces to co-host the AMS-WSM meeting, which will take place against the backdrop of beautiful beaches, lush forests, and a rich natural history setting. Steeped in the deep cultural tradition of the Hawaiian people, we will gather on the island of Oahu to “talk story” about all things malacological, framed within the theme for this year’s meeting “Building Capacity and Developing Solutions for the Future”. The venue for this year’s meeting will be the beautiful Hilton Waikiki Beach Hotel, bookended with the reception at the Waikiki Aquarium, and closing banquet at the Bishop Museum.

For more information, please visit the conference [website](#) or send e-mail to: [ams.wsm2018@gmail.com](mailto:ams.wsm2018@gmail.com).

### Conchologists of America 2018 convention



The 2018 COA convention will take place in San Diego, California, hosted by the San Diego Shell Club, 30 August – 3 September at the Sheraton San Diego Hotel & Marina, 1380 Harbor Island Drive, San Diego, California 92101. Registration: contact Nancy Hale, email: [tomnan12@att.net](mailto:tomnan12@att.net). Additional information can be found at the [COA conventions website](#).

## World Congress of Malacology 2019 American Malacological Society annual meeting 2019



The [Unitas Malacologica](#) WCM 2019 will be held in conjunction with the [American Malacological Society](#)'s annual meeting at the Asilomar Conference Grounds, Pacific Grove, California, USA, 11-16 August 2019.

## Brasilian Society of Malacology 2019 meeting



The Brazilian Society of Malacology (SBMa – Sociedade Brasileira de Malacologia) will hold its XXVI Brazilian Malacological Meeting (XXVI EBRAM) in the city of Juiz de Fora, state of Minas Gerais, southeastern Brasil in 2019. The congress will be hosted by the Universidade Federal de Juiz de Fora (UFJF). It will be a great opportunity for all 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 probably begin in January 2019.

In parallel with the activities of the congress we will be celebrating 50 years since creation of the Brazilian Society of Malacology. It will be a memorable congress! More information will be available on [www.sbm malacologia.com.br](http://www.sbm malacologia.com.br) as soon as possible.

Profa. Dra. Sonia Barbosa dos Santos – President of the Brazilian Society of Malacology  
Profa. Dra. Sthefane D'ávila – Head of the XXVI EBRAM

## International Congress for Conservation Biology 2019



Preliminary details of the [Society for Conservation Biology](#) (SCB) 29th International Congress for Conservation Biology (ICCB 2019) are as follows:

Location: Kuala Lumpur, Malaysia

Date: 22-26 July 2019

Follow #ICCB2019 on [Facebook](#)

## INTERNET RESOURCES

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

### Red List

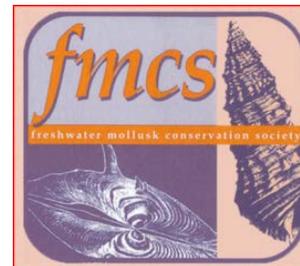
The entire *IUCN Red List of Threatened Animals* can be searched at any of the following addresses, which all take you to the same website:

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

### 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* in the past 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*.

### 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 [Freshwater Mollusk Biology and Conservation](#) 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*.

### Mollusca list

The MOLLUSCA listserver is intended as an informal forum for discussions of molluscan biology. 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 [molluscalist@lists.berkeley.edu](mailto:molluscalist@lists.berkeley.edu) with the word Subscribe in the subject line. 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. To post to the list, send email to [molluscalist@lists.berkeley.edu](mailto:molluscalist@lists.berkeley.edu). 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](mailto: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. The society publishes the journal [Molluscan Research](#).

### Brasilian Society of Malacology



The [Soceidade Brasileira de Malacologia](#) (SBMa) welcomes malacological researchers, professionals and students, Brazilian and foreign, as well as aficionados of molluscs, having as its main objective

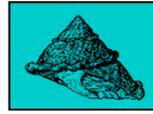
to encourage the study of malacology, promoting knowledge of molluscs and its dissemination at all cultural levels, and taking reasonable measures to preserve the Brazilian mollusc fauna.

### American Malacological Society



The homepage of the [American Malacological Society](#) carries a link to its [conservation policy](#) and to the [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.

### 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.

### IUCN Invasive Species Specialist Group

The [ISSG website](#) includes details of the Aliens-L listserver and the ISSG newsletter, [Aliens](#).

### 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.

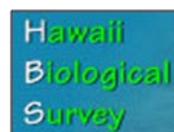
### The National Museum of Wales – Mollusca

The [Mollusca page](#) of the National Museum of Wales provides information on the global projects on molluscs underway based in Cardiff. The museum's [Mollusca collection database](#) is searchable.

### 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.

### 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](#). In 2017 an illustrated guide to the Samoan Islands land snail fauna was published (see [p. 23](#) of this issue of [Tentacle](#)).

### **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, Dinarzade 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.

### **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.

### **Field Museum land snails**

The on-line database 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.

### **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.

### **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, but a number of molluscs are listed in the [Appendices](#).

### **Other useful links**

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

## TENTACLE – PUBLICATION GUIDELINES AND INFORMATION

**Disclaimer:** *Tentacle* is not issued for purposes of zoological nomenclature. All or any names or nomenclatural acts in it are disclaimed for nomenclatural purposes. See the *International Code of Zoological Nomenclature*, Fourth Edition, Article 8.

*Tentacle* is a web-based newsletter, accessed at [www.hawaii.edu/cowielab/Tentacle.htm](http://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 the following guidelines. Carefully following the guidelines will make the lives of the editor(s) a lot easier!

Your submission **must** be explicitly relevant to **mollusc conservation**.

I usually make only editorial changes to submitted articles and in the past have accepted 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, fully 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. Please do not see *Tentacle* 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. Conformance to the guidelines has improved – perhaps because of my many many reminders! But it still takes many many hours to format your submissions – please do it for me! Especially, please pay very careful attention to the format of references in the reference lists, especially punctuation – 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 – please follow them very carefully:

- Cowie, R.H., Régnier, C., Fontaine, B. & Bouchet, P. 2017. Measuring the sixth extinction: what do mollusks tell us? *The Nautilus* 131(1): 3-41.
- Cowie, R.H., Evenhuis, N.L. & Christensen, C.C. 1995. *Catalog of the Native Land and Freshwater Molluscs of the Hawaiian Islands*. Backhuys Publishers, Leiden. vi + 248 pp.
- Cowie, R.H. 2011. Snails and slugs. In: *Encyclopedia of Invasive Introduced Species* (ed. Simberloff, D. & Rejmánek, M.), p. 634-643. University of California Press, Berkeley.

Also note that **illustrations and tables must fit in a single column**, so make sure your maps, diagrams and tables 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](http://www.mollusc.org/), 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 listserv (for details, see [p. 31](#) 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).

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

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