

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

TENTACLE



UNITAS MALACOLOGICA



EDITORIAL

I have edited *Tentacle* since issue 5 of May 1995. That's 17 issues and almost 18 years. Issues 1 and 2 were prepared on a typewriter and copied somehow (I don't know how). I am not sure how issue 3 was created, but issues 4-5 were published with assistance from the Shell oil company. This became quite complicated, and I was somewhat ambivalent about it anyway, given the environmental reputation of many oil companies. Because of the problems with Shell, which happened just at the time when it became possible to produce quite good looking documents using word processing software, every issue from issue 7 onwards, including this one, has been produced entirely using word processing software. As the software has become more sophisticated and my ability to use it to its full potential has increased, *Tentacle* has become a much more attractive, and bigger, newsletter. The structure has been re-organized from time to time to give prominence to the more important and interesting issues. And colour was introduced in issue 14 in 2006 because the constraints of photocopying in black and white and mailing hard copies were no longer limiting. Additional format changes have been made since then to make *Tentacle* more attractive visually. In addition, distribution of *Tentacle* has changed. Originally it was sent by snail mail to a small group of people, the members of the Mollusc Specialist Group. The mailing list rapidly increased, but by 2000 was still fewer than 200 people. Since at least 2002, the costs of mailing were supported by Unitas Malacologica, and that is why the UM logo has appeared on all issues of *Tentacle* since then and why all readers of *Tentacle* are encouraged to join UM. Of course, it was sent to all members of UM also by this time. Gradually, it has changed into an on line only publication, as a pdf, with all issues available on [my lab website](#) and announced via my personal list of *Tentacle* contacts, the UM list of members and the Mollusca listserver, thereby reaching probably around 1000 people directly.

I have done my best for *Tentacle* over almost two decades, but I think the time may have come for me to pass the baton. I have enjoyed editing *Tentacle* and electronically meeting so many wonderful people who are committed to mollusc conservation. I think *Tentacle* is a marvellous publication.

In this issue: click on page

News: New Pacific island species added to Red List	3
Land snail conservation in eastern Cuba	4
<i>Cerion</i> at Guantánamo, Cuba	5
Land snails will decline in Pennsylvania	7
<i>Cochlodinella</i> in eastern Cuba	8
Education about native vs alien snails in Brasil	9
Ampullariids from the Río de la Plata, Argentina	11
Mark-recapture to study molluscs in Brasil	13
Finding enids in Nepal	16
Land and freshwater molluscs in Sri Lanka	17
Freshwater bivalves in northern Vietnam	19
Status of critically endangered land snails in Madeira	20
Importance of collections for bivalve study in Argentina	21
Extraordinary springsnail radiation in Oregon, USA	23
Mollusc conservation status assessed in Canada	26
Terrestrial snails in Israel as geological indicators	27
Urban heat islands favour aliens	29
Snails and slugs listing rejected, USA	30
Karst snail conservation	31
Conservation of charismatic species threatens unknowns	32
Endemic species on the brink of extinction in Romania	34
Impacts of invasive freshwater snails in Israel	37
Snails of Trindade Island, Brasil	38
Current conservation status of molluscs in Brasil	40
Threats to land snails in Brasil	42
Monsoon forest refuge of Chinese <i>Amphidromus</i>	43
Mollusc conservation in the upper Uruguay river basin	44
Pacific island land snails: Hawaiian land snail project	46
Malacological tours in Spain	48
Recent publications relevant to mollusc conservation	48
IUCN and Mollusc Specialist Group news	51
Meetings 2013-2014	53
Internet resources	54
Members of the Mollusc Specialist Group	56

- Paraná. In: *Anais do XXIX Congresso Brasileiro de Zoologia*, p. 621.
- Pecora, I.L., Miranda, M.S. & Fontenelle, J.H. 2011. Ocorrência de *Megalobulimus paranaguensis* (Pilsbry & Ihering, 1900) na Ilha Porchat, São Vicente, SP. In: *Anais do XXII Encontro Brasileiro de Malacologia*, p. 254.
- Pecora, I.L. & Silva, G.D.F. 2011. Salvando e aprendendo com o *Megalobulimus*. In: *Anais do 6º Congresso de Extensão Universitária da UNESP*.
- Raut, S.K. & Barker, G.M. 2002. *Achatina fulica* Bowdich and other Achatinidae as pests in tropical agriculture. In: *Molluscs as Crop Pests* (ed. Barker, G.M.), p. 55-114. CABI Publishing, Wallingford.
- Silva, P.S.C., Oliveira, J.L. & Santos, S.B. 2008. O caramujo Africano *Achatina fulica* Bowdich, 1822 como indutor de ações educativas sobre espécies exóticas em escolas de ensino fundamental. *Anais da XIII Semana de Educação da UERJ*, p. 1-8.
- Silva, A., Martins, D.S.G. & Alves, M.A.O. 2009. A identificação de *Achatina fulica*, visando à diferenciação com as espécies nativas. In: *Anais do XXI Encontro Brasileiro de Malacologia*, p. 441.
- Teles, H.M.S., Vaz, J.F., Fontes, L.R. & Domingos, M.F. 1997. Registro de *Achatina fulica* Bowdich, 1822 (Mollusca, Gastropoda) no Brasil: caramujo hospedeiro intermediário de Angiostrongilíase. *Revista de Saúde Pública* 31(3): 310-312.
- Zenni, R.D. & Ziller, S.R. 2010. Invasões biológicas: problemas econômicos e ambientais com ênfase em *Achatina fulica*. In: *O Caramujo Gigante Africano Achatina fulica no Brasil* (ed. Fischer, M.L. & Costa, L.C.M.), p. 175-188. Champagnat, Curitiba.

Carlos João Birckolz & Marcos de Vasconcellos Gernet,
Universidade Federal do Paraná, Setor Litoral, Matinhos, Paraná,
Brazil. carlosbirc@gmail.com, lmv.gernet@gmail.com

INSIGHTS INTO THE NATURAL HISTORY OF AMPULLARIIDS FROM THE LOWER RÍO DE LA PLATA BASIN, ARGENTINA

By Pablo R. Martín, Silvana Burela & María José Tiecher

Apple snails (Ampullariidae) are renowned globally as successful invaders, as voracious pests of aquatic crops and as promoters of ecosystem changes in natural wetlands. However, a recent review highlighted that only 14 species of apple snails have been translocated beyond their native areas and less than half of them have caused ecological or economical impacts (Horgan *et al.*, 2012). Most of their reputation is attributable to a few New World species of the genus *Pomacea* (in particular *P. canaliculata*) and to the ramshorn apple snail, *Marisa cornuarietis*. This prompted the IUCN Invasive Species Specialist Group to include *Pomacea canaliculata* in the list of 100 of the World's Worst Invasive Alien Species (Lowe *et al.*, 2000), although at least one other species of the genus, *Pomacea maculata* (see Hayes *et al.*, 2012), could probably be included in the list.

The apple snails that have received most attention from the scientific community and the public during the last few decades are mainly the invasive ones such as *M. cornuarietis*, *P. canaliculata* and *P. maculata*. The Florida apple snail, *Pomacea paludosa*, a non-invasive species with a limited Caribbean distribution, is a remarkable exception although in

this case most of the interest comes from it being the staple food of the specialized apple snail predator, the snail kite *Rostrhamus sociabilis*, an endangered raptor in Florida. Other *Pomacea* species such as *P. patula* and *P. urceus* have also raised some conservation concern because they are overexploited for human consumption in Central and South America (Ramnarine, 2003; Espinosa-Chávez, *et al.*, 2005).

The aforementioned apple snail species are just the emerging tip of the apple snail diversity 'iceberg' the underwater part of which is the large number of species still living beyond the reach of scientific inquiry in tropical and subtropical areas around the world. Many of them inhabit inland waters of the Neotropics (Central and South America), where four genera are recognised (*Pomella* has recently been synonymised with *Pomacea*; Hayes *et al.*, 2012) and dozens of species have been described (Cowie & Thiengo, 2003), although only a few of them have received more than a name, a brief description of the shell and an imprecise type locality.

The Lower Río de la Plata basin hosts representatives of all the genera of Neotropical apple snails, including some endemic genera and species (Rumi *et al.*, 2004; Gutiérrez Gregoric *et al.*, 2006), but it is also the source of the three *Pomacea* species introduced into Asia, North America, Pacific islands and, recently, Europe (Hayes *et al.*, 2008; López *et al.*, 2010). The fame of their invasive relatives probably leads to the conservation of these non-invasive apple snails being of least concern but in fact little is known about their natural history, distribution, demography and conservation status. The large number of genera and species in the area almost certainly reflects a high diversity of life history strategies and degrees of habitat specialization. Probably many of these species are not as flexible and adaptable as the invasive representatives.

The apple snails inhabiting the Río de la Plata basin, the main hydrographic drainage in southern South America, face the impacts of habitat modifications resulting from the construction and operation of several very large dams as well as the impacts of invasive species (Scarabino, 2004; Gutiérrez Gregoric *et al.*, 2006). Beyond changing the nature of the habitat from lotic to lentic over large distances, these dams have disrupted the naturally variable hydrological regime of these rivers and hence affected the cycle of high and low waters in their flood plains. Deforestation, reforestation and land use intensification may provoke changes in detrital inputs, water quality and aquatic communities. Furthermore, the Paraná river has become a major 'hydroway' and is one of the main routes for transporting cargo among the various countries of the region (Argentina, Brasil, Paraguay and Uruguay). The Uruguay river, which supports the highest diversity of apple snail genera in the world, serves as the border between Argentina, Uruguay and Brasil and has been the focus of recent environmental concerns related to the installation of paper mill industries.

Only five out of twelve species of apple snails inhabiting Argentinean waterbodies have been included in the IUCN Red list of Threatened Species (IUCN, 2012), and none of them was considered as endangered. *Pomacea canaliculata* was

categorized as of Least Concern because of its wide distribution and positive population trend. *Pomacea megastoma*, *Felipponea neritiformis* and *Asolene pulchella* were also considered as of Least Concern because of their wide distributions, although their population trends were unknown. *Felipponea iheringi* was categorized as Data Deficient because of the lack of reliable information on its distribution. The status of the only species of *Marisa*, *M. planogyra*, which is restricted to the middle Paraná river (Castellanos *et al.*, 1976), has not been evaluated.

Some of these species were considered as widely distributed and hence of Least Concern because of their presence in three countries (Argentina, Brasil and Uruguay), although in fact they inhabit only a single drainage basin or part of it (i.e. the Uruguay or Paraná river basin). However, Rumi *et al.* (2006) considered that *Asolene platae*, *Felipponea elongata* and *F. iheringi* were endangered on the basis of their 'continuous restricted distribution'. Some species, such as *P. megastoma* and *Felipponea neritiformis*, apparently restricted to places with bedrock and running water, seem to be especially prone to reductions in habitat extent by the impoundment of sections of the rivers. Moreover, *P. megastoma* seems to be mostly restricted to the left bank of the Uruguay river and Río de la Plata because of this habitat requirement (Hylton Scott, 1943; Clavijo *et al.*, 2008). The fouling of apple snail shells and hard substrates by the invasive golden mussel, *Limnoperna fortunei*, has raised some concern especially regarding these apples snails associated with rocky bottoms (Scarabino, 2004; Clavijo *et al.*, 2008).

During the last decade there have been important advances in knowledge of the distribution of Argentinean apple snails (Rumi *et al.*, 2006). However, there were almost no studies concerning the natural history of apple snails other than *Pomacea* spp. (but see Martín, 2002). Even information about the basic aspects of the anatomy and biology of very conspicuous species such as *P. megastoma* has emerged only in the last few years. For instance, the left nuchal lobe of *P. megastoma*, used for aerial respiration in apple snails, was described as rudimentary and almost absent (Hylton Scott, 1943) but our observations showed that it can be used as a snorkel to reach the surface in the same way as in *Pomacea*. Only recently the egg masses of this species have been reported (Hayes *et al.*, 2009) and they are aerial and calcareous, as in *Pomacea*, and not gelatinous and subaquatic like those of the genus *Asolene* in which it was placed until recently (Hylton Scott, 1943; Castellanos *et al.*, 1976).

Presently there are two ongoing projects funded by the Universidad Nacional del Sur (UNS, PGI24/B185) and the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET, PIP11220090100473) on the biology and ecology of Argentinean apple snails. Our aims in the short term are to study the natural history of at least one of the non-invasive species of each genus of apple snails with the goal of achieving a better comprehension of the evolution of their behavioral and physiological adaptations.

The apple snails are collected with the required legal permissions, and then taken to the laboratory to establish



Fig. 1. Left: *Asolene pulchella* ovipositing in the lab. Right: *Asolene pulchella* crawling in the lab. (Photos: María José Tiecher)

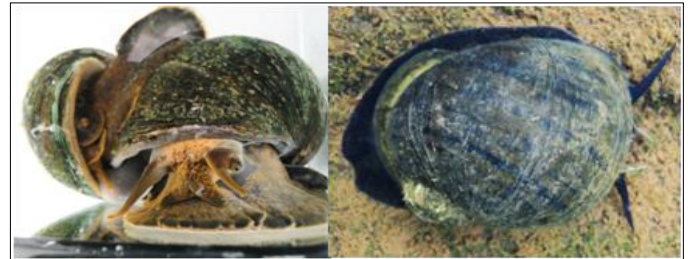


Fig. 2. Left: *Pomacea megastoma* pair in copulation in the lab. *Pomacea americanista* crawling in Bonito stream (Misiones province, Argentina). (Photos: Silvana Burela)



Fig. 3. Left: *Felipponea iheringi*, shell collected in Bonito stream, Acaraguá Basin (Misiones province, Argentina). Right: Bonito stream, a site of collection of *Felipponea iheringi* and *Pomacea americanista*. (Photos: Silvana Burela)

populations that are maintained under controlled water temperature, light and food. All possible aspects of the life history of the snails are studied, including life span, egg-laying behaviour, fecundity, thermal limits and other habitat requirements. Our experience indicates that *P. canaliculata*, *P. maculata* and *Asolene pulchella* (Fig. 1) readily grow and reproduce under laboratory conditions, but some species of *Pomacea* (*P. megastoma* and *P. americanista*; Fig. 2) and *Felipponea* (Fig. 3) at first proved to be difficult to maintain in laboratory cultures even under carefully controlled conditions. Most species do not thrive in tap water, unlike *P. canaliculata*. *Asolene pulchella* preys readily on its own egg masses and hence requires special care; in individual aquaria females frequently deposits an egg mass and eat it in the course of a single night, even with lettuce provided *ad libitum*. Some species are slow growing and long lived, apparently maturing in their second year of life at 25 °C, which makes demographic studies difficult.

It is common sense that we cannot conserve what we do not know. We hope that the information that we are gathering in our projects will help to categorize the different species of apple snails from the Lower Río de la Plata Basin and hence to preserve as much as possible of the Neotropical ampullariid diversity.

- Castellanos, Z.J. & Fernández, D. 1976. Mollusca Gastropoda Ampullariidae. In: *Fauna de Agua Dulce de la República Argentina*. (ed. Ringuelet, R.A.), p. 1-33. FECIC, Buenos Aires.
- Clavijo, C., Carranza, A. & Scarabino, F. 2008. Distribution of *Pomella megastoma* (Sowerby, 1825) (Gastropoda: Ampullariidae). In: *VII Congreso Latinoamericano de Malacología. Universidad Austral de Chile, Valdivia, Chile*, p. 280.
- Cowie, R.H. & Thiengo, S.C. 2003. The apple snails of the Americas (Mollusca: Gastropoda: Ampullariidae: *Asolene*, *Felipponea*, *Marisa*, *Pomacea*, *Pomella*): a nomenclatural and type catalog. *Malacologia* 45: 41-100.
- Espinosa-Chávez, F. & Martínez-Jerónimo, F. 2005. Growth and fecundity of *Pomacea patula* (Caenogastropoda: Ampullariidae) when fed on gel diets of *Scenedesmus incrassatulus* (Chlorophyceae). *Veliger* 47: 213-217.
- Gutiérrez Gregoric, D.E., Núñez, V., Rumi, A. & Roche, M.A. 2006. Freshwater gastropods from del Plata Basin, Argentina. Checklist and new locality records. *Comunicaciones de la Sociedad Malacológica del Uruguay* 9: 51-60.
- Hayes, K.A., Cowie, R.H., Thiengo, S.C. & Strong, E.E. 2012. Comparing apples with apples: clarifying the identities of two highly invasive Neotropical Ampullariidae (Caenogastropoda). *Zoological Journal of the Linnean Society* 166: 723-753.
- Hayes, K.A., Joshi, R.C., Thiengo, S.C. & Cowie, R.H. 2008. Out of South America: multiple origins of non-native apple snails in Asia. *Diversity and Distributions* 14: 701-712.
- Hayes, K.A., Cowie, R.H., Jørgensen, A., Schultheiß, R., Albrecht, C. & Thiengo, S.C. 2009. Molluscan models in evolutionary biology: apple snails (Gastropoda: Ampullariidae) as a system for addressing fundamental questions. *American Malacological Bulletin* 27: 47-58.
- Horgan, F.G., Stuart, A.M. & Kudavidanage, E.P. 2012. Impact of invasive apple snails on the functioning and services of natural and managed wetlands. *Acta Oecologica* In press. DOI: 10.1016/j.actao.2012.10.002
- Hylton Scott, M.I. 1943. Sobre la organización de *Ampullaria* (*Asolene*) *megastoma* Sowerby. *Notas del Museo de La Plata* 8: 269-280.
- IUCN. 2012. *IUCN Red List of Threatened Species*. Version 2012.2. Accessed 6 December 2012.
- López, M.A., Altaba, C.R., Andree, K.B. & López, V. 2010. First invasion of the apple snail *Pomacea insularum* in Europe. *Tentacle* 18: 26-28.
- Lowe, S., Browne, M., Boudjelas, S. & De Poorter, M. 2000. *100 of the World's Worst Invasive Alien Species: a Selection from the Global Invasive Species Database*. Invasive Species Specialist Group Auckland, New Zealand. 12 p.
- Martín, S.M. 2002. Características de los desoves de *Pomacea scalaris* (d'Orbigny, 1835) y *Asolene platae* (Maton, 1809) Hylton Scott, 1957 (Mollusca, Gastropoda, Ampullariidae). *Comunicaciones de la Sociedad Malacológica del Uruguay* 8: 149-153.
- Rammarine, I.W. 2003. Induction of spawning and artificial incubation of eggs in the edible snail *Pomacea urceus* (Muller). *Aquaculture* 215:163-166.
- Rumi, A., Gutiérrez Gregoric, D.E., Núñez, V., César, I.I., Roche, M.A., Tassara, M.P., Martín, S.M. & Armengol, M.F.L. 2006. Freshwater Gastropoda from Argentina: species richness, distribution patterns, and an evaluation of endangered species. *Malacologia* 49: 189-208.
- Rumi, A., Gutiérrez Gregoric, D.E., Núñez, V., Tassara, M.P., Martín, S.M., Armengol, M.F.L. & Roche, A. 2004. Biodiversidad de moluscos de agua dulce de la Región Mesopotámica, Argentina. *Instituto Superior de Correlación Geológica, Miscelánea* 12: 211-216.
- Scarabino, F. 2004. Conservación de la malacofauna uruguaya. *Comunicaciones de la Sociedad Malacológica del Uruguay* 8: 267-273.
- Pablo R. Martín, Silvana Burela & María José Tiecher, Laboratorio de Ecología, Departamento de Biología, Bioquímica y Farmacia, Universidad Nacional del Sur, San Juan 670, (8000) Bahía Blanca, Argentina. pablorafaelmartin@gmail.com

MARK-RECAPTURE METHODOLOGY: A SIMPLE AND INEXPENSIVE TECHNIQUE FOR THE STUDY OF BIVALVES AND GASTROPODS IN BRASIL

By Vanessa Fontoura-da-Silva, Jéssica Beck Carneiro, Igor Christo Miyahira, Sonia Barbosa dos Santos & Carlos Henrique Soares Caetano

The mark-recapture technique typically involves repeated sampling of a target population, allowing recognition of uniquely marked individuals previously sampled and can be used to analyze the specific capture history and movements of each individual animal (Seber, 1992). It was first used in ecology in 1896 to analyze fish movements (Ricker, 1975).

The method is as follows. The first time that you capture an individual, you have to mark the animal with a tag (or something else). The second time that you sample this same population, some individuals (the marked ones) can be identified as recaptured. Mark-recapture models are widely used in ecology, providing information on individual mobile organisms (Krebs, 1999), and the method has proven to be a great tool for quantifying various demographic parameters such as survival rate, recruitment and migration (Schwars & Seber, 1999; Senar *et al.*, 2004; Amstrup *et al.*, 2005; Kurth *et al.*, 2007; Wilson *et al.*, 2011) as well as information on absolute abundance (Krebs, 1999). It is considered one of the most reliable methods for these analyses (Villella *et al.*, 2004), but to be accurate some restrictive assumptions must be made. The study should be well-designed so that it takes into account the importance of various factors that affect these parameters, including characteristics of individuals (e.g. sex), changes over time (e.g. seasonal effects) and impacts of management (e.g. predator control) (Lettink & Armstrong, 2003).

It is also important that the animals have the same probability of being caught and tags are not lost or become illegible. Recaptures must be recorded accurately, tagging and handling must not affect the survival or recapture of animals and tagged animals must be representative of the target population (Villella *et al.*, 2004).

Most studies of population biology using the direct method of marking and recapture have focused on vertebrates and have relatively rarely been performed on invertebrates (Strayer & Smith, 2003; Henry & Jarne, 2007). Henry & Jarne (2007) reviewed studies on gastropods and concluded that mark-recapture had been used 10 times more in terrestrial vertebrates than in gastropods. In freshwater mussels this