

## **Threatened freshwater and terrestrial molluscs (Mollusca, Gastropoda et Bivalvia) of Santa Catarina State, Southern Brazil: check list and evaluation of regional threats**

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**ABSTRACT** A total of nineteen continental native mollusc species are confirmed for the Santa Catarina State (SC) (organized in ten Genera and seven Families), one aquatic Prosobranchia/Caenogastropoda (Ampullariidae), six Pulmonata terrestrial gastropods (one Ellobiidae, three Megalobulimidae and two micro-snails – Charopidae and Streptaxidae) and twelve freshwater mussels (eight Mycetopodidae and four Hyriidae). These species are designated by the International Union for Conservation of the Nature – IUCN as follows: seven as "Vulnerable", six "In Danger" and six "Without Category Established". The general regional threats that these species are subjected to are briefly analyzed.

**KEY WORDS** Biodiversity, Continental mollusc fauna, Threatened species, Santa Catarina State, Southern Brazil region

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### **INTRODUCTION**

In spite of prodigious scientific and technological progress in recent years, in throughout Brazil and other Neotropical countries, significant difficulties in evaluating the threats impinging on continental-terrestrial and freshwater-molluscs species are constantly being faced by the scientific community, especially in the geo-political territory of Santa Catarina State (SC), the smallest space portion of the Southern Brazil mosaic (Agudo & Bleicker, 2006a; Agudo-Padrón, 2006; Agudo, 2007a; Agudo-Padrón, 2007a, 2008a, 2009a, b; Agudo-Padrón & Bleicker, 2009). This state of affairs is mainly due to the lack of solid population data and to the small amount of resident limnologists in this State.

Nowadays, the Santa Catarina State authorities govern in this territory nine State Ecological Units of Conservation - six belonging to the category "Park", where access to the public is permitted in most areas, and three belonging to the category "Reserve", where

access is quite restricted and permitted only to researchers; this besides four "National Ecological Parks" within the jurisdiction of the same State.

However, do such protected areas truly result in effective conservation of our known continental malacological species and of species which to date have yet to be described?

As previously noticed by local limnologists (Moraes, 2006), all of the Brazilian native mollusc species are in imminent threat of extinction, besides forms that are still awaiting discovery. Considering the rapid rate of anthropogenic environmental degradation, it can be hypothesized that a number of such species have gone extinct before they were at least recorded and described scientifically (Simone, 2006).

Besides the environmental degradation (through deforestation for agricultural ends and/or mining exploration, pollution of the river basins with discharges of organic and inorganic pollutants, indiscriminate application of agricultural poisons and chemical fertilizers,

proliferation of the construction of hydroelectric mills, invasions of natural spaces by town planning enterprises), the Brazilian terrestrial mollusc species face stiff competition by invading forms, that are also responsible for serious sanitary and agronomic problems, among others (Agudo, 2007b; Agudo & Bleicker 2006b; Agudo-Padrón 2006, 2007a, b, 2008b, c, d; Agudo-Padrón & Lenhard, 2010). Brought to Brazil willfully for a variety of purposes, or even accidentally, those exotic species are alien to the local ecosystem and for this reason they don't possess natural predators, resulting in an uncontrolled growth of the population, that, consequently, smothers and even obliterates native species through the usurpation of their niches (Simone, 2002).

That scenario is worsened by the absence of any awareness on the conservation status of these animals, which are generally not considered charismatic enough so as to warrant the declaration of protected natural areas - the molluscs have a very smaller appeal to the population than megafaunal species, in spite of being fundamental for the ecological balance of ecosystems (Moraes, 2006) (Figs 1-11).

During the course of this study, we also had the opportunity to document personally the change in fortunes of some iconic terrestrial mollusc species - for instance the native giant snail *Megalobulimus gummatus* (Hidalgo, 1870) (Fig. 2), found mainly in the valley of the Uruguay river basin. Abundant previously at the same location, today it results difficult to track down in the local environment, as a result of the increase in regional agricultural activities (application of pesticides, mainly); meanwhile invading exotic species, such as the slug *Pallifera* sp. (Fig. 1), proliferate and colonise new areas.

In other cases (very rare), native species resist and adapt to the anthropological conditions imposed in their natural environment when this is invaded becoming themselves, in turn, agricultural pests in small vegetable cultures. An example of this situation is presented by the case of the giant native snail *Megalobulimus oblongus* (Müller, 1774) (Fig. 3), in sandbanks of the "Enseada do Brito", Palhoça Municipal District of the Great Florianópolis, a traditional village of artisanal fishermen located in the proximities of the "Serra do Tabuleiro Ecological State Park" (Agudo-Padrón & Bleicker, 2009).

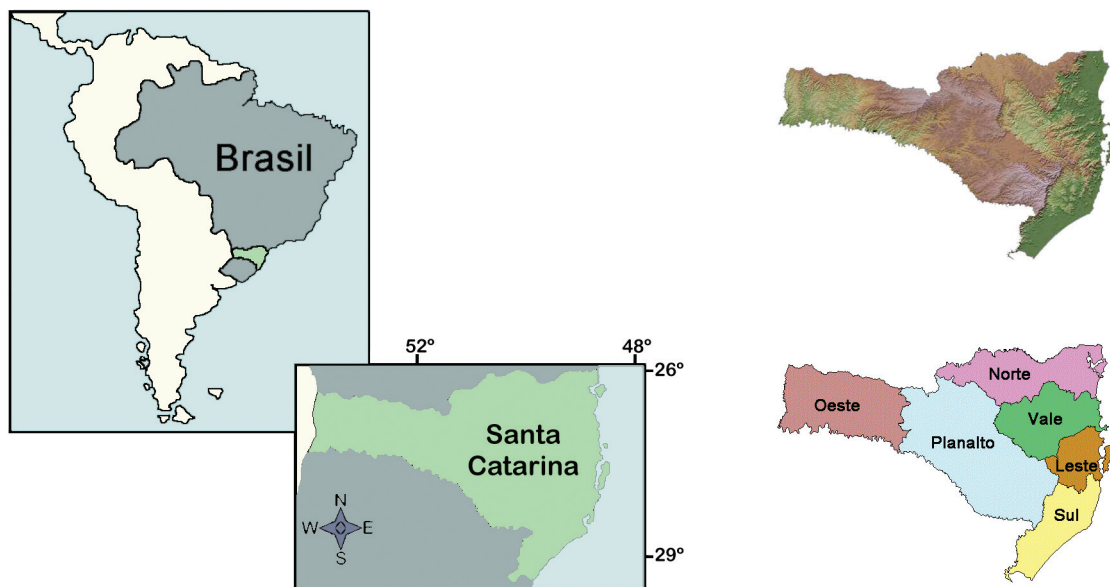


Table 1. Santa Catarina State, SC, central portion of the Southern Brazilian country (on the left), and regional geopolitical division showing physical, socioeconomic and environmental (phytogeographical) characteristics (on the right). Santa Catarina lies between latitudes 25° and 30° S and longitudes 48° and 54° W, extends 377 km from North to South and 547 km from East to West at its most distant points, and has an area of 95,985 km<sup>2</sup>, which includes 502 km<sup>2</sup> of rivers and lakes. The state constitutes only 1.13% of the total area of Brazil and is divided geographically into three large parts: the Atlantic Coastal Plains, with several rivers that discharge into the Atlantic Ocean, and two independent great river basin systems that irrigate the land in the central and western highlands, the Iguazu and the Uruguay.



Fig.1

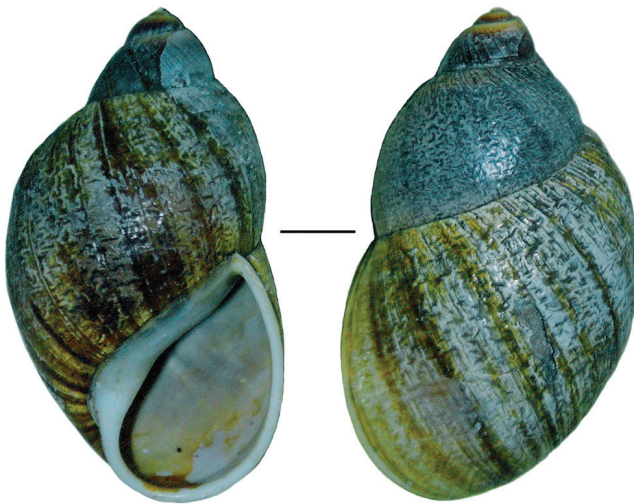


Fig.2

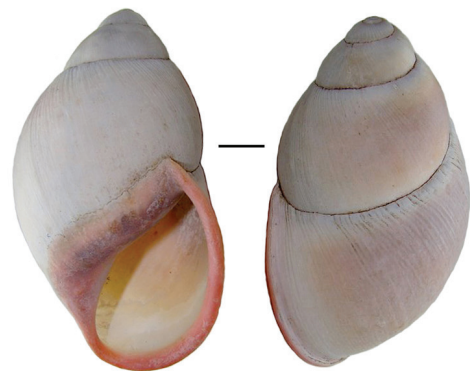


Fig.3



Fig.4



Fig.5

- Figure 1. Invasive exotic Asian slugs *Pallifera* sp.  
Figure 2. Native giant snail *Megalobulimus gummatus*, 108 mm.  
Figure 3. Native giant snail *Megalobulimus oblongus*, 70 mm (photos: P. Lenhard).  
Figure 4. Native giant snail *Megalobulimus grandis*, 130 mm (photo: G. Woehl Jr.).  
Figure 5. Native snails *Megalobulimus proclivis*, 86 mm.

Curious situation comes with the involvement of the giant freshwater native bivalve *Anodontites trapesialis* (Lamarck, 1819) in the Northern region of the State (Joinville Municipal District) and other Brazilian localities out of the State, whose parasitic larvae type “Lasidium” are undesirable and harmful pests in enterprises fish farmers (Agudo, 2005, 2008).

According to Mansur et al. (2003) and Mansur (2008), it just is not enough to place the native species in lists of those threatened by extinction: it is necessary to know our native fauna from the taxonomic, morphologic and ecological point of view so as to be able to propose handling and management strategies.

As previously noted, an inefficient administration and man’s growing need for water are bringing freshwater ecosystems to the collapse, making freshwater species the most threatened of the planet.

The molluscs that live in rivers and lakes are the most threatened of the Earth, due to the collapse of aquatic ecosystems mediated by the construction of dams and through the incessant siphoning off of water for agriculture and other purposes. The rates of extinction of species in freshwater environments are from four to six times higher than in marine or terrestrial habitats. Endemic species, such as the small aquatic snail *Potamolithus catharinae* Pilsbry, 1911, representative of the Family Hydrobiidae (Silva & Veitenheimer-Mendes, 2004), and the tiny freshwater limpets *Burnupia ingae* Lanzer, 1991 and *Ferrissia gentilis* Lanzer, 1991 (Family Ancyliidae), are particularly vulnerable to human alterations of their environment (Agudo-Padrón, 2011a, b).

The freshwater bivalve molluscs are particularly sensitive to trampling, to organic and chemical pollution, and other forms of degradation of the environment. They present relatively slow growth rates and they don’t usually occupy disturbed environments. Endemic species exist for each basin and many of these are very restricted spatially and present high rates of extinction due to the countless environmental alterations provoked recently by human settlement.

In the present work, the current regional knowledge situation of these mollusc species is revised, including IUCN general status and other information, to promote their effective conservation.

## RESULTS

### CURRENT SITUATION

Class GASTROPODA  
Subclass PROSOBRANCHIA/CAENOCASTROPODA  
Family AMPULLARIIDAE

*Pomacea sordida* Swainson, 1823  
Category IUCN: without category established

Included in the “Lista das Espécies da Fauna Ameaçadas de Extinção no Estado do Rio de Janeiro - RJ” (1997), regional category “in danger”.

Subclass PULMONATA  
Family ELLOBIIDAE

*Melampus coffeus* (Linnaeus, 1758)  
Category IUCN: without category established

Reported in the “Lista das Espécies da Fauna Ameaçadas de Extinção no Estado do Rio de Janeiro - RJ” (1997), regional category “Vulnerable”. Species considered a “marine form with wide ecological occurrence”.

Family MEGALOBULIMIDAE

*Megalobulimus grandis* (Martens, 1885) (Fig. 4)  
Category IUCN: in danger

*Megalobulimus proclivis* (Martens, 1888) (Fig. 5)  
Category IUCN: in danger

*Megalobulimus oblongus* (Müller, 1774)  
Category IUCN: without category established

Recently included in the “Lista de Espécies da Flora e da Fauna Ameaçadas no Estado do Pará - PA” (2007), regional category “in danger”.

Family CHAROPIDAE

*Rotadiscus schuppi* (Suter, 1900)  
Category IUCN: in danger  
Family STREPTAXIDAE



Fig.6



Fig.7



Fig.8



Fig.9



Fig.10



Fig.11

- Figure 6. Native freshwater mussels *Anodontites patagonicus*, 70 mm (photo P. Lenhard).  
Figure 7. Native freshwater mussel *Anodontites trapesialis*, 75 mm (photo P. Lenhard).  
Figure 8. Native freshwater mussel *Leila blainvilleana*, 120 mm (photo P. Lenhard).  
Figure 9. Native freshwater mussel *Mycetopoda legumen*, 85 mm (photo P. Lenhard).  
Figures 10-11. Regional variations of the native freshwater mussel *Rhipidodonta charruana*, 30-35 mm (photo P. Lenhard / A.I. Agudo-Padrón).

*Rectartemon depressus* (Heynemann, 1868)  
Category IUCN: without category established

Recently included in the “Livro Vermelho da Fauna Brasileira Ameaçada de Extinção” (2003-2004).  
Class BIVALVIA

Order UNIONOIDA

Family MYCETOPODIDAE

*Anodontites elongatus* (Swainson, 1823)  
Category IUCN: without category established

Recently included in the “Livro Vermelho da Fauna Brasileira Ameaçada de Extinção” (2003-2004).

*Anodontites ferrarisi* (d’Orbigny, 1835)  
Category IUCN: in danger

*Anodontites patagonicus* (Lamarck, 1819) (Fig. 6)  
Category IUCN: in danger

*Anodontites tenebricosus* (Lea, 1834)  
Category IUCN: vulnerable

*Anodontites trapesialis* (Lamarck, 1819) (Fig. 7)  
Category IUCN: vulnerable

*Leila blainvilleana* (Lea, 1835) (Fig. 8)  
Category IUCN: in danger

*Mycetopoda legumen* (Martens, 1888) (Fig. 9)  
Category IUCN: vulnerable

*Mycetopoda siliquosa* (Spix, 1827)  
Category IUCN: vulnerable

Family HYRIIDAE

*Diplodon expansus* (Küster, 1856)  
Category IUCN: vulnerable

*Diplodon multistriatus* (Lea, 1834)  
Category IUCN: vulnerable

*Diplodon rhuacoicus* (d’Orbigny, 1835)  
Category IUCN: without category established  
Recently included in the “Livro Vermelho da Fauna Brasileira Ameaçada de Extinção” (2003-2004).

*Rhipidodonta charruana* (d’Orbigny, 1835) (Fig. 10)  
Category IUCN: vulnerable

Reported in the Brazilian lists (MMA, 2004; Agudo-Padrón, 2009c) under the taxonomic synonymy *Diplodon martensi* (Ihering, 1893) – see Simone (2006).

## CONCLUSIONS

The public seminar entitled “IV Fórum de Discussão sobre a Fauna ameaçada no Estado de Santa Catarina” and held in March 2010 concluded that the species considered in this study appear visibly undervalued in the Official listing compiled by regional environment institutions (IGNIS, 2010), with only a total listing of four related marine species (two bivalves = *Crassostrea brasiliiana*, *Euvola ziczac*; and two gastropods = *Hastula cinerea*, *Olivancillaria contortuplicata*).

It is hoped that soon this situation is properly reviewed, corrected and updated.

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