

Distribution of *Deroceras reticulatum* (Müller, 1774) (Pulmonata Stylommatophora) in Argentina with first record of the Reserva de Usos Múltiples Isla Martín García, Río de la Plata superior

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(With 2 figures)

Abstract

Deroceras reticulatum is a misanthropic European species spread widely throughout South America. At the moment this species is considered a 'pest' in direct sowing such as maize, soybean, sunflower, wheat, alfalfa and clovers, among others. The aim of this paper is to report the first record of *D. reticulatum* in the Reserva de Usos Múltiples Isla Martín García, Buenos Aires province and to provide information about this species distribution in five Argentina provinces.

Keywords: *Deroceras reticulatum*, distribution, pest, exotic species, Argentina.

Distribuição de *Deroceras reticulatum* (Müller, 1774) (Pulmonata, Stylommatophora) na Argentina com primeiro registro na Reserva de Usos Múltiplos Ilha Martín García, Río de la Plata superior

Resumo

Deroceras reticulatum é uma espécie sinantrópica oriunda da Europa e com grande dispersão na América do Sul. Esta espécie é considerada atualmente praga dos cultivos de semeadura direta de milho, soja, trigo, girassol, alfafa e trevos, entre outros. O presente trabalho tem por objetivo comunicar o primeiro achado do agriolimácido *D. reticulatum* na Reserva de usos múltiplos Ilha Martín García, província de Buenos Aires e proporcionar informação sobre a distribuição desta espécie em cinco províncias argentinas.

Palavras-chave: *Deroceras reticulatum*, distribuição, praga, espécie exótica, Argentina.

1. Introduction

The genus *Deroceras* Rafinesque, 1820 (Agriolimacidae) has been recorded in every continent except Antarctica (Robinson, 1999). Two species of the genus, *Deroceras laeve* (Müller, 1774) and *Deroceras reticulatum* (Müller, 1774), were accidentally introduced into South America. *D. reticulatum* is a sinantropic European species (Wiktor, 2000; Borredá, 2003) widely spread throughout this subcontinent (Hylton-Scott, 1963; Fernández, 1973; Hausdorf, 2002; Scarabino, 2003; Vera-Ardilla and Linares, 2005; Valdovinos et al., 2005; Campos and Calvo, 2006). *Deroceras laeve* and

D. reticulatum have been identified as intermediate hosts of nematode parasites *Angiostrongylus costaricensis* and *A. cantonensis*, which involve several species of wild rodents as definitive natural hosts and humans as accidental hosts (Maurer et al., 2002; Maurer et al., 2002). *Angiostrongylus costaricensis* is responsible for abdominal disease angiostrongylosis (A.A.) (Morera and Céspedes, 1971). This disease was first reported in the Americas in Honduras in 1972 and, towards the end of 1990, its range extended from the United States of America to the north of Argentina (Morera and Amador,

1998). Rambo et al. (1997) and Maurer et al. (2002) reported cases of abdominal angiostrongylosis in southern Brazil (Santa Catarina). Several records of this disease were reported from Brazilian localities along the Uruguay river basin, which borders with the Argentinean province of Corrientes, though all the cases correspond to transmitter gastropods from the Veronicellidae family (Rea and Borda, 2001; 2002; Fleitas et al., 2005). The nematode *A. cantonensis* causes eosinophilic meningoencephalitis in humans and the first reported case in the Western Hemisphere was in Cuba (Aguir et al., 1981). Nowadays the disease has expanded to other tropical and subtropical countries of America (Dorta Contreras, 2007).

These introduced mollusks are also responsible for economic damage to agriculture and are disseminated inadvertently by seeds, harvest, fruits and farm machinery. Hausdorf (2002) considers the species from the Agriolimacidae family a "pest" to commercial field crops. The aim of this paper is to report the first record of *D. reticulatum* in the Reserva de Usos Múltiples Isla Martín García, province of Buenos Aires and to provide information on the distribution of this species in Argentina.

2. Materials and Methods

2.1. Sampling site

Martín García Island is located in the Upper Rio de la Plata, south of the mouth of the Uruguay river (34° 11' 25" S and 58° 15' 38 W). This island is an outcrop of the crystalline basement, unconformably overlain by Pleistocene and Holocene sediments (Ravizza, 1984). The particular geographical location of this multiple-use Nature Reserve and the possibility of exploitation for touristic purposes make the island an important study object.

2.2. Material

Sampling was conducted in August of 2006 and in December of 2007. Fourteen specimens were collected under rocks, four were captured along the quarry side of Cantera Grande, a pond near the island harbour (MLP N°12536) and ten were collected in the surrounding gardens (MLP N° 12821).

The geographical distribution of *D. reticulatum* in Argentina was based on the author's collections which were deposited in La Plata Museum of Natural Science (MLP), from the MLP Molluscan Collection and literature references.

The specimens were relaxed in the laboratory with menthol and then fixed in Carnoy. Total length of specimens was measured from the cephalic region to the posterior region of the body using a Vernier caliper (0.02 mm). Dissections were done under binocular stereomicroscope PZO at 10 × using the Wiktor (2000) technique.

3. Results

3.1. Description of *D. reticulatum* (Figure 1)

Terrestrial gastropod with an internal shell. General body coloration is whitish gray. The pneumostom, with whitish border, is at the mantle anterior section. In the ventral region of the body, the whitish foot is observed. Mucus is aqueous and clear. The dorsal surface of the mantle presents protuberances giving the surface a wrinkled appearance. The penis sack is conspicuously developed in the anterior body region (Total length: 3 mm). The intestinal caecum: (Total length: 1.25 mm).

Total length of examined specimens ranged from 20 to 60 mm. According to Vera-Ardilla and Linares (2005), juvenile specimens are 16 to 17 mm and adults are 35 to 40 mm in size.

3.2. List of localities in Argentina (Figure 2)

- San Carlos (33° 46' S and 69° 02' W) and Quebrada de la Pica, Mendoza, Doering (1875).
- Sierras de Córdoba, Argentina, Doering (1875).
- Cantera Grande and surrounding gardens (34° 11' 25" S and 58° 15' 38 W), Reserva de Usos Múltiples Isla Martín García, Buenos Aires, MLP N° 12536 and 12821.
- Balcarce (37° 49' 60" S and 58° 15' W), Buenos Aires. (Instituto Nacional de Tecnología Agropecuaria) INTA.
- Sauce Corto (38° 8' 60" S and 61° 47' 60" W), Sierra de la Ventana, Buenos Aires, MLP N° 34183.
- Coronel Gómez (39° 1' 60" S and 67° 39' W), Río Negro, Hylton Scott (1963).
- Isla Victoria, Lago Nahuel Huapi (40° 50' S and 71° 39' W) MLP N° 34182.
- El Bolsón (41° 58' S and 71° 31' W), Río Negro MLP 12932 and 12935.
- Arroyo Aguanda, Río Negro, Doering (1875).
- Potrero Cerrado, banks of Río Negro, Doering (1875).
- Río Turbio (51° 31' 60" S and 72° 17' 60" W), Santa Cruz MLP 12933°.
- Lago Morales, Santa Cruz, Hylton Scott (1963).
- Cancha Carrera (51° 15' S and 72° 13' 60" W), Santa Cruz MLP 12934.



Figure 1. *Deroceras reticulatum* MLP 12821.

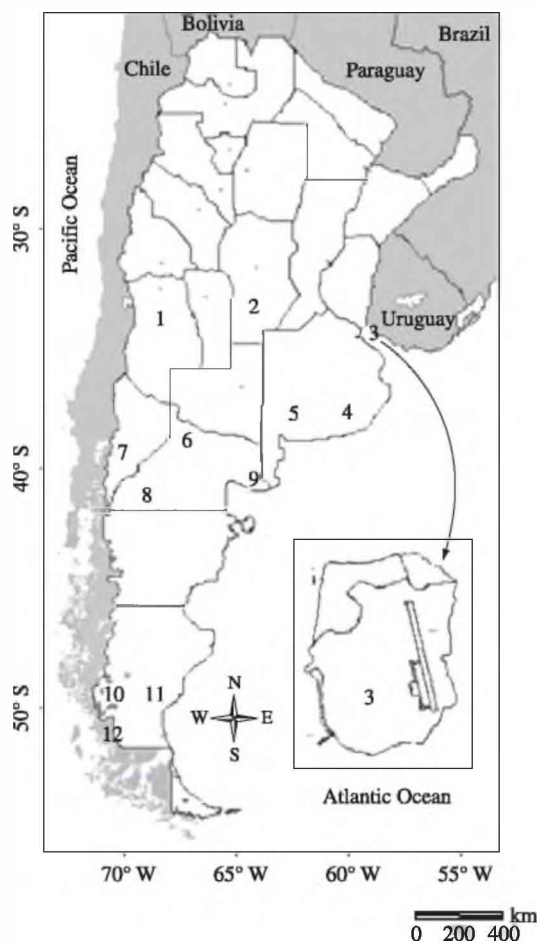


Figure 2. Distribution of *Deroceras reticulatum* in Argentina. 1) San Carlos and Quebrada de La Pica, Mendoza; 2) Sierras de Córdoba; 3) Cantera Grande and surrounding gardens; 4) Balcarce; 5) Sauce Corto; 6) Coronel Gómez; 7) Isla Victoria; 8) El Bolsón; 9) Potrero Cerrado and Arroyo Aguanda; 10) Cancha Carrera; 11) Río Turbio; 12) Lago Morales.

4. Discussion and Conclusion

The presence of *D. reticulatum* in Argentina dates back to 1875. It has been widely distributed throughout the national territory for 133 years. A slow increase in the number of this species and other slugs was observed in direct sowing plots of Córdoba and Santa Fe provinces and to the southeast of Buenos Aires province. In general, slugs damage several crops such as maize, soybean, sunflower, wheat, alfalfa and clover in the early vegetative stages (Aragón, 1997; Clemente, 2003). Direct sowing is a management practice which has spread throughout the main agricultural areas of Argentina due to its multiple benefits and advantages compared with other cropping systems. This method is widely used because the presence of plant residues and soil stability change the physico-chemical characteristics of the soil and of

several biological parameters that favour the presence of *D. reticulatum* and other species of slugs and insects. Direct sowing modifies the population dynamics of pests and their natural enemies, selecting populations of organisms that adapt themselves to the new management conditions (Aragón, 1997). According to Hammond (1998), stubble causes an increase in moisture retention in soil and a decrease in the soil temperature, giving appropriate conditions for the development of gastropod populations. Among these gastropods, *D. reticulatum* is considered the most damaging species.

In recent years, the presence of other invading pulmonates has been reported in diverse geographical points of South America, as is the case of two slugs of European origin, *Arion intermedius* Normand, 1852 and *Tandonia sowerbyi* (Férussac, 1823) in Chile (Cádiz and Gallardo, 2008), which are considered nowadays to be agricultural plagues.

Another case is that of *Achatina fulica* Bowdich, 1822, which is a terrestrial-invading gastropod, native to Africa and a potential rival of native mollusks, an agricultural pest and intermediary host of *A. cantonensis*, which causes eosinophilic meningoencephalitis, a disease that has already been registered in human populations in Brazil (Colley, 2008; Lima-Caldeira et al., 2008).

While no records of *D. reticulatum* are currently available for Isla Martín García, it is likely that the species introduction dates back to the end of the nineteenth century and the beginning of the twentieth concomitant to the settlement of the stable population (Kropfl, 2006). Since then, this process has continued due to the arrival of vegetables for both the stable and tourist population consumption.

To date, no studies have been carried out on the impact caused by *D. reticulatum* on the native flora of the Reserve, where different biological types occur: herbs, bushes, trees, climbing plants, ferns and lianas (Lahitte et al., 1996).

As mentioned above, species of Agriolimacidae such as *D. reticulatum* and *D. laeve* are intermediate hosts of the nematodes *A. costaricensis* and *A. cantonensis* which have Sigmodontinae rodents as definitive hosts, and humans, particularly infants, as accidental hosts. To date, no helminthological prospection has been performed on slugs from the Reserva Isla Martín García. Future research should be done on this subject since, simultaneously, the presence of a sigmodontine species has been detected, *Oligoryzomys delticola* (Thomas, 1917) (Udrizar-Sauthier et al., 2005), which would enter the life cycle of these parasites. From this, it could be inferred that if these slugs were infected, both the adult and infant population would be at risk of infection, given that the spread of these gastropods around the scarce 185 ha of the island is highly feasible.

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