

A Contribution to the knowledge of the earthworm fauna (Annelida, Oligochaeta) of the Argentinian Patagonia

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SUMMARY. The purpose of this study is to present a list of earthworms collected in a variety of sites in the Argentinean Patagonia. Patagonia is a vast territory in the South America running from 40° to 56° S and shared by both Argentina and Chile. Continental Patagonia belongs to the Neotropical Region, together with a strip located in the north and center of the island of Tierra del Fuego, while the southern fringe of the island belongs to the Antarctic Region (Cabrera and Willink, 1973). The most recent catalogs mentioning the oligochetofauna of the Argentinean Patagonia were issued by Mischis (2000) and Mischis & Moreno (2003). The aim of the present study is to update these previous works, and also to present data on the increased spreading of introduced species that have settled in the country. During our present sampling efforts, twelve species were collected belonging to eight genera in three families and, furthermore, one immature Ocneroдрilid. All are introduced, with the exception of *Microscolex dubius*, which is perhaps of South American origin. Due to the richness of native species, the total number of species recorded is much lower compared with those of the Chilean Patagonia. (Zicsi & Csuzdi, 2005). The species recorded in this study come from collections developed by our colleagues, voluntary helpers and the authors of this article. The specimens are deposited in the Oligochaeta collection of the Cátedra Diversidad Animal I (Universidad Nacional de Córdoba, Argentina).

INTRODUCTION

The earthworm fauna of the Argentinian Patagonia is far from being well-known. From the end of the 19th and throughout the 20th century, the first data on the earthworm fauna of southern South America (Patagonia, Tierra del Fuego and South Atlantic Islands) were presented by Beddard (1895, 1896), Michaelsen (1899, 1900) and Rosa (1901), among others, on the basis of specimens collected in the continental and insular regions. Later on, Pickford (1932), Cordero (1942) and Ljungström *et al.* (1975) presented further data on this territory. Based on the previous papers, as well as on the new data, Mischis (2000) published a list of the earthworm fauna of the Argentinian Patagonia and recorded *Microsclex collislupi*, Michaelsen, 1910 in Mendoza; *Aporrectodea trapezoides* (Dugès, 1828) in Chubut; *Notiodrilus silvestrii* Rosa, 1901 (= *Eodrilus?? Microsclex?? silvestrii*) and *Microsclex georgianus var. laveis* (Rosa, 1901) (= *Microsclex georgianus* (Michaelsen, 1888)) in Santa Cruz; furthermore, *Dendrobaena rubida* (Savigny, 1826), *Eiseniella tetraedra* (Savigny, 1826) and *Octolasion lacteum* (Örley, 1881) [as *Octolasion tyrtaeum* (Savigny, 1826)] in Rio Negro. Regarding the Tierra del Fuego region, Mischis (2000) recorded nine Acanthodrilidae species (*Acanthodrilus doellojuradoi* Cordero, 1942 (= *Eodrilus doellojuradoi*); *Chilota bicinctus* (Beddard, 1895) *Chilota corralensis var. belgicae* Cern., 1935 (= *Chilota patagonicus* Kinberg, 1867); *Microsclex michaelseni* Beddard, 1895; *Microsclex phosphoreus* (Dugès, 1837); *Notiodrilus bovei* (Rosa, 1889) (= *Microsclex bovei*); *Yagansia gracilis* (Beddard, 1895); *Yagansia longiseta* (Beddard, 1895), *Yagansia papillosa* (Beddard, 1895) (= *Yagansia longiseta* (Beddard, 1895)) and two Lumbricidae species (*Bimastos constrictus* (Rosa, 1845) (= *Dendrodrilus rubidus* (Savigny, 1826)); *Dendrobaena rubida* (Savigny, 1826)). Subsequently, Mischis and Moreno (2003) increased the list of registered species of Tierra del Fuego with the addition of *Microsclex dubius* (Fletcher, 1887) (Acanthodrilidae) and the next species belonging to family Lumbricidae: *Allolobophora georgii* Michaelsen, 1890; *Aporrectodea rosea* (Savigny, 1826); *Aporrectodea trapezoides* (Dugès, 1828); *Dendrodrilus rubidus tenuis* (Eisen, 1874); *Lumbricus rubellus* Hoffmeister, 1843 and *Octolasion cyaneum* (Savigny, 1826).

STUDY AREA

The territory of the Argentinean Patagonia developed on the Precambrian shield called Patagonia originally separated from the Brazilian shield. The region covers around 750 thousand square kilometres and extends between 40° and 56° S, from the south of the provinces of Buenos Aires, Mendoza and La Pampa to Tierra del Fuego and adjacent islands; the provinces of Neuquen, Rio Negro, Chubut, and Santa Cruz are fully included into this region. Most of its territory belongs to the Neotropical Region, while a fringe to

the south of Tierra del Fuego and several islands belong to the Antarctic Region (Cabrera and Willink, 1973) (Figure 1).

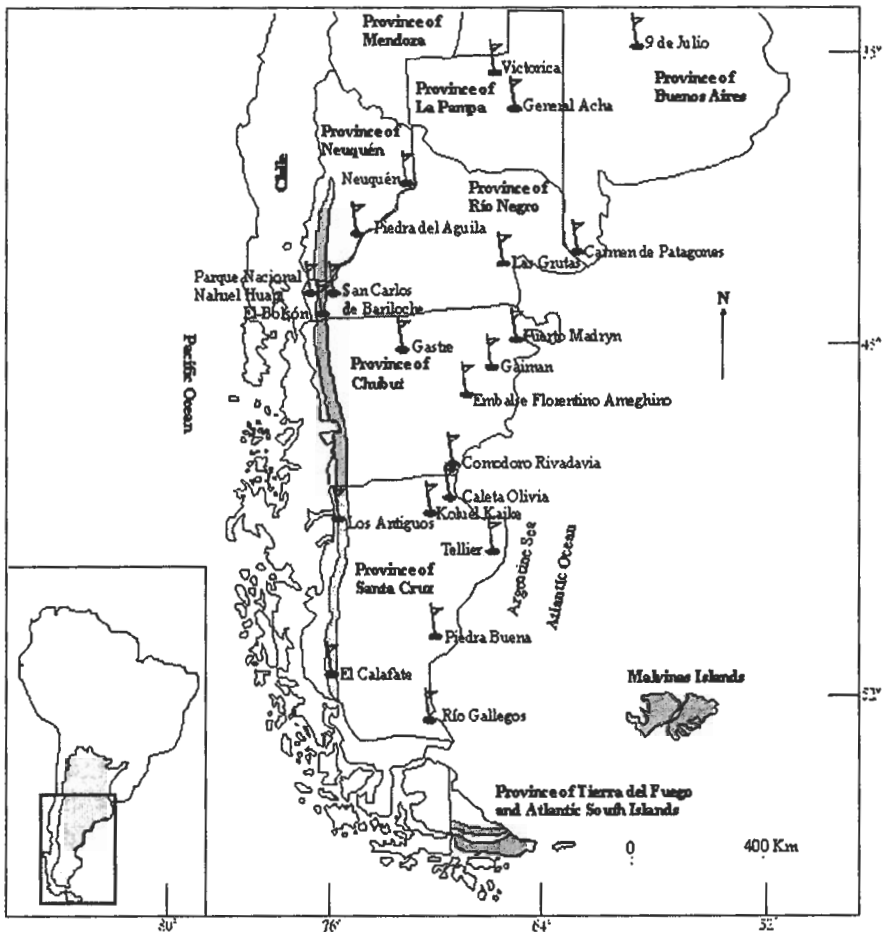


Figure 1. Biogeographic region (grey area: Antarctic Region; white area: Neotropical region) and the sampled localities (P) in Patagonia.

It is interesting to note that the geological history of Patagonia is very dynamic; many studies reported great variability in the past displacement of the arid-semiarid region between 32° and 52° S in Argentina (Patagonia area) (Mancini *et al.*, 2005).

During the late Pleistocene, several glaciations occurred in this region. Patagonian glaciations were of “piedmont-type”, a phenomenon covering the Andes Mountains and neighbouring valleys, as well. The main characteristics of the region were the dryness of the air, which precluded the growing of vegetation and development of glaciers (Clapperton, 1993).

The climatic changes in South America during the upper Quaternary can be explained by a temperature and humidity variation (Iriondo, 1999). The climate is

controlled by the dynamics of the special winds called "westerlies" which arrive from the Pacific Ocean, cross the Andes range discharging most of their water content, and continue as dry winds to the east. Owing to the extreme dryness of the air, cyclones generated arid plateaux, eolian erosions being visible in the vast region of the extra-Andean Patagonia (Iriondo, 1989, 2000).

According to Capitanelli (1988) three large geomorphologic units can be distinguished on the Argentinean territory: mountains, plateaux and coasts. The mountains to the west, especially the high summits shared with Chile, run in a north-south direction and are characterised by a marked glacial shape resulting from glaciations, where longitudinal valleys can be found. From 37° S the mountains lower toward the south and the east, with transversal valleys, which allows the humid winds from the Pacific Ocean to reach the area, causing abundant precipitation. The cold, humid mountainous area stands out for the beauty of its vast forests and glacial lakes, but the abundant precipitation diminishes towards the east. The Andean-Patagonian forest is vast, being characterised by the presence of several perennial and deciduous species, where the genus *Nothofagus* prevails.

The eastern plateaux of the mountain range, which forms the so-called non-Andean Patagonia, is set on the mentioned Precambrian shield and supports constant epeirogenic movements. These plains are raised and fractured in large blocks and are partially covered by tertiary and quaternary basalt's. They have varying heights and give the impression of steps ascending towards the west. The climate of the plateaux is cold and dry with annual precipitation ranging between 100 and 300 mm. The soil is sandy and poor in organic matter. The dominant vegetation is grassy, bushy steppe (*Festuca*, *Poa*, *Stipa*, among others) resulting from low temperatures, strong dry winds and lack of rain.

80% of the non-Andean Patagonia is greatly degraded and a third of it is a sterile desert. In addition to the harsh climate, the incorrect use of the land in breeding ovine livestock, especially overgrazing, has contributed to the erosion, which increases progressively.

The Atlantic coasts consist of cliffs reaching 200 m. in height and rivers that flow into the Ocean, forming wide estuaries.

To the west of the Argentinian Patagonia, separated by the Andean mountain range, is lying the Chilean Patagonia, which differs totally in its topography, climate, vegetation and fauna, as a result of the phenomena mentioned above.

RESULTS

The collections developed during this study were not systematically planned, but rather sporadic samplings. The localities where the samples were taken are presented in Figures 1 and 2, and the species gathered in each province are listed below.

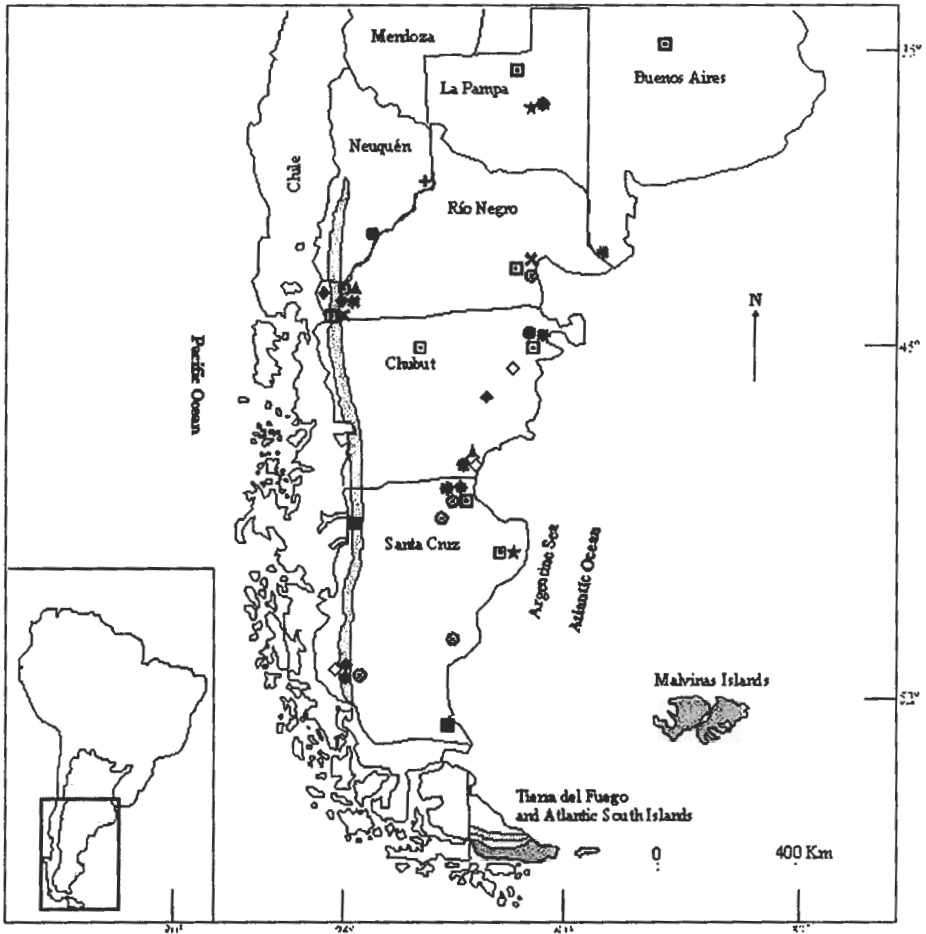


Figure 2. Earthworms distribution in the Patagonia Argentinian soils. Δ *Microscolex dubius*, \star *Aporrectodea rosea*, \circ *Aporrectodea trapezoides*, \bullet *Amyntas gracilis*, \odot *Aporrectodea caliginosa* morph *caliginosa*, \blacklozenge *Dendrodriilus rubidus*, \diamond *Dendrodriilus rubidus rubidus*, \bullet *Dendrodriilus rubidus subrubicundus*, \blacktriangle *Eisenia fetida*, \ast *Octodrilus transpadanus*, \blacklozenge *Octolasion cyaneum*, \square *Ap. caliginosa* morph *trapezoides*, \times *Octodrilus complanatus*, \blacksquare *Lumbricus rubellus*, \blackplus *Ocnodrilidae* sp.

Province of Buenos Aires

LUMBRICIDAE

Aporrectodea caliginosa [morph *trapezoides*]: 9 de Julio (Aug. 07, 2004).

Eisenia fetida (Savigny, 1826): Tornquist (Sept. 15, 2004).

Octodrilus complanatus (Dugès, 1828): Delta de Río Parana (Aug. 07, 2004).

Province of La Pampa

ACANTHODRILIDAE

Microscolex dubius (Fletcher, 1887): General Acha (Jan. 14, 1999).

LUMBRICIDAE

Aporrectodea caliginosa (Savigny, 1826) [morph *trapezoides*]: Victorica (Jan. 14, 1999).

Aporrectodea rosea (Savigny, 1826): General Acha (Jan. 14, 1999).

Province of Neuquen

OCNERODRILIDAE

Juvenile sp.? Capital (Dec. 27, 2000).

MEGASCOLECIDAE

Amyntas gracilis (Kinberg, 1867): Piedra del Aguila (Jan.15, 1999).

Province of Río Negro:

ACANTHODRILIDAE

Microscolex dubius (Fletcher, 1887) Chasicó (Mar. 21, 2001).

LUMBRICIDAE

Aporrectodea caliginosa (Savigny, 1826) [morph *caliginosa*]: Bariloche, on the way to Llao Llao (Jan. 17, 1999; Jan. 9, 1984), Chasicó (Mar. 21, 2001), Las Grutas (Jan. 10, 2001).

Aporrectodea caliginosa (Savigny, 1826) [morph *trapezoides*]: El Bolson (Jan. 19, 1999; Jan. 26, 2002).

Dendrodriilus rubidus rubidus (Savigny, 1826): Bariloche, Nahuel Huapí National Park (Jan. 18, 1999).

Eisenia fetida (Savigny, 1826): Bariloche, family homestead (Jan. 18, 1999).

Octodrilus transpadanus (Rosa, 1884): Bariloche, family kitchen garden (Jan. 18, 1999).

Octodrilus complanatus (Dugès, 1828): El Bolson (Jan. 19, 1999), Las Grutas (Jan. 10, 2001).

Octolasion cyaneum (Savigny, 1826): Bariloche, lengas wood (Jan. 18, 1999).

Province of Chubut

ACANTHODRILIDAE

Microscolex dubius (Fletcher, 1887): Gastre (Feb. 27, 2000), Puerto Madryn (Mar. 11, 2002), Comodoro Rivadavia (Feb. 23, 2004).

MEGASCOLECIDAE

Amyntas gracilis (Kinberg, 1867): Puerto Madryn (Mar. 11, 2002).

LUMBRICIDAE

Aporrectodea caliginosa (Savigny, 1826) [morph *trapezoides*]: Puerto Madryn (Mar.11, 2002; Apr. 27, 2005), Gastre (Jan. 19, 2001).

Dendrodrilus rubidus rubidus (Savigny, 1826): Comodoro Rivadavia (Jan. 23, 2004; 1999), Gaiman (Feb. 27, 2004; 1991).

Eisenia fetida (Savigny, 1826): Comodoro Rivadavia (Jan. 30, 2001).

Octolasion cyaneum (Savigny, 1826): Florentino Ameghino dam (Jan.16, 1999).

Province of Santa Cruz

ACANTHODRILIDAE

Microscolex dubius (Fletcher, 1887) Caleta Olivia (Apr. 15, 2005), Esperanza (Feb. 27, 2000).

LUMBRICIDAE

Aporrectodea caliginosa (Savigny, 1826) [morph *caliginosa*]: El Calafate way (Mar. 10, 2005), Koluel Kaike (May. 17, 2003; May. 15, 2003), Piedra Buena (Oct. 03, 2004), Caleta Olivia (Apr. 15, 2005).

Aporrectodea caliginosa (Savigny, 1826) [morph *trapezoides*]: Caleta Olivia (Apr. 15, 2005), Tellier (Apr. 15, 2005).

Aporrectodea rosea (Savigny, 1826): El Calafate way (Mar. 10, 2005), Tellier (Apr. 15, 2005).

Dendrodrilus rubidus rubidus (Savigny, 1826): El Calafate (Mar. 10, 2005).

Dendrodrilus rubidus subrubicundus (Eisen, 1874): Caleta Olivia (Apr. 15, 2005).

Lumbricus rubellus Hoffmeister, 1843: Río Gallegos (May. 09, 2003; May.18, 2003), Los Antiguos (May. 18, 2003).

Octolasion cyaneum (Savigny, 1826): El Calafate (Nov. 10, 1999).

DISCUSSION

Twelve species belonging to eight genera of three families were collected and, furthermore, an immature Ocnerodrilidae. All of them were previously recorded in the check-lists of Mischis (2000) and Mischis & Moreno (2003). Nine of the found species are European Lumbricid; one is an Asian Megascolecid and only one species belongs to the native Acanthodrilids. The Lumbricids must have been transported passively by some agents, their voluntary and involuntary introduction by men is now proven. Gates (1957, 1966) showed that they were introduced to the USA thanks by human activities and via the North America colonization by the Europeans. Lumbricids have occurred in the USA, possibly since 1500 AD. This process is still continuing, resulting in the appearance of a new European species *Lumbricus friendi* (Cognetti, 1904) in the USA (Csuzdi & Szilávecz, 2003). Gates (1987). Bouché *et al.* (2004) – among others – suggested that some worms have been transported by man via the soil of potted plants, as early as 10.000 years ago.

In Argentina, the introduction of *Octodrilus transpadanus* has been proved. Its first record in the province of San Luis, Argentina, (Mischis & Brigada, 1988) was in the earth wall of the Cruz de Piedra dam, under cypress trees (*Cupressus sempervirens*) imported from the northern hemisphere. The specimens found were introduced by planting the aforementioned trees.

The collected Lumbricid species are well-known peregrine species with great ecological plasticity and adaptability to live in a variety of environments, as has been shown in different Argentinean ecosystems (Mischis, 1999). Adverse climatic factors, such as those of Patagonia, do not affect these species since Lumbricidae is a Palearctic family, which, together with their wide ecological valence, enables them to colonize these latitudes with a minimum of favourable conditions.

The presence of *Amyntas gracilis*, a south-east Asian Megascolecid species near a house, is rather surprising, even though it is widely distributed in the centre and north of Argentina, especially in gardens and family vegetable gardens. Perhaps these artificial, protected environments provide shelters for this species to survive the otherwise hostile conditions.

Microscolex dubius is the only Acanthodrilidae species found. It is native to South America but has been widely introduced in many parts of the world. Its presence in Patagonia might also be secondary because the rise of the Andean Mountain range in the Miocene turned Patagonia into a desert, particularly the plateau. Furthermore, in the quaternary, large part of the region was covered by the southern ice-shield that destroyed the indigenous earthworm fauna (Michaelsen, 1903).

If we compare the species found in this study with the earthworm fauna of Chile (Zicsi & Csuzdi, 2005) (the Chilean Patagonia particularly), the absence of native species is remarkable. It might be due to the lack of more meticulous samplings in places untouched by humans, and/or to the climatic and soil conditions that probably extinguished the original fauna with scarce capacity of adaptation. The probable influence of the species introduced *a priori* on the disappearance of native species does not seem to have been the cause of this extinction.

ACKNOWLEDGMENTS

Our thanks are due to Teresita Poretti, N. López, Daniel Legato, Maximo Dürr, Noel Mischis, and Ana Huespe, for collecting earthworms in different sites in the Patagonian provinces. We thank the Hungarian Scientific Research Grant (OTKA No. 43508) for a research grant to the second author.

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