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DISTRIBUTION OF *LUMBRICUS FRIENDI* COGNETTI 1904 (OLIGOCHAETA, LUMBRICIDAE) AT THE EUROPEAN SCALE: FIRST FINDINGS IN SERBIA

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Abstract

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Lumbricus friendi is a European species known from the Atlantic region, introduced to the North Africa and Nearctic region. However, the Voivodina Province, in the state of Serbia, is its first record on the southeastern part of Europe and it proved to be a new species to the earthworm fauna of Serbia. Taking into account two new localities in the Voivodina Province, it is evident that the extent of occurrence for this species has increased. Consequently, this paper records an extension of the known distribution of *Lumbricus friendi*. Such a discovery is of a considerable faunistic interest: it represents the first record for Serbia and the easternmost one reported so far.

Key words: *Lumbricus friendi*, distribution, Serbia, Europe

Introduction

First original description of *Lumbricus friendi* Cognetti, 1904 was from France by Cognetti (1904). It has subsequently been reported from many other part of European area (Figure 1). The native area of *L. friendi* includes North Africa (Omodeo et al., 2003) and Europe.

Until now, *L. friendi* has been known from several localities in Pyrenees, in French part (Bouche, 1972; Zicsi and Csuzdi, 1999), Germany (Lamparski, 1985), French Alps (Cassagne et al., 2008), Spain (Rodríguez et al., 1997; Monroy et al., 2003; Butt and Briones, 2011), Scotland (Boag et al., 1997), Ireland, Wales, the Channel Islands (Friend, 1893; Sims and Gerrard, 1999), southern England (Butt et al., 2008), Italy (Omodeo et al., 2007) and Switzerland (Cuendet, 1986). The species has been also introduced to North America (Csuzdi and Szilávecz, 2003).

The aim of this paper is to present the data from our own collecting as well as the earlier data from other authors and, by analyzing the whole list of records, to trace a synthetic outline of the current distribution and zoogeographical position of *L. friendi* in the whole European territory.

Materials and Methods

The study was carried out in the Fruška Gora Mt. in Voivodina Province (Serbia). The Province of Vojvodina (44°38'–46°10'N; 18°10'–21°15'E) is predominantly a flat region, occupying the part of the south Pannonian Region. It is a forest-steppe region with a temperate-continental climate.

The hilly landscape includes only two small mountain ranges. One of them, Fruška Gora Mt. is an isolated, narrow, island mountain characterized by specific geological history and different microclimatic conditions. Lengthwise, it is approximately 80 km from east to west and is 15 km from north to south. Its highest peak is Crveni Čot at 539 m.

On the proposal of the Institute of Nature Protection of Serbia, in 1960 Fruška Gora Mt. was placed under strict protection as having “natural merit of first class”.

Data on species were obtained from the literature and from fieldwork. The data from several authors (mentioned above) were used to complete distribution maps of *Lumbricus friendi* in the whole of Europe (Figure 1).

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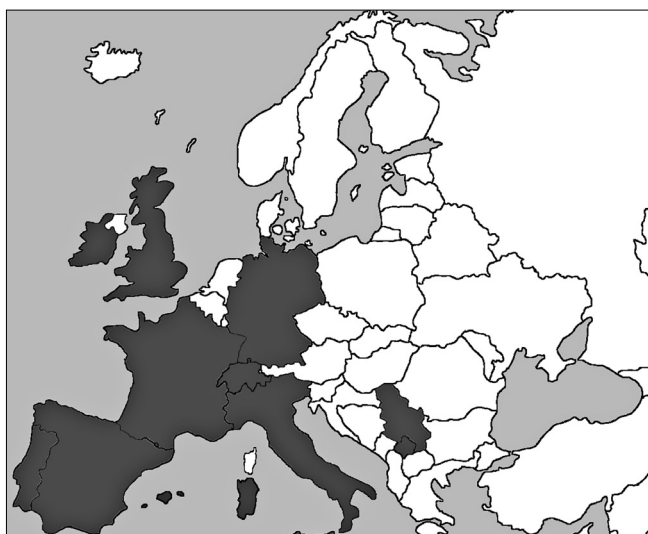


Fig. 1. Spatial distribution of *Lumbricus friendi* at the European scale

Earthworms were collected using the diluted formaldehyde method complemented with digging (0.4x0.4 m quadrates) and hand sorting as well as turning over rocks, debris and logs. The earthworms were killed in 70% ethanol, immediately fixed in 4% formalin solution and transferred and stored in 90% ethanol.

Species identification was made according to the complex features provided in Šapkarev (1978), Zicsi (1985), Mršić (1991), Csuzdi and Zicsi (2003) and Blakemore (2004).

During the field study we have collected only one specimen of *L. friendi* and it has been deposited in the University Kragujevac (Faculty of Science, Department Biology and Ecology, Karaman and Stojanović Collection).

Results and Discussion

Lumbricus friendi was detected in only one locality (Fruška gora Mt.: Iriški venac, 450 m.a.s.l.). This is the first record of *L. friendi* in Serbia and it proved to be new for the fauna of Serbia. Together with the previously reported earthworms for Serbia (Stojanović and Karaman, 2006; Stojanović et al., 2008; Milutinović et al., 2013) the number of recorded taxa is raised to 72 species and 8 subspecies.

Lumbricus friendi Cognetti, 1904

Lumbricus papillosus Friend (non Müller 1776) 1893: 453.

Dendrobaena lumbricoides Bretcher 1901: 219.

Lumbricus friendi Cognetti (nom.nov. pro *L. papillosus* Friend, non Müller 1776) 1904: 1.

Lumbricus friendi Bouché 1972: 356. Zicsi 1982: 428. Easton 1983: 482.

Lumbricus friendi friendi Blakemore 2007: 49.

Morphology and size. The body is 120 mm to 200 mm long. The prostomium is tanylobous. The body is a brown-violet colour. The first dorsal pore is in insegmental groove 6/7 to 9/10. Glandular papillae surround setae *a* and *b* on segments 10 or 11. The clitellum extends from segments 1/n 32, 33 to 37, 1/n 38 and the tubercula pubertatis are present from segments 34 to 36 (37). Internal characteristics: There are three pairs of seminal vesicles in the 9th, 11th and 12th segments.

Locality: Serbia, Fruška Gora Mt., Iriški Venac, (45°09'N, 19°51'E), 450 m altitude, 05.04.1990 – 1 specimen.

Biogeographical consideration

According to the previous investigations, the central finding of *Lumbricus friendi* is the France (Cognetti, 1904) and Spain (Rodríguez et al., 1997). Based on literature data (Mršić 1991; Sims and Gerard, 1999; Csuzdi and Szilávecz, 2003; Rota, 2005; Butt and Briones, 2011), the northernmost findings of the species have been in Ireland, the southernmost point in its distribution is in North Africa (Omodeo et al., 2003; Rota, 2005) and easternmost is Italy (Rota, 2005; Omodeo et al., 2007). But, based on our field investigations it is clear that the northern Serbia is the easternmost border of its distribution.

The high number of locations from various parts of the Franco Iberian Peninsula and the patterns of the present distribution of *L. friendi* as well, prove the important role of this area.

Based on the mentioned above data and following the distribution types given by (Csuzdi and Zicsi, 2003; Pop et al., 2010; Csuzdi et al., 2011), this species covers mainly the Franco-Iberian and, partly, the Aegean domains (Europe from the Alps to the Ural Mts), which may indicate the Atlanto-Mediterranean distribution, but relatively disjunct distribution as currently known (Rota, 2005) might denote our insufficient knowledge on the distribution of this species.

According to Csuzdi and Szilávecz (2003), *L. friendi* is well established species in the eastern part of North America (Maryland, Baltimore city) due to its abundance and distribution, in many locations which, altogether, indicate that it is not a recent introduction. On the other hand, the fact that *L. friendi* occurs in northern Serbia in only one location indicates that it is probably a recent introduction.

This contribution brings the first *L. friendi* quantitative information in the northern Serbia. However, more surveys must be conducted to understand its distribution and impact on the native earthworm fauna in this part of Europe.

Conclusion

Taking into account all the facts mentioned for *Lumbricus friendi*, it is possible to assume that the Franco-Iberian area is the area of origin and a distribution center as well. Starting from

the Iberian Peninsula it could spread to the western (Germany, Switzerland, Britain), southern (Italy) and eastern (northern Serbia) area of Europe.

Lumbricus friendi was detected only at the locality of Fruška Gora Mt. in northern Serbia and it was not identified in other regions of the Serbia, despite of intensive and repeated attempts. Nevertheless, the very fact that this species has occurred in northern Serbia, which represents the easternmost occurrence of this species at European scale, is so remarkable and gives us the right to expect further infiltration of a greater number of individuals into Serbia.

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