

SCHUBARTIANA	ISSN 1861-0366	Leipzig	Nr. 4	2010	S. 9-14
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***Cylindroiulus caeruleocinctus* (Wood, 1864), new to the fauna of Hungary, and its current European distribution (Diplopoda: Julida)**

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Abstract

Human activities are strongly influencing the distribution of millipedes, in some cases reshaping their natural dispersion to a considerable extent. Our goal was to present the first Hungarian record of *Cylindroiulus caeruleocinctus* (Wood, 1864) and to give an up-to-date picture of its European distribution. The occurrences of the species are largely synanthropic. The first records in Hungary were represented by 29 specimens, which were found in Debrecen, eastern Hungary, in an urban park and in a school in the city center. The current European distribution of the species suggests an expansion towards East and Southeast Europe. The species has not yet been reported from Romania, Bulgaria, Greece, Albania and it is also missing from the former Yugoslavia.

Keywords: millipede, synanthropic, GlobeNet, Debrecen

Összefoglalás

Az ikerszelvényesek (Diplopoda) természetes elterjedési helyzetének megváltozásában a történelmi idők óta nagy szerepe van az antropogén hatásoknak. Európa jelentős részén a *Cylindroiulus caeruleocinctus* (Wood, 1864) is csak szünantróp módon előforduló, az ember által elterjesztett faj, de Magyarországról eddig nem volt ismert. A GlobeNet projekt keretében Debrecenben végzett munkánk és más gyűjtések során előkerült 29 egyeddel sikerült igazolni a *C. caeruleocinctus* magyarországi előfordulását. A faj Nyugat-Európától kelet és délkelet felé egyre elterjedtebb, különösen a szünantróp élőhelyeken. A kontinens legészakibb részeiről, valamint Romániából, a Balkán-félszigetről és a mediterrán térség nagy részéről egyelőre hiányzik.

Introduction

The distribution of millipedes is generally limited because of their low natural dispersal capabilities. Human activities strongly affect the distribution of several millipede species, in some cases reshaping their natural dispersion to a considerable extent (HOPKIN & READ 1992). For example, half of the species occurring in the British Isles was introduced into North America (KIME 1990a). There is also an interplay between climatic factors and human agency (KIME 1990b).

The Hungarian millipede fauna in its present state consists of 101 species (KORSÓS 2005). There are 8 species which are considered as having an anthropogenic preference and are usually transmitted by humans. The julid species *Cylindroiulus caeruleocinctus* (Wood, 1864) found recently can also be considered as a human introduced anthropogenic element for the Hungarian millipede fauna.

Material and methods

The research was part of the GlobeNet project in 2004 in the town of Debrecen, eastern Hungary (MAGURA et al. 2004, 2008). The study site was a forested urban park (Nagyerdei Park) with asphalt covered paths and abundant non-native plants. The site is the urban end of an urban-rural gradient (MAGURA et al. 2005).

The specimens were collected by pitfall trapping and hand collection. Pitfall traps contained 75% ethylene glycol and were covered with bark. The specimens were preserved into 70% ethanol. Due to this treatment they became pale. For identification we used the monographs by SCHUBART (1934) and BLOWER (1985).

The material has been deposited in the Myriapoda Collection of the Hungarian Natural History Museum, Budapest, and in the first author's (DB) private collection.

Results

First we have found 4 specimens in the Nagyerdei Park: 6th September 2004, 1 male; 11th October 2004, 3 females. Between mid September and October 2008 we have collected 25 additional specimens (in three different occasions) in the centre of Debrecen, 2,5km from the urban park. 10 males and 15 females were found dead in the basement on stairs in the Péchy Mihály Highschool. Surrounded by the school building there is a small yard, and the millipedes may have looked for some warmer place to move in and died on the concrete ground of the basement.

Discussion

Cylindroiulus caeruleocinctus (Wood, 1864) (syn. *C. teutonicus* (Pocock, 1900)) was considered as a variety of *C. londinensis* (Leach, 1815) (BRADE-BIRKS 1922, BLOWER 1958), until MAURIÈS (1964) separated them into two species. The genus itself was synonymized with *Allajulus* by HOFFMAN (1979), but READ (1990) in her detailed cladistic analysis resurrected *Cylindroiulus* for those species which lack metazonal setae and possess a single mesomerit of the male gonopod, thus for *C. caeruleocinctus*, too.

Former records of the species distribution in Western Europe should be handled with care, as it was pointed out by KIME (1990a) and DAVID (1995), because they can refer to both *C. caeruleocinctus* and *C. londinensis*. However, according to BLOWER (1985), *C. caeruleocinctus* occurs mostly on calcareous soil under cultivation, and also prefers leaves with higher calcium content (LYFORD 1943). A high degree of correlation with calcareous basic soil is probably not true in the strict sense, because most of the occurrences in various synanthropic habitats blur such a tendency (KIME 2004). The species is usually found in open habitats (SCHUBART 1934), and often in synanthropic circumstances, as a result of human-mediated dispersion. In many countries it does not occur at all in natural habitats (GOLOVATCH 1984, JEDRYCZKOWSKI 1992, KOCOUREK 2004, MOCK 2006). SCHAEFER (1982) found the species in gardens of London very common in pitfall traps, but rarely in soil and litter samples. HAACKER (1968) described the species as hygrophilous with activity peaks in spring – but according to PEDROLI-CHRISTEN (1993) a smaller peak in autumn can also be found.

The species is widely distributed in Europe and in North America (BLOWER 1985). Its European range mainly occupies the western and northern part of the continent, completed by scattered Central European records (ENGHOFF 2007). KIME (1999) describes *C. caeruleocinctus* as an Atlantic species. The majority of the data from Eastern and Central Europe comes from synanthropic localities. We reviewed all available literature to provide a current European distribution (Table 1).

Table 1: Occurrence of *Cylindroiulus caeruleocinctus* (Wood, 1864) in European countries.

	Natural habitats	Synanthropic habitats	Reference
Austria		+	THALER 1988
Belgium	+	+	KIME 1992
Czech Republic		+	KOCOUREK 2004, MOCK 2006
Denmark	+	+	ENGHOFF 1974, ANDERSSON et al. 2005
Estonia		+	BLOWER 1985, ENGHOFF 2007
Finland		+	PALMÉN 1949
France	+	+	GEOFFROY 1996, DAVID 1995, DAVID 2008 in litt.
Germany	+	+	SCHUBART 1934, SPELDA 2006
Great Britain	+	+	BLOWER 1985
Hungary		+	in this article
Ireland	+	+	BLOWER 1985
Italy		+	FODDAI et al. 1995
Latvia		+	BLOWER 1985, ENGHOFF 2007
Lithuania		+	BLOWER 1985, ENGHOFF 2007
Luxemburg	+	+	KIME 1996, 1999
Netherlands	+	+	BERG 1995, JEEKEL 2000, BERG et al. 2008
Norway	+	+	ANDERSSON et al. 2005, DJURSVOLL et al. 2006
Poland		+	JEDRYCZKOWSKI 1992
Portugal	?	?	MACHADO 1946, READ 2007
Russia		+	GOLOVATCH 1992
Slovakia		+	MOCK 2006
Spain	?	?	VICENTE 1985, READ 2007
Sweden	+	+	ANDERSSON et al. 2005
Switzerland	+	+	PEDROLI-CHRISTEN 1993
Ukraine		+	CHORNYI & GOLOVATCH 1993, LOKSHINA 1962

Cylindroiulus caeruleocinctus is common in the southern and central part of the United Kingdom and in some parts of Ireland (BLOWER 1985).

Among the Scandinavian countries, it is absent from Iceland, it occurs in Norway along the southwestern and southernmost shoreline (ANDERSSON et al. 2005) both in pine and mixed deciduous forests (DJURSVOLL et al. 2006); in Sweden it was found only in the south (ANDERSSON et al. 2005); in Denmark the species is present in the entire country and it is able to live outdoor, but without doubt it is an introduced species (ENGHOFF 1974). In Finland, there is only one record from a city park of Helsinki (PALMÉN 1949).

In the Netherlands it is by far the most common diplopod species, which occurs in gardens but may even enter houses (JEEKEL 2000, BERG et al. 2008). In Belgium it is widespread, too; there are many records throughout the country (KIME 2004). Kime (1992) found it in high population densities in calcareous grasslands, and also in oak/beechn forest. Specimens have been caught in open sites and have rarely turned up in closed woodland. In Luxemburg the species is common in open habitats and in synanthropic localities as well (KIME 1996, 1999).

C. caeruleocinctus is widespread in France and in the Mediterranean region (GEOFFROY 1996, DAVID 1995, in litt., 2008). In Spain the species was not found in Cataluña, south of the Pyrenees (VICENTE 1985), but it was mentioned from Northern Spain (SERRA et al. 1996, READ 2007). It was reported from the mainland of Portugal, too (as *C. teutonicus*, by MACHADO 1946). Despite their possible confusion with *C. londinensis* (see above), these former records can still be considered valid for *C. caeruleocinctus*, because *C. londinensis* is a forest species of the warmer and wetter parts of the Atlantic zone (KIME, in litt., 2009). In contrast we questionmark the record by CEUCA (1972), because his *C. londinensis* data are from further east in open country.

In Italy *C. caeruleocinctus* occurs only in the extreme northern part of the country (FODDAI et al. 1995).

In Switzerland it is widespread (PEDROLI-CHRISTEN 1993). In Germany it is also widely distributed and was found in different biotopes (SCHUBART 1934, BLOWER 1985, KIME 1990, SPELDA 2006).

In Poland the species is a cosmopolitan element, occurring in synanthropic habitats, such as gardens, parks and houses (JEDRYCZKOWSKI 1992). It is also present in the Baltic countries (Estonia, Latvia and Lithuania) (ENGHOFF 2007).

In some Central European countries, *C. caeruleocinctus* has isolated occurrences. Occasionally, mass appearances have been reported from Austria in the cities of Innsbruck and Kufstein, probably due to human introduction (THALER 1988). In the Czech Republic in some cities such as Prague it can be very abundant (KOCOUREK 2004, MOCK 2006). In Slovakia the species was found only in the gardens of Kosiče (MOCK 2006).

From the former Yugoslavia it has been mentioned by BLOWER (1985), but it is stated as absent in the Fauna Europaea database (ENGHOFF 2007).

In the former USSR it occurs on the European plain, but it is restricted only to synanthropic habitats (LOKSHINA 1969, GOLOVATCH 1992, CHORNYI & GOLOVATCH 1993).

In the neighbourhood of Debrecen, Hungary, the nearest data are from the cities of Kosice (Slovakia, distance about 136 km) (MOCK 2006) and Lvov (Ukraine, distance about 311 km) (LOKSHINA 1969, CHORNYI & GOLOVATCH 1993). By massive increasing of human activities, and maybe also due to natural processes, it seems that the range of *Cylindroiulus caeruleocinctus* is slowly expanding towards the southern and eastern parts of the European continent as it is observed in case of some chilopod species (LINDNER 2007). At present, it is only missing from Romania, Bulgaria, Greece, and mainly from the Mediterranean territories.

Acknowledgements

We are grateful to Béla Tóthmérész and Tibor Magura (University of Debrecen) for managing the GlobeNet project in Debrecen. We thank Norman Lindner and Desmond Kime for their useful comments during the review of the manuscript. Jean-Francois David and Henrik Enghoff provided bibliographical information. The help of István Pallag is greatly acknowledged, too.

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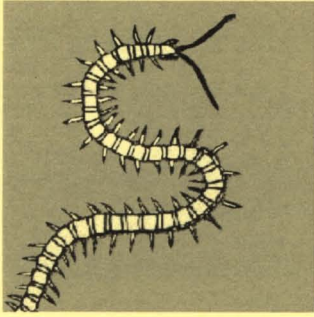
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Received: 29.I.2009

Accepted: 27.X.2010

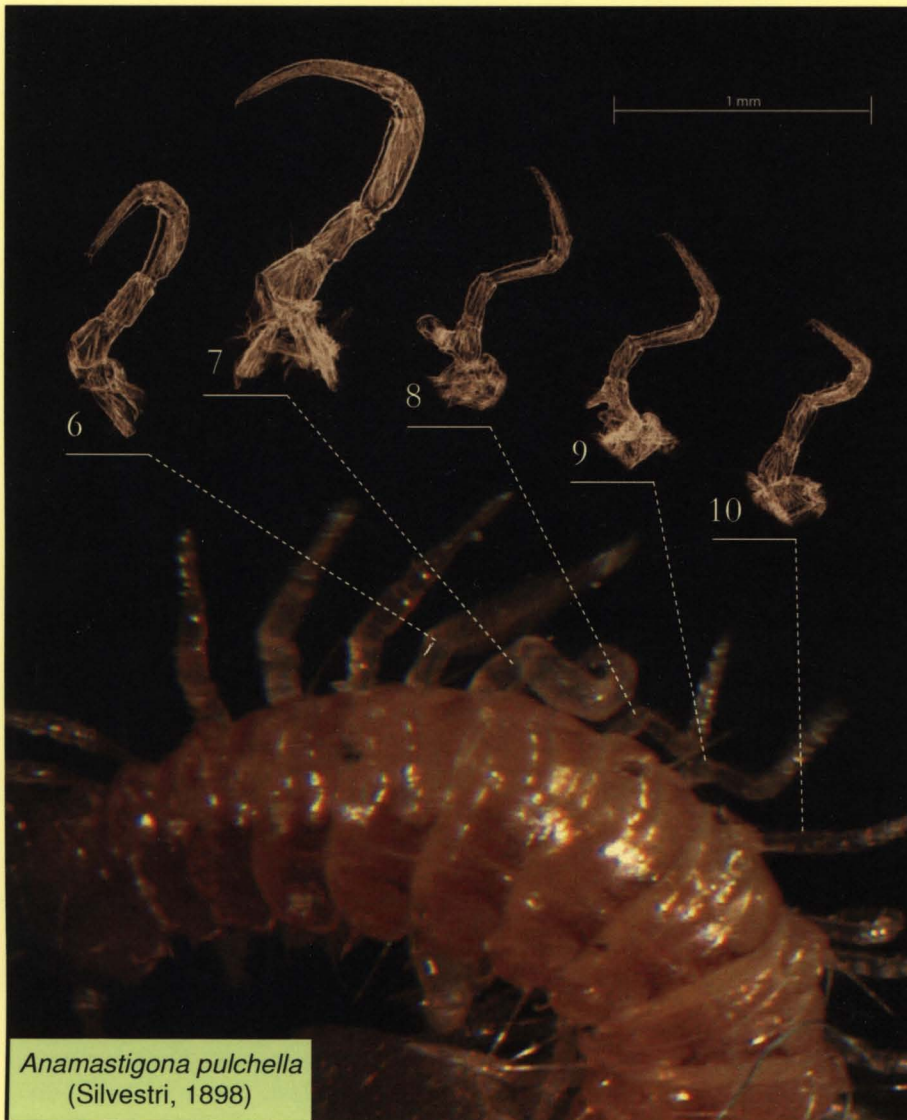


Band 4 (2010)

ISSN 1861-0366

SCHUBARTIANA

Zeitschrift der Arbeitsgemeinschaft deutschsprachiger Myriapodologen
Journal of the German-speaking Myriapodologist's Working Group



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(Silvestri, 1898)

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