

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)**

By DÁVID BOGYÓ and ZOLTÁN KORSÓS

Authors addresses

Dávid Bogyó, Department of Ecology, Debrecen University, PO Box 71, H-4010 Debrecen, Hungary;
davidbogyo@yahoo.co.uk

Zoltán Korsós, Department of Zoology, Hungarian Natural History Museum, Baross utca 13, H-1088 Budapest, Hungary; korsos@nhmus.hu

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.

References

- ANDERSSON, G.; MEIDELL, B.A.; SCHELLER, U.; WINQVIST, J.-A.; OSTERKAMP MADSEN, M.; DJURSVOLL, P.; BUDD, G.; GÄRDENFORS, U. (2005): Nationalnyckeln till Sveriges flora och fauna. Mångfotingar, Myriapoda. – ArtDatabanken, SLU, Uppsala, 351 pp.
- BERG, M.P.; SOESBERGEN, M.; TEMPELMAN, D.; WIJNHOFEN, H. (2008): Verspreidingatlas Nederlandse landpissbedden (Crustacea: Isopoda), duizendpoten en miljoenpoten (Myriapoda: Chilopoda & Diplopoda). – EIS, Nederland Vrije Universiteit, Amsterdam, 185 pp.
- BLOWER, J.G. (1958): British millipedes (Diplopoda). With keys to the species. – Synopses of the British Fauna, No. 11. Linnean Society, London, 74 pp.

- BLOWER, J.G. (1985): Millipedes. Keys and notes for the identification of the species. – Synopses of the British Fauna, N.S., No. 35. E.J. Brill, London, 242 pp.
- BRADÉ-BIRKS, S.G. (1922): Notes on Myriapoda. XXVI. The names of some Julidae and Blaniulidae. – *Annals and Magazine of Natural History* (9) 9: 160-163.
- CEUCA, T. (1972): Alcuni Diplopodi epigei della fauna di Spagna raccolti dal Dr. Giuseppe Osella. – *Memorie del Museo civico di storia naturale di Verona* 20: 507-527.
- CHORNYI, N.G.; GOLOVATCH, S.I. (1993): Millipedes (Diplopoda) of the plain areas of the Ukraine. – Kiev, 58 pp.
- DAVID, J.F. (1995): Size criteria for the distinction between *Cylindroiulus londinensis* (Leach) and *Cylindroiulus caeruleocinctus* (Wood) (Diplopoda: Julidae). – *Journal of Natural History* 29 (4): 983–991.
- DJURSVOLL, P.; ALVESTAD, T.; SOLEVÅG, P.K. (2006): Myriapod records along the Sognefjord, Western Norway. – *Norwegian Journal of Entomology* 53 (2): 375–385.
- ENGHOFF, H. (1974): Om tusindbenenes udbredelse i Danmark (Diplopoda). [On the distribution of millipedes in Denmark] – *Entomologiske Meddelelser* 42: 21–32.
- ENGHOFF, H. (2007): Diplopoda. – Fauna Europaea version 1.3, <http://www.faunaeur.org> (accessed on 24.01.2009)
- FODDAI, D.; MINELLI, A.; SCHELLER, U.; ZAPPAROLI, M. (1995): Chilopoda, Diplopoda, Pauropoda, Symphyla. – In: MINELLI, A.; RUFFO, S.; LA POSTA, S. [eds]: Checklist delle specie della fauna italiana, Calderini, Bologna, 32/33: 1–35.
- GEOFFROY, J.J. (1996) The French millipede survey: towards a comprehensive inventory and cartography of the Diplopoda in France. – In: GEOFFROY, J.J.; MAURIES, J.P.; NGUYEN DUY-JACQUEMIN, M. [eds]: *Acta Myriapodologica*. – Mémoires du Muséum National d'Histoire Naturelle 169: 269-280.
- GOLOVATCH, S.I. (1984): [The distribution and faunogenesis of the millipedes of the USSR European part]. – In: CHERNOV, Y.I. [ed.] : [Faunogenesis and phylogenesis], Nauka, Moskva, 1984: 92–138.
- GOLOVATCH, S.I. (1992): Some patterns in the distribution and origin of the millipede fauna of the Russian Plain. – *Berichte des Naturwissenschaftlich-Medizinischen Vereins in Innsbruck, Suppl.* 10: 373-383.
- HAACKER, U. (1968): Deskriptive und experimentelle vergleichende Untersuchungen zur Autökologie rhein-mainischer Diplopoden. – *Oecologia* 1: 87–129.
- HOFFMANN, R.L. (1979): Classification of the Diplopoda. – Muséum d'Histoire Naturelle, Genève, 237 pp., 1980.
- HOPKIN, S.P.; READ, H.J. (1992): The biology of millipedes. – Oxford University Press, Oxford, 233 pp.
- JEDRYCZKOWSKI, W.B. (1992): The distribution and ecology of the millipedes in Poland. – In: MEYER, E.; THALER, K.; SCHEDL, W. [eds]: *Advances in myriapodology*. – *Berichte des Naturwissenschaftlich-Medizinischen Vereins in Innsbruck, Suppl.* 10: 385–391.
- JEEKEL, C.A.W. (2000): Some miscellaneous records of Chilopoda and Diplopoda from the Netherlands. – *Myriapod Memoranda* 2: 55–61.
- KIME, R.D. (1990a): A provisional atlas of European myriapods. Part 1. – *Fauna Europaea Evertebrata* 1: 1–109.
- KIME, R.D. (1990b): Spatio-temporal distribution of European millipedes. – In: MINELLI, A. [ed.]: *Proceedings of the 7th International Congress of Myriapodology*. Brill, Leiden, 480pp.: 367–380.
- KIME, R.D. (1992): On abundance of West-European millipedes (Diplopoda). – In: MEYER, E.; THALER, K.; SCHEDL, W. [eds]: *Advances in myriapodology*. – *Berichte des Naturwissenschaftlich-Medizinischen Vereins in Innsbruck, Suppl.* 10: 393–399.
- KIME, R.D. (1996): Millipedes recorded in the grand Duchy of Luxemburg. – In: GEOFFROY, J.-J.; MAURIÉS, J.P.; NGUYEN DUY-JACQUEMIN, M. [eds]: *Acta Myriapodologica*. – Mémoires du Muséum National d'Histoire Naturelle 169: 257–263.
- KIME, R.D. (1999): The continental distribution of British and Irish millipedes. – *Bulletin of the British Myriapod Group* 15: 33–76.
- KIME, R.D. (2004): The Belgian millipede fauna (Diplopoda). – *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie* 74: 35-68.
- KOCOUREK, P. (2004): Mnohonožky – skrytá fauna v Zoo Praha. – *Živa* 52: 169–171.
- KORSÓS, Z. (2005): The millipede fauna (Diplopoda) of Hungary: a zoogeographical account. – Abstracts of lectures and posters, 13th International Congress of Myriapodology, 25–29 July 2005, Bergen, Norway, p. 24.
- LINDNER, E.N. (2007): Einige Anmerkungen zum Vorkommen von *Stigmatogaster subterraneus* (Shaw, 1789) und *Henia veswiana* (Newport, 1845) (Chilopoda: Geophilida) in Deutschland sowie Überblick über deren Verbreitung in Europa. – *Schubartiana* 2: 49–56.
- LOKSHINA, I.E. [LOKŠINA] (1969): Opređelitel dvuparnonogich mnogonozhek Diplopoda ravinoj chasti evropejskoj territorii SSSR. – *Akademija nauk SSSR, Moskva*, 78 pp.
- LYFORD, W.H. (1943): The palatability of freshly fallen forest tree leaves to millipedes. – *Ecology* 24: 252–284.
- MACHADO, A. (1946): Contribuição para o conhecimento dos miriapodes de Portugal. – *Broteria* 15: 5–37.
- MAGURA, T.; TÓTHMÉRÉSZ, B.; MOLNÁR, T. (2004): Changes in carabid beetle assemblages along an urbanisation gradient in the city of Debrecen, Hungary. – *Landscape Ecology* 19: 74–759.

- MAGURA, T.; TÓTHMÉRÉSZ, B.; MOLNÁR, T. (2005): Species richness of carabids along a forested urban-rural gradient in eastern Hungary. – In: LÖVEI, G.L.; TOFT, S. [eds]: European Carabidology 2003. - DIAS Report 114, 2005: 209–217.
- MAGURA, T.; TÓTHMÉRÉSZ, B.; HORNUNG, E.; HORVÁTH, R. (2008): Urbanisation and ground-dwelling invertebrates. – In: WAGNER, L.N. [ed.]: Urbanization: 21st Century Issues and Challenges. 2008: 213–225.
- MAURIES, J.-P. (1964): Notes sur les diplopodes Pyrénéens I. Les *Cylindroiulus* du sous-genre *Bracheoiulus* Verhoeff. – Bulletin de la Société d'histoire naturelle de Toulouse 99: 444–449.
- MOCK, A. (2006): First record of *Cylindroiulus caeruleocinctus* (Diplopoda, Julidae) in Slovakia. – Biologia 61 (2): 144.
- PALMÉN, E. (1949): The Diplopoda of eastern Fennoscandia. – Annales zoologici Societatis zoologico-botanicae fennicae „Vanamo“ 13 (6): 1–54.
- PEDROLI-CHRISTEN, A. (1993): Faunistique des mille-pattes de Suisse (Diplopoda). – Documenta Faunistica Helvetiae, 14. Centre Suisse de cartographie de la faune, Neuchâtel, 167 + LXIII pp.
- READ, H.J. (1990): The generic composition and relationships of the Cylindroiulini – a cladistic analysis (Diplopoda, Julida: Julidae). – Entomologica scandinavica 21: 97–112.
- READ, H.J. (2007): The millipede genus *Cylindroiulus* Verhoeff, 1894 in North-West Spain and northern Portugal: Recent records and descriptions of four new species (Diplopoda, Julida, Julidae). – Graellsia 63 (2): 279–294.
- SCHAEFER, M. (1982): Studies on the arthropod faunas of green urban ecosystems. – In: BORNKAMM, R.; LEE, J.A.; SEAWARD, M.R.D. [eds]: Urban Ecology. The Second European Ecological Symposium. Blackwell, 1982: 65–73.
- SCHUBART, O. (1934): Tausendfüßler oder Myriapoda. I: Diplopoda. – In: DAHL, F. [ed.]: Die Tierwelt Deutschlands, No. 28, Jena, 318 pp.
- SERRA, A.; VICENTE, M.C.; MATEOS, E. (1996): Etude des communautes de myriapodes (Chilopoda et Diplopoda) des forets prepyreneennes (Huesca, Espagne). – In: GEOFFROY, J.J.; MAURIES, J.P.; NGUYEN DUY-JACQUEMIN, M. [eds]: Acta Myriapodologica. - Mémoires du Muséum National d'Histoire Naturelle 169: 187-204.
- SPELDA, J. (2006): Improvements in the knowledge of the myriapod fauna of Southern Germany between 1988 and 2005 (Myriapoda: Chilopoda, Diplopoda, Pauropoda, Symphyla). – In: VOIGTLÄNDER, K. [ed.]: Myriapoda in Europe. Habitats and Biodiversity. Contributions to the Colloquium of European Myriapodologists. – Peckiana 4 (2005): 101–129.
- THALER, K. (1988): Fragmenta Faunistica Tirolensia – VIII (Arachnida: Aranei, Opiliones; Myriapoda: Diplopoda; Insecta: Coleoptera). – Berichte des Naturwissenschaftlich-Medizinischen Vereins in Innsbruck 75: 115–124.
- VICENTE, M.C. (1985): Diplópodos epigeos de Cataluña, II (Julidos). – EOS, Revista Espanola de Entomologia 61: 321–350.

Received: 29.I.2009

Accepted: 27.X.2010