

FIRST REPORT OF THE MILLIPEDE *Oxidus gracilis* (DIPLOPODA, POLYDESMIDA, PARADOXOSOMATIDAE) IN SERBIA

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ABSTRACT. Ten specimens of *Oxidus gracilis* (C. L. Koch, 1847) were collected in the hothouse of Botanical Garden “Jevremovac” in Belgrade. This is the first finding of an alien millipede species in Serbia.

Key words: Serbia, hothouse, alien species, *Oxidus gracilis*.

INTRODUCTION

Presently, the Serbian millipede fauna comprises 103 species (ANTIĆ *et al.*, 2013, 2014; ANTIĆ, 2015; JOVANOVIĆ and ANTIĆ, 2015). The family Paradoxosomatidae belongs to the order Polydesmida, the second largest order of millipedes in Serbia with two families and 23 species (ANTIĆ *et al.*, 2013). *Oxidus gracilis* (C. L. Koch, 1847) is the second representative of the family Paradoxosomatidae and the 104th millipede species in Serbia. To date, millipede species alien to Europe were not registered in Serbia (DAISIE, 2008), but considering that *O. gracilis* is a widespread successful anthropochore (STOEV, 2004), it is not surprising that the network of pathways among European greenhouses and hothouses travelled by this species eventually has come to include Serbia.

MATERIALS AND METHODS

Ten specimens of *Oxidus gracilis* were collected in the hothouse of Botanical Garden “Jevremovac” in Belgrade. Specimens were preserved in 70% ethanol and examined at the laboratories of Institute of Zoology, Faculty of Biology, University of Belgrade, using Carl Zeiss Jena Technival 2 binocular stereomicroscope. Gonopods were dissected and mounted in glycerin as temporary microscopic preparations and observed under a Carl Zeiss Axioscope 40 microscope. Picture of the living specimens was made with a Canon PowerShot SX530 HS digital camera.

RESULTS AND DISCUSSION

Oxidus gracilis (C. L. Koch, 1947) (Fig. 1)

Fontaria gracilis C.L. Koch, 1847

Polydesmus gracilis: auctt.

Paradesmus gracilis: auctt.

Orthomorpha gracilis: auctt.

Orthomorpha (*Kalorthomorpha*) *gracilis*: auctt.

Material studied: Four adults (3 females and 1 male) and 6 juveniles were collected on 28 September 2015 by Dragan Antić in the hothouse of the Botanical Garden “Jevremovac” in Belgrade.

Details on biology of this well-known species have been given by SCHUBART (1934), CAUSEY (1943) and BLOWER (1985). It is the only millipede species alien to Europe with established populations in some natural ecosystems on the continent and in the Caucasus (STOEV *et al.*, 2010). Its bisexual populations are maintained by laying eggs during the whole year (CAUSEY, 1943; BLOWER, 1985).



Figure 1. *Oxidus gracilis* (C. L. Koch, 1847) in the hothouse of the Botanical Garden “Jevremovac” in Belgrade (photo D. Antić).

Origin: The native range of the species is East or Southeast Asia (STOEV and KORSÓS, 2010). COOK (1911) stated that the species originates from the East Indies. STOEV and KORSÓS (2010) expressed the assumption about Ryukyu Islands of Japan as the possible site of origin of the genus, based on the finding of populations of the two congeners of *O. gracilis* in the natural forest habitats of these islands. Three out of four congeners of *O. gracilis* are distributed in Japan, but not only in the Ryukyu Islands (NGUYEN and SIERWALD, 2013). Japan, as a native territory of *O. gracilis*, was previously indicated by GOLOVATCH and KIME (2009), who noticed that the species favors higher altitudes in Middle America which could possibly reflect a northern temperate origin.

Habitat: *O. gracilis* has a high adaptive potential which enables it to populate various types of terrestrial natural habitats, agricultural, horticultural and artificial areas and those under varying human influence, as well as subterranean habitats (STOEV and KORSÓS, 2010). Unable to survive longer than two hours under the temperature of -4°C , the species can only be found in the hothouses in the northern regions (STOEV and KORSÓS, 2010).

Specimens from the hothouse of the Botanical Garden “Jevremovac” in Belgrade were found in shaded conditions under stones and branches, or walking and mating on a moist soil

partially covered in moss (Figs 1 and 2). The species seems to have established a thriving population considering the observed reproductive behaviour and juveniles of different stadia. Temperature at the hothouse varies between 19–24°C.

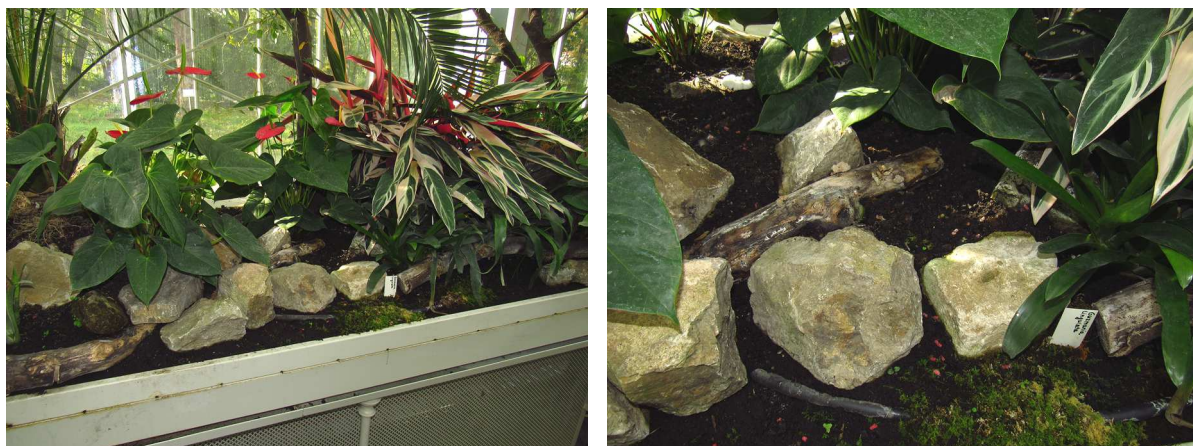


Figure 2. Habitat of *Oxidus gracilis* (C. L. Koch, 1847) in the hothouse of the Botanical Garden “Jevremovac” in Belgrade (photo D. Antić).

Distribution: Presumably, first finding of *O. gracilis* in Europe was on the Margaret Island in Danube, Budapest, reported by Tömösváry in 1879 (STOEV *et al.*, 2010). SCHUBART (1934) stated that the species was brought to the Netherlands probably around 1880, and that its presence has been reported in 1882. STOEV *et al.* (2010) noted that Latzel (1884) gave first descriptions of *O. gracilis* from several cities in the Netherlands. The millipede expanded its Asian range through tropical plants trade pathways that connect greenhouses and hothouses of cities across the world. It is possible that it has been introduced from Europe to the other parts of the world. SHELLEY *et al.* (1998) proposed that it “may be the world’s most common non-parasitic metazoan animal”.

The species is present in many parts of the world under favourable climatic conditions and in 33 European countries (STOEV and KORSÓS, 2010; STOEV *et al.*, 2010).

This is the first record of a myriapod from a hothouse/greenhouse in Serbia. Controlled temperature and humidity, as well as the variety of plant species have probably created a proper environment for some other alien myriapod species, which could be a suitable subject for more comprehensive study.

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