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NEW FACTS ABOUT DISTRIBUTION AND HOST SPECTRUM OF THE INVASIVE NEARCTIC CONIFER PEST, *LEPTOGLOSSUS OCCIDENTALIS* (HETEROPTERA: COREIDAE) IN SOUTH-WESTERN SLOVAKIA

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In the summer 2007, the alien coreid bug *Leptoglossus occidentalis* Heidemann, 1910 was observed in the Arboretum Mlyňany SAS. This important seed feeder of coniferous trees native to North America was detected on immature cones of *Pinus x schwerinii*. During the summer 2008, an occurrence of the western conifer seed bug was studied in collections of conifers in the arboretum as well as in parks and public greenery of several settlements in southwestern Slovakia. The seed bug was recorded on 11 pine species (*Pinus x schwerinii*, *P. strobus*, *P. ponderosa*, *P. sylvestris*, *P. nigra*, *P. mugo*, *P. flexilis*, *P. griffithii, P. armandii, P.densiflora* and *P. rigida*), 5 spruce species (*Picea abies*, *P. orientalis*, *P. engelmanii*, *P. wilsonii*, and *P. asperata*), on California incense cedar (*Calocedrus decurrens*) and on Douglas fir (*Pseudotsuga menziesii*). An appearance of natural enemies was studied on collected seed bugs and one individual was found infected with entomopathogenic fungus *Paecilomyces fumosoroseus*. This is the first record of natural infection of *L. occidentalis* by this fungus.

Key words: *Leptoglossus occidentalis, conifers, alien pests, south-western Slovakia*

V lete v roku 2007 sme objavili v Arboréte Mlyňany SAV nepôvodnú bzdochu z čeľade Coreidae, *Leptoglossus occidentalis* Heidemann, 1910. Tento významný škodca semien ihličnatých drevín v Severnej Amerike bol zistený v arboréte na nezrelých šiškách borovice *Pinus* x *schwerinii*. Počas leta 2008 sme študovali výskyt tejto bzdochy na zbierkach ihličnatých drevín Arboréta Mlyňany SAV a tiež v parkoch a na mestskej zeleni viacerých miest juhozápadného Slovenska. Výskyt bzdochy sme zaznamenali celkovo na 11 druhoch borovíc (*Pinus x schwerinii*, *P. strobus*, *P. ponderosa*, *P. sylvestris*, *P. nigra*, *P. mugo*, *P. flexilis*, *P. griffithii, P. armandii, P.densiflora* a *P. rigida*), 5

druhoch smrekov (*Picea abies*, *P. orientalis*, *P. engelmanii*, *P. wilsonii*, a *P. asperata*), na cédrovci (*Calocedrus decurrens*) a duglaske (*Pseudotsuga menziesii*). Sledovali sme aj výskyt prirodzených nepriateľov na odchytených a chovaných jedincoch v laboratóriu. Zaznamenali sme výskyt iba entomopatogénnej huby *Paecilomyces fumosoroseus*. Toto je zároveň aj prvý záznam prirodzeného výskytu uvedenej entomopatogénnej huby na bzdoche *L. occidentalis*.

Kľúčové slová: *Leptoglossus occidentalis*, *ihličnany, cudzokrajní škodcovia, juhozápadné Slovensko*

Leptoglossus occidentalis Heidemann, 1910, the western conifer seed bug, is a native species to North America where it is considered a major pest of conifer seed orchards (McPherson *et al.* 1990). This seed bug is a member of the family Coreidae (Heteroptera) and it was first described from California in 1910 (Bernardinelli & Zandigiacomo 2001). Since the second half of the last century, populations of the bug have been expanding eastward from its natural habitat on the west coast of North America. In the beginning of the 1990's, it reached the east coast of continent (e.g. New York State and Pennsylvania) (McPherson *et al.* 1990, Wheeler 1992) and in 1999; it was recorded from Europe, near the town of Vicenza in northern Italy (Tescari 2001). This first European record was soon followed by findings in further localities in Italy and other European countries. It is obvious from its European distribution that this species is very invasive. Over a period of nine years it had invaded Slovenia, Croatia, Hungary, Switzerland, Austria, Spain, Germany, Czech Republic, France, Slovakia, Poland, Belgium and Great Britain (Bernardinelli & Zandigiacomo 2001, 2002; Tescari 2001, 2003, 2004; Gogala 2003, Hipold 2005, Rabitsch & Heiss 2005, Ribes & Escolà 2005, Harmat *et al.* 2006, Moullet 2006, Aukema & Libeer 2007, Malumphy & Reid 2007, Lis *et al.* 2008). In Slovakia, Majzlan & Roháčová (2007) published the first occurrence of the seed bug. The authors of this finding provided just brief information about a discovery of this species on a balcony of house in Bratislava in October 19, 2007. However, no data about its population density, host spectrum or distribution have been presented. The western conifer seed bug was also recorded accidentally in collections of coniferous trees in the Arboretum Mlyňany SAS (south-western Slovakia) in July 2007. Further inspections of coniferous trees revealed a feeding activity of the seed bug in several sites of the arboretum and suggested a stable establishment of the alien species population in this environment.

Up to now, majority of *L. occidentalis* records from Europe provide just information about dates and locations of its occurrence. A range of food plants has not been studied in conditions of Europe, although this polyphagous conifer pest can attack a great variety of coniferous trees in North America (Hedlin *et al.* 1981). During our regular surveys on pestiferous insects in collections of coniferous woody plants in the Arboretum Mlyňany SAS we focused on occurrence of *L. occidentalis*. In this paper, we provide new data on a distribution of *L. occidentalis* in southwestern Slovakia and a list of coniferous species attacked by this seed bug.

2. Materials and Methods

Monitoring of the seed bug was carried out regularly in the Arboretum Mlyňany SAS (48°19´ 12´´ N, 18°22´ 09´´ E) during 2008 and irregular collections were also performed in several localities in southwestern Slovakia. In the Arboretum Mlyňany SAS, the monitoring was carried out once a month and the regular observations were performed by visual examination of cones on trees from May to October. In each sampling a total of 60 coniferous trees were observed for 3 minutes per tree. The cohort of sampling trees was chosen to cover the whole range of pinaceous taxa growing in the arboretum. All the specimens of *L. occidentalis*, which were found on the lower branches, were collected using an entomological net. For each specimen collected its life stage (nymph or adult) was determined and all the insects were counted. A coniferous species was considered to be a possible host for the seed bug only if the bugs were found feeding with inserted stylets into cone tissues. The collected seed bugs were transferred to entomological cages (30 × 30 × 60 cm) in laboratory and supplied with fresh food (twigs with immature spruce cones). The captured specimens were reared for at least 2 months for observation of possible natural enemies.

3. Results and Discussion

The first finding of *L. occidentalis* (unpublished) in the Arboretum Mlyňany SAS was done on immature cones of *Pinus* x *schwerinii* Fitschen in July 2, 2007. Four adults and seven nymphs were observed on those cones. In the course of summer 2007, we observed the seed bug several times on this pine. After a short investigation of cones on sunny sides of the trees, we could find small groups of *L. occidentalis* individuals disappearing quickly when disturbed. Results of the seed bug occurrence in the arboretum and on conifers growing in public greenery of several settlements in southwestern Slovakia during 2008 are summarized in Table 1. Altogether, the seed bug was recorded feeding on 11 pine species (*Pinus x schwerinii*, *Pinus strobus* L., *Pinus ponderosa* Dougl. ex Law., *Pinus sylvestris* L., *Pinus nigra* Arnold, *Pinus mugo* Turra, *Pinus flexilis* James, *Pinus griffithii* McClelland, *Pinus densiflora* Sieb. et Zucc., *Pinus armandii* Franch. and *Pinus rigida* Mill.), 5 spruce species (*Picea abies* (L.) Karst., *Picea orientalis* (L.) Link, *Picea wilsonii* Mast., *Picea engelmanii* (Parry) Engelm. and *Picea asperata* Mast.), on California incense-cedar (*Calocedrus decurrens* (Torr.) Florin) and on Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco). In the arboretum, the greatest number of seed bugs was collected in August. An average number of seed bugs on attacked cones of *P. x schwerinii* was 4.45 ($n = 50$) in this month. All collected individuals were captured in rearing cages and presence of parasitoids or insect diseases was monitored. No parasitoids of adults and nymphs were observed and only one individual died from a fungal disease. The fungal pathogen was identified as *Paecilomyces fumosoroseus* (Wize) Brown and Smith (Ascomycetes: Hypocreales). Although, this is the first record of natural infection of *L. occidentalis* by *P. fumosoroseus*, in laboratory conditions this seed bug showed a susceptibility to an artificial inoculation with other entomopathogenic fungus, *Beauveria bassiana* (Balsamo) Vuellemin (Rumine & Barzanti 2008).

L. occidentalis is a polyphagous conifer pest with a rather broad host range in its native range. It can attack about 40 species of conifers in the USA and Canada (Hedlin *et al.* 1981), where it can have a significant impact on seed production in lodgepole pine (*Pinus contorta* Dougl. ex Loud.) (Strong *et al.* 2001, Bates *et al.*

Table 1. List of localities with records of *L. occidentalis* in southwestern Slovakia in 2008

Locality	**DFS***	**Host tree species**	**Date of finding**
Arboretum Mlyňany SAS	7676	*Pinus* (11 species), *Picea* (5 species), *Calocedrus decurrens, Pseudotsuga menziesii*	May – October
Vráble	7775	*Pinus nigra*	September 17
Nitra	7674	*Pinus nigra, Pseudotsuga menziesii, Picea abies*	August 16, September 27
Vinodol	7875	*Pinus nigra*	August 16
Komjatice	7875	*Pinus nigra*	July 19
Palárikovo	7974	*Pseudotsuga menziesii*	July 26
Nové Zámky	8074	*Pinus nigra*	July 26
Bratislava	7868	*Pinus nigra*	August 30
Jatov	7874	*Pinus nigra*	July 26
Trnava	7671	*Picea abies*	September 20
Prievidza	7277	*Picea abies*	October 4
Zlaté Moravce	7676	*Pinus sylvestris*	September 6
Topoľčianky	7576	*Pinus nigra, Picea abies*	July 6
Hurbanovo	8175	*Pinus nigra*	August 23

**Map squares of the Databank of Slovak fauna; http://www.dfs.sk, STLOUKAL & GRUJBÁROVÁ (2009)*

2002), Douglas fir (*P. menziessi*) (BATES *et al*. 2000), and western white pine (*Pinus monticola* Dougl. ex D. Don) (CONNELLY & SCHOWALTER 1991). In European conditions, the spreading of this alien species can be readily documented from the first records published in particular countries, however only insufficient information can be found on its host spectrum. Due to specificities of the seed bug life history, its first records were mainly done outside of its host. Although our current results indicate a rather broad host spectrum of this species in Europe, most of host conifers mentioned in this paper are ornamental trees of limited silvicultural value in our region. On the other hand, this information is necessary for further studies of the seed bug life history and establishment in the new environment. The facts that *L. occidentalis* is invasive species in Europe, it can overwinter successfully in Central European climate, it has a broad host range and significant impact on seed production of conifers in its natural range can pose a serious threat to conifer seed orchards in Europe and suggest consequent environment and economic damage.

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Súhrn

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leta 2008 sme študovali výskyt tejto bzdochy na zbierkach ihličnatých drevín Arboréta Mlyňany SAV a tiež v parkoch a na mestskej zeleni viacerých miest juhozápadného Slovenska. Výskyt bzdochy sme zaznamenali celkovo na 11 druhoch borovíc (*Pinus x schwerinii*, *P. strobus*, *P. ponderosa*, *P. sylvestris*, *P. nigra*, *P. mugo*, *P. flexilis*, *P. griffithii*, *P. armandii*, *P.densiflora* a *P. rigida*), 5 druhoch smrekov (*Picea abies*, *P. orientalis*, *P. engelmanii*, *P. wilsonii*, and *P. asperata*), na cédrovci (*Calocedrus decurrens*) a duglaske (*Pseudotsuga menziesii*). Sledovali sme aj výskyt prirodzených nepriateľov na odchytených a chovaných jedincoch v laboratóriu. Zaznamenali sme výskyt iba entomopatogénnej huby *Paecilomyces fumosoroseus*. Toto je zároveň aj prvý záznam prirodzeného výskytu uvedenej entomopatogénnej huby na bzdoche *L. occidentalis*.