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Double-spined bark beetle (*Ips duplicatus*) (Coleoptera: Curculionidae): a new host – Douglas fir (*Pseudotsuga menziesii*) – Short Communication

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ABSTRACT: Spruces (*Picea* spp.) are considered to be the primary host trees of the double-spined bark beetle *Ips duplicatus* (Sahlberg, 1836), but occurrences on pines (*Pinus* spp.) are often reported. This paper documents the first recorded successful development of *I. duplicatus* on Douglas fir (*Pseudotsuga menziesii*) (Mirbel) Franco. Two densely infested Douglas fir trees were found in a forest dominated by Norway spruce (*Picea abies*) (L.) H. Karst., close to the village of Valšovice (Czech Republic). *Ips duplicatus* is an oligophagous species that attacks different coniferous tree species but was not previously reported to develop on Douglas fir. The infestation of Douglas fir recorded in the present study was most likely promoted by a large population of *I. duplicatus* in the studied region combined with a local lack of primary host trees as a consequence of bark beetle outbreak.

Keywords: Czech Republic; forestry; pest; Scolytinae

Double-spined bark beetle, *Ips duplicatus* (Sahlberg, 1836), is a boreo-alpine species native to northern parts of Eurasia, with some sporadic occurrence in Central Europe (Pfeffer 1955, 1995). However, *I. duplicatus* is currently expanding to southern regions (Piel et al. 2006; Holuša et al. 2010; Duduman et al. 2011), which is evidenced by outbreaks in Central Europe (Turčani, Hlásný 2007; Holuša et al. 2010; Olenici et al. 2011) and Central Asia (Zhang et al. 2001).

The major host tree species of *I. duplicatus* are various spruces: *Picea jezoensis* (Siebold & Zucc.) Carrière, *Picea mongolica* W. D. Xu and *Picea obovata* Ledeb. in Asia and *Picea abies* (L.) H. Karst. in Europe (Escherich 1923; Pfeffer 1989; Mrkva 1994, 1995; Zhang et al. 1995; Holuša, Grodzki 2008). This beetle is regularly reported on *Pinus sylvestris* L. and *Pinus sibirica* Du Tour and also on other conifers, *Abies alba* Mill., *Juniperus* sp. L., *Larix decidua* Mill., *Larix gmelinii* (Rupr.) Kuzen., *Larix sibirica* Ledeb., *Pinus cembra* L., *Pinus koraiensis* Siebold & Zucc., *Pinus strobus* L. (Spessivtseff 1921; Saalas 1923; Mrkva 1994; Holuša, Grodzki 2008), albeit much less frequently.

Adult beetles mainly infest the upper part of the trunk, up to the crown of 40–70 year-old stressed trees (Pfeffer 1955; Mrkva 1994, 1995; Pfeffer, Knížek 1995; Grodzki 2012). Mid and basal parts of trees are attacked only under outbreak conditions, as reported by Grodzki (2012), or in situations when other competitive bark beetles are missing (cf. Schlyter, Anderbrant 1993). These beetles also prefer sunlit trees along the margins of stands (Mrkva 1995; Grodzki 1999). Depending on the location and climatic conditions, one to three generations per year are possible (Schnaider, Sierpiński 1955; Holuša et al. 2003). *Ips duplicatus* is generally considered to be a secondary pest (Holuša 2001) and an important mortality factor for Norway spruce (Mrkva 1994, 1995; Holuša et al. 2010). Therefore, *I. duplicatus* is listed as a quarantine pest by the European Union and European and Medi-

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terranean Plant Protection Organisation (Smith et al. 1996). Moreover, the importance of this bark beetle is presently rising because its population, the number of outbreaks and volume of spruce timber attacked by this species and removed from stands are increasing in Central Europe (Holuša et al. 2010).

On the 1st of March 2014, we found approximately 50 dead individuals (9 ex. leg. det. et coll. J. Kašák, rev. J. Foit) of *I. duplicatus* in two felled Douglas fir trees (*Pseudotsuga menziesii* [Mirbel] Franco) (Pinaceae) close to the village of Valšovice (central Moravia, Czech Republic, 49°31'11.581"N, 17°42'8.727"E, 400 m a.s.l.). The infested Douglas fir trees were originally next to a road in a stand dominated by Norway spruce (*Picea abies*) and can be characterised as semi-shaded trees. The mid and upper parts of the trunks from 5 m to the crown (8–32 cm in diameter) were infested. The stems of both trees were densely colonised, with an average of 32.5 (SD = 3.4) exit holes of *I. duplicatus* per 1 dm^2 counted (n = 10; 5 from each tree). Several dead *I. duplicatus* individuals were found to be trapped in resin in the bark while boring entrance holes. This observation indicates that the trees were still alive and relatively vigorous when the beetles arrived. The present paper provides the first evidence of the successful development of *I. duplicatus* on *P. menziesii*.

Ips duplicatus as well as many other members of the genus *Ips* is an oligophagous species on conifers and is able to develop successfully in various tree species belonging to different genera of Pinaceae (Pfeffer 1995). Accordingly, Mrkva (1994), Holuša and Grodzki (2008) reported the occurrence of *I. duplicatus* on the various conifer trees mentioned above. Given these facts, it is likely that *I. duplicatus* can easily adopt a new host tree from the family Pinaceae, including some introduced tree species (*P. menziesii* is native to the western part of North America). Additionally, the recorded infestation of Douglas firs could be substantially promoted by high pressure due to a large population of *I. duplicatus* combined with a local lack of primary host trees as a consequence of an outbreak of these bark beetles. In general, a strong population of *I. duplicatus* is reported in the studied region (Mrkva 1995; Holuša et al. 2010), an area where Norway spruce is by far the most widespread tree species. Moreover, the infested Douglas firs were only approximately 200 m distant from a sawmill, which may support the local population of bark beetles, as previously documented by Langström and Hellqvist (1990) and Borkowski (2001).

Currently, Douglas fir is a popular forestry species, and its proportion in stands is increasing in Central Europe (Ferron, Douglas 2010; Podrázský et al. 2013). However, development of some aggressive bark beetles (*Ips typographus* [L.] and *Pityogenes chalcographus* [L]) was reported from felled Douglas firs (Bertheau et al. 2012), this tree species is not significantly threatened by any bark- or woodboring pest in Europe (Pfeffer 1995; Sláma 1998). Based on the finding presented here, *I. duplicatus* might be a threat to Douglas fir trees. The actual capability of *I. duplicatus* to cause damage to Douglas fir needs to be verified by future studies.

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