

## 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 korai-*

*ensis* 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 1<sup>st</sup> 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<sup>2</sup> 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 wood-boring 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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## References

- Bertheau C., Salle A., Rossi J.P., Bankhead-Dronnet S., Pineau X., Roux-Morabito G., Lieutier F. (2009): Colonisation of native and exotic conifers by indigenous bark beetles (Coleoptera: Scolytinae) in France. *Forest Ecology and Management*, 258: 1619–1628.
- Borkowski A. (2001): Threats to pine stands by the pine shoot beetles *Tomicus piniperda* (L.) and *Tomicus minor* (Hart.) (Col., Scolytidae) around a sawmill in southern Poland. *Journal of Applied Entomology*, 125: 489–492.
- Duduman M.L., Isaia G., Olenici N. (2011): *Ips duplicatus* (Sahlberg) (Coleoptera: Curculionidae, Scolytinae) distribution in Romania – preliminary results. *Bulletin of the Transilvania University of Brasov, Series II*, 53: 19–26.
- Escherich K. (1923): *Die Forstinsekten Mitteleuropas*. Vol. 2. Berlin, Parey: 663.
- Ferron J.L., Douglas F. (2010): Douglas-fir in France: history, recent economic development, overviews for the future. In: Spiecker H., Kohnle U., Makkonen-Spiecker K., Von Teuffel K. (eds): *Opportunities and risks for Douglas fir in a changing climate*. Freiburg, Oct 18–20, 2010: 11–13.
- Grodzki W. (1999): Problematika výskytu lýkožrouta severského *Ips duplicatus* (Sahlberg) (Coleoptera: Scolytidae) na území Polska. *Zpravodaj ochrany lesa*, 5: 13–15.
- Grodzki W. (2012): Two types of Norway spruce *Picea abies* (L.) H. Karst. infestation by the double spined bark beetle *Ips duplicatus* C.R. Sahlb. (Coleoptera: Scolytinae) in southern and north-eastern Poland. *Folia Forestalia Polonica, Series A*, 54: 169–174.
- Holuša J. (2001): Is dying of spruce forest in Silesia a result of drought, fungi or bark beetles? *Journal of Forest Science*, 47: 100.
- Holuša J., Zahradník P., Knížek M., Drápela K. (2003): Seasonal flight activity of the double-spined spruce bark-beetle *Ips duplicatus* (Coleoptera, Curculionidae, Scolytinae) in Silesia (Czech Republic). *Biologia*, 58: 935–941.

- Holuša J., Grodzki W. (2008): Occurrence of *Ips duplicatus* (Coleoptera: Curculionidae, Scolytinae) on pines (*Pinus* sp.) in the Czech Republic and southern Poland – Short communication. *Journal of Forest Science*, 54: 234–236.
- Holuša J., Lubojacký J., Knížek M. (2010): Distribution of double-spined spruce bark beetle *Ips duplicatus* in the Czech Republic: spreading in 1997–2009. *Phytoparasitica*, 38: 435–443.
- Langström B., Hellqvist C. (1990): Spatial distribution of crown damage and growth losses caused by recurrent attacks of pine shoot beetles in pine stands surrounding a pulp mill in southern Sweden. *Journal of Applied Entomology*, 110: 261–269.
- Mrkva R. (1994): Lýkožrout severský (*Ips duplicatus* Sahlberg), nový významný škůdce na smrku. *Lesnická práce*, 73: 35–37.
- Mrkva R. (1995): Nové poznatky o bionomii, ekologii a hubení lýkožrouta severského. *Lesnická práce*, 74: 5–7.
- Olenici N., Duduman M.L., Olenici V., Bouriaud O., Tomescu R., Rotariu C. (2011): The first outbreak of *Ips duplicatus* in Romania. In: Delb H., Pontuali S. (eds): Proceedings of the Working Party 7.03.10 Methodology of Forest Insect and Disease Survey in Central Europe. Freiburg, Sept 20–23, 2010: 135–140.
- Piel F., Grégoire J.C., Knížek M. (2006): New occurrence of *Ips duplicatus* Sahlberg in Herstal (Liege, Belgium). *OEPP/EPPO Bulletin*, 36: 529–530.
- Podrázský V., Čermák R., Zahradník D., Kouba J. (2013): Production of Douglas-fir in the Czech Republic based on national forest inventory data. *Journal of Forest Science*, 59: 398–404.
- Pfeffer A. (1955): Fauna ČSR. Svazek 6. Kůrovci Scolytoidea. (Řad: Brouci – Coleoptera). Praha, Nakladatelství Československé akademie věd: 324.
- Pfeffer A. (1989): Kůrovcovití (Scolytidae) a jádrohlodovití (Platypodidae). Praha, Academia: 137.
- Pfeffer A. (1995): Zentral- und westpaläarktische Borken- und Kernkäfer: (Coleoptera: Scolytidae, Platypodidae). Basel, *Pro Entomologia*: 310.
- Pfeffer A., Knížek M. (1995): Expanze lýkožrouta *Ips duplicatus* (Sahlb.) ze severské tajgy. *Zpravodaj ochrany lesa*, 2: 8–11.
- Saalas U. (1923): Die Fichtenkäfer Finnlands. *Annales Academie Scientiarum Fennicae, Serie A*, 22: 746.
- Schlyter F., Anderbrant O. (1993): Competition and niche separation between two bark beetles: existence and mechanisms. *Oikos*, 68: 437–447.
- Sláma M.E.F. (1998): Tesaříkovití – Cerambycidae České Republiky a Slovenské Republiky. Krhanice: 399.
- Schnaider Z., Sierpiński Z. (1955): Z biologie kornika zrosložebnego (*Ips duplicatus* Sahlb.). *Roczniki Nauk Leśnych, Prace Instytutu Badawczego Leśnictwa*, 13: 59–68.
- Smith I.M., McNamara D.G., Scott P.R., Holderness M. (eds) (1996): *Quarantine Pests for Europe*. Wallingford, CAB International: 1425.
- Spessivtseff P. (1921): Beitrag zur Kenntnis der Borkenkäferfauna Schwedens. *Entomologisk Tidskrift*, 42: 219–223.
- Turčáni M., Hlásný T. (2007): Spatial distribution of four spruce bark beetles in north-western Slovakia. *Journal of Forest Science*, 53: 45–52.
- Zhang Q.H., Schlyter F., Liu G.T. (1995): Spatial distribution, mortality and sex ratio of overwintering *Ips duplicatus* in a *Picea mongolica* reserve in Inner Mongolia, China with a diffusion model. In: Hain F.P., Salom S.M., Ravlin W.F., Payne T.L., Raffa K.F. (eds): *Behavior, Population Dynamics, and Control of Forest Insects*. Proceedings of a Joint IUFRO Working Party Conference. Maui, Feb 6–11, 1994: 109–122.
- Zhang Q.H., Liu G.T., Schlyter F., Birgersson G., Anderson P., Valeur P. (2001): Olfactory responses of *Ips duplicatus* from inner Mongolia, China to non host leaf and bark volatiles. *Journal of Chemical Ecology*, 27: 995–1010.

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