Occurrence and distribution of the northern bark beetle, *Ips duplicatus* (Sahlberg, 1836), in Austria

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Abstract: *Ips duplicatus* (Sahlberg) (Coleoptera, Scolytinae) gilt als boreo-alpine Art. Nach einigen frühen, nicht gesicherten Meldungen aus dem 19. Jahrhundert wurde *I. duplicatus* in Österreich ab den 1980er Jahren in der Nähe holzimportierender Betriebe gefunden. Angeregt durch zunehmende Funde in Ostösterreich ab 2013 und Berichte über Schäden in der Tschechischen Republik wurde 2017 ein österreichweites Monitoring mit Pheromonfallen (Theysohn Schlitzfallen, beködert mit Dupliwit) initiiert. Auf 19 von 27 Standorten wurde *I. duplicatus* nachgewiesen. Funde wurden in allen Bundesländern (außer Wien, wo keine Fallen platziert wurden) gemacht, in den meisten Fällen waren die Fallen in Wäldern, bei denen kein direkter Einfluss durch holzimportierende Betriebe gegeben war. Der Flugverlauf ähnelte dem des Buchdruckers. Im Jahr 2018 wurde darüber hinaus erstmals ein Stehendbefall an Fichten, gemeinsam mit *Ips typographus*, nachgewiesen. Das Fallenmonitoring zeigt, dass *I. duplicatus* in Österreich weit verbreitet und etabliert ist.

Key Words: *Ips duplicatus*, Scolytinae, range expansion

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Ips duplicatus is considered a boreo-alpine species, originally described from Finland as *Bostrichus duplicatus* by Sahlberg (1836). Only sporadic records existed from Central Europe until a few decades ago (Pfeffer 1995). Outbreaks of *I. duplicatus* were reported from Poland and the Czech Republic in the 1990s; the species has been detected with pheromone traps in the entire area of the Czech Republic (Holuša & al. 2010). In 2006, the occurrence of *I. duplicatus* was reported from northwest and central Slovakia (Zúbrik & al. 2006). The range of the beetle has been expanding since then with increasing impact on spruce forests (Lorenc & al. 2018; Petercord & Lemme 2018). Currently, the presence of *I. duplicatus* is listed for 15 EU Member States (Austria, Belgium, Bulgaria, Czech Republic, Croatia, Estonia, Finland, Germany, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Sweden) and five other countries (Belarus, Norway, Russia, Serbia, Ukraine) (EFSA Panel on Plant Health 2017, CABI 2018, EPPO 2018). Greece, Ireland and the United Kingdom are free from the pest and classified as protected zones.

Historic records of *Ips duplicatus* in Austria

Early, unconfirmed reports. The *Fauna Austriaca* by Redtenbacher (1874) is a frequently cited reference for the occurrence of *I. duplicatus* in Austria. However, based on discussions in contemporary literature (Kratz 1876, Eichhoff 1877, Henschel 1878) we assume that this record is based on an erroneous identification; the beetle in question was rather *Ips amitinus*. A second reference (e.g. in Reitter 1916, Escherich 1923) appears to be based on the description of a "*Tomicus infucatus* n. sp." by Eichhoff (1878) from one specimen collected in Styria. Wachtl (1884) and Reitter (1894) doubt this new description and point out the similarity to *Ips judeichii*, which is synonym to *I. duplicatus*. Horion (1951) lists *I. duplicatus* for Lower Austria and Styria but mentions the low reliability because of lacking specimens.

The late 20th Century. From the late 1980s on, *I. duplicatus* was found in pheromone traps for *I. typographus* in the vicinity of wood processing industry. Moreover, *I. duplicatus* was intercepted on imported timber (Holzschuh 1989) indicating a connection between the recent findings and wood import. An attack of spruce trees near a saw mill in northern Lower Austria was reported in 2000 (Tomiczek & al. 2001). Pheromone traps deployed near this and other saw mills in the area in the following year caught numerous specimens of *I. duplicatus* (H. Krehan, personal communication). Overall, the species was recorded in north-western Lower Austria and central Upper Austria.

In 2013, one of the authors (GS) noticed a single specimen of *I. duplicatus* in a Pheroprax-baited (BASF) monitoring trap for *I. typographus* placed in a forest area in central Lower Austria with no wood industry or wood trading facility in the vicinity. Following this finding, a trap baited with the specific lure Dupliwit (Witasek Pflanzenschutz GmbH, Feldkirchen) was installed on this site. Since then, specimens (Fig. 1) have been caught in this area every year.

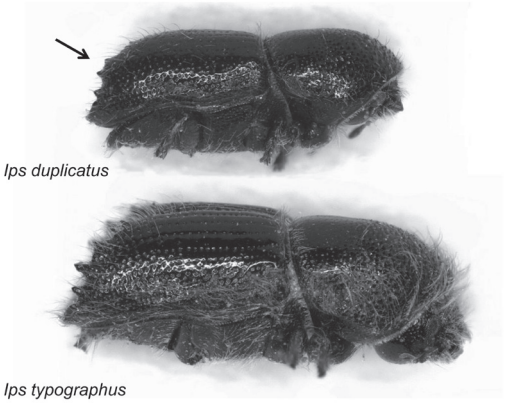

Fig. 1: *Ips duplicatus* from a pheromone trap in lower Austria in comparison to *Ips typographus*. The elytral declivity of *I. duplicatus* is punctuated and shiny, with four teeth on each side. The 2nd and 3rd tooth on the declivity originate from a common basis (arrow); 3rd tooth is not distinctly capitate; distance between sutural teeth equal or smaller than distance to 2nd tooth. Photos: J. Connell, BFW.

Survey with pheromone traps in 2017

Motivated by the findings in our monitoring trap and increasing reports of damage from the Czech Republic, we started a trap-based survey in 2017. Theysohn traps were baited with Dupliwit and placed at ca. 1.5 m height in open areas in or near spruce forests. Traps were operated in all Austrian Federal Provinces except Vienna on a total of 27 sites. The trapping period on each site was at least six weeks covering June and July. *I. duplicatus* was confirmed in all Provinces. Specimens were caught on 19 sites (Fig. 2); in most cases there was no direct influence from wood processing industry or timber trade.

The flight phenology of *I. duplicatus* was similar to the one of *I. typographus*. The traps on a monitoring site in Lower Austria revealed a similar onset of spring swarming in mid April 2018 and two peaks in late May to early June as well as early August (Fig. 3) likely indicating flights of 1st and 2nd filial generation. Total numbers of *I. duplicatus* were much lower than numbers of *I. typographus* in a trap baited with Pheroprax placed in 50 m distance on the same site.

In the summer of 2018, for the first time in Austria an attack of standing spruce (*Picea abies*) by *I. duplicatus* without direct influence from timber storage was recorded in a forest in Lower Austria (Fig. 3). Attacked trees were also infested by *I. typographus*. *I. duplicatus* galleries were established in parts with thinner bark. Breeding galleries consisted of two to three slightly undulated maternal galleries originating from a nuptial chamber, which was covered in most cases but sometimes open. Mother galleries were thinner than the ones of *I. typographus*.

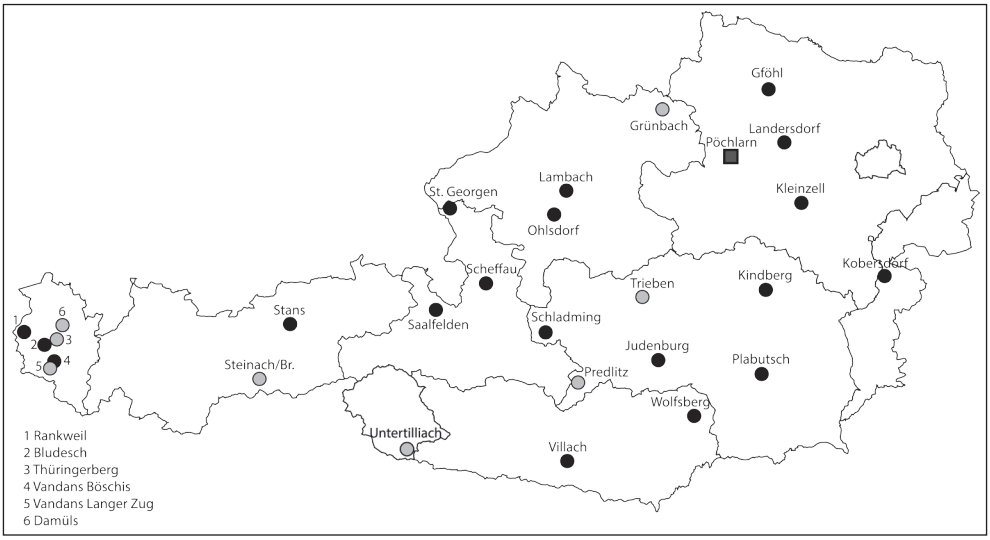

Fig. 2: Results of the trap-based *Ips duplicatus* survey in Austria, 2017 (Theysohn traps baited with Dupliwit): Dark grey dots = *I. duplicatus* present; light grey dots = *I. duplicatus* not present. Grey square = first confirmed infestation in a forest distant from timber storage.

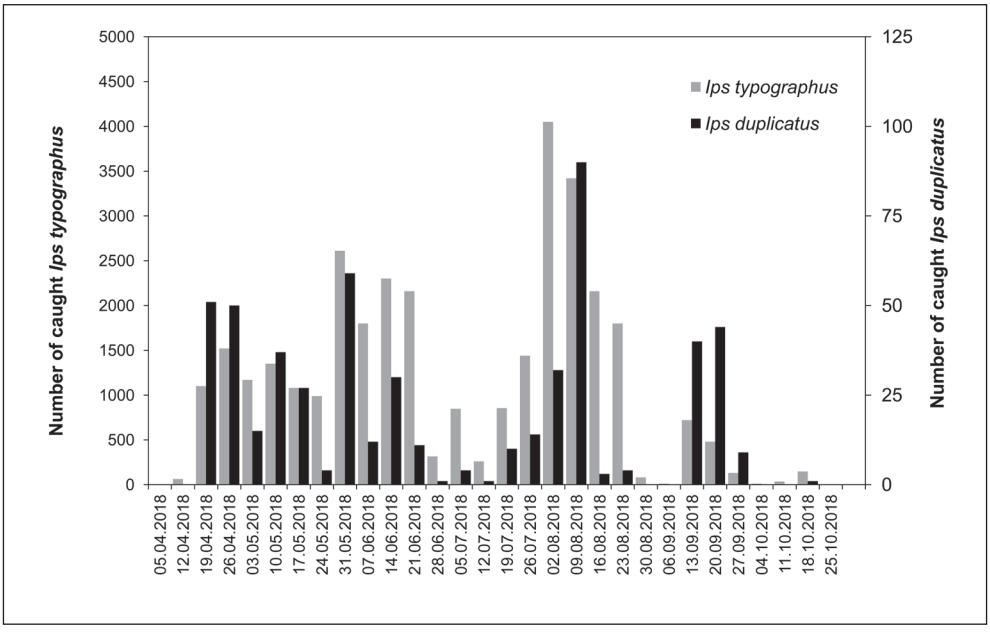

Fig. 3: Weekly trap catches of *Ips duplicatus* (lure: Dupliwit) and *Ips typographus* (lure: Pheroprax) on the monitoring site Landersdorf, Lower Austria in 2018. Note the different scales.

Conclusions

The pheromone trap survey in 2017 ascertained that *I. duplicatus* is widely distributed and can be considered established in Austria. Its occurrence is not restricted to areas directly influenced by wood processing industry or timber trade. Therefore, trap catches are not just interceptions but represent established populations. *I. duplicatus* can be surveyed easily by trapping with efficient pheromone lures. Despite the wide presence in the pheromone survey, we know of only one recent record of *I. duplicatus* attacking standing spruce (see above). We assume that the species has been overlooked in attacked trees in recent years. Forest personnel will likely attribute an attack to the well known *I. typographus* and the morphologically similar breeding galleries of *I. duplicatus* will not be recognized.

The origin of the population(s) in Austria remains unknown. A connection to timber imports from north-east Europe in the late 20th Century is likely. We assume that the observed distribution is the result of a range expansion in recent decades. The status of the early reports from Austria from the 19th Century remains unresolved; many of them appear questionable. Examining Eichhoff's *Tomicus infucatus* specimen would be of interest.

Acknowledgements

We thank foresters and forest protection experts of the Province Forest Authorities for operating the traps and sending the specimens during the survey.

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