Attraction of *Epuraea bickhardti* St.-Claire Deville and *E. boreella* (Zetterstedt) (Coleoptera, Nitidulidae) to ethanol and α-pinene

L. M. Schroeder

Schroeder, L. M. 1993: Attraction of *Epuraea bickhardti* St.-Claire Deville and *E. boreella* (Zetterstedt) (Coleoptera, Nitidulidae) to ethanol and α-pinene. — Entomol. Fennica 4:133–135.

High numbers of *Epuraea* beetles (Coleoptera, Nitidulidae) were caught in flight barrier traps baited with ethanol and the conifer monoterpene α-pinene. Of the *Epuraea* beetles caught, 95% were *E. bickhardti* and 3% were *E. boreella*. *E. bickhardti* was strongly attracted by ethanol alone. Ethanol in combination with α-pinene attracted both *E. bickhardti* and *E. boreella*. No sex related differences between treatments were detected for either of the species.

L. M. Schroeder, Swedish University of Agricultural Sciences, Division of Forest Entomology, S-75007 Uppsala, Sweden

1. Introduction

The genus *Epuraea* (Coleoptera, Nitidulidae) comprises 39 species in Fennoscandia (Lundberg 1986). Information about the biology of *Epuraea* species is scarce in the literature. One reason for this may be that the adults of many of the species are morphologically very similar. Thus reliable identifications generally have to be based on the appearance of the male genitalia. *Epuraea* species have been demonstrated to breed in dead or dying trees attacked by bark beetles, in sap flows from damaged trees, and in fungi (Nuorteva 1956, Palm 1959, Freude et al. 1967). Many beetle species inhabiting dead or dying trees are attracted by volatiles released from this kind of substrate. In earlier studies (Schroeder 1988, Schroeder & Lindelöw 1989) high numbers of *Epuraea* beetles were caught in traps baited with the degradation product ethanol and the conifer monoterpene α-pinene. However, no detailed analysis of the species of *Epuraea* caught in those studies was made.

The aim of this study was to find out which of the *Epuraea* species present in conifer forests are attracted in flight to ethanol and α-pinene.

2. Materials and methods

The study presented here is based on *Epuraea* material obtained in earlier field experiments conducted in a mixed stand of Scots pine and Norway spruce in central Sweden (Schroeder 1988). The attraction of beetles to ethanol and α-pinene was studied with flight barrier traps.

In 1986 (May 2–May 4) attraction of beetles to (–)-α-pinene (Fluka 97%) alone and in combination with four different release rates of 95% ethanol (5% water) was studied (Table 1). Release rates were estimated in the laboratory by measuring the weight loss of the dispensers (vials with differently sized openings) over time when placed in a wind tunnel at 0.5 m/s and +15°C. Unbaited control traps were included in the experiment. The six treatments were arranged in 15

randomized blocks. The distance between traps in each block was at least 6 m and the distance between blocks at least 10 m. After this experiment the same experimental setup was used to assess attraction to ethanol alone (May 5–May 6). The release rates employed in this experiment were the same as those used in the previous experiment. For further experimental details, see Schroeder 1988.

Sex determinations were made by dissection for *E. boreella* (Zetterstedt) and by examining the middle tibia for *E. bickhardti* St.-Claire Deville.

3. Results

Ninety-five percent of the total number of *Epuraea* beetles caught in the two experiments were *E. bickhardti* and 3% were *E. boreella*. These were the only *Epuraea* species caught in sufficiently high numbers to permit differences in numbers of beetles caught among the various treatments to be analysed statistically. *E. pygmaea* (Gyllenhahl), *E. angustula* (Sturm), *E. unicolor* (Olivier), and *E. biguttata* (Thunberg), were most numerous among the other *Epuraea* species caught.

Seven *E. bickhardti* were caught in the unbaited traps in the two experiments, while 395 were caught in the traps baited with ethanol alone and 3285 in the traps baited with combinations of ethanol and α-pinene (Table 1). In both experiments the number of *E. bickhardti* caught increased with increasing ethanol release rates. The differences in catch between unbaited and baited traps were statistically significant at the $P = 0.05$ level at the two highest release rates for the traps baited with ethanol alone and for all four combinations of ethanol and α-pinene. Traps baited with α-pinene alone caught about eight times as many *E. bickhardti* as unbaited traps but the difference was not statistically significant.

Not a single *E. boreella* was caught in the unbaited traps, whereas 98 were caught in the traps baited with combinations of ethanol and α-pinene. Most of these were caught at the two highest ethanol release rates, which were also the only treatments that differed significantly in *E. boreella* catch from unbaited traps. Only a few *E. boreella* were caught in the traps baited with α-pinene alone.

The female proportion of the *E. bickhardti* catch in the experiment with ethanol alone was 45%, while in the experiment with combinations of ethanol and α-pinene it was 51%. Fifty percent of the *E. boreella* caught were females. No difference in sex ratio between treatments was detected for any of the species (χ^2-test, $P < 0.05$).

4. Discussion

Both *E. bickhardti* and *E. boreella* inhabit Scots pine and Norway spruce in Scandinavia (Saalas 1917, Nuorteva 1956). The adults and their progeny are found under the bark of dead trees, often in bark beetle galleries. This type of decayed breeding material may release high amounts of ethanol (cf. Cade et al. 1970, Moeck 1970), in combination with monoterpenes. α-pinene is one of the major monoterpene constituents of both Scots pine and Norway spruce (Heemann & Francke 1977, Yazdani & Nilsson 1986, Strömvall & Petersson 1991). Detailed information

Table 1. Total numbers of *E. bickhardti* and *E. boreella* caught in flight barrier traps baited with ethanol alone (E) or α-pinene alone (P) and in combination with ethanol (P+E). Unbaited traps were included in both experiments. Release rates in mg/hr. — Values within a species and experiment followed by the same letter are not significantly different at $P = 0.05$ level (nonparametric multiple comparison of Tukey-type).

	Release rate (mg/hr) α-pinene	ethanol	*E.bickh.*	*E.boreella*
Experiment 1				
Unbaited	–	–	1^{a}	–
E	–	1.5	18^{ab}	–
E	–	13	17^{ab}	–
E	–	128	111^{b}	–
E	–	2116	249^{c}	–
Experiment 2				
Unbaited	–	–	6^{a}	0^{a}
P	10	–	46^{ab}	3^{a}
P+E	10	1.5	111^{b}	5^{a}
P+E	10	13	182^{bc}	3^{a}
P+E	10	128	837^{cd}	26^{b}
P+E	10	2116	2155^{d}	64^{b}

about the feeding habits of *E. bickhardti* and *E. boreella* is not available. In the laboratory *E. bickhardti* is able to develop successfully on a diet of bark beetle eggs (Nuorteva 1956), suggesting that this species may be predatory.

Ethanol is absent or present in only small amounts in newly felled conifers unsuitable as breeding material for *Epuraea* species, while large quantities of monoterpenes are released from this kind of trees (Ikeda et al. 1980, Strömvall & Pettersson 1991). This may explain the observed weak attraction of *E. bickhardti* to α-pinene alone compared with the attraction to combinations of ethanol and α-pinene.

Acknowledgements. I wish to thank H. H. Eidmann for comments on the manuscript. Financial support from the SJFR Research Council is gratefully acknowledged.

References

Cade, S. C., Hrutfiord, B. F. & Gara, R. I. 1970: Identification of a primary attractant for Gnathotrichus sulcatus isolated from western hemlock logs. — J. Econ. Entomol. 63:1014–1015.

Freude, H., Harde, K. W. & Lohse, G. A. 1967: Die Käfer Mitteleuropas, 6. — Goecke & Evers, Krefeld. 310 pp.

Heemann, V. & Francke, W. 1977: Gaschromatographisch-Massenspektrometrische Untersuchungen der flüchtigen Rindeninhaltsstoffe von Picea abies (L.) Karst. — Planta Medica 32:342–346.

Ikeda, T., Enda, N., Yamane, A., Oda, K. & Toyoda, T. 1980: Attractants for the Japanese pine sawyer, Monochamus alternatus Hope (Coleoptera: Cerambycidae). — Appl. Entomol. Zool. 15:358–361.

Lundberg, S. 1986: Catalogus Coleopterorum Sueciae. — Entomologiska Föreningen i Stockholm och Naturhistoriska Riksmuseet, Stockholm. 155 pp.

Moeck, H. A. 1970: Ethanol as the primary attractant for the ambrosia beetle, Trypodendron lineatum (Coleoptera: Scolytidae). — Can. Entomol. 102:985–995.

Nuorteva, M. 1956: Über den Fichtenstamm-Bastkäfer, Hylurgops palliatus Gyll., und seine Insektenfeinde. — Acta Entomol. Fennica 13:1–118.

Palm, T. 1959: Die Holz- und Rinden-Käfer der Süd- und Mittelschwedischen Laubbäume. — Opuscula Entomol., Suppl. 16. 374 pp.

Saalas, U. 1917: Die Fichtenkäfer Finnlands. I. — Ann. Acad. Scient. Fenn. (Ser. A)8(1). 547 pp.

Schroeder, L. M. 1988: Attraction of the bark beetle Tomicus piniperda and some other bark- and wood-living beetles to the host volatiles α-pinene and ethanol. — Entomol. Exp. Appl. 46:203–210.

Schroeder, L. M. & Lindelöw, Å. 1989: Attraction of scolytids and associated beetles by different absolute amounts and proportions of α-pinene and ethanol. — J. Chem. Ecol. 15:807–817.

Strömvall, A.-M. & Petersson, G. 1991: Conifer monoterpenes emitted to air by logging operations. — Scand. J. Forest Res. 6:253–258.

Yazdani, R. & Nilsson, J.-E. 1986: Cortical monoterpene variation in natural populations of Pinus sylvestris in Sweden. — Scand. J. Forest Res. 1:85–93.

Received 26.II.1992