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## Feeding ecology of pine shoot beetles (*Tomicus* spp.) in tree crowns of Scots pine (*Pinus sylvestris* L.) stands under one-year outbreak

A. Borkowski

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Studies were carried out in southern Poland during 2002–2006 in Scots pine stands under the effect of an outbreak of pine shoot beetles. The qualitative aspects of beetle feeding in tree crowns, studied on the basis of fallen shoots collected on experimental plots, are presented in this paper. The beetle numbers affected the age distribution of damaged shoots and the proportion of multiple attacks. The proportions of one-year-old shoots and the numbers of shoots with more than two attacks increased in the marginal part of the stand in the year of intensive feeding of beetles and in the subsequent year. A similar proportion of shoots with two attacks in both stands under investigations in individual study periods, with no relation to beetle numbers, does not permit to use this characteristic for forecasting purposes. The average length of tunnels in shoots attacked once reached 20 mm at maximum. The average length of tunnels (measured from the place of shoot disruption) was greater in shoots with two attacks than in shoots with a single one ( $P < 0.0001$ ). The difference was not significant ( $P = 0.3429$ ) only in stand B during the study season 2004–2005. The majority of the tunnels made in apical portions of shoots with two attacks damaged the tissue of apical shoots. The distance between the base of the second tunnel and the shoot apex in shoots with two attacks, and its significant ( $P < 0.01$ ) linear relationship with the length of beetle tunnels, indicated a high nutritional quality of apical portions of shoots.

**Keywords:**

*Tomicus piniperda*; *T. minor*; *Pinus sylvestris*; needle drop; shoot damage

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