

## THE DEVELOPMENT OF BARK BEETLES IN LOGGING RESIDUES IN SPRUCE STANDS

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### Introduction and objective

Residual wood, which have been left behind in spruce stands after forest harvesting, can be a big risk for forest protection, because it often provides brood chambers for bark-breeding beetles such as the eight-toothed spruce bark-beetle (*Ips typographus* L.) or the six-toothed spruce bark-beetle (*Pityogenes chalcographus* L.)

Such residual wood mainly originates from tree tops (head logs and bayonet deformations) or butt ends (foxy butt logs). Dressing this wood requires a lot of time and money. Proceeds of this difficultly saleable assortments mostly are not cost-effective.

There are only a few generalizable investigations into the hatchability of spruce residual wood. Recommendations concerning the leaving behind of residual wood in spruce stands being harmless have not been supported sufficiently scientific so far.

The objective of these investigations consists in assessing hatchability of residual wood under the consideration of the felling period and timber conversion, and deriving conclusions for forestal practice.

### Materials and methods

The experimental stands are situated in the growth region "Mittlerer Thüringer Wald". Up to now two trial series have been carried out. Each trial series lasted for one year, the first from November 1995 to October 1996 and the second from April 1997 to March 1998.

Monthly (with the exception of March 1996 and November 1997) sample trees were felled and divided into different logs (butt end, crown logs and head log) according to a pattern (Fig. 1). The first trial series only included variant A.

On the bark of each log 2 to 4 windows (12,5 x 20 cm) were marked. These bark-windows were regularly checked for entrance holes to find out the beginning of bark-beetle infestation. Before the hatching of young beetles the bark-windows were taken out to analyse gallery patterns.

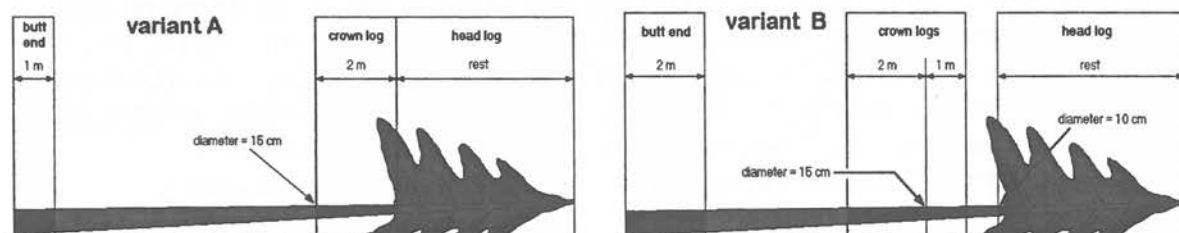


Fig. 1: Pattern for dividing trees into sample logs.

### Results

#### **Eight-toothed spruce bark-beetle (*Ips typographus* L.)**

•The comparison of 1- and 2-metres butt ends or crown logs shows that there aren't fundamental differences in the infestation intensity. For this reason short-cutting into 1-metre logs isn't sufficient to prevent bark beetle infestation (Figs 2-3).

•In comparison with other logs butt ends show the lowest infestation and therefore they constitute the slightest danger for the remaining stand. The butt ends of the sample trees felled in May or June show the highest infestation level (Fig. 4).

•1- and 2-metres crown logs are highest infested when the sample trees were felled from December to July (Fig. 5).

•Head logs always show a relatively high infestation level and form a risk factor, which shouldn't be underestimated (Fig. 6).

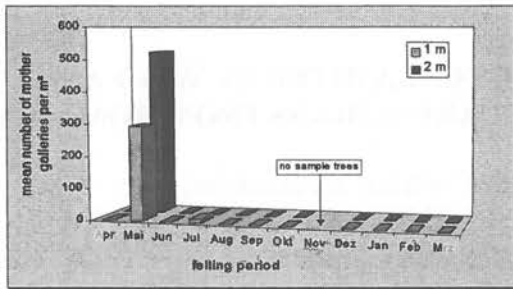


Fig. 2: Infestation by *Ips typographus* at the butt ends 1 and 2 metres long (second trial serie).

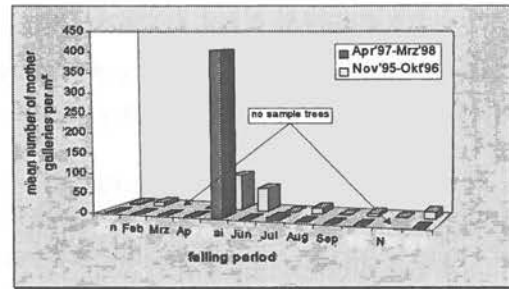


Fig. 4: Infestation by *Ips typographus* at the butt ends.

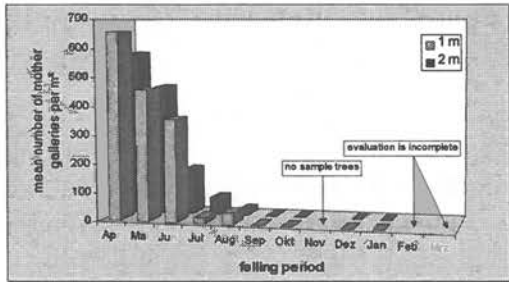


Fig. 3: Infestation by *Ips typographus* at the crown logs 1 and 2 metres long (second trial serie).

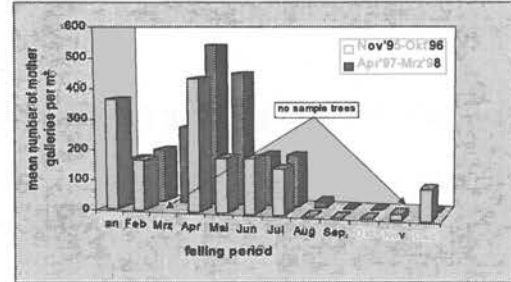


Fig. 5: Infestation by *Ips typographus* at the crown logs.

### Six-toothed spruce bark-beetle (*Pityogenes chalcographus* L.)

- As expected butt ends are unpopulated.
- 1- and 2-metres crown logs put down from August to November seem to be nearly undangerous. The same months of each trial serie partly show a very different infestation level (Fig. 7).
- With the exception of those test logs laid out in July and August the head logs are infested comperatively high (Fig. 8).

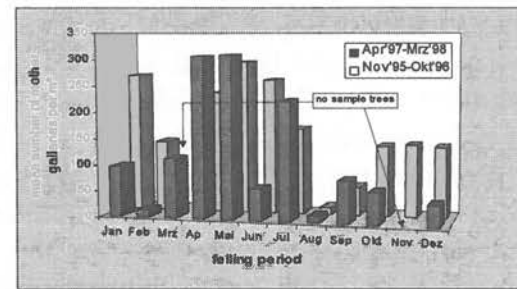


Fig. 6: Infestation by *Ips typographus* at the head logs.

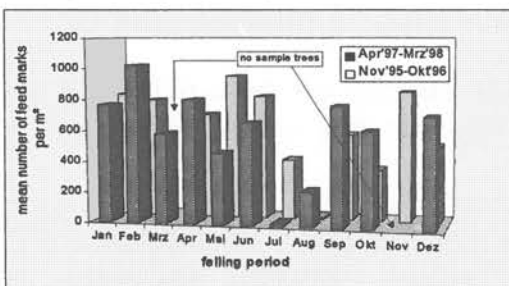


Fig. 7: Infestation by *Pityogenes chalcographus* at the crown logs.

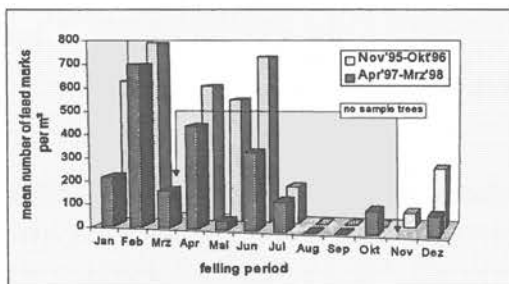


Fig. 8: Infestation by *Pityogenes chalcographus* at the head logs.

### Discussion

Infestation of spruce residual wood with bark beetles are affected by various factors such as

- weather
- location (exposure, altitude above sea-level)
- position of residual wood in stand (solarisation, ground vegetation)
- timber conversion (dimension, branching)
- population density of bark beetles
- potential of natural enemies (antagonists)
- inter- and intraspecific competition for brooding places
- availability of wood of various hatchability at the same time

For this reasons our present results still aren't generalizeable. Rather our results reflect the situation at a special place for a special period of time.

In other regions further trial series are necessary to support the present test results and to investigate the influence of the experimental area. Also bark beetle infestation will have to be investigated when the population density is higher than now.