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Preface

The tenth regular workshop of the IUFRO Working Party WP 7.03.10 "Methodology of Forest Insect and Disease Survey in Central Europe" was held in Freiburg im Breisgau, Germany, September 20-23, 2010. It was organized and hosted by the Forest Research Institute of Baden-Württemberg, Department of Forest Protection. The workshop topics focused to the following themes: Biotic Risks and Climate Change in Forests, with respect of three subtopics in context to Climate Change: 1) Risk assessment of actual and introduced pests and diseases; 2) Survey of actual and introduced pests and diseases and 3) Information platform on pests and diseases occurrence in Central Europe.

All together 77 participants attended the meeting. During the scientific program, 29 oral and 29 poster presentations were organized as well as a guided tour through the historical part of the city of Freiburg. The whole day field excursion introduced us the local forest protection highlights of the famous Black Forest - including the strictly protected forest reserve Napf with its bark beetle situation.

Our working group is mainly engaged in biotic influences to the forest health condition in Central Europe, but although researchers from elsewhere are welcome to attend. Meetings are an ideal platform to exchange information on methods and techniques in forest protection, conducting of forest pest and disease survey and advisory service, which have a long tradition within European forest research institutes and faculties. It is a unique platform for both, forest entomologists and forest pathologists to meet together in one place to discuss and share experiences, practices and scientific results.

The IUFRO group wish to express their gratitude to the German colleagues who perfectly organized the fruitful meeting in Freiburg: Dr. Horst Delb, Silvia Pontuali and staff from the Forest Research Institute of Baden-Württemberg (FVA). Our special thanks go to Prof. Konstantin von Teuffel, director of the institute, who hosted us in Freiburg and to Dr. Hansjochen Schröter, section leader of forest protection, for his impressive contribution at the Black Forest excursion. We also thank the organizers and Renate Krieg for bringing the manuscripts together and preparing the proceedings.

Milos Knizek

Beat Forster

Wojciech Grodzki

Coordinator and deputy coordinators of WP 7.03.10

Participants of the Workshop at the excursion to the Black Forest, Feldberg-Stübenwasen, September 22nd, 2010

Flight activity of the ambrosia Beetles *Trypodendron laeve* and T*rypodendron lineatum* In relation to Temperature in Southern Sweden

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Introduction

The aim of this study was to investigate the flight activity and abundance of the ambrosia beetle, *Trypodendron lineatum* Olivier 1795 (Col., Scolytinae) in southern Sweden after storm-fellings in Jan 2005 (Gudrun) and Jan 2007 (Per), that blew down 75 and 12 million m^3 of wood, respectively. We also wanted to relate the flight activity to temperature and weather conditions. Unexpectedly, we found the hitherto poorly known species *Trypodendron laeve* Eggers 1939 (synonyms: *Trypodendron proximum* Niijima 1909; mistaken for *Trypodendron piceum* Strand 1946) in our traps. *T. laeve* has been largely overlooked in the literature, and until recently the distribution of *T. leave* has been poorly known in Fennoscandia (KVAMME 1986, MARTIKAINEN 2000, LINDELÖW 2010). Also in central Europe the knowledge on *T. laeve* has been poor. Records from 1982 in Austria were thought to be related to imported timber from Russia, but the wide distribution of *T. leave* indicates that it should be considered as a native species (BUSSLER & SCHMIDT 2008, KIRKENDALL & FACCOLI 2010).

Material and Methods

Since spring 2005 the flight activity of *Trypodendron* spp. has been studied at two research stations in southern Sweden, Asa and Tönnersjöheden. Both research stations are located in the area affected by storm-fellings in 2005 and 2007.

At both study sites, funnel traps were placed in two storm-damaged stands, one with Norway spruce (*Picea abies)* and another with Scots pine (*Pinus sylvestris)*, where all felled trees remained. One trap was placed in a sun exposed position and another trap in a shaded position at the nearby stand edge. The traps were baited with pheromones (XL-ecolure®; containing >0.25% lineatin, <85 % ethanol, >10 % synergistic components) and emptied weekly from late March through September. The traps positions were the same in all years.

In 2005-2006 the catches of *Trypodendron*-beetles were not identified to species, but from 2007 until 2010 three different species of *Trypodendron* were identified and separated – *T. lineatum, T. laeve* and *T. domesticum.* This study will exclusively focus on the *T. lineatum* and *T. laeve* since *T. domesticum* is connected to broadleaved trees and occurred in low numbers.

Results and discussion

In 2005, the first season after the storm, a lot of suitable breeding material such as wind–thrown trees and high stumps were left in the forest and the trap catches of *Trypodendron spp*. consequently increased the following two years, as the population was building up (Figure 1). The catches peaked in 2007 thereafter the numbers of ambrosia beetles declined during the following years.

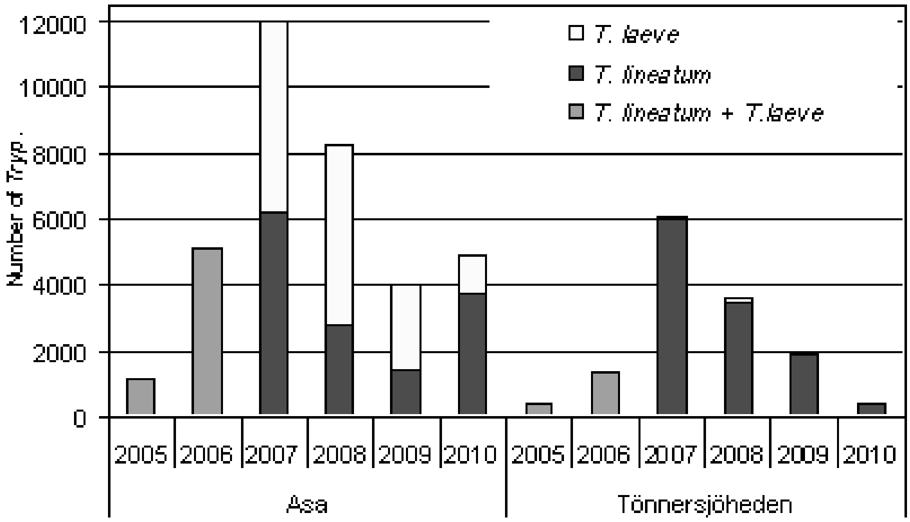

Figure 1: Total catch (n=4; all traps) of *T. lineatum* and *T. laeve* 2005 - 2010 in Asa and Tönnersjöheden

There are several possible explanations to the decline after 2007. Obviously the wind-thrown trees and high stumps left after Gudrun in 2005 were no longer suitable as breeding substrate after 2007, as they had either been colonised by beetles in earlier years or dried out at this time. According to LÅNGSTRÖM *et al.* (2009), the storm-felled trees after Per in 2007 were quickly taken care of and may hence have acted as trap trees for bark beetles, possibly contributing to the decline of the populations of ambrosia beetles as well as the spruce bark beetles *Ips typographus*. Tree mortality also declined after 2007 (LÅNGSTRÖM 2009) and as ambrosia beetles often colonize beetle-killed spruce trees the amount of breeding material for these beetles probably decreased with the declining tree mortality.

Each year, spring flight started the same week as the maximum air temperature for the first time reached 14℃ (Figure 2). One week before first flight in 2010 southern Sweden had average temperatures below zero (Figure 2). This indicates that neither *T. laeve* nor *T. lineatum* need a warming-up period prior to flight, i.e. no certain temperature sum is required before first flight in spring. These results agree well with obtained flight pattern for *T. lineatum* in the large Nordic study, but it is worth noticing that the flight in southern Sweden in 1968 and 1969 started 2-3 weeks later than in our study (ANNILA 1972).

Earlier studies show that the swarming of *T. laeve* starts earlier and lasts for a shorter time compared to *T. lineatum* (KVAMME 1986, MARTIKAINEN 2000). MARTIKAINEN (2000) showed that there was only a little overlap in flight periods of *T. laeve* and *T. lineatum* at three different localities in Finland during 1997. This pattern corresponds to some degree with the results in this study. In all studied years *T. laeve* took flight approximately at the same time as *T. lineatum* but 50 % of the flight occurred around 20 days earlier in *T. laeve* than *T. lineatum* and was in general ceased in the beginning of May while *T. lineatum* continued until beginning of July (Fig 2).

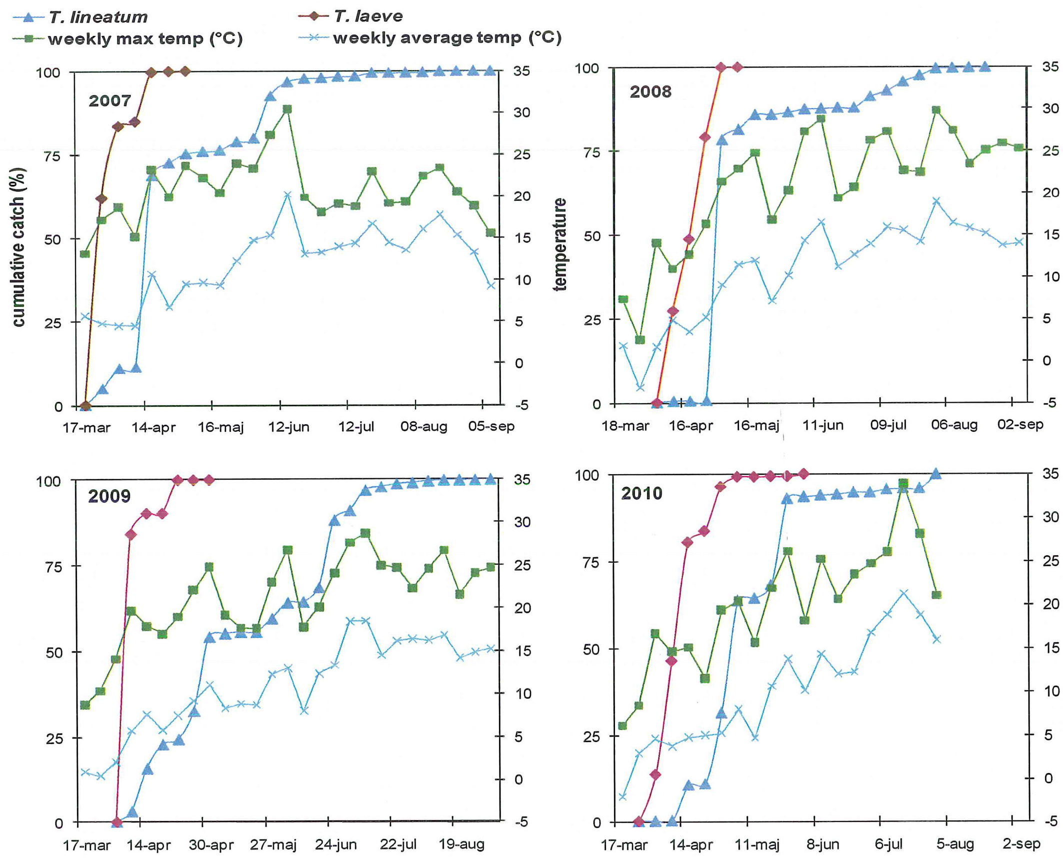

Figure 2: Cumulative total trap catch of T. lineatum and T. laeve and weekly maximum and mess temperature in Asa 2007-2010 (n°4; all traps)

There are at least two explanations for the prolonged swarming in *T. lineatum* compared to *T. laeve.* First, there is a difference in the overwintering behaviour, as *T. lineatum* overwinters in the soil (BORDEN 1988) while *T. laeve* has been observed over-wintering in the wood in a standing tree (MARTIKAINEN 2000). This may explain why *T. laeve* can fly in large numbers instantly when the right air temperature threshold is reached while individuals of *T. lineatum* is dependent on local conditions on the ground (e.g. thickness of the snow cover, slope aspect or sun exposure) before they take flight. Secondly, the prolonged flight period in *T. lineatum* that also was reported by ANNILA *et al.* (1972) may be due to a sister brood flight that has been observed by FOCKLER & BORDEN (1972); a trait that *T. laeve* apparently is lacking. Hence, a large part of the trap catch from around early June is probably a sister-brood flight, since its unlike that the parent beetles may linger in soil that long and since emerging offspring beetles do not respond to pheromones until the following spring (BORDEN 1988).

During the study period, *T. laeve* was very abundant in Asa, forming 52 % of the total trap catch in 2007-2010 (Table 1). In Tönnersjöheden *T. laeve* was caught in low numbers but the species was a new finding for this location and the province of Halland. Both *T. lineatum* and *T. laeve* were trapped in higher numbers in traps situated in shade rather than traps situated exposed to sun (data not shown).

There was a clear difference between the pine and spruce stands, a higher proportion of *T. laeve* was caught in the pine stands, whereas *T. lineatum* was relatively more abundant in the spruce stands (Table 1). In Asa, *T. laeve* formed 68% of the catch in traps situated in the pine stand and 41 % in the spruce stand. There was about three times more *T. lineatum* caught in the spruce than in the pine stand at both locations, but equal numbers of *T .laeve* in Asa and twice as many at Tönnersjöheden (Table 1).

Subjecting the data to an analysis of variance (GLM, location, year, tree species) a significant difference between the trap catches in the spruce- and pine stand for *T. lineatum* but not for *T. laeve* was found.

Table 1: The sum of the total trap catch 2007-2010 in Norway spruce Picea Abies and Scots Pine Pinus sylvestris in Asa and Tönnersjöheden.

		T. lineatum	T. laeve
Asa	Spruce	10373	7164
	Pine	3726	7876
Tönnersjöheden	Spruce	8925	161
	Pine	2832	86
	GLM	p=0.03	p=0.91

Our results show that *T. laeve* may at least locally be very common. Bearing in mind that the pheromone used in the traps has been developed for *T. lineatum* (Macconnell 1977), it is likely that it is more attractive to *T. lineatum* than to *T. laeve.* So with an unbaited trap, the proportion of *T. laeve* might have been even higher.

Our preliminary results also suggest that there may be a difference in host preference between the two species, but so far we have only established that *T. leave* was relatively more abundant in pine stands than in spruce. As at least *T. lineatum* does not immediately respond to host odours when they leave their overwintering sites and may fly for up to 8 hours (BORDEN 1988), it is likely that our trap catches only to a small degree contain beetles overwintering at the trapping sites. This indicates that *T. lineatum* is more attracted to spruce than pine stands, whereas *T. laeve* may be relatively more attracted to pine. The true host preference of both species, however, needs to be further clarified.

In conclusion, we found that the abundance of ambrosia beetles peaked in 2007, two years after the storm. *Trypodendron lineatum* and *T. laeve* were equally common at Asa, whereas the latter was recorded for the first time in Halland, although in low numbers. At both sites, *T. leave* flew earlier and during a shorter time period than *T. lineatum.* The former species was also more frequent in the studied pine stands than in spruce, but the possible host preferences of the two *Trypodendron*-species needs further studies.

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