Phoretic mites associated with bark beetles

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Abstract. Our research was focused on mites occurring on bark beetles in the High Tatras region in Slovakia. Two methods were used: bark beetles captured to pheromone traps from 15 research sites and beetles extracted directly from their galleries from one site. In total 4188 bark beetles were collected, with 3740 mites attached to their bodies or inside galleries. These mites belonged to 16 species plus 6 higher taxons with problematic determination. The most abundant species was *Iponemus gaebleri* in galleries and *Insectolaelaps quadrisetus* on beetles from pheromone traps.

Introduction

Scolytid beetles are small insects that can cause serious damage during their outbreaks in forests. Many different organisms can be associated with Scolytid beetles and some of them are their natural enemies. In recent time small number of studies focused on Acari and their relationship with insects. Acari also occur quite often on bark beetles and they have a potential of reducing populations of bark beetles as their biological control agents by eating their eggs (Lindquist, 1969). Kielczewski et al. (1983) studied mite – bark beetle relationships in Poland, Moser & Bogenschütz (1984) in Germany and Moser et al. (1989) in Sweden. In Slovakia Mašán (2001) published a checklist and a key to phoretic uropodid mites found in different types of habitats in Slovakia. But mites associated with Slovak biggest pest of spruce stands (*Ips typographus*) are poorly understood and studied, with only few authors dealing with this issue (Kršiak, 2009; Feketeová, 2011a,b).

Data and methods

First method: pheromone traps were placed on 15 sites in spruce stands which were then used to collect bark beetles. From the total number of bark beetles extracted from pheromone traps, 100 of them were chosen from each site randomly and preserved in the ethanol (in some sites the number of randomly chosen beetles was higher). Phoretic mites on their bodies were collected using a stereo microscope and precise positions of mites on bark beetle bodies were recorded. Mites were also preserved in the ethanol and mounted to microscopic slides using Liquido de Swann. Determination was done on a light microscope (400x to 1500x zoom) using these keys: Mašán, 2001; Bregetova et al., 1977.

The second method was extracting beetles directly from their galleries. In summer and autumn of 2011, 34 logs (about 1,5m long) were placed on the experiment site in Štart near Tatranská Lomnica and were left there for aprox. 40 days. After that the logs were taken to the lab and the bark was "peeled" of the logs. Living beetles were captured and preserved in the ethanol, also frass from some bark beetle galleries was preserved in alcohol and searched for mites. In the summer, part of the experiment 28 of 34 logs contained bark beetles, but in the autumn only 16 logs. The same process as in the previous method was used for mites and they were determined using these keys: Mašán, 2001; Lindquist, 1969; Moser & Bogenschütz, 1984; Karg, 1989.

Results and discussion

These results are only preliminary.

<u>First metod (pheromone traps):</u>

- 2675 *Ips typographus* individuals were processed (sex ratio was balanced: 1312 females (49,05 %) and 1363 males (50,95 %), only 347 beetles were positive on mites (12,97%)
- 837 mites were found on their bodies
- 190 mites were found in alcohol sediments

The total of **1027** mites belonged to **9 species**. The most abundant species in descending order:

I. quadrisetus: 482 individuals, all in deutonymph stage, all were found under the elytra of the beetle

T. polytricha: 220 individuals, all in deutonymph stage, their most favorite attachment place was the elytral depression on the back of the beetle

U. ipidis: 55 individuals, all in deutonymph stage, they were found in the elytral depression, on the coxa I and between legs I and II.

H. piceae: 85 individuals, all in hypopus stage, found all over beetles body

P. austriaca: 13 individuals, all in deutonymph stage

U. feideri: 9 individuals, all in deutonymph stage

P. ipidarius: 8 individuals, all in adult (female) stage, first record of this mite in Slovakia, possible biological control agent, found between legs I and II

I. gaebleri: 6 individuals, all in adult (female) stage, first record of this mite in Slovakia, possible biological control agent, found mostly on the elytral depression

T. karawaiewi: 2 individuals, all in deutonymph stage

Two new species (*P. ipidarius*, *I. gaebleri*), can be considered as a potencial bark beetle egg predator (Kielczewski et al., 1983; Lindquist, 1964). Although found in relatively small numbers on bark beetles from pheromone traps, in the second method they were one of the most numerous species in the whole experiment. This fact is difficult to explain and more data is needed to clarify why the difference was so big. In order to clarify the difference occurred, one of the possible interpretation could be wrong methods used, or perhaps even not an ideal weather conditions during the collection of beetles or just a coincidence, because the beetles were chosen randomly from pheromone traps and could have had significantly less phoretic mites attached on their bodies as other mites in the trap.

Second method (beetle extraction from galleries):

- 1513 *I. typographus* individuals were processed, females: 962 (63,58%), males: 551 (36,42%)
- summer part: 1249 *I. typographus*, females: 785 (62,85%), males: 464 (37,15%)
- autumn part: 264 *I. typographus*, females: 177 (67,05%), males: 87 (32,95%)
- on beetle bodies and in their galleries 2713 mites were found (2274 in summer and 439 in autumn)

The total of **2713** mites belonged to **14 species** and 6 higher taxons with problematic determination. The most abundant species in descending order (autumn and summer combined):

I. gaebleri: 1729 individuals, only adult stages (vast majority of females)

P. ipidarius: 228 individuals, only adult stages (vast majority of females)

H. piceae: 170 individuals, all in hypopus stage

T. polytricha: 93 individuals, found in every stage (larvae, protonymph, deutonymph, adult – male and female)

U. ipidis: 84 individuals, found in every stage (larvae, protonymph, deutonymph, adult – male and female)

I. quadrisetus: 70 individuals, found as a protonymph and deutonymph

P. austriaca: 35 individuals, found in every stage (larvae, protonymph, deutonymph, adult – male and female)

Plus seven other species which didn't surpass 14 found individuals.

Two new species for Slovak fauna (*I. gaebleri*, *P. ipidarius*) were also found inside galleries and in greater numbers than in pheromone traps. *I. gaebleri* was found inside 85% of logs in summer and *P. ipidarius* in 62% of logs in autumn. These are significant numbers and require a further research, to evaluate the potential use of these mites as bio control agents on *I. typographus*.

Conclusion

We have evaluated 4188 bark beetles with 3740 mites associated with them throughout the year 2011 with the use of two methods. The most important fact is, that two new mites (for Slovak fauna) were found. Their influence on our bigger spruce pest *I. typographus* needs to be evaluated by further experiments.

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