

Invertebrates inhabiting fruiting bodies of *Heterobasidion* spp. on decayed wood of *Picea abies*

Līva Legzdiņa^{1, 2}, Voldemārs Spuņģis², Tālis Gaitnieks¹, Audrius Menkis³

¹ Latvian State Forest Research Institute «Silava», Salaspils, Latvia,

² Department of Zoology and Animal Ecology, Faculty of Biology, University of Latvia, Riga, Latvia

³ Department of Forest Mycology and Plant Pathology, Swedish University of Agricultural Sciences, P.O. Box 7026, SE-75007 Uppsala, Sweden

Pathogenic fungi from the genus *Heterobasidion* are the major causative agents of root rot in conifers of temperate and boreal forests. However, despite the ecological and economic importance, information on invertebrates inhabiting fruiting bodies of *Heterobasidion* spp. is scarce. Previous research has mainly focuses on a single invertebrate order or invertebrates associated with *Heterobasidion* have been investigated together with other saproxylic fungi. Information on invertebrates associated with *Heterobasidion* can provide a better understanding on how the control of root rot could affect these invertebrates, including threatened species. These effects can be expected due to changes in microhabitat conditions and substrate availability.

The aim of this study was to determine the diversity of invertebrates in fruiting bodies of *Heterobasidion* spp. growing on decayed wood of *Picea abies*.

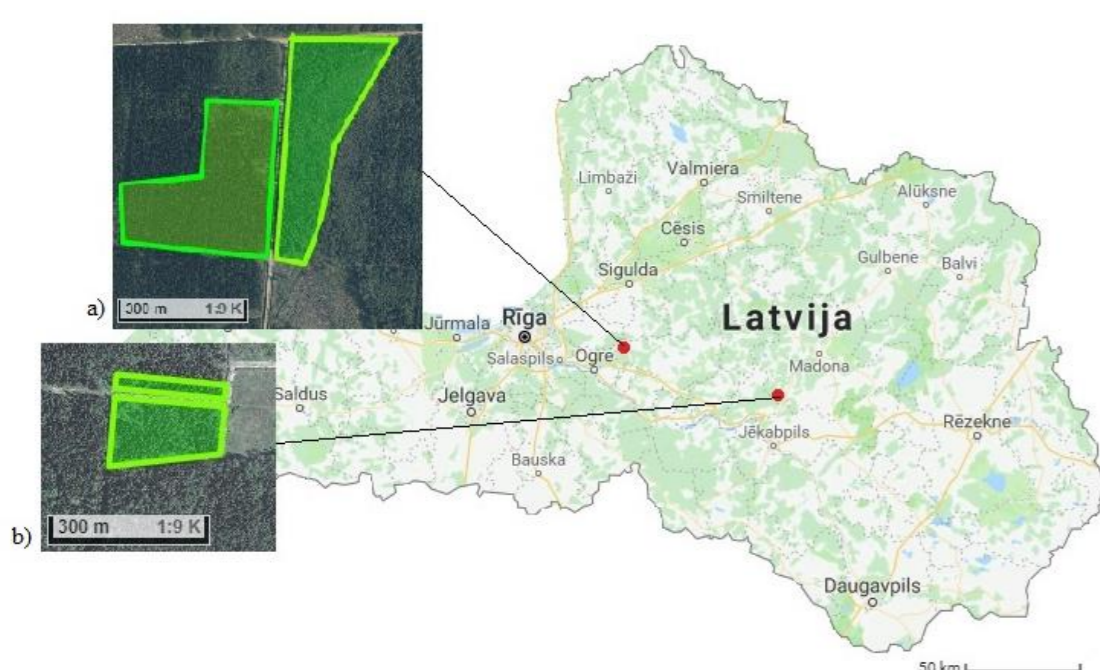


Figure 1. Sampling plots in Latvia: a) Ogre; b) Kalsnava.

Methods

The fruiting bodies of *Heterobasidion* spp. were sampled in autumn 2016 from large dimension logging residuals with an average diameter of 25 centimeters. Two sample plots were selected that fit the following criteria: contain spruce wood of various dimensions and of different decomposing stages, as well as of different age and decomposition stages of *Heterobasidion* spp. fruiting bodies. Collected samples were 10 cm x 10 cm in size and differed in thickness, age and decomposition stage (Fig. 2 & 3). Oldest sampled fruiting body was 7 years old. In the laboratory, invertebrates from 69 fruiting body samples were collected using Tullgren funnel traps (Fig. 4 & 5).



Figure 2. *Heterobasidion* spp. fruit bodies in the field.



Figure 3. Tools used for the sampling

Results

A total of 4987 invertebrate individuals, 105 of them being larvae, representing 16 orders were collected. *Heterobasidion* spp. fruit bodies were dominated by mites, springtails and beetles (Table 1). Most common mites belonged to *Carabodes* genus; most common beetles represented Ciidae family. Threatened species of invertebrates have not been found.



Figure 4. Tullgren funnel traps used for sampling.



Figure 5. Invertebrates collected from *Heterobasidion* spp. fruiting body sample.

Table 1. The number of individuals collected from *Heterobasidion* fruiting bodies. The number of individuals per invertebrate taxon shown in brackets.

Invertebrate group	Number of individuals	
Mites Acari	4111	Carabodidae (3223), Oppiidae (357), Pthiracaridae (45), Ceratozetidae (38), Crotoniidae (36), Hypochthoniidae (30), Eupthiracaridae (11), Damaeidae (9), Nanhermanniidae (5), Eremaeidae (4), Tenuialidae (2), Galumnidae (2), Xenillidae (1)
Springtails Collembola	309	Neanuridae (205), Onychiuridae (42), Isotomidae (33), Tomoceridae (12), Hypogastruridae (9), Entomobryidae (7), Smithuridae (1)
Beetles Coleoptera	166+66*	Ciidae (148+12*), Elateridae (1+24*), Cantharidae (18*), Staphylinidae (8+8*), Ptilidae (6), Carabidae (3), Silphidae (3), Anobiidae (1)
Milipedes Diplopoda	126	Blaniulidae (112), Polydesmidae (13), Julidae (1)
True flies Diptera	50+39*	Chironomidae (21+15*), Bracycera (4+16*), Sciaridae (17+1*), Cecidomyiidae (2+3*), Stratiomyidae (1+3*), Ceratopogonidae (3), Bibionidae (1+1*), Psychodidae (1)
Haplotaxida	41	Enchytraeidae (21), Lumbricidae (20)
Thrips Thysanoptera	35	
Hymenoptera	15	Parasitica (14), Formicidae (1)
Spiders Aranea	10	
Snails Gastropoda	6	Zonitidae (4), Arionidae (1), Clausiliidae (1)
Centipedes Chilopoda	5	
True Bugs Hemiptera	2	
Lepidoptera	2	Tineidae (2)
Isopods Isopoda	2	Trichoniscidae (2)
Harvestmen Opiliones	1	
Protura	1	

*indicates the number of larvae collected

Conclusions

The study provided comprehensive data on composition and diversity of invertebrates inhabiting *Heterobasidion* fruiting bodies. It also demonstrated that the control of *Heterobasidion* root rot is likely not affecting the threatened species of invertebrates.

Future objectives

Results indicated that invertebrate diversity in fruiting bodies of *Heterobasidion* spp. could be connected to wood dimensions on which fruiting body is growing. It may also be associated with the decomposition stage of wood and of fruiting body. However, more research is needed to understand these factors, as well as the impact of fruit body size, thickness, age and pH.

Further research is needed to determine the possible role of various invertebrate groups and species as a vectors of *Heterobasidion* disease in coniferous forests.

Acknowledgements

This study was financially supported by JSC Latvian State Forests project No. 5-5.5_0004_101_16_4, Latvian Council of Sciences grant project No. lzp-2018/1-0431, State Research Programme “Forest and earth entrails resources: research and sustainable utilization – new products and technologies” (ResProd) project “Even-age spruce stands cultivation potential in fertile forest ecosystem” and ERDF project No. L-KC-11-0004.

Contacts: liva.legzdina@silava.lv