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Early detection of invasive seed chalcids (Megastigmus spp.) through extensive surveys in major European botanical gardens: the example of rose seed chalcids

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BOOK OF ABSTRACTS

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All Division 7 (Forest Health) Meeting

120 - Insect pests and pathogens of tree reproductive structures in a changing world: assessing

K 8 (Konzerthaus Freiburg)

IUFRO17-3053 **Messing with megagagametophyte gene expression allows a seed parasite (Megastigmus spermotrophus) to harness the storage reserves of its host, Douglas-fir.**

von Aderkas, P.* (1); Donaleshen, K. (1); Ehlting, J. (1)

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Abstract: Douglas-fir seed is susceptible to a parasitic chalcid wasp that lays its eggs into megagametophytes during a period corresponding to central cell and egg maturation, i.e. immediately before and during fertilization. Whether a conifer egg aborts or is fertilized, the megagametophyte that houses the eggs never aborts: instead, it is manipulated by the larva. Four types of ovules/seeds were studied: 1. pollinated and uninfested, 2. pollinated and infested, 3. unpollinated and uninfested, and 4. unpollinated and infested. A de novo reference transcriptome was assembled in Trinity. Expression values were estimated based on the alignment of the original reads back onto the reference transciptome using RSEM. Transcripts were annotated based on sequence similarity to genes of Pinus taeda, Arabidopsis thaliana, Nasonia vitripennis, and the UniProt database. Differential gene expression in Douglas-fir suggests that M. spermotrophus is capable of manipulating its host. Infested treatments had more transcripts related to seed storage, cell division and growth, solute transport, programmed cell death and hormone signaling that were similarly expressed in pollinated than unpollinated seeds. Although larval feeding triggers some genes involved in wounding, defense genes against herbivory are not up-regulated, meaning the insect achieves an uncontested access to the seed's storage reserves.

Douglas-fir, seed parasite, gene expression

K 8 (Konzerthaus Freiburg)

IUFRO17-880 **Early detection of invasive seed chalcids (Megastigmus spp.) through extensive surveys in major European botanical gardens: the example of rose seed chalcids**

Roques, A. (1); Auger-Rozenberg, M.-A.* (1)

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Abstract: Botanical gardens at Paris National Museum of Natural History and Kew were sampled during 2013-2015 for hips of wild roses, Rosa spp., in order to check the possible presence of seed consumers on the shrubs planted in these urban areas. Depending on the year, the survey concerned 19- 32 species in Paris and 56-70 in Kew. More than 50000 seeds were X-rayed of which 13-28% were infested by insect larvae in Paris but ca. 6% in Kew. Besides Megastigmus aculeatus, a native seed chalcid present in the surroundings of both sites, adult emergence revealed the additional infestation by 4 alien species of Megastigmus which were not recorded until now in these regions. Two species, confirmed by molecular analyses, originated from North America, one from Eastern Europe, the origin of the last one being yet unknown. The exchange/trade of seeds is the most likely pathway. The presence of a large set of rose species also allowed to test for specificity of chalcids in relation to botanical sections within the genus Rosa. Gardens and arboreta thus proved to constitute a tool for early detection of alien seed insects. The study is expected to be extended to other gardens and arboreta of Eurasia, and to tree and shrub species

Rosa, seed, seed chalcid, invasion

K 8 (Konzerthaus Freiburg)

IUFRO17-2355 **Cone and seed insects-mediated impacts of global change on forest health: observations, predictions, and management options.**

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Abstract: The vast majority of the scientific literature on the interactions between global change and forest pests has focused on insects that are directly or indirectly affecting tree survival. In comparison, the interactions with insects affecting tree reproduction, particularly cone and seed insects, have received little attention although seed availability is likely to severely constrain the response of tree populations to climate change. The current state of knowledge suggests that cone and seed insects can have unexpected impacts on the ability of tree populations to respond to a changing environment. Indeed, recent results show that insects can limit the spatial migration of forest tree populations hindering their capacity to track ecological niches as the environment is changing. The alternative strategy for persistence of tree populations under climate change, i.e. the adaptation to new conditions in current locations, can also be affected by insect seed predation although the mechanisms of interactions are even less well understood. We argue that our capacity to predict how these insects will respond to and interact with climate change is hampered by the shortage of information on their long-term impacts on the functioning and sustainability of forest ecosystems. In this presentation we will review how cone and seed insects are expected to respond and interact with climate change, how some of the complex interactions between these insects and climate change are already observed and what are the information gaps that limit our capacity to predict their future impacts. Finally, we will discuss a number of considerations in the management of these insects in a changing climate.

cone and seed insects, climate change, adaptation