Comments to EAB recommendations 2018.

EAB stressed strongly 2 major points; the <u>hypotheses-based science (HBS),</u> including the need for graphical plan, and <u>Team-cohesion</u>.

Hypothesis-based science (HBS)

HBS1: "1-p project summaries", including <u>explicit hypothesis generation</u>, have been strongly pushed by the scientific leader, but is still not completed. This is still new way of conducting science for both some senior and junior scientists.

HBS1: Roofing experiment was detailed discussed with expert Sigrid after EAB visit. She also visited field site in late September.

HBS1: Collaboration on chemical analysis as well as re-orientation of experimental design ("just add water") in regard to water stress and beetle population build-up in 2018 were agreed or are under intensive discussion, respectively.

HBS2: Ecotypes

Background. The three ecotypes of Norway spruce represent phenotypic (visible) adaptation in many key traits along altitude. The species is continuously undergoing adaptation under the wide range of abiotic factors such as temperature, correlated to elevation. In EXTEMIT-K, we are evaluating Norway spruce as a species and therefore, we have to include the three ecotypes, otherwise the results would strictly only be relevant to a specific altitudinal (climatic) condition.
Scientifically speaking, the transition along the altitude is a main spin of our research, as we are including the elevation, water stress levels (no stress, mild, and severe stress) and current genetic structure capturing the population history. The idea is to do as many measurements as we can and then we relate the physiological and chemical characteristics (single-tree) of a large number of trees across three sites (ecotypes) as well as in one common garden (three ecotypes grow together - clonal trial in Cukrak). We evaluate all these characteristics in a combined multi-site statistical analyses. Our results are thus

relevant to Norway spruce as a species, not just to a plot or a specific altitudinal (climatic) condition.

Hypothesis: Ecotype structure of wild Czech spruce population exists and influences ecological responses, understanding this structure will allow basing ecological and physiological studies on genetically known material. Considering this eco-genetic structure is a valid way to generalise "from plot to globe" for conifer response to imminent climatic changes.

Background and hypothesis, above, will be further elaborated and put into context of literature, methods, and participants etc in a forthcoming "1-p Research Plan".

HBS3: Barking up the wrong tree? Discussions spring semester 2018 resulted in at least partial understanding and agreement that

1) ***Less volatile compounds (host acceptance cues)*** might be more important than volatiles (long distance 'signalling' from suitable, stressed hosts = 'primary attraction') for host selection tree attack. Analysis of compounds like fatty acids and phenolics (Faccoli and Schlyter 2007; Ishangulyyeva et al. 2016) could be accommodated in EXTEMIT / CULS with help of instrumentation HPLC-MS that will be available by cooperation in new EVA project (headed by Sandy Liebholt).

2) Surviving trees "***Last Tree Standing***" will be more important to forest genetics and forest persistence under climatic change than 'first casualties' (i.e. stressed trees) (Erbilgin et al. 2017; Balogh et al. 2018; Six et al. 2018). This is a new facet of response to climatic change and tree-beetle interaction, not included in EXTEMIT and will need additional funding (national or H2020).

3) This new understanding was presented at ISCE 2018 August, Budapest by scientific leader and to Team early September.

HBS4: Project map

Several attempts were made during spring 2018 to create a "multidimensional all in one" map or graphic, but with low success or acceptance. Recent discussion gave that we better split 'map' into a more conventional Gantt chart plus a more conceptual, scientific scheme, possibly in addition an organisational schedule.

For the Gantt chart, we have a simple one at very end of the scientific plan. We realised now that the time scale used was strongly flawed, aimed at only the purely scientific work, as if EXTEMIT would have been scientifically operational from day 1.

Instead, we must clearly show the "preparation" phase of the project as we cannot forget to fulfil another major goal of the project: Build a team from the point almost ZERO and construct laboratories with necessary equipment. This took almost two years!

Thus, two 'maps' will be produced.

Team cohesion

Progress:

1) Post-team meeting dinners in town, arranged

2) a senior scientist out-of-office/over-night meeting social & admin scheduled for November 5-6 (planned for once/semester) and

3) a general informal out-of-office/over-night meeting social & scientific for all (emphasis students & junior scientist presentations, in Scanian Lund/Alnarp "PheroDay"-style) in April 2019 in planning (planned for once or twice/year).

EU InterReg application on applied research in bark beetle control submitted early 2018 and passed formal check at end of spring semester 2018. This application integrated several PIs of EXTEMIT.

Ongoing preparation of H2020 (started already at very end of 2018, but aborted due to lack of time). Topic 'Novel methods for (invasive) bark beetle surveillance and management' including remote sensing, chemical ecology, RNAi and *Last Tree Standing*. This application will involve and integrate work of several PIs of EXTEMIT.

The EXTEMIT-K team is now regular administrative unit with the head and assistant. Assistant (Andrea Lepiešová) will provide better service for the members of the team and she will organise social events too. She cannot be paid by the project money, thus faculty provided her salary.

The office building structure of faculty has very limited possibility to organise informal coffee breaks. Two years ago, the idea of reconstruction of old faculty

building was prepared with enhanced space for meeting rooms. At present, we are in phase of getting the final permission for reconstruction. The budget for this reconstruction was agreed by CULS rector and ministry. The end of reconstruction we can expect in 2019/early 2020.

Refs for HBS3: Barking up the wrong tree?

Balogh SL, Huber DP, Lindgren BS (2018) Single-generation effects on terpenoid defenses in lodgepole pine populations following mountain pine beetle infestation. PLoS ONE 13:e0196063

Erbilgin N, Cale JA, Hussain A, Ishangulyyeva G, Klutsch JG, Najar A, Zhao S (2017) Weathering the storm: How lodgepole pine trees survive mountain pine beetle outbreaks. Oecologia 184:469-478

Faccoli M, Schlyter F (2007) Conifer phenolic resistance markers are bark beetle antifeedant semiochemicals. Agric For Entomol 9:237-245 https://doi.org/10.1111/j.1461-9563.2007.00339.x

Ishangulyyeva G, Najar A, Curtis JM, Erbilgin N (2016) Fatty Acid composition of novel host jack pine do not prevent host acceptance and colonization by the invasive mountain pine beetle and its symbiotic fungus. PLoS ONE 11:e0162046

Six DL, Vergobbi C, Cutter M (2018) Are survivors different? Genetic-based selection of trees by mountain pine beetle during a climate change-driven outbreak in a high-elevation pine forest. Front Plant Sci 9

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