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To: State service for protected areas in Lithuania under Ministry of environment
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Copy:
Baltic environmental forum
Lithuanian Ministry of Environment

Submission on the proposed establishment of in situ genetic management zones within the Punios šilas in the context of proposal for revision and correction of the planning scheme of the Nemuno kilpų regional park (Punia forest).

To whom it may concern,

Firstly, my observation as an outsider and non European (but resident in Lithuania for one year) is that I am surprised that, with so little intact and unlogged natural forest habitat left in Lithuania, there is any reluctance to give what is left the highest possible level of protection.

Secondly, as a conservation geneticist, familiar with debates surrounding the conservation of natural habitat, threatened species and biodiversity around the world, I am very surprised and disappointed that serious consideration is being given to such a radical human intervention into the natural ecological and genetic processes operating in an intact, high conservation value forest.

The goals of the EUFORGEN program to conserve and manage genetic diversity and adaptive potential in commercially exploited tree species are laudable, especially in a world confronted by rapid climate change. However, these goals should not be used incautiously to justify radical intervention in forests that have high conservation value for entire communities of species, some of which are rare and vulnerable.

Mr Bassano's correspondence to the BEF (as I received a copy of this correspondence during an organized event in Punios šilas on May 21, 2021) restates EUFORGEN's general principles and counsels against complete neglect of genetic processes operating in nature reserves, but it does not necessarily endorse "heavy" intervention of the kind being proposed. "Active" management which would not compete with the biodiversity conservation goals of protection Punios šilas might consist of genetic monitoring using seeds and small tissue samples for DNA extraction and population genetic analysis.

Continued logging or tree removal at any level in the reserve is likely to affect its capacity to sustain viable natural populations of multiple species. The proposed management zones represent about 10% of the proposed reserve and one of the two zones is contiguous with the present strict reserve zone, heightening the potential risk of impacting on important species. Research shows reduced species diversity in logged areas of the Punios šilas relative to the strict reserve (Preikša 2011)

Genetic biodiversity is but one level of biodiversity nested within other equally important levels such as species and community biodiversity and all are vulnerable to human impacts. For the species which shun human activity such as logging and do not utilise the resulting ecologically degraded areas, are their population sizes not potentially reduced, or their mobility therefore reduced by the maintenance of forestry intervention zones? Both of these consequences potentially reduce the ability of populations to retain genetic diversity and maintain their evolutionary potential, the stated target of the proposed in situ forest management program for spruce and pine. I would expect it is incumbent upon the advocates of the intervention scheme to provide evidence that their operations do not impact on other species.

Punios šilas represents one of the last areas of relatively intact forest habitat in Lithuania and it is known to be a highly valuable repository of biodiversity. I understand that if protected and allowed to age naturally, without any tree removal or other human interventions, the forest will in time multiply the area of high conservation value old growth forest in Lithuania by several fold. Does the case for the continued radical intervention for the sake of theoretically maintaining long term adaptive potential of one or two widely distributed and abundant forest species really outweigh the importance of having a large, continuous intact forest that supports multiple other species for whom Punios šilas could well represent their greatest protection against regional extinction?

It is my view as a conservation geneticist that characterising the risk to pine and spruce by allowing them to persist at Punios šilas without human intervention as potentially "catastrophic" (Mr. Bazzano's letter to the BEF) is exaggerated and not supported by scientific data that pertain to the species and populations in question.

I raise the following scientific concerns about the proposed active management program.

1. There are several potentially significant impacts of the proposed in situ management approach.

- intervention by managing age structure will certainly apply an unknown and difficult to measure amount of artificial selection of some kind. That is, a form of domestication or adaptation to cultivation is likely to be imposed upon the population of unculled trees, seeds collected and seedlings which have been allowed to germinate spontaneously in the altered non-natural intervention zones. This has the potential to reduce the adaptedness or fitness of the populations used in the artificial breeding program to the natural conditions in the reserve (Frankham 2008).
- altering the age structure in so called "mature and overripe stands" by removing the contribution of the older, larger trees (which probably make a disproportionate contribution to the seedbank) to engineer more mixed age stands will shorten the generation time and therefore accelerate the rate at which any evolution caused by the artificial selection regime will occur (Frankham 2008). The larger, more fecund trees are also likely to be among the fittest by virtue of having persisted to old age. Reducing their contribution to the breeding population risks lowering mean fitness of the population.

2. The recommendations implicitly relate the importance of maintaining a high enough genetic effective population size (N_e) to avoid random genetic drift and inbreeding and therefore to ensure evolutionary potential is maximised (Charlesworth 2009). N_e is likely to be quite large in such a common species of pine and spruce and possibly well above the levels at which drift and inbreeding threaten population viability and maintenance of quantitative genetic variation. To justify the radical intervention proposed by the foresters I would expect there to be estimates of N_e , ratio of N_e to N (population size) and spatial genetic neighbourhood size (which acts as a proxy for N_e in continuously distributed populations where gene flow is non random with respect to the entire species range) and therefore quantitatively-backed predictions of dangerous impacts on genetic diversity in the species in question if no intervention occurs.

Are there estimates of demographic and genetic effective populations size of pine and spruce in the reserve (or appropriate population neighbourhood)? If there are, is there evidence of inbreeding depression and genetic drift in populations of pine and spruce of similar effective populations sizes that suggest the capacity of the Punios šilas to adequately maintain sufficient evolutionary potential will not be sufficient if it is left unmanaged?

3. I cannot find published studies on the genetic population structure of the two species that suggest the Punia forest harbours unique neutral or quantitative genetic variation. It could well be the case that inclusion of specimens from surrounding populations in any breeding program adequately captures the gene variants present in Punios šilas.

Given the obvious and undesirable consequences for nature conservation of maintaining a large area of occasional tree felling operations within the proposed reserve, and the lack of a data specific to the populations of pine and spruce supporting the case for intervention it is difficult to

see how the "in situ" breeding populations aimed at preserving genetic diversity cannot be established nearby but outside the proposed reserve.

The recommendations in effect mean that the value of one or two commercial forest species trumps the interests of the remainder of the plant and animal communities that they coexist with and depend upon. The so called in situ MPBS (Multiple Population Selection Concept) treats the target species as if it were a crop without regard to the impacts that growing these managed stands have upon the other species in the community they would normally interact and coevolve with naturally.

In conclusion, it is my view that the argument for coopting a significant area of Punios šilas to establish in situ genetic reserves managed with heavy intervention for two commercial forest species is poorly supported by scientific arguments and relevant data. On the other hand, the biodiversity and nature conservation benefits of excluding significant human impacts across the entire reserve are obvious.

I would recommend:

- converting the entire Punios šilas area into a strict nature reserve in perpetuity including the areas proposed as genetic nature reserves.
- conduct regular non-invasive genetic sampling within Punios šilas and across Lithuania (using highly polymorphic codominant molecular markers such as SNPs and microsatellites) of pine and spruce for estimation and long term monitoring of genetic diversity, effective population size and population genetic structure.

Sincerely,
Dr Phillip England

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Brief curriculum vitae for Phillip England

PhD, BSc (Hons) Macquarie University - conservation genetics

MSc UNSW - molecular genetics

Bachelor of Fine Arts University of Tasmania (Dean's Honour Role)

>40 scientific papers in peer-reviewed journals and three scientific book chapters.

16 years post PhD as a research scientist in conservation genetics. 8 years prior PhD as a researcher in molecular genetics. Now retired from science.

Selection of my papers demonstrating expertise relevant to this submission:

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