

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Evaluation of the Diploma Thesis by Opponent

Thesis Title **Evaluation of population genetic parametres of two Mongolian carnivore species.**

Name of the student **Bc. Zuzana Bartošová**

Thesis supervisor **Mgr. Barbora Černá Bolfíková, Ph.D.**

Department **Department of Animal Science and Food Processing**

Opponent **Ing. Jana Svobodová, Ph.D.**

Formulation of the aims	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Appropriate research methods	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Fulfilment of the aims	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
The scientific contribution of the thesis and originality	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
The theoretical background of the author (literature review, theoretical background)	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Data analysis	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4
Handling with scientific literature (relevant citations)	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Argumentation and critical thinking	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Abstract and keywords	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4
Structure of the chapters and paragraphs	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4
Accuracy of terminology and comprehensibility	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Formatting, layout and general impression	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Evaluation of the work by grade (1, 2, 3, 4)	2			

Evaluation: 1 = the best

Date 10/09/2024

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Other comments or suggestions:

The thesis evaluates the genetic diversity and gene flow (structure) of populations of three carnivore species: the Gobi bear, the red fox, and the corsac fox in Mongolia. The study found low genetic diversity within the Gobi bear population, which is explained by the small size and isolation of the population. According to the author of the thesis, red fox populations showed moderate genetic diversity, while the genetic diversity of the corsac fox population was lower in comparison to the red fox population. The Mongolian population of the red fox also shows signs of inbreeding. Surprisingly, no significant genetic structure was detected in any of the Mongolian populations.

The literature review focuses on the current distribution, ecology, and population genetics of selected carnivore species. Thanks to this review, I gained a relatively good overview of the issues. However, it is not well explained why these three carnivore species were included in the thesis. With regard to the Gobi bear, I even got the impression that there is nothing more to discover about it. Moreover, the Gobi bear is not a member of the Canidae family, and the title of the thesis is "Evaluation of Population Genetic Parameters of Two Mongolian Carnivore Species."

The chosen laboratory procedures are standard for this type of sample. Additionally, the selected data analyses align with the aims of the work. However, since genotyping fecal samples is very prone to errors, the text should specify how many times the PCR was repeated for heterozygous and homozygous genotypes. Moreover, analysis from tetranucleotide loci are generally more reliable than from dinucleotide loci, so Tables 1 and 4 should indicate which type of loci are involved. Mongolia is undoubtedly a unique environment, and despite the very small sample sizes, I consider the results of this study to be beneficial for the management of the selected carnivore species. I was looking forward to the results of the thesis. However, the data are poorly processed, and I am unsure if the student fully understands the results. My comments are as follows:

- In the cluster analyses (Fig. 12), samples of domestic dogs and wolves from Mongolia, as well as red foxes from Europe, have also been included. However, the text does not clarify how these samples were collected (including their distribution), how they were genotyped, etc.
- The quality of microsatellite loci has been evaluated only through the estimation of null alleles (Tables 6, 7, and 8). Some calculated null allele proportions are negative numbers, it is incorrect, ratios cannot be negative. (By the way, calculating the average of null alleles is not meaningful.) Proportions of null alleles can significantly affect estimates of other genetic diversity parameters. Moreover, if problematic loci have been included in the cluster analysis and PCA, these results could also be influenced, potentially leading to an overestimation of gene flow. My question is: What is the meaning of F_{null} in Tables 6, 7, and 8, and to what extent are the results of the analyses accurate?
- For a more detailed evaluation of the gene flow in red fox populations I would analyse these samples separately.
- Though cluster analysis by Structure did not reveal any structure within Gobi bear population, the results should be presented in the text too.
- In the case of PCA, I would recommend using the MANOVA test to evaluate the significance of the visualized structure. Additionally, it is unclear which samples and loci were included in the PCA and how the populations were initially defined.
- The cluster analysis and ordination techniques (PCA) only evaluate gene flow (genetic structure); they do not analyse genetic diversity. Nevertheless, they are included in the chapter titled "Genetic Diversity of the Population."
- „The inbreeding coefficient was estimated to be 0.215 for the red fox population ... „ That is incorrect, there is 0,163 in Table 7.

In my opinion, the discussion contains a long text about the success of sample amplification, which was not the aim of the thesis. The presented spatial distribution of recaptured Gobi bear samples is not discussed at all. Some sentences from the Discussion are imprecisely worded, and misleading:

- “The population structure analysis of Gobi bears revealed a low level of genetic diversity, as estimated by observed heterozygosity ($H_o = 0.26$) while seven out of 12 loci were not polymorphic.” These values are only parameters of genetic diversity.
- The average inbreeding coefficient ($F_{is}=0.163$) and significant deviation from HWE indicates a moderate level of inbreeding within this population which may reduce genetic diversity and increase the likelihood of genetic disorders .. „ What do you mean by genetic disorder? HWE for particular loci are not presented in the thesis.

The thesis also contains many technical errors. There is no mention of Corsac fox in the abstract, in keywords. The abstract should also contain the Latin names of the species. Captions of images and graphs are insufficient, information on sample sizes, numbers of microsatellite loci must be included there.

As mentioned above, the results of the work are promising for the protection of selected carnivore species in Mongolia. Although the work has some professional and formal shortcomings, I recommend that the diploma thesis of Bc. Zuzana Bartošová be accepted for defense.

Questions for thesis defence:

The thesis evaluates the limitations of the work, but only in the context of sample size. Could the author critically assess other limitations of the chosen methodology?

In the past, within the framework of building socialism, everything was possible. Were there any translocations of red foxes between Europe and Mongolia?

Is it possible to assume crossbreeding between red fox and corsac fox?

The significant genetic structure in red fox populations was found at very fine spatial scale (Kimmig et al. 2019 Mol. Ecol.). Although Mongolia is a large country the thesis did not show a significant restriction of gene flow in this species. Where in Mongolia might potential barriers for selected carnivore species be located?

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