FACTORS AFFECTING INFESTATION OF TREES BY *COSSUS COSSUS* (LINNAEUS, 1758) (LEPIDOPTERA: COSSIDAE) IN THE CZECH REPUBLIC

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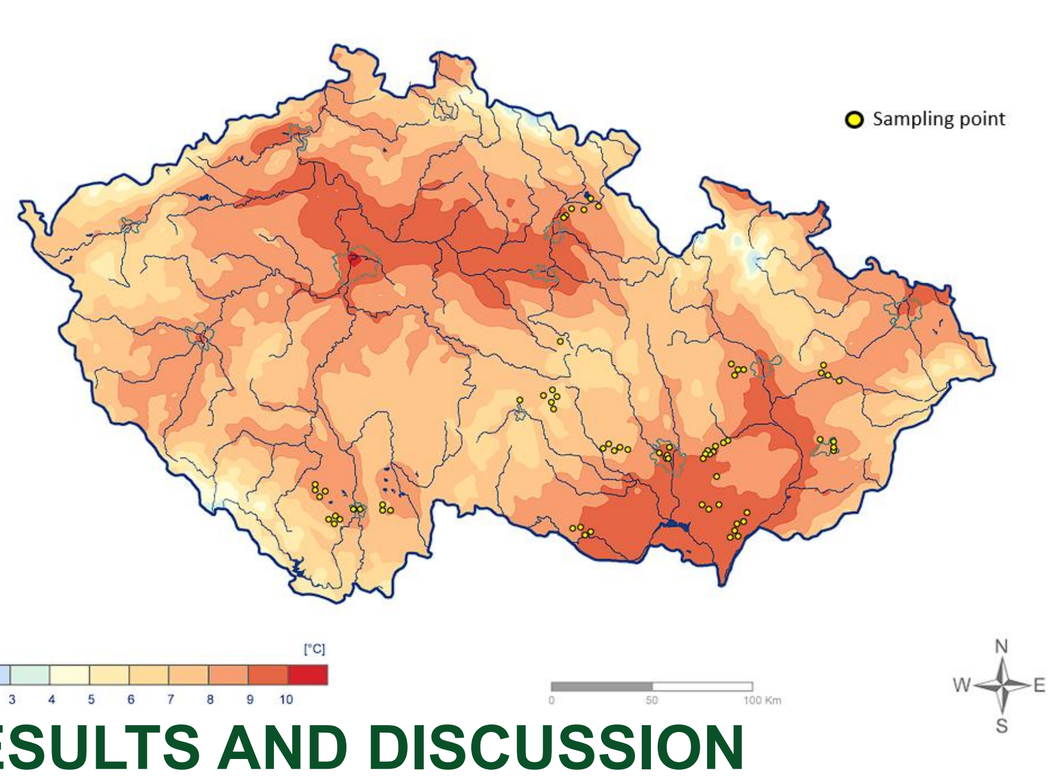
INTRODUCTION

The goat moth (*Cossus cossus* (Linnaeus, 1758)) is the most widely distributed species of genus *Cossus* from the family Cossidae. Its larvae develop under the bark and in the wood of a variety of broad leaf trees and shrubs of about 20 plant families and cause physiological and technical damage to host woody plants. It is widespread in temperate zones of many European and Asian countries, and in North Africa (Yakovlev, 2011). In the Czech Republic, it causes serious damage to various ornamental trees. To prevent and minimize losses from this pest infestations, it is important to have detailed knowledge of the characteristics of trees and habitats that are sensitive to infestation. The main goal of this study is to gain new knowledge on the ecological requirements of the species concerning tree and habitat characteristics to support effective monitoring and controlling this pest species.

Mean annual temperature map of the Czech Republic (www.chmi.cz)

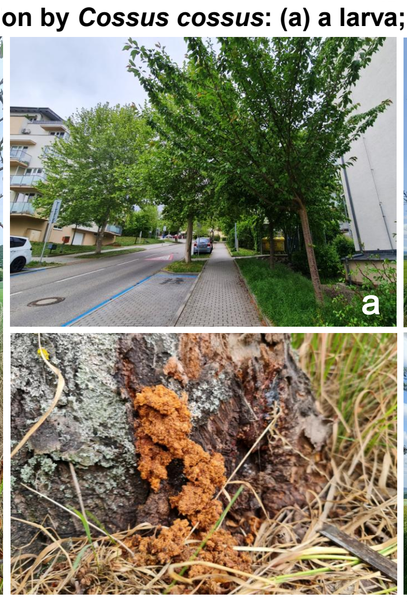


MATERIAL AND METHODS

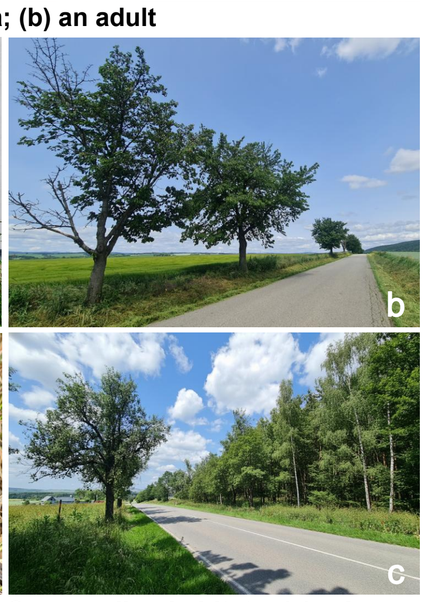
The study was conducted across various tree lines in the Czech Republic. At each locality, all trees along the line were inspected for feeding galleries of *C. cossus* to assess the infestation rate in a locality. Infested trees were classified into 3 categories based on severity of infestation; low, medium and severe. At least 10 non-infested trees were sampled as a control. The characteristics of tree and habitat, such as tree species, DBH, tree vitality, stem cracks, stem damage, bark roughness, type of surrounding habitat, etc., were recorded. The effects of these characteristics on the severity of infestation were investigated through random forest algorithms. The permutation importance was used to check the importance of the explanatory variables. Ordinal logistic regression was used to evaluate the statistical significance of each explanatory variable. Lastly, the marginal effect of the selected significant variables was visualized with a partial dependence plot.

A tree with severe infestation by *Cossus cossus*: (a) a larva; (b) an adult

A tree with a cracked and damaged stem



A feeding gallery with expelled frass of *Cossus cossus*



Surrounding habitats: (a) urban area; (b) field/meadow; (c) forested land

RESULTS AND DISCUSSION

A total of 1,380 trees were sampled from 68 localities in the Czech Republic. The five tree species with the highest relative number of infested trees are *Sorbus*, *Malus*, *Pyrus*, *Fraxinus* and *Cerasus avium*, respectively (Fig. 3). Overall, the preference of *C. cossus* was more driven by characteristics of individual trees than by habitat, with key factors being vitality, old stem damage, stem cracks and recent stem damage, respectively (Fig. 1). All these factors had positive effects on a probability of tree infestation (Fig. 2), indicating that *C. cossus* primarily targets unhealthy and/or damaged trees.

Fig. 1

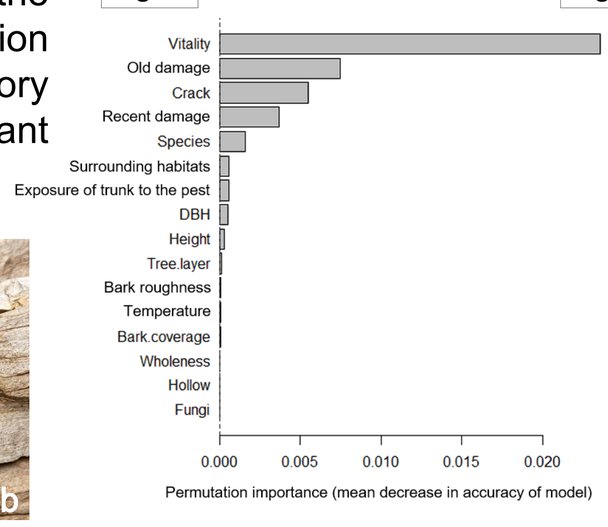


Fig. 2

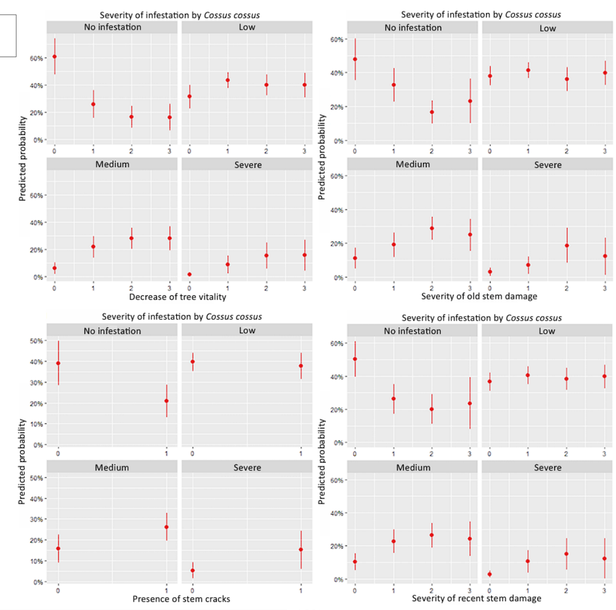
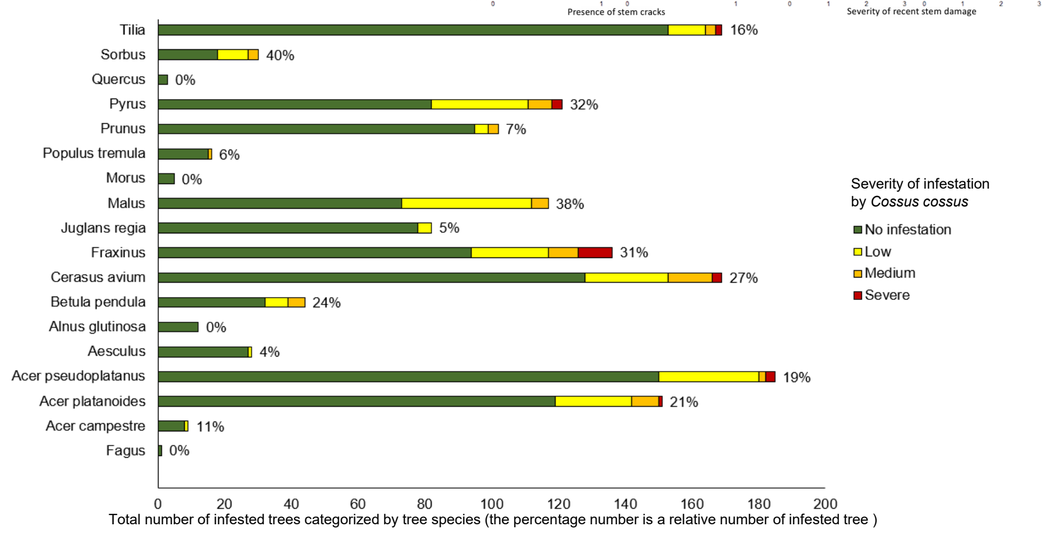


Fig. 3



ACKNOWLEDGEMENT

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[1] YAKOVLEV, R.V. (2011) Catalogue of the Family Cossidae of the Old World (Lepidoptera). *Neue Entomologische Nachrichten, 66*, 1-130..

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