1 Shifts of the climate niches of two key pests under changing climate – two methods of assessment.

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There are major gaps between the actual and attainable yields of crops, attributable largely to the pests, diseases and weeds. In global change research, estimates of crop yields using simulation models frequently do not take into account these factors causing discrepancies between observed and predicted yields. Furthermore invertebrates and plant pathogen are highly adapted to change and so are prime targets for risk assessment in global climate change. Therefore predicting the potential distribution of all pests, both indigenous and introduced, plays a key role in determining the effects of global change effects on agricultural, horticultural and forestry ecosystems. Pest-host relationship can be affected by climate change in different ways. Pests that are currently of minor significance may become key species, thereby causing serious loses in European countries. The distribution and intensity of current key pest and diseases may be affected leading to changed effects on yield and on control measures such as pesticides and integrated pest management. It is also apparent that pests will migrate as crops will migrate in association with climate-induced changes in crop compositions in various regions. In the same time the pesticide usage will change thus leading in some cases to increase of the production costs. European corn borer (ECB), *Ostrinia nubilalis*, Hübner) and Colorado Potato Beetle (*Leptinotarsa decemlineata*, Say) are two major pests of corn and potatoes respectively in Europe with range of optional host plants. Their rate of development is known to be closely correlated with daily air temperature whilst the population density is to great extend dependent on other weather parameters, host availability and farming practices. For these reasons we have chosen them as model organisms in order to widen the reach of the present assessments of the climate change impacts on crop growth and development. Based on the literature overview we derived a relatively simple dynamic phenological model indicating developmental stage and overall weather suitability in the given time during the season based on the meteorological parameters. As an alternative climate matching

approach of CLIMEX that enables to predict the potential geographical distribution of a species in relation to mean monthly climatology was tested. The advantage of the former approach is much finer (daily) time step and capability to capture inter-seasonal variability of the pest developmental rates. The latter approach provides rather robust estimate of overall climatic suitability however it much less data intensive. Results of both approaches were evaluated using observed field distributions of the pests. In the final step we assessed potential development of the ECB and CPB climate niches under expected environmental change using number of GCMs based scenarios during period 2010-2100 using both methods. These outputs were then presented in the form of the potential climatic niches of ECB and CPB in the Czech Republic using GIS software and 1x1 km resolution.

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