

УДК 551.583; 551.582; 504.38

POSSIBLE CHANGE IN ESTIMATED CLIMATIC RANGE OF INSECT PESTS
OF AGRICULTURAL PLANTS IN RUSSIA: ITALIAN LOCUST
AND MEDITERRANEAN FRUIT FLY

Anton Yu. Bogdanovich *

Yu. A. Izrael Institute of Global Climate and Ecology (IGCE), Moscow, Russia

Mathematical modeling of species climatic ranges is regarded as a key tool for assessing potential impacts of climate change on ecosystems and agriculture. In the present work, the RANGES system is employed, which, on the basis of observed climate data or climate model outputs together with climate predictor values, estimates the probability of a geographic point belonging to the climatic area of distribution or climatic range of a certain species. In contrast to approaches based on multi-year mean characteristics, the limitations of the climate predictors are tested separately for each year within the considered time interval.

The climatic ranges of the Italian locust and Mediterranean fruit fly, two insect pests of agricultural crops, are evaluated for the climatic conditions of 1990–1999, 2030–2039, 2050–2059 under a set of climate change scenarios. Among the large number of insect pests affecting crop production, these two species are considered to be dangerous or potentially dangerous under the climatic conditions of Russia. The calculations are carried out using climate data produced by the global climate model developed at the Marchuk Institute of Numerical Mathematics of the Russian Academy of Sciences, providing a basis for assessing possible future shifts in the spatial distribution and risk levels of these pests.

According to the obtained results, an overall expansion of the climatic range of the Italian locust towards the north, especially in the European part of Russia, can be noted. However, under some climate-change scenarios, a slight decrease in the probability of belonging to the climatic range is projected for parts of the Central Black Earth Region. For the Mediterranean fruit fly, whose current climatic range in Russia is mainly confined to the Black Sea coast, an expansion of the climatic range to the North and East is expected by the middle of the twenty-first century.

<https://doi.org/10.46991/PYSUC.2026.SI1.011>

Keywords: RANGES system, insect pests, Italian locust, Mediterranean fruit fly, climate change.

References: Semenov S.M., Bogdanovich A.Yu., et al. Atlas of Climate-Related Threats to Public Health, Food Security, and Forests in Russia, Related to Changes in the Climatic Ranges of Harmful Species. Version 1.0. Moscow, Federal State Budgetary Institution “Yu.A. Izrael Institute of Global Climate and Ecology” (2026), 64.

Bogdanovich A.Yu. The RANGES System: Structure, Calculation Procedure and Application Example. *Hydrometeorological Research and Forecasting* 1 (2025), 37–50. <https://doi.org/10.37162/2618-9631-2025-1-37-50>

* **Corresponding Author:** Anton Yu. Bogdanovich, Senior Researcher, Yu.A. Izrael Institute of Global Climate and Ecology, Glebovskaya st., 20B, Moscow, Russia. E-mail: bogda-anton@yandex.ru