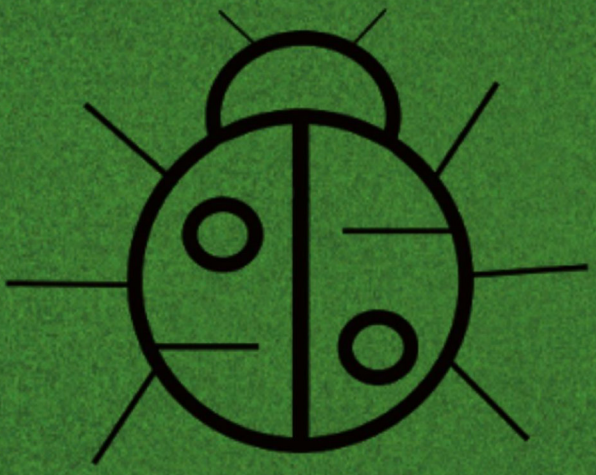
ALIEN SPECIES OF ANIMALS, FUNGI AND PLANTS IN BELARUS AND NEIGHBORING COUNTRIES



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of the 1st International Scientific Conference

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The scientists' materials presented are devoted to modern aspects of faunal research, and monitoring and ecology of alien and invasive species in Belarus and neighboring countries.

The materials are intended for researchers, university lecturers, graduate students, and students of specialized educational fields. The authors of each paper are solely responsible for the accuracy of the information presented, correctness of the citation sources, statistical, personal and other data given in the articles.

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Contents

ON THE NORTH-EASTERN INVASIVE RANGE LIMIT OF *AGRILUS PLANIPENNIS* (COLEOPTERA: BUPRESTIDAE) IN THE EUROPEAN RUSSIA

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Introduction. The invasion of the East Asian emerald ash borer (*Agrilus planipennis* Fairmaire) (Coleoptera: Buprestidae) into Europe started with an unintended introduction and the first outbreak of the species in Moscow (Russia), presumably in the late 1990s, although the first record in Moscow refers to 2003. Since than the buprestid has covered a distance of about 600 km southward from Moscow and has reached Ukraine (Orlova-Bienkowskaja et al., 2020). North of the Moscow Province, it reached only Yaroslavl located 240 km north-east of the suburbs of Moscow and still in habits there (Vlasov, 2020). The Yaroslavl "enclave" of the emerald ash borer is separated from its main invasive range by approximately 180 km to the north-eastern direction, and no records of *A. planipennis*are known so far in the cities of Rostov and Pereslavl-Zalessky situated between Moscow and Yaroslavl and planted with ash trees (*Fraxinus*) (Vlasov, 2020). Earlier, we suggested that northward spreading of the emerald ash borer can be limited by such factors as insufficient heat accumulation and absence of necessary food supply (European and North American ash species) on the way of the emerald ash borer from Moscow to St. Petersburg (Afonin et al., 2016). Therefore, in this work, we aimed to identify the factors determining the disruption's limits of the emerald ash borer's invasive range between Moscow and Yaroslavl.

Materials and methods. To identify the ecological limits of the distribution of the species in the north, we carried out an ecological niche analysis of the well mapped invasive range of *A. planipennis* in North America. The developed ecological niche model was used to determine the boundaries of the potential range of the emerald ash borer in northern Europe. The method of ecological niche modeling was described earlier (Afonin & Sokolova, 2018). Data on the distribution of *A. planipennis* were taken from various published sources (including (Orlova-Bienkowskaja et al., 2020)). The global maps of the accumulated degree days used in the analysis and modeling were recalculated from the monthly mean temperature layers taken from the spectroradiometer of the Terra spacecraft – the product MOD11C3 (Afonin, Milyutina & Fedorova, 2019).

Results. The ecological niche modeling demonstrated that the northern limit of distribution of *A. planipennis* in North America is well described by the isoline of 700 accumulated degree-days (ADD) above the lower temperature threshold of development of 10 °C. Application of this model to the territory of Europe demonstrated that the continuous isoline of 700 ADD runs somewhat north of Moscow near Sergeev Posad, and further to north-east towards Yaroslavl (but only as isolated heat islands with ADD > 700). In Sergeev Posad and Yaroslavl, the ADD value is more than 700, and *A. planipennis* has been found in these cities (Vlasov, 2020), whereas in Pereslavl-Zalessky and Rostov the ADD is less than 700, and the emerald ash borerhas not been found there (Vlasov, 2020).

Conclusion. Thus, we conclude that the occurrence of *A. planipennis* in cities along the line Sergeev Posad – Pereslavl-Zalessky – Rostov – Yaroslavl is determined by the ADD at each particular settlement: the emerald ash borer is distributed only in areas where the ADD exceeds 700.

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