*Zoosymposia* 22: 145–145 (2022)
https://www.mapress.com/j/zs


# Abstract

ISSN 1178-9905 (print edition)
**ZOOSYMPOSIA**
ISSN 1178-9913 (online edition)

https://doi.org/10.11646/zoosymposia.22.1.93

## Modelling the potential distribution of ticks in China: past trends and future changes*

XIN YANG[1] & SEN LI[1,2,3*]
[1]*College of Environment Science and Engineering, Huazhong University of Science and Technology, Wuhan 430070, China*
[2]*UK Centre for Ecology & Hydrology, Wallingford OX10 8BB, UK*
[3]*Environmental Change Institute, University of Oxford, Oxford OX1 3QY, UK*
[*]*Corresponding author.* ✉ *senli@hust.edu.cn*

**In*: Zhang, Z.-Q., Fan, Q.-H., Heath, A.C.G. & Minor, M.A. (Eds) (2022) *Acarological Frontiers: Proceedings of the XVI International Congress of Acarology (1–5 Dec. 2022, Auckland, New Zealand)*. Magnolia Press, Auckland, 328 pp.

Ticks are known as vectors of various pathogens causing zoonotic diseases, such as Lyme borreliosis, tick-borne encephalitis, and Crimean-Congo hemorrhagic fever. While China is known to have recorded more than 100 tick species over the country, knowledge of the pattern and determinants of ticks' potential distribution under climate change remains very limited, hindering the development of preventing and controlling the risk of tick-borne diseases. In this study, we adopted a recent spatial dataset of distribution and diversity of ticks in China (Zhang *et al.* 2019), and selected four representative tick species in mainland China, i.e., *Dermacentor marginatus, Dermacentor silvarum, Haemaphysalis longicornis* and *Ixodes granulatus*. These species have different, typically regional distribution foci. A Maximum Entropy (MaxEnt) model was used for analyzing the key environmental factors influencing the distribution of these four species and mapping their spatial potential distribution in the current situation (Yang *et al.* 2020) and in 2050 under four combined climate and socioeconomic scenarios (i.e., SSP1-RCP2.6, SSP2-RCP4.5, SSP3-RCP7.0 and SSP5-RCP8.5) over the country (Yang *et al.* 2021). The results showed that the extent of the urban fabric, cropland and forest, temperature annual range and precipitation of the driest month were the key determinants of the potential distributions of the four tick species. It is suggested that the potential distributions of ticks may shift to further north in China with climate warming. The distribution probability of ticks in central and southern China declined due to a predicted reduction of forests. Our results predicted that the distribution would generally decrease under the extreme emission scenario (RCP8.5) due to the expected impact of land use, in contrast with previous studies finding an estimated amplification of tick distribution probability under RCP8.5. Our results added new evidence on the potential distribution of ticks and pinpointed the emerging risk areas for the prevention and control of tick-borne zoonoses in mainland China.

**Keywords**: ticks, potential distribution, climate change, land use change, MaxEnt, China

### References

Zhang, G., Zheng, D., Tian, Y. & Li, S. (2019) A dataset of distribution and diversity of ticks in China. Scientific Data, 6, 105. https://doi.org/10.1038/s41597-019-0115-5

Yang, X., Gao, Z., Zhou, T., Zhang, J., Wang, L., Xiao, L., Wu, H. & Li, S. (2020) Mapping the potential distribution of major tick species in China. *International Journal of Environmental Research and Public Health*, 17, 5145. https://doi.org/10.3390%2Fijerph17145145

Yang, X., Gao, Z., Wang, L., Xiao, L., Dong, N., Wu, H. & Li. S. (2021) Projecting the potential distribution of ticks in China under climate and land use change. *International Journal for Parasitology*, 51, 749–759. https://doi.org/10.1016/j.ijpara.2021.01.004

*Submitted: 30 Sept. 2022; Accepted by Allen Heath: 4 Oct. 2022; published: 30 Nov. 2022*