



Monitoring the impact of global climate change by analyzing animal groups in thermophilic fauna corridors in Bulgaria

Maria Naumova¹, Teodora Marius Teofilova¹, Tsvetelina Gerasimova¹, Boyan Vagalinski¹, Vera Antonova¹, Sirma Zidarova¹, Albena Vlasseva¹, Teodor Trifonov¹, Ivaylo Georgiev², Simeon Indzhov³, Vassil Vassilev⁴, Stela-Teodora Trendafilova³, Maya Slavova³

¹ Institute of Biodiversity and Ecosystem Research (IBER), Bulgarian Academy of Sciences (BAS), 1 Tsar Osvoboditel Blvd., 1000 Sofia, Bulgaria

² Technical University, 11 Professor Georgi Bradistilov Str., 1756 Sofia, Bulgaria

³ Faculty of Biology, Sofia University, 8 Dragan Tsankov, 1164 Sofia, Bulgaria

⁴ GeoPolymorphic Cloud Association, 58 Sitnyakovo Blvd., 1111 Sofia, Bulgaria

INTRODUCTION & AIM

Bulgaria has a diverse fauna, including thermophilic and xerophilic Mediterranean, as well as Central and Northern European species. However, no analysis on the percentage ratio between thermophilic and other faunal elements exists. Potential corridors for thermophilic fauna penetration include the valleys of the Struma, Mesta, and Maritsa rivers, as well as along the Black Sea coast.

This project aims to establish the species composition of various animal groups, which are crucial for ecosystems and act as bioindicators. Indicator species will be identified to monitor the long-term effects of global climate change.

Combining different research approaches and various field methods for collecting material will contribute to achieving the set goal.

METHODS

Twelve main study sites were designated - three in each bio corridor, from the southernmost point on Bulgarian territory north to where the Mediterranean influence is still significant (Fig. 1). These sites were visited monthly, while tributaries of the rivers and other locations along the corridors were studied on additional basis.

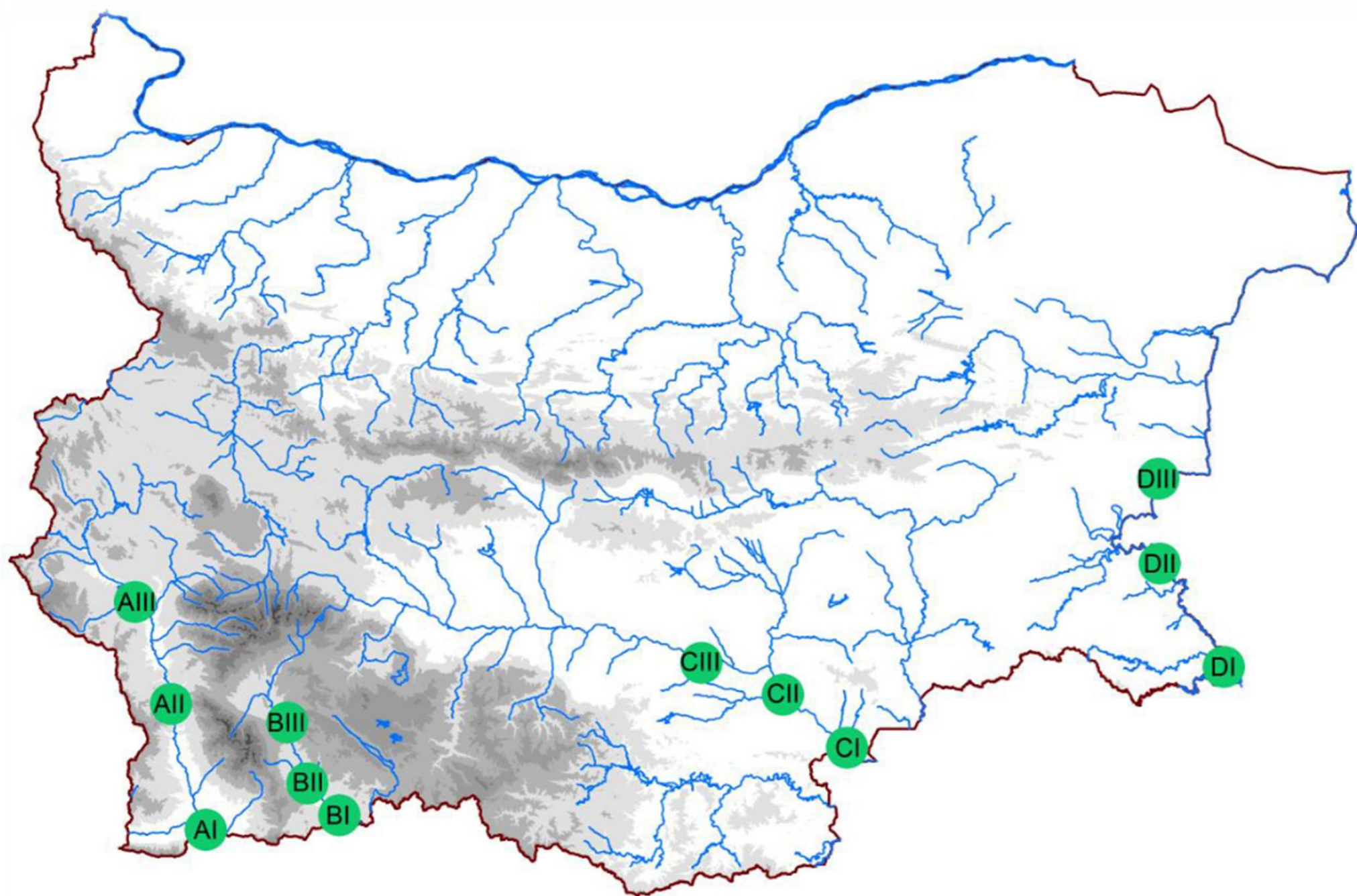


Figure 1. Map of Bulgaria with the locations of the main study sites, where the pitfall traps were placed. The four bio corridors are: **A.** Struma River; **B.** Mesta River; **C.** Maritsa River; **D.** Southern Black Sea Coast.

A total of 126 pitfall traps and ten mesovoid shallow substratum (MSS) traps were set. Malaise traps were set for the duration of 150 days. The invertebrate fauna was additionally sampled manually by hand collecting, leaf litter sifting and sweep netting. Sherman small folding live traps were used for the sampling of small mammals, while photo traps were placed to record the macrofauna. In suitable conditions bats were monitored using bioacoustic registration. Amphibians and reptiles were sampled primarily manually. During field surveys birds were identified by sound and visually.

RESULTS & DISCUSSION

Since the beginning of 2023 over 1700 pitfall trap samples and over 160 MSS trap samples were collected. More than 300 samples were collected manually, including 15 species of amphibians and 33 species of reptiles, 31 of which are protected by the Biodiversity Act and have a high conservation status. Over 500 individuals of ten species of medium and large mammals, as well as 16 small mammal species were recorded.

During the study period a total of 1213 species of invertebrates were identified, including 427 species of arachnids (Arachnida: Araneae, Scorpiones, Solifugae), 25 diplopods, 48 land snails, 175 hymenopterans, 48 of which ants, 402 coleopterans and 26 species from the orders Blattodea, Mantodea, Dermaptera, Psocoptera and Embioptera.

Of particular interest, together with the multiple endemic and Mediterranean species recorded, are three new species for Bulgaria – *Dactylopiastes digiticeps*, *Synema ornatum* (Araneae) and *Ameles spallanzania* (Mantodea), and one new species for Europe – *Orthobula charitonovi* (Araneae). Several species, like *Uroctea durandi*, *Latrodectus tredecimguttatus* (Araneae), *Brachyiulus apfelbecki* (Diplopoda), *Eyprepocnemis plorans* (Orthoptera) and *Polyphaga aegyptiaca* (Blattodea), were recorded at new localities further north than their known distributions in Bulgaria, and are good candidates for indicator species.



CONCLUSION

The overall completion of this survey will establish suitable indicator species for climate change monitoring by studying the faunal complexes along four major migration corridors. Additional studies will clarify the rates of penetration of thermophilic elements after qualitative and quantitative comparison of the composition of the faunas, both along the south-north and east-west gradients, as well as the degree of anthropogenic impact on the analyzed habitats locally and regionally. This can help develop strategies for managing the surveyed areas in a manner that is beneficial to humans and biodiversity.

FUNDING

This study is funded by the National Science Fund of Bulgaria under Grant contract number KP-06-N61/6 – 14.12.2022.