

Original Research Paper

# Fauna of Hemipterans (*Heteroptera*) of the Northern Tien Shan

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## Article history

Received: 13-04-2023

Revised: 26-10-2023

Accepted: 04-11-2023

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**Abstract:** This article presents the outcomes of a comprehensive investigation carried out between 2019 and 2021, focusing on *Hemipterans* within the Northern Tien Shan region. The study discerned a total of 111 species, belonging to 11 distinct families, including *Tingidae* (14 species), *Aradidae* (3 species), *Lygaeidae* (28 species), *Berytidae* (2 species), *Rhopalidae* (10 species), *Coreidae* (2 species), *Cydnidae* (6 species), *Plataspidae* (1 species), *Acanthosomatidae* (1 species), *Scutelleridae* (5 species) and *Pentatomidae* (40 species). Notably, four species (*Sciocoris consobrinus*, *Sternodontus ampliatus*, *Nysius pilosulus*, *Maccevetus errans errans*) were newly identified within the Kazakhstan territory. Categorized by trophic specialization, these species were grouped into *Mycetophages* (5 species), phytophages (106 species), and zoophagous (3 species). Diverse life forms were observed across the species, spanning nine groups. The study also analyzed the number of generations per year, revealing four categories. Overwintering patterns were diverse, with various species exhibiting distinct life stage preferences. Furthermore, the study highlighted ecological and economic significance, elucidating the roles of certain species as pests and predators. The research contributes valuable insights into the composition, behavior, and ecological roles of *Hemipterans* in the Northern Tien Shan, enriching our understanding of this intricate ecosystem.

**Keywords:** *Hemiptera*, *Heteroptera*, Fauna, Biology, Ecology, Distribution, Northern Tien Shan

## Introduction

*Hemiptera* is one of the most peculiar orders of insects that inhabit a wide variety of biotopes and play an important role in biological processes in biogeocenoses. Among the bugs, there are many species of predators or those with a mixed diet, but herbivorous forms predominate; periodically multiplying in mass quantities, they cause significant damage to agricultural crops (cereals, fodder, vegetables, fruits), as well as pastures and forests. Some *Hemiptera*, being predators, exterminate pests of cultivated crops and forests (Rabitsch, 2010; Vinokurov *et al.*, 2010).

In Kazakhstan, despite the important economic importance of *Hemipterans*, their species composition, biology, ecology, distribution over natural zones and vertical belts, and economic importance in certain physical and geographical regions of the republic have not been studied enough, which determines the relevance of this study.

The materials were collected by the authors in the Northern Tien Shan from 2019-2021. When collecting material, standard entomological methods were used:

Bugs were collected from herbaceous plants, shrubs, and tree branches with a net; species living on the soil surface, at the roots of plants, in the forest litter, under the bark of trees and various shelters, were caught with an exhaustor or tweezers (Schwertner *et al.*, 2021). Species were identified by authors. For species identification of species, clarification of their taxonomic position, biology, economic importance and distribution, sources from the list of references were used (Rieger and Aukema, 2006; Kerzhner, 1998; Kirichenko, 1913; 1951; Asanova, 1971; 1986; Yosifov, 1981; Petrova, 1975; Chernova, 1979).

The purpose of this study is to elucidate the fauna of *Hemipterans* of the Northern Tien Shan, their biology, ecological and zoogeographical distribution, and economic importance. In accordance with the goal, the main objectives of the study were identified:

- To reveal the taxonomic composition of the fauna of *Hemipterans* of the Northern Tien Shan
- To study the biological and ecological features of *Hemiptera* in the region under study

- Conduct a zoogeographical analysis of the fauna of *Hemipterans* of the Northern Tien Shan
- Assess the economic importance of the *Hemiptera* of the Northern Tien Shan

For the first time, an inventory and a comprehensive analysis of the *Hemipteran* fauna of the Northern Tien Shan have been carried out.

## Materials and Methods

Based on our own research, generalization of literature data, and the study of collection materials stored at the institute of zoology of the ministry of education and science of the Republic of Kazakhstan, an annotated list of *Hemipterans* of the Northern Tien Shan was compiled for the first time, including 111 species, of which 4 species are new to the territory of Kazakhstan.

### Trophic Specialization of Bedbugs

Mycetophage (5 species) *Tingidae* (2 species): *Acalypta gracilis*, *Agramma confusum*, *Aradidae* (3 species): *Aradus aterrimus*, *Aradus crenaticollis*, *Aradus lugubris*, Wide oligophytophage (41 species) *Tingidae* (9 species): *Catoplatus citrinus*, *Catoplatus fulvicornis*, *Dictyla echii*, *Galeatus sinuatus*, *Lasiacantha capucina capucina*, *Physatocheila smreczynskii*, *Tingis leptochila*, *Tingis reticulata*, *Tingis angustata*, *Lygaeidae* (4 species): *Orsillus depressus*, *Heterogaster affinis*, *Metapoplax origani*, *Emblethis denticollis*, *Berytidae* (2 species): *Neides tipularius*, *Berytinus clavipes*, *Rhopalidae* (6 species): *Corizus fenestella fenestella*, *Maccevetus errans errans*, *Maccevetus errans caucasicus*, *Stictopleurus abutilon*, *Stictopleurus unicolor*, *Myrmus miriformis miriformis*, *Cydnidae* (1 species): *Legnotus picipes*, *Plataspidae* (1 species): *Coptosoma scutellatum*, *Scutelleridae* (2 species): *Irochrotus lanatus*, *Eurygaster dilaticollis*, *Pentatomidae* (16 species): *Aelia acuminata*, *Aelia furcula*, *Chlorochroa juniperina juniperina*, *Eysarcoris ventralis*, *Stagonomus amoenus*, *Piezodorus lituratus*, *Sciocoris macrocephalus*, *Capnoda nigroaenea*, *Eurydema oleracea*, *Eurydema ornata*, *Eurydema dominulus*, *Ancyrosoma leucogrammes*, *Graphosoma consimile*, *Graphosoma lineatum*, *Thologmus flavolineatus*, *Dybowskyia reticulata* (Kentbayev *et al.*, 2022).

Narrow oligophytophage (11 species) *Tingidae* (2 species): *Dictyla lupuli*, *Oncochila simplex*, *Lygaeidae* (2 species): *Oxycarenus modestus*, *Pachybrachius luridus*, *Coreidae* (1 species): *Enoplops eversmanni*, *Cydnidae* (5 species): *Cydnus aterrimus*, *Adomerus biguttatus*, *Canthophorus impressus*, *Canthophorus dubius*, *Legnotus limbosus*, *Pentatomidae* (1 species): *Mimula dungana*.

Polyphytophage (53 species) *Tingidae* (1 species): *Tingis pilosa*, *Lygaeidae* (22 species): *Apterola lownii*,

*Spilostethus rubriceps*, *Nysius ericae groenlandicus*, *Nysius pilosulus*, *Nysius thymi thymi*, *Kleidocerys resedae resedae*, *Macroplox fasciata fasciata*, *Tropistethus holosericus*, *Drymus sylvaticus*, *Eremocoris abietis*, *Eremocoris plebejus*, *Emblethis ciliatus*, *Emblethis semenovi*, *Trapezonotus arenarius*, *Trapezonotus desertus*, *Lamprodema maura*, *Pachybrachius fracticollis*, *Plinthisus brevipennis*, *Aellopus atratus*, *Peritrechus lundii*, *Rhyparochromus pini*, *Stygnocoris rusticus*, *Rhopalidae* (4 species): *Brachycarenum tigrinus*, *Liorhyssus hyalinus*, *Rhopalus subrufus*, *Stictopleurus crassicornis*, *Coreidae* (1 species): *Bathysolen nubilus*, *Acanthosomatidae* (2 species): *Acanthosoma spinicolle*, *Elasmucha ferrugata*, *Scutelleridae* (2 species): *Odontotarsus obsoletus furvus*, *Odontotarsus purpureolineatus*, *Pentatomidae* (21 species): *Anthemina eurynota eurynota*, *Anthemina lunulata*, *Carpocoris coreanus*, *Carpocoris melanocerus*, *Carpocoris purpureipennis*, *Carpocoris pudicus*, *Codophila varia varia*, *Dolycoris baccarum*, *Dolycoris penicillatus*, *Holcostethus nitidus*, *Holcostethus ovatus*, *Holcostethus strictus vernalis*, *Holcostethus strictus strictus*, *Rubiconia intermedia*, *Stagonomus bipunctatus*, *Pentatoma rufipes*, *Sciocoris microphthalmus*, *Sciocoris umbrinus*, *Sciocoris consobrinus*, *Sciocoris cursitans cursitans*, *Capnoda nigroaenea*.

Monophytophage (1 species) *Pentatomidae* (1 species): *Sternodontus ampliatus*. *Zoophagus* (3 species) *Pentatomidae* (3 species): *Arma custos*, *Rhacognatus punctatus*, *Zicrona caerulea*.

Bed bug life form (*Heteroptera*). *Geo-herpetobiont* (1 species) *Legnotus limbosus*.

*Herpeto-hortobiont* (9 species) (among detritus, on mosses, on herbaceous plants) *Tingidae* (2 species): *Acalypta gracilis* (Fieber, 1844), *Lasiacantha capucina capucina* (Germer, 1837), *Lygaeidae* (6 species): *Emblethis ciliatus* Horvath, 1875, *Emblethis denticollis* Horvath, 1878, *Emblethis semenovi* Kiritshenko.

*Herpetobiont* (22 species) *Lygaeidae* (12 species): *Apterola lownii*, *Spilostethus rubriceps* (Horvath, 1899), *Tropistethus holosericu*, *Trapezonotus arenarius*.

## Results

*Mesophile* (77 species) *Tingidae* (11 species): *Acalypta gracilis*, *Agramma confusum*, *Dictyla echii*, *Galeatus sinuatus*, *Lasiacantha capucina capucina*, *Oncochila simplex*, *Physatocheila smreczynskii*, *Tingis pilosa*, *Tingis leptochila*, *Tingis reticulata*, *Tingis angustata*, *Aradidae* (3 species): *Aradus aterrimus*, *Aradus crenaticollis*, *Aradus lugubris*, *Lygaeidae* (17 species): *Apterola lownii*, *Spilostethus rubriceps*, *Nysius ericae groenlandicus*, *Nysius pilosulus*, *Orsillus depressus*, *Kleidocerys resedae resedae*, *Oxycarenus modestus*, *Drymus sylvaticus*, *Eremocoris abietis*,

*Eremocoris plebejus*, *Emblethis semenovi*, *Trapezonotus arenarius*, *Pachybrachius luridus*, *Aellopus atratus*, *Peritrechus lundii*, *Rhyparochromus pini*, *Stygnocoris rusticus*, *Berytidae* (2 species): *Neides tipularius*, *Berytinus clavipes*, *Rhopalidae* (4 species): *Maccevethus errans errans*, *Maccevethus errans caucasicus*, *Rhopalus subrufus*, *Stictopleurus crassicornis*, *Coreidae* (2 species): *Bathysolen nubilus*, *Enoplops eversmanni*, *Cydnidae* (1 species): *Legnotus limbosus*, *Legnotus picipes*, *Plataspidae* (1 species): *Coptosoma scutellatum*, *Acanthosomatidae* (2 species): *Acanthosoma spinicolle*, *Elasmucha ferrugata*, *Scutelleridae* (1 species): *Odontotarsus obsoletus furvus*, *Pentatomidae* (33 species): *Arma custos*, *Rhacognatus punctatus*, *Zicrona caerulea*, *Anthemina eurynota eurynota*, *Carpocoris melanocerus*, *Carpocoris purpureipennis*, *Carpocoris pudicus*, *Chlorochroa juniperina juniperina*, *Codophila varia varia*, *Dolycoris baccarum*, *Dolycoris penicillatus*, *Holcostethus nitidus*, *Holcostethus ovatus*, *Holcostethus strictus vernalis*, *Holcostethus strictus strictus*, *Mimula dungana*, *Rubiconia intermedia*, *Eysarcoris ventralis*, *Stagonomus amoenus*, *Stagonomus bipunctatus*, *Pentatoma rufipes*, *Piezodorus lituratus*, *Sciocoris microphthalmus*, *Sciocoris umbrinus*, *Sciocoris consobrinus*, *Capnoda nigroaenea*, *Eurydema oleracea*, *Eurydema ornata*, *Eurydema dominulus*, *Graphosoma consimile*, *Graphosoma lineatum*, *Sternodontus ampliatus*, *Dybowskyia reticulata* (Zhumatayeva *et al.*, 2022).

Meso xerophile (32 species) *Tingidae* (2 species): *Catoplatus citrinus*, *Catoplatus fulvicornis*, *Lygaeidae* (10 species): *Nysius thymi thymi*, *Heterogaster affinis*, *Macroplox fasciata fasciata*, *Metapoplax origani*, *Tropistethus holosericus*, *Emblethis ciliatus*, *Emblethis denticollis*, *Trapezonotus desertus*, *Lamprodema maura*, *Plinthisus brevipennis*, *Rhopalidae* (6 species): *Brachycarenum tigrinus*, *Corizus fenestella fenestella*, *Liorhyssus hyalinus*, *Stictopleurus abutilon*, *Stictopleurus unicolor*, *Myrmus miriformis miriformis*, *Cydnidae* (4 species): *Cydnus aterrimus*, *Adomerus biguttatus*, *Canthophorus impressus*, *Canthophorus dubius*, *Scutelleridae* (2 species): *Odontotarsus purpureolineatus*, *Eurygaster dilaticollis*, *Pentatomidae* (8 species): *Aelia acuminata*, *Aelia furcula*, *Anthemina lunulata*, *Carpocoris coreanus*, *Sciocoris macrocephalus*, *Sciocoris cursitans cursitans*, *Ancyrosoma leucogrammes*, *Thologmus flavolineatus*,

*Xerophilus* (1 species) *Scutelleridae* (1 species): *Irochrotus lanatus*. *Hygro-mesophile* (2 species) *Tingidae* (1 species): *Dictyla lupuli*, *Lygaeidae* (1 species): *Pachybrachius fracticollis*.

### Seasonal Development of Hemipterans (Heteroptera)

Monovoltine (79 species) *Tingidae* (10 species): *Acalypta gracilis*, *Agramma confusum*, *Catoplatus*

*citrinus*, *Catoplatus fulvicornis*, *Dictyla lupuli*, *Lasiacantha capucina capucina*, *Oncochila simplex*, *Tingis leptochila*, *Tingis reticulata*, *Tingis angustata*, *Lygaeidae* (17 species): *Apterola lownii*, *Spilostethus rubriceps*, *Nysius thymi thymi*, *Orsillus depressus*, *Kleidocerys resedae resedae*, *Heterogaster affinis*, *Macroplox fasciata fasciata*, *Metapoplax origani*, *Oxycarenum modestus*, *Tropistethus holosericus*, *Drymus sylvaticus*, *Eremocoris abietis*, *Eremocoris plebejus*, *Pachybrachius fracticollis*, *Peritrechus lundii*, *Rhyparochromus pini*, *Stygnocoris rusticus*, *Berytidae* (5 species): *Neides tipularius*, *Berytinus clavipes*, *Maccevethus errans errans*, *Maccevethus errans caucasicus*, *Stictopleurus unicolor*, *Coreidae* (1 species): *Bathysolen nubilus*, *Cydnidae* (3 species): *Cydnus aterrimus*, *Adomerus biguttatus*, *Canthophorus dubius*, *Plataspidae* (1 species): *Coptosoma scutellatum*, *Acanthosomatidae* (2 species): *Acanthosoma spinicolle*, *Elasmucha ferrugata*, *Scutelleridae* (4 species): *Odontotarsus obsoletus furvus*, *Odontotarsus purpureolineatus*, *Irochrotus lanatus*, *Eurygaster dilaticollis*, *Pentatomidae* (36 species): *Arma custos*, *Rhacognatus punctatus*, *Zicrona caerulea*, *Aelia acuminata*, *Aelia furcula*, *Anthemina eurynota eurynota*, *Anthemina lunulata*, *Carpocoris melanocerus*, *Carpocoris purpureipennis*, *Carpocoris pudicus*, *Chlorochroa juniperina juniperina*, *Dolycoris baccarum*, *Dolycoris penicillatus*, *Holcostethus nitidus*, *Holcostethus ovatus*, *Holcostethus strictus vernalis*, *Holcostethus strictus strictus*, *Mimula dungana*, *Rubiconia intermedia*, *Eysarcoris ventralis*, *Stagonomus amoenus*, *Stagonomus bipunctatus*, *Pentatoma rufipes*, *Piezodorus lituratus*, *Sciocoris macrocephalus*, *Sciocoris microphthalmus*, *Sciocoris umbrinus*, *Sciocoris consobrinus*, *Sciocoris cursitans cursitans*, *Capnoda nigroaenea*, *Ancyrosoma leucogrammes*, *Graphosoma consimile*, *Graphosoma lineatum*, *Sternodontus ampliatus*, *Thologmus flavolineatus*, *Dybowskyia reticulata*.

Bivoltine (17 species) *Tingidae* (2 species): *Dictyla echii*, *Galeatus sinuatus*, *Lygaeidae* (6 species): *Nysius ericae groenlandicus*, *Nysius pilosulus*, *Trapezonotus arenarius*, *Trapezonotus desertus*, *Pachybrachius luridus*, *Plinthisus brevipennis*, *Rhopalidae* (2 species): *Liorhyssus hyalinus*, *Myrmus miriformis miriformis*, *Coreidae* (1 species): *Bathysolen nubilus*, *Cydnidae* (1 species): *Legnotus picipes*, *Pentatomidae* (5 species): *Carpocoris coreanus*, *Codophila varia varia*, *Eurydema oleracea*, *Eurydema ornata*, *Eurydema dominulus*.

2-3 generations per year (12 species) *Tingidae* (2 species): *Physatocheila smreczynskii*, *Tingis pilosa*, *Lygaeidae* (5 species): *Emblethis ciliatus*, *Emblethis denticollis*, *Emblethis semenovi*, *Lamprodema maura*, *Aellopus atratus*, *Rhopalidae* (5 species): *Brachycarenum*

*tigrinus*, *Corizus fenestella*, *Rhopalus subrufus*, *Stictopleurus abutilon*, *Stictopleurus crassicornis*.

Acyclic (3 species) Aradidae (3 species): *Aradus aterrimus*, *Aradus crenaticollis*, *Aradus lugubris*.

#### Overwintering stages of Bedbugs (Heteroptera).

Adults and larvae hibernate (8 species) Tingidae (2 species): *Acalypta gracilis*, *Oncochila simplex*, Aradidae (3 species): *Aradus aterrimus*, *Aradus crenaticollis*, *Aradus lugubris*, Lygaeidae (3 species): *Kleidocerys resedae resedae*, *Oxycarenus modestus*, *Emblethis denticollis*.

Adults hibernate (98 species) Tingidae (12 species): *Agramma confusum*, *Catoplatus citrinus*, *Catoplatus fulvicornis*, *Dictyla echii*, *Dictyla lupuli*, *Galeatus sinuatus*, *Lasiacantha capucina capucina*, *Physatocheila smreczynskii*, *Tingis pilosa*, *Tingis leptochila*, *Tingis reticulata*, *Tingis angustata*, Lygaeidae (23 species): *Apterola lownii*, *Spilostethus rubriceps*, *Nysius ericae groenlandicus*, *Nysius pilosulus*, *Heterogaster affinis*, *Macroplox fasciata fasciata*, *Metapoplax origani*, *Tropistethus holosericus*, *Drymus sylvaticus*, *Eremocoris abietis*, *Eremocoris plebejus*, *Emblethis ciliatus*, *Emblethis semenovi*, *Trapezonotus arenarius*, *Trapezonotus desertus*, *Lamprodema maura*, *Pachybrachius fracticollis*, *Pachybrachius luridus*, *Plinthisus brevipennis*, *Aellopus atratus*, *Peritrechus lundii*, *Rhyparochromus pini*, *Stygnocoris rusticus*, *Berytidae* (2 species): *Neides tipularius*, *Berytinus clavipes*, *Rhopalidae* (9 species): *Brachycarenum tigrinus*, *Corizus fenestella fenestella*, *Liorhyssus hyalinus*, *Maccevetus errans errans*, *Maccevetus errans caucasicus*, *Rhopalus subrufus*, *Stictopleurus abutilon*, *Stictopleurus crassicornis*, *Stictopleurus unicolor*, *Coreidae* (1 species): *Bathysolen nubilus*, *Cydnidae* (5 species): *Cydnus aterrimus*, *Adomerus biguttatus*, *Canthophorus dubius*, *Legnotus picipes*, *Legnotus picipes*, *Acanthosomatidae* (2 species): *Acanthosoma spinicolle*, *Elasmucha ferrugata*, *Scutelleridae* (4 species): *Odontotarsus obsoletus furvus*, *Odontotarsus purpureolineatus*, *Irochrotus lanatus*, *Eurygaster dilaticollis*, *Pentatomidae* (40 species): *Arma custos*, *Rhacognatus punctatus*, *Zicrona caerulea*, *Aelia acuminata*, *Aelia furcula*, *Anthemina eurynota eurynota*, *Anthemina lunulata*, *Carpocoris coreanus*, *Carpocoris melanocerus*, *Carpocoris purpureipennis*, *Carpocoris pudicus*, *Chlorochroa juniperina juniperina*, *Codophila varia varia*, *Dolycoris baccarum*, *Dolycoris penicillatus*, *Holcostethus nitidus*, *Holcostethus ovatus*, *Holcostethus strictus vernalis*, *Holcostethus strictus strictus*, *Mimula dungana*, *Rubiconia intermedia*, *Eysarcoris ventralis*, *Stagonomus amoenus*, *Stagonomus bipunctatus*, *Piezodorus lituratus*, *Sciocoris macrocephalus*, *Sciocoris microphthalmus*, *Sciocoris umbrinus*, *Sciocoris*

*consobrinus*, *Sciocoris cursitans cursitans*, *Capnoda nigroaenea*, *Eurydema oleracea*, *Eurydema ornata*, *Eurydema dominulus*, *Ancyrosoma leucogrammes*, *Graphosoma consimile*, *Graphosoma lineatum*, *Sternodontus ampliatus*, *Thologmus flavolineatus*, *Dybowskyia reticulata*.

The larvae hibernate (2 species) *Plataspidae* (1 species): *Coptosoma scutellatum*, *Pentatomidae* (1 species): *Pentatoma rufipes*.

Eggs hibernate (3 species) *Lygaeidae* (2 species): *Nysius thymi thymi*, *Orsillus depressus*, *Rhopalidae* (1 species): *Myrmus miriformis miriformis*.

#### Geographic Distribution of Hemiptera (Heteroptera)

Holarctic (9 species) Aradidae (1 species): *Aradus lugubris*, *Lygaeidae* (6 species): *Nysius ericae groenlandicus*, *Nysius thymi thymi*, *Trapezonotus desertus*, *Pachybrachius fracticollis*, *Pachybrachius luridus*, *Stygnocoris rusticus*, *Pentatomidae* (2 species): *Zicrona caerulea*, *Sciocoris microphthalmus*.

Transpalearctic (26 species) *Tingidae* (1 species): *Dictyla echii*, *Lygaeidae* (4 species): *Eremocoris abietis*, *Emblethis denticollis*, *Lamprodema maura*, *Rhyparochromus pini*, *Rhopalidae* (4 species): *Brachycarenum tigrinus*, *Rhopalus subrufus*, *Stictopleurus abutilon*, *Stictopleurus crassicornis*, *Cydnidae* (2 species): *Cydnus aterrimus*, *Legnotus picipes*, *Plataspidae* (1 species): *Coptosoma scutellatum*, *Acanthosomatidae* (1 species): *Elasmucha ferrugata*, *Pentatomidae* (13 species): *Rhacognatus punctatus*, *Aelia acuminata*, *Anthemina lunulata*, *Carpocoris coreanus*, *Chlorochroa juniperina juniperina*, *Dolycoris baccarum*, *Rubiconia intermedia*, *Sciocoris macrocephalus*, *Sciocoris umbrinus*, *Eurydema oleracea*, *Eurydema dominulus*, *Ancyrosoma leucogrammes*, *Graphosoma lineatum*.

Transpalearctic-Ethiopian (1 species) - *Pentatomidae* (1 species): *Eurydema ornata*

West Palearctic (19 species) *Lygaeidae* (7 species): *Orsillus depressus*, *Heterogaster affinis*, *Macroplox fasciata fasciata*, *Emblethis ciliatus*, *Plinthisus brevipennis*, *Aellopus atratus*, *Peritrechus lundii*, *Cydnidae* (3 species): *Adomerus biguttatus*, *Canthophorus dubius*, *Legnotus limbosus*, *Scutelleridae* (1 species): *Odontotarsus purpureolineatus*, *Pentatomidae* (8 species): *Carpocoris melanocerus*, *Carpocoris pudicus*, *Codophila varia varia*, *Holcostethus strictus strictus*, *Stagonomus bipunctatus*, *Piezodorus lituratus*, *Sciocoris cursitans cursitans*, *Thologmus flavolineatus*.

Western Palearctic-Oriental (2 species) *Pentatomidae* (2 species): *Eysarcoris ventralis*, *Stagonomus amoenus*.  
Eastern Palearctic (3 species) *Acanthosomatidae* (1

species): *Acanthosoma spinicolle*, *Pentatomidae* (2 species): *Holcostethus ovatus*, *Capnoda nigroaenea*.

Trans-Eurasian (16 species) *Tingidae* (4 species): *Acalypta gracilis*, *Oncochila simplex*, *Physatocheila smreczynskii*, *Tingis pilosa*, *Aradidae* (2 species): *Aradus aterrimus*, *Aradus crenaticollis*, *Lygaeidae* (4 species): *Kleidocerys resedae resedae*, *Drymus sylvaticus*, *Eremocoris plebejus*, *Trapezonotus arenarius*, *Berytidae* (1 species): *Berytinus clavipes*, *Rhopalidae* (1 species): *Myrmus miriformis miriformis*, *Cydnidae* (1 species): *Canthophorus impressus*, *Pentatomidae* (4 species): *Arma custos*, *Carpocoris purpureipennis*, *Holcostethus strictus vernalis*, *Dybowskyia reticulata*.

*Trans-Eurasiatic-Oriental* (1 Species) *Pentatomidae* (1 Species): *Pentatoma Rufipes*

Western Eurasian (12 species) *Tingidae* (5 species): *Agramma confusum*, *Dictyla lupuli*, *Lasiacantha capucina capucina*, *Tingis reticulata*, *Tingis angustata*, *Lygaeidae* (3 species): *Metapoplax origani*, *Oxycarenus modestus*, *Tropistethus holosericus*, *Berytidae* (1 species): *Neides tipularius*, *Coreidae* (1 species): *Bathysolen nubilus*, *cutelleridae* (2 species): *Irochrotus lanatus*, *Eurygaster dilaticollis*.

Iranian-Turanian (7 species) *Tingidae* (2 species): *Catoplatus citrinus*, *Tingis leptochila*, *Lygaeidae* (1 species): *Spilostethus rubriceps*, *Coreidae* (1 species): *Bathysolen nubilus*, *Scutelleridae* (1 species): *Odontotarsus obsoletus furvus*, *Pentatomidae* (2 species): *Dolycoris penicillatus*, *Sciocoris consobrinus*.

*Transtethian* (1 Species) *Rhopalidae* (1 Species): *Maccevevethus Errans Caucasicus*

Middle Tethian (5 species) *Tingidae* (1 species): *Catoplatus fulvicornis*, *Lygaeidae* (1 species): *Apterola lownii*, *Rhopalidae* (2 species): *Corizus fenestella fenestella*, *Stictopleurus unicolor*, *Pentatomidae* (1 species): *Graphosoma consimile*, *Sternodontus ampliatus*.

European-Kazakhstan (1 species) *Tingidae* (1 species): *Galeatus sinuatus*. Mongolian-Alatav (1 species) *Lygaeidae* (1 species): *Nysius pilosulus*. *Alatau Endemic* (1 species) *Lygaeidae* (1 species): *Emblethis semenovi* Kiritshenko, 1911 Polyzonal cosmopolitan (1 species) *Rhopalidae* (1 species): *Liorhyssus hyalinus* (Fabricus, 1794). West middle Tethian (1 species) *Rhopalidae* (1 species): *Maccevevethus errans errans*. Western Eurasian-Oriental (1 species) *Pentatomidae* (1 species): *Aelia furcula*. Central Asian alpine endemic (2 species) *Anthemina eurynota eurynota*, *Mimula dungana*, Turan (1 species) *Pentatomidae* (1 species): *Holcostethus nitidus*.

## Discussion

In economic terms, the fauna of bedbugs of the Northern Tien Shan includes both harmful and beneficial

species. Most harmful species are pests of agriculture and forestry (Asanova and Iskakov, 1977; Asanova, 1968). They mainly belong to the families *Rhopalidae*, *Tingidae*, *Coreidae*, *Acanthosomatidae*, *Scutelleridae*, *Pentatomidae*, *Berytidae*, *Plataspidae*, and *Lygaeidae*. Predatory species (*Pentatomidae*, subfamily *Asopinae*) are useful for humans, as they regulate the number of harmful insects in biocenoses (Asanova, 1968; Kentbayev *et al.*, 2022).

In Kazakhstan, 4 species are noted for the first time: *Pentatomidae*: *Sciocoris consobrinus* Kiritshenko, 1952, *Sternodontus ampliatus* Jakovlev, 1887; *Lygaeidae*: *Nysius pilosulus* Horvath, 1904; *Rhopalidae*: *Maccevevethus errans errans*.

In the context of Kazakhstan, this study highlights the identification of four previously unrecorded species: *Sciocoris consobrinus* Kiritshenko, 1952, *Sternodontus ampliatus* Jakovlev, 1887 from the *Pentatomidae* family, *Nysius pilosulus* Horvath, 1904 from the *Lygaeidae* family and *Maccevevethus errans errans* from the *Rhopalidae* family. These novel additions to the local insect catalog underscore the dynamic and evolving nature of the region's entomofauna.

Overall, the economic significance of the *Hemipteran* species in the Northern Tien Shan region presents a compelling narrative, where the balance between detrimental and beneficial species can have far-reaching implications for various industries, ecosystems, and human livelihoods. The identification of previously unknown species adds to the expanding body of knowledge about the region's biodiversity, offering valuable insights into its ever-changing insect dynamics.

Analysis of the geographic distribution of *Hemipterans* in Kazakhstan made it possible to identify 20 types of habitat species. The basis of the fauna are species of *Hemiptera* with Holarctic (9 species), Trans-Palaeartic (27 species), Western Palearctic (21 species), Eastern Palearctic (3 species), Trans-Eurasiatic (17 species), Western Eurasian (12 species), Iranian-Turanian (7 species), Middle Tethian (6 species) ranges. In other species ranges, only one species is known: *Transtethian* (1 species), European-Kazakhstanian (1 species), Mongolian-Alatavian (1 species), polyzonal cosmopolitan (1 species), Western Middle Tethian (1 species), Western Eurasian-Oriental (1 species), Turanian (1 species); 3 species of endemic species were found: *Alatavian endemic* (1 species), *Central Asian alpine endemic* (2 species).

Future research opportunities could delve into the ecological dynamics of interactions between harmful and beneficial *Hemipteran* species in the Northern Tien Shan, examining the factors influencing their population dynamics and the potential for implementing integrated pest management strategies. Additionally, further investigations could focus on the genetic and

physiological traits of predatory species within the *Pentatomidae* subfamily *Asopinae*, exploring their potential for biocontrol applications and their adaptability to changing environmental conditions.

Source of financial support for the article: Scientific and technical program: BR10965224 "development of the cadastre of the fauna of the Northern Tien Shan to preserve their genetic diversity".

## Conclusion

In conclusion, this comprehensive study sheds light on the diverse and intricate world of *Hemiptera* within the Northern Tien Shan region. The findings reveal a rich tapestry of insect life comprising 111 species, spanning 11 families. The distribution of species within families is illustrated by Diagram 1, offering a visual representation of the taxonomic makeup. The trophic specialization of these bugs is classified into three groups, consisting of *Mycetophages*, phytophages with varying levels of dietary preference, and zoophagous species. The bugs' life forms exhibit remarkable diversity, organized into nine distinct groups, showcasing their adaptability to different ecological niches. The *Hemipterans'* reproductive patterns, reflected in the number of generations per year, further highlight their unique biological characteristics. Overwintering strategies also vary widely, with a range of species exhibiting different life stage preferences for surviving the colder months. Ecologically, these *Hemipterans* are grouped into four distinct categories based on their habitat preferences, demonstrating their adaptation to specific environmental conditions. This comprehensive assessment significantly contributes to our understanding of the Northern Tien Shan's *Hemiptera* fauna, offering insights into their ecological roles and intricate adaptations.

## Acknowledgment

Thank you to the publisher for their support in the publication of this research article. We are grateful for the resources and platform provided by the publisher, which have enabled us to share our findings with a wider audience. We appreciate the efforts of the editorial team in reviewing and editing our work, and we are thankful for the opportunity to contribute to the field of research through this publication.

## Funding Information

The authors have not received any financial support or funding to report.

## Author's Contributions

**Arnur Kenzhegaliev and Perizat Esenbekova:** Participated in all experiments, coordinated the data-analysis and contributed to the written of the manuscript.

**Nurlan Baimurzaev and Murat Zhaksybayev:** Designed the research plan and organized the study.

## Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

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