

Original Research Paper

Wood and Shrub Dwelling Pentatomidae (Heteroptera) of Rotected Areas of South-Eastern Kazakhstan

¹Meruyert Baizhunis, ²Perizat Esenbekova, ¹Gulshat Anarbekova and ³Laszlo Orloci

¹Kazakh National Agrarian University Almaty, Kazakhstan

²Institute of Zoology Science Committee Ministry of Education and Science of the Republic of Kazakhstan, Almaty, Kazakhstan

³Botanical Garden of Eotvos University, Budapest, Hungary

Article history

Received: 17-03-2021

Revised: 01-07-2021

Accepted: 06-07-2021

Corresponding Author:

Meruyert Baizhunis
Kazakh National Agrarian
University Almaty, Kazakhstan
Email: meruert.baizhunis@bk.ru

Abstract: A biodiversity inventory of the woody of five families protected areas of the Charyn SNNP. The research revealed 30 species of predatory hemipterans from 5 families: *Nabidae* (4 species), *Anthocoridae* (12 species), *Reduviidae* (3 species), *Miridae* (5 species), *Pentatomidae* (6 species). According to trophic specialization, they are zoophages. According to the number of generations per year, they are divided into 3 groups: Monaovoltine (18 species), bivoltine (5 species), polyvoltine (6 species) and 1 species has an unknown number of generations. Among the predatory hemipterans of the Charyn SNNP, 21 species hibernate in the imago stage, 3 species - in the imago and larva stage and 6 species - in the egg stage. According to ecological features, all types are mesophila. Associated to the habitats of the Charyn SNNP the hemipterans are divided into several groups: dendrobionts (15 species), dendro-tamnobionts (2 species), dendro-tamnohortobionts (2 species), dendro-hortobionts (9 species), tamna-hortobiont (1 species), eurybiont (1 species). 2 species are included in the Red book of the Almaty region: *Armacustos* and *Zirconia erulea*.

Keywords: Pentatomidae, Dendrobium, Protected Areas, South-Eastern Kazakhstan

Introduction

Hemipterans, or Bugs (*Heteroptera*), represent the largest order of insects with incomplete transformation. Hemipterans are of great importance in nature, they are well adapted to a variety of environmental conditions, food relations among bugs are distinguished by herbivores, carnivores and species with a mixed diet, consuming both plant and animal food. Some of the hemipterans, being the predators destroy the pests of crops and forests. In Kazakhstan, despite the important economic significance of hemipterans, their species composition, biology, ecology, distribution by natural zones and vertical belts and economic significance in certain physical and geographical areas of the republic are not sufficiently studied, which determines the relevance of this study.

The authors have previously published articles on water hemipterans and coleopterans (Yessenbekova and Nurgaliyev, 2010; Esenbekova *et al.*, 2013), but dendrobium predatory hemipterans have not been studied.

The goal of the study was to create an annotated list of all recorded dendrobium Pentatomidae, with information on each species preferred habitats, trophic habits, diapause

and other relevant data. These data serve two purposes: To inform forest and protected area management plans and to form the basis for long-term monitoring of protected area forest and ecosystem health. Monitoring the status of key species (pests, threatened species) critical.

Summarized Material and Methods Discussion

The biology and ecology of the dendrobiums Pentatomidae of South-Eastern Kazakhstan are poorly studied. This study is the first to focus on identifying tree and shrub dwelling Pentatomidae in the protected areas of this highly biodiverse region. We also documented key life history and ecological characteristics of the collected species: Feeding type, diapause, volcanism and habitat moisture preferences, using both our field data and field notes from existing collections maintained at the Kazakh national museum collections. 30 species of predatory hemipterans from 5 families were identified: Nabidae (4 species), Anthocoridae (12 species), Reduviidae (3 species), Miridae (5 species), Pentatomidae (6 species). Of these, 2 species (*Armacustos*, *Zirconacaerulea*) are listed in the Red Book of the Almaty region.

The Results of Research

An annotated list of identified species is provided below.

Family Damsel Bugs -Nabidae

Himacerus apterus Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn and Temirlik rivers, 05.2018, 2♀, 1♂; 06.08.2018, 1♂; 18.08.2018, 4♂, 2♀; 18.05.2018, 1♂, into the light; 01.08.2018, 1♂, 2♀ (1 full-wing. +2 short-winged forms); ash grove, 15.05.2018, 3♂, 2♀; 08.06.2018, 1♂, 2♀+ larva of the II age; 12.07.2018, 3♂, 4♀; 27.06.2018, 2♂, 2♀+ 1 larva of the III age; floodplain of the Charyn and Temirlik rivers, 28-29.06.2019, 2♀, 2♂; 12-15.07.2019, 3♀, 2♂; 08-10.08.2019, 1♀, 2♂. Dendro-tamnobiont (in deciduous forests, parks, gardens, floodplain woody-shrubby thickets), larvae of the 1st and 2nd ages keep in the grass, from the 3rd age they move to shrubs and then to trees; mesophile; zoophage (mites and small insects with soft covers) (Koschel, 1971; Kerzhner, 1981); monovoltine; overwinter eggs.

Nabis siniferus siniferus Hsiao, 1964. Almaty region, Uyghur district, CharynSNNP, floodplain of the Charyn and Temirlik rivers, 28-29.06.2019, 3♀, 4♂; 12-15.07.2019, 2♀, 2♂; 08-10.08.2019, 2♀, 3♂. Eurytope (found in the valleys of the Charyn and Temirlik rivers; mesophile; zoophage (feeds mainly on eggs and larvae of bugs, cicadas, etc.); monovoltine overwinter imago.

Nabis pallidus Fieber, 1861. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 06.06.2018, 3♀, 2♂; 30.06.2018, 3♀, 4♂; 11.07.2018, 3♀, 2♂; 05.08.2018, 1♀, 2♂; 16.08.2018, 3♀, 2♂; 03.08.2018, 6♀, 3♂; 30.08.2018, 3♀, 2♂; in the floodplain of the Charyn river, 22-24.06.2018, 8♀, 2♂; on the bank of the Charynriver, 01.08.2018, 4♀, 6♂; 03.08.2006, 6♀, 2♂+ larva of the II-III age; 09.08.2018, 5♀, 6♂+ larva of the II age; 10.08.2018, 5♀+13 larvae of the II-III age; floodplain of the Charyn river, 28.06.2019, 2♀, 3♂; floodplain of the Temirlik river, 29.06.2019, 2♂, 1♀; 11-12.07.2019, 4♂, 3♀; 08-10.08.2019, 3♀, 2♂. Dendrobium (on tamarisk); mesophile (steppe and semi-desert zone); zoophage (feeds on various insects); bivoltine; overwinter imago (Kerzhner, 1981).

Nabis viridulus Spinola, 1837. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28.06.2019, 2♀, 2♂; 25.05.2018, 2♀, 3♂; 07.08.2018, 3♀, 2♂; floodplain of the Temirlik river, 08.06.2018, 2♀, 2♂; 29.06.2019, 2♂, 3♀; 11-12.07.2019, 4♂, 4♀. Dendrobium (on tamarisk *Tamarix*); mesophile (steppe and semi-desert zone); zoophage (feeds on various insects: Aphids, eggs and larvae of bugs); monovoltine; overwinter imago (Kerzhner, 1981).

Family Small Predators - Anthocoridae

Anthocoris angularis Reuter, 1884. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 12.06.2018, 2♀, 2♂; Charyn forest district, 26.06.2018, 3♀, 1♂; 14.07.2018, 3♀, 2♂; 23.08.2018, 4♀, 3♂; floodplain of the Temirlik river, 10.07.2018, 2♀, 1♂; in the valleys of the Charyn and Temirlik rivers, 28-29.06.2019, 3♀, 4♂; ash grove, 11-12.07.2019, 4♂, 2♀; 08-10.08.2019, 3♀, 2♂. Dendrobium (in the valleys of the Charyn, Temirlik rivers, on sea buckthorn, willows and turangs); mesophile; zoophage (leafblocks and larvae of various insects) (Elov, 1976); monovoltine; overwinters imago Rare.

Anthocoris confusus Reuter, 1884. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river. 16.06.2018, 3♀, 2♂; floodplain of the Ili river. 16.06.2018, 1♀, 2♂; Charyn forest district, 26.07.2018, 3♀, 1♂; floodplain of the Charyn, Temirlik rivers, 28-29.06.2019, 3♀, 2♂; ash grove, 29.06.2019, 3♀, 3♂; 11-12.07.2019, 4♂, 2♀; 08-10.08.2019, 3♀, 2♂. Dendrobium (on various deciduous trees: *Acer*, *Betula*, *Alnus*, *Quercus*, *Populus*, *Salix*, *Ulmus*, sometimes on herbaceous plants); mesophile; zoophage (feeds on aphids, leafblocks, butterfly caterpillars); monovoltine; overwinters imago (Elov, 1976).

Anthocoris limbatus Fieber, 1836. Almaty region, Uyghur district, Charyn SNNP, edged Maken border, 16.06.2018, 1♀, 1♂; 13.08.2018, 3♀, 3♂; Charyn forest district, 15.06.2018, 1♀, 2♂; 18.08.2018, 1♀, 2♂; floodplain tugai of the Charyn, Temirlik rivers, 18.07.2018, 2♀, 1♂; 16.06.2018, 2♀, 2♂; 28-29.06.2019, 2♀, 2♂; ash grove, 29.06.2019, 2♀, 1♂; 10-12.07.2019, 3♂, 2♀. Dendrobium (floodplains of rivers, as well as mixed forests, on willows); mesophile; zoophage (feeds on small insects, their larvae and eggs); monovoltine; overwinters imago (Elov, 1976).

Anthocoris minkipistaciae Wagner, 1957. Almaty region, Uyghur district, Charyn Natural Park, Charyn forest district, 13.07.2018, 4♀, 3♂; 20.06.2018, 2♀, 2♂. Dendrobiont (on *Populus*, etc.); mesophile; zoophage (aphids, leafhoppers); monovoltine; overwinters imago (Elov, 1976).

Anthocoris nemorum. Almaty region, Uyghur district, Charyn SNNP, Charyn forest district, 16.06.2018, 1♀, 2♂; 25.06.2018, 1♀, 2♂; edged Maken border, 15.06.2018, 4♀, 3♂; floodplain of the Ili river, 26.06.2018, 2♀, 2♂; 21.05.2018, 1♀, 1♂; downstream of the Ili river, 26.06.2018, 1♀, 3♂; floodplain of the Charyn river. 13.08.2018, 1♀, 1♂; 21.08.2018, 3♀, 2♂; floodplain of the Charyn, Temirlik rivers, 28-29.06.2019, 4♀, 3♂; ash grove, 29.06.2019, 2♀, 3♂; 10-12.07.2019, 3♂, 4♀; 08-10.08.2019, 1♀, 2♂. Dendro-hortobiont (on woody and herbaceous plants); mesophile; zoophage (plays a large role in regulating the number of pests of Apple trees, feeds on aphids, mites, worms, thrips, eggs and caterpillars of scoops, eggs *Miridae*) (Elov, 1976); polyvoltine; overwinters imago.

Anthocoris nemoralis (Fabricius, 1794). Almaty region, Uyghur district, Charyn Natural Park, Charyn forest district, floodplain of the Charyn river. 16.06.2018, 2♀, 1♂; 25.08.2018, 1♀, 2♂; edged Maken border, 12.07.2018, 2♀, 2♂; 16.08.2007, 2♀, 2♂. Dendro-hortobiont (found in large numbers on various deciduous fruit trees, shrubs and herbaceous plants), mesophile; zoophage; bivoltine or 2-3 generations per year; overwinters imago (Elov, 1976).

Anthocoris pilosus (Jakovlev, 1877). Almaty region, Uyghur district, CharynSNNP, Charyn forest district, 19.06.2018, 1♀, 2♂; ash grove, 12.06.2006, 1♀, 1♂; 16.06.2006, 4♀, 3♂; edged Maken border, 16.06.2018, 5♀, 2♂; 03.08.2018, 3♀, 2♂; Charyn forest district, 23.07.2018, 3♀, 13.08.2018, 3♀, 3♂; 02.09.2018, 2♀, 1♂; floodplain of the Charyn, Temirlikrivers, 28-29.06.2019, 2♀, 3♂; ash grove, 29.06.2019, 2♀, 1♂; 10-12.07.2019, 4♂, 4♀. Horto-dendrobiont (found in large numbers on herbaceous plants, shrubs and deciduous trees: *Populus*, *Salix*, fruit trees), mesophile; zoophage, is one of the main enemies of different types of aphids on tree and shrub species; polyvoltine; overwinters imago (Elov, 1976).

Orius laticollis laticollis Reuter, 1884. Almaty region, Uyghur district, Charyn SNNP, Charyn forest district, 02.06.2018, 2♀, 3♂; floodplain of the Charyn river, 25.08.2018, 1♀, 3♂; edged Maken border, 25.06.2018, 1♀, 2♂; 03.08.2018, 3♀, 2♂; floodplain of the Charyn, Temirlikrivers, 28-29.06.2019, 4♀, 5♂; ash grove, 29.06.2019, 2♀, 3♂; 10-12.07.2019, 5♂, 4♀; 08-10.08.2019, 3♀, 2♂. Dendrobiont; mesophile (in wet places, mainly on *Salix*, as well as on *Populus*, *Zygophyllum*, *Artemisia*); zoophage (aphids, leafhoppers, thrips, etc.); polyvoltine; overwinters imago (Elov, 1976).

Orius majusculus Reuter, 1879. Almaty region, Uyghur district, Charyn SNNP, Charyn forest district, floodplain of the Charyn river. 15.06.2018, 1♀, 3♂; 15.06.2018, 2♀, 1♂; floodplain of the Ili river, 15.06.2018, 2♀, 1♂; 22.07.2018, 4♀, 3♂; floodplain of the Charyn, Temirlik rivers, 28-29.06.2019, 4♀, 5♂; ash grove, 28-29.06.2019, 4♀, 3♂; 10-12.07.2019, 5♂, 5♀. Dendrobiont (on fruit deciduous trees); mesophile (lives in wet places); zoophage (various insects, mites and their eggs); bivoltine; overwinters imago (Elov, 1976).

Orius minutus (Linnaeus, 1758). Almaty region, Uyghur district, Charyn SNNP, Charyn forest district, floodplain of the Charyn river. 16.06.2018, 1♀, 2♂; 19.07.2018, 3♀, 3♂; floodplain of the Ili river, 15.06.2018, 2♀, 3♂; edged Maken border, 15.06.2018, 1♀, 3♂; floodplain of the Temirlik river, 25.06.2018, 2♀, 3♂; edged Sartogay border, 15.07.2018, 1♀, 3♂; 28-30.07.2018, 4♀, 5♂; 26.08.2018, 1♀, 1♂; floodplain of the Ili river, 11.06-26.2018, 5♀, 6♂; 26.07.2018, 1♀, 1♂; the floodplain of the Temirlik river, 31.05.2018, 1♀, 1♂; 02.06.2018, 4♀, 5♂; ash grove, 09.08.2018, 1♀, 2♂; 16.07.2018, 1♀, 3♂; 13.06.2018, 1♀, 3♂; 15.06.2018, 1♀, 2♂; floodplain of the

Charyn, Temirlik rivers, 28-29.06.2019, 5♀, 5♂; ash grove, 28-29.06.2019, 2♀, 3♂; 11-12.07.2019, 3♂, 4♀; 08-10.08.2019, 4♀, 3♂. Tamno-hortobiont (on herbaceous plants, valley shrubs and trees: Willow, spirea, birch, flowers and leaves); mesophile; multi-eating zoophage (various insects, mites and eggs of various harmful invertebrates); polyvoltine; overwinters imago (Elov, 1976).

Xylocoris cursitans Fallen, 1807. Charyn Natural Park, Charyn forest district, 03.06.2018, 2♀, 3♂; Floodplain of the Ili river, 22.08.2018, 1♀, 2♂; edged Maken, Sartogay border, 14.06.2018, 3♀, 4♂; 09.06.2018, 1♀, 3♂; floodplain of the Charyn river, 02.06.2018, 3♀, 4♂. Dendrobiont (on the bark and under the bark of *Populus*, *Quercus*, etc., often in the course of bark beetles); mesophile (forest); zoophage (various insects); bivoltine; overwinters imago. It occurs in the middle taiga subzone (Elov, 1976).

Family Assassin bugs - Reduviidae

Empicoris vagabundus Linnaeus, 1758. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, caught in the light, 15.06.2018, 2♀, 1♂; 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 1♂, 2♀; ash grove, 28-29.06.2019, 3♀, 2♂; 11-12.07.2019, 3♂, 3♀. Dendrobiont, caught in an ash grove in the light; mesophile; zoophage; the number of generations is unknown; imago and larvae of older ages overwinter (Puchkov, 1987).

Rhynocoris annulatus (L., 1758). Almaty region, Uyghur district, Charyn SNNP, Charyn forest district, floodplain of the Charyn river, 24.05.2018, 2♀, 3♂; 10.06.2018, 1♀, 2♂; 10.06.2018, 2♀, 1♂; floodplain of the Ili river 19.06.2018, 1 larva the III age; edged Maken, Sartogay border, 10.07.2018, 2♀, 2♂; 28-30.07.2018, 2♀, 4♂; 22.07.2018, 2♀, 2♂; 14.08.2018, 2♀, 2♂; floodplain of the Charyn river, 28-29.06.2019, 4♀, 3♂; floodplain of the Temirlik river, 29.06.2019, 3♂, 2♀; ash grove, 28-29.06.2019, 4♀, 3♂; 11-12.07.2019, 3♂, 5♀; 08-10.08.2019, 2♀, 2♂. Dendro-hortobiont (at various trees, shrubs and herbaceous vegetation); mesophile; polyphagous zoophage; monovoltine; larvae of the IV-V ages. Overwintering of larvae is proved by field observations (Puchkov, 1987).

Rhynocoris iracundus (Poda, 1761). Almaty region, Uyghur district, Charyn SNNP, Charynforest district, floodplain of the Charyn river, 06.06.2018, 2♂; 24.06.2018, 2♀, 2♂; 25.06.2018, 2♀, 1♂; edged Maken, Sartogay border, 14.08.2018, 1♀, 2♂; 13-14.08.2018, 1♀, 3♂; 13.07.2018, 2♀, 2♂; floodplain of the Ili river 18.07.2018, 2♀, 2♂; downstream of the Ili river, 18.07.2018, 2♀, 2♂; floodplain of the Ili river 23.06.2018, 1♀, 3♂; Charynforest district, 26.06.2018, 2♀, 1♂; 28-30.07.2018, 2♀, 4♂; floodplain of the Temirlik river, 29-31.05.2018, 1♀, 2♂; edged Sartogay border, 05.06.2018, 2♀, 3♂; 03.06.2018, 1♀, 1♂; 20.07.2018, 2♀, 1♂;

floodplain of the Charyn river, 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 1♂, 2♀; ash grove, 28-29.06.2019, 3♀, 2♂; 11-12.07.2019, 3♂, 3♀, 08-10.08.2019, 2♀, 2♂. Dendro-hortobiont; mesophile; zoophage (willingly catch various insects: Leaf-eaters, wasps, bees, butterfly caterpillars, etc.); monovoltine; overwinter larvae of older ages (Puchkov, 1987).

Family Plant bugs - Miridae

Campylomma verbasci Meyer-Dur, 1843. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 1♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 2♂, 2♀; 11-12.07.2019, 3♂, 2♀. Horto-dendrobiont; mesophile; zoophytophage; polyvoltine; overwinter eggs (Drapolyuk, 1980; Hägglund *et al.*, 2015).

Cylloceria decorata Kiritschenko, 1931. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 3♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 2♂, 3♀; ash grove, 11-12.07.2019, 3♂, 4♀. Dendrobium (on apple, pear, birch, elm); mesophile; zoophage: Destroys aphids (Drapolyuk, 1980; Hägglund *et al.*, 2015); monovoltine; overwinter eggs.

Blepharidopterus angulatus (Fallen, 1807). Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 1♂; floodplain of the Temirlik river, 29.06.2019, 2♂, 2♀; ash grove, 28-29.06.2019, 3♀, 2♂; 11-12.07.2019, 3♂, 3♀; 08-10.08.2019, 1♀, 2♂. Dendrobium (on hardwoods); mesophile; zoophytophage (feeds on aphids); monovoltine; overwinter eggs (Drapolyuk, 1980).

Deraeocoris lutescens (Schilling, 1830). Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 4♀, 4♂; floodplain of the Temirlik river, 29.06.2019, 2♂, 2♀; ash grove, 28-29.06.2019, 3♀, 2♂; 11-12.07.2019, 2♂, 3♀. Dendrobium (on deciduous and fruit trees); mesophile; zoophage; bivoltine; overwinter imago. In Moldova, it is more common on oaks and breeds there in bulk (Drapolyuk, 1980).

Pilophorus perplexus Douglas & Scott, 1875. Алматинская обл., Уйгурский район, Чарынский ГНПП, пойма р. Чарын, 28-29.06.2019, 2♀, 2♂; пойма р. Темирлик, 29.06.2019, 1♂, 2♀; ясеневаляроща, 28-29.06.2019, 2♀, 4♂; 11-12.07.2019, 3♂, 1♀. Дендробионт; мезофил; зоофаг; моновольтинный; зимуют яйца (Drapolyuk, 1980).

Pilophorus perplexus Douglas & Scott, 1875. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 1♂, 2♀; ash grove, 28-29.06.2019, 2♀, 4♂; 11-12.07.2019, 3♂, 1♀. Dendrobiont; mesophyll; zoophage; monovoltine; overwinter eggs (Drapolyuk, 1980).

Family Stink Bugs - Pentatomidae

Armacustos Fabricius, 1794. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 2♂, 1♀; ash grove, 28-29.06.2019, 1♀, 2♂; 11-12.07.2019, 2♂, 2♀; 08-10.08.2019, 1♀, 2♂. Dendro-hortobiont; mesophile; zoophage (feeds on various small arthropods); monovoltine; overwinter imago (Puchkov, 1965; Hägglund *et al.*, 2015). It is listed in the Red book of Almaty region (Havrylenko and Lystopadskiy, 2012).

Picromerus lewisi Scott, 1874. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 1♂, 2♀; ash grove, 28-29.06.2019, 2♀, 2♂; 11-12.07.2019, 2♂, 1♀; 08-10.08.2019, 1♀, 1♂. Dendro-hortobiont; mesophile; zoophage; monovoltine; overwinter eggs (Puchkov, 1965).

Rhacognathus punctatus Linnaeus, 1758. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 1♂; floodplain of the Temirlik river, 29.06.2019, 1♀; ash grove, 28-29.06.2019, 2♀, 2♂; 11-12.07.2019, 1♂, 2♀. Dendrobiont (on *Salix*, *Betula*, aspen, raspberry, nettle, etc.); mesophile (river valleys with woody and shrubby vegetation); zoophage (various small arthropods); monovoltine; overwinter imago. The new generation imago appears in mid-August (Puchkov, 1965).

Troilus luridus Fabricius, 1775. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 1♂, 2♀; ash grove, 28-29.06.2019, 1♀, 2♂; 11-12.07.2019, 1♂. Dendro-tamnobiont (on woody and shrubby vegetation); mesophile; zoophage [27, 28]; monovoltine; overwinter imago.

Pinthaesus sanguinipes Fabricius, 1781. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 2♂, 2♀; ash grove, 28-29.06.2019, 1♀, 2♂; 11-12.07.2019, 2♂, 1♀; 08-10.08.2019, 1♀, 2♂. Dendro-tamno-hortobiont; mesophile; zoophage; monovoltine; overwinter imago (Puchkov, 1965).

Zicrona caerulea Linnaeus, 1758. Almaty region, Uyghur district, Charyn SNNP, floodplain of the Charyn river, 28-29.06.2019, 2♀, 2♂; floodplain of the Temirlik river, 29.06.2019, 2♀, 2♂; ash grove, 28-29.06.2019, 2♀, 1♂; 11-12.07.2019, 1♂, 2♀. Horto-tamno-dendrobiont; mesophile; zoophage; monovoltine; overwinter imago (Puchkov, 1965; Hägglund *et al.*, 2015). It is listed in the red book of Almaty region (Havrylenko and Lystopadskiy, 2012).

From Table 1 it can be seen that the fauna of the predatory hemipterans of the Charyn SNNP consists of the families *Nabidae*, *Anthocoridae*, *Reduviidae*, *Miridae*, *Pentatomidae*, 30 species were identified.

Table 1: Taxonomic composition of predatory hemipterans of the Charyn SNNP

Name of Taxa	Biology and ecology
Family Nabidae	
<i>Himacerus apterus</i> Fabricius, 1798	tamno-dendrobiont, mesophile, zoophage, monovoltine, overwinter eggs
<i>Nabissi noferussi noferus</i> Hsiao, 1964	eurybiont, zoophage, monovoltine, overwinter imago
<i>Nabis pallidus</i> Fieber, 1861	dendrobiont, mesophile, zoophage, bivoltine, overwinter imago
<i>Nabis viridulus</i> Spinola, 1837	dendrobiont, mesophile, zoophage, monovoltine, overwinter imago
Family Anthocoridae	
<i>Anthocoris angularis</i> Reuter, 1884	dendrobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Anthocoris confusus</i> Reuter, 1884	dendrobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Anthocoris limbatus</i> Fieber, 1836	dendrobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Anthocoris minkipistaciae</i> Wagner, 1957	dendrobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Anthocoris nemorum</i> Linnaeus, 1761	dendro-hortobiont, mesophile, zoophage, polyvoltine, overwinter imago
<i>Anthocoris nemoralis</i> Fabricius, 1794	dendro-hortobiont, mesophile, zoophage, polyvoltine, overwinter imago
<i>Anthocoris pilosus</i> Jakovlev, 1877	dendro-hortobiont, mesophile, zoophage, polyvoltine, overwinter imago
<i>Orius laticollis laticollis</i> Reuter, 1884	dendrobiont, mesophile, zoophage, polyvoltine, overwinter imago
<i>Orius majusculus</i> Reuter, 1879	dendrobiont, mesophile, zoophage, bivoltine, overwinter imago
<i>Orius minutus</i> Linnaeus, 1758	tamno-hortobiont, mesophile, zoophage, polyvoltine, overwinter imago
<i>Orius niger</i> Wolff, 1811	horto-dendrobiont, mesophile, zoophage, bivoltine, overwinter imago
<i>Xylocoris cursitans</i> Fallen, 1807	dendrobiont, mesophile, zoophage, bivoltine, overwinter imago
Family Reduviidae	
<i>Empicoris vagabundus</i> Linnaeus, 1758	dendrobiont, zoophage, the number of generations is unknown; imago and larvae of older ages overwinter
<i>Rhynocoris annulatus</i>	dendro-hortobiont, mesophile, zoophage, monovoltine, overwinter imago and larvae of the IV-V ages
<i>Rhynocoris iracundus</i> Poda, 1761	dendro-hortobiont, mesophile, zoophage, monovoltine, overwinter larvae and imago
Family Miridae	
<i>Campylomma verbasci</i> Meyer-Dur, 1843	xopro-dendrobiont, mesophile, zoophytophage, polyvoltine, overwinter eggs
<i>Cyllecoridea decorata</i> Kiritshenko, 1931	dendrobiont, mesophile, zoophytophage, monovoltine, overwinter eggs
<i>Blepharidopterus angulatus</i> Fallen, 1807	dendrobiont, mesophile, zoophytophage, monovoltine, overwinter eggs
<i>Deraeocoris lutescens</i> Schilling, 1830	dendrobiont, mesophile, zoophytophage, бивольтинный, overwinter imago
<i>Pilophorus perplexus</i> Douglas & Scott, 1875	dendrobiont, mesophile, zoophytophage, monovoltine, overwinter eggs
Family Pentatomidae	
<i>Armacustos</i> Fabricius, 1794	dendro-hortobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Picromerus lewisi</i> Scott, 1874	dendro-hortobiont, mesophile, zoophage, monovoltine, overwinter eggs
<i>Rhacognatus punctatus</i> Linnaeus, 1758	dendrobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Troilus luridus</i> Fabricius, 1775	dendro-tamnobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Pinthaeus sanguinipes</i> Fabricius, 1781	dendro-tamno-hortobiont, mesophile, zoophage, monovoltine, overwinter imago
<i>Zicrona caerulea</i> Linnaeus, 1758	horto-tamno-dendrobiont, mesophile, zoophage, monovoltine, overwinter imago

Conclusion

As a result of field studies 2018-2020 on the territories of the Charyn SNNP, 30 species of predatory hemipterans from 5 families were identified: *Nabidae* (4 species), *Anthocoridae* (12 species), *Reduviidae* (3 species), *Miridae* (5 species), *Pentatomidae* (6 species). Of these, 2 species (*Armacustos*, *Zicronacaerulea*) are listed in the Red Book of the Almaty region.

Hemipterans are characterized by wintering at different stages of development. In most species, winter diapause occurs at the imago stage, but few species winter in the egg or larva stage. The hemipterans of the Charyn SNNP wintering in the imago stage are 21 species, in the imago stage and larvae only 3 species overwinter, in the egg stage 6 species overwinter.

The seasonal development of the hemipterans is heterodynamic. Voltinism of the population reflects the number of annual generations. For the hemipterans of the

Charyn SNNP, 3 known types of voltinism are characteristic: Monovoltine species - 18; bivoltine - 5; polyvoltine - 6 species, *Empicoris vagabundus* the number of generations is unknown. According to ecological features, all types of mesophiles, they inhabit open and shaded habitats with a moderate degree of moisture.

By confinement to the habitats, the hemipterans of the Charyn SNNP are divided into several groups: Dendrobiums (15 species), dendro-tamnobionts (2 species), dendro-tamno-hortobionts (2 species), dendro-hortobionts (9 species), tamno-hortobiont (1 species), eurybiont (1 species).

Author's Contributions

All authors equally contributed in this work.

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

References

- Drapolyuk, I. S. (1980). Overview of plant bugs (Heteroptera, Miridae) of the fauna of the USSR and Mongolia // *Insects of Mongolia*. - Vol. 7. - L.: Publishing House "Nauka", pp, 43-68.
- Elov, E. S. (1976). Hemiptera sem. Anthocoridae (Heteroptera) Central Asia and Kazakhstan. *Entomol. Entomol. Nauka Publishing House, L*, 55(2), 369-380.
- Esenbekova, P. A., Kh, B. M., & Ubraimov, A. A. (2013). Materials for the autumn fauna of predatory aquatic beetles of the Ili River. *Proceedings of the Charyn State National Natural Park*, Almaty, 1, 100-102.
- Hägglund, R., Hekkala, A. M., Hjältén, J., & Tolvanen, A. (2015). Positive effects of ecological restoration on rare and threatened flat bugs (Heteroptera: Aradidae). *Journal of Insect Conservation*, 19(6), 1089-1099. <https://doi.org/10.1007/s10841-015-9824-z>
- Havrylenko, V. S., & Lystopadskiy, M. A. (2012). Dendrophilous avifauna: Issues of terminology and environmental classification (on the example of the avifauna of the biosphere reserve Askania-nova). *Ecology and Noospherology*. 2012; 23(3-4), 72-82.
- Kerzhner, I. M. (1981). Hemipterans family Nabidae. Proboscis insects. // *Fauna of the USSR*. - T. 13. - Vol. 2. - L. Nauka., 1981.-pp. 327.
- Koschel, H. (1971). Zur Kenntnis der Raubwanze *Himacerus apterus* F. (Heteroptera, Nabidae) Teil I 1. *Zeitschrift für angewandte Entomologie*, 68(1-4), 1-24. <https://doi.org/10.1111/j.1439-0418.1971.tb03116.x>
- Puchkov, V. G. (1965). Shieldmen of Central Asia (Hemiptera, Pentatomidea). *Frunze: Ilim*.
- Puchkov, V. G. (1987). Hemiptera. Predators Fauna of Ukraine. *Kiev. Naukova Dumka*, 21(5), 248.
- Yessenbekova, P. A., & Nurgaliyev, A. Ye. (2010). To the fauna of water hemipterans of Charyn natural park//*Bulletin of Al-FarabiKazNU*. - Almaty, 1 (43), pp, 89-91.