ANNOTATION

of the dissertation on "Study of the biodiversity and ecological status of Hemiptera (Heteroptera) of Ile-Alatau SNPP" for the degree of Doctor of Philosophy (PhD) in the educational program 8D05204 - "Ecology"

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Relevance of the research work. Insects are the largest group of animals, accounting for 70% of the world's wildlife diversity. They play an important role in the cycle of organic matter on earth among all groups of animals and the processing of energy stored in plants, so it is relevant to create a scientific basis for the conservation of biodiversity and conduct research on them for their effective utilization.

Hemiptera are one of the largest groups of insects in Kazakhstan, which are of great importance in nature. They are found everywhere - from deserts of different types to subalpine and alpine meadows. The biology of hemiptera is different: terrestrial species predominate among them, but there are also species that live in water. Due to the diversity of life forms, this group plays an important role in the structure of biocenosis.

They belong to insects with incomplete transformation and go through the following developmental stages - eggs, larvae and adults. They are characterized by hibernation at different stages of development. The vast majority of hemiptera feed on plant juices, mainly their generative organs and seeds.

Hemiptera are one of the largest groups of insects. They live in different biotopes and play an important role in biological processes in biogeocenosis. Among them there are many predators and herbivorous species. Plant-eating species reproduce widely, harm forests and agriculture. And predatory species have a favorable effect by regulating the numbers of harmful species in forests and agriculture.

Despite the economic importance of hemiptera, their practical significance in Kazakhstan has not been fully studied. Therefore, our work in this direction is relevant.

The purpose of the study: Study of biological and ecological features of hemiptera (Heteroptera) on the territory of Ile-Alatau SNPP, analysis of beneficial and harmful impacts and development of appropriate recommendations and conclusions.

Research objectives:

1. Determination of the taxonomic composition of hemiptera (Heteroptera) on the territory of the Ile-Alatau SNPP.

2 Study of biological and ecological features of hemiptera (Heteroptera) on the territory in the research area.

3 Analyze the results of the study and write specific conclusions and suggestions about the economic importance of hemiptera.

Research methods

Collection and study of hemiptera were carried out according to generally accepted methods. The most common way to collect insects from plants is "mowing". Bedbugs were collected from herbaceous plants, shrubs and tree branches by mowing with an entomological net. "Mowing" not only collects insects, but also carries out quantitative measurements: they compare the number of specimens of a species caught in a net for a certain number of strokes in different areas (or on different plants), or take into account changes in the number of species.

It is recommended to use so-called exhausters to collect especially small ones.

Collecting insects in the evening under an artificial light source gives good results, as many “crepuscular” and “nocturnal” insects are active at this time. Nocturnal flying insects congregate on night lights (especially ultraviolet lights attract them). White screens placed under and behind the lights make gathering easier. White cloth can be used as such a screen. The effectiveness of trapping depends on the proper installation of the light trap. The light source should be at a height of 1.5 m from the surface, so that it can be seen from afar. of white cloth, on which flying insects are clearly visible. Insect trapping on warm, windless, dark nights is very effective.

After killing the insects collected in the stain, they were spread out on cotton mattresses and labeled. The label was labeled with the name of the geographical point, the date of collection and the name of the collector. The geographic point should be specified as accurately as possible. Specifying the time of collection is important information, as this allows later retrieval of the necessary data from the field diary. It is also recommended to indicate the plants from which the insects were collected (as there may be a food link). If the insects were collected in a mountainous area, it should be indicated from which slope and at what altitude. It is also important to indicate from where exactly the insects were caught: under rocks, under tree bark, on the banks of water bodies, from rodent holes, etc. Insects

- Assessment of the practical significance of the hemiptera of the Ile-Alatau State National Natural Park (phytophagy: pests of agricultural and forest crops; zoophagia: useful predatory species).

Compliance with the directions of scientific development or government programs:

The dissertation work was carried out in accordance with the research plan of the target program of the RSE "Institute of Zoology" of the National Academy of Sciences of the Republic of Kazakhstan BR10965224 "Development of the cadastre of the fauna of the Northern Tien Shan to preserve its genetic diversity" (2021-2023).

Description of doctoral student's contribution to the preparation of each publication

On the subject of the dissertation published 7 scientific articles, of which 3 articles are published in scientific editions recommended by the committee on quality assurance in the field of education and science of the Republic of Kazakhstan, 1 article is a foreign publications Scopus (Q3 and percentile - 57%), 3 articles in the proceedings of international scientific conferences near and far abroad, certificate of state registration for the object of copyright - 1 (work of science). All publications were prepared in the course of the research.

Research materials on the topic of the thesis were presented at international scientific-practical conferences: 1) XII International Scientific and Practical Conference “Global Science and Innovation 2021: Central Asia” in the framework of the international scientific journal “Global Science and Innovation 2021: Central Asia” held on February 5, 2021 in Nursultan Nazarbayev (Astana), Kazakhstan. 2) International Scientific Forum “Science and Innovation - Modern Concepts”. - Moscow, August 26, 2022. 3) International Scientific Conference “Zoological research in Kazakhstan in the XXI century: conclusions, problems and prospects” April 13-16, 2023, Almaty, Republic of Kazakhstan.

The scope and structure of the dissertation

The dissertation work is written on a computer text with a volume of 148 pages and consists of an introduction, 3 chapters, a conclusion and a list of references containing 132 titles, of which 35 are in a foreign language. The paper presents 28 tables, 22 diagrams and 130 illustrations.

in cotton mattresses were placed in boxes so that the mattresses would not be damaged.

The collected insects were dried well, otherwise they may become moldy. In the laboratory, the species composition of the collected insects was determined using microscopes and identifiers.

Justification of novelty and significance of the results obtained

For the first time on the territory of the Ile-Alatau State National Nature Park the species composition of hemiptera insects was completely determined. As a result of the research 135 species belonging to 15 families of hemiptera insects were identified. Hemiptera insects are divided into 5 groups depending on their life forms: dendrobionts (23 species, 17%), dendro-tamnobionts (5 species, 4%), dendro-chortobionts (8 species, 6%), tamnobionts (1 species, 0.5%), tamno-chortobionts (2 species, 1.5%), chortobionts (66 species, 49%), herpetobionts (14 species, 10%), herpeto-chortobionts (5 species, 4%), geo-herpetobionts (1 species, 0.5%), horto-tamno-dendrobionts (2 species, 1.5%).

According to trophic relationships among bed bugs, zoophages, mycetophages, phytophages and zoophytophages are distinguished. Phytophages dominate among them - 91 species: polyphytophages - 50 species, broad oligophytophages - 31 species, narrow oligophytophages - 10 species, zoophages - 21 species, zoophytophages - 11 species, mycetophages - 12 species. Hemiptera insects in Ile-Alatau SNPP overwinter at different stages of development. Wintering in the adult stage is 93 species, wintering in the adult and larval stage - 16 species, wintering in the egg stage - 23 species, wintering in the egg and larval stage - 16 species. Depending on the number of generations per year, hemiptera of Ile-Alatau SNPP are divided into 5 groups: monovoltine, bivoltine, species with 2-3 generations per year, polyvoltine, acyclic species. The majority of species are monovoltine species, 96 species have been reliably recorded, bivoltine species - 20 species, polyvoltine species - 3 species, having 2-3 generations per year - 4 species, acyclic species - 11 species. Species in the study area are divided into 3 ecological groups: mesophiles - 129 species, meso-xerophiles - 4 species, hygro-mesophiles - 2 species.

Endemic species: family Pentatomidae: Mimula alatavica, Alatau endemic: family Miridae: Compsidolon alatavicum, family Lygaeidae: Emblethis semenovi, Central Asian mountain endemic: family Pentatomidae: Antheminia eurynota eurynota.

Eysarcoris ventralis (Westwood,1837) (Heteroptera) from the family Pentatomidae is registered for the first time in Kazakhstan.

Description of the main results of the study

- As a result of the study, the species composition of the fauna of hemiptera of Ile-Alatau State National Nature Park was determined and an annotated list was compiled;

- The biological (trophic relationships, number of generations per year, wintering at different stages of development) and ecological (by habitat confinement) peculiarities in the studied region were analyzed.

- The structure of the fauna of hemiptera and features of the most widespread species were revealed. The act of introduction indicates their practical importance, provides information on useful bioregulator species that control the number of pests.

The species composition, biological and ecological features, as well as beneficial and harmful effects of hemiptera in Ile-Alatau SNPP were studied, which will allow to determine their impact on the environment. Data on biological and ecological features and distribution will be used in the control of harmful species in the study area. The results of the study contribute to the assessment of biodiversity in Kazakhstan and will help in the creation of the Cadastre of fauna on the territory of special protected areas of South-East Kazakhstan (Ile-Alatau SNPP). Also the obtained data on species composition of hemiptera meet the obligations on inventory of fauna of Kazakhstan in accordance with the International Convention on Conservation, Restoration and Effective Use of Biodiversity.

The main provisions (proven scientific hypotheses and other conclusions that are new knowledge)

- Determination of the species composition of the fauna of hemiptera of the Ile-Alatau State National Natural Park, compilation of an annotated list;

- Analysis of biological (trophic relationships: zoophages, zoophytophages, phytophages; by the number of generations per year: monovoltine, bivoltine, having 2-3 generations per year, polyvoltine; wintering at various stages of development: egg, larva, imago) and ecological (by their proximity to habitats: mesophiles, mesoxerphiles, hygromesophiles) features of hemiptera in the region under study.