Flora and fauna of Chingiztau

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Abstract. The article presents the results of research on the species composition of the flora and fauna of the Chingiztau mountain range for 2013-2016. List of plants of Chingiztau includes 302 species from 126 genera and 52 families. Vascular plants of Chingiztau are grouped into seven groups by life forms: annuals, biennials, perennial grasses, shrubs, semi-shrubs, shrubs and trees. All plants in relation to the water regime can be divided into three groups: hygrophytes – 10%, mesophytes – 30%, xerophytes – 60%. 325 species of insects from 110 families and 14 orders have been identified in the mountainous area of Chingiztau. Representatives of the Orthoptera, Lepidoptera, Diptera, Hymenoptera and Coleoptera orders dominate in this region.The vertebrates of Chingiztau include 112 species: fish are represented by 1 species, amphibians by two species, reptiles by three species, birds by 86 species and mammals by 20 species. On the territory of the Chingiztau ridge, 14 species of mosses belonging to 10 families and 10 genera, class 1 were identified.

1 Introduction

Rational environmental management with the economic development of natural resources is currently gaining unprecedented relevance. In this regard, the development of effective scientific programs and important environmental tasks is impossible without a comprehensive study of regional flora and fauna.

The Chingiztau mountain range is part of the East Kazakhstan small steppe mountains and is located in the Abai region, to the west and southwest of the village of Karaul in the Abai district. The length of the massif is 200 km and it includes three mountain ranges (Chingiztau, Akshatau, Khanchingiz). The highest point of the massif is Mount Kosoba (1304 m).

Animals and plants of East Kazakhstan were studied in the 50s and 60s. During the operation of the Semipalatinsk Nuclear Poligon, no research has been conducted in Chingiztau, therefore, there are no modern literary data on the flora and fauna of Chingiztau.

2 Materials and Methods

In order to study the flora of the Chingiztau ridge more thoroughly, the methods of floral plant complexes were used. Taking into account the recommendations of the above-mentioned authors, we have carried out work on identifying the contours of floral complexes.

The test sites were described according to the standard methodology on sites with an area of 100 m^2.That were homogeneous in terms of edaphic and phytocenotic parameters. The flora inventory is compiled according to the generally accepted system of A. Engler. When compiling the inventory of plant species, herbarium material collected by us in 2013-2016 in the Chingiztau mountain range was used [1-3].

In entomological research, collection methods, special equipment for research were used, and attention was also paid to the ecology of organisms. Further processing and determination of the material is carried out in the laboratory. The species composition of insects was revealed by special determinants [4, 5].

Ichthyological research. The species composition of the fish was carried out visually, as well as when catching with a net and a small net [6].

Studies of amphibians and reptiles are carried out using the method of accounting areas, the size of which is selected in accordance with the territorial activity of the species. Gender and age category (adults, semi-adults and juveniles) are determined by external morphological features (body size, weight, coloration) [6].

Ornithological research. provide for the counting of all encountered species and individuals of birds on the site by circumambulating its perimeter using a 12-fold binocular. A Nikon D7000 digital camera with a Tamron SPDi 200-500 long-focus lens was used to photograph birds [6-8].

Theriological research. The accounting of mammals was carried out mainly visually during hiking or automobile routes of various lengths. For colonial mammals, all habitable and uninhabited burrows were counted. The species composition was also determined by analyzing the products of vital activity and by interviewing the local population [6].

3 Results and Discussion

The aim of the work was to study the species composition of vascular plants, entomofauna and fauna of vertebrates of the Chingiztau mountain range, in order to identify the current state of the animal and plant world of the region. The result of the studies of fauna and flora was the published collective monograph [9].

For the studied region, a small proportion of gymnosperms of 4 species (1.3%), horsetail 2 species (0.66%) and fern 2 species (0.66%) and quite a lot of mosses were recorded – 42 species belonging to 24 genera and 22 families. For Kazakhstan, 12 species of mosses have been discovered for the first time in the Kazakh small steppe mountains

In Chingiztau, there are 60 monocotyledons species (17%), dicotyledons – 234 species (77%).Species–rich families – 20 (38%), single-species families - 17 (32%). Volumetric families are: Labiaceae – 18 species, Cruciferous -19, Rosaceae – 20, Fabacaea – 28, Chenopodioideae – 28, Poaceae – 40 and Compositae– 43.

Various plant life forms are found in Chingiztau. According to I.G. Serebryakov, 7 groups were identified: trees – 7 (2.3%); shrubs - 21 (7%); semi–shrubs – 7 (2.3%); shrubs – 2 (0.6%); perennial grasses 233 (77.1%); biennials 11 (3.7%) and annuals - 21 (7%) of species.

In relation to moisture, all plants can be divided into three groups: xerophytes – 184 (60%); mesophytes – 101 (30%); hydrophytes – 17 (10%) species.

Anthropogenic activity has a great influence on the vegetation cover of the Chingiztau mountain range. Territories around villages are occupied by weeds and ruderal vegetation *(Chenopodium,Atripliceae,Salsola, Limonium, Artemisia).* Aquatic and coastal plants are few and confined to the rivers and streams of the inner territory of Chingiztau *(Myriophyllum, Lemna, Ceratophyllum, Carex, Caltha, Butomus, Sparganium).* Plants of arid habitats with various adaptations to reduce transpiration and reduce overheating *(Festuca, Stipa, Potentilla, Artemisia, Sophora, Sedum, Orostachys, Goniolimon)* dominate here.

Shrubby vegetation is confined to the lower parts of the slopes and flat areas of the valleys *(Filipendulaulmaria, Coteneastermelanocarpa, Rosa laxa, Rosa spinosissima,Loniceratatarica, Caraganafrutex, Juniperussabina, Berberissibirica).*

Woody vegetation grows in low areas and is confined to water bodies *Salix triandra, Betula pendula, Betula microphilla, Crataegus altaica, Padus racemosa, Populus tremula, Rosa majalis.* Xerophytic plant species grow in the lower tie*r: Geranium silvaticum, Ligularia sibirica, Seneciojacobeae, Heracleumsibiricum, Epilobiumpalustre*ets.

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Juniper trees on the mountain slopes are a kind of business card of Chingiztau.

The Chingiztau mountain range is saturated with medicinal plants: *Thymus marschallianus*, *Crataegus altaica*, *Delphinium elatum*, *Rosa laxa*, *Valeriana tuberose*, *Tanacetumvulgare*,*Inulabritanica*, *Fragariaviridis, Leonurusquinquelobatus, Achillea millefolium, Menthapiperita* etc.

There are poisonous plants on Chingiztau, among them the *Dictamnusangustifolius*stands out for its decorative properties.

Diagram 1 shows data on the entomofauna of various ranges (Khan Chingiz, Akshatau and Chingiztau) with the allocation of dominant families.

In general, the biocenoses of various Chingiztau ranges have a rich insect fauna. The study region was dominated by diptera – species from the family Muscidae, Simulidae, Culicidae, Syrphidae, Bombyliidae, Hymenoptera – Apidae, Halictidae, Formicidae and coleoptera - Melyridae, Chrysomelidae, Coccinellidae, Meloidae and Cerambycidae.

There are many insect pests in the region, which are often found on pasture plants. Insects belonging to 7 orders (about 200 species) have been identified on pasture plants. Phytophagous insects were more common among theOrthoptera, Equidoptera, Hymenoptera, Coleoptera, Diptera and Lepidoptera. They are also noted amongHomoptera and Hemiptera.

Insects that feed on woody and shrubby plants.Caragana, Salix, Rosa, Filipendula, Halimodendron, Berberis, Ribes, Prunusgrow in the region. About 45 species of Hemiptera, Lepidoptera and Coleopterahave been found on these plants.

Pollinating insects (about 155 species). Apidae (*Apis, Bombus*ets.) andSphecidae*,* as well asbeetles, butterflies and flies, play a prominent role in visiting flowering plants here.

Entomophage insects (35 species). There are many parasitic and predatory insects throughout the territory of the massif, among them, in terms of their importance and abundance, there are mice. The vast majority of ants destroy pests of pasture plants. Among the active entomophages, Sphecidae, Eumenidae and Scolidaecan be distinguished. Representatives of Odonata, Neuroptera, Mantidae are also entomophages. And there are many predators among the diptera.

Diptera that feed on the blood of warm-blooded animals. Since there are a lot of mountain streams and rivulets in this region, conditions are created for the reproduction and development of blood-sucking insects. Usually, from the end of spring to the middle of summer, their mass flight is recorded. Therefore, there are a lot of representatives of Culicidae, Tabanidae and Simuliidaehere.

Insect parasites (about 30 species). In this mountain range, due to the large number of farm animals, as a rule, there are also their parasites, in particular they are represented by Hypodermatidaeand Gasterophilidae. Also, the larvae of all representatives of Meloidaeare parasites of various insects.

Insects are the food base of vertebrates. Vertebrates, mainly birds and reptiles, feed on insects. Beetles, butterflies, and locusts predominate in the forage diet of birds. In the reservoirs of Chingiztau, the larvae of various insects serve as a feeding object for amphibians and fish.

The areas of the Akshatau and Chingiztau mountain ranges have the greatest species diversity of entomofauna. The Khanchingiz range is characterized by slightly less biodiversity.

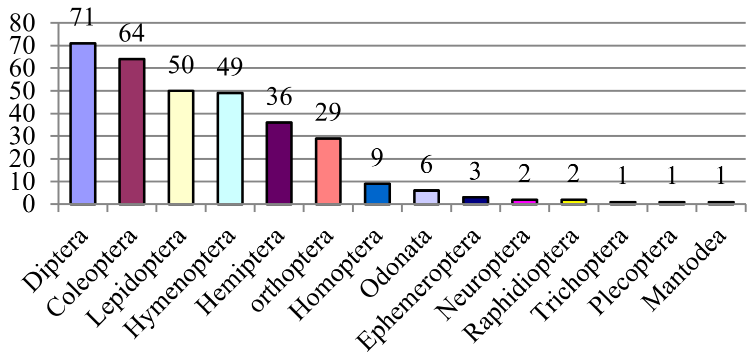

Fig. 1. The ratio of insect species of Chingiztau by order

Vertebrates of the region. There are significant differences in the quantitative and qualitative composition of vertebrates of 3 mountain ranges that are part of the Chingiztau mountain range.

Thus, 43 vertebrate species have been described on the territory of the Khanchingiz range, the Chingiztau range – 65 and the Akshatau range - 87, respectively. The ichthyofauna is represented everywhere by only one species – the Phoxinusphoxinus.

The fauna of amphibians of Khanchingiz and Akshatau is represented by one species – the green toad, another species has been discovered on the Chingiztau ridge – the sharp-faced frog. Reptiles were found everywhere. The *Lacerta agilis*and the *Elaphe dione*live throughout the territory, the common one is found only in Akshatau.

The richest ornithofauna of Akshatau is 65 species, of which 19 species live only in this territory, 52 species of birds have been found on Chingiztau (14), and 32 species on Khanchingiz (4).

The flora of the Chingiztau mountain range includes 302 plant species belonging to 182 genera and 57 families. The leading families in terms of the number of species are Compositaceae (38 species), Cereals (25 species), Legumes (28 species), Rosaceae (21 species) (Diagram 2). According to the results of the ecological and phytocenotic classification, the studied communities were classified as steppe and low-altitude dry meadows. Among the associations, the most common ones are shrubby-herbaceous, shrubby-cereal-herbaceous, wormwood-herbaceous, onion, ferule. 71 species of early flowering plants have been registered in Chingiztau.

The flora of the Chingiztau mountain range contains a large number of valuable and promising plants for economic use. Among them, 38 forage species, 91 medicinal species, 42 honey-bearing species and 13 poisonous plant species are of particular interest.

There are 13 species of plants in the studied area that require protective measures to one degree or another (*Tulipa patens*,*Fritillária meleagroídes, Pulsatilla patens,* Paeonia hybrida*, Campanula persicifolia, Allium subtilissimum, Andrachne telephioides, Orchis* *militaris, Parnassia palustris, Adonis vernalis, Gentiana decumbens, Corydalis glaucescens regel,Adenophora liliifolia* etc.). It is recommended to add some species to the protected status in the future.

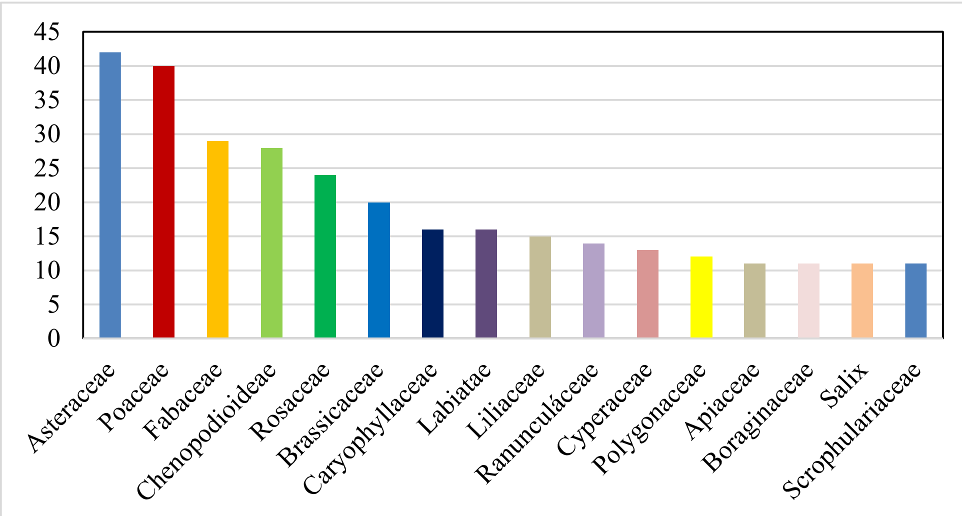

Fig. 2. The largest families of Chingiztau plants

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The group of key insect species includes the most characteristic species of all the Chingiztau ranges: *Asiotmethismuricatus,Bicoloranabicolor, Locustamigratoria, Euchorthippuspulvinatus*, *Calliptamusitalicus, Dolycorisbaccarum,Rhyparochromusvulgaris,Lyguspratensis,Tentyrianomas*, *Coccinellaseptempunctata*, *Adoniavariegate,Cryptocephalussericeus*, *Cetoniaaurata*, *Trichusfasciatus,Mylabrisquadripunctata, Acmaeopspratensis,Muscaamita, M. tempestiva, Fanniacanicularis, Luciliacaesar, Sarcophagacarnaria, Vespavulgaris*, *Bombusterrestris*, *Cataglyphisaenescens, Melanargiarussiae, Satyrusferula.*

Rare species in the region include: *Oedipoda caerulescens,Dictyophara europaea,Kleidocerys resedae, Raglius alboacuminatus, Coranus griseus,Leptura virens,Staphylinus latebricola*, *Agonum sexpunctatum*, *Chrysanthia viridissima,Meloe proscarabaeus,Bombylius discolor,Physocephala chrysorrhoea, Parasarcophaga jacobsoni,Sapygina desemguttata,Zygaena carniolica, Ematurga atomaria, Polygonia egea, Oeneis tarpeia. Scolia hirta* is very rare and is included in the Red Book of Kazakhstan [10].

The hydrobionts of the mountain range include the common minnow and 2 species of amphibians: the *Rana arvalisи Bufotes viridis*. All three species live in shallow temporary and permanent reservoirs.

The reptiles include a *Lacerta agilis*, *Elaphe dione and Natrix natrix*. The number of *Lacerta agilis* is high, with a predominance of females. Snakes are very rare and few in number.

The total biodiversity of Chingiztau birds includes 86 species from 14 orders. The Passeridae order is the most species-rich (36 species). The dominant species are also the common *Pastor roseus*, *Emberiza buchanani*, *Oenanthe oenanthe.*

Bird species such *Corvus monedula*, *Fringilla coelebs, Emberiza cioides* bunting obviously use the territory of a small-scale roamer when roaming. 11 species from the order falconiformes were identified, the highest numbers were noted for the *Milvus migrans* and the *Falco naumanni*. The order Charadriiformes - 14 species, Anseriformes - 8 species.

Columbiformes, Upupiformes, Gruiformes, Caprimulgiformes, Cuculiformes,Galliformes and Strigiformesare are represented by one or two species. High numbers were noted for the belladonna crane, ogar and grey partridge. Eight species of birds inhabiting the Chingiztau mountain range – the *Anthropoides virgo, Aquila nipalensis, Hieraaretus fasciatus, Falco cherrug, Ciconia nigra, Chettusia gregaria* and *Syrrhaptes paradoxus, Bubo bubo* are included in the Red Book of the Republic of Kazakhstan.

20 species of mammals from 5 orders were found on the territory of Chingiztau. Seven species of rodents: *Myospalax myospalax, Marmota baibacina, Lagurus lagurus, Clethrionomys Streltsov's, Allactaga sibirica, Spermophilus erythrogenus* - in the foothill valleys. Six species of predatory mammals are the (*Vulpes vulpes, Canis lupus, Felis manul, Lynx lynx, Meles meles, Mustela nivalis*). Four species of artiodactyls - *Ovis ammon, Alces alces, Capreolus pygargus, Sus scrofa*. There are three species of hares - (*Lepus timidus, Lepus europaeus*) and *Ochotona pusilla*. One type of insectivore is the *Erinaceus europaeus*. Two species of mammals – *Felis manul* and *Ovis ammon* belong to specially protected species.

Conclusion

The inventory of vascular plants includes 302 species from 126 genera and 52 families. The following families predominate in the flora: Asteraceae – 43 species; Fabaceae – 28; Chenopodiaceae -28, Poaceae – 40; Rosaceae -20 and Labitae – 18. Various life forms are represented in Chingiztau: trees – 7 (2.3%); shrubs 21- (7%); semi–shrubs - 7 (2.3%); shrubs – 2 (0.6%); perennial grasses 233 (77.1%); biennials of 11 (3.7%) and annuals of 21 (7%) species. In relation to moisture, all plants in the region can be divided into three groups: xerophytes – 184 (60%); mesophytes – 101 (30%); hydrophytes – 17 (10%) species. In total, 42 species of mosses belonging to 2 classes, 22 families, and 26 genera were noted. The few groups that are diverse in appearance and frequency of occurrence are the of mosses families of the Grimmiaceae and Bryaceae. Radishes have been isolated for the East Kazakhstan region of of mosses species: *Pohlia wahlenbergii, Bryum pseudotriquetrum* and *Bryum uliginosum.*

325 species from 14 orders have been found on the territory of the Chingiztau mountain range. Of all the orders, the most diverse and numerous are the Orthoptera, Coleoptera, Hymenoptera, Diptera and Lepidoptera. Only one species of insect is classified as rare and endangered.

The vertebrates of the Chingiztau mountain range are represented by 5 classes and 112 forks: fish - 1 species, amphibians - 2 species, reptiles - 3 species, birds - 86 species, mammals - 20 species. Eight species of birds and two species of mammals can be classified as rare and endangered.

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