

**SPECIES DIVERSITY AND DISTRIBUTION OF ENTOMOFAUNA  
IN THE SOUTHERN MIDDLE TAIGA OF THE MIDDLE OB**

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We gave data on the species diversity and distribution of entomofauna in the southern middle taiga of the Middle Ob. The habitat distribution of individual species, as well as of taxonomic insect groups was identified.

*Key words: biodiversity, entomophages, fauna, insects, habitats, Middle Ob, pollinators.*

**Citation:**

Tyumaseva, Z.I., Guskova, E.V. (2016). Species diversity and distribution of entomofauna in the Southern Middle taiga of the Middle Ob. *Biological Bulletin of Bogdan Chmelniitskiy Melitopol State Pedagogical University*, 6 (3), 51–53.

Поступило в редакцію / Submitted: 08.09.2016

Принято к публикации / Accepted: 10.10.2016

**crossref** <http://dx.doi.org/10.15421/201670>

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**INTRODUCTION**

The study of biological diversity is an important task, especially for poorly examined areas. Thus, the development of space-time monitoring of insects is of a great scientific interest. Such studies have the largest value on the territories involved in the economic activity. One of these regions is the Middle Ob, with its intensive extraction of hydrocarbons. The problem of hydrocarbon pollution is one of the priority issues arising in oil regions. At present, it is impossible to completely eliminate oil spills, so the study of ecosystem responses, the identification of insect species composition and of their population dynamics in successions is of a great importance. The fauna and population of several insect groups in the region is being studied quite intensively. In recent years, there were publications on individual groups: Coleoptera, Diptera, Hymenoptera (Dukhin, 2010; Demidova & Tyumaseva, 2011; Akopyan, 2013). Our study is aimed to indicate the species diversity and distribution of insects in the southern middle taiga of the Middle Ob and to undertake a quantitative registration of certain groups of insects-pollinators and entomophages.

**MATERIAL AND METHODS**

To identify the species composition of insects, the specimens were collected by mowing with a butterfly net in shrub and herbaceous vegetation. Specimens from trees were collected by mowing round the tree crowns and shaking insects into a canopy or an entomological probe. 25 shakes from one tree were equivalent to one probe of net collection. For study of pollinators (bees, wasps, bumble-bees), we used general ecological and entomological research methods (Popov, 1950; Fasulati, 1971; Pesenko, 1982).

The registration was performed with route method: individual catching with a standard butterfly net in the area of 500 m<sup>2</sup> during 30 minutes. The relative abundance of species was determined by the percentage of corresponding specimens in the collection and a five-point logarithmic scale (Pesenko, 1982). The study of herpetobion insects was performed with method of Barber pitfall traps (Fasulati, 1971). We used plastic glasses with the diameter of 75 mm, filled to .25 of volume with a solution of 4 percent formalin as a fixative. Iron cones were also used as traps. All the traps were dug into the soil so that their upper edges were on the same level with the ground. We set 10 traps in each collection point at the same time. The extraction of specimens was performed in 6-7 days. In total, we had 500 trap-days. The entomophages were divided into rare, common and dominant basing on the following percentage: the species having less than one percent of specimens in the total collection were considered rare; from 1 to 10 percent of specimens - common; the species with more than 10 percent the collection was considered dominant.

The study of the entomofauna in the southern middle taiga of the Middle Ob was performed during five years from 2006 to 2010. The species composition of insects was indicated in different biotopes: glade in the dark coniferous forest, coupe in mixed forest, coupe in spruce-birch forest with rich motley grass, aspen forest turning into a birch-aspen forest, Pyy'-Yah riverside, power transmission line right-of-way in the fir-spruce forest, pine-aspen forest, areas along highways, catenas of Vadelyp oilfield, edges and glades of the birch-coniferous forest.

## RESULTS

**Glade in the dark coniferous forest** is in 1,5 km from the base camp of Salym oilfield. The dark coniferous forest is represented by *Abies*, *Picea obovata*, *Pinus sibirica* (Pinaceae) and *Betula* (Betulaceae). Motley grasses, reed and rosebay vegetation grows in the glade. The undergrowth is represented by *Betula* (Betulaceae), *Picea obovata*, *Pinus sibirica* (Pinaceae), *Populus tremula* (Salicaceae), *Sorbus* (Rosaceae). Among the shrubs, *Rosa*, *Rubus idaeus* (Rosaceae) and *Lonicera* (Caprifoliaceae) are dominating. In lowlands there is a thicket of *Salix* (Salicaceae). *Angelica sylvestris* (Apiaceae), *Chamerion angustifolium* (Onagraceae), *Carex* (Cyperaceae), *Calla palustris* (Araceae), *Typha* (Typhaceae) grow locally along the glade. On Apiaceae, the Diptera occur in mass, among them the Syrphidae are prevailing (8 species). Motley grass is inhabited by beetles: Scarabaeidae (dominating: *Cetoniinae*, *Trichius*), Cerambycidae, Alleculidae, Oedemeridae and others. On flowering plants *Chamerion angustifolium* (Onagraceae), *Medicago*, *Melilotus* (Fabaceae), insects-pollinators occur, with the predominance of *Apis* and *Bombus* (Apidae). From the end of the third decade of June to the middle of the third decade of July, a mass activity of horseflies (Tabanidae) is registered, then the peak of their activity weakens (Duhin, 2010). From the end of July to the middle of August, most insects could be observed at different stages of development, and we registered that in this area their development cycle is delayed. We met in mass the larvae and pupae of Lady Beetles (Coccinellidae) and various butterflies.

**Felled area in mixed forest (second year after cutting).** Cutting in the mixed forest was made two years ago on the edge of the dark coniferous forest. In the examined area, Homoptera and Diptera are the dominant orders (according to the degree of dominance). In Diptera, the following insect families are dominant: Culicidae, Simuliidae, Ceratopogonidae, Phlebotomidae. On the coniferous trees we registered mainly the specimens of Homoptera: Adelgidae, Pemphigidae, Aphididae, Diaspididae. The dendrobiont beetles of the studied biotope were Elateridae, Cerambycidae, Chrysomelidae, Anthribidae. In addition to this, we met such entomophages as Coccinellidae.

**Felled area in the fir-birch forest with rich motley grass.** We noted a massive development of *Chrysomela populi* (Chrysomelidae) on young poplars in the coupe. On each small poplar tree (1,5 m) we observed up to 15 specimens of this beetle. High insolation and moderate moisture contributes to the formation of rich motley grass. Longhorn beetles (Cerambycidae), *Trichius* (Scarabaeidae), Curculionidae beetles are dominant on the Fabaceae plants. From the group of insects-pollinators we registered *Apis* and *Bombus* (Apidae), Syrphidae. Braconidae and Asilidae were noted in small number. The Phytophages prevail in the examined area.

**Aspen forest, turning into the birch-aspen forest.** Under the trees canopy, the equisetum-motley vegetation and green moss with motley grass is developed. This type of biotope is characterized by poor composition of plants. The fresh cutting in the forest is inhabited by the Diptera. The following families were considered dominant: Limoniidae, Bibionidae, Culicidae, Simuliidae, Ceratopogonidae, Mycetobiidae, Tabanidae, Xylomyidae, Dolichopodidae, Conopidae, Otitidae, Anthomyiidae, Syrphidae. More rare (less than one percent in cuts) were the specimens of families Bombyliidae, Asilidae, Tachinidae, Phoridae. When mowing in the grass and shrubs, about 40% in the collection was constituted by the specimens of families Aphididae, Thripidae, Formicidae, Miridae.

**Pyy'-Yah riverside** (natural levee of the river Pyy'-Yah). In 10-15 meters from the Pyy'-Yah riverside there is a logging for construction. This biotope is characterized by rich motley grass: *Aconitum septentrionale* (Ranunculaceae), *Angelica sylvestris*, *Pleurospermum uralense* (Apiaceae), *Filipendula ulmaria* (Rosaceae), *Trifolium medium*, *Vicia sepium*, *Vicia cracca* (Fabaceae), *Solidago virgaurea*, *Cirsium arvense* (Asteraceae) etc. On the inflorescences of *Pleurospermum uralense* we indicated a diversity of insect species, where the Syrphidae (Diptera), *Trichius* (Coleoptera), Scarabaeidae, *Leptura*, *Strangalia* (Coleoptera, Cerambycidae), Vespidae, Ichneumonidae, Braconidae (Hymenoptera) were dominant.

**Power transmission line right-of-way in the fir-spruce forest** is in 15 km from the city of Salym. The vegetation cover of this biotope is heterogeneous. Motley grasses, reed and rosebay vegetation is predominating there. The undergrowth includes *Betula* (Betulaceae), *Picea obovata*, *Pinus sibirica* (Pinaceae), *Populus tremula* (Salicaceae), *Sorbus* (Rosaceae). The dominant shrubs are *Rosa*, *Rubus idaeus* (Rosaceae) and *Lonicera* (Caprifoliaceae). In some places in the glade we met a thicket of *Angelica sylvestris*, *Chamaenerion latifolium*, in swampy areas – *Carex* (Cyperaceae), *Calla palustris* (Araceae), *Typha latifolia* (Typhaceae) etc. The Syrphidae (Diptera) were registered in mass (up to 20 specimens on one plant) on *Angelica sylvestris*, as well as other specimens of this order. In the order Coleoptera the predominant were *Trichius fasciatus* (Scarabaeidae), *Leptura*, *Strangalia* (Cerambycidae) in Hymenoptera – *Bombus*. There were single specimens of Vespidae, Ichneumonidae, Braconidae (Hymenoptera).

In Lepidoptera, we noted Satyridae, Geometridae, Lycaenidae and Nymphalidae. Thus, the analysis of the entomofauna in this biotope proved the predominance of phytophages.

**Pine-aspen forest** is characterized by woody vegetation: *Picea obovata*, *Pinus sibirica*, *Abies sibirica* (Pinaceae), *Betula* (Betulaceae), *Populus tremula* (Salicaceae), the equisetum-motley vegetation is developed under the canopy. This area is subjected to strong transformation, forest fellings are regularly made.

The representatives of Diptera are dominant here: Limoniidae, Billionidae, Culicidae, Simuliidae, Ceratopogonidae, Mycetobiidae, Tabanidae, Xylomyidae, Dolichopodidae, Syrphidae, Conopidae, Otitidae, Anthomyiidae etc. There are single specimens of Tachinidae, Bombyliidae, Phoridae and Asilidae.

In the collection with mowing we found in mass the Aphididae (Hemiptera), Thripidae (Thysanoptera), Formicidae (Hymenoptera) and Heteroptera. During 5 years in July – first decade of August, we registered an active development of Heteroptera of the families: Miridae, Reduviidae, Anthocoridae, Acanthosomatidae and Pentatomidae. The specimens of Acrididae and Tettigoniidae were met only at the larval stage of development. The development of Lepidoptera (Satyridae and Nymphalidae) was observed on *Angelica sylvestris* and *Aconitum septentrionale*. The caterpillars of Geometridae were met in mass on the trunks of *Populus tremula*, *Betula* and *Abies sibirica* (20 - 42 caterpillars on each trunk).

**Areas along highways.** All these territories are characterized by low moisture and presence of ruderal plants. The dominant plants are: *Artemisia*, *Sonchus arvensis* (Asteraceae), *Chamaenerion angustifolium* (Onagraceae), *Trifolium medium*, *Trifolium pratense*, *Melilotus officinalis*, *Vicia cracca* (Fabaceae), *Potentilla argentea* (Rosaceae), *Leonurus quinquelobatus* (Lamiaceae). The species diversity is poor.

**Catenas of Vadelyp field.** In the catenas there are cuttings which violated the natural pine-aspen forest vegetation. On the cuttings there is forest vegetation, but there is also a quick overgrowth with cereals, sedges, equisetum, bead-ruby, rosebay. The undergrowth of birch and aspen is about 30–40 cm. It is inhabited in mass by larvae and pupae of *Chrysomela populi*. On each small aspen tree (40 cm) we noted from 10 to 15 adults of leaf beetles. In mowing, the dominant order was Diptera. Near the cut trees (fir, pine, birch, aspen) we found anthills (on the territory of about 30 m we noted 8 anthills, 6 of them had a dome of 50-60 cm). The species composition of terrestrial insects is monotonous and poor.

**Edges and glades of the birch-coniferous forest.** The birch-coniferous forest is strongly swamped. Fern and equisetum grow in high places. We met moss-lichen cover and trunks of firs and spruces covered with lichen. There is a large number of Diptera, among them the Culicidae are dominant. On the edges and glades in the birch-coniferous forest we met *Carex vesicaria* and *C. cespitosa*, *Chamaenerion angustifolium* (Onagraceae), *Trifolium pratense*, *Melilotus officinalis*, *Vicia cracca* (Fabaceae) etc. There are many fallen trees in the forest. The birch trunks are damaged by the larvae of Scolytinae beetles; there is a large number of galls on aspens. When mowing with the butterfly net, the Muscidae and Syrphidae (Diptera) are dominant. The number of insects in this biotope is small, and the biodiversity is poor.

## DISCUSSION

The analysis of entomofauna in the southern middle taiga of the Middle Ob has indicated the dominance of phytophages among all the insects in the examined habitats. During five years of study, the order domination of different terrestrial insect groups changed only for two orders: Homoptera and Diptera, which have the highest dominant characteristics.

The papilionoidea (Lepidoptera) prevail among the insects-pollinators - 34 species, then comes Syrphidae (Diptera) – 28 species, Apidae (Hymenoptera) – 26 species.

The entomophages are represented by five orders: Odonata, Hemiptera, Coleoptera, Diptera, Neuroptera. The quantitative ratio of the entomophages in typical habitats of the Middle Ob is following: Odonata – 16 species (18,6%), Hemiptera – 5 species (5,8%), Coleoptera (Carabidae – 19 species (22%), Dytiscidae – 5 species (5,8%), Staphylinidae – 10 species (11,7%), Coccinellidae – 22 species (25,6%), Diptera (Asilidae) – 5 species (5,8%), and Neuroptera (Chrysopidae – 4 species (4,7%)).

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