

Systematic analysis of butterflies in Bukhara region

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Abstract: Our research analyzes the diversity, abundance, distribution by biotope and seasonal changes in the species composition of butterflies found in Bukhara region. It is inevitable that diverse biotic, abiotic and anthropogenic factors affect the butterfly fauna. The aggravation of climatic conditions occurring in subsequent years, as well as changes in the types of crops, will naturally affect the butterflies of Bukhara region. In particular, planting new varieties of crops, in turn, contribute to an increase in the inherent diversity of insects, especially invasive species in the country. Key words: *Spodoptera exigua*, *Pieris brassicae*, *Agrotis segetum*, *Leptidea sinapis*, *Sarpocapsa pomonella*

1 Introduction

Lepidoptera are considered insects that have evolved with complete metamorphosis. Through a comprehensive study of butterflies, which are important in nature and human life we could manage their number as well as maintain the preservation of environmental sustainability and diversity of butterflies. Thus, particular attention has been paid to environmental protection, biodiversity conservation and the rational use of biological resources in our republic since the first years of independence (<https://insects.space/ru/>, <https://play.google.com/store/apps/details?id=ua.agrosoftex.determinant2&hl=ru>, <https://www.insectidentification.org/bugfinder-start.asp>). In Bukhara region, not enough attention is paid to scientific research on the species composition, abundance, reproduction, bioecological features, distribution and importance of butterflies in natural biotopes and agrocenoses. Assessment of the negative impact of butterflies on cultivated plants, determination of population density, as well as the development of measures to preserve aesthetically significant, rare species in the conditions of Bukhara region were also taken into consideration.

2 Material and methodology

The research was carried out in various natural biotopes of Bukhara region (Jandor, Romitan, Bukhara, Peshku, Gijduvan, Shafirkan, Karaulbazar) - semi-deserts, natural reservoirs, developed territories, agricultural landscapes, and developed urban zones with

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stationary and route method, and by observing and collecting samples of butterflies at different times of the year (spring, summer, autumn). The collection of butterflies for the purpose of determining the species composition was carried out mainly with the help of an entomological mattress. A butterfly trapped in a mattress bag was killed when its wings were gathered together with the help of a thumb and index finger and placed in jars with chloroform to protect them from external damage [1-4]. A glass or plastic container with a wide neck was used for temporary storage of collected butterflies. The actual vegetation phase of crops begins when temperature is above +10 °C [5]. A number of scientific sources were used to determine the systematic position of butterflies [1;2;6]. Online detectors were also used to identify species when needed [10]. Night route calculations were done using conventional LED lights. Collections of insects caught in different years were also used (stored in the Zoo Museum of Bukhara State University). The climate of Bukhara is sharply continental with an average rainfall of 125-175 mm per year, which is observed mainly at the beginning of the spring season and at the end of autumn. Hot sunny days last up to 240 days, during which, on average. The hottest days are observed in the summer months, when the daytime air temperature reaches 38.7-46.2 degrees and even higher than in late June and early July. Winter is dry and cold, the average temperature in January ranges from 4.0 to -13 degrees. The average relative humidity is 40-60%.

3 Result and discussion

Our observations to determine the species composition of the butterfly fauna in Bukhara were conducted over a period of 8 years, starting from 2015. Based on the analysis of the field materials collected, it was found that 39 species of butterflies from 8 families (Pieridae, Noctuidae, Nymphalidae, Sphincidae, Tortricidae, Pyralidae, Lycaenidae, Plutellidae) are found in Bukhara region.

Table 1. Systematic analysis of butterflies found in Bukhara region.

№	Butterfly species.	Spring	Summer	Autumn
	Kingdom.	Metazoa		
	Subkingdom.	Eumetazoa		
	Phylum.	Arthropoda		
	Subphylum.	Tracheata		
	Class .	Insecta		
	Subclass.	Ectognata		
	Order.	Lipidoptera		
	Suborder .	Trenata		
	Family.	Pieridae		
1	<i>Aporia crataegi</i>	+	+	
2	<i>Anthocharis cardamines</i>	+	+	
3	<i>Zegris eupheme</i>	+		
4	<i>Zegris pyrothoe</i>	+		
5	<i>Zegris fausti</i>	+		
6	<i>Pieris brassicae</i>	+	+	+
7	<i>Leucochlloe daplidicae</i>	+	+	+

8	<i>Pontia daplidice</i>	+	+	+
9	<i>Pieris rapae</i>	+	+	+
10	<i>Pontia chloridice</i>	+	+	+
11	<i>Pieris napi</i>	+	+	+
12	<i>Colias erate</i>	+	+	+
13	<i>Leptidea sinapis</i>	+	+	
14	<i>Colias palaeno</i>		+	
15	<i>Colias hyale</i>	+	+	+
16	<i>Leptidea amurensis</i>	+	+	+
17	<i>Colias chrysotheme</i>	+	+	
18	<i>Colias croceus</i>	+	+	+
19	<i>Colias myrmidone</i>	+	+	+
20	<i>Colias eurytheme</i>		+	
Family. Noctuidae				
21	<i>Agrotis segetum</i>	+	+	
22	<i>Heliothis armigera</i>	+	+	+
23	<i>Spodoptera exigua</i>	+	+	+
24	<i>Agrotis segetum</i>	+	+	
25	<i>Agrotis exclamationis</i>		+	
26	<i>Agrotis obesa</i>			+
27	<i>Yeixoa temera</i>			+
28	<i>Agrotis crossa</i>		+	+
29	<i>Chloridea obsolete</i>	+	+	+
Family. Nymphalidae				
30	<i>Vanessa cardui</i>	+	+	+
31	<i>Vanessa urticae</i>	+	+	+
Family. Sphingidae				
32	<i>Macrppglossum stellatarum</i>	+	+	+
33	<i>Celerio euphorbiae</i>	+	+	+
Family. Tortricidae				
34	<i>Sarpocapsa pomonella</i>	+	+	+
Family. Pyralidae.				
35	<i>Ostrinia nubilalis</i>	+	+	
36	<i>Choreutis nemorana</i>	+	+	
37	<i>Diaphania Glyphodes pyloalis</i>	+	+	+
Family. Lycaenidae				
38	<i>Lycaena icarus</i>	+	+	+
Family. Plutellidae				
39	<i>Pluttella maculipenins</i>	+	+	+

When analyzing the seasonal distribution of butterflies found in Bukhara region, 8 (20.4%) butterfly species belong to the spring-summer ecological group, 22 (56%) butterfly species belong to the spring-autumn, 3 (8%) butterfly species belong to the summer, 2 (5.1%) butterfly species belong to the autumn, 3 (8%) species of butterflies belong to the spring ecological group and 1 (2.5%) butterfly species is assigned to the summer-autumn ecological group (Table 1). Spring, summer and autumn seasons are favorable for life of butterflies; they multiply many times and leave offspring. As a result the number of individuals in the population increases.

Table 2. The spectrum of the leading butterfly families found in Bukhara region

	Families	Number of species	%
1	Pieridae	20	51,2
2	Noctuidae	9	23,06
3	Nymphalidae	2	5,12
4	Sphincidae	2	5,12
5	Tortricidae	1	2,5
6	Pyalidaye	3	8
7	Lycaenidae	1	2,5
8	Plutellidae	1	2,5
	Total	39	100

According to the results, among 39 species of butterflies found in Bukhara region, the largest number by species composition belongs to the family Pieridae - 20 species (51.2%), and the family Noctuidae includes 9 species (23.06%), the family Nymphalidae 2 species (5.12%), the family Sphincidae includes 2 species (5,12%), 1 species belongs to the family Tortricidae (2.5%), 3 species belong to the family Pyralidae (8%), 1 species belongs to the family Lycaenidae (2.5%), 1 species belongs to the family Plutellidae (2.5%) (Table 2).

People get aesthetic pleasure from butterflies. However, domesticated butterflies such as the silkworm also produce valuable products such as silk. However, it also plays a role in the food chain in nature. In addition, they are also unsurpassed pollinators for plants. Butterflies are divided into day and night butterflies, depending on what time of day they lead an active life. Flight, nutrition, and reproduction of the day butterflies occur during the light period of the day.

They differ from each other in the way they find shelter and hide at dusk. Today, the data of the state cadaster of wildlife objects do not allow us to obtain accurate data on the total number of butterfly species found in Bukhara region. Therefore, it is advisable to carry out practical work in this direction. Changes in butterflies periodic population are associated with the change of seasons. Non-periodic changes in the number of butterfly populations are observed due to natural adverse environmental conditions like drought, typical severe winter frosts and a reduction in food sources due to high temperatures in the summer season. Unfortunately, in recent decades, related to human economic activity in the territories where our observations were made, such unfavorable circumstances as the

formation of settlements in the steppe zone of the region, the laying of automobile and railway networks, overgrazing of livestock around reservoirs in the steppe zone, on pastures, arson of reed beds and lichens, have led to, which is the reason for the reduction in numbers.

Table 3. Taxonomic analysis of butterflies of Bukhara

Phylum	Class	Order	Family	Species
Arthropoda	Insecta	Lipidoptera	Pieridae	<i>Aporia crataegi</i>
				<i>Anthocharis cardamines</i>
				<i>Zegris eupheme</i>
				<i>Zegris pyrothoe</i>
				<i>Zegris fausti</i>
				<i>Pieris brassicae</i>
				<i>Leucochlloe daplidicae</i>
				<i>Pontia daplidice</i>
				<i>Pieris rapae</i>
				<i>Pontia chloridice</i>
				<i>-Pieris napi</i>
				<i>Colias erate</i>
				<i>Leptidea sinapis</i>
				<i>Colias palaeno</i>
				<i>Colias hyale</i>
				<i>Leptidea amurensis</i>
				<i>Colias chrysotheme</i>
				<i>Colias croceus</i>
				<i>Colias myrmidone</i>
				<i>Colias eurytheme</i>
			Noctuidae	<i>Agrotis segetum</i>
				<i>Heliothis armigera</i>
				<i>Spodoptera exigua</i>
				<i>Agrotis segetum</i>
				<i>Agrotis exclamationis</i>
				<i>Agrotis obesa</i>
				<i>Yeixoa temera</i>
				<i>Agrotis crossa</i>
			Nymphalidae	<i>Heliothis armigera</i>
				<i>Vanessa cardui</i>
				<i>Vanessa urticae</i>
			<i>Sphingidae</i>	<i>Macrppglossum stellatarum</i>
				<i>Celerio euphorbiae</i>
			<i>Tortricidae</i>	<i>Sarpocapsa pomonella</i>
			Pyrilidae	<i>Ostrinia nubilalis</i>
				<i>Choreutis nemorana</i>
				<i>Diaphania Glyphodes pyloalis</i>
			Lycaenidae	<i>Lycaena icarus</i>
			Plutellidae	<i>Pluttella maculipenins</i>

The leading butterfly families found in Bukhara region include 2 families with 9 or more species. The leading butterfly families comprise 29 species (74.3%), the remaining 6 families comprise 10 species (25.7%). In the remaining families, the species are distributed as follows: one family consisting of 3 species (Pyrilidae), 2 families consisting of 2

species (Nymphalidae, Sphingidae), 3 families consisting of 1 species (Plutellidae, Lycaenidae, Tortricidae,) (Table 3)

4 Conclusion

The study of butterflies found in Bukhara region is very important for the creation of their cadaster, constant monitoring, and protection of species of practical importance. The diversity of butterflies, systematic analysis, population dynamics, the degree of knowledge and information are necessary for the organization of activities for the conservation and sustainable use of the butterfly world. The study of butterflies found in Bukhara region is essential for assessing the state of their populations and identifying trends in their changes, developing recommendations on ways to preserve rare and endangered species. The development of territories where rare butterflies are common in nature, the excessive use of plants there for livestock, and the development of industry lead to a non-restorable result of such natural resources of nature. The preservation and protection of them, as well as the reproduction of their species, is our duty to future generations.

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