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Biology And Phenology Of Flight Of Adults Of Geometridae In The Conditions Of The Khorezm Oasis

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Abstract: *The paper presents the results of biology and phenology of flight of adults of Geometridae in the conditions of the Khorezm Oasis, as well as a review of the literature on this topic. Presented 18 species of 2 subfamilies: Archiearinae and Sterrhinae, which also includes previously published information on finds in the region.*

Keywords—: Geometridae; Lepidoptera; Archiearinae and Sterrhinae; caterpillar; chrysalis; adult butterfly; phenology

INTRODUCTION

Butterflies of different shapes, small or medium-sized (average wingspan: 20-55 mm). Many species are characterized by a slender abdomen and wide wings. Some species keep their wings spread out, some - folded top-like. There are species in which females are short-winged or without wings at all. Some species have a thick body, which gives them a certain resemblance to cocoons. Antennae of males are often comb-like, females are thin, bristle-like. The proboscis is developed in most species. The Russian and Latin names of the family reflect the peculiar way of crawling of the caterpillars of these butterflies, which, as it were, measure their way. In the process of movement, the caterpillar clings to the substrate with its pectoral legs and, bending in an arcuate manner, pulls the rear end of the body, then attaches with its abdominal legs and, stretching the body, again transfers the fulcrum to the pectoral legs. The family is distributed all over the world; about 1000 species live in the Palaearctic. Caterpillars feed on both herbaceous and woody plants.

Moth butterflies are mostly nocturnal. Adult butterflies (imago) feed on the nectar of flowering plants.

Eggs are most often oblong-oval. The color changes as it develops. Just before the exit, the caterpillars are dark brown.

The **caterpillar** is naked, like all Lepidoptera, worm-like. Consists of a head, three thoracic and ten abdominal segments. The main difference from caterpillars of other families is that the abdominal legs are located on the sixth and tenth, less often the fifth - sixth or fourth - fifth body segments. Therefore, the caterpillars move in a peculiar way, the back of the body is pulled to the front when moving. The caterpillars of Geometridae are characterized by a masking color to match the tone of foliage or tree bark and a characteristic defensive posture. The disturbed caterpillar pulls the body at an angle to the substrate, being held by two pairs of abdominal legs. At this point, it is very similar to a short dry knot. Caterpillars, having hatched from eggs, begin intensive feeding. Among the moths, there are both oligophages (Plum Geometridae (Angerona prunaria) and monophages) Winter Geometridae (Operophthera brumata). After feeding, the caterpillars go into the soil and pupate there.

Pupa. The morphological structure is specific, but most often the pupae are smooth, reddish-brown and are in the ground in a cocoon or without it. Species of such genera as Ourapteryx, Selenia, Angerona pupate on tree branches in spider cocoons. Pupae of these genera are characterized by green, yellow and gray colors of the integument. Overwinter pupae.

MATERIALS AND METHODS.

When studying the flight of imago Geometridae, we used phenological methods, such as the method of visual observation. Visual methods of phenological observation of insects are common, especially over those objects that serve as indicators of the boundaries of natural seasons and subseasons for comparability. When organizing phenological studies, we first of all identified a site for general observations, which should characterize the average conditions for a given area.

The collection of moths was carried out at light and in a light trap for 5 years (in 2014 from June 1 to August 16 and from September 12 to 20, in 2019) in the paragraph below. Below is a description of the position of these points and their vegetation.

"Xonka (agrocens)" area of the Khorezm region (41 ° 28′12 ′ N 60 ° 46′48 ′ E): The collection was carried out by X.U. Bekchanov, M.X.. Bekchanov and G.K. Komiljanova into the light trap on the cordon.

Vegetation: Mongolian oak, hawthorn, Ussuri pear, apple berry, willow (tal), spirea, daurian wild rose, Central Asian grapes.

A small part of butterflies were collected by the authors during route work in other parts of the reserve and in its vicinity.

The Lower Amudarya State Biosphere Reserve (NABR) was established in 2011 within the framework of a joint project of the United Nations Development Program, the Global Environment Facility and the Government of the

Republic of Karakalpakstan "Conservation of the tugai forests of Karakalpakstan in the Amu Darya delta" based on the Badai-Tugai nature reserve. In addition to the territory of the former reserve, the tugai forests of the Beruniy and Amu Darya districts of Karakalpakstan were transferred to the biosphere reserve ": the collection was carried out by X.U. Bekchanov, M.X. Bekchanov and G.K. Komiljanova on the territory of the central base of the reserve, not far from its border (44 ° 06′30′N 59 ° 40′52′E) in the desert of the tugai forest

Vegetation: In the valley and the floodplain of the river, tugai plants are widespread: reeds, gray poplar, wild dzhida , tamarisk, silver chingil, sedge, willow on meadow soils: hairy wheatgrass,digitaria , calamagrostis, etc.Selin, Juzgun, white saxaul, sedge are found in sandy places of the outskirts of the region. In places where gray-brown soils are distributed, weeds and wormwood grow.

"Akhcha kul" of the Republic of Karakalpakstan, Ellikala region: The collection was carried out by X.U. Bekchanov, M.X.. Bekchanov and G.K. Komiljanova into the light trap on the cordon (41 ° 50 ′ 37 ′ N 60 ° 54 ′ 33 ′ E) about 450 m above sea level), located on the territory of Lake Akhcha Kul. The arboreal and shrub vegetation includes willow (tal), poplar, elm, tamarisk, silvery chingil, cattail, and reed.

"Tollik tukai of the Gurlensky district of the Khorezm region (TGHO": The collection was carried out by X.U. Bekchanov, M.X. Bekchanov and G.K. Komiljanova at night under lanterns on the eastern outskirts of the village of Vazir (41 º 50` 30` N 60 º 23` 45`E) on the territory of a mixed tugai forest in the upper left part of the Amudarya

Vegetation: common tugai plants: reeds, gray poplar, wild dzhida (sucker), tamarisk, silvery chingil, sedge, tal on meadow soils: hairy wheatgrass, common finger grass, reed grass and camel thorn, licorice naked, willow (tal) , cattail, in nearby areas rice fields, etc.

"Kakrali tugai of the Gurlensky district of the Khorezm region (KGHO": The collection was carried out by X.U. Bekchanov, M.X. Bekchanov and G.K. Komiljanova into the light trap of a mixed tugai forest, the site is mainly dominated by turanga (41 º 50` 30` N 60 º 23` 45`E) about 100 m above sea level) about 300 m from the highway to Toshkent - Nukus

Vegetation: reeds, gray poplar, wild djida, tamarisk, silver chingil, sedge, thaw on meadow soils: wheatgrass, common finger, reed grass and camel thorn, naked licorice, willow, cattail, in nearby areas rice fields, etc.

Study area and its climate. Khorezm region is located in the western part of Uzbekistan. In the north-west and north it borders with the Republic of Karakalpakstan, in the south and west - with Turkmenistan, in the south-east, east and north-east - with the Bukhara region. Almost the entire territory of the region is occupied by plains and small hills. According to its geographical position, it is located between 40 ° -42 ° north latitude and 60 ° -62 ° east longitude. The climate is sharply continental, with hot and dry summers and rather cold winters. In winter, the air temperature in the Khorezm region and neighboring Karakalpakstan is on average 5-8 ° C lower than in the rest of the southern and eastern parts of Uzbekistan. The average annual temperature is + 12.0 ° C, the average January temperature is -5.0 ° C, the average July temperature is + 30.0 ° C. The absolute minimum temperature was -32 ° C, the absolute temperature maximum was + 45 ° C. On average, 78-79 mm of precipitation falls on the territory of the district per year (most of them fall in spring and autumn).

RESEARCH RESULTS.

In the fauna of the Lepidoptera geometridae of the spring-summer-autumn phenological period in the Khorezm oasis, 18 species were recorded. Flight phenology of adult geometridae. Phenological periodization is based on the identification of seasonal threshold phenomena in the life of plants and animals. For the purpose of phenological periodization of the occurrence of imago butterflies, a change in the species composition of flying butterflies and a change in the share of flying species with different types of development cycles can be taken as such. The beginning of the emergence of butterflies (especially mass ones) is the prevailing favorable conditions for their emergence from pupae and clearly appears in nature due to the presence of "fresh" (not flown around) butterflies. The end of the flight usually looks like a long-term occurrence of individual fly-by specimens and is recorded with difficulty. It depends on the individual life span of butterflies, which is limited both by its own biological characteristics of the species and by external factors - the abundance of insectivorous predators and the presence of local weather cataclysms - strong winds, showers, etc., which can produce almost complete elimination of migrating birds in one day. species of the corresponding phenological group. In addition, the long-term occurrence of butterflies in the second half of the summer can be determined by the emergence of a partial or optional second generation, which is often observed both in Europe and the Far East. Below are the data collected from the works of E.A. Belyaev and A.P. Burnasheva.

1.The spring period begins in the third decade of April and is marked by the emergence of two species of geometridae of the Archiearinae subfamily - Archiearis parthenias and Leucobrephos middendorfii. The first of them can be considered a pheno-indicator of this period, while the second species is very rare in collections.

2. The early summer period begins from the third decade of May. It is characterized by the beginning of mass emergence of geometridae in nature (in the third decade of May, 12 species of moths were recorded, and in the first decade of June - 20 species of moths compared to 2 species in the second decade of May). The phenoindicators of the beginning of this period can be considered the appearance of such common and noticeable species as Angerona prunaria, Cyclophora albipunctata, Ematurga atomaria, Plagodis pulveraria. This group of species includes a very common and noticeable species - Rheumaptera hastata, although its emergence was noted already in the second decade of May.

3. The mid-summer period begins in the second decade of June. With its onset, among the emerging geometridae, a

sharp increase in the proportion of species wintering in the caterpillar phase is observed. The emergence of many species from the subfamily Sterrhinae, Idaea aureo laria, Holarctias rufinaria, Scopula ornata, Scopula immorata, is characteristic of the beginning of the mid-summer period, the appearance of which should be considered a phenoindicator of the beginning of the considered period of flight of Geometridae.

4. The late summer period begins in the second decade of July and is characterized by a sharp decline in the rate of emergence of geometridae species in combination with a sharp increase in the proportion of species overwintering at the egg stage. Phenoindicators of the beginning of this period can be Carsia sororiata, Dysstroma citrata, Epione repandaria, Epione vespertaria, Epirrita autumnata,

5. The pre-autumn period begins in August. It is characterized by a general decline in the emergence of butterflies to single species with different wintering phases of development, and the emergence of butterflies of the optional second generation, which can be considered phenoindicators of this period - Cyclophora albipunctata, Selenia tetralunaria

Table 1.

Wintering phases of development and flight of adult Geometridae in the Khorezm Oasis.

№	View	Winters	April	May			June			July			August		
			3- rd	1-st	2-nd	3-rd	1-st	2-nd	3-rd	1-st	2-nd	3-rd	1-st	2-nd	3-rd
1	*Archiearis parthenias* L.	Pupa							0	0	0	0	0	0	0
2	*Leucobrephos middendorfii*	Pupa	0			0	0	0	0	0	0	0	0	0	0
3	*Angerona prunaria* L.	Caterpillar	0	0											0
4	*Cyclophora albipunctata*	Pupa	0	0	0					0	0			0	0
5	*Ematurga atomaria*	Pupa	0	0	0									0	0
6	*Plagodis pulveraria* L.	Pupa	0	0	0							0	0	0	0
7	*Rheumaptera hastata* L.	Pupa	0	0											0
8	*Idaea aureolaria*	Caterpillar	0	0	0										0
9	*Holarctias rufinaria* Stgr.	Caterpillar	0	0	0	0	0							0	0
10	*Scopula ornate*	Caterpillar	0	0	0	0	0					0	0	0	0
11	*Scopula immorata*	Caterpillar	0	0	0	0								0	0
12	*Carsia sororiata* H	Egg	0	0	0	0	0	0	0	0					
13	*Dysstroma citrate*	Egg	0	0	0	0									
14	*Epione repandaria*	Egg	0	0	0	0	0	0	0	0					
15	*Epione vespertaria*	Egg	0	0	0	0	0	0	0						0
16	*Epirrita autumnata*	Egg	0	0	0	0	0	0							
17	*Cyclophora albipunctata*	Pupa	0	0						0	0			0	0
18	*Selenia tetralunaria* Hufn	Pupa	0	0	0				0	0	0	0	0		0

CONCLUSION.

This article provides data on the morphology of the geometridae family. In the process of material processing on the territory, in the fauna of the spring-summer-autumn phenological period in the Khorez oasis, 18 species of geometridae belonging to 2 subfamilies were identified. Based on the data of E.A. Belyaev and A.P. Burnasheva identified 5 phenological periods (spring, early summer, middle summer, late summer, pre-autumn) differing in the number and composition of species.

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