

QUANTITATIVE ANALYSIS OF FAUNA OF BUTTERFLIES (RHOPALOCERA, LEPIDOPTERA) OF MEGHRI REGION OF ARMENIA

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ABSTRACT

The article is dedicate to clarify some of the quantitative characteristics of butterflies (Lepidoptera: Rhopalocera) of Meghri region: one of the richest and most diverse regions of Armenia. At current, 154 species of butterflies have registered in the various habitats of the investigated region. These species can be divided into four groups: 1) abundant - 7 species (indices of the relative abundance of these species vary from 3.18 to 6.34%), 2) common - 31 species (0.75-2.68%) 3. rare - 66 species (0.15-0.72%); 4. very rare - 50 species (0.004-0.14%). Thus, the basis of the total population of butterflies forms 38 abundant and common species that arrange 76% of all registrations. The share of the remaining 116 rare and a very rare species is 24%.

Keywords: *butterflies (Rhopalocera), Armenia, Meghri region, relative abundance*

INTRODUCTION

Meghri region is one of the richest and most distinctive regions of Armenia in the faunal regard. However, the invertebrate fauna insufficiently and irregularly studied in the region and whole Armenia: particularly, we have in view degree of researching of separate major taxa. Thus, it is clearly, that butterfly (Lepidoptera: Rhopalocera) fauna insufficiently studied. Butterflies are one of the brightest and most conspicuous groups of insects, which also have significant environmental value.

Publications about the butterfly fauna of the country is extremely rare, despite the fact that the collection of materials were regularly in Armenia since at least the late 19th - early 20th century (thus, quite extensive material was collected in the middle of 20th century by M.A. Ryabov). There is only one generalized work of S.A. Vardikyan [1], who [2] also published fragmentary information about rare butterflies of Armenia as well as S.A. Mirzoyan et al [4]. Solitary works on specific aspects of butterfly fauna of Armenia published in the period 1990-2004 [3, 11, 12]. You can find quite extensive information about the butterflies of Armenia in generalized works on the fauna of the Caucasus [5] and CIS countries [14, 15]. Certain aspects on fauna of Meghri region represented in recent works [6, 7, 8], which concern species composition, zoogeography and threats to butterflies of Meghri region, however questions about habitat distribution and quantity peculiarity of common butterflies are still incomplete.

Meanwhile, the specified data become a particularly urgency, since a large "Arevik" national park was organized in the region in 2009. Challenges of park zoning, organization of protection and further condition monitoring of provided ecosystems need to attract the widest possible range of data on different groups of animals and plants. Lepidoptera (in particular – butterflies) is one of the most perspective groups of animals, the study of which may introduce a significant contribution to the indicated works of the National Park. In connection with proceeding we have studied butterflies of the region for several years until the present time.

MATERIALS AND METHODS

The data base for this work was gathered in Meghri region from 2005 (data collections became systematic after 2006). Data collection was conducted on 49 routes in 19 geographical locations of the region in the spring and summer season. There were organized 16 expeditions to collect the material (a total of about 225 days).

According to the results of this work we have recorded 28,510 registrations of 154 species of butterflies. Also, we have examined the materials of the State Museum of Nature in Armenia, materials of the stock collection of the museum of the Zoology Institute of NAS RA, materials of the collection of American University of Armenia and the materials of private collections of A.V. Danchenko, S.A. Andreev, K.G. Eranyan, K.Simek, Ch. Papé, B. Jost.

The main method of quantitative calculation was «Pollard Walk» transect counting method [13]. Routes of transects were laid out to sample representative habitats and ran as far as possible parallel to the slopes. The length of routes reached up to 500 meters in the slightly-rugged areas, and no more than 200 at highly-rugged areas. The width of routes

was 10 meters. According to the requirements of the technique there were chosen mostly sunny or light cloudy (but necessarily not windy) days to undergo routes. Generally we realized counts with moderate speed of walk from 11:00 am to 15:00 pm. We've registered only those individuals which have been found within the five meter strip on each side of route. Count of imago butterflies was conducted on transects from April to September. We've determined most of the butterflies on the spot, but sometimes, due to difficulty of distance identification, we have captured it and let out after the determination. Specimens were fixed only when the visual determination was difficult in the field. Trapping was carried out by standard, butterfly-net from a nylon mesh with a diameter of 350 mm. Trapped specimens have been pinned and labeled.

We were recorded encountered species and their quantity data on our tape recorder and after returning to base camp, the data are processed and entered into a mobile computer. This algorithm greatly increased the speed of data collection.

We used the taxonomy and nomenclature in accordance with the «Guide to the butterflies of Russia and adjacent territories» [14, 15].

In the analysis of the fauna of butterflies we take into account the frequency of occurrence and density of species. Calculation of the relative abundance of species and identification of their specific gravity in the fauna of the region allows grouping of all the species into the following categories - abundant (indices of the relative abundance of these species vary from 3.18 to 6.34%), common (0.75 to 2.68%), rare (0.15 to 0.72%), very rare (0.004 to 0.14%). The percentage was revealed as the ratio of the number of registrations of a particular species for all types of habitat to the total number of all registrations in the region for the entire period of field work.

RESULTS AND DISCUSSION

Calculation of the relative abundance of species and identification of their specific gravity in the fauna of the region allowed us to distribute the entire species composition as it shown in *Table*.

Table. The relative abundance of butterflies' species of Meghri region of Armenia

Species	Total records	Share of the records, %	Species	Total records	Share of the records, %
Erynnis tages	250	0.88	Colias thisoa	70	0.25
Erynnis marloyi	28	0.10	Colias aurorina	142	0.50
Carcharodus alceae	270	0.95	Colias crocea	1075	3.77
Carcharodus lavatherae	3	0.01	Gonepteryx rhamni	170	0.60
Spialia orbifer	76	0.27	Gonepteryx farinosa	213	0.75
Pyrgus melotis	3	0.01	Esperarge climene	8	0.03
Pyrgus sidae	110	0.39	Pararge aegeria	298	1.05
Pyrgus serratulae	144	0.51	Lasiommata megera	90	0.32
Pyrgus armoricanus	25	0.09	Lasiommata maera	19	0.07
Pyrgus alveus	25	0.09	Melanargia galathea	82	0.29
Pyrgus jupei	19	0.07	Melanargia russiae	67	0.24
Eogenes alcides	70	0.25	Melanargia larissa	301	1.06
Gegenes nostrodamus	16	0.06	Coenonympha pamphilus	438	1.54
Thymelicus lineola	62	0.22	Coenonympha saadi	417	1.46
Thymelicus sylvestris	259	0.91	Coenonympha arcania	30	0.11
Ochlodes silvanus	164	0.58	Coenonympha leander	122	0.43
Hesperia comma	2	0.01	Erebia aethiops	93	0.33
Parnassius mnemosyne	107	0.38	Erebia graucasica	58	0.20
Parnassius apollo	8	0.03	Erebia medusa	95	0.33
Iphiclides podalirius	213	0.75	Protorebia afra	39	0.14
Papilio machaon	175	0.61	Hyponephele lycaon	36	0.13
Papilio alexanor	4	0.01	Hyponephele lupina	102	0.36
Leptidea sinapis	302	1.06	Maniola jurtina	738	2.59
Leptidea duponcheli	50	0.18	Hipparchia pellucida	104	0.36
Anthocharis cardamines	227	0.80	Hipparchia syriaca	81	0.28
Anthocharis gruneri	225	0.79	Hipparchia fatua	10	0.04
Euchloe ausonia	197	0.69	Hipparchia parisatis	350	1.23
Zegris eupheme	73	0.26	Brintesia circe	51	0.18
Aporia crataegi	763	2.68	Satyrus amasinus	218	0.76
Pontia daplidice	1484	5.21	Satyrus effendi	3	0.01
Pontia chloridice	10	0.04	Pseudochazara pelopea	39	0.14
Pieris bryoniae	110	0.39	Pseudochazara beroe	5	0.02
Pieris pseudorapae	1741	6.11	Chazara briseis	256	0.90
Pieris krueperi	48	0.17	Chazara persephone	64	0.22
Pieris brassicae	1427	5.01	Chazara bischoffi	1	0.004
Colias sareptensis	714	2.50	Libythea celtis	379	1.33

Table. The relative abundance of butterflies' species of Meghri region of Armenia

Species	Total records	Share of the records, %	Species	Total records	Share of the records, %
Thaleropsis ionia	168	0.59	Thersamonolycaena alciphron	82	0.29
Limenitis reducta	347	1.22	Thersamonia thetis	4	0.01
Neptis rivularis	288	1.01	Athamanthia phoenicura	152	0.53
Vanessa atalanta	28	0.10	Lampides boeticus	5	0.02
Vanessa cardui	48	0.17	Chilades trochylus	42	0.15
Inachis io	22	0.08	Tarucus balcanicus	514	1.80
Polygonia c-album	172	0.60	Cupido minima	87	0.31
Polygonia egea	22	0.08	Cupido osiris	358	1.26
Nymphalis xanthomelas	90	0.32	Everes argiades	30	0.11
Nymphalis polychloros	82	0.29	Celastrina argiolus	576	2.02
Aglais urticae	242	0.85	Pseudophilotes vicrama	63	0.22
Argynnis paphia	58	0.20	Glaucopsyche alexis	171	0.60
Argynnis pandora	60	0.21	Iolana iolas	8	0.03
Argynnis aglaja	76	0.27	Maculinea arion	10	0.04
Argynnis adippe	3	0.01	Plebeius argus	170	0.60
Argynnis niobe	10	0.04	Plebeius idas	118	0.41
Issoria lathonia	200	0.70	Plebeius christophi	374	1.31
Brenthis daphne	5	0.02	Plebejides zephyrinus	73	0.26
Brenthis hecate	44	0.15	Eumedonia eumedon	62	0.22
Clossiana euphrosyne	28	0.10	Aricia agestis	1807	6.34
Boloria caucasica	36	0.13	Ultraaricia crassipuncta	19	0.07
Euphydryas aurinia	42	0.15	Cyaniris bellis	299	1.05
Melitaea didyma	496	1.74	Vacciniina alcedo	42	0.15
Melitaea cinxia	215	0.75	Kretania eurypilus	2	0.01
Melitaea punica	102	0.36	Neolysandra coelestina	56	0.20
Melitaea pseudosibina	50	0.18	Agriades pyrenaicus	204	0.72
Mellicta caucasogenita	33	0.12	Lysandra bellargus	906	3.18
Thersamonia thersamon	85	0.30	Lysandra corydonius	60	0.21
Favonius quercus	13	0.05	Meleageria daphnis	56	0.20
Armenia ledereri	56	0.20	Polyommatus icarus	1556	5.46
Armenia hyrcanica	82	0.29	Polyommatus amandus	367	1.29
Nordmannia spini	164	0.58	Polyommatus dorylas	36	0.13
Nordmannia ilicis	8	0.03	Polyommatus thersites	82	0.29
Nordmannia abdominalis	154	0.54	Agrodiaetus ripartii	1	0.004
Callophrys chalybeitincta	185	0.65	Agrodiaetus demavendi	25	0.09
Callophrys paulae	28	0.10	Agrodiaetus damon	2	0.01
Tomares romanovi	12	0.04	Agrodiaetus firdussii	5	0.02
Lycaena phlaeas	383	1.34	Agrodiaetus vanensis	2	0.01
Heodes virgaurea	79	0.28	Agrodiaetus zarathustra	2	0.01
Heodes tityrus	146	0.51	Agrodiaetus altivagans	3	0.01
Heodes candens	48	0.17	Agrodiaetus damonides	1	0.004

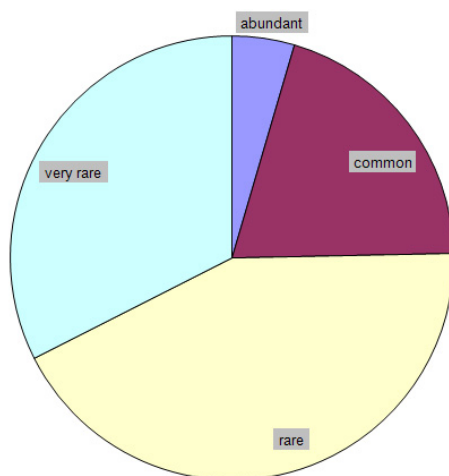


Figure. Butterflies grouped by their relative abundance

As a result of analysis the fauna of butterflies has been distributed to the following groups (see *Figure*):

1. abundant - 7 species. Indices of the relative abundance of these species vary from 3.18 to 6.34%
2. common - 31 species. Indices of the relative abundance of these species vary from 0.75 to 2.68%.
3. rare - 66 species. Indices of the relative abundance of these species vary from 0.15 to 0.72%.
4. very rare - 50 species. Indices of the relative abundance of these species vary from 0.004 to 0.14%.

CONCLUSIONS

Thus, the basis of the total population of butterflies forms 38 abundant and common species that arrange 76% of all registrations. The share of the remaining 116 rare and a very rare species is 24%. In our opinion, the first two categories (abundant, common) should be recommended for inclusion in the monitoring as potential indicators of ecosystem. The category of "very rare" needs to assess the conservation status in whole Armenia, which will allow us to decide include this species in Red Book of RA. The category of "rare" requires regular surveys for assessing trends in their quantity and, therefore, including them in the scheme of monitoring of indicator species or proposing their inclusion in the red list.

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