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HOROLOGY AND TAXONOMY OF FAMILY GEOMETRIDAE IN SOME LOCALITIES IN SHARR MOUNTAIN

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Abstract

In this study were collected the adult individuals of species that belong on the family Geometridae (Moths) - group of Lepidoptera in ten localities of Sharr Mountain, the part which belongs to the Republic of North Macedonia. Our research has lasted two-years (2019-2020) from April to November. Compared to the literature review and with the results of this study this family of moths is counted as the family with high species richness from other groups of Heteroceras. The material was collected during the night period in several localities in Sharr Mountain, by light-traps (pyramids with white sheets, equipped with UV lamp). The collected material was narcotized and systematized in plastic boxes lined with cotton or soft material to avoid damage or destroy of the individuals because then we will have a lot of difficulties in morphological determination. The collected material was transported to the laboratory of the Institute of Ecology and Technology in Sharr Mountain, for preparation and morphological determination. In this period of field observation were collected 101 adult individuals and in laboratory we identified (with stereo microscope Nikon SMZ 1500) 48 species of Geometridae moths belonging to 21 genera and 9 subfamilies.

Keywords: Geometridae moths, field observation, morphological determination, Sharr Mountain.

1. Introduction

The family Geometridae has been researched to some extent sufficiently on the European Continent and so far 9 subfamilies with 21 genera and 832 species are known (data from iNatyra.org,Yron Budowski, Jean iNatura.org, Yaron Budowski, Jean-Paul Boerekamps, Bobby McCabe), (Charles M. et.al. 2016); (Phylogeny and Evolution of Lepidoptera), while according to the author (Hausman, 2001) the number of Geometridae reaches up to 900 species.

In the Republic of North Macedonia this family is very little researched and is represented by 360 species. The first research is by the Austrian researcher Rebel & Zerny (1913) describing 3 species. Then follow the studies by Daniel F., Forster W. & Osthelder L. 1951 describes 142 species, further studies by Pinker R., 1968 with 162 species collected in the territory of the Republic of North Macedonia. (Daniel F., Forster W., 1951), (Pinker R., 1968). Globally, the number of Geometridae species reaches 24,000 species (Charles M., 2016).

The territory we have explored includes the region of Sharr Mountain, starting from the village of Simnica to the village of Jazhince. The material was collected from 10 localities with different altitudes. In Fig .1. below are the localities with numbers from 1 to 10 on Sharr Mountain. The lowest altitude was 610 m, while the highest altitude was 1745 m.

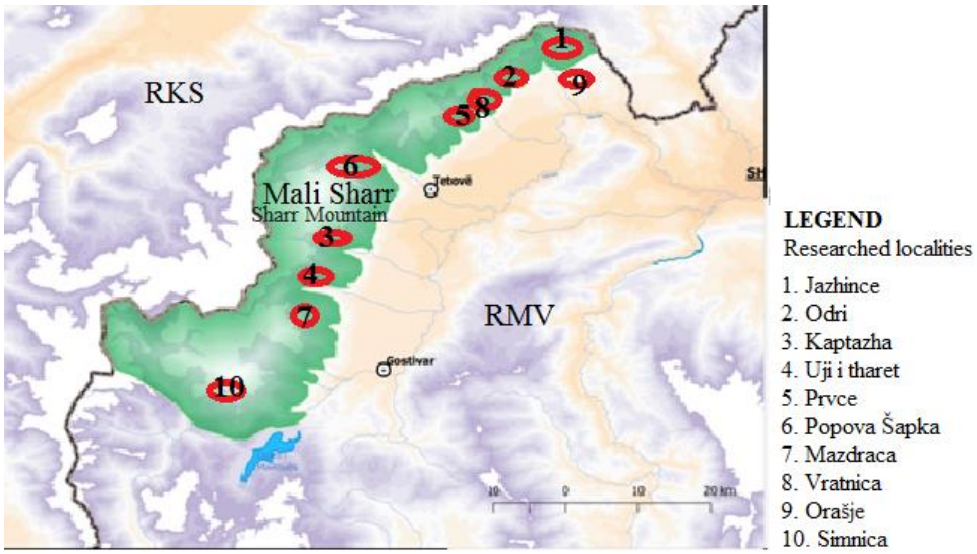


Fig 1. Geographical map of the Sharr Mountain massif where the researched localities are presented marked with red circles and numbers, from 1-10 (Krpach, et Al., 2015).

The material is collected starting from the spring season from April to autumn season in October. Each locality has data on altitude, a time when the material was collected, and brief terrain description including plant world because butterfly attendance is related to the presence of plants in a region.

This paper is based on the material collected and analyzed in a systematic-ecological way and will contribute to the better knowledge of the Geometridae family in the Sharr Mountain massif. The researched terrain starts in the plain areas from the lowest altitude with 610m-793m (Simnica-Jazhince) region rich in herbaceous plants, shrubs, wild and cultivated vegetation and continues with the mountainous terrain with 1115m-1745m altitude (Prvce –Popova Šapka) subalpine mountainous terrain rich in herbaceous plants, shrubs and tall woody plants. Based on the number of individuals in the localities the results of this study showed that the localities that have more developed vegetation and the highest altitude have a greater number of individuals, such as in Popova Šapka and Uji i tharet more individuals are found while in the localities of Vratnice, Jazhince and Orašje with little individuals.

Sharr Mountain is located in the northwestern part of the Republic of North Macedonia. It is one of the highest mountains (Tito Vrv, 2,748 m) and by area (840.2 km2 in the Republic of North Macedonia) as one of the largest mountains in the Balkans. The basic mountain ridge is about 80 km long (10-20 km wide) extending in a southwest-northeast direction. The total area of Sharr Mountain is 840.2 km², of which 693.9 km² are over 1,000 m high.

Fig 2. View from Sharr Mountain. (Org).

Three main climatic types are present in the research field: variable Mediterranean climate, medium continental climate and mountainous climate. Knowing the climatic conditions, temperature, humidity of this region we assigned 10 points for family research; Geometridae.

2. Material and methods

For the collection of material during field expeditions during the evening and night period, a series of tools and field materials are needed such as: Entomological pyramid with white sheets, vehicle for transporting material on the ground, special for mountainous areas, altimeter and GPS, apparatus for measuring altitude above sea level and geographical coordinates (latitude and longitude), entomological envelopes for entering the material respectively butterflies and recording data from the field (place, date and name of collector, coordinates), camera for photographing the terrains explored and possibly photographing butterflies during the period of rest or food intake on plants or soil, bags for transporting terrain material, which are usually of thick material or leather held on the arm, neck or waist, pencil with labels, which give information about the place of collection, date and nature of the living environment(terrain) where the collection takes place e.g. meadow, forest, gorge, alfalfa, place with cultivated plants, stone, valley, canyon, etc., container with ether where traps with UV lamp are placed, plastic boxes for storage of material, entomological tweezers, UV lamp 15 W as a trap for capturing Geometridae, head light, lantern, diethyl ether (C2H5)2O, entomological needles, softwood boards, parchment paper.

Fig 3. Necessary tools for carrying out field work (Org.) 1) Pyramid, 2) transport vehicle, 3) GPS device, 4) entomological envelope 5) camera 6) transport bag, 7) notebook for notes 8) container for catching butterflies 9) plastic boxes, 10) types of tweezers, 11) ultraviolet light 12) lantern, 13) stereomicroscope, 14) Desiccator, 15) boards for preparation (Org)

An important step in creating quality collections depends on the quality and quantity of fieldwork. Geometrids are collected at night using a forward-positioned ultraviolet (UV) lamp light source. A fabric measuring 1.8 x 2.2 m. Car lights are used to power the light source. After the capture, the butterflies were placed in entomological envelopes where brief data on the region were written and the material was sent to the laboratory at the Ecological Technological Institute in Popova Šapka. In case the drying of any specimen was noticed, we softened the material with a desiccator, then placed them on the preparation boards, where they were reinforced with special entomological needles, and then the identification was done with the identification key. In some species it has been necessary to analyze the genital apparatus for more reliable determination. After determining the collected material we put it in the box and on each copy we put a label with information about the name of the species, author, altitude, coordinates, and the name of the collector of the material-legator.
The ideal place to store butterfly collections are wooden boxes with glass lids which will be hermetically closed. Since butterflies are numerous, inside the edges of the boxes are placed bags filled with disinfectants which remove these pests such as: naphthalene crystals.

Fig 4. Fieldwork and the Institute and the background of the Geometridae family collections on Sharr Mountain, the material is in the laboratory of the Ecological and Technological Institute on Popova Šapka, Sharr Mountain (Org.).

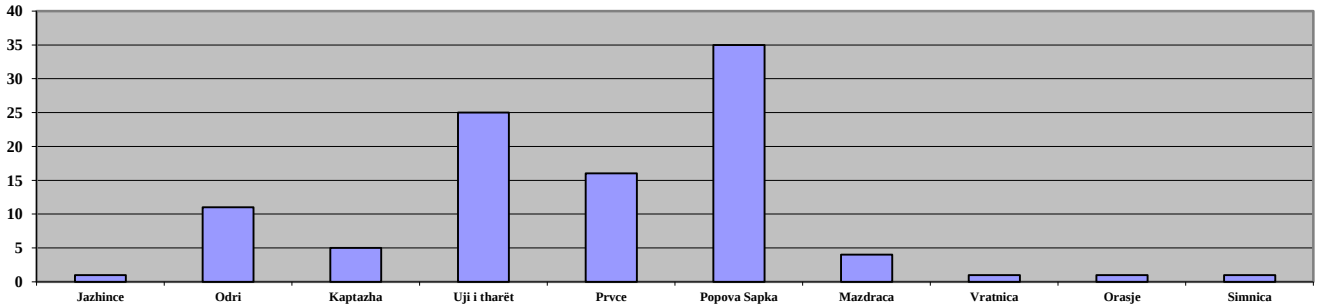
3. Results and discussions

According to the data we have presented in the table, it results that in the 10 localities researched with names and data of coordinates and altitude above sea have been collected a total of 101 individuals of moles of the family Geometridae with a total of 48 species. Based on the number of individuals we see that the locality Popova Šapka leads with 35 captured individuals, then the locality Uji i tharet, Negotino (Polog), respectively the locality Uji i tharet. It seems that there are places that possess abundant vegetation in this region, while we have encountered fewer individuals in the localities of Vratnica, Orašje, Jazhince with 1 individual. This has certainly been related to the moment of atmospheric conditions that have prevailed during the field research. The following graph shows 10 localities with the number of species for each locality.

Table 1. Geometridae collected in 10 researched localities on Sharr Mountain.

No.	Location researcher	Collected Geometridae	Altitude	Latitude	Longitude
1.	Research locality no.1 Jazhince	1 individual	793 m	N 42^0 09'10.83”	E 21^0 10'11.03”
2.	Research locality no.2 – Odri	11 individuals	635 m	N 42^0 07'03.64”	E 21^0 05'57.08”
3.	Research locality no.3 – Kaptazha	5 individuals	661 m	N 41^0 54'46.52”	E 20^o 54'06.687"
4.	Research locality no.4	25 individuals	656 m	N 41^0 52'59.68’’	E 20^0 52'07.14’’

	–Uji i tharet				
5.	Research locality no.5 –Prvce	16 individuals	1115 m	N 42º07'35,88"	E 21º 04'28,7"
6.	Research locality no.6 – Popova Šapka	35 individuals	1745 m	N 42^0 00'57.2”	E 20^0 57'52.2”
7.	Research locality no.7 – Mazdraca	4 individuals	731 m	N 41^0 53'18.28”	E 20^0 51'25.38”
8.	Research locality no.8 – Vratnica	1 individual	701 m	N 42^0 11'84.44”	E 21^0 12'63.12”
9.	Research locality no.9 – Orašje	1 individual	769 m	N 42^0 14'46.75”	E 21^0 12'75.45”
10.	Research locality no.10 – Simnica	2 individuals	610 m	N 41^0 44'46.82”	E 20^0 55' 29.69”
	In total	**101 individuals**			



Graph 1. Number of Geometridae collected in 10 localities in the Sharr Mountain region.

Table 2. Presents the species and genus of Geometridae, the locality in which that species was found with geographical coordinates.

Family Geometridae				
No.	**Types, genders**	**Location with no. 1-10**	**Geographical coordinates**	**Place**
1.	*Chiasma clathrata* (Linnaeus, 1758)	1	N 42^0 09 '10.83” E 21^0 10'11.03” Alt.793 m	Jazhince
2.	*Hypomecis roboraria* (Denis&Schiffermüller, 1775)	2	N 42^0 07'03.64” E 21^0 05'57.08” Alt.635 m	Odri
3.	*Angerona prunaria* (Linnaeus, 1758)	2	N 42^0 07'03.64” E 21^0 05'57.08”	Odri

			Alt.635 m	
4.	*Ematurga atomaria* (Linnaeus, 1758)	2, 6	N 42^0 07'03.64” E 21^0 05'57.08” Alt.635 m	Odri
			N 42^0 00'57.2” E 20^0 57'52.2” Alt.1745 m	Popova Šapka
5.	*Melanthia procellata* (Denis & Schiffermüller, 1775)	2	N 42^0 07'03.64” E 21^0 05`57.08” Alt.635 m	Odri
6.	*Horisme corticata* (Treitschke, 1835)	2, 3, 5	N 42^0 07'03.64” E 21^0 05'57.08” Alt.635 m	Odri
			N 41^0 54'46.52” E 20º 54'06.687" Alt.661 m	Kaptazha
			N 42º07'35,88" E 21º 04'28,7" Alt.1115 m	Prvce
7.	*Horisme tersata* (Denis&Schiffermüller, 1775)	2, 4, 9	N 42^0 07'03.64” E 21^0 05`57.08” Alt.635 m	Odri
			N 41^0 52'59.68’’ E 20^0 52'07.14’’ Alt.656 m	Uji i tharet
			N 42^0 14'46.75” E 21^0 12'75.45” Alt.769 m	Orašje
8.	*Geometridae*	2	N 42^0 07'03.64” E 21^0 05'57.08” Alt.635 m	Odri
9.	*Geometridae*	2	N 42^0 07'03.64” E 21^0 05'57.08” Alt.635 m	Odri
10.	*Timandra comae* (Schmidt, 1931)	3	N 41^0 54'46.52” E 20º 54'06.687" Alt.661 m	Kaptazha
11.	*Lythria purpuraria* (Linnaeus, 1758)	3	N 41^0 54'46.52” E 20º 54'06.687" Alt.661 m	Kaptazha
12.	*Aplocera plagiata* (Linnaeus, 1758)	3, 6	N 41^0 54'46.52” E 20º 54'06.687" Alt.661 m	Kapatazha
			N 42^0 00'57.2” E 20^0 57'52.2” Alt.1745 m	Popova Šapka

13.	*Idaea dimidiata* (Hufnagel, 1767)	3	N 41^0 54'46.52” E 20º 54'06.687" Alt.661 m	Kaptazha
14.	*Scotopteryx chenopodiata* (Linnaeus, 1758)	5, 6	N 42º07'35,88" E 21º 04'28,7" Alt.1115 m	Prvce
			N 42^0 00'57.2” E 20^0 57'52.2” Alt.1745 m	Popova Šapka
15.	*Alcis jubata* (Thunberg, 1788)	5	N 42º07'35,88" E 21º 04'28,7" Alt.1115 m	Prvce
16.	*Eupithecia sp.*	5, 4, 6	N 42º07'35,88" E 21º 04'28,7" Alt.1115 m	Prvce
			N 41^0 52'59.68’’ E 20^0 52'07.14’’ Alt.656 m	Uji i tharet
			N 42^0 00'57.2” E 20^0 57'52.2” Alt.1745 m	Popova Šapka
17.	*Thetidia smaragdaria* (Fabricius, 1787)	5	N 42º07'35,88" E 21º 04'28,7" Alt.1115 m	Prvce
18.	*Ourapteryx sambucaria* (Linnaeus, 1758)	5	N 42º07'35,88" E 21º 04'28,7" Alt.1115 m	Prvce
19.	*Epirrhoe rivata* (Hübner, 1813)	5, 4, 10	N 42º07'35,88" E 21º 04'28,7" Alt.1115 m	Prvce
			N 41^0 52’59.68’’ E 20^0 52’07.14’’ Alt.656 m	Uji i tharet
			N 41^0 44'46.82” E 20^0 55' 29.69” Alt.610 m	Simnica
20.	*Macaria notate,,* (Linnaeus, 1758)	4	N 41^0 52'59.68’’ E 20^0 52' 07.14’’ Alt.656 m	Uji i tharet
21.	*Idaea degeneraria* (Hübner, 1799)	4	N 41^0 52'59.68’’ E 20^0 52'07.14’’ Alt.656 m	Uji i tharet
22.	*Ecliptopera capitata* (Herrich Schäffer, 1839)	4	N 41^0 52'59.68’’ E 20^0 52'07.14’’ Alt.656 m	Uji i tharet
23.	*Epirrhoe galiata* (Denis & Schiffermüller, 1775)	4	N 41^0 52'59.68’’ E 20^0 52'07.14’’	Uji i tharet

			Alt.656 m	
24.	*Horisme vitalbata* (Denis & Schiffermüller, 1775)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
25.	*Perizoma alchemillata (*Linnaeus, 1758)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
26.	*Selenia lunularia* (Hübner, 1788)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
27.	*Perizoma alchemillata* (Linnaeus, 1758)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
28.	*Idaea ochrata* (Scopoli. 1763)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
29.	*Hypomecis punctinalis* (Scopoli, 1763)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
30.	*Idaea aversata* (Linnaeus, 1758)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
31.	*Cyclophora linearia* (Hübner, 1799)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
32.	*Idaea serpentata* (Hufnagel, 1767)	4	N 41^0 52'59.68'' E 20^0 52'07.14'' Alt.656 m	Uji i tharet
33.	*Scopula ornata* (Scopoli, 1763)	7	N 41^0 53'18.28" E 20^0 51'25.38" Alt. 731 m	Mazdraca
34.	*Macaria liturata* (Clerck, 1759)	7	N 41^0 53'18.28" E 20^0 51'25.38" Alt. 731 m	Mazdraca
35.	*Heliomata glarearia* (Denis & Schiffermüller, 1775)	8	N 42^0 11'84.44" E 21^0 12'63.12" Alt. 701 m	Vratnica
36.	*Peribatodes rhomboidaria* (Denis & Schiffermüller, 1775)	10	N 41^0 44'46.82" E 20^0 55' 29.69" Alt.610 m	Simnica
37.	*Scotopteryx moeniata* (Scopoli, 1763)	6	N 42^0 00'57.2" E 20^0 57'52.2" Alt. 1745 m	Popova Šapka
38.	*Aplocera praeformata* (Hübner, 1826)	6	N 42^0 00'57.2" E 20^0 57'52.2" Alt. 1745 m	Popova Šapka

39.	*Epirrhoe alternate* (Müller, 1764)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
40.	*Scopula sp.*	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
41.	*Perizoma albulata* (Denis & Schiffermüller, 1775)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
42.	*Scopula decorata* (Denis & Schiffermüller, 1775)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
43.	*Scopula immorata* (Linnaeus, 1758)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
44.	*Scopula marginepunctata* (Goeze, 1781)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
45.	*Thera variata* (Denis & Schiffermüller, 1775)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
46.	*Campaea margaritaria* (Linnaeus, 1767)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
47.	*Opisthograptis luteolata* (Linnaeus, 1758)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka
48.	*Epirrhoe molluginata* (Hübner, 1813)	6	N 42^0 00'57.2” E 20^0 57'52.2” Alt. 1745 m	Popova Šapka

From several weeks of research and descriptions done together with legator Zeqiri R., worker at the Museum of Natural Sciences - Skopje collected during 2015-2019 in several localities on Sharr Mountain have been collected and determined a total of 17 species of Geometridae in the massif.

Species of the family Geometridae on Sharr Mountain from data obtained from the Museum of Natural Sciences – Skopje						
No	**Types, genders**	**Place- Sharr Mountain** **Locality**	**Geographical coordinates**	**Date**	**Number of exemplar**	**Legator**
1.	*Alcis repandata** (Linnaeus, 1758) (Pinker, 1968) *Boarmia repandata* (Linnaeus, 1758) (Daniel et al., 1951)	Lugina e ambasadoreve	N:42º01'24.6" E:20º54'06,0" Alt.1561m	22.07.2016	(1 exem)	R. Zeqiri
2.	*Selenia lunularia** (Hübner, 1788) (Pinker, 1968) (Daniel et al., 1951) (Michieli, 1963)	Popova Šapka, hotel Scardus	N:42º00'95"; E: 20º52'87" Alt.1774 m	23.06.2016	(1 exem.)	R. Zeqiri
3.	*Aplocera praeformata** (Hübner, 1826) (Pinker, 1968) (Daniel et al., 1951)	Popova Šapka, hotel Scardus Lugina e ambasadoreve	N:42º00'95"; E: 20º52'87" Alt. 1774m N:42º01'24.6" E:20º54'06,0" Alt. 1561m	30.07.2016 16.06.2018 12.08.2019	(1 exem.) (3 exem.)	R. Zeqiri
4.	*Epirhoe molluginata** (Hübner, 1813) (Pinker, 1968) (Daniel et al., 1951)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt. 1774m	16.06,2018	(3 exem.)	R. Zeqiri
5.	*Thera cognata** (Thunberg, 1792) (Pinker, 1968) (Daniel et al., 1951)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt.1774m	22.06.2018	(1 exem.)	R. Zeqiri
6.	*Epirhoe galiata** (Denis & Schiffermüller, 1775) (Pinker, 1968) (Daniel et al., 1951) (Michieli, 1963)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt. 1774m	22.06.2018	(1 exem.)	R. Zeqiri
7.	*Phasiane bipunctaria** (Denis & Schiffermüller 1775) (Pinker, 1968) *Ortholita bipunctaria** (Denis	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt.1774m	16.06.2018 22.06.2018	(2 exem.)	R. Zeqiri

	& Schiffermüller 1775) (Daniel et al., 1951)					
8.	*Catarhoe cuculata* (Hufnagel, 1767)* (Pinker, 1968) (Daniel et al., 1951)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87", Alt. 1774m	16.06.2018	(1 exem.)	R. Zeqiri
9.	*Camptogramma bilineata** (Linnaeus, 1758) (Pinker, 1968) *Cidaria bilineata* (Linnaeus, 1758) (Daniel et al., 1951) (Rebel H.&Zerny H., 1931)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt. 1774m	16.06.2018	(1 exem.)	leg. R. Zeqiri
10	*Nychiodes (Nychiodes) obscuraria** (de Villers, 1789) (Олга Гашиh et al.,, 2001)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt. 1774m	16.06.2018	(1 exem.)	R. Zeqiri
11	*Opisthograptis luteolata** (Linnaeus 1758) (Pinker, 1968) (Daniel et al., 1951)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt. 1774m	16.06.2018	(1 exem.)	R. Zeqiri
12	*Rhodometra sacraria** (Linnaeus, 1767) (Pinker, 1968) (Daniel et al., 1951) (Rebel H.&Zerny H., 1931)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt. 1774m	01.11.2018	(1 exem.)	R. Zeqiri
13	*Scopula (Calothysaris) imitaria** (Hübner, 1799) (Daniel et al., 1951) *Acidalia imitaria** (Hübner, 1799) (Rebel H., 1913) (Rebel H.&Zerny H., 1931)	v. Leshok	N: 42º8'951"; E: 21º7'11" Alt. 631m	30.05.2015	(1 exem.)	R. Zeqiri
14	*Campaea margaritata** (Linnaeus 1761)	Lugina e ambasadoreve	N:42º01'24.6" E:20º54'06,0" Alt. 1561m	22.07.2016	(1 exem.)	R. Zeqiri

	(Pinker, 1968) (Daniel et al., 1951) (Michieli, 1963)					
15	*Gnophos myrtillata** (Denis & Schiffermüller, 1775) (Pinker, 1968) (Daniel et al., 1951) (Michieli, 1963)	Lugina e ambasadoreve Popova Šapka, hotel Scardus	N:42º01'24.6" E:20º54'06,0" Alt.1561m N: 42º00'95"; E: 20º52'87", 1774m,	22.07.2016 16.06.2018	(1 exem.) (1 exem.)	R. Zeqiri Xh.Abdiu
16	*Ligdia adustata** (Denis & Schiffermüller, 1775) (Pinker, 1968)	Popova Šapka, hotel Scardus	N: 42º00'95"; E: 20º52'87" Alt. 1774m	30.07.2016	(1 exem.);	R. Zeqiri
17	*Epirrhoe alternata** (Müller, 1764) (Pinker, 1968) *Cidaria alternata** (Müller, 1764) (Daniel et al., 1951)	v. Bozovce, Selishte	N: 42º05'01"; E: 20º05'09", Alt. 1319 m	05.09.2019	(1 exem.)	R. Zeqiri,

4. Conclusions

From the data according to the tables described above from the two-year research 2019-2020, 101 adult individuals of the family Geometridae (females and males are ♀♂) were collected, comprising a total of **48 species** compared to the number of Geometridaes of the Republic of North Macedonia 360 species or expressed in percentage **13.3%** species have been found in the Sharr mountain range. The material is stored in the collections of the scientific fund of the laboratory of the Ecological and Technological Institute on Popova Šapka on Sharr Mountain.

Based on the formula of species frequency encountered in 10 localities we find that the most frequent species are: Epirrhoe rivata (Hübner, 1813), with 39.5%, then the species: *Eupithecia* sp.31.25,%, *Horisme corticata* (Treitschke, 1835) with 31.5%, species: *Peribatodes rhomboidaria* (Denis & Schiffermüller, 1775) represented by 20.8%. While with lower frequency is presented the species: *Chiasma clathrata*, (Linnaeus, 1758) with 2.0%.

During the two-year research (2019-2020) in this territory were collected close to **101 adult individuals** which after determination resulted in finding **46 + 2 = 48 species** compared to the species of Geometridae possessed by the Republic of North Macedonia 360 expressed in percentage 13.3% are found in the Sharr mountain massif belonging to **21 genera** within the family Geometridae.

If we add here the data from the Museum of Natural Sciences-Skopje collector leg. R. Zeqiri of the years 2015-2019 a total of **17 species**, then the number of species of moths of the family Geometridae in Sharr Mountain reaches **65 species**.

From the research done in 10 localities in Sharr Mountain more individuals we have gathered in locality no. 6. in Popova Šapka, a total of 35 individuals. When determining species of the family Geometridae **2 species** are undetermined due to lack of technology for genetic analysis in the laboratory.

From the species frequency analysis, the highest frequency from the 10 localities studied has the species: *Epirrhoe rivata* (Hübner, 1813), with 39.5%, while the lowest frequency species: *Chiasma clathrata*,

(Linnaeus, 1758) with 2%.

This research will contribute and will be a push in the future for other researchers in order to provide more detailed information on the moles of the family Geometridae in the Sharr Mountain massif, and other regions of the Republic of North Macedonia, because we think that the number of species in this territory should be much greater.

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