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ECOLOGY AND NUMBER DYNAMICS OF BEZOAR GOATS (*CAPRA AEGAGRUS* ERXLEBEN, 1777) IN THE MRAV MOUNTAIN RANGE OF NAGORNO KARABAKH REPUBLIC

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Abstract. The mammal fauna of Nagorno Karabakh has 6 orders and 101 species. The three-dimensional location, geographical location and temperate climate characteristic of the mountainous country contributed to the formation of such diversity. For the first time this paper presents the distribution and dynamics of the number of bezoar goats (*Capra aegagrus* Erxleben, 1777), an ancient inhabitant of the northern, central and southern parts of Nagorno Karabakh, which is an important component of mountain ecosystems, in the Mrav mountain range. As a result of our long-term observations, we have found out the distribution areas of these animals in the Mrav mountain range, the reasons for their distribution in the mountains and their seasonality. We have found out that male and Bemale bezoar goats have their own preferences for slope curvatures, so females prefer to stay at 47° curvatures in winter, while males prefer to stay at 50–55° slopes. Meanwhile, the opposite phenomenon is recorded in summer. We have also studied the distribution of different sexes in the southern, eastern and northern slopes in winter and summer. We have registered the specifics of distribution above the sea level with vertical zoning. As a result of our observations, we have found out the changes and dynamics of the number of bezoar goats in the Mrav mountains, identified some reasons that negatively affect the growth and development of these animals.

Keywords: Nagorno Karabakh Republic; fauna; Mrav; mountains; bezoar goat; distribution; curvature; slope; number; dynamics.

ЭКОЛОГИЯ И ДИНАМИКА ЧИСЛЕННОСТИ БЕЗОАРОВЫХ КОЗЛОВ (*CAPRA AEGAGRUS* ERXLEBEN, 1777) НА ГОРНОМ ХРЕБТЕ МРАВ НАГОРНО-КАРАБАХСКОЙ РЕСПУБЛИКИ

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Аннотация. Фауна млекопитающих Нагорного Карабаха представлена 6 отрядами и 101 видом. Формированию подобного разнообразия способствовали трехмерное расположение, географическое положение и характерный для горной территории умеренный климат. В статье впервые представлены распределение и динамика численности безоарового козла (*Capra aegagrus* Erxleben, 1777), старейшего обитателя северной, центральной и южной частей Нагорного Карабаха, который является важнейшим компонентом горных экосистем, в частности – горного хребта Мрав. С помощью многолетних наблюдений мы выявили ареалы распространения этих животных и особенности их распределения по склонам в горном хребте Мрав, причины и сезонность их распространения. Мы также выяснили, что мужские и женские особи данного вида отдают предпочтение склонам с выраженным наклоном, причем самки зимой предпочитают склоны с крутизной в 47°, в то время как крутизна склонов, на которых предпочитали оставаться самцы, колебалась от 50° до 55°, причем летом наблюдается обратное явление. Нами изучено распределение представителей обоих полов на южных, восточных и северных склонах горного хребта Мрав в зимний и летний периоды. Зарегистрированы также особенности распространения безоарового козла от вертикальной зональности. Мы рассмотрели характер изменений и динамики численности безоаровых козлов в Мравских горах, выявили некоторые причины, негативно влияющие на рост и развитие этих животных.

Ключевые слова: Нагорный Карабах; фауна; Мрав; горы; безоаровый козел; распространение; склон; крутизна; численность; динамика.

Introduction

The mammal fauna of Nagorno Karabakh is rich and diverse, it has six orders: Eulipotyphila, Chiroptera, Rodents, Lagomorphs, Carnivora and Artiodactyla and 101 species [1–5]. Such diversity is due to the mountainous country's three-dimensional location, geological history, diversity of landscapes, geographical location, temperate climate, as well as human economic activities.

Despite such diversity, two taxonomic groups have been fully studied in our fauna to date: Eulipotyphila and Chiroptera. Nevertheless, those studies cannot be conclusive. This is due to the fact that for many years no full studies have been carried out in the fauna of Nagorno Karabakh and the beginning of studies can be considered the 90s of the 20th century. The full studies of the Nagorno Karabakh fauna of the mentioned period have been and are constantly hindered by the Azerbaijani aggressions.

In the mammal fauna of Nagorno Karabakh, the order of Artiodactyla is represented by five species: wild boar, roe deer, Caucasian red deer, Armenian mouflon and bezoar goat. The last four species are registered in the Red Book of Animals of Karabakh (Artsakh) [6].

In the fauna of Nagorno Karabakh, bezoar goats (*Capra aegagrus* Erxleben, 1777) are historically widespread and occupy the mountain ranges of the northern, central and southern parts of Nagorno Karabakh and are considered to be one of the most important parts of mountain ecosystems. There is no data on the number of bezoar goats in the world. It is assumed that it does not exceed 50,000 [7].

Bezoar goats are considered among the ancient inhabitants of Nagorno Karabakh fauna. Their bones dating back to the Pleistocene were discovered in Armenia [8]. These animals are widespread in the fauna of Nagorno Karabakh and can be found in the Mrav, Jraberd, Katoghikesar, Tsarasar, Karvachar, Dadivank, Kusanats, Great and Small Kirs, Bardutagh mountain ranges. Although bezoar goats have a wide distribution area in our conditions, there are still no definitive data on the ecology, population dynamics and general biology of these animals. Some information about these animals in the fauna of Nagorno Karabakh can be found in the works of Dinnik and Vereshagin [9; 10].

The Mrav mountain range is the eastern continuation of the Sevan mountain range in the Lesser Caucasus mountain system. The length is about 70 km. The highest point is the peak of Aryutya (3724 m). It is made of volcanic rocks, cut by deep canyons and river valleys. The range begins with the Great Hinal peak (3367 m), in which four mountain ranges, Mrav, Sevan, Kaflankala and East Sevan, form a cross. There are about twenty peaks on the range, the height of which exceeds 3000 meters. The most notable peaks are Mets Hinal (3367 m), Spitakasar (3200 m), Omar (3395 m) and Mrav (3340 m), after which the mountain range is named. It is the watershed of the right tributaries of the middle stream of the Kuri and Tartar. The landscape is a mountain meadow, there are forests, landslides, sag ponds on the slopes [11]. With its location, topography, forested and bushy areas, subalpine and alpine meadows, the Mrav mountain range is favorable for the growth and reproduction of bezoar goats.

Materials and methods

The population of bezoar goats living in the Mrav mountain range was the object of our studies. The material for the work was the data collected by us in the mentioned mountain range from 1999 to 2022. For observations, we have selected stations in two parts of the Mrav mountain range, Shahumyan and Martakert, where we have carried out observations by route-hiking methods in different years (fig. 1). In each station, we have implemented 15 calculation routes, each 10 km long. We calculated the length of the route using the "Easy Fit" pedometer program on the phone. Routes are pre-selected based on location, terrain and weather conditions. Every year we made monthly observations, the calculations were made by 4–5 participants and lasted 7 days (fig. 1).

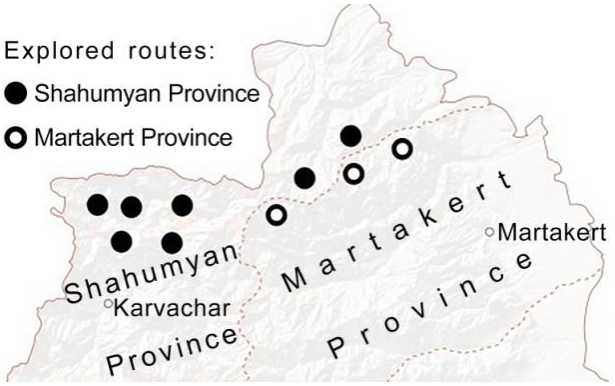

Figure 1 – Explored routes

In total, we spent 1932 field days during the mentioned period. During the hot season, we started the calculations in the morning hours (4–5 a.m.) and continued until the afternoon (12–1 p.m.), after which we continued from 4 a.m. until night. In the second half of autumn, we started the observations from 7–8 a.m., and in winter we started later and continued intermittently until night. We performed the calculations in the observation points according to the principles of Weinger's [12] method. Ecological observations were carried out by classical methods widely accepted in zoology [13–15].

We calculated the density (σ) of bezoar goats in the routes as σ= a/lxr [16], where *a* is the number of recorded individuals, *l* is the length of the route, and *r* is the depth of view (fig. 1). We used Navigator 12×50 binoculars and 3PT-457 spyglasses, night vision equipment for animal observations. We fixed the found habitats of animals using the GPSmap62stc navigator. We also used classic topographical characteristics such as slope curvature (degree), height above the sea level (m), slope location [17; 18]. We used Victure, HC 200 and DC-3BC model light detectors to determine the movement and number of animals.

Results and summary

In the biodiversity of Nagorno Karabakh, ungulates have a unique place. The bezoar goats are registered in the Red Book. The primary and main component of any population monitoring is the number and spatial distribution of the said population, which in turn is one of the most important criteria of the population's condition. One of the priority tasks of any civilized country is the study of its own bioresources, based on the data of which they can plan the conservation and exploitation of species.

On the territory of Nagorno Karabakh, the range of distribution of bezoar goats is limited by the mountain ranges located in the northern and southern, as well as in the central parts of Nagorno Karabakh. In the past, the bezoar goat habitats covered almost the entire Lesser Caucasus, but starting from the 70s and 80s of the 19th

century, the habitats of these animals began to decrease. One of the main reasons for the reduction of the habitats was the development of long-distance cattle breeding, irregular hunting, and in recent years, also the military operations unleashed by the Azerbaijan, which cover part of the habitats of these animals.

In Nagorno Karabakh, the bezoar goat habitats cover the entire Mrav mountain range, from 3340 m to 3724 m. In the west, they go down the mountain slopes to the canyons of the Knarava and gorges of the Lev rivers (2750 m), and in the east, they go down the mountain slopes to the gorges of the Trghi river (2320 m). Like all mountain ungulates, the distribution of bezoar goats in the mountains depends on the seasons of the year, the terrain height, as well as the slope curvature. Our observations have confirmed that this is also true in the case of bezoar goats [19].

During the observations, we recorded 79 and 95 groups of bezoar goats, respectively, in the western and eastern subslopes of the Mrav mountain range. During the entire study, we recorded 2816 individuals on both slopes: 1185 on the western slope, and 1631 on the eastern slope.

Our observations have revealed that in the Mrav mountain range, as well as in other mountains, preference is given to those mountain slopes where there are terraces, outcrops, niches that serve as shelters, which is also proven by literary data [20; 21]. Analyzes of the winter distribution of bezoar goats depending on hillside slope indicate that they appear on slopes of 30–57°. As can be seen from figure 2 (*A*), females are found in winter at maximum 47° slopes, the number of which is 0.6% of the number of studied animals, and the vast majority of males prefer to stay at 45–55° slopes. Compared to females, males prefer more rocky places in winter, as we think, for defense purposes, because during mating season they lose weight, become exhausted and weak and vulnerable to predators.

In summer, the opposite is recorded: females occupy the highest slopes, and males are located on the lower slopes (fig. 2: *B*). Females occupy high slopes also for defense purposes, as they have newborn kids in that area. According to our observations, females occupy 31–57° slopes and males remain at 25–45° slopes.

Females spend the entire summer on high slopes after birth, while males remain at the upper sides of the forest zone and often move to the subalpine and alpine zone to graze, but choose locations with good visibility and generally stay closer to cliffs.

In our observations, we also recorded some differences in the distribution of males and females in mountain slope locations. In winter, more males than females are found on the southern slopes of the Mrav mountain range (table 1).

As can be seen from table 1, on the southern slopes of the Mrav range in winter, 50.9% were females, 54.7% were males. Males also predominate in winter on all other slopes. Females predominate on eastern and northern slopes in summer. As a result of our long-term observations, it was found that there are also differences in the vertical zoning distribution of bezoar goats in winter and summer periods, depending on the altitude of the sea surface. Moreover, in winter, the nature of the distribution of males and females among mixed groups does not differ significantly, but they are located at heights of 1200–2800 m above the sea level (fig. 3: *A*).

In contrast to the winter period, significant differences in the distribution of males and females are observed in summer (fig. 3: *B*). In summer, females occupy the altitudes of 1200–3500m asl and the main part is located at the altitudes of 1600–2800 m asl. And in the meantime, the males are found at the altitudes of 1400–2200 m asl.

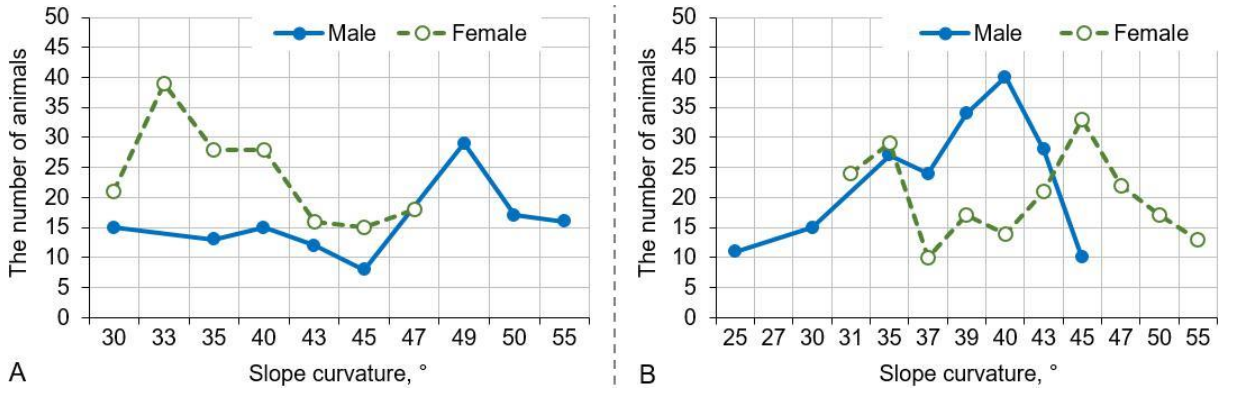

Figure 2 – The location of male and female individuals in the Mrav mountain range depending on the slope curvatures: *A* – winter (n = 290, 125♂; 165♀); *B* – summer (n = 389, 189♂; 200♀)

Table 1 – Distribution of bezoar goats in different slope locations

Slope location	Winter (October–April)				Summer (May–September)			
	female		male		female		male	
	number of individuals	%	number of individuals	%	number of individuals	%	number of individuals	%
Southern	89	50,9	52	54,7	158	30,9	149	37,2
Eastern	55	31,4	33	34,7	189	37,0	135	33,8
Northern	31	17,7	10	10,6	164	32,1	116	29,0
Total:	175	100,0	95	100,0	511	100,0	400	100,0

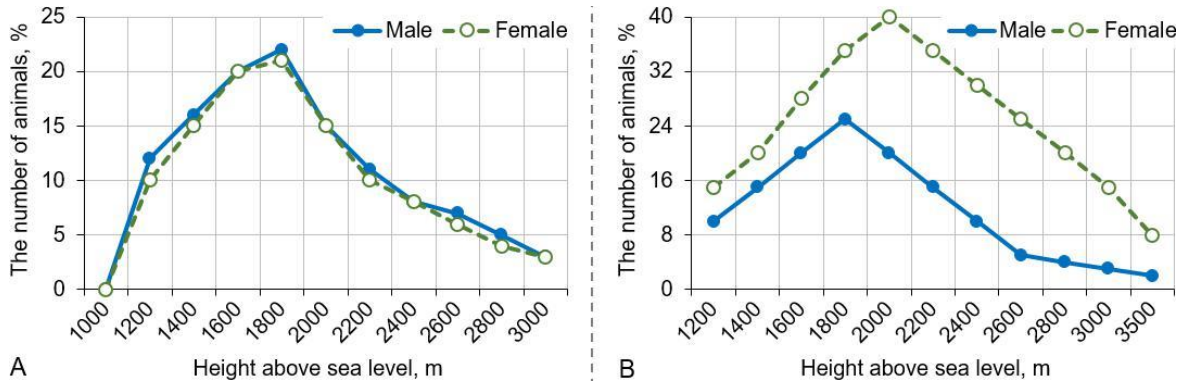

Figure 3 – Altitude distribution of male and female bezoar goats in the Mrav mountain range in winter (*A*) and summer (*B*)

Table 2 – Dynamics of the number of bezoar goats by months and years

Years	Months												Total
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
1999	3	5	6	14	33	13	17	10	15	20	14	6	156
2000	–	10	3	7	5	8	11	9	12	14	16	–	95
2002	5	–	15	9	17	15	28	15	12	4	–	–	120
2003	–	–	–	11	21	13	9	8	12	8	10	6	98
2004	4	6	8	13	15	13	21	32	15	10	8	5	150
2005	5	9	24	34	28	20	14	20	12	15	11	4	196
2006	7	5	8	18	21	19	16	22	17	25	13	8	179
2008	3	8	24	28	31	27	32	34	14	–	10	2	213
2009	4	6	14	16	12	15	29	28	25	19	11	3	182
2010	6	5	15	17	10	18	26	31	24	22	9	4	187
2011	2	5	18	23	31	25	32	34	14	12	10	2	208
2012	9	4	8	14	13	19	25	21	17	19	11	8	168
2013	5	9	12	13	16	19	17	20	18	16	17	6	168
2014	–	–	–	–	15	23	12	–	16	8	12	–	86
2016	3	–	–	–	18	26	13	17	13	–	–	–	90
2017	–	–	–	19	21	18	22	28	5	–	–	–	113
2018	5	6	14	21	13	10	9	32	21	18	8	5	162
2019	–	9	–	17	23	20	–	18	17	16	3	–	123
2020	–	–	16	–	11	13	21	–	–	–	–	–	61
2021	–	–	–	–	–	–	–	–	12	18	–	–	30
2022	–	5	12	14	9	7	11	6	–	–	–	–	64

Our long-term studies of the numbers and dynamics of bezoar goats are presented in table 2. From table 2, it is evident that the number of bezoar goats changes both in different years and in different months of the same year. As it is known, the number of animals and the number dynamics is the subtraction of growth and mortality.

Based on our observations, the maximum amount of bezoar goats was registered in 2008 and 2011. We calculated the least amount of bezoar goats in 2021, which, in our opinion, was due to 2020 war unleashed by Azerbaijan in Nagorno Karabakh. The number of bezoar goats in the fauna of Nagorno Karabakh was affected by various natural and anthropogenic factors. During the Soviet years, the habitats of these animals were used as pastures for farm animals, which is quite a stress for bezoars. Unregulated hunting and poaching also had an impact on the variation in the number of bezoar goats. The number, growth and reproduction of bezoar goats in Nagorno Karabakh were negatively affected by the war operations carried out regularly by the Azerbaijani aggressors, and today the northwestern part of the Mrav mountain range is occupied by the Azerbaijanis, and we haven't had any information about bezoar goats for the last three years.

Conclusions:

1. In the fauna of Nagorno Karabakh, bezoar goat habitats are limited to the mountain ranges in the northern, central and southern borders. The Mrav mountain range has its unique role and importance as a bezoar habitat, where all the favorable conditions for the bezoar goats are present.

2. Bezoar goats in the Mrav mountain range prefer slopes with terraces, outcrops, niches as such places contribute to the safety of these animals.

3. The analysis of the bezoar goat locations shows that depending on the seasons of the year and the sex of the animals, they prefer to live on the curvatures of the mountain slopes.

4. The distribution of bezoar goats in summer and winter is also different depending on vertical zoning.

5. During our long-term studies, it has been found that the number of bezoar goats is subject to changes due to various reasons.

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