

REPUBLIC OF AZERBAIJAN

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A B S T R A C T

of the dissertation for the degree of Doctor of Science

**THE FAUNA AND ECOLOGY OF MINORITY
TERRESTRIAL VERTEBRATES ANIMALS IN
NAKHCHYVAN AUTONOMOUS REPUBLIC**

Specialty: **2401.01 - Zoology**

Field of science: **Biology**

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Baku - 2021

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
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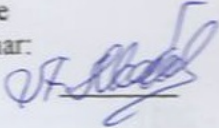
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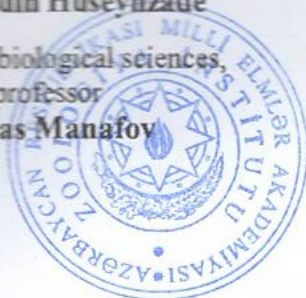
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INTRODUCTION

The actuality of the subject. In modern times, the extinction of vertebrate species as a result of environmental imbalances poses a serious crisis threat. Therefore, in order to preserve the diversity of fauna, it is very important to protect their habitats and prevent the factors that affect the degradation of ecosystems.

The principles of protection of vertebrate species in their natural and transformed environments make the potential for their purposeful and effective use more relevant in the future.

The ecological catastrophe in the world occurs primarily in anthropogenic transformation of habitats, which has a serious negative impact on the distribution of vertebrate animals in the ecosystem, the formation and development of their species.

After gaining independence for the second time, our country pays great attention to the protection of nature and the efficient use of its resources. Special attention is paid to the study of the faunal status of small terrestrial vertebrate species that are sensitive to anthropogenic influences and their distribution in nature.

Although the result of an evolutionary process is considered the extinction of some species in nature, the main reason for the loss of biodiversity is the result of human activity. Situations such as industrialization, global warming and sustainable use of natural resources have led to the loss of natural habitats of animals and plants and their constant threat.

Currently, the study, forecasting and assessment of changes in nature by types of indicators has become one of the main conditions of environmental monitoring. It should be considered that large organisms are the best indicators for assessing the state of an ecosystem, and continuous changes in the number of species belonging to these organisms make it possible to obtain certain information about the general state of the environment. The current condition of terrestrial vertebrates in the territory of the Autonomous Republic, as well as their important habitats have not been studied in detail. The research conducted was not regular, systematic, and some

rare species were superficially investigated by various non-governmental organizations during the project. Therefore, there is very little information about the current state of the few vertebrate species in the area.

Our research has clarified the species composition of the terrestrial vertebrate fauna of the area, and obtained important scientific conclusions about its ecology.

During the study, it was determined that in addition to rare species that meet internationally accepted conventions and agreements, as well as certain criteria, there are 61 species of terrestrial vertebrates in the territory of the autonomous republic. These species need to be studied in detail so that they do not become extinct due to anthropogenic or other influences or are not included in the list of rare species in the future. Development of scientific recommendations for the protection of species is one of the urgent problems of the day and is of great scientific and practical importance. The purpose and objectives of the study. The research has clarified as much as possible the fauna of terrestrial vertebrates of the Nakhchivan Autonomous Republic located in an important region of Azerbaijan in terms of geographical features. At the same time, the study of a small number of existing, relatively little-known species, their identification in the taxonomy, ecological status, population numbers, factors that led to the decline, and the development of conservation measures on a scientific basis formed the core of the goal. To achieve the goal, the following tasks are planned to be performed:

- ✓ To determine the systematic status of the few species included in the reptile (*Reptilia*) fauna of the Autonomous Republic, to collect information on their ecology;

- ✓ To determine of the systematic status of the few species included in the ornithofauna (*Aves*) of the Autonomous Republic, collection of information on their ecology;

- ✓ To determine the systematic status of the few species included in the terrestrial fauna (*Mammalia*) of the Autonomous Republic, collecting information on their ecology;

✓ To identify negative factors affecting the bioecology of small species included in the fauna of terrestrial vertebrates of the autonomous republic;

✓ Development of proposals and recommendations on the restoration, efficient use and conservation of the few number of species widespread throughout the area.

Method of research. To perform the dissertation, field research was carried out, and materials were collected. During the research, binoculars, cameras, telescopes, handles, cloth bags, traps that catch without killing were mainly used. Exterior measurements of dead and living animals were taken and the accuracy of the results was determined. Some surviving individuals were identified, after the measurements were taken, their colorful pictures were taken and marked and released back into nature. Both systematic and ecological analysis of few vertebrate species were conducted.

Basic provisions for defense:

1. Results obtained from the study of 374 species of terrestrial vertebrate fauna widespread in the territory of the Autonomous Republic;

2. Results obtained from the study of the most important bioecological features of 61 species of terrestrial vertebrates identified in the territory of the Autonomous Republic;

3. Proposals for the protection, reproduction, and efficient and sustainable use of rare species in the area;

- Results obtained from the study of small number of reptile species widespread in the territory of the Nakhchivan Autonomous Republic;

- Results obtained from the study of a small number of species of ornithofauna widespread in the territory of the Nakhchivan Autonomous Republic;

- Results obtained from the study of a small number of species included in the teriofauna widespread in the territory of the Nakhchivan Autonomous Republic;

4. Current status of small species in ecosystems, comparison of natural and anthropogenic factors affecting them, development of

scientific-methodical proposals aimed at reducing these effects.

Scientific novelty of the research. Species belonging to the fauna of terrestrial vertebrates of the Autonomous Republic have been studied in detail for the first time. The position of few species in the taxonomy has been inspected and their ecological conditions have been clarified. The available literature and personal research revealed that 374 vertebrate species are distributed throughout the Autonomous Republic, including 8 of 39 reptile fauna species, 38 of 265 species of birds, and 15 of 70 mammalian fauna are the minority species in the area. During the study, the systematic composition of the fauna of few species, the ecological situation, the impact of adverse factors on the distribution areas were assessed. A detailed study of the herpetofauna species, taxonomic status and ecological characteristics of the region, which is of great ecological importance, revealed 39 reptile species in the area, including 3 species of turtles, 15 species of lizards and 21 species of snakes. *Emys obicularis* Linn. belonging to the genus 1805, 1758 turtle species, *Darevskia unisexualis* Darevski, 1966 lizard species and *Pelias eriwanesis* Reuss., 1933 viper species were first identified and included in the fauna of Nakhchivan Autonomous Republic. *Darevskia unisexualis* Darevski, 1966 species of lizard is also shown for the first time in the fauna of Azerbaijan.

As a result of the study of the ornithofauna of the area, the species composition of birds, the distribution of species by zones, seasonal nature, distribution according to reproductive conditions and ecological groups were studied. Based on the collected materials and analysis of the literature, it was determined that 265 species of modern birds belonging to 18 groups, 51 genera and 147 genera were distributed.

During the study, *Aquila pomarina*, *Anser albifrons*, *Andropoides virgo*, *Larus melanocephalus*, *Larus cachinnans*, *Sterna albifrons*, *Prunella ocularius*, *Hippolais languida*, *Silvia currica*, *Phylloscopus trochilus*, *Parus aterus*, *Tranylochellus*, *Calidrius temincki*, *Calidrius minuta*, *Turdus pilaris* species Nakhchivan Autonomous Republic, *Lanius nibichus*, *Clamiator glandarius*, Lin. 1758, *Larus armenicus* But. 1934, *Rhodospiza obsoleta* and *Sturnus*

vulgaris caucasicus Lorez, 1887 subspecies was first noted for the Azerbaijani ornithofauna.

There are 70 species in the mammalian fauna in the territory of the Autonomous Republic, of which 53 are LC, 10 are NT, 5 are VU, 1 is EN and 1 is CR. During the study, the systematic structure of some mammalian species was identified and changes were made according to the International nomenclature.

Theoretical and practical significance of the work. The results of a comprehensive study of few species in the Autonomous Republic and the developed practical recommendations will allow to assess the situation of endangered species in the area, as well as special areas that ensure the sustainability of biodiversity, predict changes, convert and protect them. The study of the minority fauna of the dry vertebrates will help to identify the current and projected threats to the common dry vertebrate fauna in the region, and to monitor for the species in general.

The study of few terrestrial vertebrate fauna will help to identify existing and projected threats to terrestrial vertebrate fauna in the region as a whole, and to conduct monitoring based on small species. The study of few terrestrial vertebrates in the area will serve to enrich and effectively protect scientific ideas about the fauna of terrestrial vertebrates in general. The results of the research can also serve as a model for the study of the ecological situation by identifying few terrestrial vertebrate species in other regions of the Republic of Azerbaijan. The study of small species will allow to determine the ecological status of animal species included in the fauna of terrestrial vertebrates in the territory of the autonomous republic as a whole and will play an important role in solving environmental problems. Identifying these problems can also play an important role in protecting Azerbaijan's biodiversity. Clarification of minority species, as well as their distribution areas, migration routes, determination of their ecological status in the autonomous republic, will play an important role in preventing the spread of some infectious diseases.

The results obtained on the distribution of different rodent species reflected in the study can be used in epidemiological

management systems. Determining the species composition of warm-blooded animals, which are carriers of viruses and bacteria in natural foci of infection, will strengthen the effective fight against the negative effects on them.

Approbation and application of the work. The obtained results constitute a major part of the research work done in 2011-2016. The main provisions of the dissertation were discussed at the meetings of the "Zoological researches" department of the Institute of Bioresources of Nakhchivan Branch of ANAS, in the seminars of the Scientific Council of the Institute, at the extended meeting of the Institute of Bioresources and "Zoology" department of Nakhchivan State University. Materials of the research work are published in the News of ANAS (2009), News of Nakhchivan Branch (2004-2017), Works of the Institute of Zoology (2016), Works of the Azerbaijan Zoological Society (2010, 2014, 2017), News of Dagestan State University (Makhachkala, 2009), India. (2014, 2015, 2016, 2017, Spain (2017) scientific journals, the establishment of the Nakhchivan Autonomous Republic: History and Modernity (2010), "The concept of spring roads for the conservation and rational use of waterfowl and waterfowl and waterfowl" Astana, 2010 », Eurasian Cranes: Collection of works of the international conference“ Cranes of Palarctic: biology, protection, management (in memory of academician PS Pallas) ”(Volgograd, October 11-16, 2011),“ Birds 2013 numbers 19th conference of the European bird census council ”(Romania),“ Actual problems of modern natural sciences ”dedicated to the 94th anniversary of Heydar Aliyev (04-05 May 2017) years) was discussed at the scientific conference.

Name of the organization where the dissertation work is performed. The research was carried out at the Institute of Bioresources of the Nakhchivan Branch of the National Academy of Sciences of Azerbaijan.

Publications. 46 scientific works reflecting the results of the research work, including 33 articles, 4 conference materials and 9 books were published. 17 scientific works, including 15 articles and 2 theses, were published in prestigious journals abroad.

The volume and structure of the dissertation. The dissertation work was 422221 characters, including the title page, table of contents and introduction 38076 characters, 7 chapters (370461 characters), result (11016 characters), production recommendations (2142 characters), list of abbreviations in the dissertation (526 characters) and a list of 345 titles of literature used in different languages.

THE MAIN CONTENT OF THE WORK

CHAPTER I. Literature summary

The first chapter of the dissertation contains detailed information on the formation and diversification of vertebrate fauna in the world by epochs and periods, its distribution in the Caucasus ecoregion and the study of Azerbaijan as a whole, as well as in the autonomous republic. This section also contains information about scientists conducting research on vertebrates. Information on vertebrate fauna in the territory of the Autonomous Republic mainly covers research conducted in the late XIX-XX and early XXI centuries. The results of the study are reflected in numerous articles and monographs.

During the research, it was found that the results of the research were not satisfactory. Thus, these studies do not reflect the current state of the terrestrial vertebrate fauna of the area, and the data is completely outdated.

CHAPTER II. Research materials and methods

The Nakhchivan Autonomous Republic, where the study was conducted, is a region of the Republic of Azerbaijan located between the northern latitude $38^{\circ}31'1''$ - $39^{\circ}47'1''$ and the eastern longitude $44^{\circ}46'1''$ - $46^{\circ}10'1''$. It covers an area of 5.5 000 km² and is bordered by the Islamic Republic of Iran to the south and southwest, the Republic of Armenia to the north and east, and the Republic of Turkey to the west (11 km). The Nakhchivan Autonomous Republic is divided into 7 administrative districts (Ordubad, Julfa, Shahbuz, Babek, Kangarli, Sharur and Sadarak).

The relief structure of the Autonomous Republic is divided into the following heights:

1. Plain belt 600-1000 m;
 2. Low mountain belt 1000-1500 m;
 3. Middle mountain belt 1500-2300 m;
 4. High mountain belt 2300-3904 m:
- a) The lower hemisphere of the highlands, 2300-3500 m; b) The upper hemisphere of the highlands, above 3500 meters.

The research was carried out in 2011-2016, covering all areas of the autonomous republic. The object of research was the terrestrial vertebrate fauna of the autonomous republic, field research was conducted in various natural complexes, anthropogenic landscapes and biotopes of the area, covering all seasons, covering a total of 410 days. 36 permanent observation points (DMCs) have been selected in 6 hospitals differing in relief, climate, soil, flora and fauna to study the small number of terrestrial vertebrates of the region. All parameters were evaluated when selecting stationary sites, taking into account the geographical characteristics of the area and the specific environmental features of the species that could be observed.



Map-scheme. Stations and permanent observation posts.

I stationary: Ordubad region - territories of Kilid, Kotam, Soyugdagh, Tillak forest, Gazangol mountain, Qabaqlidagh, Pazmari,

Urmus villages;

II stationary: Julfa region - Aydash mountain, Ilandagh, Daridagh, Kharaba Khoshkeshin, Gal, Shrud, Arafsa villages, Khaznadera mountain;

III stationary: Babek region - Sirab cave, Gendra, Darasham, Nohuddag mountains, around Gulustan village, Bananiyar reservoir, around Goy nuk village;

IV stationary: Shahbuz region - Turkesh, Badamli-Shada, Garagaya, Kukudag, Darabogazy mountain, Bichenak forest, Batabat plateau, Tokhlugaya mountain areas;

V stationary: Arazboyu - around Garachug and Garabok, Tumbul villages, areas along Sadarak border checkpoint;

VI stationary: Kangarli-Sharur-Sadarak regions - Chalkhangala, Lizbirt gorge, Garagush mountain, Ardicdag, Shapurbulag village, Arpachay reservoirs.

During the selection of hospitals, all parameters were assessed, the geographical features of the area and certain ecological characteristics of the species to be observed were taken into account.

The research was conducted mainly on the basis of visual observations, some species were based on handcuffs, nets and traps, species from different groups were obtained by different methods and camera work, and some were studied on the spot (bats were ringed, snakes, lizards and some rodents were marked).) was released back into nature. During the study, the species of land vertebrate fauna, number composition, nesting, migratory habitats, bird contact with biotopes, as well as ecological characteristics of biotopes, existing and projected threats and impacts were determined based on visual observations. During the study, 10-22x50 magnifying binoculars, a Canon Eos 700D camera and two different lenses of 75-300 mm by 18-55 mm, Tamron 1.4x teleconverter, 20x60 magnifying glass and Shvarovsky telescope were used to take pictures of the species. has been. The surveyed objects were photographed and the distribution areas were shown on the map. In addition to the widely used methods when observed in different orographic and climatic conditions, on foggy and rainy days, [YS. Ravkin, 19671; AP.Kuzyakin, 19612; VI

Osmlovskaya, 19523, etc.] species' lifestyle and behaviour, biotope affiliation, acoustic activity were studied and internet sites were also used. In the plains, the speed was 1.5-2.0 km / h on foot, 1.2-1.5 km / h on the slopes, and 30-35 km / h by car. The 3-point (multiple, ordinary, minor) number category proposed by AP Kuzyakin (1961) has been slightly modified since both the "few" and the "rare" category are used.

The number status of the species in the area, as well as their place in the taxonomy were determined by comparative analysis with other species from the same group (Table 1).

Table 1
Criteria for determining the number of species (per 1 km²)

Quantity Status Criteria	Rare	Minority	Ordinary species	Numerous species
Individual / 100 m ² (indoor station)	<0.1	0.1 >1	1 >10	10 >100
100 % trap / day (small mammals)				
Per 1/sq m (large or medium-sized species)				
Individual / 1 sqm (bats)				
Percentage of enrollment in other types of the same group				

The following formula was used to find average number of studes:

$$M = \frac{\sum(X \times F)}{n}$$

1. Ravkin Yu.S. To the method of accounting of birds of forest landscapes // Nature of foci of tick-borne encephalitis in Altai. Novosibirsk: -Science, -1967, -p. 66-75.
2. Kuzyakin AP On the method of accounting for forest birds during the accounting period // Questions of the organization and methods of accounting for the resources of the underground vertebrate fauna. - M., -1961, -p. 122-124.
3. Osmylovskaya B. Formozov A. Methods of accounting for the number and geographical distribution of diurnal birds of prey // In Sat. Methods of accounting and the number of geographical distribution of terrestrial vertebrates. -M: Ed. AN USSR, -1952, -p. 68-96.

Determination of all morphometric signs is based on the method 1979⁴ of Ploxincki, and the arithmetic mean is found. The local protection status of the species is given in accordance with the existing “Red Book” categories of the Republic of Azerbaijan, and the international status is given in accordance with the categories defined by BTMI-20166⁵.

In the analysis of the numerical dynamics of terrestrial vertebrates, the results were directly aligned with the historical stages proposed by NK Vereshagi (1959)⁶, and the controversial views of a number of authors who had previously appeared in the literature were taken into account. External signs were measured with a barbell, body weight was weighed on a pharmacy scale (to the nearest 0.1 g). Statistical surveys were conducted using the Statistical Computer Software package.

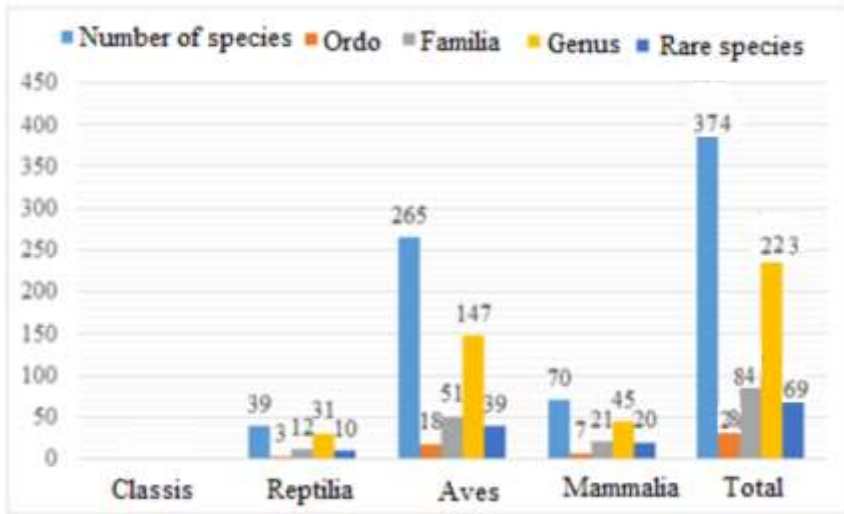
CHAPTER III. Modern state of terrestrial vertebrate fauna of the Nakhchivan Autonomous Republic

The Nakhchivan Autonomous Republic, which is part of the Central Asian region, consists of landscapes with different natural conditions that differ from each other in climate, soil, vegetation and relief. Different conditions in each landscape had a major impact on the formation of a unique fauna. In accordance with such natural conditions, certain morpho-physiological and behavioral adaptations were formed in the fauna of terrestrial vertebrates of the area, and a special geographical area was assisted. The fauna of terrestrial vertebrates of the Autonomous Republic belongs to 3 classes, 39 species of reptiles (Reptilia), 265 species of birds (Aves) and 70 species of mammals (Mammalia). (Graphic 1).

4. Plokhinsky, N.A. Biometrics / - Moscow: Moscow State University Publishing House, - 1979. - 367 p.

5. The IUCN red list threatened of species (<https://www.iucnredlist.org>)

6. Vereshchagin N.K. Mammals of the Caucasus. - M.-L. : Publishing house of the Academy of Sciences of the USSR, - 1959, - 703 p.



Graphic 1. Taxonomic spectrum and rare species of vertebrate fauna of the Autonomous Republic.

It should be noted that the taxonomy of several species is still being clarified. Undoubtedly, new taxa are expected to be discovered as a result of the application of complex methods, especially within the widespread species.

When a detailed study of the vertebrate fauna of the region, which is of great ecological importance, the clarification of its ecological features and taxonomic situation, it was determined that 414 species were distributed in the area (Table 2).

**Table 2
Taxonomic spectrum of vertebrate fauna spread in Azerbaijan, including Nakhchivan AR**

Classis	Azerb.	Nach.AR	Ordo		Family		Genus		Rare species	
			Azerb.	Nakh.AR	Azerb.	Nakh.AR	Azerb.	Nakh.AR	Azerb.	Nakh.AR
Cyclostomata	1	-	1	-	1	-	1	-	1-0	-
Osteichthyes	104	33	12	6	16	8	52	27	4-9	1
Amfibia	11	7	2	1	5	4	9	6	5-6	1

Continuation table 2.

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>
Reptilia	63	39	3	3	12	12	31	31	8-14	10
Aves	407	265	19	18	65	51	187	147	36-71	39
Mammalia	115	70	7	7	26	21	57	45	14-42	20
Total	701	414	44	35	125	96	337	256	68-142	71

As can be seen from the table, the closest class to danger is amphibians with 60%, and mammals with 36.84%. Then, reptile class members make up 21.87%, birds - 16.55%, and fish - 8.18%. 9 species of reptiles, 54 species of birds and 26 species of mammals from the fauna of terrestrial vertebrates distributed in the area are included in the “Red Book” of Azerbaijan (2013). Research has shown that over the years, large and noticeable creatures have become more exposed to anthropogenic influences. This is reflected in the second edition of the Red Book of the Republic of Azerbaijan (2013), and about 40% of mammals are included in the list of rare species and special protection status has been applied.

When the taxonomic status and ecological features of the herpetofauna of the region were clarified, it was determined that 39 reptile species were distributed in the area. Of these, 3 species belong to the group of turtles, 15 species to lizards and 21 species to snakes.

Among the herpetofauna species in need of protection, *Testudo graeca* and *Pelias erivanensis* Sensitive - VU, *Eremias pleskei* in crisis - CR have high protection status of BTMI. Of the other species, 19 are LC, 2 are NT, one is LR / lc, and one is LR / nt. Thirteen of the species distributed in the area are included in the Close to Threat - NE category due to their relatively good condition. The distribution of reptile fauna species by groups, species, number of species, and distribution of species in the Autonomous Republic have determined.

The fact that some of the species mentioned by our predecessors during the study period: *Rhynchocalamus melanocephalus*, *Psammophis lineolatus* are very rare or not observed, indicates that the descendants of these species are in serious danger of extinction. As no individual *Psammophis lineolatus* has been found

during the study period, it is thought to have become extinct in the area.

When assessing the categories of the Red Book of Azerbaijan, 9 of these species were assigned to different sections of the endangered categories - II (II. 1., II.2., II.3., II.4.) And "Little is known about" or "Distributed in a Restricted Area" - category "DD" - included in various sections IV (IV.1. and IV.2.). 3 of the species are distributed in one stationery, one in 2 stationeries, 2 in 3 stationeries and 1 in 4 stationeries. *Testudo graeca Linnaeus, 1758, was observed in five hospitals in the area.* During the analysis of ornithofauna of other vertebrates, 265 species of modern birds belonging to 18 groups, 51 family and 147 genera were identified on the basis of materials collected in the area and information on ecological groups.

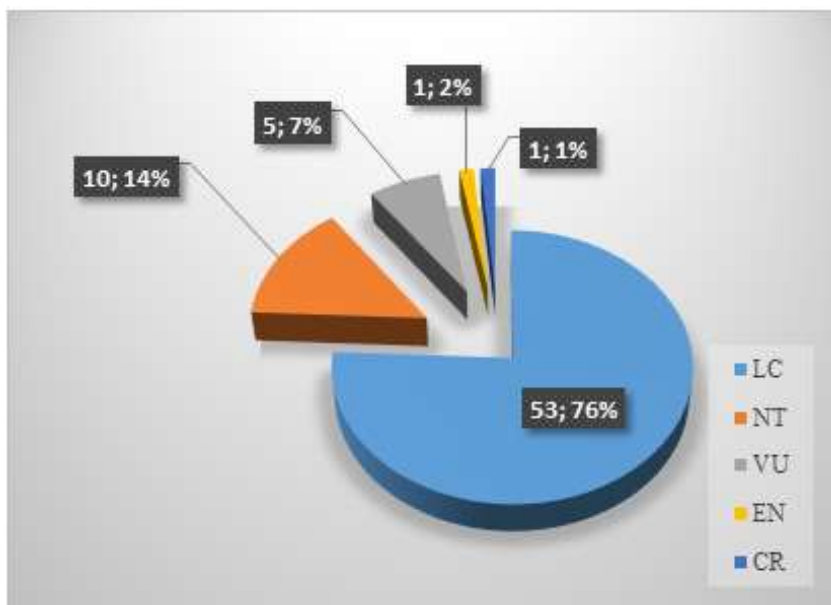
Thus, there are 93 species in the plains, 13 in the plain-foothills, 61 in the foothills, 33 in the foothills-mountains, 24 in the mountains, and 41 in the interzones. Among the ecological groups of ornithofauna, the richest group belongs to the limnophilic species. Limnophilic birds cover 82 (30.94%) of the 265 species spread across the area. The next place is occupied by dendrophil species (70 species; 26.42%). Petrophilic and oreophilic groups represent 71 species (26.79%) and include a large number of species close to the dendrophilic group.

Birds inhabiting all landscapes in the area represent 38.34% of the total nesting species, with 38 species. A number of synanthropic birds were also inhabited in the Selitep sites of the Nakhchivan Autonomous Republic, which are only 4 (1.51%) species.

During the study of the ornithofauna of the Autonomous Republic, it was found that the species that reproduce in the area are more predominant (177 species; 69.41%). According to the principle of nest division, there are 119 (67.24%) species of birds nesting in the open. There were 21 species (11.85%) nesting in closed conditions (in a tree ward, in holes dug in the ground and in covered areas of anthropogenic structures), and 37 (20.90%) species of ornithofauna nesting in both open and covered conditions (eurytop species).

Birds that have nest area dominate with in species (84.73%). The main reason for this was found to be the relatively even distribution of the food base for the species. The number of intermediate birds is 12 (6.8%), and is approximately equal to the number of colony-forming birds (15 species; 8.47%).

Looking at the results of the study of mammal fauna, another class of vertebrate fauna of the Autonomous Republic, it was found that 70 species are distributed in the area, of which 53 LC, 10 NT, 5 VU, 1 EN and 1 i has CR statuses [25, 34, 39, 42, 44, 45], (Graphic 2).



Graphic 2. Distribution of mammal species distributed in the territory of the Autonomous Republic by threat categories.

Species are unevenly distributed in the area. Species are unevenly distributed in the area. While 52 of the 70 mammal species were recorded in mountainous areas, there were 62 species in the plains (dsh 600-700 m) and in the foothills, of which 21 were rare in nature, 33 were common and 8 were numerous species. Of the 52 species recorded in the mountain forest zone (d.s.h. 700-2200 m), 26 species

were rare, 21 were common and 5 were numerous. In the mountain-meadow zone (d.s.h. 2200-3000 m) 20 species were found, of which 12 are small, 6 are ordinary and 2 are large. In the last nival zone and its rocks (d.s.h. 3000-3900 m) 5 species are spread, of which 3 are rare and 2 are ordinary species. Two of the species were not found in any elevation areas of the area (manul cat and striped kaftar). The first zone of the site (d.s.h. 500-700 m) is characterized by 10 species, of which 3 are minor, 5 are ordinary and 2 are numerous. (Table 3).

Table 3

Number composition of mammals in major mountainous landscapes

Come across	Highland steppe		Mountain forest		Mountain meadow		Nival	
	n	%	n	%	n	%	n	%
Numerous	9	32,86	5	34,28	12	17,14	2	2,86
Common	13	18,60	23	20,00	6	7,14	3	4,28
Fewer	13	18,60	14	32,86	5	8,57	3	4,28
Rare	23	12,86	24	7,14	2	2,86	2	2,86

Accordingly, 5 species (4 minor and 1 ordinary) were found to be characteristic of the dsh 700-2200 m, 3 species (*Ellobius* (*Afghanomys*) *lutescens*, *Sorex volnuchini* and *Chionomys nivalis*) were characteristic at altitudes of 2200-3000 m and higher.

CHAPTER IV. Systematic status and ecology of minority species of Reptilia fauna distributed in the territory of Nakhchivan Autonomous Republic

When detailed study of herpofauna of the ecologically significant region, taxonomic status and ecological characteristics were revealed, 39 species of reptile species were found in the area, of which 8 were estimated as few (Table 4).

Table 4

Few reptile species found in the territory of the Autonomous Republic

№	Species	Observed stations	Categories of danger	
			Local	International
1	2	3	4	5
1	<i>Testudo graeca</i> Linn., 1758	I,II,III,V,V I	VU; II.1;II.4.	VU
2	<i>Phrynocephalus helioscopus</i> Pall., 1773	I,II,III,V	CR;II.1.;II. 2	LC
3	<i>Trachylepis septemtaeniata</i> Reuss, 1834	I,II	LC;II.1;II.2 ; II4	NE
4	<i>Hemorrhoids nummifer</i> Reuss, 1834	IV	VU	LC
5	<i>Platiceps najadum</i> Eichw., 1831	I,V,VI	VU	LC
6	<i>Zamennis hohenackeri</i> , Str., 1873	IV	LC; II.2;II.4;IV.1	LC
7	<i>Montivipera raddei</i> Boett., 1890	I,II,IV	VT;II.2.,IV.1; IV2	LC
8	<i>Pelias eriwanensis</i> , Reuss, 1933	IV	VU	

During the study period, 3 of the species were distributed in one hospital, 1 in 2 hospitals, 2 in 3 hospitals and 1 in 4 hospitals. *Testudo graeca* Linnaeus, 1758, was observed in five hospitals in the area.

Testudo graeca Linn., 1758 species Which is considered to be a minority in the area, is represented by 2 subspecies including *T. graeca iberica*, and *T. graeca armeniaca*. Of these subspecies, *T. g. iberica* Although it is widespread within the autonomous republic, the other subspecies is observed in small geographical areas.

In the samples obtained, the full length of the carapace in the male samples ranged from 186.00 to 262.00 mm and averaged 225.06 mm, and the width ranged from 137.0 to 184.0 mm and averaged 157.91 mm. The height of the plastron in males ranged from 160.10 to 243.00 mm, with an average of 187.81 mm, and anterior width (PGI) ranged from 76.00 to 105.00 mm, with an average of 92.69 mm. The posterior width of the plastron (PGIS-I) in males varies between 95.00-129.00 mm, with an average value of 106.13 mm. The ratio of the full length to the width of the carapace varies from 1.34 to 1.61 mm in males, the average value is 1.42 mm, and the ratio of the dorsal length to the height varies from 1.97 to 2.39 mm in males, the average value is 2.14 mm. According to the biotopic-extrapolation assessment in the territory of the Nakhchivan Autonomous Republic, there are 3-5 individuals per hectare.

For *Phrynocephalus helioscopus* Pall., 1773 - species (8 males, 11 females, and 8 young), the length of the middle nostril was 28.26 mm \pm 4.72 (1 SD) in young men and 43.4 mm in females. 4.97 and 45.35 mm \pm 5.05 in males. Correspondingly, the body length was 59.30 \pm 11.12 mm in young, 95.2 \pm 11.89 mm in females and 92.17 \pm 9.42 mm in males. During the faunus evaluation, it was found that the subspecies of *Phrynocephalus h.horvathi* (Meh., 1894) was estimated to have 5-6 individuals per hectare, according to biotopic-extrapolation estimates.

The collected samples belonging *Traussilepis septemtaeniata* Reuss., 1773 species - show that it is a nominal subspecies. When the data obtained during the study were compared with the data from previous studies, it was confirmed that the species was a nominal subspecies. In 2 individuals of the samples studied, the body length was 205.50 mm, with a change of 203-208 mm. The ratio of head + stem length to the front foot varies between 3.31-3.79 mm, on average 3.61 mm. The ratio of the head + hull to the rear leg length is an average of 24.70 mm, ranging from 23.26-26.16 mm. According to biotopic-extrapolation estimates in the Nakhchivan Autonomous Republic, there are 8-12 individuals per hectare.

Zamenis hohenackeri Strauch, 1873 - a group of snakes, obtained from the observation point of the Strait of the Autonomous Republic. In the sample, the body length was 60-80 cm. In a captured disc sample, praeocular and loreal are present on both sides. Postoculars are 2 on both sides. Temporal is 1-2 pieces. Supralabial is 8 on both sides and 9 on both sides of the sublabial. The number of backbones between 95 and 110 mm ventral is 23. The subcaudal number is 67 and the ventral number is 211. Rostral height is 2.89 mm and genome is 4.58 mm. The ratio of the rostral height to the genesis is 0.63 mm. The ratio of bass genesis to length is 0.51mm. The ratio of tail length to trunk length is 0.22 mm. The length of the body is 70.5 cm. According to biotopic-extrapolation estimates in the Nakhchivan Autonomous Republic, there are 3-4 individuals per hectare.

Platyceps najadum Eichwald 1831 – when the examples belonging to the data of this species taken from the old Kotam observation site are comparable in information given in literature, color, pattern, folidosis, body sizes and proportions, it was in accordance with the indicators of the *Platyceps najadum albitemporalis* Darevski et. Orlov, 1994 subspecies. The body length of the sample was 87.0 cm, the tail length was 28.0 cm, and the head-to-width ratio was 1.48. The ratio of head + trunk length to tail length is 2.10. The preocular are 2-2 on both sides of the head. Postoculars were counted as 2 on the left and 3 on the right. Loreal 1, supralabial 9-9, sublabial 10-11. Temporal is 2 + 3 units. Ventral is 219 units and subcaudal is 134 units. The number of shovel scales between 90 and 115 mm ventral is 19. It is a thin, non-venomous snake with a body length of up to 140 cm. It was found only in hospitals I, V, VI in the territory of the Autonomous Republic. According to biotopic-extrapolation estimates, there are 1-2 individuals per hectare.

Hemorrhoidis nummifer Reuss., 1834 - Was given as under the name of the Earlier Coluber ravergieri nummifer Reuss, 1834 subspecies and was later noted as a different species. When comparing the data collected from the samples obtained with the color, pattern, folidosis, body size and values given in the literature, it was found that the sample belonged to the Hemorrhoidis nummifer Reuss type. In the

study, it was observed that the tip of the frontal shield came into contact with the upper Preocular shields. The preocular and postocular are 2-2 and the loreal shield is 1. Supralabial is 8-8 and sublabial is 10-10. Temporal is 2 + 2 units and Ventral is 217 units. The number of shovel scales between 90 and 115 mm Ventral is 25. The rostral index is 124.41 mm, the head index is 54.81 mm and the tail index is 20.88 mm. Body length is 411.66 mm. Other body sizes and proportions were also calculated. According to biotopic-extrapolation evaluation, there are 5-6 individuals per hectare in the area.

Montivipera raddei Boettger, 1890 - The species was found only in hospitals I, II and IV in the territory of the autonomous republic during the period of research. This species, which was previously considered a subspecies of *Vipera xanthina raddeii*, later received the status of a separate species as *V. raddeii*.

Canthal scales are 2 in all specimens and slightly protruding outwards. Rostral height ranged from 4.55 to 4.83 mm, with an average of 4.68. The width of the head is 11.72-12.79 mm, the average is 12.05 mm. The length of the head is 19.32-26.89 mm, the average is 24.26 mm. Head + body length is 616-797 mm, average number is 682.70 mm, and body length is 649-844 mm, average number is 723.67 mm.

The rostral index is 124.41 mm, the head index is 54.81 mm and the tail index is 20.88 mm. Body length is 411.66 mm. Other body measurements and proportions were calculated.

The ratio of the rostral width to the height is between 0.90-1.12 and the average is 0.99. The ratio of head length to width varies between 1.65 and 2.20, with an average of 2.00. The ratio of head + horn 95 to tail length ranges from 9.34 to 11.85 and the average number is 10.65.

Vipera eriwanensis Reuss, 1933 - According to the biotopic-extrapolation assessment of this species, which was first observed and photographed at the Batabat observation post of the fourth station, there are 5-8 individuals per hectare. The body length is up to 50 cm, it is a relatively small species of viper.

CHAPTER V. Systematic outcome and ecology of the minority species included in the ornithofauna (*Aves*) of the territory of the Nakhchivan Autonomous Republic

During the study period, 38 of the 265 species included in the ornithofauna of the area were considered to be minority. In addition to the environmental parameters of these sites, their observations were assessed, as well as their local and international status.

During the research, it was observed that 10 of the few species spread in the area were distributed in one hospital, 8 in 2 hospitals, 8 in 3 hospitals, 5 in 4 hospitals, 2 in 5 hospitals and 5 in 6 hospitals. (Table 5).

Table 5
Minority species of ornithofauna of the autonomous republic

№	Species	Observed stations	Categories of danger	
			Local	International
1.	<i>Pelecanus crispus</i>	V	VU,II,1	LC
2.	<i>Pelecanus onocrotalus</i>	V	VU,II,1	LC
3.	<i>Microcarbo pygmeus</i>	V,VI	LC	LC
4.	<i>Ardea purpurea</i>	V	LC	LC
5.	<i>Cygnus cygnus</i>	V	VU	LC
6.	<i>Cygnus olor</i>	V	LC III	LC
7.	<i>Anser erythropus</i>	V	VU II,1	CR
8.	<i>Aythya nyroca</i>	IV,V	NT II,1	NT
9.	<i>Aquila chrysaetos</i>	I,II,IV,VI	LC	LC
10.	<i>Circus macrourus</i>	I,II,V,VI	NT; IV.1	EN
11.	<i>Accipiter gentilis</i>	I,II,IV,V	LC; IV.1.	LC
12.	<i>Accipiter brevipes</i>	I,II,III,VI	VU	LC
13.	<i>Buteo rufinus</i>	II,III,IV, V,VI	EN	LC
14.	<i>Circaetus gallicus</i>	II,III,IV, V,VI	VU; II.1	LC
15.	<i>Gypaetus barbatus</i>	II,III,IV, V,VI	LC; IV.1	VU
16.	<i>Neophron percnopterus</i>	I,II,III,IV	VU; II. 1	VU
17.	<i>Falco cherrug</i>	II,III	EN; II.1	VU
18.	<i>Falco biarmicus</i>	III,IV,VI	LC; IV.1.	VU
19.	<i>Falco peregrinus</i>	II,III,IV, V,VI	EN, II.1.	LC
20.	<i>Falco subbuteo</i>	I,II,IV	LC, IV.1.	LC

Continuation table 5.

1	2	3	4	5
21.	<i>Falco columbarius</i>	I,II,III,IV,V	LC; IV.1	LC
22.	<i>Falco naumanni</i>	II,III,IV,V,VI	LC; III	LC
23.	<i>Tetraogallus caspius</i>	I,II,IV	LC; IV.1.	NE
24.	<i>Perdix perdix</i>	II,III,IV	LC; IV.1.	VU
25.	<i>Ammoperdix griseogularis</i>	II,III	LC; II. 2.	VU
26.	<i>Grus grus</i>	V,VI	LC; III	VU
27.	<i>Anthropoides virgo</i>	III	LC; III	VU
28.	<i>Recurvirostra avosetta</i>	III,IV	LC; IV.1	LC
29.	<i>Larus ichthyaetus</i>	V,VI	LC; IV.1.	NE
30.	<i>Pterocles orientalis</i>	I,II,III,V,IV	LC; II. 3	EN
31.	<i>Irania gutturalis</i>	II,IV,VI	LC; IV.1, IV.2.	LC
32.	<i>Oenanthe xanthopyrna</i>	I,II,III	LC; IV.1.	NE
33.	<i>Rhodopechys githagineus</i>	II,III	LC; IV.2.	LC
34.	<i>Bucanetes mongolicus</i>	III	LC; IV.1, IV.2.	LC
35.	<i>Emberiza buchanani</i>	II,III,VI	LC; IV.2.	NE
36.	<i>Melanocorypha bimaculata</i>	II	LC; IV.1.	NE
37.	<i>Rhodopechys sanguinea</i>	II	LC; IV.2.	LC
38.	<i>Sitta tephronota</i>	II,III,IV	LC; IV.2.	NE

In 2011, for the first time, a species of *Pelecanus crispus* Brunch, 1832 -species, which was rarely evaluated in ornithological studies in the area, was established near the Araz River. Estimated population of 220-250 individuals is spread throughout the region. Sədərək keçid məntəqəsi, Nehrəm kəndinin yaxınlığındakı göl, Araz anbarı və Araz çayında müşahidə olunmaqla, əsasən qış immiqrantıdır.

Pelecanus onocrotalus Linn. 1758 - The species is a spring migrant, winter immigrant, and transit species in various parts of Azerbaijan. The number of people in the Autonomous Republic is 10-15 people, and the population changes tend to rise.

Phalacrocorax pygmaeus Pallas, 1773 - There is also a wintering population in the Autonomous Republic. Although the

species is a winter immigrant, it has also been observed during the breeding season. The highest number in the area in 2015 was 149 individuals.

The *Ardea purpurea* Linn., 1776 - Species in the Autonomous Republic is estimated to have 3-5 pairs. Species are observed during the nesting period. It was confirmed that it nested in the area during the research. The reproductive population of the species in the study area was identified as a pair, although it was thought that a maximum of two couples could nest. The most important element that threatens the reproductive population of the species is adverse changes that occur in the habitat of the area. The basis of these changes is a decrease in the water level.

Cygnus cygnus Linn. 1758 - The species, which is a spring immigrant to the area, was found in the Araz River in 2013 by 32 individuals and in 2016 by 21 individuals near the Sadarak checkpoint and near the "Solprom" reservoir area. Fluctuations are observed in populations. In the changing of populations fluctuations are observed.

Cygnus olor Gm. 1789 - The highest number of migration periods of this species, which belongs to the European fauna type, in the territory of the autonomous republic was 13 individuals in 2011, and the lowest number was 5 individuals in 2013-2015.

Anser erythropus Linn., 1758 - The highest number of species observed during the winter in the territory of the autonomous republic was in 2012 with 5,000 individuals.

Aythya nyroca Guld., 1770 - The species, which belongs to the Arctic fauna, is a local and spring immigrant. Only reproductive populations of the species are observed in the area. There are 5-6 pairs in the territory of the Autonomous Republic, and population changes tend to decline. In our research, this species was found in Lake Batabat II during the nesting period, but no nests were found. The largest number of species in the area was observed in 2015 with 11 individuals

Aquila chrysaetos Linn., 1758 - It is a sedentary species, but also descends to the plains to feed in winter. The number of breeding birds is not more than 5-6 pairs. The highest number in 2014 was 6 pairs.

Circus macrourus Gm., 1770 - The population density of the species has decreased, with the highest number of individuals in the territory of the autonomous republic being 4 individuals.

Accumiter gentilis Linn., 1758 - Is found in the Bichenak fores, in the territory of Shakarabad village, in Nakhchivanchay and in dense oases of Ordubad region. It is a declining species. The population density tends to decrease with the maximum number of 9 individuals in the territory of the Autonomous Republic.

Accipiter brevipes Sev., 1850 - Although this species, one of the smallest and rarest of the three breeds of hawks that breed in our country, is widespread in all regions of the autonomous republic, it is rarely found in breeding individuals. The number of individuals breeding in the area is less than 5-10 pairs. The highest number was observed in the territory of the Autonomous Republic in 2011 in 3 pairs, and in 2013-2016 in one pair.

Buteo rufinus Cretz, 1829 – Is a sedentary species found in the plains and mid-mountain slopes along the Araz. Until the 1970s, it was an ordinary number, even numerous during migration. Later, the density of the reproductive population in Azerbaijan decreased. Over the past 10 years, the population of both reproductive and wintering populations has reached dangerous levels. The largest number in the territory of the Autonomous Republic in 2013 was 9 pairs. The number is constant.

Circaetus gallicus Gm., 1788 - It came to the area in April to breed and moved in September. It has been the usual number until the last 40-50 years. The number of population in the territory of the Autonomous Republic does not exceed 4-5 pairs.

Gypaetus barbatus Linn., 1758 - In the 1990s, there was a danger of falling into a critical situation, it was included in the "Red Books" of the Republic of Azerbaijan and Nakhchivan AR. The maximum number in the Autonomous Republic was 7 pairs. Many years of persecution of livestock, followed by the destruction of hunters as rivals and the loss of the fodder base, have led to a decline in the number of species.

Neophron percnopterus Linn., 1758 - It is the smallest of the carcasses in the area and is observed in the Nakhchivan Middle Mountains and along the Araz belt. Until the 1990s, it was an ordinary number, but in recent years it has been sharply reduced and included in the category of Endangered (EN). 15 pairs nested in the territory of the Autonomous Republic.

Falco cherrug Gray., 1834 - Although it looks like an ordinary hawk, it has a larger structure and a longer tail. It comes to the area for the winter and Some populations that migrate pass through the territory of the autonomous republic (October and March). The most common number in 2012 was 2 individuals.

Falco biarmicus Temm., 1825 - *Falco b. feldeggii* Schlegel subspecies is widespread. Very little is known about the general population density. It has been determined that it breeds in the rocks of the "Nohuddag" territory of the Autonomous Republic. The technosphere is very sensitive to noise and other anthropogenic factors.

Falco peregrinus Tunst., 1771 - It spreads and reproduces in all high-rise buildings of the Autonomous Republic. *Falco p. brookei* subspecies is widespread in the territory. There are sedentary, wintering and migrant populations. The highest number was 12 pairs in the 2011 and 2016 series.

Falco subbuteo Linn., 1758 - This species arrives in the territory of the autonomous republic in late April, early May and migrates in October. Until the 1960s and 1970s, it was a common species, but then its distribution gradually shrunk and its population density declined. A maximum of 8 pairs were registered in the territory of the Autonomous Republic in 2012.

Falco columbarius Linn., 1758 - This species, which is one of the smallest members of *Falconiformes*, comes to winter in this area, and the migrant population also passes through here. Autumn migration occurs in September-November, and spring migration in March-April. The maximum number in the territory of the Autonomous Republic was 5 individuals.

Falco naumanni Linn., 1818 - The species is found in the plains and foothills of the autonomous republic. They come to the area in March to breed and migrate in August. It begins to produce offspring in late May. It usually forms a colony, each colony has 4-9 nests, on average 5 nests. Its food consists of 65% of insects and 30% of rodents. The number is declining. This species, whose main food is insects, has been identified as 15 pairs.

The *Tetraogallus caspius* Gm., 1784 - It is a representative of a group of chickens and is a sensitive species that continues to decline in the territory of the autonomous republic. It is widespread in the Autonomous Republic on the high cliffs of the mountains, at an altitude of 2400 m. It rises to an altitude of 2600-3000 m for nesting. In winter, it drops to an altitude of 1800-2500 m. Over the past 20 years, the Lesser Caucasus has been a conflict zone, which has had a negative impact on habitats and is declining in number. Currently, 10-15 pairs of birds are registered in the territory of the autonomous republic.

Perdix perdix Linn., 1758 - Males and females of the small group of chickens are similar in color. It is distributed in the plains and mountainous areas of Shahbuz region of the Autonomous Republic in summer, in Ilandagh and Bashkend massifs of Julfa region and in winter in Nehramdag area of Babek region. Although a sedentary bird, it changes depending on seasons. Under optimal conditions, there are no more than 4-5 individuals per 100 hectares. The total number in the territory of the Autonomous Republic varies between 250-300 individuals. They form small groups (5-20 individuals). It is a monogamous bird that breeds during the breeding season.

Ammoperdix griseogularis Brandt., 1843 - It is a typical species for the territory of the Autonomous Republic and belongs to the Sensitive-VU category. It is a small species that is endangered and adapts to new conditions. One of the distinguishing features of the beautiful thyme is that it extends to the left of the brown-black stripes on the sides of the body from the waist down and forward. The range of the species forms the south-eastern edge of the area. It is mainly distributed in the area opposite the villages of Nohuddagh, Gendera,

Ilandagh, Daridagh, Vaykhir and in the Gilyanchay valley. It is a sedentary species. There are no more than 40 pairs in the area. The highest number was recorded in 2015 in 37 pairs.

Grus grus, Linn., 1758 - It belongs to the group of Gurniformes and is a species sensitive to the territory of the autonomous republic - VU. Autumn migration occurs in August-November, and spring migration in March-May. It is found in arable lands and newly sprouted areas near the Araz River. Uses the area for food, staying overnight and recreation. The largest number in the Autonomous Republic was registered in 2015, 5,000 individuals.

Anthropoides virgo Linn., 1758 - Unlike other cranes, it lives not in wetlands, but in low-lying steppes and semi-deserts. During the period of migration from the territory of the Autonomous Republic, it passes in late March and early April. In May 2011, one individual was observed around the city of Nakhchivan, and in 2015, 40 individuals were observed in a field near the Araz River.

Recurvirostra avosetta Linn., 1758 - Belonging to the genus Charadriiformes, is in the *Vulnerable* - VU category for the area. It is observed during migration in the territory of the Autonomous Republic. There were no more than 40-50 pairs in the autonomous republic during this period. Generally, the species is continuing to decline.

Larus ichthyaetus Temm., 1773 – It is the largest of the species of seagull and was observed during the migration and wintering periods in the Araz reservoir, Sadarak crossing point, as well as on the Silver Lake. No more than 2-3 individuals were observed in the area during the migration period. Generally, the species is continuing to decline.

Pterocles orientalis Linn., 1758 - It is a small species that belongs to the group of pigeons. It is spread in the territory of the Autonomous Republic along the Araz plain and in the areas around Ilandagh. The number in the area is estimated at 80-100 pairs. It is a sedentary species.

Irania gutturalis Guerin-Meneville, 1843 - It is a small species for the territory of the Autonomous Republic. It was observed by us in

the territory of Zangazur National Park, in Jahrichay, in the rocky and bushy areas of Bichanak village. It is a nomadic species. It is very rare in Europe. In optimal conditions, it does not exceed 2-3 individuals per 4-5 km². According to estimates in the area, the total number is 20-40 pairs. Currently, 10-15 pairs of birds are registered in the territory of the autonomous republic.

Oenanthe xanthopyrmyna Hemp. & Ehr., 1834 - This bird is a VU species - Sensitive to a small area. It was noted that it was found and nested in all heights of Ordubad, Julfa and Babek districts of the Autonomous Republic. It prefers mainly mountainous areas, along with arid, steppe climate and high shrub plains. Selects suitable places, such as hollows and cracks in steppes and bare rocks. 30-40 pairs of birds were registered in the territory of the Autonomous Republic.

Rhodopechys githagineus Lichtenstein, 1823 - It is the minority sensitive species in the territory of the Autonomous Republic - VU. It is distributed in Ilandagh, Nohuddagh, Gendera, Nehramdagh, Kotam, Bichenak, Badamli, Kukudagh and Garagaya areas of the region. Since the area of distribution is some areas of Shahbuz, Julfa, Babek and Ordubad districts, in optimal conditions it is not more than 5-7 individuals per 3-4 km². The highest number of 18 pairs was registered in 2013, and the lowest number in 2016 was 12 pairs.

Bucanetes mongolicus Swinhoe, 1870 - It is the minority sensitive species in the territory of the Autonomous Republic - VU. It was found in Bulgan in the spring of 1915 and around the villages of Aza (Julfa district) in the 1960s and 1970s. Currently registered in the "Nohuddag" and "Gendere" areas of Julfa. Only in Nakhchivan Autonomous Republic it was observed by us in the "Nohuddag" of Julfa region in 2010. The number does not exceed 0 - 1 individuals every 5 km². There are no more than 10 to 15 pairs in the area.

Emberiza buchanani Blyth, 1844 - It is few sensitive for the territory - VU type. In Azerbaijan it is mainly found in Nakhramdag, Nohuddag, Darasham, Ilandag, Jamald and Daryagag areas of the Nakhchivan Autonomous Republic. The number should not exceed 0 - 1-2 individuals every 5 km². There are no more than 10 to 15 pairs

in the area. The highest number was recorded in 2016 with 12 individuals.

Melanocorypha bimaculata Menetries, 1832 - It is the least sensitive type of VU in the territory of the Autonomous Republic. It is spread in the plains and middle mountainous areas along the Araz. The main population is found in Ilandagh and surrounding areas of Julfa region (Bashkend, Ortakend and Ashagikend) in fields and open areas. In Azerbaijan mainly Nakhchivan Autonomous Republic it is estimated at 100-500 pairs mainly in the autonomous republic. The number should not exceed 0 - 1-2 individuals every 5 km². The maximum number of 5 pairs was recorded in 2015-16, and the minimum number was 3 in 2011-12.

Rhodopechys sanguinea Gould, 1838 – It is minority Sensitive for the territory - VU type. It is found in the mountainous areas of Julfa and Ordubad districts of the Nakhchivan Autonomous Republic. The maximum number of individuals in the area was 9 in 2011, and the minimum number was 3 in 2012-2013.

Sitta tephronota Sharpe, 1872 - It is minority Sensitive for the territory - VU type. It is observed in all high rocks of the area. Considering that there are more rocky parts, it is expected that 2-4 pairs are spread in 2-3 km². During the study period, the maximum number was 100 individuals in 2012, and the minimum number was 32 individuals in 2011.

CHAPTER VI. Systematic status and ecology of a few species included in the fauna of mammals (*Mammalia*) distributed in the territory of the Nakhchivan Autonomous Republic

During the study period, 15 of the 70 mammal species identified for the territory of the autonomous republic were assessed as minor. The remaining species are numerous, common and rare. Hospitals with a small number of mammal species and their local and international hazard categories have been identified (Table 6).

Table 6

**Stations in which rare species of mammals are observed,
their local and international threat status**

№	Species	Observed stations	Categories of danger	
			Local	International
1	2	3	4	5
1.	<i>Rhinolophus ferrumequinum</i>	I,IV	LC; II.4.	LC
2.	<i>Rhinolophus hipposideros</i>	I,II,III	LC; II.2.	LC
3.	<i>Rhinolophus euryale</i>	I,IV	NT;II.4.	NT
4.	<i>Rhinolophus mehelyi</i>	I,II	VU II,I	VU
5.	<i>Myotis mystacinus</i>	III	LC	LC
6.	<i>Myotis emerginatus</i>	III	LC; II.4.	LC
7.	<i>Myotis blythii</i>	I,III,VI	NT;II.4.	LC
8.	<i>Plecotus aurtus</i>	I,III	LC	LC
9.	<i>Miniopterus schreibersii</i>	I,IV	NT; II,4	NT
10.	<i>Chionomys nivalis</i>	I,II,IV	LC;II,IV	LC
11.	<i>Apodemus uralensis</i>	I,II,III,IV	LC	LC
12.	<i>Dryomys nitedula</i>	I,II,IV	LC	LC
13.	<i>Ursus arctos</i>	I,II,IV,VI	LC; II.3.	LC
14.	<i>Capra aegagrus</i>	I,II,III,IV,VI	VU, II.1.,II.3.	VU
15.	<i>Ovis orientalis gmelinii</i>	I,II,III,IV,VI	VU; II.1.,II.3.	VU

Of the minority species, 2 are found in the 1station, 4 in the 2 stations, 3 in the 4 stations, and 2 in the 5 stations.

Rhinolophus ferrumequinum Schrcber, 1774 - It has been observed that the cave system is used in the area throughout the year. The fact that the species uses the cave all year round shows that it is highly dependent on cave life. It is mostly observed in winter and spring around Turkesh village. He uses the Sirab Cave and the Kohnagala Pass in Nakhchivan for breeding and rearing in winter, spring and autumn. The highest winter population was 125 individuals around Turkesh village in January 2013, and the highest spring population was 163 individuals in September 2014. Individuals who wake up from hibernation in April and May go to the Sirab Cave in

June, to the decommissioned mining tunnels around the villages of Paragachay and Kotam.

Rhinolophus hipposideros Bechstein, 1800 - During the study period, the average value of the total weight of 9 individuals in the samples of the species was 3.82 ± 0.48 g (change 3.00-8.00 g), according to IK Rakhmatulina, and in 2006 it was 5.1 ± 0.18 (4, It is noted that 4-6,2) q. *R. hipposideros* is the least observed rhinolophid bat in the area. The highest number of individuals was found in December and January. While Turkesh uses a shelter near the village for the winter, he uses only the Sirab Cave to raise and raise puppies. The species was not found in the shelters in Gumushlu and Kotam.

Rinolophus euryale Blasius, 1858 - The species is highly dependent on cave life, using the Sirab Cave all year round, mostly for wintering, hatching and rearing for 12 months. It uses bat nests and mining tunnels in the village of Kalaki, Ordubad region, only in July-August for breeding and rearing puppies. The winter colony in the Sirab cave was 18 individuals in November 2012, and the spring colony was 33 individuals in July 2015. Births and poultry colonies were observed overnight with *R. ferrumequinum*, *R. meheli*, *Myotis myotis*, *M. blythii* and *M. nattereri*.

Rinolophus mehelyi Matschie, 1901 - Is one of the least common species in caves. Earlier it was known only in 6 areas of the area, but now it was acquired in one of the mine tunnels (up to 200 m long) in January 2011 and October 2012, at 1578 m, in the village of Kelaki in Ordubad district. The type uses Sirab cave for wintering purposes only. There were 63 individuals registered in February 2014. Wintering colonies were sometimes observed in the same colonies as *M. nattereri*.

Myotis mystacinus Kuhl, 1817 - Are maximum of 9 individuals were found in the Sirab Cave during the winter months. The obtained samples were recorded in the sections of the cave in the form of small colonies formed individually and by several individuals.

Myotis emerginatus Geoffroy, 1806 - It was found only in the winter months in the Sirab Cave, in the interior of the main parts of the cave, which are slightly warmer. Most were observed in January

in small groups with 93 individuals in winter, and in summer in cracks with 3–5 individuals with *M. mystacinus*. The absence of other shelters during the summer months suggests that it does not use this cave as a breeding ground.

Myotis blythii Tumes, 1857 - Are used in the Sirab cave and Silver Tunnels in the summer, and the Kalyaki mining tunnels in the winter. The winter colony was 32 individuals in March 2013, and the spring colony was 21 individuals in August 2014. The specimens of this species from September have been very greasy. There were half-sleeping colonies in their bodies. The winter colonies are formed by extensive stone cracks and holes.

Individuals who wake up from hibernation in April and May go to the Sirab Cave and the Silver Mining Tunnels in June. In early June, an embryo was found in female individuals from a colony observed in the Silver Mining Tunnels. Throat females were recorded in the first half of June. Only females were observed in the breeding colonies, males in separate colonies, and in juvenile colonies in July with both sexes.

Plecotus aurltus Geoffroy, 1758 - With only one individual encountered in the Sirab Cave in December 2012, it is believed that the species did not use the cave and accidentally entered to protect it from the cold. *P. auritus* mentioned in the study is a new record for the Sirab Cave.

Miniopterus schreibersii Kuhl, 1817 - Uses the Syrab cave and the Kalyaki bat nest for winter, and the Silver Tunnel and the Turkes cave in the summer. The use of the cave system for 10 months during the year indicates a high reliance on this cave. The spring colony was 13 individuals in September 2012, and the winter colony was 21 individuals in January 2014.

It was observed that the species formed colonies on the sidewall and ceiling walls of the cave for wintering. The smaller colonies are associated with *R. ferrumequinum* and *R. euryale* species.

Chionomys nivalis Martins, 1842 - GN Guliyev conducted 2003⁷ types of cariological research on the samples taken in Batabat. The researcher notes that the karyotype of all the animals studied was

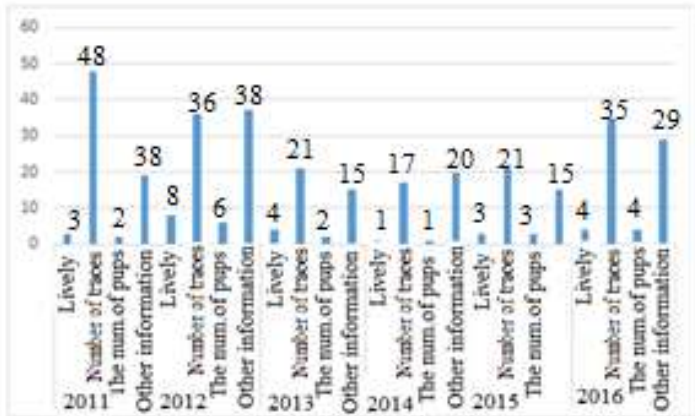
2n = 56. M. n of the samples obtained during the study period. olympius Neu. identified as belonging to the subspecies. This subspecies differs from all other subspecies by the bright yellow-gold color of the upper part of the body.

Apodemus uralensis Pallas, 1811 - Species is spread around the villages of Batabat in Shahbuz, Khazarnara in Julfa, Old Kotam and *Dyrnys villages* in Ordubad. The morphological features and sizes of the samples obtained were consistent with the researchers' research and it was clarified that the samples were *A. uralensis*.

Dryomys nitedula Pallas, 1778 Specimens were obtained from the Bichenak forest in the autonomous republic of Shahbuz, along the river oases in the Ordubad region, and in the Khaznadere area of Julfa, in the midst of cliffs, fruit orchards, mixed forests and mixed forests.

Ursus arctos Linn. 1758 - different populations of the species are commonly observed in Shahbuz and Ordubad.

During the study period, 23 adults and 18 puppies of brown bear were found alive, of which 8 were adults and 6 were puppies in 2012. (Graphc 3)



Graphic 3. Live, trace number, puppies and other information of the brown bear by years.

In 2014, at least one adult and one baby were found. According to the extrapolation assessment, the number of months in the territory of the autonomous republic was 30-40 individuals.

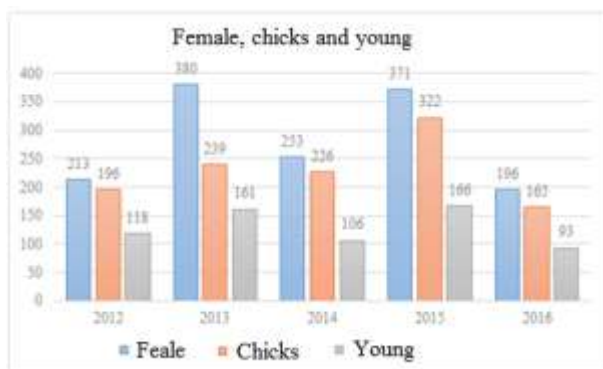
Capra aegagrus Erxleben, 1777 - One of the 5 subspecies of the species distributed in the world in the territory of the autonomous republic - *C. a. aegagrus* subspecies is widespread (Table 7).

Table 7

Indicator of Bezoar goats in hospitals in 2011-2016

Observation		Gender characteristics observed in individuals								Σ
Station	Years	Age composition of male individuals				The female and pups				
		2-4	5-9	>10	To	F	C	Y	To	
I,II,III,IV,V,VI	2012	364	178	43	585	213	196	118	527	1112
I,II,III,IV,V,VI	2013	271	236	56	563	380	239	161	780	1343
I,II,III,IV,V,VI	2014	202	200	68	470	253	226	106	585	1055
I,II,III,IV,V,VI	2015	165	288	63	516	371	322	166	859	1375
I,II,III,IV,V,VI	2016	216	243	76	535	196	165	93	454	989
Cəmi		1218	1145	306	2669	1413	1148	644	3205	5874

During the study, the dynamics of the female, puppies and young individuals for years was determined (Graphic 4).



Graphic 4. Dynamics of age and number composition of female, puppy and young individuals of rock goat, by years.

If we look at the percentage of breeding of Bezoar by years, this figure is 92% in 2012, 62.9% in 2013, 89.3% in 2014, 86.8% in 2015, and 84% in 2016.

7. Quliyev, Q.N. Comparison of *Chionomus roberti* carotype with *Ch.nivalis* and *Ch.gud* karyotypes (Crisetidae, Rodentia) // . - Baku: Materials of the I Congress of the Azerbaijan Zoological Society Science, - 2003. - p. 459-463.

Although the number of females was not as high as in other years, the highest fertility rate (213: 196; 92%) was in 2012. Although the highest number of females was in 2013-2015, the percentage of fertility was the lowest (380: 239 heads) and (371: 322 heads).

Ovis orientalis gmelini Blyth, 1841 - During the study of mouflon in the area, the age and sex composition were determined by years. The sex and age composition of mouflons for the study period are given in the table below (Table 8).

Table 8

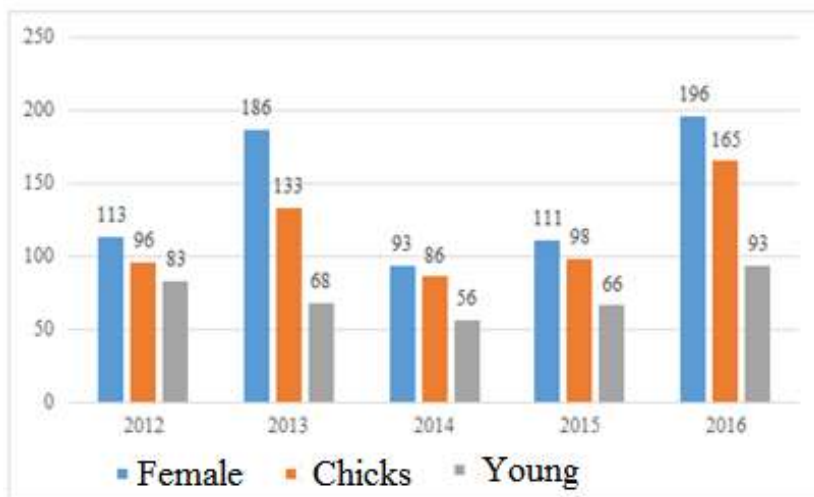
Sex and age composition of the Muflon for years

Observation		Gender characteristics observed in individuals								Σ
Station	Date	Age composition of male individuals				The female and pups				
		2-4	5-9	>10	To	F	C	Y	To	
I,II,III,VI	2012	64	78	43	185	113	96	83	292	477
I,II,III,VI	2013	76	33	67	176	186	133	68	387	563
I,II,III,IV,VI	2014	46	93	26	165	93	86	56	235	400
I,II,III,VI	2015	65	88	57	210	111	98	66	275	485
I,II,III,VI	2016	36	63	26	125	196	165	93	454	579
Total		287	355	219	861	699	578	366	1643	2504

If we look at the table, we see that the highest number of sheep was in 2013 (563 individuals). The lowest number of years was in 2014 (400 heads).

Looking at the age structure of males by years, the highest rate in the 2-4 age group was 76 in 2013, and the lowest was 36 in 2016; In the 5-9 age group, the highest number was 93 in 2014, and the lowest was 33 in 2013; In the group of 10 years and older, the maximum number of individuals was 67 in 2013, and the minimum number of individuals was 26 in 2016.

If we look at the number of puppies born, it was 165 in 2016, and the minimum number was 96 in 2012. If we look at the dynamics of the number of females, puppies and young individuals over the years, the maximum number of females in 2016 was 196 (Graphic 5).



Graphic 5. Number of mouflon females, puppies and young individuals by years.

If we look at the percentage of breeding of mouflon sheep by years, this figure is 85% in 2012, 71.5% in 2013, 92.5% in 2014, 88.3% in 2015 and 84% in 2016.

CHAPTER VII. Evaluation of the ecological situation in the territories of the Autonomous Republic

Significant changes have occurred in ecosystems as a result of close interaction with anthropogenic activities and environment. Various methods have been used to determine the general status of these changes. One of such methods is the method of determination by indicator organisms. Through this method, the hidden features are identified and uncovered, and systematic monitoring of environmental changes is provided.

Because vertebrates are more demanding on environmental factors and have excellent nervous systems and sense organs, they are considered to be the most appropriate indicator of their rapid and accurate response to any environmental change in the ecosystem, biotope. Primarily endemic species with high conservation status were

used as indicators. Because these species are more sensitive to any change. In the absence of these species, dominant species of regional significance or background in the area were used as indicators. Thus, dominant species are closely involved in the trophic relationship and development of the biotope.

During the study, when we conducted an environmental assessment based on the indicator species, their number per hectare or km² was determined and extrapolated to the entire area. During the monitoring, an environmental assessment was conducted based on the change in the number composition, and a system of measures was developed.

RESULTS

The following results were obtained on the basis of research on the doctoral dissertation on "Fauna and ecology of small terrestrial vertebrates in the Nakhchivan Autonomous Republic":

1. The fauna of terrestrial vertebrates of the Nakhchivan Autonomous Republic was represented by 3 classes, Reptilia 39 species, Aves 265 and Mammals (70 species). Of these, 61 were rated as minority [37].

2. For the first time during the research period, the faunal conditions of few species were clarified and their ecological features were studied. The areas where the species are distributed have been mapped, original photographs have been taken, measurements have been taken in the laboratory of individuals assisting the species, made into museum material, and certain species have been released back into the nature [13, 18, 20, 26, 30, 31].

3. As a result of the study of the reptile class of Nakhchivan AR, for the first time it was determined that reptiles are represented by 3 groups, 12 family, 31 genera and 39 species. Of these, *Emys obicularis* Linnaeus, 1758, *Pelias eriwanses* Reuss, 1939 and *Darevskia unisexualis* Darevski, 1966 species were first included in the fauna of the Nakhchivan Autonomous Republic. *Darevskia unisexualis* Darevski, specie 1966 is also noted for the first time for the herpetofauna of the Republic of Azerbaijan. When the taxonomic

status and ecological characteristics of the Herpetofauna species were clarified, it was determined that *Testudo graeca* has the status of Sensitive - VU, and *Eremias pleskei* has the status of Crisis - CR in accordance with the main categories of BTMI [32].

4. For the first time in the study of the Reptiles, one of the three species of turtle species - *Testudo graeca*, 2 species out of 15 species of lizards - *Phrynocephalus helioscopus*, *Trachylepis septemtaeniata*, and 5 of 21 species of snakes *Zamenis hohenackeri*, *Montivipera raddei*, *Pelias eriwanensis* was regarded as a minority species depending on the frequency of occurrence. *Testudo graeca* Linnaeus, which is considered to be a minority, is represented by 2 subspecies of specie 1758, *T. graeca iberica* and *T. graeca armeniaca*, and from these subspecies *T. g. iberica* was determined that the to be widespread within the autonomous republic, while the other subspecies is observed in small geographical areas. Researched as a minority *Phrynocephalus helioscopus* Pall., 1771 was identified as a subspecies of *Phrynocephalus h.horvathi*, Meh., 1894 in the territory of the Autonomous Republic. When the obtained data belonging to Few *Trachylepis s. septemtaeniata* Reuss, 1834 are compared with data from previous studies it was confirmed that the population was a nominative subspecies. The specie has been described by previous researchers as *Mabuya aurata septemtaeniata* Reuss. Comparing the data on *Platyceps najadum* Eichwald samples with the data given in the literature in terms of color, pattern, folidosis, body size and proportions, *Platyceps najadum albitemporalis* subtype was found to be suitable. As a result of research of 2 *Coluber ravergieri nummifer* subtype material obtained from Badamli-Shada observation point and Bichanak village it has been confirmed that it evolved as *Hemorrhoids nummifer* Reuss. [13, 18,20, 26, 30, 31, 37].

5. For the first time in the study of ornithofauna in the area, 265 species of modern birds belonging to 18 groups, 51 family and 147 genera were distributed based on the analysis of materials collected on the distribution of species by zones, species composition, seasonality, distribution according to reproductive conditions, ecological groups and literature data. During the study, 23 species and one subspecies

were first introduced into the fauna of the Nakhchivan Autonomous Republic: *Aquila pomarina*, *Anser albifrons*, *Andropoides virgo*, *Larus melanocephalus*, *Larus cachinnans*, *Sterna albifrons*, *Prunella ocularius*, *Hippolais languida*, *Silvia curruca*, *Phylloscopus trochilus*, *Parus ater*, *P. carotene.*, *Tringa erythropus*, *Phlomachus pugnax*, *Calidrius temincki*, *Calidrius minuta*, *Turdus pilaris*, *Lanius nibichus*, *Clamator glandarius*, *L. armenicus* species and *Sturnus vulgaris caucasicus* subspecies. For the first time, 38 of the species were considered as a minority for the area: *Pelecanus crispus*, *Pelecanus onocrotalus*, *Ardea purpurea*, *Cygnus cygnus*, *Cygnus olor*, *Anser erythropus*, *Athya nyroca*, *Aquila chrysaetos*, *Circus macrourus*, *Accipiter gentilis*, *Accipiter brevipes*, *Buteo rypus* *Falco cherrug*, *Falco biarmicus*, *Falco peregrinus*, *Falco subbuteo*, *Falco columbarius*, *Falco naumanni*, *Tetraogallus caspius*, *Perdix perdix*, *Ammoperdix griseogularis*, *Grus grus*, *Anthropoides virgo*, *Recurvirostra avosetta*, *Lanthococcus*, *Larus*, *Bucanetes mongolicus*, *Emberiza buchanani*, *Melanocorypha bimaculata*, *Rhodopechys sanguinea*, and *Sitta tephronota*. A small colony of *Pelecanus crispus* Brunch, which is widespread in the area, was first identified in 2011 near the Araz River. A small number of species have been evaluated from a faunistic and ecological point of view [2, 3, 5, 15, 38, 41, 45].

6. During the study of ornithofauna, 18 species with Global status, 24 species with European threat status, 24 species belonging to the Red Book of Azerbaijan were identified in the area and these species were assessed in 5 main categories (CR, EN, VU, NT and DD). 89 of the species distributed in the territory of the Autonomous Republic are Bern; 48 Ramsar, Bonn, Bern, AEWA; 4 Ramsar, Bonn, Bern; 26 Sites, Bonn, Bern; 43 Bonn, Bern; 5th Sites, Bern; 14 Ramsar, Bern; one Bonn, Bern, AEWA; Five are included in the Ramsar, Sites, Bonn, Berne conventions and the AEWA agreement. The condition of 6 species (*Pica pica*, *Corvus monedula*, *C. frugilegus*, *C. Cornix*, *Passer domesticus*, *Columa palumbus*) was not evaluated as satisfactory. Depending on the migratory status of species, *Passeriformes* - 44.15% prevail over all species. The following places

are occupied by *Caradriiformes* - 13.96%, *Falconiformes* - 10.56%, *Anseriformes* - 7.16%) and *Ciconiiformes* - 4, 52% [5,16, 19, 21, 25].

7. It was found that 16 of the 28 recorded species of Rhinoceroses, which are characteristic of the natural conditions of the area and are better adapted to these conditions, use the natural conditions of the area throughout the year and for reproduction. In terms of seasonality, the next place is taken by representatives of the group of *Ciconiiformes*. Most of the birds in the area (177 species) are species belonging to the *Passeriformes* (92 species) and *Falconiformes* (16 species). It is observed that, except for *Larus argentatus*, *L. cachinnans*, and *L. canus* species, which belonged to the larvae group for reproduction, others left the area during the autumn migration. The species belonging to the groups of *Anseriformes* (9 species), *Falconiformes* (7 species), *Caradriiformes* (7 species) and *Passeriformes* (8 species), which came for wintering, prevailed over the representatives of other groups. During the migration period, wetlands were more prevalent. Thus, the species that is well-adapted to the natural and geographical conditions of the region, are the representatives of the *Passeriformes*, *Falconiformes*, and chickens. If we look at the distribution of species according to the seasonal nature, 92 (34.72%) were found throughout the year, 85 (32.07%) came for breeding, 46 (17.36%) came for winter, and 28 (10.57%) came during migration, wintering migrants and non-breeding summer visitors were 14 species (5.28%) (5.28[1, 4, 5, 9, 10, 12, 14, 15,17, 22, 27, 29, 35].

8. When examining the mammalian fauna of the Autonomous Republic, it was found that during the study, 70 species were found in the area, which were grouped into 6 groups, 21 family, 41 specie. For the first time, the systematic structure of the class was refined. 15 of the 70 mammal species, 9 species for bats, 3 for rodents, one specie for predators, and 2 for double ungulates were rated as minority. Of the species distributed in the area, 53 are LC, 10 are NT, 5 are VUs, one is EN and one is CR [23, 24, 33, 34, 32, 36, 37,39,40,42,43, 44].

9. Due to the relatively stable ecological situation in Ordubad, Shahbuz, Araz reservoir areas during the ecological assessment in the hospitals where small species are distributed, they were included in

the Sustainable Monitoring and Progress + 1 threat category. Due to environmental conditions in Ilandag, Nehramdag, Toxic and Karagaya settlements, degradation has been attributed to different degrees of hazard category (Ilandag Important, Deterioration-2; Nehramdag Protection, 1: Dehydration and Dehydration, 3) [6, 7, 8, 46].

10. According to the results on the migration of double ungulates in Nakhchivan AR, more vertical migrations were recorded in Bezoar goats and mouflons. This is typical for summer and winter months. The distribution of animals by age and sex groups according to altitude depending on the seasons was also determined [44].

11. In many parts of the Autonomous Republic, the population of the mouflon, which is in danger of extinction due to the loss of habitat as a result of increasing human population and illegal hunting, has significantly decreased compared to the 1960s. Currently, this subspecies, with a population of 550-650, lives in three large populations, the main population of which is Nehramdag-Daridagh-Ilandagh. In other hospitals, small populations of sheep were observed [12, 33, 34].

12. Studies and general observations indicate that vertebrates can be used as favorable indicators in environmental monitoring because they are more well-established large organisms and they respond quickly and accurately to environmental disturbances in the ecosystem, including biocenosis. For this purpose, first of all, high-status species were used as indicators. The results of the environmental assessment show that since the middle of the twentieth century, the number of factors threatening biodiversity and ecosystems has increased, ecosystems have been degraded as a result of human activities, many fauna species have become extinct or their numbers have begun to decline sharply. The study of the main sources of danger has led to the conclusion that human activity, which is a more effective factor in modern times, has made it impossible for vulnerable animal species to survive without some protection measures. Excessive use of insecticides, toxins from food groups reduce the number of land vertebrates: either death or anomalies, some species are destroyed in the region due to superstitions and prejudice. Expansion of crop

rotation is one of the negative effects of the fact that the number of domestic animals per head is higher. [13,20, 28].

PRACTICAL RECOMMENDATIONS

The following system of practical suggestions has been developed taking into account the mentioned risks:

1. Prevention of harmful and polluting effects of industrial enterprises on the vertebrate fauna of the area and strict control by specialists;

2. Illegal hunting and fishing activities in the area should be controlled, with strict sanctions taken against poaching;

3. Implementation of biotechnical measures in areas where the endangered species are distributed and migrated, identification boards prepared by specialists on the biodiversity of the area should be hung in appropriate places (in English and Azerbaijani);

4. Demonstration of documentaries, creation of websites, distribution of books, brochures and posters to educate people living in the target areas where the species' habitats are declining and in crisis, and to introduce the ecological features of the species;

5. Selection of more “poor” ecosystems, unless it is necessary to destroy rich ecosystems during construction and building works;

6. Installation of special sieves to prevent the spread of river pollution into the valleys;

7. Ensuring the promotion of natural agriculture on riverbanks to protect the food chain in nature;

8. Accepted instructions must be followed in the use of harmful drugs, accidental use of insecticides and herbicides should be prevented;

9. Achieving optimal reproduction of animals by softening, reducing and minimizing the factors that negatively affect the reproduction of the species by constantly collecting all scientific data on the annual growth of few double ungulates and the mortality rate;

10. One of the factors that has a significant negative impact on the status and distribution of populations is the prevention of persistent

grazing of wild double ungulates in the grazing areas, limiting such grazing and exclusion from the grazing habitats of wild double ungulates.

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The defense will be held on 25 June 2021 at 14⁰⁰ at the meeting of the Dissertation council D.01.071 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Activity at the Institute of Zoology of Azerbaijan National Academy of Sciences

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Abstract to the necessary addresses on 24 may 2021 years sent.

Signed for print: 21.05.2021
Paper format: 60x84^{1/16}
Volume: 77836 characters
Number of hard copies: 20