

The III Edition of the "Red Book" of the Republic of Azerbaijan in solving the issue of biodiversity protection

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Due to the complexity of the natural climatic conditions, and geological relief structure, the Caucasus region, including Azerbaijan, is one of the main rich centers of biodiversity in the world. The impact of global climate change, expanding anthropogenic factors, and the fact that Armenia has exposed Azerbaijan's territories to environmental terrorism in violation of international law and conventions by 2020 have severely harmed the region's unique biodiversity. Red lists and the "Red Book" of the Republic of Azerbaijan are drawn up in accordance with the international system to save elements of biological diversity that are in danger of disappearing for one reason or another. In 2023, with the joint efforts of the Ministry of Ecology and Natural Resources and the Azerbaijan National Academy of Sciences, the third edition of the "Red Book" was published. With the liberation of Karabakh from occupation and the restoration of Azerbaijan's sovereignty, a historical opportunity has arisen for the preservation and efficient use of the biological diversity of the region, and the publications have also covered the liberated territories. The current edition of the "Red Book" includes 241 rare and endangered animals, 460 plants and fungal species. The third edition of the "Red Book" is an important contribution of the Azerbaijan National Academy of Sciences and the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, scientific institutions, scientists, and specialists to the "Year of Heydar Aliyev".

Keywords: *"Red book", flora, fauna, endangered and rare species*

Due to the variety and complexity of the natural climatic conditions and geological relief structure, the Republic of Azerbaijan occupies one of the most advanced places in the world in terms of the richness of biodiversity. Studies revealed that the country is one of the centers of the initial formation and endemism of a number of flora and fauna species [Flora of Azerbaijan; Animal World of Azerbaijan. Vertebrates, 2004; Asgarov, 2016; Ibadullayeva, Gahramanova, 2016; Mammadov et al., 2016; Talibov et al., 2021]. However, the loss of natural environments due to anthropogenic landscapes, including the expansion of urbanization and agricultural areas, the intensification of global climate changes, the strengthening of fragmentation and other negative

stress factors, has led to the disappearance of some plant and animal species, and many are facing the threat of extinction. Another serious threat to the biodiversity of Azerbaijan in the last 30 years was the occupation of 20 percent of the territory of the republic that remained under occupation until 2020 and subjected to environmental terrorism by Armenia.

As a result of the damage to natural landscapes and forest cover by the invaders and the use of prohibited weapons during military operations, contrary to a number of international conventions that the Republic of Azerbaijan joined (1993 - UN Convention on Biological Diversity: <https://www.cbd.int>; 1993 - UNESCO Convention on the Protection of the World Cultural and Natural

Heritage: <http://whc.unesco.org/en/convention>; 1998 - The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) <https://www.cites.org>; 1998 - The UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention), 1999- Convention on the Conservation of European Wildlife and Natural Habitats. (Bern Convention): <https://www.coe.int/en/web/bern-convention>; 2005- The Cartagena Protocol on Biosafety to the Convention on Biological Diversity; 2000 -The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention): <https://www.ramsar.org>; 2011 - European Landscape Convention: <https://www.coe.int/en/web/landscape>), the UN Sustainable Development Goals, and other relevant international documents and legislative acts, the unique biodiversity of the region was seriously damaged. It is encouraging that Azerbaijan has already fully restored its sovereignty over all of Karabakh's territories and that opportunities for studying the territories and protecting biodiversity have increased.

As previously stated, a combination of these or other stressors, primarily humans' exploitative attitude toward nature, leads to a decrease in species diversity, which ensures the continuation of living life on Earth, as well as the extinction of many valuable plant, fungal, and animal taxa. Realizing the gravity of the situation, progressive humanity, particularly, the scientific circles raised the alarm from the middle of the last century and managed to make the appropriate authorities respond to this dangerous process. The world community has adopted international environmental conventions, including biological diversity, and other important documents, and all possible measures have been taken to ensure their implementation. Red lists of endangered species at the international, regional, and national levels are prepared and regularly updated, and the necessary information on these lists is published in the form of official "red books" of countries and certain regions.

An appropriate system was established by the International Union for Conservation of Nature [IUCN] in 1989 to compile red and pink lists of

endangered species, to define categories and criteria for assessment, and to classify species at high risk. The Red Survey books have been used since 1994 to specify the categories and criteria of endangered species, and the lists, as well as the categories and criteria, have been updated and modified several times for over 30 years.

The Republic of Azerbaijan was not left out of the process. Preparation and publication of red lists with the support of the state, measures taken for the protection of rare and endangered species have always been in the spotlight. The most important of these measures is the regular preparation and publication of the "Red Book" of the Republic of Azerbaijan, which is an official state document on the functional status of rare and endangered species of wild animals, plants, and fungi in the territory of the republic. Like all over the world, the red list of fauna and flora includes the alpha, beta, and gamma early warning systems at diversity, species, and ecosystem levels, and also determines the direction of conservation activities.

Species of fauna and flora are included in the "Red Book" of the Republic of Azerbaijan in 2 categories: endangered and rare species.

The first category includes species whose number and range have significantly decreased and reached a crisis level as a result of the influence of some negative factors (loss and destruction of habitats). Species that tend to decrease in number and are found in small areas belong to rare species.

Animal and plant species are considered to be rare when there is no proper information about their number and reserves in nature and certain difficulties exist in organizing their protection.

Since the beginning of the 1970s, due to the purposeful policy and continuous activity of the National Leader of the Azerbaijani people, Heydar Aliyev, a large amount of work has been carried out for the restoration, reintroduction, and expansion of the population areas of a number of plant and animal species that are in danger of extinction in the country.

In the Azerbaijan SSR, by this great statesman's will, 8 very important laws on ecology, environmental protection, and efficient use of natural resources, 32 decisions of the Central Committee of the Communist Party of Azerbaijan and the Council of Ministers were adopted in 1969-1982. It is also important that the first government

decision to establish the country's "Red Book" for the protection of the rich gene fund of the flora and fauna of the Republic of Azerbaijan coincided with the period (1977) when the Great Leader led Azerbaijan.

It took 12 years to implement this decision. The "Red Book" covering the territory of the country was published for the first time during the Soviet period - in 1989 [The "Red Book" of the Azerbaijan SSR, 1989]. The second edition of the "Red Book" was prepared much later - in 2013 under the leadership of a great scientist, public and political figure, academician Jalal Aliyev, and was published in 2 volumes [The "Red Book" of the Republic of Azerbaijan. Fauna, 2013; "Red Book" of the Republic of Azerbaijan. Flora, 2013]. In 2010, the "Red Book" of the Nakhchivan Autonomous Republic was also published [Talibov, Ibrahimov, 2010].

140 rare and endangered plant species are included in the first edition of the "Red Book" of the Republic of Azerbaijan. 33 rare species included in the first edition were removed from the second edition for various reasons. The second edition of the "Red Book" describes 330 species, including 266 higher (1 species of mosses) and 20 primitive plants, 14 species of fungi.

The first edition of the "Red Book" includes 108 animal names, of which 14 are mammals, 36 are birds, 13 are reptiles and amphibians, 5 are fish, and 40 are insects. The second edition of the "Red Book" includes 223 species of animals that are rare, endangered, and in need of protection, of which 72 belong to the class of birds and 77 to the class of insects.

It is known that according to Decree No. 186 of the President of the Republic of Azerbaijan dated August 30, 1999, on the implementation of the Law of the Republic of Azerbaijan "On the Animal World", and following the Regulation adopted by the Decision No. 125 of the Cabinet of Ministers of the Republic of Azerbaijan dated July 15, 2000, the publications of the "Red Book" are organized by the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan in connection with the National Academy of Sciences of Azerbaijan. According to this regulation, the "Red Book" of the Republic of Azerbaijan must be revised and published no later than 10 years.

To remove from the list, the species that were included in the I and II editions of the "Red Book" and due to the protection measures carried out during the past period, a significant increase in the number and range of which was recorded, as well as species that had not been found in the flora and fauna of the country for a long time, while their names were on the list, besides, taking into account the serious need to add species whose numbers and distribution were significantly reduced, activities on the new – the III edition of the "Red Book" were intensified in 2019.

In this regard, to resolve the issues faced by the Azerbaijan National Academy of Sciences, the relevant decisions of the ANAS Presidium dated October 16, 2019, and January 9, 2020, were adopted, and the ANAS editorial board of the publication was formed. The editorial staff includes well-known scientists, specialists, and leaders in relevant fields.

The main issues for the III edition of the "Red Book" were planned as follows: definition of preliminary lists; collection of field materials (also herbarium for plants); clarifying the taxonomic status of rare and endangered species by evaluating them according to international and local categories and criteria; creating an electronic database; taking pictures of species and preparing distribution maps; essay writing, book design.

Taking into account the results of the discussions organized and coordinated by the Division of Biological and Medical Sciences of ANAS, the Editorial Board of "Red Book" prepared a work program covering the years 2019-2023 for the 3rd edition and approved by decision No. 8/9 of the Presidium of ANAS dated February 14, 2020. Local and international experience, the experience of the CIS countries and Turkey were taken into account in the preparation of the program.

All possible activities in the implementation of the work program were carried out by the relevant editorial staff of ANAS, working groups made up of scientists and specialists of the institutes of Botany, Zoology, Dendrology, Nakhchivan Bioresources, the Central Botanical Garden, and other scientific research and educational institutions. The preparation, verification, and clarification of the status of the red lists of plants, fungi, and animals were carried

out within the framework of both thematic plans of the institutes and national strategies and action plans adopted several times over the past 20 years for the protection and sustainable use of biological diversity in the republic.

Following the "Regulations on the "Red Book" of the Republic of Azerbaijan", on October 16, 2020, an agreement was signed between the Azerbaijan National Academy of Sciences and the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan on cooperation and division of labor regarding the third edition. In 2019-2021, the editorial staff and working groups of ANAS operated under the strict supervision of the Division of Biological and Medical Sciences of ANAS.

The work of the groups was led by the director general of the Institute of Botany, MSE AR, doctor of biological sciences, Professor Sayyara Ibadullayeva and the department head of the institute, doctor of biological sciences Aydin Asgarov, acting director of the Institute of Zoology, MSE AR, doctor of philosophy in agricultural sciences, Associate Professor Aladdin Eyvazov, executive director of the same institute, doctor of biological sciences, Associate Professor Elshad Ahmadov.

Regularly meetings were held at scientific research institutions of DBMS and Bioresources Institute of Nakhchivan Department of ANAS (currently these institutes are included in the structure of the Ministry of Science and Education of the Republic of Azerbaijan), Baku State University, Ganja State University, the representative office of the World Wildlife Fund for Nature (WWF) in Azerbaijan, in the Azerbaijan Ornithological Society with the involvement of botanists and zoologists working in other scientific and educational institutions, extensive discussions were held, existing plans were clarified, and decisions were made. Most of the meetings were attended by employees of the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, and in several meetings, the Minister of Ecology and Natural Resources Mukhtar Babayev, and other responsible persons participated.

Relevant seminars and training courses were also held during the past period, considering the need for specialists to become familiar with

international experience and acquire deeper knowledge regarding the evaluation of the species planned to be included in the III edition of the "Red Book" of the Republic of Azerbaijan according to the categories and criteria of the IUCN Red List. In this regard, the training course organized jointly by the Azerbaijani representative office of the WWF and the Institute of Zoology, on October 17-19, 2022, should be especially mentioned. Commission member of IUCN, ecologist Dr. Andrew Rodrigues was invited to the course, where members of the working groups of various organizations (Ministry of Ecology and Natural Resources of the AR, Institutes of Botany and Zoology, etc.) involved in the preparation of the III edition of the "Red Book" participated.

The three-day training covered topics, including the process of determining taxonomic ranks and categories, diversity and uniqueness, the nature of categories, the role of various criteria, protective measures in the process of compiling the Red List, completeness of data, the importance of scientific results and predictions, ecological importance and interactions between species, rules for using imprecise data for taxon assessment, scaling issues, taxon assessment at the global, regional or national level, taxon mapping across geographical areas, etc.

On November 22, 2022, the relevant decision of the ANAS Presidium regarding the new structure of the Editorial Board of the III edition of the "Red Book" was adopted. Academician Isa Habibbayli, the president of ANAS, was appointed the chairman of the editorial board by ANAS. The person responsible for the scientific development of the book and the editors responsible for flora and fauna were also mentioned in the decision.

Activities on the third edition of the "Red Book" of the Republic of Azerbaijan, large-scale scientific research was carried out on the basis of a program developed by botanic and zoological scientists and specialists of Azerbaijan, taking into account local and international experience and involving modern research methods.

First, the meetings of the Editorial Board of the "Red Book" and the working groups created in the Institutes of Botany and Zoology of the MSE AR were held, taking into account the studies and literature data of the last years, as well as the previous editions of the book, rare and endangered

plants were selected for inclusion in the III edition, approximate lists of fungi and animal species have been prepared again. At the meetings, proposals for delisting species that have lost conservation importance and inclusion of endangered species were discussed. The general decisions were made based on the broad geography, taxonomy, morphology, and other characteristics of each species, as well as the global general knowledge of experts on that species.

Then, with the help of scientific monitoring carried out in all regions of the republic along the research routes, the current status of rare and endangered plant, fungal, and animal species, their population structure, composition, and number of individuals, and their distribution were clarified, and areal maps were drawn up.

Based on the compiled lists, information about the populations of species in their distribution areas, including GPS coordinates, was collected based on common descriptors. In order to determine the factors of external influence, the monitoring was carried out according to the bioecology of the respective species and the seasons. Unlike the previous two editions of the "Red Book", this time, on the basis of the collected data, species were evaluated according to the categories and criteria of the International Union for Conservation of Nature (IUCN).

In multidisciplinary studies, modern information and computer technologies, aerospace data, mathematical and statistical modeling methods were widely used in predicting changes in priority plant, fungal, and animal species and developing future scenarios.

A large volume of scientific and technical information collected during the 4-year research period, some of which fell into the period of the COVID-19 pandemic and quarantine, was analyzed and processed, the relevant materials were translated into English and the third edition of the "Red Book" was compiled, and text, maps, and images were edited.

In the book's layout, each target species is described on one page. This page reflects the results of the international and national assessment according to the IUCN categories and criteria, the description of the species, bioecological characteristics, distribution, limiting factors, existing and proposed conservation measures (the

last 4 indicators are also given in English). A photo of the species on the page and a distribution map provide visibility. Information about the description of the species, bioecological characteristics, and distribution are confirmed with references to relevant literature sources.

Limiting factors for most species include mainly anthropogenic (overharvesting, hunting and grazing, expansion of anthropogenic landscapes, fragmentation, use of herbicides, etc.), and partly natural and semi-natural factors (climate changes, mass impact of pests and invasive species, etc.).

It is known that the territories occupied by Armenia for up to 30 years were not sufficiently reflected in the second edition of the "Red Book" of the Republic of Azerbaijan. Because it was impossible to carry out any research, monitor, and determine the real situation of rare and endangered species and their populations in the region. Rare pearls of nature included in the "Red Book" of the Republic of Azerbaijan and the "Red List" of the International Union for Conservation of Nature were destroyed, medicinal plants were collected, and valuable dendroflora samples (Oriental sycamores (*Platanus orientalis* L.), red oak (*Quercus rubra* L.) included in the "Red Book" were cut and transported away. The fate of the flora and fauna diversity of the specially protected natural areas with an area of 43 thousand hectares - Basitchay and Garagol state nature sanctuaries, Arazboyu, Lachin, Gubadli, and Dashalti state nature reserves included in the "Red Book" of the Republic of Azerbaijan was questionable.

After the liberation of our lands under the leadership of Commander-in-Chief, President Ilham Aliyev, and thanks to the bravery of the Azerbaijani soldier, it was possible to involve the region in research on the III edition of the "Red Book".

One of the main topics of the international conferences organized by the Division of Biological and Medical Sciences of ANAS in 2021-2022 and held with great success ("Biodiversity, land, and water resources of Karabakh: past, present and future", May 20-21, 2021; Karabakh- II International congress of applied sciences dedicated to Victory Day and the dear memory of our martyrs, November 8-10, 2021; " "Biodiversity, soil and water resources of

Shusha and adjacent territories: a look into the future”, September 22-23, 2022), was related to the red lists of the Karabakh region, rare and endangered species, and the problems of their protection.

Fifteen species of the fauna of Karabakh, always distinguished by its richness, had been included in the second edition of the "Red Book" of the Republic of Azerbaijan. In the territories occupied by Armenia for nearly 30 years, 56 species of insect fauna are rare, endemic, and in danger of extinction. It should be noted that most of them are beneficial insects.

There are 12 species of fish that were once widely used in the diet of the local population in the internal water basins of Karabakh, 7 of which are included in the Red List of the IUCN along with the II edition of the "Red Book".

The fauna of birds in the Lesser Caucasus was particularly rich. Until 1993, 288 species of birds belonging to 16 orders and 57 families were registered in the territory of Karabakh (for comparison, there are 407 species of birds belonging to 19 orders and 65 families in the territory of Azerbaijan). Of these, 50 species were included in the second edition of the "Red Book".

Before the occupation, 64 species of mammals belonging to 6 orders (115 in Azerbaijan) were recorded in the territory of Karabakh. Some of them are included in the Red List of the International Union for Conservation of Nature, as well as in all editions of the "Red Book" of the Republic of Azerbaijan.

Many of the 266 rare and endangered species of higher plants described in the first two editions of the "Red Book" of the Republic of Azerbaijan, including a number of species endemic to the region, such as khari bul bul, platanus, and oak are found in Shusha and the surrounding areas.

Our scientists worked selflessly in the expeditions conducted for the exploration of the flora and fauna samples included in the "Red Book" in the territories freed from occupation.

Sayyara Ibadullayeva, director general of the Institute of Botany, MSE AR employees of the institute, PhD in biology Nuri Movsumova, PhD in physics and mathematics Elman Yusifov, head of the laboratory of the Institute of Zoology of MSE AR, PhD in biology Tavakkul Iskanderov, researcher Elshad Asgarov, head of the laboratory

of the Institute of Microbiology, doctor of biological sciences, professor Elman Isgandar, other scientists and specialists conducted research in separate areas of the region cleared of mines.

Red kite (*Milvus milvus* L., 1758), Mehely's horseshoe bat (*Rhinolopus meheli* Matschie, 1901), European free-tailed bat (*Tadarida teniotis* Raf., 1814; In Azerbaijan, it was recorded only in the Shusha valley), Olivier's agama (*Trapelus ruderatus* Olivier, 1804), Eastern rock-nuthatch (*Sitta tephronota* Sharpe, 1872), Karabakh tulip (mountain tulip) (*Tulipa karabachensis* Grossh.), Karabakh psephellus (*Psephellus karabaghensis* Sosn. (= *Centaurea karabaghensis* (Sosn.) Sosn.); recorded only around the city of Khankendi), Caucasian zelkova (*Zelkova carpinifolia* (Pall.) Dippel), Alcea (*Alcea sachsachanica* Iljin), Pulsatilla (*Pulsatilla violacea* Rupr.), Shusha astragalus (*Astragalus schuschaensis* Grossh.), Steppe peony (*Paeonia tenuifolia* L.; found only in Zangilan, Basitchay State Nature Reserve), Orange day-lily (*Hemerocallis fulva* (L.) L.), and dozens of other animal and plant species related to fauna and flora of the Karabakh territory have been included in the third edition of the "Red Book".

Decisions made and implemented, numerous measures, purposeful work, conducted expeditions and camera studies, high attention and control of the management over the entire process gave positive results, and the III edition of the "Red Book" was elegantly published.

The current edition of the "Red Book" includes 241 rare and endangered species of fauna (152 vertebrates, 89 invertebrates; 39 mammals, 78 birds, 18 reptiles, 11 fish, 7 aquatic invertebrates, 82 insects, 6 amphibians) and 460 species of flora (423 plants: 383 higher plants, 15 higher with spores, 6 mosses, 14 lichens, 5 algae; and 37 fungi).

CONCLUSION

In conclusion, it is important to note that a large creative team worked on the third edition of the "Red Book" of the Republic of Azerbaijan. The book was created thanks to the great and hard work of the editorial staff, working groups, the institutes of Botany, Zoology and Dendrology, Ministry of Science and Education of the Republic of

Azerbaijan (MSE AR), Baku State University, Nakhchivan Institute of Bioresources of the MSE AR, Ganja State University, Azerbaijan Society of Ornithologists, Central Botanical Garden, etc., researchers of organizations in relevant fields, dozens of compilers, experts in information technologies, design, mapping, translation, editing, etc. The publication is dedicated to the "Year of Heydar Aliyev" marked by the Decree of the President of the Republic of Azerbaijan dated September 29, 2022, and is a valuable contribution of the creative team to the glorious jubilee.

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